EfD – Natural Capital (NatCap) Collaborative Workshop

Outcomes Report

26–27 May 2025
Cape Town

University of Cape Town • iYunivesithi yaseKapa • Universiteit van Kaapstad

EfD | Natural Capital collaborative (NatCap)

Environmental-Economics Policy Research Unit
EPRU

Executive Summary

The Natural Capital Collaborative (NatCap) workshop "*Aligning Natural Capital Research with Policy Priorities in Sub-Saharan Africa*" took place in Cape Town on 26–27 May 2025, bringing together environmental economists, policymakers, and practitioners from across sub-Saharan Africa (SSA) to chart a sustainable natural resource management agenda. As part of the Environment for Development (EfD) network, NatCap focuses on four thematic areas: *Water Systems*, *Forestry*, *Sustainable Agriculture*, and *Ecosystem Services & Biodiversity*. During the workshop, scholars and policymakers jointly identified the most acute evidence gaps, highlighted opportunities for cross-country collaboration and outlined an agenda that will guide EfD's funding proposals and partner engagement over the coming years.

Water Systems

Participants highlighted persistent gaps in basic water data and service delivery: limited integration of groundwater and surface water data (with key aquifers and Strategic Water-Source Areas poorly monitored), high levels of non-revenue water (water lost to leaks or theft) straining utilities, and severe sanitation shortfalls leading to faecal pollution with unmeasured health costs. In response, the workshop prioritised research to *map groundwater–surface water interactions* and quantify the value of protecting natural recharge areas, to *diagnose the drivers of water losses* and pilot interventions (e.g. smart metering and community reporting) that reduce leaks and improve affordability for vulnerable households, and to *trace pollution pathways* while evaluating low-cost nature-based solutions (NbS) (e.g. wetland restoration) for sanitation and water treatment. Together the objective of these efforts is to deliver evidence for more climate-resilient and equitable water management in SSA.

Sustainable Agriculture

Attendees noted that the adoption of sustainable farming practices in Africa remains low and uneven; conservation agriculture, agro-forestry and water-efficient techniques have yet to spread widely, partly because data on their performance under local conditions are fragmented. Participants therefore identified as a priority the consolidation of spatial and socio-economic data sets (soils, climate, farming systems) into an open platform that would allow cross-country analysis of technology impacts. Future studies could draw on GIS tools to assess how conservation agriculture and agro-forestry perform across differing rainfall zones and soil types. The workshop also highlighted the value of lab-in-field experiments and valuation work to test which mixes of information, incentives or market access are most likely to encourage smallholders to adopt climate-smart practices and lessen deforestation pressure. Such investigations could generate evidence on farm-level benefits, including possible gender-differentiated outcomes, thereby informing policies aimed at raising productivity while safeguarding land and water resources.

Forestry

Discussions revealed that unclear land tenure and weak local incentives continue to undermine sustainable forest management across countries. Property-rights ambiguities, particularly where community claims are unrecognised, combine with limited economic rewards for stewardship to drive deforestation and degradation. Participants noted that

newer climate-finance instruments, including carbon credit markets, face mistrust because of verification challenges and limited institutional capacity for enforcement. The workshop therefore highlighted the need for research that compares alternative management regimes (for example, community forestry or co-management versus state control) and that tests incentive mechanisms capable of delivering tangible benefits to local stakeholders. Further enquiry into the *transparency and cost-effectiveness of African carbon projects* was also viewed as essential for building more credible and equitable crediting arrangements. Evidence in these areas would inform policies aimed at strengthening community rights, improving confidence in conservation finance and promoting the sustainability of forests.

Ecosystem Services & Biodiversity

Participants noted a severe paucity of local data on the value of ecosystem services (especially for non-market benefits such as cultural and urban ecological services) and a weak evidence base linking natural capital changes to household welfare. This gap is particularly acute in understanding how ecosystem degradation or conservation affects different groups (with gender- and age-differentiated impacts largely unmapped). To bridge these gaps, the workshop proposed *field-testing context-appropriate valuation methods* and building capacity among policymakers to interpret and use such valuation results. Research should also explore *equitable benefit-sharing mechanisms* for ecosystem services, examining how gains from conservation (e.g. improved watershed services or ecotourism revenue) can be shared with local communities and marginalised groups. Additionally, teams plan to *evaluate innovative conservation finance models*, including Payments for Ecosystem Services (PES) programs and biodiversity offsets, to see how they can be effectively implemented in African contexts. These efforts will support the integration of natural capital values into development planning and help ensure that biodiversity conservation contributes to poverty alleviation.

Common Insights Across Themes

Common challenges surfaced repeatedly across all themes. Foremost is the need to overcome pervasive data fragmentation by developing harmonised, open platforms that integrate hydrological, ecological and socio-economic information, thereby enabling coherent policy analysis. Participants also called for valuation studies that translate natural-capital evidence into the fiscal metrics required by ministries of finance and planning, alongside strengthened governance arrangements and local analytical capacity for maintaining accounts and enforcing resource rights. All groups emphasised inclusive design, requiring explicit attention to gender, youth and other vulnerable constituencies, while climate resilience provides a unifying lens through which future research must anticipate variability and extremes. Finally, sustainable financing emerged as essential: credible, transparently costed proposals and partnerships with regional bodies and climate-finance mechanisms are needed to secure the resources that will carry this agenda from analysis to implementation.

In sum, the NatCap Collaborative Workshop achieved a clear alignment of diverse stakeholders around a coherent, evidence-based agenda for natural capital management. The plenary sessions and breakout groups jointly produced an agreed list of research priorities for each theme, based in on-the-ground realities and cross-country comparisons. These priorities will inform EfD's internal and external funding proposals, ensuring that the next phase of NatCap research directly addresses key policy gaps and contributes to sustainable development across sub-Saharan Africa.

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Introduction

The Natural Capital Collaborative (NatCap) is an initiative under the EfD (Environment for Development) network dedicated to advancing applied research on natural capital to inform policymaking in the Global South. NatCap was launched in 2021 as a platform to connect researchers and decision-makers around common environmental challenges; in particular, water resource management, sustainable agriculture, forestry, and ecosystem services & biodiversity. Through NatCap, EfD aims to generate rigorous evidence on the value of natural capital and how it can be managed for long-term sustainability, while also achieving social goals like poverty reduction and gender equality. The EfD network itself is an international consortium of environmental economics research centres, striving to create centres of excellence that bridge research and policy for sustainable development. NatCap represents EfD's commitment to natural capital accounting and nature-based solutions (NbS) as pathways to these outcomes.

In this context, the EfD NatCap Collaborative Workshop was organised in Cape Town on 26–27 May 2025. The workshop was hosted by the Environmental Policy Research Unit (EPRU) at the University of Cape Town, bringing together approximately 50 participants from Africa, the Americas, and Europe (including experts from universities, government ministries, and international organisations). The central objective of the event was to share experiences in natural capital management and to co-develop a research agenda that addresses pressing natural resource challenges in sub-Saharan Africa. In particular, the organisers aimed to identify key policy gaps in the four NatCap thematic areas and to outline research strategies for filling those gaps through collaborative, multi-country efforts. By convening a diverse mix of researchers and policymakers, the workshop also sought to strengthen the science–policy interface – ensuring that research questions are grounded in real-world policy needs, and that emerging evidence can be translated into practical guidance for decision-makers.

The structure of the workshop was designed to facilitate both broad cross-cutting dialogue and deep thematic enquiry. Plenary sessions formed the backbone of the two-day programme, offering a forum for setting the stage, exchanging insights across countries and reaching consensus on priorities. Between these plenaries participants met in thematic breakout rooms aligned with NatCap's four pillars. Two rooms were convened: the first combined the Water Systems theme, chaired by Dr Róger Madrigal (CATIE/EfD-Central America), with the Ecosystem Services and Biodiversity theme, represented by Professor Amin Karimu (EPRU/University of Cape Town) on behalf of Dr Jane Turpie; the second brought together Forestry, led by Professor Randall Bluffstone (Portland State University), and Sustainable Agriculture, led by Professor Salvatore Di Falco (University of Geneva). The Theme Leaders, whose stewardship extends well beyond the event itself, guided discussion so that each pillar could be examined in depth while linkages between paired themes were simultaneously explored. Day 1 opened with a plenary of keynote remarks, followed by a morning session introducing the four themes, breakout discussions through midday and an afternoon plenary at which each room reported its preliminary findings. Day 2 began with a policy-focused plenary on governance, finance and equity before the breakout groups reconvened to integrate those cross-cutting considerations into their thematic action plans. A final plenary then validated the refined research priorities and considered concrete next steps and partnerships. Throughout, question-and-answer segments and participatory exercises ensured that voices from diverse regions and sectors were fully heard.

Participants at the NatCap Collaborative Workshop (Cape Town, May 2025).

