Technical Background Paper Nature-based solutions for climate adaptation in the Guinean Forests of West Africa

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Introduction

Nature-based climate adaptation in the Guinean forests of West Africa project (abbreviated as the NbS project) is a 3-year collaborative initiative (March 27, 2023 – March 31, 2026), implemented by World University Service of Canada (WUSC) and Centre d'Études et de Coopération Internationale (CECI). It contributes to enhancing the adoption of gender responsive and inclusive nature-based solutions (NbS) for climate change adaptation among communities residing in the Guinean forest region of Côte d'Ivoire, Ghana, and Guinea, specifically in the landscapes of Wassa Amenfi Landscape and Lake Bosomtwe Landscape in Ghana, land-scapes surrounding Taï National Park, and the Lôh-Djiboua region in Côte d'Ivoire, landscapes surrounding the Kounounkan Forest Reserve and the Madina Oula landscape in Guinea.

NbS seeks to improve women's leadership in climate adaptation planning processes by increasing the restoration of degraded forests and key habitats, and by increasing gender-responsive investments in landscape restoration that can provide income potential for women. The project focuses on engaging with a wide range of stakeholders to develop local and regional capacity to use evidence and engage with women and marginalized groups to prioritize locally relevant NBS to climate change adaptation that contributes to enhanced biodiversity and gender equality.

WUSC and CECI implement the project in close collaboration with International Union for Conservation of Nature (IUCN), CIFOR-ICRAF (World Agroforestry), The International Barcode of Life (IBOL) and Abantu for Development, along with a wide network of local governments, civil society organizations and private sector partners.

This document provides a summary of research conducted during project inception planning in 2023, including baseline study, a gender analysis and a climate vulnerability analysis. Chris Huggins from the University of Ottawa prepared the report drawing upon research and analysis contributed by a wide range of local stakeholders. We are sharing this summary so that researchers, practitioners and activists can learn from our early work, and can accompany us in our learning.

List of Acronyms

ASM	Artisanal	and Small-Scale	Mining
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- MERL Monitoring, Evaluation, Research and Learning
- NbS Nature Based Solutions
- NTFPs Non-Timber Forest Products

NBS Priject

1. Introduction

This report presents results of initial research for the project "Nature-based solutions for climate adaptation in the Guinean Forests of West Africa" (henceforth referred to as the NbS Guinean Forests project), which include gender based analysis, vulnerability assessments, and a project baseline study, in the context of relevant background information. It is intended to identify initial findings and raise questions for further consideration during project implementation.



A map showing the the location of Guinea, Côte d'Ivoire, and Ghana.

The Guinean Forests of West Africa is a "global biodiversity hotspot" (IUCN 2015) with high concentrations of endemic species; however, "nearly all the major protected areas of the Guinean rainforest are under pressure from cocoa expansion" (Gockowski, & Sonwa, 2011: 318) as well as other economic activities. More broadly, "at least 80% of West Africa's original rainforest extent [is] now an agriculture-forest mosaic" (Maguire-Rajpaul, et al 2022). The NbS Guinean Forests project is being implemented in three countries - Ghana, Côte D'Ivoire and Guinea, across the following six landscapes:

Ghana



Tree Cover in Ghana

Wassa Amenfi Landscape, Ghana. In the Wassa Amenfi Landscape in the Western Region the majority of the population practice farming, particularly commercial crops such as cocoa, coffee, palm oil, kola and rubber, as well as food crops for sale and consumption. Other key livelihood practices include harvesting timber, gathering non-timber forest products (NTFPs), artisanal and small-scale mining (ASM), livestock-keeping, and fish farming.

Lake Bosomtwe Landscape, Ghana. Lake Bosomtwe is located in the Ashanti Region, within the moist semi-deciduous forest zone of the country. The Lake Bosomtwe Landscape incorporates the UNESCO Lake Bosomtwe Biosphere Reserve, which comprises the lake's watershed. The reserve is important as a significant area of biodiversity and as a tourist attraction. As of 2021, about 50,000 people lived within 24 communities in the catchment, most of whom practice fishing and farming, and/or ASM to a much lesser extent. Fish yields have declined in recent years, making livelihoods more precarious.

Côte d'Ivoire



Tree Cover in Côte d'Ivoire

Taï National Park, Côte d'Ivoire. The Taï National Park is the largest protected rainforest in West Africa. It is surrounded by several gazetted (protected) forest areas with very high rates of deforestation, due primarily to conversion of forest to cocoa plantations. Other livelihood activities include production of rubber, coffee, palm oil, and food crops (rice, maize, cassava, yam, eggplant, okra, pepper, plantain) (Kouassi et al, 2023). Areas around the Park have high numbers of foreign nationals (e.g. 41.6% of the population of Nawa region), while many others are lvorian migrants from other regions (Kouassi et al, 2021).

