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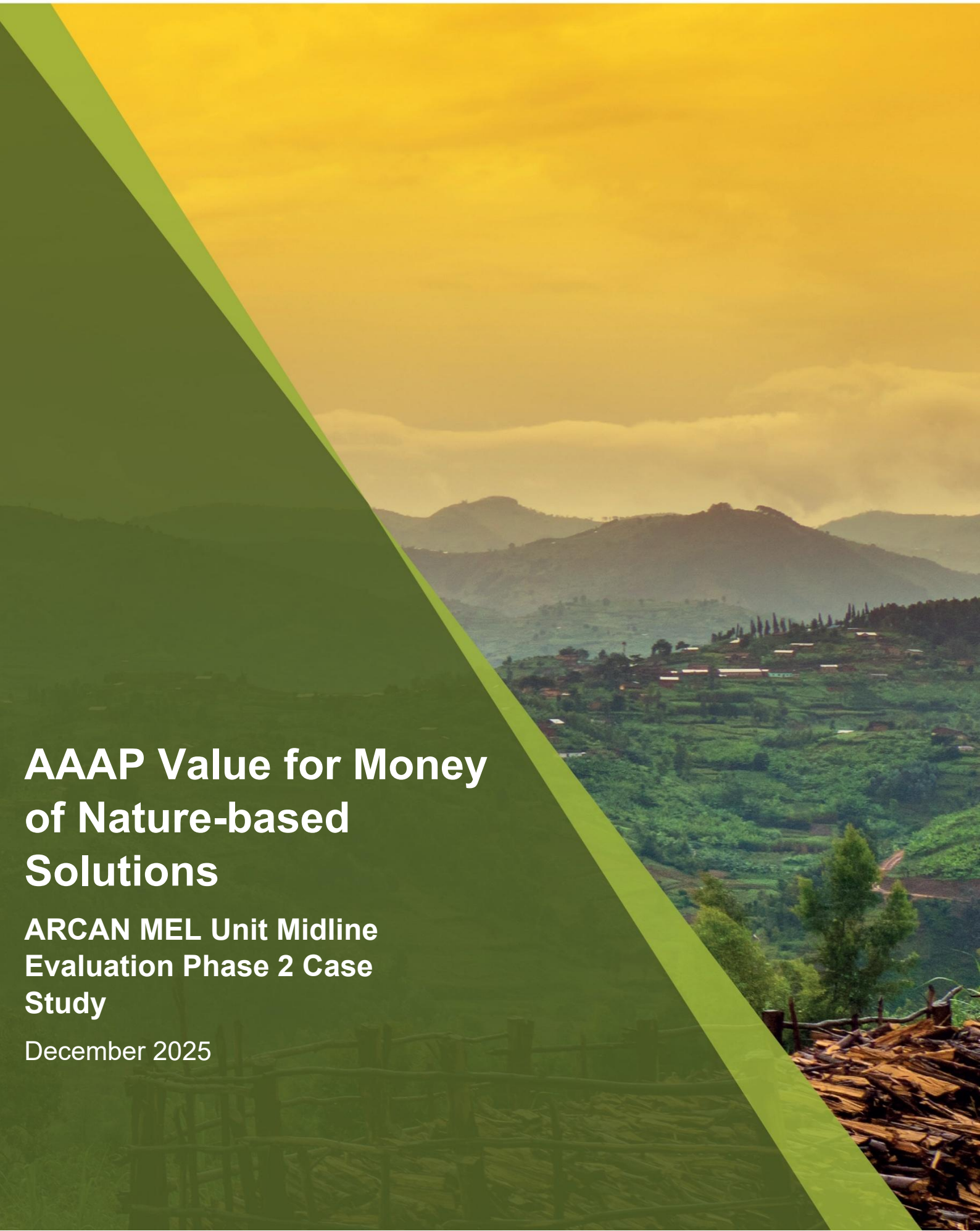

AAAP Value for Money of Nature-based Solutions

ARCAN MEL Unit Midline Evaluation Phase 2 Case Study

December 2025

Contents

Acronym List

Acronym	Definition
AAAP UFF	Africa Adaptation Acceleration Programme Upstream Financing Facility
ARCAN	Africa Regional Climate and Nature Programme
BCG	Boston Consulting Group
BCR	Benefit-Cost Ratio
CA	Conservation Agriculture
CBA	Cost-Benefit Analysis
CBO	Community-Based Organisation
DSO	Designated Safeguarding Officers
GCA	Global Center on Adaptation
EQ	Evaluation Question
FCDO	UK Foreign, Commonwealth and Development Office
FGD	Focus Group Discussion
GDPR	General Data Protection Regulation
ICF	International Climate Fund
IFI	International Financial Institution
IMF RSF	International Monetary Fund's (IMF) Resilience and Sustainability Facility (RSF)

IP	Implementing Partner
IRR	Internal Rate of Return
KII	Key Informant Interview
KPI	Key Performance Indicator
MDB	Multilateral Development Bank
NbS	Nature-based Solutions
NDC	Nationally Determined Contribution
NGO	Non-Governmental Organisation
NPV	Net Present Value
O&M	Operations & Maintenance
OECD DAC	The Organisation for Economic Co-operation and Development's Development Assistance Committee
PAD	Project Appraisal Document
PPP	Public-Private Partnership
TA	Technical Assistance
TIRP 2	Second Tanzania Intermodal and Rail Development Project
ToC	Theory of Change
TRC	Tanzania Railway Corporation
TTL	Task Team Leaders
UFF	Upstream Financing Facility
VfM	Value for Money
WB	World Bank

Acknowledgements

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The case study was led by Gil Yaron (Evaluation Lead), with support from Marleen Verhagen (ARCAN MEL Climate Finance and Policy Pillar Lead Analyst). We would like to thank GCA for facilitating interviews.

Executive Summary

This case study was conducted as part of the second phase of the Midline Evaluation of the Africa Regional Climate and Nature Programme (ARCAN), commissioned by the UK's Foreign, Commonwealth and Development Office (FCDO). Our area of interest is the Africa Adaptation Acceleration Programme (AAAP) Pillar 2: Infrastructure and Nature-based solutions and we focus specifically on the added value of the GCA use of Nature-based Solutions (NbS) to increase the climate resilience of infrastructure. We do this by analysing GCA's work in support of the USD 200m World Bank-funded Second Tanzania Intermodal and Rail Development Project (TIRP 2) - a major rail infrastructure project with links to agriculture and water sectors.

Research for the case study has consisted of document review and semi-structured interviews with key informants in September and October 2025. Specifically, we have reviewed all GCA-produced reports relevant to the TIRP 2 project, the World Bank TIRP 2 Project Appraisal Document, the AAAP 2024 Results Report and 2025 Semi-Annual Progress Report as well as the external evaluation of the AAAP Upstream Financing Facility (UFF) (August 2025) by the Boston Consulting Group, as commissioned by GCA. Semi-structured interviews have been conducted in-person and remotely with GCA staff of the Infrastructure and NbS team, and remotely with representatives of the Tanzania Railway Corporation and the World Bank.

We are grateful to GCA for their time and effort in providing evidence, reviewing this report and engaging in constructive discussion around our findings and recommendations.

Key Findings

GCA's analyses in support of making the TIRP 2 project climate resilient are highly relevant considering the severe climate challenges Tanzania faces generally as well as the specific risks these pose to its infrastructure network in particular. The recent external evaluation of AAAP conducted by BCG similarly concludes that the work under AAAP's Pillar 2: Infrastructure and NbS is generally highly relevant to the adaptation priorities of the countries it works with.

GCA's support to the TIRP 2 project is coherent with other national and sectoral initiatives in Tanzania. The TIRP 2 project forms part of a wider effort by the Government of Tanzania, the World Bank and other development partners to address Tanzania's central railway infrastructure bottlenecks to improve its economic growth potential and transit function regionally.

Our findings are consistent with the recent evaluation of AAAP confirming external coherence of AAAP's Infrastructure and NbS Pillar work but identifying a need to strengthen internal coherence with other AAAP pillars. A TIRP 2-specific example includes the potential for increased alignment between AAAP's Infrastructure and NbS and Food Security Pillars – particularly relevant in light of the proposal for conservation agriculture as a nature-based solution towards enhancing the Dar es Salaam-Isaka railway corridor's climate resilience.

Adding NbS improves Value for Money (VfM). This result is demonstrated by the systematic comparison of options with/without NbS under alternative plausible weather-related hazard parameters. GCA has used innovative thinking and strong technical capacity to demonstrate that using NbS for the bulk of events and grey infrastructure for the extremes minimises total cost for a given protection level.

GCA economic analysis supports using NbS although it systematically overstates net benefits. The proposed climate resilient options for TIRP 2 show high potential for delivering VfM. The adaptation measures identified by GCA could unlock a Net Present Value (NPV) of ~$125 million, Benefit to Cost ratio (BCR) of 5:1 and an internal rate of return (IRR) of ~24%, once the adaptation measures are in place. However, these are very likely to overstate net benefits. This is because very large crop productivity benefits of conservation agriculture for farmers in catchments above flood prone areas are included whereas the costs of supporting smallholders to switch to conservation agriculture (CA) are not. These costs are non-trivial, occur at the start of the intervention and will reduce NPV. The (comparatively small) costs of GCA technical assistance are also not included. Nonetheless, NbS remain economically attractive even with these additional costs.

Conservation agriculture is a NbS but it is also a well-established development intervention and the GCA study findings would be strengthened by including community-based development expertise from the

outset. While there is good evidence that conservation agriculture can significantly improve crop yields in Tanzania, the literature also suggests that getting farmers to make this switch requires considerable support. For example, a recent comparison of conventional and conservation agriculture in the Dodoma region of Tanzania found less than 5% of farmers switching to conservation agriculture on their whole farm due to the time required to see significant gains and various practical constraints. Claiming significant benefits from a switch to conservation agriculture (the key NbS) without explaining *how* this will be delivered weakens the credibility of the CBA. Integrating upstream CBA estimates with downstream practical experience would strengthen these results.

The GCA report on carbon finance opportunities for Tanzania's railways – GCA (2025d) – is a well-executed think piece to raise awareness of the potential value of NbS but the chances of uptake would be increased by working with existing private and NGO actors active in the voluntary carbon market in Tanzania as well as trying to sell this idea to additional World Bank teams and Tanzanian institutions.