By its design, the workshop not only identified *what* research should be done (the content of the priorities), but also addressed *how* to organise and implement that research. The presence of high-level policymakers alongside researchers meant that discussions frequently tested the practicality and policy relevance of proposed studies. Likewise, the multi-country composition of each breakout group meant that any given issue (be it water leakage, forest conservation, or agricultural innovation) was examined through multiple lenses; revealing commonalities across countries as well as context-specific nuances.

This report presents the outcomes of the workshop in detail, structured as follows:

- Four sections (Sections 2–5) explores each of NatCap's four thematic areas – Water Systems, Forestry, Sustainable Agriculture, and Ecosystem Services & Biodiversity – summarising the key issues identified and the research priorities defined for each.
- Section 6 offers an integrated analysis of cross-cutting issues that emerged across the themes, such as data needs, valuation methods, governance challenges, climate resilience, social inclusion, and financing.
- Finally, Section 7 concludes with next steps and reflections on how these outcomes will inform future NatCap collaborative research.

This report is intended for internal EfD and NatCap stakeholders, to consolidate our understanding of the workshop outcomes, and has been written in an accessible style to also inform partners and potential funders about the research directions being pursued. The goal is to provide a comprehensive account of the workshop that can guide our *academic efforts* (by pinpointing knowledge gaps) and our *policy engagement* (by highlighting where evidence is most needed), ultimately bridging the gap between research and actionable policy in natural capital management.

Thematic Areas

Water Systems

Water is a fundamental natural asset in sub-Saharan Africa, underpinning agriculture, energy, health, and ecosystems. However, unsustainable use and inadequate management of water resources have led to scarcity, inequitable access, and ecosystem degradation in many parts of the region. The workshop's discussions on water systems brought these issues to the fore, highlighting both the biophysical and governance dimensions of water challenges. This section summarises the key issues and policy gaps identified by participants regarding water, and the priority research avenues they defined to address these gaps.

2.1 Issues and Gaps in Water Systems

A number of persistent challenges in water resource management were identified, many of which stem from gaps in data, infrastructure, and governance. One major issue is the lack of integrated data on groundwater and surface water. Participants from multiple countries (e.g. Ghana, South Africa, Uganda) reported that basic information on groundwater levels, recharge rates, and interactions with rivers is sorely lacking. Aquifers and Strategic Water-Source Areas (critical landscapes like mountain catchments that feed rivers and aquifers) provide a significant share of water supply, yet they remain *"weakly monitored"*. This data gap means that water planning is often based on unreliable estimates, leading to either over-extraction (and wells running dry) or under-utilisation of potential storage, as well as blind spots in drought preparedness. Furthermore, responsibilities for water data tend to be fragmented across geological surveys, water departments, and meteorological agencies, with little coordination.

Another prominent gap is the issue of Non-Revenue Water (NRW), water that is produced and enters the distribution system but does not generate revenue for the utility, due to physical losses (leakages, pipe bursts) or commercial losses (theft, unbilled consumption, metering errors). In many African cities, NRW levels are extremely high, sometimes exceeding 40–50% of total water supply. At the workshop, a South African delegate recounted how in some municipalities, leaks and illegal connections are so prevalent that *"nearly half the water"* is lost before reaching any customer. Other South African delegates similarly noted an upward trend in NRW, calling it "unsustainable" for already strained water services. High NRW not only represents wasted water in a region where scarcity is acute, but also a huge financial drain on utilities, undermining their ability to maintain infrastructure or invest in expansion. Delegates from Kenya, Uganda, and South Africa pointed to under-funding of operations and maintenance as both a cause and consequence of high NRW; old pipes leak more, and lost revenue means less money to fix pipes, a vicious cycle. It was also emphasised that the problem isn't purely technical: governance failures, such as lack of accountability for leak repairs and illegal connections, exacerbate NRW.

A third critical issue discussed was the sanitation deficit and resulting water pollution. Many sub-Saharan African communities, especially in peri-urban and rural areas, still lack adequate sanitation facilities. Open defecation and poorly maintained latrines lead to faecal contamination of both surface waters and shallow groundwater. Delegates cited cases (e.g. in Uganda and Kenya) where waterborne diseases and environmental health costs are rising

due to contamination of water sources by human waste. However, these health and productivity costs are often unquantified and thus invisible in policy debates. Additionally, the nexus between sanitation and water pollution is not effectively managed: water and sanitation departments might work in silos, and conventional infrastructure (sewer networks, treatment plants) is expensive and slow to deploy. This gap pointed to the need for both better data on pollution hotspots and innovative approaches to waste management that can protect water quality.

Underpinning all these specific gaps is a social and equity dimension: water scarcity and service failures tend to hit the poorest communities hardest. Participants noted that tariff structures in many places are regressive – for example, poor households without piped connections pay more per litre buying from vendors than wealthier households do from the tap, and rising block tariffs penalise large families sharing one connection. When supplies are intermittent, it is women and girls who often bear the burden of collecting water or coping with household health issues. Thus, inequitable water access was recognised as both a problem in itself and a symptom of governance gaps.

Cross-country comparisons during the workshop underscored that these issues are widespread. Ghana and South Africa, despite differing climates, both struggle with inadequate groundwater data and pollution of key water bodies. East African countries like Kenya reported similar NRW challenges as those in Southern Africa. Uganda, though at a different stage of water infrastructure development, emphasised data deficiencies and the need for improved water storage and irrigation efficiency. Such parallels suggest that solutions may be transferable or at least instructive across countries – an insight that motivated the idea of shared data platforms and comparative studies.

In summary, the key policy-relevant gaps identified in the Water theme were: (a) poor integration of groundwater and surface water data and management, (b) excessive water losses and the institutional failings around maintaining water supply infrastructure, (c) inadequate sanitation leading to pollution of water resources, and (d) the inequities and social burdens resulting from these failures. These gaps highlight where current policies and practices are not delivering sustainable outcomes. Notably, the workshop intentionally avoided jumping straight to solutions or recommendations; instead, it focused on articulating these gaps clearly, as they point to areas where further research and evidence are needed to inform better policy. The next subsection details how the participants translated these gaps into a focused research agenda.

2.2 Potential Priorities For Research in Water Systems

2.2.1 Groundwater–surface water linkages & the value of green vs. grey infrastructure

Participants emphasised that effective water planning requires a much clearer understanding of how aquifers, rivers and catchment landscapes are hydrologically connected. Basic data on groundwater levels, recharge rates and exchange with surface flows remain patchy across the region, which hampers the protection of Strategic Water-Source Areas that already supply a substantial share of national water.

Participants highlighted the need for detailed hydro-geological mapping and monitoring, coupled with cost–benefit analyses that can weigh the merits of conserving upstream catchments, wetlands or artificial recharge schemes against further investment in dams,

boreholes and other conventional works. Such evidence would equip ministries and planning agencies to allocate limited capital more efficiently, recognising not only volumetric yields but also ecological co-benefits such as flood regulation and biodiversity support.

2.2.2 NRW diagnostics and socially responsive loss-reduction strategies

High NRW levels were flagged by delegates from Kenya, South Africa and Ghana as a critical brake on both water security and utility finances. Discussions stressed the importance of rigorous, multi-country diagnostics that can disentangle physical losses (ageing pipes, illegal connections, deliberate sabotage) from commercial losses (meter errors, billing weaknesses).

Participants proposed comparative audits across the entire supply chain (production, transmission, distribution and retail) so that utilities and regulators can see where inefficiencies and institutional bottlenecks lie. Further, participants suggested rigorous, multi-country diagnostics that track water from abstraction through transmission, distribution and retail. Such studies would isolate the institutional, behavioural and technical drivers of loss, allowing utilities, regulators and finance ministries to set realistic performance targets, rehabilitation budgets and design tariffs that protect low-income users. Participants viewed the use of emerging tools such as remote sensing and community-based leak reporting as promising avenues for rapid assessment, while noting that Ghanaian representatives considered a focused cross-country study on NRW feasible within approximately one to three years.

2.2.3 Sanitation-driven pollution and low-cost mitigation options

The delegates underscored that inadequate sanitation infrastructure, including widespread open defecation and poorly maintained latrines, is a major yet under-quantified driver of contamination in both surface and shallow groundwater. As such, tracing faecal contamination across water sources was seen as a priority. Delegates from Ghana, Uganda and Kenya highlighted rising water-borne disease burdens and the lack of systematic data on pollution hotspots. Research is therefore needed to trace contamination pathways, monetise associated health costs and test practical interventions that can be deployed in resource-constrained settings.

Options discussed included waterless sanitation technologies, improved toilet facilities in peri-urban and rural settlements, and nature-based treatment systems such as constructed wetlands or bio-filtration gardens. Comparative evaluations against conventional sewerage would enable planners to judge trade-offs in cost, maintenance and climate resilience, thereby informing integrated water and sanitation policies.