Lôh-Djiboua Region, Côte d'Ivoire. Lôh-Djiboua Region is in Gôh-Djiboua District, south-west Côte d'Ivoire. The population is about 65% rural. Cocoa production predominates but there has been a recent decline in average annual rainfall, due to climate change (Kassin et al, 2018), and rising temperatures also threaten cocoa production. The main drivers of deforestation are logging and agriculture. Some ASM also takes place in the region.

Guinea



Tree Cover in Guinea

Kounounkan Forest Reserve, Guinea. The Kounounkan massif and plateau are located in the Kindia Region. The Kounounkan Classified Forest (also known as Kamalayah), is home to 30 threatened plant species, including eight unique endemic species. There are an insufficient number of forest guards present (Couch et al, 2019). Pastoralists practice seasonal grazing on the massif, and start small fires, which can threaten biodiversity. Communities engage in small-scale timber harvesting.

Madina Oula, Guinea. Madina Oula borders Sierra Leone, and is a transit route for cross-border travelers, with a high level of male outmigration (Camara et al, 2011). Research in 2009 found that 98% of people participated in collective reforestation and protection (Ngendakumana et al, 2012). Unfortunately, the same research found an average 10% survival rate for trees planted.

2. Climate change impacts in the region

The West Africa region is particularly vulnerable to climate change impacts because of exposure to extreme weather conditions and limited adaptation potential (Gbode et al, 2023). Ghana, for example, is likely to experience a 10%–30% increase in the number of days of dangerous heat stress conditions, by the end of the century (Fotso-Nguemo et al, 2023). The ND-Gain country rankings, which combine predicted exposure to climate change impacts with capacity to adapt, rank Guinea 157th, Côte D'Ivoire 140th, and Ghana 114th out of 185 countries (ND-GAIN, 2023). Because agriculture plays a dominant role in livelihoods and economic activities in most West African countries, reduced yields due to climate change will have negative effects in terms of food security and macro-economic growth (Onyekuru, 2023). There is insufficient gender disaggregated data on the impacts of climate change (UNFCCC, 2019), although it is generally thought that women will face worse impacts than men as they are often directly reliant on natural resources for livelihoods and generally have fewer resources to adapt (e.g. finance, access to education, etc).

Changes in temperature and rainfall will make some crops (such as cocoa) viable only at higher altitudes (Ladarach et al, 2013). Climate-related reduction in commercial crop viability will increase migration, pressure on land, and potential land-related conflicts (MINEDD, 2018). Authors of a comprehensive scientific model for climate change impacts on cocoa production in the region, "recommend a comprehensive strategy aiming at the maintenance or increase of shade trees in cocoa farms" due to temperature increases and other impacts (Schroth et al, 2016).

The Government of Ghana has identified key climate impacts, including droughts, rainfall variability, flooding, excessive heat, infrastructure damage, sea level rise, loss of carbon sinks, severe dry winds, a shorter growing season, and unpredictable extreme events (NAP Global Network, 2023). The NbS Guinean Forests Gender-Based Analysis around Lake Bosomtwe, Ghana, found that high temperatures make it difficult for children to study, resulting in low school attendance. The same research found that due to reduced incomes from fishing and farming, women have adopted additional livelihood activities such as soap-making, and many young people have migrated to cities in search of alternative livelihoods.

In Guinea, climate change is likely to reduce availability of potable water, which will disproportionately impact women as they are typically responsible for fetching water and as the main users of water in the household, are more often in contact with polluted water and hence at greater risk of contracting water-borne diseases (MEEF, 2019). Due to forest degradation, and reduced rainfall, women and girls are forced to travel further to fetch water and firewood for cooking, leading to time poverty and preventing them from engaging in schooling or income-earning activities (MEEF, 2019). This is in addition to other climate impacts.

In Côte D'Ivoire, 17% of households must spend 30 minutes or more per day to obtain drinking water, a task mostly done by women (INS, 2012). This will be exacerbated by rising temperatures and changing precipitation regimes. In many areas, food insecurity and other challenges will drive temporary migration, particularly by men looking for economic opportunities. This will put extra pressure on women who remain at home, dealing with livelihood activities as well as care responsibilities (MINEDD, 2018). Other climate impacts include strong Harmattan windstorms, droughts, and flooding (Bunn et al, 2019).

3. Definition and examples of Nature-based solutions for climate adaptation

There are multiple definitions of nature-based solutions (NbS), and while most include environmental, social and economic aspects, there is a risk that biodiversity can be overlooked (Seddon et al, 2021). However, marginalizing biodiversity objectives is counter-productive, as biodiverse landscapes provide greater ecosystem services (e.g. soil biodiversity can increase crop yields) and are more resilient to fires, pests and diseases (Seddon et al, 2020). While the emphasis in this paper is on climate adaptation, NbS are also important for mitigation: "NbS are estimated to be able to deliver 37 percent of the cost-effective climate mitigation needed through 2030" (World Bank, 2020: 47).