GCA has provided excellent technical assistance, but the "opportunistic" bespoke model to **add climate resilient infrastructure and NbS to IFI project design constrains effectiveness and sustainability.** Regarding GCA support to TIRP 2, stakeholders praised the quality of the TA provided noting that they got the "A team", whereas they felt some commercial providers had sent their "C team" to Africa. The GCA offer is based on technical strength and a strong understanding of policy context. Despite this, the "opportunistic" short-term consultancy-based model makes it difficult to reach from upstream to downstream influence. The implicit assumption in moving from short-term to longer-term intermediate outcomes and final outcomes is that influencing an investment design document will translate to implementation. However, providing excellent upstream technical assistance where opportunities arise has value but will not be sufficient to influence implementation. This is likely to require additional downstream engagement and a more strategic approach to assignments taken.

GCA will need a more strategic focus to secure this downstream engagement. In this case, the World Bank TIRP 2 Project Appraisal Document (PAD) pre-dated AAAP support and GCA was brought in for design options to address flooding hotspots along the 120-km Igandu–Kilosa section of railway. The PAD itself, has a broad perspective, involving transport, agriculture and water sectors. Implementing any NbS for improved flood resilience will require working with stakeholders from all of these sectors at a catchment level. Hence, there would be far more opportunity for translation of climate resilience if GCA had been integrated into the PAD at the outset, with local partnerships that allowed support to implementing stakeholders.

Adding NbS to rail infrastructure will be transformational for Tanzania if carried through to implementation. However, we are currently at the start of this process and GCA is not institutionally embedded in the pathway to impact. Currently, AAAP's ability to create incentives for others to act is classified as an early signal of progress towards transformational change.

Recommendations

1. **GCA will need a more strategic focus to secure this downstream engagement. A more strategic approach by GCA will involve securing engagement and partnerships at the outset and longer-term involvement to improve the chances of influencing implementation**. It may require turning away opportunities for short-term TA in favour of longer-term projects. This approach will also require GCA service providers to have a wider set of capabilities and to involve local NGO/CBO partners as well as working with government institutions across sectors. **– Recommendation for GCA**

2. **Situate proposed NbS interventions within a broader development impact pathway to identify key partners, necessary associated interventions and critical assumptions for downstream uptake. This is likely to require adding community-based development expertise to technical teams**. GCA is already strengthening their offering by using tools co-developed with the University of Oxford to identify larger scale adaptation solutions before developing climate risk assessments and bringing stakeholders together with masterclasses. There is scope to make this broader focus more systematic. **– Recommendation for GCA**

3. **Ensure that the cost-benefit analysis for NbS include costs of securing behaviour change to switch to conservation agriculture (or other NbS) as well as benefits. – Recommendation for GCA and practitioners in general.**

4. **GCA economic cost-benefit analysis should include reasonable preparatory costs, as a sensitivity test at a minimum. – Recommendation for GCA and practitioners in general.**

1.0 Introduction

This case study has been conducted as part of the second phase of the Midline Evaluation of the Africa Regional Climate and Nature Programme (ARCAN), commissioned by the UK's Foreign, Commonwealth and Development Office (FCDO). The Midline Evaluation of the ARCAN portfolio has been delivered by the ARCAN MEL Unit and focuses on assessing progress across ARCAN's five thematic pillars. The Midline Evaluation aims to generate actionable learning on how programme results can be sustained and scaled, contributing to their potential to further systemic change. Findings might be relevant for ARCAN's implementing partners, the FCDO as well as other actors in the wider climate and development space working on related themes.

The focus of this case study is the Africa Adaptation Acceleration Programme (AAAP), which falls under ARCAN's Climate Finance and Policy Pillar. The AAAP is implemented by the Global Center on Adaptation (GCA) and includes four pillars, of which two are funded by the FCDO: the Infrastructure and Nature-based Solutions Pillar, and the Climate Finance Pillar. The case study focuses on AAAP Pillar 2: Infrastructure and Nature-based solutions and assesses the added value of the GCA use of Nature-based Solutions (NbS) to increase the climate resilience of infrastructure. It does this by analysing GCA's work in support of the World Bank-funded Second Tanzania Intermodal and Rail Development Project (TIRP 2) as an example.

The TIRP 2 is a 200 million USD World Bank credit to the United Republic of Tanzania, and the Project Appraisal Document (PAD) was approved in March 2024. TIRP 2 is a major rail infrastructure project with links to agriculture and water sectors[1]. Early implementation of the PAD requires more detailed design work, and this provided an opportunity for GCA input. GCA has produced a number of reports[2] to support the detailed design of the TIRP 2 project in 2024 and 2025.

The ARCAN MEL Unit case study on AAAP's support to TIRP 2 complements the external programme-level evaluation of AAAP completed by the Boston Consulting Group in August 2025 through its more in-depth assessment of the VfM of Nature-based Solutions in particular. Whereas the BCG evaluation has included the GCA TIRP 2 study also as an example to illustrate VfM of the AAAP Infrastructure and NbS pillar, the analysis is conducted at a less detailed level (e.g. no distinction is made between NbS (green) and traditional (grey) adaptation solutions) – which has led to a more aggregate (and less accurate) assessment of net benefits. The ARCAN MEL Unit case study simultaneously draws on the BCG evaluation to contextualise its findings within a broader pillar- and programme-level perspective, e.g. with regard to the relevance and likelihood of sustained uptake of AAAP's advisory work.

2.0 Approach and Methodology

2.1 Case Study Evaluation Questions

The case study seeks to address the following evaluation questions:

[1] https://documents1.worldbank.org/curated/en/099031124192536375/pdf/BOSIB12798c0d00d11b16217e34f437defa.pdf

[2] Climate-resilience and Adaptation Options for the Second Intermodal and Rail Development Project (Tanzania): Site Assessment and Multi-Stakeholder Engagement Brief (April 2024); Climate-resilience and Adaptation Options for Joint Standard Gauge Railway (Tanzania Burundi) and Second Intermodal and Rail Development Project (Tanzania): Climate Hazard Screening Report (March 2024); Climate-resilience and Adaptation Options for the Second Intermodal and Rail Development Project (Tanzania): Climate Stress-Test and Vulnerability Report (October 2024); Climate-resilience and Adaptation Options for the Second Intermodal and Rail Development Project (Tanzania): Adaptation and Resilience Investment Options and Financing Rationale Report (March 2025); Climate-resilience and Adaptation Options for the Joint Tanzania-Burundi Standard Gauge Railway Project and Second Intermodal and Rail Development Project in Tanzania: Technical Guidelines for Climate Resilient Rail Infrastructure (March 2025); Greening Tanzania's Railways: Leveraging Nature-Based Solutions for Climate Resilience and Carbon Finance: Integrating Reforestation, Agroforestry, and Westland Restoration Along Railway Corridors to Mitigate Climate Risks and Unlock Carbon Credit Revenues (May 2025).

EQ1: What is the added value of the GCA approach of using NbS for climate resilient infrastructure?

EQ1.1: How does adding NbS improve VfM?

EQ1.2: What lessons can be learned on producing synergies by joining up World Bank agriculture and infrastructure work?

EQ1.3: What factors will make it feasible for GCA estimates of carbon finance to pay for maintaining adaptation?

EQ2: What strategies can GCA use to increase the likelihood of their infrastructure work delivering transformational change?

EQ2.1: How can implementation plans be built into projects?

EQ2.2: What What lessons can be learned on building strategic partnerships to support implementation?

The evaluation questions and sub questions are answered using the TIRP 2 project as an example but are intended to inform GCA's work more broadly – with a specific focus on its activities under AAAP Pillar 2: Infrastructure and NbS. As project implementation is at a very early stage and detailed design work is on-going, it was not possible to model probabilities associated with each stage of the proposed impact pathway. Hence, we have taken a more qualitative approach for EQ2[3].

FCDO travel advice in the run-up and aftermath of the Tanzanian election also meant that a proposed in-country visit could not be undertaken. This is discussed under limitations below.

2.2 Research Design

2.2.1 Data Collection Methods

Research for the case study has consisted of document review and semi-structured interviews with key informants in September and October 2025. Specifically, we have reviewed all GCA-produced reports relevant to the TIRP 2 project, the World Bank TIRP 2 Project Appraisal Document, the AAAP 2024 Results Report and 2025 Semi-Annual Progress Report as well as the external evaluation of the AAAP UFF (August 2025) by the Boston Consulting Group, as commissioned by GCA.

Semi-structured interviews have been conducted in-person and remotely with GCA staff of the Infrastructure and NbS team, and remotely with representatives of the Tanzania Railway Corporation and the World Bank.

We are grateful to GCA for their time and effort in providing evidence, reviewing this report and engaging in constructive discussion around our findings and recommendations.

2.2.2 Data Analysis

Data analysis followed a structured process using the case study's evaluation matrix as a framework, combined with the signals of transformational change framework specifically developed for AAAP by the ARCAN MEL Unit (included as Annex 5). Triangulation across different sources was followed to test validity of claims and ensure a comprehensive analysis leading to balanced findings.

[3] This is a slight deviation from the original ToR for this case study (attached as Annex 1). The original ToR intended to use probabilistic modelling based on steps along the impact pathway to make an assessment of the estimated net benefit of the project, However, due to the very early stage of the project, this was not possible. Preparations for implementation are currently being discussed between the various stakeholders involved and the specific steps of the implementation pathway are yet to be defined.

2.2.3 Limitations

We planned to conduct in-country interviews in Tanzania as part of the case study research, but this proved challenging logistically. The plan was to use snowball sampling from these initial interviews for follow-up interviews, yet this was not feasible within the case study timeframe. However, we were able to interview sufficient key informants from the GCA team (3), the Tanzania Railway Corporation (1) and World Bank (2). We have also triangulated findings from the limited number of KIIs with detailed evidence from document reviews, including an independent evaluation of AAAP[4]. These KIIs combined with in-depth review of both project and programme documentation have allowed us to address the case study's evaluation questions with a high degree of confidence.