2.2.4 Consolidating hydrological, utility and health data into an open platform

All of the preceding priorities rely on better-quality and better-integrated data and information. Participants therefore highlighted the serious need for the establishment of an open, regionally accessible database that links hydrological records, utility performance statistics and public-health indicators. Existing datasets are often siloed within separate departments or commercialised, creating duplication, gaps and limited comparability. A shared platform, potentially hosted in collaboration with EfD centres, national research councils and international agencies, would allow cross-country benchmarking of rainfall–run-off dynamics, NRW trends and pollution impacts. In turn, this evidence base could support scenario modelling of tariff reforms, identification of critical recharge zones and appraisal of sanitation interventions.

While no formal timeline was adopted, delegates also reflected on how work in these priority domains could be sequenced if funding and partnerships materialise. A plausible progression would begin with short-term activities such as bringing existing hydrological and utility datasets into a shared platform, mapping critical recharge areas and scoping small-scale pilot interventions through desk studies and rapid field assessments. Medium-term efforts might then extend to on-the-ground trials: community leak-reporting schemes, behaviourally informed sanitation nudges and initial monitoring of nature-based treatment sites. Over a longer horizon (three years and beyond), the expectation is that well-evidenced pilots could inform tariff revisions, prompt the designation of protected recharge zones or justify the scaling of low-cost sanitation models; such outcomes will inevitably hinge on government budget cycles, regulatory processes and sustained advocacy. In discussing feasibility, participants judged early data and mapping tasks to be highly achievable with current resources, while field experiments were viewed as moderately feasible, subject to funding and local engagement. Policy uptake was recognised as the most uncertain phase, requiring political alignment and institutional momentum. By envisaging deliverables at each stage (maps, diagnostic reports, pilot evaluations and policy briefs) participants aim to maintain stakeholder interest and enable course-corrections as new evidence emerges.

Strengthening regional collaboration emerged as a prerequisite for delivering the proposed Water Systems research agenda. Delegates stressed that the existing network of EfD centres should act as a neutral convener, linking national water ministries, utility regulators and research institutes to share protocols and pool expertise. National water ministries provide natural hubs, given their mandates to water systems, to commission cost–benefit studies and guide tariff reforms. Multilateral lenders and regional development banks, notably the African Development Bank, the Development Bank of Southern Africa and the World Bank, bring both funding and an insistence on robust economic evidence, making them strategic allies for scaling pilot results. Research councils and donors such as the National Research Foundation and the Agence française de Développement can support comparative econometric work and data harmonisation across countries. At field level, municipal utilities and water user associations offer the billing and leakage data required for granular analyses, while universities within the EfD network supply the economic modelling expertise. Hydrologists, engineers and public-health specialists will be engaged as methodological partners so that economic insights translate into technically credible guidelines. By situating economists at the centre of these multi-disciplinary teams, the partnership could accelerate the uptake of research on groundwater valuation, non-revenue water and sanitation externalities in budgetary and regulatory decisions throughout the region.

To summarise, the Water Systems theme of the workshop produced a clear set of research priorities that directly respond to the identified policy gaps. By focusing on integrated water data, reducing losses, improving sanitation through new approaches, and strengthening the evidence base in economic terms, these priorities aim to empower African policymakers with the information and tools needed for more sustainable and equitable water management. Implicit in this is the recognition that water issues cannot be solved by engineering and hydrology alone – governance, behaviour, equity, and cross-sector linkages are all part of the equation. The research agenda reflects that complexity, ensuring that outputs will be relevant not just to water agencies, but also to finance ministries, health departments, and community organisations working towards water security.

Forestry

Forests and woodlands in sub-Saharan Africa provide critical ecosystem services (such as carbon sequestration, water regulation, and biodiversity habitat) and support millions of livelihoods through timber, fuelwood, and non-timber products. Despite their importance, these resources are under intense pressure from agricultural expansion, illegal logging, and other forms of degradation. The workshop's focus on forestry brought to light several entrenched issues that hinder sustainable forest management and explored how targeted research could help resolve them. This section outlines the key issues and policy gaps in the forestry sector identified by participants, followed by the priority research areas formulated to address those gaps over the coming years.

3.1 Issues and Gaps in Forestry

One of the most prominent issues discussed was the ambiguity of property rights and tenure in forest areas. Throughout many African countries, forests are governed by a mix of customary rights, state ownership, and various forms of community tenure, often overlapping and conflicting with one another. Participants noted that unclear or insecure land and tree tenure undermines sustainable management: communities lack incentives to invest in forest conservation or tree planting if they fear the government or private companies might reallocate the land, while governments struggle to enforce regulations if local people do not recognise their legitimacy. A telling example came from East Africa, where in some Reducing Emissions from Deforestation and Forest Degradation(REDD+) pilot projects aimed at reducing emissions from deforestation and forest degradation, the rights to carbon revenues were recentralised to national governments, leaving local communities disillusioned and less cooperative. Such property-rights ambiguities lead to disputes, unsustainable exploitation (the classic "tragedy of the commons" in some cases), and difficulties in implementing any incentive-based conservation schemes.

Closely related to tenure issues are weak local incentives for sustainable forest management. Even where communities do have some rights, the economic alternatives often favour deforestation in the short term – for example, converting forest to agriculture or charcoal production might be one of the few viable livelihoods. The workshop highlighted that existing incentive mechanisms (like community forestry programs or revenue-sharing from ecotourism) are often inadequately designed or implemented, thus failing to compete with the drivers of deforestation. Participants mentioned that many communities have yet to see tangible benefits from conservation initiatives, which erodes trust. In Ghana and Nigeria, for instance, benefit-sharing arrangements from timber revenues are in place on paper but in practice communities see very little cash flow, partly due to corruption or bureaucratic capture. This lack of positive incentive to keep forests standing is a major gap – policies focus heavily on enforcement (sticks) and too little on carrots.

Another major issue identified was the credibility (or lack thereof) of emerging carbon markets and other conservation finance mechanisms in the forestry sector. The idea of financing forest conservation through carbon credits or payments for ecosystem services (PES) has gained traction, but in Africa this approach faces scepticism. Workshop delegates pointed out multiple credibility and verification challenges: instances of overstated carbon benefits, unclear additionality, leakage (where protecting one area shifts deforestation to another), and difficulties in monitoring carbon stocks accurately. Moreover, many voluntary carbon projects in Africa have been criticised for not delivering promised community benefits

or for being opaque in their financial flows. This has led to mistrust among both local stakeholders and policymakers, some of whom view carbon deals as a new form of “green” resource grab. An institutional capacity constraint exacerbates this – few African countries have strong systems in place to verify carbon projects or enforce standards. So while carbon finance could be a game-changer for funding forest protection, its current implementation gap is a significant policy and research concern.

A more operational gap discussed was the fragmented data and monitoring systems for forests. While most countries have done forest inventories or remote-sensing based forest cover assessments, these are often infrequent (e.g. one-off studies) and not integrated into continuous monitoring. Spatial data on forests might not be harmonised with data on agriculture, fires, or biodiversity, making it hard to plan across sectors. Participants mentioned that in some countries, the forest authority’s data might even contradict the environment ministry’s data due to different methods. This fragmentation means that policymakers often do not have a clear picture of what is happening in forests until a crisis (like a major wildfire or a sudden spike in deforestation) occurs. The lack of high-resolution, regularly updated spatial data also impedes the targeting and evaluation of any interventions.

Another issue that emerged, particularly in discussions linking agriculture and forestry, is the prevalence of wildfire and fire management problems. In parts of East and Southern Africa, seasonal bushfires – some accidental, many deliberately set for land clearing or poaching – are causing significant forest loss and degradation of woodland quality. Tanzanian and Kenyan participants noted that traditional fire management knowledge has eroded, and current policies tend to be punitive (banning fires outright) rather than constructive (like controlled burns or community fire brigades). As climate change leads to hotter, drier conditions in some regions, wildfire risk is rising, yet policy responses and research on fire ecology in African forests are limited. This is a gap in both knowledge and policy – understanding how to reduce harmful fires while possibly using fire as a management tool could greatly benefit forest conservation.

The workshop discussions underscored that these forestry issues are interconnected with socio-economic factors. Rapid population growth and poverty put pressure on forests for land and resources. Without alternative livelihoods or energy sources, rural populations will continue to turn forests into farms or charcoal. Thus, gaps in broader rural development policy (like lack of agricultural productivity growth or rural energy access) feed into deforestation. While those broader issues are beyond the forest sector per se, participants acknowledged that a holistic view is needed: sustainable forestry cannot be achieved in isolation from agricultural policy and community development.

Cross-country comparisons revealed both commonalities and differences. For example, property rights issues were noted in countries as diverse as Uganda (with central forest reserves vs community forests) and Nigeria (where open-access woodlands are prevalent). Carbon market scepticism was echoed by participants from East, West, and Southern Africa alike, suggesting this is a continent-wide challenge. On the other hand, specific contexts differ: in Ethiopia, for instance, large government-led reforestation programs mean the policy gap is more about effectiveness and maintenance, whereas in DRC or Cameroon, the gap might be more fundamental governance and security in forest zones. Recognising such variation is important for tailoring research to context.