NbS have become more widespread in recent years, involving state, bilateral and multilateral agencies, and private sector actors. However, more commitments are needed (Brears, 2022). The cocoa industry has been highly involved in forest conservation schemes. Examples include partnership between cocoa purchasing company OFI in Ghana and IUCN in a project to promote agroforestry in smallholder cocoa plantations. The company stood to benefit from its investment through more stable, higherquality cocoa supply, while achieving its corporate social responsibility goals. However, critical researchers warn that corporate actors tend to emphasize commercial agricultural productivity at the expense of other local priorities, and may undermine state sovereignty by taking responsibilities from government agencies (Maguire-Rajpaul et al, 2022: 86). Partnerships should therefore be inclusive, and asymmetries of information and power should be actively addressed throughout the project cycle.

Influential definitions of "Nature Based Solutions" include: 'actions to address environmental, social and economic challenges simultaneously by maximizing the benefits provided by nature (...) inspired by, supported by, or copied from nature' (EC, 2015), and "actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits" (Cohen-Sachman et al., 2016).

The NbS Guinean Forests project will incorporate multiple strategies, but landscape restoration through agroforestry is likely to be key. A cost-benefits analysis of agricultural adaptation strategies in West Africa found that, "planting of trees, increased use of fertilizers, use of resistant varieties, mixed farming and crop diversification... generate the highest returns, with highest annual mean net benefits" (Onyekuru et al, 2023). Planting of trees can take many forms, including agroforestry, silvopasture (in livestock-based systems) and single- or mixed-species plantations (Martin et al, 2021).

Many areas in the six sites are dominated by small-scale cash-cropping. Crops like cocoa and coffee are well-suited to agroforestry, as they benefit from some shade. Crops often planted alongside cocoa include cashew, peanut, papaya, coffee, orange, african walnut, water yam, avocado, mango, banana, guava, njangsa (ricinodendron heudelotii), sugar cane, and elephant ear (Colocasia esculenta), though suitability depends on regional agro-ecological conditions (Bunn et al, 2019). Trees on small-holder farms provide economic benefits for households (improved crop yields; fruits, nuts or other foods; fodder for livestock, firewood, timber and medicines) and environmental benefits (improving soil quality and soil fertility, reducing soil erosion, and potentially improving local microclimates). Intercropped shade farm systems typically require less fertilizer and other agrichemicals (herbicides and pesticides) than no-shade farms (Nunoo et al, 2015). There are multiple forms of agroforestry systems, from simple to complex, with

different amounts of tree cover. There are also different industry and government standards (Critchley et al, 2021).

While agroforestry offers multiple benefits to farmers, choices around integrating trees into small-holder farming systems are mediated by many factors including existing household assets, household gender dynamics, local socio-cultural norms, levels of education, age of household head, and family size (Nunoo et al, 2015). For example, older farmers are less likely to plant trees on farms in Western Ghana, presumably because of the heavy physical requirements of tree-planting and perception that older farmers will not benefit from long-term benefits of trees; poorer farmers are also less likely to plant trees (Osei et al, 2019). Another study found that "planting hybrid cocoa varieties, extension services, membership of farmers' association and training" are associated with adoption of smallholder cocoa agroforestry in Ghana (Nunoo et al, 2015). While many organizations emphasize environmental benefits, research has found that, "farmers' pro-forest and pro-shade-tree behavioural changes were less motivated by ecological discourse, and more by... the potential to increase yields and/or bolster their farm's climate resilience" (Maguire-Rajpaul, et al 2022: 84).

A survey in Western Ghana found that 85% of respondents agreed that agroforestry could promote sustainable cocoa yields and increase income, while 62.5% of cocoa landscapes in the region had no shade or minimal shade (Nunoo et al, 2015). Clearly, knowledge is insufficient to ensure adoption of such practices. Research in Ghana found that the vast majority of respondents believed some form of incentive would be needed (Nasser et al, 2020), while Osei et al (2019) found that farmers identified Payment for Environmental Services and access to seedlings through public nurseries, as key to encouraging reforestation. Obstacles to small-holder tree planting in Ghana include extra labour and financial costs of tree planting and maintenance; the relatively long period between planting and direct benefits (such as harvesting fruit or timber) lack of credit; lack of land rights documentation and perceived insecurity of rights to trees (Boni, 2006, cited in Osei et al, 2019).

Large-scale, externally led reforestation projects rarely succeed, because the planted trees are often not cared for, the land is used for livestock grazing, or is re-cleared for agriculture (Holl & Brancalion, 2020). Researchers recommend that, "tree-planting efforts must be integrated as one piece of a multifaceted approach to address complex environmental problems; be carefully planned to consider where and how to most effectively realize specific project goals; and include a long-term commitment to land protection, management, and funding" (ibid. pg 580). In addition, they advise that allowing natural forest regeneration is more effective than planting trees. Other alternatives include farmer managed natural regeneration which involves farmers nurturing resprouting tree and shrub stumps on their farms (Karambiri et al, 2023: 222). Nunoo et al (2015) note that, "success of tree planting programmes are often evaluated in terms of tree growth and survival, livelihood outcomes, ecosystem services, and area covered" rather than according to conservation and biodiversity outcomes. Given that gender dimensions are often overlooked in such projects, the NbSCAG project seeks to address this gap by ensuring equitable participation and benefits for all genders.