3.0 Findings

3.1 Relevance

GCA's analyses in support of climate-proofing the TIRP 2 project are highlight relevant considering the severe climate challenges Tanzania faces generally as well as the specific risks these pose to its infrastructure network in particular. Tanzania is characterised by significant and varied climate risks with considerable current and future expected impacts on its infrastructure network, related goods and services availability as well as on the health and well-being of its population. In addition, the economic costs incurred as a result of climate-related disasters are already significant currently and expected to rise further in line with the increasing need for large-scale adaptation action. Climate resilience measures are currently implemented inadequately in Tanzania generally, including in the transport sector, which causes both connectivity issues as well as substantial economic losses. Tanzania is also situated at a strategic location, making its transport network not only essential within its own national context – but also a pivotal gateway for the six landlocked countries it shares a border with. Disruptions to its transport system thus have significant implications for the immediate connections to and longer-term development potential of these areas. Among the various climate risks identified, flooding presents the highest risk to the transport sector in Tanzania, leading to damages, disruptions and delays and negative social and economic impacts as a result[5]. As such, GCA's technical assistance to the implementation of the TIRP 2 project to enhance the climate resilience of the railway – and its Kilosa – Igandu section specifically, which is particularly vulnerable to flooding – through grey and green adaptation solutions[6], is highly relevant in the wider context of Tanzania's climate vulnerability as well as in light of the specific challenges this poses to the transport sector in particular.

The recent external evaluation of AAAP conducted by BCG similarly concludes that the work under AAAP's Pillar 2: Infrastructure and NbS is generally highly relevant to the adaptation priorities of the countries it works with. Reliable infrastructure systems are crucial to further Africa's development potential. GCA's efforts to enhance critical infrastructure's resilience aim to contribute to their continued functioning under future climate scenarios[7]. Acknowledging well-functioning infrastructure as a pivotal enabler to wider socio-economic development, GCA's work under its Pillar 2 – including its support to the TIRP 2 project – is highly relevant to partner countries' needs in both the immediate and longer term, and increasingly so as long as climate risks continue to rise for the African continent.

3.2 Coherence

GCA's support to the TIRP 2 project is coherent with other national and sectoral initiatives in Tanzania. The TIRP 2 project forms part of a wider effort by the Government of Tanzania, the World Bank and other

[4] Boston Consulting Group (2025)
[5] Project appraisal document on a proposed credit in the amount of US$200 million to the United Republic of Tanzania for a second Tanzania intermodal and rail development project, The World Bank, March 2024.
[6] Grey infrastructure refers to traditional engineering solutions. Green solutions or NbS sustainably manage and restore natural systems to maintain healthy ecosystems and promote resiliency, as well as reducing the impact of anticipated negative effects of climate change.
[7] BCG (2025), External evaluation of the Africa Adaptation Acceleration Program (AAAP) Upstream Financing Facility.

development partners to address Tanzania's central railway infrastructure bottlenecks to improve its economic growth potential and transit function regionally. TIRP 2 is also aligned to Tanzania's National Transport Policy that aims to develop a reliable and efficient transport network; integrating sustainability as an integral element of all transport planning, implementation as well as operations and maintenance efforts. TIRP 2 as well as GCA's support to it are well-aligned with Tanzania's Nationally Determined Contribution (NDC), which prioritises climate-proofing of critical infrastructure and the promotion of low-emission transport, including through investments in its rail networks. Similarly, they are in line with Tanzania's National Climate Change Response Strategy (2021-2026) that emphasises the importance of climate resilient infrastructure for reducing service disruptions and resulting economic losses[8]. Additionally, GCA's support to TIRP 2 is coherent with its efforts towards an increased emphasis on NbS as a means to enhance infrastructure resilience throughout the region more generally. Whereas grey adaptation solutions have traditionally received more focus, GCA explicitly seeks to promote hybrid as well as exclusively nature-based adaptation solutions due to their perceived potential for long-term cost effectiveness and the production of co-benefits.

Our findings are consistent with the recent evaluation of AAAP confirming external coherence of AAAP's Infrastructure and NbS Pillar work but identifying a need to strengthen internal coherence with other AAAP pillars. Examples of this include the potential for enhanced alignment with AAAP's Locally-led Adaptation sub-pillar, which could contribute to ensuring that infrastructure investment solutions are in line with community-level (adaptation) priorities[9] – an aspect assumed to be conducive to their long-term effective implementation. A TIRP 2-specific example includes the potential for increased alignment between AAAP's Infrastructure and NbS and Food Security Pillars – particularly relevant in light of the proposal for conservation agriculture as a nature-based solution towards enhancing the Dar es Salaam-Isaka railway corridor's climate resilience.

3.3 Efficiency and VfM

EQ1: What is the added value of the GCA approach of using NbS for climate resilient infrastructure?

EQ1.1: How does adding NbS improve VfM?

Adding NbS improves VfM. This result is demonstrated by the systematic comparison of options with/without NbS under alternative plausible weather-related hazard parameters. GCA has used innovative thinking and strong technical capacity to demonstrate that "…over a 30+ year infrastructure life cycle, NbS investments can have very attractive returns when bundled with carbon credits. The comparative analysis likely will show that for moderate flood events (e.g. <10-year return period), NbS can nearly eliminate damage at a fraction of the cost of grey measures, whereas for the most extreme events (>100-year), grey measures might still be needed as a fail-safe. Thus, a cost-effective strategy is to use NbS for the bulk of events and grey for the extremes – this minimizes total cost for a given protection level." (GCA, 2025d, p35)[10].

GCA economic analysis supports uptake of NbS although it systematically overstates net benefits. The proposed climate resilient options for TIRP 2 show high potential for delivering Value for Money (VfM). The adaptation measures identified by GCA could unlock an NPV of ~$125 million, BCR of 5:1 and an IRR of ~24%, once the adaptation measures are in place. However, these are very likely to overstate net benefits. This is because very large crop productivity benefits of conservation agriculture for farmers in catchments above flood prone areas (option 1.2 for flood control in GCA (2025)) are included[11] whereas the costs of supporting smallholders to switch to conservation agriculture (CA) are not. Farmers face higher financial costs when adopting CA, particularly in the early years of transition[12]. A broader economic analysis should also account for "the need

[8] Project appraisal document on a proposed credit in the amount of US$200 million to the United Republic of Tanzania for a second Tanzania intermodal and rail development project, The World Bank, March 2024.
[9] BCG (2025), External evaluation of the Africa Adaptation Acceleration Program (AAAP) Upstream Financing Facility.
[10] Greening Tanzania's Railways: Leveraging Nature-Based Solutions for Climate Resilience and Carbon Finance, GCA, May 2025
[11] "Option 1.2 presents a very high net benefit, which is driven by crop productivity gains (1.24 Billion USD) through contour farming." GCA (2025b) p17
[12] FAO & UNDP. 2020. Conservation agriculture for climate change adaptation in Zambia: A cost-benefit analysis. Rome, FAO.

for targeted extension support, financial provision such as input subsidies and low-interest credit schemes to ease the financial burden on smallholder farmers, additional structured knowledge dissemination."[13] The (comparatively small) costs of GCA technical assistance are also not included (see below). The literature on CA introduction in Sub-Saharan Africa suggests these changes would reduce the BCR and IRR but the interventions would remain economically attractive. We do not have access to the model used for economic analysis of the various climate resilient infrastructure options but a number of parameters as well as results for the CA option are given in GCA (2025). To better understand what difference it would make to the viability of this NbS if we add realistic costs to encourage farmers to adopt CA, we have constructed a financial model based on:

1. A review of the literature on CA in sub-Saharan Africa to identify the minimum year 1 payment required to encourage adoption14. Summary results are shown in Table 1 below.
2. The reported crop mix, prices, yield gains and costs for the CA intervention in GCA (2025), supplemented by external evidence sources and some clearly stated assumptions. These are given in Annex 8.

GCA (2025) report net present value (NPV) of USD 1111 million and BCR of 84.3 for option 2.1 based on CA[15]. Using their parameters as far as possible (see Annex 8), we estimate the NPV from the introduction of CA as USD 1136 million with a BCR 20.6. This excludes the costs of covering typical year 1 additional costs to encourage smallholder famers to switch. If we add in this USD 125/ha cost, we see a reduction in NPV to USD 131 million and a BCR of 18.6 (see Table 2 below). While these figures can only be indicative, they support the conclusions that including more realistic costs for CA will reduce NPV in particular (as these costs are borne at the start of the project) but that the economic arguments for NbS remain sound.

Table 1: Identifying the year 1 costs for farmers to switch to CA

Cost/Revenue Item	Conventional Tillage	Conservation Agriculture (CA)	Financial Impact of CA
Land Prep (Labor)	High (Ploughing)	Low (Ripping/Pitting)	+$30 (Saving)
Weed Control	Low (1-2 weedings)	High (Herbicides/Labor)	-$60 (Cost)
Equipment Purchase	$0 (Owns hoe)	$45 (Jab Planter)	-$45 (Cost)
Residue Value	$50 (Feed for cattle)	$0 (Left as mulch)	-$50 (Opportunity Cost)
Net Year 1 Impact	--	--	-$125 (Net Loss)

Table 2: CA costs and benefits

	Excluding switching cost	Including switching cost
NPV	£1,135,932,992	£131,716,735
IRR	196%	129%
Present Value Costs	£65,564,264	£72,521,811
Present Value Benefits	£1,350,002,317	£1,350,002,317
BCR	20.6	18.6

[13] Qange Siphesihle , Mdoda Lelethu , Nontu Yanga , Mabitsela Mosima M. , Gidi Lungile S (2025), Evaluating the impact of adopting conservation agriculture on farm returns of smallholder vegetable farmers in the Eastern Cape Province: implication for extension services, Frontiers in Sustainable Food Systems, DOI=10.3389/fsufs.2025.1605561

[14] Frontiers in Agronomy (2021) & Frontiers in Sustainable Food Systems (2023) on adoption drivers and yield gaps in Eastern/Southern Africa. International Journal of Agricultural Sustainability and Agrekon (2023) for South African wheat and Ethiopian maize income data. Canadian Foodgrains Bank and Eden Equip for specific machinery pricing in Tanzania and South Africa. ResearchGate studies (2009-2021) regarding weed management costs in Nigeria and Zimbabwe.

[15] See GCA (2025) Table 7-16.

The approach to NbS in this case study appears to reflect the approach to NbS in the broader GCA infrastructure portfolio. The 2025 BCG external evaluation of AAAP's Upstream Financing Facility[16] uses the GCA TIRP 2 study to illustrate VfM for the AAAP Infrastructure and NbS pillar. They report an average BCR of 4:1 for the pillar as a whole and 5:1 for TIRP 2[17]. However, we note that BCG (2025) fail to identify the overstatement of net benefits in the TIRP 2 case.