In summary, the key policy gaps in forestry highlighted were: (a) insecure or unclear tenure regimes; (b) inadequate incentive structures for communities; (c) mistrust and weak governance in conservation finance (carbon markets/PES); (d) insufficient data and monitoring systems; (e) and challenges in managing fire and other direct threats. Underlying all these is a capacity gap; both at local level (communities lacking support to manage forests) and at institutional level (agencies lacking tools and trust to enforce and encourage sustainable practices). The workshop deliberately framed these not as failures to be solved overnight, but as *knowledge and action gaps* where targeted research could make a difference by informing better policies or demonstrating viable approaches. The next part details the research priorities the participants crafted to begin closing these gaps.

3.2 Potential Priorities For Research in Forestry

3.2.1 Forest tenure and management models

Participants stressed that widespread tenure ambiguities continue to hamper sustainable forest management. Comparative evidence is lacking on how different ownership or management regimes influence forest condition and local welfare. Future studies could therefore compare community-managed forests, co-management arrangements (where communities share responsibilities with government), and conventional state-managed protected areas or concessions. Indicators of interest include deforestation rates, biodiversity status, household income generation, and the distribution of benefits among women, youth, and other marginalised groups.

Illustrative sites mentioned in the discussion included a successful community forestry initiative in Tanzania and a proximate state-run reserve; lessons from outside Africa, such as long-standing schemes in Nepal, were flagged as useful comparators that might be adapted to African contexts. By analysing governance elements such as boundary clarity, enforcement mechanisms, and benefit-sharing rules, such work is expected to inform future tenure reforms and community-based stewardship programmes.

3.2.2 Community incentive schemes for forest protection

Building on tenure issues, delegates emphasised the importance of incentives that align local livelihoods with conservation goals. Gender considerations were repeatedly highlighted: women, as principal users of fuelwood and other forest resources, must be direct beneficiaries.

Research opportunities lie in designing and testing benefit-sharing mechanisms that allow communities to realise tangible gains from maintaining forest ecosystem services. Examples discussed included payments for ecosystem services (PES) to upland communities safeguarding watershed forests, eco-certification with premium pricing for sustainably produced timber or non-timber products, and conservation agreements that exchange development support for specific protection commitments. Possible pilots could involve community forestry funds that allocate a share of timber or carbon revenue to local projects, or alternative livelihood initiatives such as beekeeping and shade-grown coffee. Rigorous evaluations of these schemes would shed light on cost-effectiveness and scalability, helping governments and non-government organisations to decide which models merit wider adoption.

3.2.3 Credibility and effectiveness of carbon finance

Scepticism around voluntary carbon markets emerged as a recurring theme. Participants considered it crucial to learn from existing REDD+ pilots and other offset projects in order to improve transparency and fairness. Retrospective analyses could map the flow of carbon revenues, comparing funds reaching local implementers with those absorbed by intermediaries such as consultants or verifiers. Verification processes, additionality assessments, and leakage risks also warrant closer scrutiny. Building on such insights, workshop delegates proposed exploring the feasibility of regional certification standards or an African carbon registry to bolster trust, and investigating community-led monitoring models that complement satellite verification. Experiences in governance capacity building from organisations such as the International Development Research Centre (IRDC) were cited as valuable inputs. Developing a framework for 'fair carbon finance' by incorporating principles of free prior informed consent, independent grievance mechanisms, and equitable revenue sharing, was identified as a high-impact step towards increasing both uptake and local benefit of carbon funding.

3.2.4 Socio-ecological monitoring tools

Data fragmentation presents a major barrier to evidence-based forestry policy. Participants therefore called for the creation of integrated mapping tools that combine forest cover trends with socio-economic indicators such as population density, poverty levels, and fire incidence. Advances in remote sensing (higher-resolution imagery, near-real-time fire detection) could be merged with ground data from household surveys or censuses to build interactive dashboards for policymakers. Such tools would enable users to pinpoint deforestation hotspots and understand underlying drivers; whether linked to road access, shifting cultivation, or wildfire.

A proposed output discussed at length was a harmonised 10 km × 10 km carbon-sequestration grid, originally mooted by the EfD Global hub, which could underpin both land-use planning and carbon accounting across countries. Capacity-building elements, such as training workshops, user manuals, and technical support, were deemed essential so that national agencies and local practitioners can interpret and apply the resulting data products.

3.2.5 Interactions among forest policy, livelihoods, and climate

Finally, participants noted the need for scenario-based modelling to explore how forest policies perform under varying socio-economic and climate futures. Questions raised included: what livelihood impacts arise if a strict logging moratorium is introduced without viable alternatives; to what extent might large-scale agro-forestry relieve or intensify pressure on natural forests; and how could climate adaptation priorities conflict with carbon-driven mitigation strategies? System-dynamics or agent-based models, calibrated with field data, were suggested as appropriate tools for analysing such trade-offs and co-benefits. Outputs could range from academic publications to user-friendly policy simulators, helping decision-makers test alternative strategies (such as doubling protected-area coverage or introducing timber plantation subsidies) before large-scale implementation.

Participants recognised that the feasibility and evidentiary demands of each priority vary in length. Short- to medium-term efforts (roughly one to two years) could reasonably include developing prototype mapping tools or compiling initial comparative case studies on tenure.

Investigations that hinge on behavioural change (such as tracking the effectiveness of community incentive schemes) or assessing the full implications of reformed tenure frameworks would require a longer horizon of three to five years. Workshop discussions outlined an indicative timeline rather than a firm workplan: within the first year, a small working group might be convened to examine voluntary carbon-market design and its relevance to African contexts; by the end of the second year, a comparative review of forest-tenure reform experiences could be drafted with accompanying policy options; by years two to three, pilot evaluations of PES or community forestry funds might generate early lessons; and over three to five years, accumulating longitudinal data could support decisions about scaling successful approaches or revising national legislation.

Effective progress on any of the priority areas will depend on broad collaboration. Participants pointed to a range of potential allies: national ministries of forestry and environment, which oversee tenure and incentive policies; community forest associations and indigenous groups, which are central to field-level implementation; and continental platforms such as the Forestry Research Network for Sub-Saharan Africa (FORNESSA) and the African Forest Landscape Restoration Initiative (AFR100), which could facilitate knowledge exchange. Lessons from organisations with experience in multi-country environmental governance (IDRC was one example) were viewed as instructive for structuring future partnerships. Engagement with finance specialists and standards bodies, including entities such as Verra or the UNFCCC accreditation process, would also be valuable should the carbon-market line of enquiry advance.

Although described under separate headings, the five forestry themes are inherently connected. A shared data platform, for instance, would underpin both tenure comparisons and carbon-finance assessments, while equity considerations cut across every topic. Collectively, these themes represent areas where additional research could yield high policy leverage and lend themselves to multi-country collaboration across sub-Saharan Africa.

If taken up, work in these directions could help create an enabling environment for improved forest governance; characterised by clearer rights, stronger community engagement, credible financial flows, and evidence-based decision support. Participants situated these needs within a wider regional context: African forests now face mounting pressures from population growth and climate change, making coherent policy responses all the more urgent. By emphasising distributional outcomes and the integrity of financial mechanisms, the identified research directions aim to inform policies that conserve forests in ways that are both socially just and economically robust, complementing continental goals around inclusive green growth and climate action.

Sustainable Agriculture

Agriculture remains the backbone of most sub-Saharan African economies and livelihoods, yet it is also a leading driver of environmental change – consuming water resources, encroaching into forests, and being highly vulnerable to climate variability. During the workshop, participants from various countries dissected the barriers to sustainable agriculture uptake and identified where policy support and evidence are currently lacking. This section outlines those key issues and gaps, and then describe the research priorities that were defined to support a transition to more sustainable, climate-smart agricultural systems across the region.

4.1 Issues and Gaps in Sustainable Agriculture

One of the overarching issues raised was the low uptake of sustainable farming practices – such as conservation agriculture (minimal tillage, crop rotation, soil cover), agro-forestry (integrating trees into farming systems), and water-efficient techniques (like drip irrigation or rainwater harvesting). Despite decades of pilot projects and advocacy, participants observed that these practices have not been widely adopted at scale in sub-Saharan Africa. For example, conservation agriculture remains patchy; many smallholder farmers still plough extensively and leave soils exposed, contributing to erosion and soil fertility decline. Similarly, while agro-forestry (like planting Faidherbia albida trees in croplands for soil fertility) has shown benefits in trials, it's far from mainstream in most extension programs.