While agroforestry and other tree-related activities are likely to be key to the NbS Guinean Forests project, it also seeks to ensure that biodiversity is conserved in hotspots such as national parks and other protected areas. This is part of the reason for a landscape approach, which links up fragmented areas of forest and provides ecosystem benefits at scale.

4. Rural livelihoods, biodiversity loss and deforestation in the Guinean Forests of West Africa

In rural areas of the three countries, most households depend on firewood and charcoal for energy, and expansion of small-scale agriculture is also a significant contributor to deforestation. Farmers of commercial crops, such as cocoa and coffee, have tended to reduce shade cover on their farms to maximise productivity; hybrid cocoa varieties require little or no shade (Critchley et al, 2021). Cocoa, rubber and similar commercial crops tend to be controlled by men, although women contribute labour to commercial farming (in addition to specializing in food crop production).

The region has a high population growth rate, and farming remains extensive rather than intensive, due to lack of access to capital, information, markets, and technologies. Large-scale activities, controlled by multinational companies, economic and political elites are also significant drivers of deforestation in some cases, and researchers have warned of 'blame narratives' that focus on small-holders while ignoring these more powerful commercial actors (Otutei, 2014 citing Fairhead and Leach, 1996; 1998; and Leach and Mearns, 1996). Otutei (2014) reports that logging companies in Ghana are frequently able to contravene contracts and laws due to their economic power and political influence, with negative consequences for the environment and local farmers. Researchers such as Nyerges and Green (2000) contend that to understand natural resource management, researchers should "relate people's positions in local social hierarchies to the exploitation of the natural resources on which they depend". Further, they argue that "forests in western Africa... have been fully part of human social life for centuries, if not millennia", and hence insist upon understanding forests as part of politics, culture and livelihoods. Often, scientists and policy-makers focus on legal definitions or scientific indicators, neglecting broader historical and socio-political aspects of access to, or exclusion from, particular areas.

More than 60% of Côte D'Ivoire's forest cover disappeared between 1986 and 2019 (Critchley et al, 2021). While some cocoa farmers practice agroforestry, "adoption of agroforestry is driven by gender, the length of residency, and the number of cash crops grown by the farmers" (Kouassi et al, 2023). Women are less likely to invest in agroforestry, probably because they have limited land tenure rights. Also, foreign (non-citizen) farmers, despite being numerous in the cocoa sector, have tenuous land rights which dissuade them from investing in trees (Kouassi et al, 2021). In addition to expansion of agriculture, drivers of deforestation include, "lack of protection for GFs [gazette forests] and to a lesser extent protected areas, and significant shortcomings in the management of forest resources); bushfires (accidental or intentional, often for agriculture or hunting); and mining, notably illegal small-scale gold mining" (World Bank, 2018).

Similarly in Guinea, deforestation is driven by slash-and-burn cultivation, cocoa, oil palm and rubber farms, including large corporate plantations, artisanal salt extraction and fish smoking, which require the use of wood; bauxite mining, which requires roads and railroads for transporting the ore to the coast, leading to deforestation on these routes (Reforestaction, 2023).

Deforestation in Ghana is driven by, "overexploitation of natural resources through illegal and unsustainable logging and mining, and agricultural expansion, coupled with land tenure insecurity" (Acheampong et al, 2019). In Ghana, while chiefs are traditional guardians of forests, they may receive payments from commercial logging companies for the right to log on land held under custom (Otutei, 2014). Forest resources represent 38% of the income of Ghana's forest dwellers, and deforestation threatens their livelihoods (Acheampong et al, 2019).

In all three countries, "state [agricultural] extension services are inconsistently delivered; instead, many smallholders attempt to rely on a bricolage of information from elsewhere" (Maguire-Rajpaul et al 2022).

Women often have less access to information on climate change and adaptation strategies. In addition, indigenous knowledge that women possess is often underestimated and dismissed. Gender roles and inequalities are closely related to the adoption of agricultural practices and land use options (Collins, 2018). Marginalization of women is therefore not only an issue of gender justice, but also a barrier to effective climate adaptation. The UNDP Gender Inequality Index ranks Ghana 130th, Côte d'Ivoire 155th and Guinea 157th out of 170 countries, indicating that much progress is still needed (UNDP, 2022). In Guinea for example, few sectoral policies and none of the policy documents related to climate change adaptation adequately address gender issues, though there have been recent efforts to correct this (MEEF, 2019).

While smallholder farmers are often blamed for deforestation and negative biodiversity outcomes, some households engage in autonomous strategies to improve their livelihoods while protecting the environment. This includes, "raising rabbits and grasscutters (Thryonomys swinderianus) for meat; hunting common game in permitted seasons; gathering mushrooms; growing avocadoes and garden eggs (Solanum aethiopicum); and intercropping with locally valued trees, particularly oil palm and kola (Cola nitida)... growing nitrogen-fixing legumes for subsistence and improving soil fertility, and producing organic fertilisers from waste and chicken droppings" (Maguire-Rajpaul et al 2022: 85-86). These local livelihood diversification and adaptation strategies are not always acknowledged by agricultural extension workers who tend to stick to prescribed interventions (ibid.)