GCA cost-benefit analysis (CBA) should include reasonable preparatory costs. The estimates for the TIRP 2 do not include the €122,000 study costs. GCA note that this is a pilot study and replication will be done at a lower cost. A conservative approach would therefore be to estimate a reasonable replication cost and include this in the CBA. Given an estimated net present value (NPV) of nearly USD 125,000,000, adding these up-front costs is not expected to significantly change the results, but will strengthen credibility.

EQ1.2: What lessons can be learned on producing synergies by joining up World Bank agriculture and infrastructure work?

Conservation agriculture is a NbS but it is also a well-established development intervention and the GCA study findings would be strengthened by including community-based development expertise from the outset. The GCA recommended climate-resilience and adaptation options for the Second Tanzania Intermodal and Rail Development Project (TIRP 2) study combines option 1.2 (Dams with NbS – conservation farming for catchment Management – to control flooding), option 2.2 (grey infrastructure – gabions – to reduce landslides) and option 3.1 (green track planting – a NbS – to reduce track temperature). Flood reduction (Dams with NbS) provides some 46% of total intervention projected NPV and adoption of conservation agriculture (with significant increases in expected crop yields at no net cost) leading to reduced dam sedimentation is the primary driver of these expected results.

Conservation agriculture is a NbS in this context, but it is also a well-established development intervention. While there is good evidence that conservation agriculture can significantly improve crop yields in Tanzania, the literature also suggests that getting farmers to make this switch requires considerable support[18]. For example, a recent comparison of conventional and conservation agriculture in the Dodoma region of Tanzania found less than 5% of farmers switching to conservation agriculture on their whole farm due to the time required to see significant gains and various practical constraints[19]. Claiming significant benefits from a switch to conservation agriculture (the key NbS) without explaining *how* this will be delivered weakens the credibility of the CBA. Integrating upstream CBA estimates with downstream practical experience would strengthen these results.

EQ1.3: What factors will make it feasible for GCA estimates of carbon finance to pay for maintaining adaptation?

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[16] BCG (2025), External evaluation of the Africa Adaptation Acceleration Program (AAAP) Upstream Financing Facility.

[17] Although project reports provided to us by GCA indicate a BCA of 4.87 for the TIRP 2 work.

[18] Food and Agriculture Organization of the United Nations (FAO). Benefits of Conservation Agriculture (CA). https://www.fao.org/conservation-agriculture/impact/benefits-of-ca/en/ (last accessed 23/11/2025); Mabagala, P. and Mzimbiri, R. (2025). The Contribution of Conservation Agriculture on Food Security in Mainland Tanzania. Eastern Africa Journal of Official Statistics 1(1). DOI:10.63933/eajos.1.1.2025.8; Mbaga, S.G., Ngaga, Y.M. and Nyamoga, G.Z. (2024). Comparison of profitability of conservation and conventional agriculture in Bahi District, Dodoma, Tanzania. Journal of Agriculture and Environmental Sciences 9(2): 111-123. https://doi.org/10.20372/jaes.v9i2.10324; Mkonda, M.Y. (2017). Conservation Agriculture in Tanzania. Sustainable Agriculture Reviews (pp. 309-324). DOI: 10.1007/978-3-319-48006-0_10; Mwamponda, J. (2023). Conservation agriculture makes a difference. World Renew: https://worldrenew.ca/our-stories/conservation-agriculture-makes-a- difference?srsltid=AfmBOorcyETTQwLIlebQsvSlfWEKdmm_OVhsSszFSBOT3EDe 1k0hFgBW (last accessed 23/11/2025); Sariah, J.E., L, F., L., M., Mmbando, F., Ngatoluwa, R. and Titi, U. Enhancing Agricultural Resilience and Sustainability in Eastern and Southern Africa. Key Findings and Recommendations for Tanzania. SIMLESA: https://simlesa.cimmyt.org/wp-content/uploads/tanzaniaB-min-1-1.pdf (last accessed 23/11/2025); Selya, N.Y., Dimoso, P. and Mgale, Y. J. Exploring the Adoption and Impact of Conservation Agriculture among Smallholder Farmers in Semi-Arid Areas: Evidence from Chamwino District, Tanzania. Research on World Agricultural Economy, Nan Yang Academy of Sciences Pte Ltd (NASS), vol. 4(2). DOI: 10.22004/ag.econ.335356; Shetto, R., Mkomwa, S., Mlengera, N. and Mwakimbwala, R. (2022). Conservation Agriculture in the Southern Highlands of Tanzania: Learnings from Two Decades of Research for Development. Conservation Agriculture in Africa: Climate Smart Agricultural Development, pp. 122-136.

[19] Mbaga, S.G., Ngaga, Y.M. and Nyamoga, G.Z. (2024). Comparison of profitability of conservation and conventional agriculture in Bahi District, Dodoma, Tanzania. J. Agric. Environ. Sci.9(2): 111-123. https://doi.org/10.20372/jaes.v9i2.10324.

The GCA report on carbon finance opportunities for Tanzania's railways – GCA (2025d) – is a well-executed think piece to raise awareness of the potential value of NbS. The chances of uptake would be increased by working with existing private and NGO actors active in the voluntary carbon market in Tanzania as well as trying to sell this idea to additional World Bank teams and Tanzanian institutions. Despite making a very convincing case for NbS, there are many obstacles to secure the engagement and support of local institutions with capacity to take the proposed roadmap to secure carbon credits from the railway corridor forward. For example, the report notes that farmers and pastoralists are actively using much of the landscape and there is a history of resource conflicts between pastoralist and farming communities over land access. Hence, despite the fact that TRC legally owns the railway reserve land, and has authority to grant access for reforestation activities, any reforestation or restoration in the rail corridor will need conflict-sensitive planning that involves community stakeholders and avoids exacerbating tensions. The report also notes the challenge of ensuring young plantings survive in harsh conditions (irrigation or rainwater harvesting may be needed in the establishment phase), and guarding against damage (wildfires, animal grazing, or human interference).

Longer-term GCA strategic engagement to build partnerships that leverage existing local capacity will be needed to overcome these obstacles and make carbon credits a reality. For example, there are existing private and NGO actors active in the voluntary carbon market in Tanzania[20]. Without these partnerships and institutional arrangements, we are relying on assumptions to take us from outputs to intermediate outcomes in the Theory of Change (ToC). This makes progress along the impact pathway very uncertain (discussed further below). A longer-term strategic engagement by GCA will therefore be required to support the roadmap.

3.4 Effectiveness and Sustainability

EQ2: What strategies can GCA use to increase the likelihood of their infrastructure work delivering transformational change?

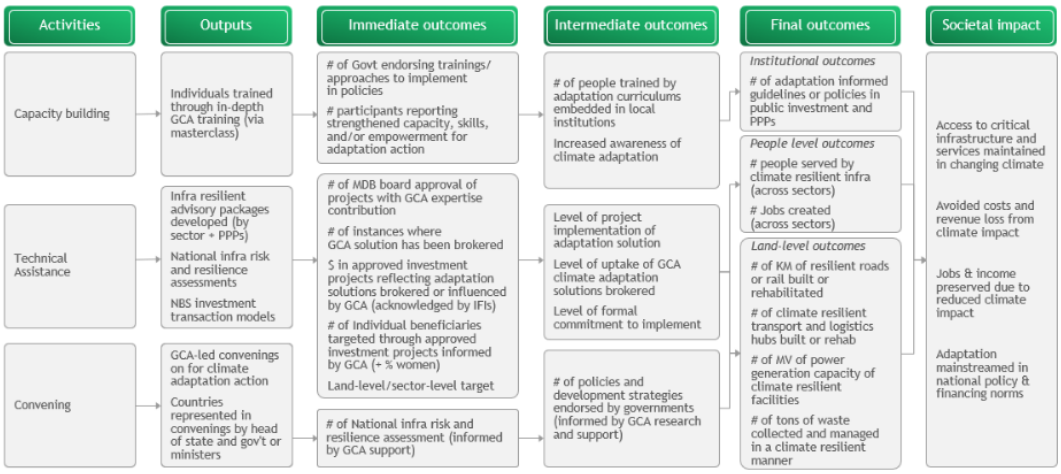
EQ 2.1: How can implementation plans be built into projects?

GCA has provided excellent technical assistance, but the current GCA model constrains effectiveness and sustainability. GCA support for TIRP 2 in Tanzania has followed an "opportunistic" bespoke model to add climate resilient infrastructure and NbS to IFI project design. Interviews suggest that MDB requests for technical assistance/consultancy frequently follow this route to influence project design i.e. GCA technical assistance aims to influence delivery by influencing design documents that subsequently get carried forward in the implementation phase. This "upstream solutions brokering" impact pathway can be seen in the infrastructure and NbS pillar of the AAAP ToC[21] below.

[20] Private companies include Carbon Tanzania and the DBG Group. NGOs include The Nature Conservancy (TNC), African Wildlife Foundation and TECOSO.

[21] This pillar is one of the four AAAP pillars (Food Security; Infrastructure and NbS; Youth Entrepreneurship and Adaptation Jobs; and Adaptation Finance.

Figure 1: The AAAP Theory of Change under the Infrastructure & NbS pillar



Source: BCG (2025) Figure 12

The implicit assumption in moving from short-term to longer-term intermediate outcomes and final outcomes is that influencing an investment design document will translate to implementation. In practice, this is likely to require additional downstream engagement. Regarding GCA support to TIRP 2, stakeholders praised the quality of the TA provided noting that they got the "A team", whereas they felt some commercial providers had sent their "C team" to Africa. The GCA offer is based on technical strength and a strong understanding of policy context. The BCG (2025) evaluation also finds "Majority of stakeholder interviewed value the rigor and coordination GCA brings"[22]. Despite this, the "opportunistic" model makes it difficult to reach from upstream to downstream influence.

EQ 2.2: What lessons can be learned on building strategic partnerships to support implementation?

GCA will need a more strategic focus to secure this downstream engagement. In this case, the World Bank TIRP 2 Project Appraisal Document (PAD)[23] pre-dated AAAP support and GCA was brought in for design options to address flooding hotspots along the 120-km Igandu–Kilosa section of railway. The PAD itself, has a broad perspective, involving transport, agriculture and water sectors. Implementing any NbS for improved flood resilience will require working with stakeholders from all of these sectors at a catchment level. Hence, there would be far more opportunity for translation of climate resilience if GCA had been integrated into the PAD at the outset, with local partnerships that allowed support to implementing stakeholders.