Workshop discussions highlighted several reasons for the slow uptake of sustainable farming practices. First, farmers rarely see reliable, locally proven evidence of long-term yield or profit gains; most demonstrations occur under conditions unlike their own. Second, many techniques impose high initial labour or knowledge demands. Third, risk-averse farmers tend to prefer familiar methods, so they avoid innovations such as new crop rotations or mulching unless strong support is in place. Finally, policy signals can be mixed: subsidies for conventional inputs such as fertiliser or subsidised tillage inadvertently discourage agro-ecological approaches. Bridging the gap between the concept of sustainable agriculture and its practical adoption therefore requires context-specific evidence, clearer communication of benefits and policy reforms that reward, rather than penalise, sustainable choices.

A second major gap identified was the fragmentation of data and knowledge regarding agriculture and its environmental impacts. Participants from Ethiopia and Nigeria emphasised that there are no harmonised national databases linking key factors such as water use in agriculture, land management practices, input use, and yields. Data exists in silos: agricultural survey data might sit in one ministry, climate data in another, and soil maps in another, rarely analysed together. This fragmentation makes it difficult to assess, for example, how a particular farming practice is impacting local water resources or soil health. It also hampers cross-regional comparisons – a technique proven in one country is often not well documented in a way that others can learn from it. The extension services were singled out as both victims and contributors to this data problem: they often operate without access to up-to-date research findings or spatial data that could guide their advice, and the feedback they gather from farmers isn't systematically captured to inform research. Without an integrated evidence base, scaling up sustainable agriculture is essentially flying blind.

Another issue discussed was the interplay between agriculture and adjacent ecosystems, notably forests, which is partly covered in the forestry section but is equally an agricultural issue. Many participants noted the trend of agricultural expansion into forested or marginal lands as populations grow and as climate change alters suitable zones. In places like Nigeria, policies to boost agriculture (like promoting cash crops or large-scale farms) sometimes undermine forest conservation goals, indicating a policy gap in reconciling land use. The intentional use of fire in agriculture ("slash-and-burn" for land clearing, or burning crop residues) was also noted as a persistent practice that can lead to uncontrolled wildfires harming both farms and forests. In addition, the two-way relationship between agriculture and biodiversity was raised: pests and pollinators move across farm-forest boundaries, meaning decisions in one affect the other. The implication is that agricultural policies often ignore these externalities; for instance, a push for monoculture crop production may raise pest pressures that then affect nearby forests, creating new environmental health issues.

Participants also expressed concern over the lack of climate resilience in current agricultural systems. Climate variability (irregular rains, new pests with warming, more frequent droughts) is already exposing the fragility of traditional practices. Yet, adaptation strategies such as crop diversification, water-saving irrigation, or soil moisture conservation are not being adopted widely enough. This gap is partly informational (farmers may not know what strategies work, or lack access to drought-resistant seeds), and partly systemic (poor rural credit access means farmers cannot invest in new technologies or inputs that might help them adapt). The result is that agricultural productivity in many African regions is stagnating or even declining once you factor in land degradation and climate stress, threatening both food security and prompting further expansion into ecologically sensitive areas.

A methodological and institutional issue that underpins the above is the critique that research in agriculture (and development projects) often relies on short-term, experimental approaches that are not fully suited to capturing long-term, landscape-level processes. Participants pointed out that typical project cycles and RCTs might last 2–3 years, whereas soil regeneration or climate adaptation benefits might need a decade to manifest. Moreover, ethical and practical constraints mean we often cannot randomise things like who gets land rights or who gets exposed to a climate shock – hence the call for more quasi-experimental and modelling approaches to complement field trials. This gap suggests that the research toolkit for generating evidence in sustainable agriculture needs broadening and that data transparency and sharing (to allow pooled analyses and natural experiments) is crucial.

From a policy perspective, a key gap identified was in the economic valuation of ecosystem services in agriculture, and using those valuations to inform legal or policy decisions. For instance, Nigeria and South Africa's representatives argued for systematic valuation of ecosystem services lost when land is converted unsustainably, to strengthen legal challenges against such conversions. This indicates that in many cases, policy-makers lack quantification of gains and losses from agricultural transformations (be it carbon sequestration, water regulation, or cultural values) and so policy remains biased towards immediate productive gains. Without that evidence, defending a forest patch against conversion to farmland, or arguing for maintaining a wetland rice system versus drainage, is much harder.

In summarising the gap analysis for sustainable agriculture: (a) There is a clear recognition that sustainable practices exist but are not being widely implemented (the "know-do" gap), (b) a major reason is insufficient evidence tailored to local contexts and lack of integration of data (the knowledge infrastructure gap), (c) policies often do not internalise the

environmental externalities of agriculture or foster cross-sector synergy (the governance alignment gap), and (d) climate change is amplifying the cost of these gaps, making it urgent to innovate and adapt agriculture for resilience. The workshop participants across different countries found that many of these issues resonated broadly – whether in East African highlands, West African savannas, or Southern African semi-arid regions, farmers face similar hurdles in changing practices and policymakers face similar blind spots. Thus, a collaborative research and action approach is justified to tackle problems that transcend any one locality.

4.2 Potential Priorities For Research in Sustainable Agriculture

4.2.1 Open Data and Knowledge Platform for Agriculture–Environment Linkages

Participants from several countries agreed that the first prerequisite for progress is a shared data infrastructure that breaks existing silos. Delegates from Ethiopia, Tanzania, Nigeria and South Africa called for a harmonised, centralised database that would pool national-scale survey material, spatial layers and administrative statistics so that researchers and decision-makers can draw consistent comparisons across regions. The proposal emphasised merging existing EfD datasets with newly compiled GIS layers and making them accessible to all stakeholders, thereby reducing duplication and ensuring that future analyses of agriculture–forestry interactions start from a common evidential base.

Although no explicit timeline was endorsed, the conclusion of the session was that establishing such a platform is an immediate priority and should proceed in tandem with the thematic studies outlined below. To accelerate uptake, participants also agreed that a dedicated post-doctoral coordinator would report back to government partners on data architecture options and oversee harmonisation of GIS layers across countries.

4.2.2 GIS-Based Analysis of Conservation Agriculture and Agro-forestry

Across the discussions, contributors stressed that questions of where particular practices work best can only be answered through spatially explicit analysis. Ethiopian and South African teams highlighted the value of fine-grained GIS layers to explore the interplay between crops and trees, while collaborators from Tanzania and Nigeria urged that a continent-wide pixel map of potential carbon sequestration be constructed to inform both conservation agriculture and agro-forestry planning. By overlaying land-use data with biophysical variables, the envisaged studies would reveal how conservation tillage, mulching or mixed tree–crop systems perform under differing soils and rainfall patterns, guiding extension services towards the zones where the benefits are likely to be greatest and helping policymakers to target investment where it can deliver both productivity gains and forest protection. Delegates further highlighted that fine-scale wildfire and pest incidence layers should be incorporated so that spatial models can flag areas where invasive species or recurrent fires threaten the long-term success of tree–crop systems.

4.2.3 Field Experiments and Evaluations of Incentives for Technology Adoption

Multiple delegations observed that information campaigns alone rarely shift entrenched farming practices. Tanzania and Ethiopia reported that farmers respond when incentives align clearly with expected pay-offs, citing both a Tanzanian call for cost–benefit evidence and Ethiopia's experience with a work-for-technology programme that relaxes liquidity

constraints. The overriding goal is to identify incentive structures that lower risk, raise returns and therefore accelerate the voluntary uptake of sustainable practices.

Because randomised trials can be difficult to implement in complex rural settings, participants recommended a mix of quasi-experimental approaches and laboratory-in-the-field games to test insurance products, input subsidies and payment mechanisms under realistic decision environments. Speakers from Ethiopia and Nigeria stressed that liquidity constraints remain binding; therefore, trials should test work-for-technology schemes and micro-finance packages alongside standard subsidy designs to reveal which mix best unlocks investment by poorer farmers. By testing incentives, this research would directly inform policy on how to design programs (subsidy reforms, agricultural extension approaches, or grant schemes) that effectively encourage sustainable practices. It moves beyond "educating" farmers towards actively reducing risk and enhancing the appeal of sustainability.

4.2.4 Multi-Season Evaluations of Agronomic, Economic and Environmental Outcomes

While incentives matter, delegates from South Africa and Kenya argued that policymakers still need hard proof that sustainable techniques deliver superior yields, healthier soils and reduced pressure on surrounding forests. The participants therefore called for longitudinal studies that track yields, pest and disease incidence, wildfire impacts and soil-water dynamics under contrasting management regimes. Ethiopia emphasised measuring water productivity at farm level, whereas Nigeria pointed to the need for data linking forest quality to community livelihoods. Kenya proposed that these panels also track household health expenditures so that policymakers can quantify potential savings when intact ecosystems reduce water-borne disease and smoke-related illnesses. Such evidence, gathered over multiple seasons and landscapes, would allow researchers to quantify the full suite of agronomic and ecological benefits and to identify any unintended consequences of intensified production.