5. Policy Frameworks in the Three Countries

In **Côte D'Ivoire**, the forest sector policy (Déclaration de Politique Forestière 2017) calls for zerodeforestation agriculture and sustainable management of Gazetted Forest and National Parks. The strategy encompasses in particular: (i) restoration of degraded Gazetted Forests; (ii) transferring control of highly degraded forests to the private sector, for sustainable agroforestry (iii) allowing 'sustainable' commercial exploitation of some Gazetted Forests; and (iv) creation of new protected areas (World Bank, 2018). The current Forest Code grants property rights over trees to citizens. The new code also specifically highlights the role of cocoa agroforestry in forest restoration. However tree rights may not be common knowledge among local communities (Kouassi et al, 2023). Rights to trees are closely linked to land rights, but rights to a tree can be held by the person who established or planted it under an agreement with the landowner. This situation is clear where the 'landowner' has either a land title or a land certificate, but according to ClientEarth (2021) "there is no legal certainty regarding the ownership of trees planted on land subject to customary rights" (pg. 6). Rural land is considered state property and only the State and Ivorian individuals who acquired land before 23 December 1998 can own a land title. The state has tried to encourage registration of customary land, but the system is expensive and slow. Only 8% of women hold a land title or a certificate, compared to 22% of men (Banque Mondiale, 2017).

Customary land rights are recognized by the state as long as they have been held continuously and without disputes; such land cannot be sold or leased. The vast majority of rural land is held under customary tenure arrangements (Pritchard, 2016). Under custom, land rights are usually vested in the family and lineage of the person who first cleared the land. Traditionally, non-indigenous persons are only able to gain user rights to land (not ownership) through payment of tributes to the indigenous land owning families. Commercialization of the agricultural sector (through dominance of cash crops) has led to conflicts between immigrants and indigenous land-owners. Scholars warn that these issues are largely ignored by contemporary 'zero-deforestation' schemes and campaigns led by multinational cocoa-purchasing corporations (Maguire-Rajpaul, et al 2022). Côte D'Ivoire is heavily invested in REDD+ and the National REDD+ Strategy prioritizes supporting zero-deforestation agriculture, in partnership with supply chain organizations and the private sector. The cocoa sector is particularly important to this strategy. There is a national target of restoring forest cover (including agroforestry areas) to 20% of total land area by 2030 (Critchley et al, 2021). The original National Adaptation Plan of Côte D'Ivoire was not gender-sensitive, but efforts have been made to integrate gender analysis into adaptation activities (MINEDD, 2019). Gender has been mainstreamed into Nationally Determined Contributions (NDCs) documents in Côte d'Ivoire in 2020.

In **Ghana**, about 80% of land is under customary tenure, and rights of men and women to use and own land and resources vary according to custom. 'Indigenous' inhabitants have more secure land rights than migrants. The land rights of migrants are based on agreements with the chief or 'indigenous' land-users. Migrants cannot plant tree crops unless the land owner gives express permission to the migrant farmer. Lack of authorization from landowners for migrant farmers to plant trees on their land may impede afforestation. To address lack of rights to trees, governmental and non-governmental extension services have announced that on-farm shade trees can be registered, though research suggests this has yet to occur widely in practice (Nasser et al, 2020). In Ghana, men typically own larger farms than women (Asare and Ræbild, 2016). This means that men are generally better able to manage trade-offs between trees and crops by dedicating surplus land to tree-planting (Hashmiu, 2015). Ghana has the *Taungya* system, which involves the temporary transfer of degraded areas of forest to farmers in order to plant tree seedlings alongside food crops. After three years the farmers must leave the forest. According to Hashmiu (2015), enthusiasm for the system has waned amongst farmers. The National Forest Plantation Development Programme sets a

target of 3 million ha to be planted by 2040 (FC 2016).

The National Development Planning Commission (NDPC) leads district-level climate adaptation planning and mainstreaming. Climate change vulnerability assessments for key sectors are being conducted, and standalone adaptation plans for 10 districts are being developed (Government of Ghana, 2018).

Ghana's institutionalization of REDD+ has been praised as a potential decentralizing mechanism, which "aims to embed rule-making power in regional multi-stakeholder governing boards, including local government and community leaders, and to use the pre-existing CREMA (Community Resource Management Area) mechanism to implement local CSC interventions" (Maguire-Rajpaul, et al 2022), while "linking rights based approaches to community resource management areas (CREMAs) is opening new streams of potential benefits for local communities" (FAO, 2022). A gender strategy document for the National Adaptation Plan was prepared in 2020 by the Environmental Protection Agency (EPA).