The TIRP 2 support is just one example from the GCA portfolio. However, our findings are consistent with the conclusions on this pillar reached by the external BCG 2025 evaluation. "The pillar has not yet crossed the threshold where its tools are default practice inside line ministries, PPP units, or MDB operational manuals. Closing that gap will require fewer bespoke engagements and more codified standards, plus deeper partnerships with treasuries and regulators to lock maintenance and financing rules in place. In short: strong proof of concept, early evidence of shaping role, but runway left before the approach can claim true systemic impact." (p.38).

GCA are aware of the challenge of taking up requests for NbS TA in upstream work and are keen to:

- Look for larger scale NbS adaptation solutions from the start – using the tool co-developed with the University of Oxford – before developing climate risk assessments. This will help generate landscape level rather than isolated solutions.

[22] P31, Op. Cit.
[23] Project appraisal document on a proposed credit in the amount of US$200 million to the United Republic of Tanzania for a second Tanzania intermodal and rail development project, The World Bank, March 2024.

- Engage a broader stakeholder group from the start. GCA already has experience of this approach and the benefits that it brings in some countries. Green fencing in Mauritania, PPP Masterclasses and Transport sector work in Senegal are examples.
- Encourage the WB/IFIs to discuss outside their sector (e.g. between the transport and agriculture teams) to identify synergies early on.

3.5 Impact and KPI 15

Adding NbS to rail infrastructure in Tanzania will be transformational if carried through to implementation. However, we are currently at the start of this process and GCA is not institutionally embedded in the pathway to impact. While the indirect link between GCA's upstream influencing work and downstream outcomes makes it challenging to determine the impact of its interventions, the Signals of Transformational Change Framework as developed for AAAP does provide some indication of its likelihood to contribute to systemic change. In particular, this is related to its ability to create incentives for others to engage in enhanced adaptation action. By delivering its 'science-to-design[24]' solutions, GCA provides solid evidence of the climate risks critical infrastructure faces across Africa and the associated costs – as well as of the avoided losses and damages that can be achieved by implementing grey and green adaptation solutions. Adaptation solutions proposed are generally very much in line with stakeholders' identified needs and interests and include clear next steps in terms of their realisation. They are – with regard to TIRP 2, and generally – currently however mostly still restricted to the advisory stage, and not yet implemented in practice. As such, AAAP's ability to create incentives for others to act is classified as an early signal of progress towards transformational change. The potential for this to progress to an interim or advanced stage depends on the extent to which its adaptation solutions will actually become embedded in the regulatory, policy and financial frameworks that support their widespread uptake.

[24] BCG (2025), External evaluation of the Africa Adaptation Acceleration Program (AAAP) Upstream Financing Facility.

4.0 Conclusions

This case study confirms that GCA's use of Nature-based Solutions (NbS) offers clear added value for enhancing the climate resilience of large-scale infrastructure. The technical analyses undertaken for TIRP 2 demonstrate that integrating NbS can substantially improve Value for Money, reduce climate-related risks, and generate socio-economic co-benefits. However, the findings also highlight that the realisation of these benefits depends on strengthened coherence, more realistic economic assessments, and deeper engagement with implementation partners.

The analysis shows strong upstream relevance and technical rigour but also exposes structural constraints in GCA's current "opportunistic" model of engagement. While GCA effectively influences investment design documents, this upstream influence does not automatically translate into downstream implementation. The findings therefore point to the need for a more strategic approach that embeds GCA earlier in project cycles, strengthens cross-sectoral partnerships, and ensures continuity of support through implementation.

Similarly, while the VfM case for NbS is compelling, the current cost-benefit analysis systematically overstates expected net benefits due to incomplete accounting of switching costs, community support requirements, and preparatory inputs. Findings relating to conservation agriculture further emphasise that behaviour change and community-based development expertise are critical determinants of feasibility—yet are not fully integrated into the technical analysis. Addressing these gaps will strengthen the credibility, realism, and uptake of NbS recommendations.

Finally, the potential for transformational change is present but still at an early stage. The advisory work has begun to create incentives and evidence for action, but scaling and sustainability will require institutional embedding, broader partnerships (including carbon market actors), and alignment across AAAP pillars. The recommendations therefore directly respond to the implementation challenges identified: enhancing strategic engagement, expanding technical teams to include community-based expertise, strengthening internal AAAP coherence, and refining economic analysis to include full costs.

In sum, while GCA's technical leadership and analytical contributions are strong, translating upstream influence into sustained climate-resilient outcomes will require a more strategic, integrated, and implementation-oriented approach—precisely the direction outlined in the recommendations below.

5.0 Recommendations

1. **GCA will need a more strategic focus to secure this downstream engagement. A more strategic approach by GCA will involve securing engagement and partnerships at the outset and longer-term involvement to improve the chances of influencing implementation.** It may require turning away opportunities for short-term TA in favour of longer-term projects. This approach will also require GCA service providers to have a wider set of capabilities and to involve local NGO/CBO partners as well as working with government institutions across sectors. **– Recommendation for GCA**

2. **Situate proposed NbS interventions within a broader development impact pathway to identify key partners, necessary associated interventions and critical assumptions for downstream uptake. This is likely to require adding community-based development expertise to technical teams.** GCA is already strengthening their offering by using tools co-developed with the University of Oxford to identify larger scale adaptation solutions before developing climate risk assessments and bringing stakeholders together with masterclasses. There is scope to make this broader focus more systematic. **– Recommendation for GCA**

3. **Ensure that the cost-benefit analysis for NbS include costs of securing behaviour change to switch to conservation agriculture (or other NbS) as well as benefits. – Recommendation for GCA and practitioners in general.**

4. **GCA economic cost-benefit analysis should include reasonable preparatory costs, as a sensitivity test at a minimum. – Recommendation for GCA and practitioners in general.**

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Annex 1: Original ToR: Midline Phase 2 Case Study Concept Note: AAAP VfM NbS

1. Background, scope and case study objectives

The ARCAN MEL Unit (led by Ecorys) and FCDO identified VfM of Nature-based Solutions (NbS) as a key evidence gaps from Phase 1 of the Midline Evaluation. Discussion with FCDO and GCA (ARCAN's implementing partner for the AAAP pillar) in April, May, and June 2025 identified that a VfM-focused evaluative case study on GCA nature based solutions (NbS) for resilient infrastructure would help address this evidence gap and assist the GCA MEL team evolution from monitoring to a broader MEL remit.

Discussion with AAAP highlighted GCA support to the WB Tanzania railway development (TIRP 2) project as a good basis for the case study. This support builds on earlier GCA NbS work and, in Tanzania, produced the following outputs:

1. Climate risks assessment along the Dar es Salaam - Dodoma corridor, across hazards
2. Detailed flood modelling on the Kilosa-Gulwe section already identified at high risks of floods by the project stakeholders
3. Identification and cost-benefit appraisal of adaptation and resilience options, including NbS opportunities, supporting risks mitigation to the railway (landslide, floods, sedimentation)
    a. along the corridor, in the railway right of way,
    b. and landscape type of interventions at the water basin level on the specific Kilosa-Gulwe section
4. Leading to developing detailed rationales for NbS implementation:

a. Carbon market opportunities for Tanzania Railways Corporation (TRC), along the corridor's right of way.

    i. GCA results show that by targeting 338 hectares of railway-adjacent land for reforestation, agroforestry, and wetland restoration, the project could sequester over 27,000 tonnes of CO_2 over 20 years. Accessing carbon markets would generate enough revenues to implement these solutions, in addition to the quantified benefits to avoided damages to the infrastructure.

    ii. This is now to be discussed with the World Bank (WB) who are providing an agriculture loan and TRC.

b. Large-scale Water management and Nature-based Solutions on the Kilosa-Gulwe section

    i. GCA results quantifies the costs and benefits of landscape intervention in the water basin. The rehabilitation of water dam in the area, combined with Reforestation along riverbanks and Conservation of agriculture projects, would improve the railway resilience and operations reliability, and provide co-benefits for project beneficiaries and local communities.

    ii. This is now discussed between the WB transport and agriculture practices, to consider taking this integrated approach into consideration for subsequent potential investments in conservation agriculture and water dam rehabilitation. This integrated, cross cutting approach is itself unusual and has potential to support mainstreaming NbS within the WB.

The objectives of this case study are to:

1. Unpack the GCA approach to NbS for resilient infrastructure to illustrate projected benefits from avoided damages to infrastructure and socioeconomic and environmental co-benefits to communities and the increased probability of realising benefits by developing a holistic financing rationale and identifying potential revenue streams.

2. Estimate the costs and projected benefits for this case (drawing on GCA project findings and costs).

3. Set out the impact pathways and assumptions required for key projected benefits to be realised. This ToC is implicit in the GCA NbS analysis for the Tanzania Railway project[25] and a number of important policy and financing steps are set out in the implementation roadmap. The projected project benefits are conditional on these steps being realised i.e. estimated benefits will be realised if the steps in the implementation roadmap (or a modified version) are realised. The project estimated net benefit (estimated benefits – estimated costs) can therefore be expressed as the estimated net benefit of each component in the implementation roadmap multiplied by the probability this is achieved. This type of disaggregation has been used for projecting donor funded impact by The Global Innovation Fund[26] and to project indicative benefits of CGIAR innovations[27]. The aim in this case study is simply to join up the projected impact pathway and assumptions (developed by CGA with development partners and stakeholders) with projected net benefits. As a purely hypothetical example, looking at initial steps in the implementation roadmap we might have:

Key implementation component	Weight in realising estimated CBA	Estimated probability of success (at year 0)	Estimated probability of success (at year 1)
A. Feasibility study	10%	High	High
B. Stakeholder Consultations and Partnership Building	40%	Medium	High
C. Secure Financing	50%	Medium	Medium

By assigning indicative values to “low”, “medium” and “high” probabilities, we can produce an expected CBA value based on realising the implementation roadmap (and associated assumptions).

Benefits of this approach:

- Make projected net benefits more transparent
- Provide a dynamic VfM tool to help reassess estimated CBA as policies and assumptions change
- Encourage policy makers and funders to engage on critical drivers of change

4. Identify potential (qualitative) additional benefits from using this integrated approach to NbS with an MDB (in this case the WB).