4.2.5 Property Rights and Land Use Policy Experiments

Breakout discussions revealed that insecure and poorly defined land and forest rights remain a central obstacle to sustainable resource management. Participants from Nigeria, Ethiopia and Tanzania pointed to persistent ambiguity over who controls forest parcels, noting that such gaps encourage illegal logging, land grabs and the displacement of local users when central governments transact carbon credits on global markets.

Several countries argued for experiments that compare alternative tenure arrangements, ranging from individual household titles to community-level stewardship models, in order to test which configurations deliver the strongest incentives for conservation while safeguarding rural livelihoods. Ethiopia emphasised the need to analyse how clearer rights in agro-forestry settings help households cope with climate shocks, while South Africa highlighted property rights as a prerequisite for any credible voluntary carbon market capable of curbing deforestation. Across regions there was agreement that pilot programmes should track how tenure clarity influences farmer investment in trees, wildfire prevention and the adoption of sustainable practices, thereby generating evidence to guide wider land-policy reforms.

4.2.6 Integrating Climate Resilience Metrics into Agricultural Planning

Climate risk featured throughout the conversations, with Ethiopia stressing that water productivity must sit at the heart of any definition of sustainable agriculture and Kenya underscoring farmers' demand for long-term climate information to guide planting decisions

and participation in carbon markets. Tanzania drew attention to the interplay between forestry and agriculture under changing rainfall patterns, while regional contributors under the EfD umbrella called for national GIS databases that couple climate series with soil, land-cover and socioeconomic layers. Building on these points, the research agenda centres on embedding explicit resilience indicators (such as seasonal yield stability, wildfire incidence and water-use efficiency) into all trials of conservation agriculture and agro-forestry. Spatial analyses using the proposed shared database would model how suitability zones for specific practices shift under projected temperature and precipitation changes, allowing planners to prioritise water-saving and risk-buffering innovations in the most vulnerable areas well before crises emerge.

Collaboration is again central. The workshop identified partnerships with national agricultural research systems (NARS) and universities in each country to carry out field trials, as well as international bodies like the CGIAR centres (e.g. ICRAF for agro-forestry, CIMMYT for conservation agriculture) which have longstanding experience in these domains. By involving ministries of agriculture and even farmers' unions early (some participants were from those), the research will stay tuned to ground realities and policy entry points. There was also mention of working with the Food and Agriculture Organization (FAO), especially on the spatial data aspects, since FAO has global data portals and tools that could complement the NatCap platform.

By focusing on data integration, targeted evidence generation, and incentive design, the sustainable agriculture research agenda from the workshop aims to break the cycle of low adoption and environmental degradation. Generating research within these areas will equip policymakers with the information to craft better support for sustainable practices – such as evidence-backed extension messages, smarter subsidies, and integrated land use policies – and empower farmers with both the knowledge and the means (through incentives or reduced risks) to change their practices in favour of long-term sustainability.

Ecosystem Services & Biodiversity

Biodiversity and the ecosystem services it underpins remain central to livelihoods and economies across sub-Saharan Africa, yet these contributions are seldom reflected in mainstream policy debates. The breakout sessions devoted to Ecosystem Services & Biodiversity therefore focused on how to recognise, measure and communicate the value of natural capital, as well as the institutional conditions needed for that information to shape decisions. The discussions yielded a diagnostic of key gaps and a set of priority research areas that participants felt would be most policy-relevant. Importantly, these are framed as areas *where future work is needed*, not as projects that NatCap or EfD has already committed to undertake.

5.1 Issues and Gaps in Ecosystem Services & Biodiversity

The breakout discussions converged on the view that economic valuation of biodiversity and ecosystem services in Africa remains rudimentary. Participants from Ghana and South Africa stressed that ministries and treasuries "believe in seeing numbers", yet local figures for services such as bush-meat provisioning, groundwater-dependent ecosystems or wetland flood attenuation are scarce. In the absence of context-specific values, planners default to estimates imported from other regions or to purely biophysical indicators, neither of which resonate with national budget processes. Several speakers noted that attempts to defend conservation spending routinely stall when finance officials ask for cost–benefit evidence grounded in domestic realities.

Evidence linking natural capital to household welfare is likewise thin. Although workshop delegates recognised that communities depend on resources ranging from game meat and wild products to tourism revenues, rigorous data tracing how ecosystem changes affect incomes, health or poverty reduction are limited. This evidential gap fuels a perception that conservation competes with development, especially when opportunity costs (such as foregoing mineral extraction inside protected areas) are immediate while ecosystem benefits appear distant or diffuse. Uganda's representatives highlighted minerals in parks as an example where policymakers seek clarity on trade-offs but lack credible socio-economic analysis.

Data fragmentation emerged as a structural obstacle. South African participants described how species inventories, protected-area boundaries and socio-economic statistics reside in separate agencies, often using incompatible classifications. Ghanaian and Kenyan delegates echoed these concerns, pointing to partial or outdated records on wetlands, non-timber products and groundwater-dependent ecosystems. Where natural-capital accounts exist, they are frequently pilot exercises that have not been integrated into routine government reporting, making it hard to compile a comprehensive national picture or track trends over time.

Governance and capacity constraints compound these problems. Environmental departments are typically under-resourced, and many officials are unfamiliar with economic or integrated assessment methods. As a result, even when valuation studies are produced, they are seldom mainstreamed into planning or budgeting. Several delegates called for capacity building that reaches beyond environment ministries to finance and planning

portfolios, noting that without such engagement natural-capital evidence risks “sitting on a shelf”. Siloed mandates further complicate matters: responsibility for, say, biodiversity offsets or benefit-sharing schemes may be spread across multiple departments, each assuming another will act.

On the analytical front, participants identified a shortage of integrated socio-ecological modelling and scenario analysis. Uganda and South Africa emphasised the need for models that connect ecosystem dynamics with economic and social outcomes, helping policymakers visualise trade-offs between, for example, expanding agriculture in strategic groundwater areas and sustaining long-term water security. Kenya added that adaptation strategies are often biased towards familiar options precisely because decision-makers lack tools that reveal the full range of consequences.

Finance and incentives were also flagged as under-examined. The group discussed biodiversity offsets linked to mining and the broader promise of nature-based solutions, yet noted that robust evaluations of additionality, cost-effectiveness and equity are rare. Without such evidence, it is difficult to distinguish effective mechanisms from those that merely shift problems or entrench elite capture.

Finally, climate change is altering baselines faster than policy can respond. Shifting flood zones, prolonged droughts and rising temperatures are expected to reshape habitats and ecosystem service flows, but these dynamics are not routinely factored into conservation strategies or natural-capital accounts. Delegates agreed that incorporating climate resilience into biodiversity planning is urgent, particularly for wetlands, peatlands and other ecosystems that buffer climate extremes.

In a nutshell, the biodiversity discussions highlighted five interlocking gaps: (a) limited, locally grounded valuation evidence; (b) weak links between ecosystem change and household welfare; (c) fragmented data and slow uptake of integrated natural-capital accounting; (d) governance and capacity shortfalls that inhibit mainstreaming; and (e) insufficient analytical tools and finance evaluations, especially under accelerating climate change. The workshop aimed to turn these gaps into a roadmap for research that can inform better integration of natural capital in development planning.

5.2 Potential Priorities For Research in Ecosystem Services & Biodiversity

5.2.1 Strengthening Context-Specific Valuation Evidence

Across countries there was a shared frustration that many decisions still lean on benefit-transfer figures from other continents or on purely biophysical indicators. Ghanaian and South African delegates stressed that ministries and treasury officials “believe in seeing numbers”, yet valuations are often either imported from other countries or limited to biophysical indicators that hold little sway in fiscal debates. Uganda’s team added that without locally grounded figures, conservation arguments “get lost in translation” inside finance cabinets. Participants therefore flagged a need to generate and compare valuation approaches that fit African socio-ecological realities, including low-literacy settings, customary tenure and communal resource governance.

Contingent valuation, choice experiments, participatory ranking and citizen-science data collection were all mentioned as candidates for testing, with deliberate attention to cultural framing and multiple languages. Equally important is documenting the practical aspects of

survey design, sampling and enumeration so that environment ministries can commission or replicate studies themselves. The group underlined that the output should not be a single set of numbers but clear methodological guidance explaining what each approach captures, where it performs well, and how uncertainty ought to be communicated to planners and budget officers. Examples cited included valuing storm-protection services of coastal wetlands in South Africa's KwaZulu-Natal province, estimating the cultural significance of sacred groves in northern Ghana, and quantifying livelihood support from wildlife corridors that straddle Kenyan conservancies and Ugandan national parks. In every case, the emphasis was on policy usability: credible ranges of monetary or non-monetary metrics that can be fed into cost–benefit analyses, spatial plans and compensation schemes.