In **Guinea**, the Forest Code (2017) emphasizes avoiding forest conversion, and promoting natural forest management. The Forestry Amendment Act 2019 provides policy support to community conservation, deforestation, and reforestation. Barriers to reducing deforestation, and expanding forest cover, include "a growing population, undocumented fragmented land ownership, pressure from poor socioeconomic conditions, and a lack of institutional collaboration" (Williamson, n.d.). Customary rights to land, which predominate in rural areas, are not recognized under Guinean law; though customary land can be registered, land registration is impractical or impossible for most rural households due to the costs and complexity of the process (Diallo et al, 2021). Most rural land therefore legally remains the property of the state (ARD, 2008). The Guinean constitution, land law, civil code and other laws and policies guarantee women's rights to own land, but in rural areas, customary laws and socio-cultural norms mean that in practice women have, in practice, only user rights to land and limited decision-making power over land use (Diallo et al, 2021). Gender was mainstreamed into the NDCs for Guinea in July 2022. Local Development Plans (PDL) include climate change adaptation activities.

While most commercial interventions take a legalistic view of land rights issues, in practice legal rights to land (or property such as trees) are embedded within, and mediated by, socio-economic and socio-cultural relations. For example, in many cultures, trees are used in customary tenure systems to indicate ownership of land (Evans et al, 2015). Rather than depending on legal definitions, the NbS project will more realistically consider the ability of participants, especially women, to exercise agency in particular contexts. Through working with women's organizations, and seeking the collaboration of local leaders, the project may ensure positive outcomes for all participants, despite unequal gender and power relations within households and communities. This is not to say that women's organizations automatically promote inclusive and equitable outcomes according to WUSC's definitions (Abdu, et al. 2022); and training and consultations with local organizations may lead to better alignment with the project's equity objectives.



6. Summary of the Theory of Change for the NbS project

The NbS Guinean Forests project aims to reach about 2,116,520 inhabitants of forest fringe communities, 50% of whom are estimated to be women. Activities include consultation with women on their indigenous knowledge of biodiversity and forest use, direct training of community members in forest restoration, and training on Free, Prior and Informed Consent and land rights. The project's Theory of Change (ToC) prioritizes using locally relevant NbS to climate change adaptation. "The project will support a more inclusive planning process, the restoration of degraded forests and support an increase in investments for NbS and biodiversity". It notes that environmental challenges "impact women and men differently, owing to their different roles and control over forest management and agricultural systems. Consultations indicate that deforestation has increased the burdens on women in gathering firewood, medicine and other forest products, while decreasing women's income potential and increasing time poverty" (WUSC and CECI, 2023). The project aims to pilot NbS approaches before bringing them to scale, which should permit activities to be tailored to local contexts and constraints to be addressed before they are fully rolled-out. WUSC and CECI are collaborating with other development partners to support the implementation of the NBS Guinean Forest project. These partners include ABANTU for Development, CIFOR-ICRAF, IUCN, and the International Barcode of Life - IBoL, and a range of local CBOs, government agencies and private sector partners. Working with these partners, the project seeks to influence key intermediaries involved in forest governance and relevant value chains in order to better engage on adaptation and biodiversity through a strong gender lens. These intermediaries will include representatives of local village leadership, national women's organizations, as well as business owners/leaders, policy makers, investors and donors. The emphasis on women's organizations is appropriate. While the effectiveness of women's organizations varies widely, research in Ghana found that "the likelihood of household gender equality was higher in households where a woman was participating in an FBO" (farmer-based organization) (Abu et al, 2022: 9)

The Theory of change emphasises community participation and gender-sensitive planning; project objectives and targets are holistic and involve both quantitative and qualitative metrics. This is much more likely to have a sustained and beneficial impact for the majority of participants than a simple objective of trees planted or hectares restored (see e.g. Holl and Brancalion, 2020).

The ToC indicates that the project takes a "holistic approach" as defined in Seddon et al (2021) (see text box). Using this definition, key issues for the project to maintain focus on are different forms of knowledge (i.e. validating indigenous, local, traditional forms of knowledge, and integrating them into planning along with 'scientific' forms of knowledge); identifying and managing the spillover effect from one habitat into others; identifying potential conflicts and avoiding them and/or managing them; and collaborating with a range of stakeholders in a way that links up with broader state and large-scale programmes and projects.