[25] GCA (2025), Greening Tanzania’s Railways: Leveraging Nature-Based Solutions for Climate Resilience and Carbon Finance, V2, May.
[26] Global Innovation Fund | Practical Impact Methodology
[27] Yaron and Menzies, Estimating Projected Benefits: A Manual, CGIAR, 2021

2. Case study methodology

The case study process will involve the following steps:

1: Setting out the background to NbS use by GCA (mid-late July)

- Review of documents provided by GCA (Ecorys)
- Draft NbS development story (Ecorys with review by GCA)

2: Estimate costs and benefits of NbS approach in the Tanzania Railway case (July-Aug)

- GCA to provide a multi-dimensional cost-benefit assessment of potential NbS, including avoided damages to the infrastructure, but also socioeconomic and environmental benefits, to develop holistic financing rationale and identify potential revenue streams. The estimated CBA for the TIRP 2 would include cost estimates for GCA work and implementing NbS.
- Ecorys to provide feedback.

3: Identify pathways to projected impact and associated drivers/risks (End July)

- Ecorys working with GCA. In person meetings (over 2 days). Build on the implementation roadmap.
- Produce initial expected values and dynamic VfM model.

► **4: In person interviews with Tanzania Railway Corporation and Tanzania WB office team to test expected benefit pathways and assumptions (including additional potential benefits from integrated working) – August**

- Jointly develop semi-structured interview template.
- GCA identify interviewees. Ecorys undertake (10?) key informant interviews (KIIs) over 5 days.

► **[Possibly 5: Remote interviews with WB Washington DC team to test expected benefit pathways and assumptions (including additional potential benefits from integrated working)**

- Jointly develop semi-structured interview template.
- GCA identify interviewees. Ecorys undertake (4 – 6?) key informant interviews (KIIs).]

6: Produce case study write up with revised CBA and VfM model (September)

Deliverables:

A concise case study report (max. 20 pages) with a 3-page summary and annexes.

A validation meeting with GCA.

A short presentation of findings and lessons to FCDO and GCA.

Annex 2: ARCAN Evaluation Framework

Evaluation Questions and OECD-DAC Criteria	Criteria and supporting questions	Evaluation Activity/ MEL Product/Data Source	Analysis
Relevance To what extent are ARCAN programmes' delivery country-led (i.e., responding to local community and national priorities) and strengthening national or community leadership, capacity, and commitment (in what ways, for whom – with specific focus on the most vulnerable including women/girls and other excluded groups - and in what contexts)? [*EQ3*]	ARCAN delivery is informed by and responds to local community and national needs, policies and priorities; including those specific to gender and social inclusion of the most vulnerable groups Programme delivery/design is sensitive and responsive to context, including: • ARCAN delivered in ways that is informed by and responds to (local and national) gendered needs and priorities, recognising differential starting points • ARCAN implementation builds and strengthens national/ community leadership, capacity and commitment • ARCAN adapts to changing needs and contexts • ARCAN implemented in ways that reflect needs of different social groups (most vulnerable including women/girls and other excluded groups), recognising different starting points on the basis of, inter alia, age, disability, indigeneity	**Evaluation Midline/ Endline:** ***Phase 1*** 1. Document analysis building on programme documents, annual reports etc, external evaluations; context-specific literature 2. Select KIIs with FCDO (remote) ***Phase 2*** 3. Continued document analysis 4. Select KIIs and FGDs (remote and in-country) i) Interviews with FCDO/ IPs (**process evaluation style questions**) ii) Interviews with key external stakeholders [NB relevance refers to beneficiary and stakeholder needs, relevance to context, relevance to UK govt priorities]	Thematic Analysis Context Analysis Contribution Analysis
Efficiency **1.** Are the ARCAN portfolio and programmes using resources efficiently and effectively to achieve their goals? [New overarching] *Key questions to help answer this EQ:* i. **What are the opportunities to enhance efficiency and cost effectiveness across the ARCAN portfolio? (midline) [EQ8]** ii. **What key lessons (positive and negative) have been learned from** ARCAN's **experience with regards to VfM that can inform the design and implementation of future portfolio programmes? (endline) [EQ10]**	• How do the returns on investment compare to the ones proposed in the Business Case (ARCAN)? For programmes: design/ economic appraisal? • To what extent, and how, have resources been efficiently allocated between work streams? • How do the different cost effectiveness data from different pillars/ programmes compare? • What are the processes of compiling VfM data in the pillars/ programmes? • Are there adaptive management examples that drive VfM in programmes? • For those IPs with existing VfM framework/ reporting: how does VfM fit in the wider delivery frameworks (s)? • What kind of mechanisms exist in programmes to control costs and/ or maximise benefits? To what extent is there commitment to consideration of equity goals alongside effectiveness and equity, and what trade-offs are made?	**Evaluation Midline/Endline**: 1. Financial reporting from IPs 2. KIIs: Interviews with IPs, FCDO (remote and in-country) **Evaluation: Portfolio VFM** **Deep Dive (Y2)** **Monitoring: Programme specific VFM case study;** Building on Results Framework/ ARCAN VfM framework/ AR	Cost effectiveness data analysis (VfM indicators, results, other CE study findings from pillars, etc) Analysis of VfM case study findings Cost efficiency analysis Qualitative assessment on lessons learned

	• Resource allocation processes/ mechanisms, including the extent to which equity is represented • Cost effectiveness indicators from ARCAN VfM Framework		
Effectiveness **2.** How and to what extent does ARCAN contribute to strengthening people's resilience, improving management of natural resources, and increasing access to renewable energy, for the most vulnerable to climate change? For whom – with specific focus on the most vulnerable including women/girls and other excluded groups -and in what contexts? [*EQ2*] *Key questions to help answer this EQ, plus potential deep dive focus (ii-iv)– selecting three deep dives.* i. **How effective was the ARCAN portfolio at mobilising additional and or more effective climate- and nature-related investment, for whom, and in what contexts? (All IPs except FFF)** ii. **How, and to what extent, has the ARCAN portfolio contributed to the improved management of natural resources (particularly sustainable land management), for whom, and in what contexts? (CAFI, FFF)** iii. **How, and to what extent, has the ARCAN portfolio contributed to strengthened resilience of populations to climate shocks, for whom and in what contexts? (WISER, CIWA, FFF, AAAP)** iv. **How, and to what extent, has the ARCAN portfolio facilitated greater access to clean energy, for whom, and in what contexts? (SRMI, SEFA)**	**Delivery of programmes under thematic pillars – relevant outcomes and Programme ICF KPI results:** • Number of people supported to better adapt to the effects of climate change (ICF KPI 1) • Number of people with improved access to clean energy (ICF KPI 2) • Number of people (disaggregated by key GESI groups) whose resilience has been improved (ICF KPI 4) • Volume of emissions reductions avoided/supported by ICF TA (ICF TA KPI 5) • Finance mobilised (£) for climate change purposes (ICF KPI 11 & 12) • Area under sustainable land management practices (ICF KPI 17) **Evidence for pathways to outcomes in the theory of change:** • Design and implementation of national and subnational plans, policies and strategies supported; • Increase in no. of countries with regional, national, subnational (local) plans, policies, strategies, sectoral pla ns (energy, integration of climate, NRM etc) • Innovation approaches embraced [eg ARCAN contribution to greater availability of innovative approaches and technologies to deliver positive impacts on poverty and the environment in sectors such as energy, natural resource management, agriculture, and environmental degradation] • Capacity to access new and existing climate finance strengthened • New investment mobilised for Climate (amount and extent, influence of ARCAN on new and existing funding) • Improved natural resource management and protection including transboundary water • Increased sustainable land management • Improved availability and (capacity to) access and use of climate information	**Evaluation Midline/Endline (sub-Q 3i):** ***Phase 1*** 1. Document analysis building on programme documents, annual reports etc, external evaluations; context-specific literature 2. Select KIIs with FCDO (remote) ***Phase 2*** 3. Continued document analysis 4. Select KIIs and FGDs (remote and in-country case studies) i) Interviews with FCDO/ IPs (**process evaluation style questions**) ii) Interviews with key external stakeholders **Evaluation Deep Dives** in order to confidently demonstrate what FCDO/ARCAN has achieved in relation to **OUTCOME 1** in the theory of change. Are the pathways to desired changing working or not? How, for whom and in what context? **(sub-Q 3ii-iv)** Focus on socio-economic outcomes and impact: Who is expected to benefit? Has this been achieved? If so, how? If not, why not? What has been the contribution of ARCAN? Contribute to the global evidence base on what works and what doesn't work in building adaptation and resilience to CC. Suggested Deep Dives: 1) Energy; 2) Resilience; 3) Sustainable land management. 1. **Document analysis**: programme documents, annual reports etc, external evaluations; context-specific literature 2. **In-country and remote data collection, primary and secondary data:** KIIs and FGDs (in-country and remote) a) Interviews with FCDO/ IPs b) Interviews with key external stakeholders (at all institutional levels)	Case Study approaches to focus on evidence gaps in the ToC through deep dives (thematic and contribution analysis) Analysis of Monitoring data Analysis of independent evaluations of ARCAN programmes Meta-analysis and Synthesis (endline)