5.2.2 Understanding and Improving Benefit-Sharing Mechanisms

A second theme concerned who gains and who loses when biodiversity is conserved. Kenyan participants described court cases where neighbouring communities felt excluded from revenue streams generated by protected areas. Ghana's delegation referred to community wildlife ranches where a handful of elites captured most profits from bush-meat licences. South African discussants noted ongoing debates over how much of the Kruger National Park tourism surplus should return to villages outside its gates. These examples fed into a wider research priority: mapping existing benefit-sharing arrangements, assessing their distributional outcomes, and diagnosing design features that foster or hinder equity. Cases ranged from tourism revenue-sharing pacts to community land-lease models, game-meat quotas, bioprospecting contracts and locally led natural-product enterprises (such as Aloe ferox harvests in the Eastern Cape).

Participants saw value in comparative, multi-country work that can tease out common bottlenecks such as unclear tenure, weak monitoring or gendered barriers to participation. While the group suggested that pilot trials of innovative mechanisms could be informative, the immediate need is systematic evidence on real-world performance: whether schemes truly change behaviour; how benefits reach poorer households; and what institutional safeguards prevent elite capture. Lessons could then feed into draft guidelines for future agreements or revisions of protected-area regulations. Several speakers insisted that such evidence must encompass social indicators alongside ecological outcomes, covering income variability, perceptions of fairness and gender inclusion.

5.2.3 Evaluation of Payments for Ecosystem Services (PES) and Finance Instruments

Biodiversity offsets, watershed PES schemes, and other conservation-finance tools have proliferated across the continent, yet workshop participants agreed that robust evidence of additionality, cost-effectiveness, and social acceptability remains thin. South African delegates cited recent offset projects linked to the mining sector, noting uncertainties over long-term ecological equivalence. Kenyan and Ugandan colleagues pointed to donor-supported PES pilots that attracted initial enthusiasm but have not undergone systematic impact evaluation. Consequently, participants nominated comparative assessment of existing schemes as a research priority. Suggested analytical foci included: baseline counterfactuals to determine whether observed conservation outcomes exceed business-as-usual scenarios; distributional studies to detect elite capture; and cost-benefit comparisons with command-and-control regulation.

While green bonds and debt re-configuration were briefly mentioned by a Kenyan speaker as potential future vehicles, the discussion primarily centred on instruments already operating in the region, such as corporate biodiversity offsets and water-user payments to upstream communities. By clarifying when and where such instruments deliver genuine environmental and welfare gains, researchers could furnish policymakers with evidence-based guidelines, reduce scepticism among finance ministries, and help safeguard community interests.

5.2.4 Integration of Climate Impacts & Resilience into Ecosystem Valuation and Planning

Participants repeatedly stressed that climate dynamics are altering both ecosystem service provision and conservation baselines. South African representatives described how shifting flood zones complicate town-planning and increase disease risk, while Ugandan speakers warned that prolonged droughts intensify pressure on protected areas. Despite these challenges, climate adaptation considerations are seldom embedded in biodiversity strategies or valuation studies.

The workshop therefore highlighted an opportunity for research that couples ecosystem valuation with scenario-based climate projections. Potential avenues include estimating how the economic value of wetlands for flood mitigation may rise under intensified rainfall regimes, or identifying climatic refugia where species persistence is likely to remain high. Ghanaian delegates noted that such analyses could strengthen the case for nature-based solutions within national adaptation plans and unlock finance earmarked for resilience objectives. Participants urged that methodological development proceed alongside stakeholder engagement, to ensure that climate-aware valuations are comprehensible to planners and compatible with existing natural capital accounting frameworks.

5.2.5 Developing Socio-Ecological Mapping and Decision-Support Tools

Data fragmentation emerged as a core obstacle to evidence-based biodiversity management. South African speakers illustrated how species records, protected-area boundaries, and socio-economic data reside in different agencies, complicating integrated assessments. Ugandan and Kenyan participants echoed this concern, adding that limited access to remotely sensed information further hampers monitoring of change.

Against this backdrop, the assembly identified the development of interoperable mapping platforms as a high-leverage research direction. Such tools could overlay biodiversity indicators, ecosystem service flows, poverty metrics, and exposure to climate hazards, thereby enabling decision-makers to visualise trade-offs and synergies. Ghanaian delegates observed that spatially explicit evidence is often persuasive for finance officials because it conveys opportunity costs in concrete geographic terms. Key technical questions flagged for investigation included: harmonising classification systems across jurisdictions; incorporating community-generated data without compromising quality; and designing user interfaces that match the analytical capacity of provincial or district planning offices. Delegates also recommended piloting the integration of these tools into statutory processes, for example environmental impact assessments or land-allocation hearings, to test usability in real-time policy contexts.

5.2.6 Institutional Capacity Building and Policy Mainstreaming of Natural Capital

Finally, participants agreed that methodological advances will have limited influence unless institutions can interpret and apply the resulting evidence. South African and Ghanaian

delegates described how earlier natural capital accounting pilots remained isolated because finance and planning ministries were not involved from the outset. Ugandan representatives noted that many officials are wary of economic terminology, viewing it as outside their expertise, while Kenyan participants highlighted the risk of "project fatigue" if studies do not translate into tangible policy instruments.

Consequently, the delegates called for research into effective capacity-building and mainstreaming pathways. Suggested topics included documenting comparative cases where natural capital accounts shaped budget or permitting decisions; analysing the incentive structures within ministries that either support or impede uptake of ecological information; and evaluating the impact of targeted training on officials' willingness to request and use biodiversity data. Delegates also saw merit in exploring institutional models that facilitate sustained collaboration between scientists, civil-society organisations, and government, such as advisory councils or co-produced data portals. By examining these arrangements, future studies could reveal how best to embed natural capital considerations into ordinary governance routines rather than relying on ad hoc project cycles.

This thematic work would involve partnerships with academic and policy institutions. The Natural Capital Accounting community (like the WAVES partnership or the UN's EEAP – Experimental Ecosystem Accounting Project) would be natural allies, as would NGOs and think tanks focused on biodiversity-economy links (Conservation International, WWF, etc., some of which have economists in African projects). Government partners would include not just environment ministries but ideally finance or planning ministries, to whom the case for natural capital needs to be made (some workshop panellists like Uganda's Ministry of Finance representative show such interest). On the ground, working with local universities and conservation areas (national parks, community conservancies) will be key for data and pilot projects.

The priorities above represent areas where the workshop's biodiversity participants perceived pronounced knowledge and policy gaps. They are set out here not as a prescribed research agenda but as a menu of opportunities that, if pursued, could strengthen the evidence base for aligning biodiversity conservation with inclusive development across Africa. Importantly, the discussions underscored the value of comparative, multi-country collaboration: many ecological challenges and institutional constraints are shared, yet the diversity of social and biophysical contexts provides a natural laboratory for learning. Researchers, governments, and funding partners may therefore wish to consider these priorities when shaping future programmes, mindful that rigorous evidence, co-created with policymakers and communities, offers a pathway to elevating natural capital from peripheral concern to central pillar of sustainable growth.

Cross-Cutting Issues and Shared Challenges

Although the four thematic streams of the workshop explored different resource sectors, participants repeatedly returned to a common set of system-level concerns that influence every aspect of natural capital management in sub-Saharan Africa.

6.1 Data Fragmentation and Integration

Across all themes, participants agreed that progress is held back less by an absence of measurements than by the dispersal of those measurements among unconnected agencies and formats. Hydrological gauges, satellite images, biodiversity inventories and household surveys sit in separate custodial silos, usually with incompatible classifications and patchy metadata. The result is an evidence base that cannot be joined into a coherent view of natural-capital trends or trade-offs. Speakers pointed out that this fragmentation reduces the credibility of valuation studies, limits the scope for regional comparison and often leads to repeated collection of the same variables at considerable cost. The workshop therefore endorsed a pragmatic first step: audit what already exists, agree on essential fields and spatial units, and establish simple protocols for controlled sharing. Delegates saw EfD's neutral convening role as helpful for brokering these agreements, while acknowledging that technical standards alone will not solve the problem. Concerns over revenue, reputational risk and legal mandates still deter many agencies from releasing data, so any integration effort will need clear incentives and safeguards for participating institutions.

6.2 Valuation Challenges and Evidence for Policy

Reliable valuations that resonate with ministries of finance and planning remain scarce, particularly for groundwater regulation, urban watershed services and non-timber forest benefits. Several delegations described how the absence of defensible figures weakens court cases, budget bids or tariff reforms, even when ecological arguments are compelling. Methodological obstacles were matched by communication barriers. Stated-preference surveys and replacement-cost calculations are often viewed with scepticism by officials unfamiliar with their assumptions, while highly technical reports fail to influence fiscal debate. Workshop discussions therefore stressed context-specific indicators, such as avoided health costs from wetland restoration or livelihood gains from legalised game-meat trade, presented in formats that policy audiences can interrogate. Delegates expressed interest in pairing future valuation pilots with short training sessions for finance and planning staff so that the uncertainties and caveats behind headline numbers are fully understood. Timing also matters: evidence is most persuasive when delivered during tariff reviews, budget negotiations or environmental impact hearings, not as retrospective academic critique.