To some extent, the ToC is positioning the NbS project within a long-running debate over the relative environmental benefits of either a) *intensifying agriculture* (e.g. through agri-chemicals, hybrid seeds, etc); b) *'greening' extensive agricultural systems* through agroforestry and various climateA "Holistic approach" includes "(1) participatory design and implementation using different forms of knowledge; (2) a landscape approach that considers a wide range of connected habitats and the effects that interventions in one habitat or area have on others; (3) evaluating and managing the full range of benefits, trade-offs and conflicts across landscapes and societies and (4) implementing NBS as part of an integrated sustainability strategy across sectors" (Seddon et al, 2021 pg. 1534). smart approaches. Those in favour of intensification argue that it minimizes the amount of land used for agriculture, hence permitting conservation of existing forested areas. Attempts to resolve the debate use different indicators; for example, greenhouse gas (GHG) emissions from increased use of agrichemicals in the intensification case, and GHG emissions from deforestation; biodiversity indicators; etc. (Gockowski & Sonwa, 2011). Some researchers argue that increasing canopy cover within smallholder commercial farms, and increasing fertilizer use, may be the best way to protect against further agricultural expansion: contending that canopy cover of 35%-50% provides high productivity while leading to limited biodiversity and ecosystem function decline (relative to 80% canopy) (Gockowski & Sonwa, 2011). Livelihood outcomes, gender dimensions, and other socio-political factors should also be taken into account in such decision-making.



7. Methodology

Data Collection Instruments and Training

Two research instruments were used in the baseline research: semi-structured interviews (SSI) and household surveys. Focus-Group discussions and key-informant interviews were used in the Gender Based Analysis Plus (GBA+) and vulnerability assessments. SSIs were conducted with systems actors (government officials, women's organization leaders, private sector actors, etc.) who could potentially play a direct role in the project and may have specialized knowledge. SSIs were also conducted with local government officials and customary leaders. These key informants were typically located in urban centres in the same landscapes as the participants in the household surveys. Surveys were carried out with community members and other potential participants in the project. 26 communities were randomly selected across the six landscapes. For both household surveys and SSI's, a combination of quantitative data (e.g. using likert scales) and qualitative data (e.g. using open-ended questions, and multiple choice questions) was collected.

	Côte d'Ivoire	Guinea	Ghana	Totals
Household Surveys (female participants)	142	347	418	907
Household Surveys (male participants)	380	141	209	730
SSIs with Systems Actors (female participants)	5	16	1	22
SSIs with Systems Actors (male participants)	6	32	9	47
SSIs with Local Government officials and Community Leaders (female participants)	5	15	14	34
SSIs with Local Government officials and Community Leaders (male participants)	24	68	33	125
Totals	562	619	684	1865

The total number of interviews and surveys collected in the baseline survey was as follows:

8. Summary of key findings from GBA+, Vulnerability, and Baseline Studies

Perceptions of Gendered use of Trees and Forests:

The strong connections between access to trees and livelihoods, especially women's livelihoods, were clear from baseline research. Fruit trees were identified as vital for household food security, and are largely the domain of women. Another consideration is that many participants emphasized sales of fruits, nuts and other non-timber forest products (NTFPs).

Participants emphasized the importance of 'forests' for community livelihoods, but did not specify whether these were protected areas. This is a sensitive topic, as it can broach on illegal activities, as literature suggests that local people often access protected areas, e.g. to collect NTFPs. It was therefore considered to have been problematic to enquire too directly about it. However, because of its importance, more data should be collected on this issue, in a conflict-sensitive way.

Perceptions of Vulnerability to Climate Change Impacts

Men and women have different perceptions of vulnerability to climate change. Women often, though not always, reported higher levels of vulnerability (to climate change impacts on livelihoods as well as disasters) than men. Also, younger people (18-35) tended to perceive their households as less vulnerable to climate change impacts, compared to older participants. The responses of older participants might reflect their lived experiences of changes over time, or their more vulnerable status (e.g. due to health issues).

Overall, participants perceive livelihoods in their households as moderately vulnerable to climate change impacts, while household vulnerability to climate change-related disasters was seen slightly lower, though also moderate. Disaster risks were perceived as lower in Côte d'Ivoire than the other two countries.

Local knowledge of biodiversity

A key assumption of the NBS project, as stated in the Theory of Change, is that in order to support climate change adaptation decision making, there is a need for stakeholders, including women and their organizations, to have better access to evidence of the current state of biodiversity, ecological dynamics, and changes over time. Participants were therefore asked whether they had heard of different forms of biodiversity. Results from household surveys suggest that women are less likely to have heard of the concept of biodiversity than men. Participants in Côte d'Ivoire had the lowest scores. There is a lot of opportunity for awareness-raising and training around biodiversity and related issues in all three countries. Younger women (18-35) were more likely to reply that they knew what biodiversity was, compared to older women (for men, age differences showed no clear pattern). The majority of local government officials, community leaders and actors interviewed were not familiar with the concept of biodiversity, though there were large differences between sites.



However, this indicator should be treated with caution. While participants may not have heard of biodiversity as a scientific concept, they may have valuable knowledge related to the topic that was not captured on the surveys or interviews.

Existing Reforestation and climate adaptation Activities

Women were often less likely than men to report that reforestation activities were taking place in their communities. This may indicate differences in the level of knowledge about such activities, and could in turn be linked to gendered differences in participation, etc. Most respondents said that the trees used in existing reforestation efforts were **moderately** appropriate for women's economic needs. There were no clear gender patterns in responses to this question. However, older participants (men and women) provided lower scores, on average, than the 18-35 age group. Interpretation of this response is open to question. For example, do older people have different preferences for tree species, or do older people have a different level or kinds of knowledge than younger people?