	• Use of climate data to inform investment decisions, programme focus etc • Improved resilience capacities (including climate adaptation) • Improved availability and access to clean energy *For all areas: Effectiveness-related outcomes reflect gender equality and social inclusion* *Unintended results and alternative pathways* *Enablers and barriers ('mechanisms' of change), including: Political economy factors (incentives, interests, beliefs, power of partners and external actors); contextual factors (economic, social, political will and commitment; funding; conflict risk etc)* *'For whom?': ARCAN portfolio contributes to gender equality and social inclusion*	**Review and synthesis of upcoming IP independent evaluations:** (2023: CAFI, WISER, 2024: SEFA – assume available for midline. 2024: CIWA – assume available for endline. Annual: AAAP) **Endline Synthesis across deep dives and other primary and secondary data sources/evidence** **Building on Monitoring data.** The monitoring overarching question is '*to what extent are IPs delivering against programme outputs and outcomes'*. This contributes towards answering a foundational evaluative question: are the conditions in place for activities to lead to desired/intended outcomes for those expected to benefit? **1.** IP Monitoring Data/ Results Framework outcome data **2.** Monitoring visits reports: progress report of project level implementation against IP ToC and project specific stories of change on IP progress (co-developed with IPs) **3.** Programme-specific GESI and VfM case studies (in collaboration with IP)	
Impact **3.** How, and to what extent have the ARCAN portfolio and programmes catalysed transformational change (for whom – with specific focus on the most vulnerable including women/girls and other excluded groups - and in what contexts)? (endline) *Key questions to help answer this EQ:* **i. How and to what extent are ARCAN projects achieving (or where results not yet evident due to timeframes) likely to achieve transformational change? [KPI15]** **ii. Sustainability: How effectively do ARCAN programmes support sustainability of outcomes and impacts?**	4.i KPI15 Scorecard: likelihood of transformational change. Drivers, Mechanisms, Barriers/Enablers: • Political will and local ownership: need for the change is agreed locally and the process is locally owned and inclusive. • Capacity and capability can be equitably increased: countries and communities have the capacities and capabilities necessary to bring about the change; • Innovation: innovative technologies are equitably piloted, with the potential to demonstrate new ways of doing things, which could lead to wider and sustained change; • Evidence of effectiveness is shared: approaches which have proved successful in one location are made widely available and lessons on their usefulness are credible and shared widely • Gender Equality and Social Inclusion: ARCAN programmes actively contribute to GESI by identifying and tackling barriers to gender inequality and social exclusion in formal institutions (e.g. policy) and informal institutions (practices), and working to transform power relations positively and support	**Evaluation Midline/Endline**: ***Phase 1*** 1. Document analysis building on programme documents, annual reports etc, external evaluations; context-specific literature 2. Select KIIs with FCDO (remote) ***Phase 2*** 3. Continued document analysis 4. Select KIIs and FGDs (remote and in-country) i) Interviews with FCDO/ IPs (**process evaluation style questions**) ii) Interviews with key external stakeholders **Building on and validating Monitoring Data:** M team working with IPs to track progress against key indicators including KPI15, and develop project-specific stories of change on IP progress (co-developed with IPs)	KPI15 scorecard analysis Thematic analysis of evaluation data Contribution Analysis Synthesis/ meta-analysis

	collective action by marginalised people where appropriate. • Leverage / create incentives for others to act: the costs of climate action are reduced to the point that acting on climate is a sensible decision for commercial firms, private individuals and governments. These cost reductions may need to be steep enough to overcome behavioural inertia; • Replicable: good ideas piloted by the ICF are replicated by others in the same country and more widely; • At scale: interventions (such as national, sectoral or regional programmes) that have sufficient reach to achieve institutional and policy reform, or drive down costs of technology deployment; ARCAN is tackling different levels of scale in concert. Equitable; recognising the reality of gender inequality and social exclusion, and ensuring that use of the approach is equitable and contributes to gender equality and social inclusion • Sustainable: change is likely to be sustained once ICF support ends. 4.ii ARCAN programmes' contribution to fostering (inclusive and equitable) enabling environment including: i) Capacities ii) Ownership iii) Political Will iv) Resources/ budgetary commitments of relevant stakeholders		
Coherence **4.** How and to what extent are ARCAN programmes contributing to complementarities, synergies, knowledge sharing and learning between within and beyond ARCAN, including through benefits from being more than the sum of their parts in the ARCAN portfolio? For whom – with specific focus on the most vulnerable including women/girls and other excluded groups – and in what contexts? [EQ6]	• Increased regional, national and local collaboration and partnerships due to ARCAN • Key stakeholders draw from evidence and learning generated by the programme to support improvements in programming; examples of adaptive management based on programme-level learning. Learning shared formally and informally within and across IPs and outside of ARCAN. Drawing on learning from other programmes/the knowledge and experience of stakeholders at all levels • Complementarities: ARCAN Activities, projects, or policy efforts build on the strengths and account for the limitations of each other. • Synergy: The interaction of two or more ARCAN programmes such that the overall result is greater than the sum of its parts. Examples that	**Evaluation Midline/Endline**: ***Phase 1*** 1. Document analysis building on programme documents, annual reports etc, external evaluations; context-specific literature 2. Select KIIs with FCDO (remote) ***Phase 2*** 3. Continued document analysis 4. Select KIIs and FGDs (remote and in-country) i) Interviews with FCDO/ IPs (**process evaluation style questions**) ii) Interviews with key external stakeholders	Thematic Analysis Contribution Analysis

	programmes deliver more outcomes and impacts than working in isolation including : e.g. reaching more people; mobilising more finance than targeted, or delivery greater analysis than planned (e.g WISER adding value to CIWA)	

Annex 3: Case Study Evaluation Questions

Evaluation Question	Sub-Questions	OECD DAC Criteria	Relevant Interviewee(s)	Key Sources for Document Review and data analysis considerations	Relevant TC Drivers and Mechanisms
1. What is the added value of the GCA approach of using NbS for climate resilient infrastructure?	**1a. How does adding NbS improve VfM?** **1b. What lessons on producing synergies by joining up WB agriculture and infrastructure work emerge?** **1c. What factors will make it feasible for GCA estimates of carbon finance to pay for maintaining adaptation solutions?**				
2. What strategies can GCA use to increase the likelihood of their infrastructure work delivering transformative change?	**2a. How can implementation plans be built into projects?** **2b. What lessons on building strategic partnerships to support implementation can be drawn?**				

Annex 4: List of Interviewees

Organisation	Number of interviewees
Global Center on Adaptation (GCA)	3
Tanzania Railway Corporation	1
World Bank Tanzania	2
Total	**6**

Annex 5: AAAP Signals of Transformational Change Framework

AAAP definition of transformational change:

AAAP seeks to accelerate climate change adaptation across Africa through i**) influencing investments** to ensure infrastructure assets and services are resilient to climate change; ii) **unlock access to adaptation finance** through designing innovative public and private financial solutions, influencing investments for the financial sector and monetisation of adaptation benefits. This will be the result of i) increased capacity and capabilities to identify the need for, manage and oversee the implementation of adaptation initiatives; ii) promoting the uptake and mainstreaming of innovative adaptation solutions; iii) creating incentives for other to act towards enhanced adaptation; iv) scaling and replicating of effective adaptation solutions and v) establishing mechanisms that support the continued presence of the required resources, capacity and commitment and enabling environment to support adaptation action without relying on programme funding.

TC Level	Criteria	Indicator	Signal	Definition	Timeline	
Driver	**Capacity and capabilities increased**	Extent to which stakeholders independently design, manage, implement, and (access) finance (for) adaptation initiatives.	No Signal	Capacity-building efforts exist but **are ad hoc / one-off, externally driven** (e.g., by donor), and do not equip stakeholders with lasting skills and the ability to further adaptation initiatives independently.	N/A	Example [Advanced Signal]: National Roads Authority has the capacity to independently identify the (regular) need for and commission an analysis of the climate vulnerability of the existing road network and prioritise investment into its enhanced resilience accordingly.
			Early Signal	Training and capacity-building efforts are structured to ensure skills transfer in an appropriately **contextualised** manner, with initial steps toward **local ownership** of knowledge and its **continued implementation** being visible.	0 – 1 year	
			Interim Signal	Stakeholders begin taking **ownership of the knowledge and skills** developed, as well as of what is required to – **continue to – implement** these effectively. **Reliance on external expertise and resources is reduced**, and follows needs identified by the stakeholders concerned (i.e. not defined by donors/external service providers).	1 – 2 years	
			Advanced Signal	Local, national, or regional institutions demonstrate the ability to design, manage, implement and (access) finance (for) adaptation initiatives	3 – 5 years	

				autonomously, showing **sustained ownership of the knowledge and skills** required for this at present as well as a **vision** and institutional leadership on what capacity and capabilities are required to continue **to do this effectively in the future**.		
Driver	**Increased innovations**	Extent to which innovative adaptation solutions are adopted and mainstreamed	No Signal	Pilots or activities exist but remain **experimental**, externally driven or confined to **small-scale** (e.g. project-based) applications with **no pathway for actual implementation and/or wider adoption**.	N/A	Example [Advanced Signal]: It is standard practice for the Ministry of Transport to liaise with the Ministry of Agriculture during the planning and design phase of a new railway project to explore the resilience benefits that may be achieved through integrating Nature-based Solutions into its design.
			Early Signal	Innovative adaptation solutions (e.g. Nature-based Solutions, innovative adaptation finance mechanisms) are explored in combination with **efforts to further their actual adoption** by and **further spread** throughout the relevant institutions.	0 – 1 year	
			Interim Signal	**Early adoption occurs** as proven innovations gain traction, with **increasing uptake** by key actors – combined with a sense of **ownership** of and ability to use and further develop these solutions **independently**.	1 – 2 years	
			Advanced Signal	Proven innovations are **fully mainstreamed or institutionalised** within local, national, or regional networks and systems, becoming part of formal **policies, planning and guidelines** or being embedded as common/standard practice within relevant institutions.	3 – 5 years	
Mechanism	**Create incentives for others to act**	Effectiveness of incentives in catalysing increased action towards enhanced adaptation	No Signal	Incentive mechanisms exist but are **ineffective** due to a mismatch with stakeholders' interests and needs, **inadequate reach and visibility** or failure to stimulate action beyond a **small number** of actors.	N/A	Example [Advanced Signal]: National law stipulates adaptation requirements needing to be considered for any infrastructure initiative to be
			Early Signal	Incentives **align with stakeholders interests and needs**, effectively convey the urgency or expected benefits of action and are **clear in terms of what is required or feasible** in terms of next steps, i.e. what they incentivize towards.	0 – 1 years	

			Interim Signal	Incentives are **effectively spread and implemented**, reaching **an increasing number of different actors** (e.g. government bodies, financial institutions, academia etc.) who in turn leverage these towards a **more widespread joint commitment** to the type of action required.	1 – 5 years	implemented in order to be granted formal approval by the relevant Ministry; National Roads
			Advanced Signal	Long-term incentives are **embedded in regulatory, policy or financial frameworks** and lead to **widespread uptake** and sustained commitment from various – and increasingly varied – stakeholders.	5 – 8 years	Agency has integrated adaptation considerations as a standard component of its O&M manuals.
Mechanism	**Replicability**	Extent to which adaptation models and solutions are replicated within or beyond their original context	No Signal	Projects or interventions exist as a **one-off initiative**, without any consideration of or prospect towards their replication within or beyond their original context.	N/A	Example [Advanced Signal]: a National Infrastructure Risk and Resilience Assessment (National Roadmap) is developed in several African countries, following the model developed under AAAP - guiding the respective countries' climate resilient infrastructure investment planning.
			Early Signal	Models and solutions are developed with the **potential for and ambition towards replication**, which is being prepared for from a capacity development, financial resources as well as outreach perspective. Early interest in and ability to replicate these is identified.	1 – 2 years	
			Interim Signal	Models and solutions are **successfully replicated** in or beyond their original context, either by stakeholders involved from the outset replicating the same model (e.g. with a different focus or target group) in its original setting or by other stakeholders adopting and replicating it in their respective contexts.	3 – 5 years	
			Advanced Signal	Models are **successfully and structurally replicated, influencing systemic changes** beyond the original scope of the programme.	5 – 10 years	
Mechanism	**Scalability**		No Signal	Initiatives are implemented **without any vision on or efforts towards** exploring their **scaling potential**.	N/A	Example [Advanced Signal]:

		Extent to which adaptation initiatives expand in scope, reach or impact	Early Signal	Scaling is being considered and initiatives are designed with their scaling potential in mind. **Early-stage scaling plans** are being developed and **outreach** to relevant stakeholders is being conducted. Efforts are made to **secure resources** to test initiatives' scaling feasibility.	1 – 3 years	Adaptation is mainstreamed into entire national economic and financial systems (beyond the policy-specific level) as a result of AAAP's work with the IMF's RSF.
			Interim Signal	**Early signs of scaling** are visible. Initiatives are being expanded in scope and/or adapted to increase reach or impact. Efforts are being made for the **required resources**/financing to be scaled up accordingly.	3 – 5 years	
			Advanced Signal	**Scaling is fully underway, supported by a sustained stream of investments**. Expansion of initiatives is no longer project-dependent, but supported by **durable mechanisms embedded** within relevant institutions or systems.	5 – 8 years	
Enabler	**Sustainability**	The adaptation activities and changes delivered by AAAP are likely to be sustained beyond the duration of the project or programme.	No Signal	Interventions rely **heavily on programme funding and/or external initiative**. No clear strategy or commitment to sustaining results beyond the programme period.	N/A	Example [Advanced Signal]: Ministry of Transport has structurally allocated a percentage of its annual investment budget for adaptation of new or existing infrastructure assets and periodically liaises with national (academic) partners that are leading in the field on how this can be applied most effectively.
			Early Signal	**Sustainability is considered from the outset** of an initiative, conscious efforts are being made to support sustainability of activities delivered and results achieved – without any concrete guarantees being visible yet.	0 – 2 years	
			Interim Signal	**Concrete measures** are being taken to support results sustainably, including e.g. financial, institutional or policy arrangements. Commitment and capacity to sustain results are present.	1 – 3 years	
			Advanced Signal	Results are sustained durably through **robust mechanisms guaranteeing the continued presence** of the required resources, capacity and enabling environment to support these without relying on continued programme funding. **Ownership** of results as well as the **commitment** to sustain and further develop these is evident among relevant stakeholders.	5 – 8 years	

Annex 6: Ethics and Safeguarding

The approach has drawn upon key FCDO guidance in the document 'DFID ethical guidance for research, evaluation and monitoring activities[28]' (published in May 2019) and further guidance including: the FCDO Principles for Digital Development, the Social Research Association Research Ethics Guidance, OECD Quality Standards for Development Evaluation, United Nations Evaluation Group Ethical Guidelines, and the Integrating Human Rights and Gender Equality in Evaluation Guidelines. It has also adhered to the FCDO's Leave No One Behind commitments, the International Development (Gender Equality) Act 2014, the UK Disability Inclusion Strategy, and the UK's broader international commitments such as the Washington Principles. Furthermore, Ecorys is a member of the FCDO-supported Safeguarding Leads Network and is a signatory to the pledge to the private sector to collectively improve practice on safeguarding. All team members have been briefed on the relevant ethical and inclusion procedures for ARCAN.

Our primary data collection has included KIIs with project stakeholders – those directly engaged by ARCAN including programme MEL and research managers, FCDO pillar leads, implementing partners and downstream partners, and external stakeholders. For selected IP country case studies, where relevant we have conducted interviews or focus groups with intended beneficiaries of ARCAN programmes. We have reviewed fieldwork plans for ethical considerations and mitigated any risks, as well as ensuring compliance with the GDPR.

In person or virtual, our KIIs have all adhered to the following requirements:

- **Verbal consent will be required for interviews**: Informed consent has been sought from all informants. Information has included explaining to potential respondents the purpose and nature of the evaluation. An information note script has been read aloud before each KII/focus group discussion, covering the nature and purpose of the evaluation and explaining the approach to anonymity, confidentiality, and data protection. Respondents have not been obliged to participate, and this has been communicated to IPs and other organisations supporting the recruitment of respondents. We have ensured informed consent is obtained from all individuals before commencing interviews.
- **Anonymity**: The key ethical issue for the evaluation is protecting and managing the confidentiality of stakeholders. All engagement with stakeholders, including providing information related to the evaluation, has been done in a way that respects individuals and their confidentiality. No individuals have been identified by name in the report or in a way that would allow them to be identified from contextual information.
- **Data protection**: Data will be stored in accordance with Ecorys' Data Protection Policies. As a registered data controller with the Information Commissioner's Officer (Z5564761), Ecorys has a designated Data Protection Officer who is responsible for protecting data in line with General Data Protection Regulation (GDPR). Ecorys applies rigorous GDPR-compliant processes to ensure that all staff and participants are aware of how and why personal data are collected, used, and stored, and how long they will be retained for, and to ensure that data are collected only for valid purposes and kept only for as long as necessary.

Safeguarding

Safeguarding procedures for the ARCAN MEL contract are based on FCDO guidance, particularly the advice given in Enhanced Due Diligence: Safeguarding for external partners, and Ecorys' and Altai's Codes of Conduct. If it is

[28] Thorley, L., & Henrion, E. (2019). DFID ethical guidance for research, evaluation and monitoring activities. Prepared for the UK Department for International Development.

decided that the evaluation will invite participation from potentially vulnerable individuals, the ARCAN MEL safeguarding procedures are intended to provide an appropriate and sufficient framework that ensures the wellbeing of those involved in the evaluation, including participants and potential participants, as well as members of the evaluation team. ARCAN MEL Fieldwork Plans have been submitted along with our evaluation protocol to an internal ethics review panel, where required.

Key principles of our safeguarding approach include:

- **Protection and privacy of participants**: Methodological checks ensure participants cannot be identified with their responses or in any of the reports. This extends to all participants and to all topics, not just sensitive issues. Data collection takes place in private, and all data will be securely and appropriately stored – any physical data will remain with the researcher until it can be placed in secure storage; electronic data will be password protected. Sensitive personal data, for example gender, age, ethnicity, disability, religion will not be collected.
- **Informed consent**: Oral informed consent, obtained at the outset of KIIs, will empower participants to make informed decisions about engaging in the study by providing:
  - clear explanations of the aims and objectives of the study
  - potential risks associated with participation
  - clarity around voluntary participation and the right to withdraw from the evaluation
  - processes around any safeguarding issues including the role and contact details of the Designated Safeguarding Officers (DSOs)
- **Partnership**: It is our intention that the evaluation serves to further establish good relationships with stakeholders. They have been and will be consulted and informed about all evaluation activities. This is intended to promote acceptance of the evaluation across the IPs and DPs, and identify any emerging ethical or safeguarding issues.
- **Prompt investigation of issues**: DSOs at Ecorys and Altai will act in the event of any safeguarding issues being raised. The specific process to be taken in the event of safeguarding issues being raised are outlined in the Project Implementation Manual. We acknowledge that participants who wish to raise safeguarding issues may in principle be reluctant to notify the ARCAN MEL team, and so we will provide contact information for Ecorys DSOs who are not part of the core team and can rather act at 'arm's length' from the project.
- **Training:** All researchers/data collection staff attend training that addresses safeguarding and whistleblowing procedures. This covers handling disclosures, reporting allegations, confidentiality, and codes of practice and behaviour.

Ethical Approval

The ARCAN MEL Unit observes all guidelines and rules relating to the conduct of research and evaluation in the countries selected for in-country data collection. We seek ethical approval (or exemption as appropriate) for all primary data collection by writing formally to the relevant authorities in the relevant jurisdictions, where required. A study protocol describing the design and data collection, analysis, participant confidentiality and consent, and the study tools is submitted for review and approval as required. If ethical approval is required, formal responses from the relevant authorities approving data collection activities are a prerequisite for the evaluation data collection to proceed.

ARCAN MEL also abides with Ecorys internal policy guiding the conduct of research and evaluation.

Any proposals to carry out research with potentially vulnerable individuals require internal ethical approval. The evaluation protocol is in that case submitted to an internal ethics review panel for review and approval. The members of the ethics panel have independence from each project that they scrutinise. This enables them to put the participants at the centre of their review. The ethics panel reviews the protocol and provides feedback on the approach. The total process for internal and external ethical review exemption is expected to take around 2 – 4 weeks.

Annex 7: Use and Influence Plan

This will be discussed and finalised with FCDO following the submission of this report.

Annex 8: Data used for economic analysis of adding costs of switching to CA

Variable/parameter	Value	Source
Discount rate	6%	
Period of analysis (years)	40	
TZH/USD (2024)	2,614.55	https://www.exchange-rates.org/exchange-rate-history/usd-tzs-2024-12-24
Hectares	59000	GCA 2025
% of projected yield gain Year 3-7	42%	Assumption
% of projected yield gain Year 8+	60%	GCA 2025
% of farmers participating	20%	Assumption
Year 1 switching cost USD/ha	125	Literature review
Year 1 switching cost USD	7,375,000	
Total Capex Years 1-8	23,600,000	GCA 2025
% Capex/year	1/8	Assumption
Total Opex annual	3,140,000	GCA 2025

Crop	Share	Current yield (kg/ha)	Maximum potential Yield increase	Crop price 2024 TSH/kg
Rice	31%	2862	96%	2000
Maize	27%	1475	103%	600
Potatoes	30%	8430	222%	1000

Crop	Crop price 2024 TSH/kg	Crop price 2024 USD/kg	Years 3-7 (annual) Yield increase USD	Year 8+ (annual) Yield increase USD
Rice	2000	0.764949991	43,091,211	86,182,421
Maize	600	0.229484997	20,033,329	40,066,658
Potatoes	1000	0.382474996	201,792,956	403,585,913