6.3 Governance and Institutional Constraints

Throughout the workshop delegates repeatedly emphasised that many technical barriers to effective natural-capital management are rooted in governance shortcomings. Speakers from all four themes pointed to overlapping mandates, inconsistent regulations and limited enforcement capacity, noting that these problems manifest differently across sectors yet

share a common thread of institutional fragmentation. Property-rights ambiguity in forestry, weaknesses in monitoring groundwater abstraction and pollution, and heavy dependence on external consultants because of limited in-house analytical skills were cited as illustrative examples. Participants observed that siloed decision-making (whether between ministries or between national and local levels) tends to undermine cross-sector objectives; for example, agricultural incentives may inadvertently raise wildfire risk or increase pressure on strategic water-source areas.

Several interventions therefore called for more systematic horizontal coordination and for sustained investment in public-sector skills, although no single institutional model was endorsed. Discussions also highlighted the importance of engaging local communities in governance processes and of recognising the political-economy realities that shape implementation, including vested interests around resource rents and tariff structures.

6.4 Climate Resilience and Environmental Change

Climate variability and long-term climatic change were recurrent reference points in every breakout room and plenary, consistently portrayed as amplifiers of existing pressures on water, land and biodiversity. Water Systems participants drew on recent flood damage in KwaZulu-Natal and prolonged droughts in East Africa to illustrate how erratic rainfall is undermining supply networks, contaminating coastal aquifers and complicating sanitation planning. Forestry and agriculture specialists linked rising temperatures to more frequent wildfires, pest outbreaks and shifting crop suitability, while biodiversity delegates warned that species range shifts could erode the ecosystem services on which many rural livelihoods depend.

Across themes the discussion converged on the potential of nature-based solutions to moderate these risks. Examples included restoring wetlands to buffer floods and improve downstream water quality, protecting strategic recharge zones to stabilise urban supply, and expanding agro-forestry to temper on-farm microclimates. Yet speakers stressed that the protective value of such interventions is not yet quantified with sufficient rigour. Priority research questions therefore include how green and grey infrastructure compare in cost–benefit terms under different climate scenarios and how benefit-sharing arrangements can ensure that local communities capture a fair share of any resilience dividends.

6.5 Gender and Social Inclusion

Delegates consistently emphasised that natural-capital issues intersect with entrenched social inequalities. Uganda and Ghana highlighted the disproportionate burden placed on women and girls when water services fail, from longer collection times to heightened health risks. Forestry and biodiversity discussions noted that ecosystem degradation often strips women, youth and poorer households of safety-net resources such as fuelwood, non-timber forest products and wild foods. Sustainable-agriculture sessions added that women farmers typically control smaller plots and have less access to credit and extension services, leaving them more exposed to climate and market shocks. Participants agreed that future studies should move beyond aggregate indicators, collecting sex-disaggregated and intra-household data to reveal who gains or loses from policy reforms. Several speakers called for participatory methods that respect indigenous and pastoralist knowledge, arguing that equitable outcomes

are more likely when affected groups help frame research questions and interpret results. Inclusivity is therefore not an optional add-on but a pre-condition for interventions that are both politically feasible and socially just.

6.6 Financing and Resource Mobilisation for NatCap Research

Limited public budgets and fragmented funding streams were identified as major barriers to advancing the research and pilot activities discussed during the workshop. Environment ministries in most participating countries operate under tight fiscal constraints, making external grants, national development banks and innovative partnerships essential. Plenary speakers pointed to forthcoming windows at the Green Climate Fund, Global Environment Facility and regional institutions such as the African Development Bank, while noting that successful applications will require robust data, clear valuation evidence and demonstrable policy relevance. EfD's Director, Gunnar Köhlin, underlined that transaction costs can be reduced if centres pool expertise into multi-country, multidisciplinary proposals that speak directly to funders' adaptation and mitigation mandates. Participants therefore encouraged EfD and NatCap theme leaders to act as conveners, helping build consortia and identify "champions" inside line ministries and state-owned banks who can shepherd projects from concept to implementation. Transparency was another recurrent concern, particularly in emerging carbon markets: property-rights clarity, benefit-sharing rules and credible monitoring were seen as prerequisites for attracting finance that genuinely rewards conservation outcomes. Taken together, the discussions underscored that resource mobilisation is inseparable from data quality, valuation credibility and inclusive governance, and that each research proposal must weave these elements into a coherent funding narrative.

Conclusions and Next Steps

The Cape Town EfD-NatCap workshop marked a useful step in clarifying where fresh evidence and closer collaboration could most effectively support natural-capital stewardship in sub-Saharan Africa. Across two days of breakout discussions and plenary exchanges, researchers and policymakers converged on a concise set of policy-relevant questions rather than a prescriptive research workplan. The meeting therefore produced a constellation of priority areas that can guide future proposal writing, while keeping open the possibility of adaptation as contexts, partnerships and funding opportunities evolve.

Delegates agreed that progress in water, forestry, agriculture and biodiversity is repeatedly hampered by several systemic bottlenecks: fragmented and often inaccessible datasets, limited and poorly communicated valuation evidence, overlapping or weak institutions, and uneven social impacts that fall disproportionately on women, poorer households and resource-dependent communities. Climate variability amplifies each of these challenges. Recognising those common constraints provides an essential reference point for any subsequent project design.

The workshop confirmed that natural-capital questions rarely fit into single ministerial silos. Examples discussed included the hydrological link between groundwater and upstream land use, the influence of agricultural fire management on forest health, and the role of wetlands in both biodiversity conservation and urban water quality. Participants therefore called for research architectures that allow water, land and ecosystem questions to be tackled together, ideally through shared spatial platforms, aligned indicators and joint stakeholder forums.

Breakout rooms distilled an initial set of topics that would merit coordinated investigation:

- *Water Systems*: mapping strategic groundwater–surface water interactions; diagnosing the causes and equity implications of non-revenue water; comparing green and grey sanitation solutions; testing behaviourally informed approaches to household water conservation.
- *Forestry*: evaluating community versus state tenure models; assessing the credibility and benefit-sharing rules of voluntary carbon markets; documenting wildfire drivers and mitigation strategies; quantifying non-timber livelihoods and health co-benefits.
- *Sustainable Agriculture*: analysing adoption incentives for conservation agriculture and agro-forestry under different climate and market conditions; exploring digital tools for extension and water-saving irrigation; estimating the yield–soil–biodiversity trade-offs of alternative practices.
- *Ecosystem Services and Biodiversity*: improving practical valuation toolkits for policy appraisal and litigation support; piloting natural-capital accounts that link ecosystem indicators to fiscal and poverty outcomes; investigating how payment or insurance schemes can secure long-term ecosystem functionality.

These items are starting points. They do not constitute a final research portfolio, nor did the workshop prescribe specific methods, budgets or completion dates. Rather, they indicate where delegates saw the greatest potential to fill knowledge gaps, inform imminent policy decisions and attract funder interest.

Participants highlighted the value of comparing similar problems across different contexts, for example groundwater monitoring lessons from Ghana and South Africa, or wildfire experiences from Kenya and Tanzania. Multi-country working groups were encouraged as a means to build critical mass, share methods, and create a pan-African evidence base capable of influencing regional financing windows such as those of the African Development Bank or ECOWAS.

Several governments are revising national development plans, water tariffs or climate contributions in the next two to three years, while multilateral facilities such as the Green Climate Fund are expected to issue calls that match the workshop themes. Participants therefore proposed an immediate mapping exercise to identify national policy timetables and prospective funding rounds, so that forthcoming studies can be timed to supply relevant evidence when decisions are taken.

Next steps.

1. *Concept-note development*: Each thematic group will draft short concept notes that specify research questions, potential partners, and preliminary resource needs.
2. *Data and capacity audit*: Before embarking on new surveys, teams will catalogue existing datasets, assess quality, and outline minimal interoperability standards.
3. *Stakeholder engagement plans*: Groups will identify focal ministries, municipal utilities, community bodies and private-sector actors, setting out how they will be involved from project inception through to dissemination.
4. *Consortium building and resource mobilisation*: The EfD global hub will assist with proposal coordination, offering grant-writing support and facilitating dialogue with bilateral and multilateral funders.
5. *Progress follow-up*: A virtual meeting six weeks after the workshop will review draft concept notes, share feedback on partnership discussions and agree on the sequencing of joint activities.

Throughout these steps, the principle remains that research serves a practical purpose only when it is co-created with, and intelligible to, end users. The workshop's emphasis on data transparency, valuation clarity, institutional cooperation and social inclusion should therefore anchor every proposal that emerges. By maintaining this focus, the EfD-NatCap community can turn the priorities identified in Cape Town into concrete contributions that help African governments and societies manage their natural capital more sustainably and equitably.