With the exception of the Madina Woula landscape in Guinea, most communities reported that climate adaptation projects were **not** taking place currently. In half of the sites, women were more likely to provide 'no' responses than men, suggesting gendered differences in knowledge about, or participation in, such projects. Further, on average, people aged 36+ were more likely to reply "no" than younger people. The reasons for this are unclear, e.g. older people might have a different understanding of 'climate adaptation' than young people; or older people might be less aware of such projects than younger people.

In communities that reported that such projects were taking place, about 77% of men and 73% of women responded that they involved women's organizations. Communities in Côte d'Ivoire provided the most negative responses (53% on average said that projects involved women's organizations).

Potentials for gender-inclusive inclusive multi-stakeholder collaboration

As noted above, a fundamental objective of the NbS project is to improve collaboration between local, national and regional stakeholders on climate adaptation and forest restoration. Local leaders and systems actors were asked about the quality of collaboration at the current time. On a scale of 1 (poor) to 3 (very good) local leaders provided an average of 2.3. For systems actors, the average was '2' suggesting that relationships are moderately good. There was fairly wide variation. The NbS project represents an opportunity to improve some of these collaborative relationships. In Ghana, the GBA+ assessment identified tensions between state agencies making decisions regarding climate adaptation, and customary leaders, who feel marginalized in decision-making. Also, local community Chiefs may be overlooked by more powerful Paramount Chiefs. In Guinea, women should be involved in developing Local Development Plans (which include climate change adaptation) but the GBA+ assessment found that they are rarely involved. In Côte D'Ivoire, participants from villages in Loh Djibouah region interviewed for the GBA+ assessment reported that women were only involved in decision-making in 40% of villages, and were generally marginalized in decision-making in all villages. Customary leaders, however, attempt to facilitate women's participation.

A key element of support to forest restoration is the provision of appropriate technical services and access to technical expertise from diverse stakeholders. Local leaders were asked whether they knew of women's organizations, community and/or forest groups that had successfully accessed expertise and/or technologies for reforestation, climate adaptation, etc in the last six months. Positive responses averaged 68%. Women participants gave lower scores than men, on average. System actors were asked to report on their own organizations' access to relevant expertise and/or technologies. Slightly less than half of the systems actors interviewed reported that their organization had successfully accessed relevant expertise and/or technologies in the last six months. The reported level of access was lowest in Côte d'Ivoire.

Key informants were also asked about how they perceived the accessibility of relevant expertise and technologies to women's organizations, community and forest groups. Local Leaders provided an average

score for this question of 1.96 on a scale of 1 (inaccessible) to 3 (very accessible), while systems actors gave an average score of 2.25, and identified obstacles to access including lack of education, lack of training, inadequate government policies (especially in Guinea), and lack of funding.

Key informants were also asked about their capacity and confidence to use best-fit and technically appropriate restoration methods. On a scale of 1 (little) to 3 (a lot), participants provided an average score of 1.85 regarding internal capacity. The score was slightly lower for women than for men. For the question about confidence, a higher score was given (2.32). Examples of restoration methods provided include reforestation/tree planting (majority of responses), agroforestry, clearing areas to prevent bushfires, and rehabilitating mine sites (Ghana). Systems actors responded with higher levels of confidence and capacity compared to local leaders.

A final assumption of the project Theory of Change is that restoration pilots will be most sustainable and scalable if they can crowd in investment from government and private actors. The project includes various activities, including market systems analysis and a business grant fund, in order to identify and scale investable models for forest restoration and gender-responsive adaptation. In the baseline study, key stakeholders were asked if they are "knowledgeable" about investable models of gender responsive NbS to climate change adaptation. On a scale of 1 (no knowledge) to 3 (very knowledgeable), local leaders provided an average score of 2.04 with men giving higher scores than women. However, few examples provided by local leaders in interviews were demonstrably 'gender-responsive'. Some were arguably not environmentally sustainable either. Systems actors reported themselves to be moderately knowledgeable about investable models of gender responsive NbS, giving a slightly higher average score than local leaders (2.3). Like local leaders, systems actors provided examples of NbS which were not necessarily gender-responsive (e.g. "tree planting") or environmentally sustainable (e.g. "trade").

Roles and Capacities of Women in forest restoration, climate adaptation, and other NbS approaches

The majority of household members surveyed, both men and women, reported that laws in the three countries provided women with the right to participate in forest restoration. The positive responses were highest in Ghana. Younger women (18-35) were slightly more likely than older women to say that state laws provided women with rights, while younger men (18-35) were less likely than older men to say that state laws provided rights. This may suggest that younger participants are particularly engaged in gendered competition for land, and/or that younger men have less knowledge of land tenure laws than older men. In addition, most household members, men and women, reported that customary laws provided women with the right to participate in forest restoration. Women 18-35 were slightly less likely than older women to believe that custom provides women with rights; men 18-35 were also less likely to believe this than older men. The question 'do women have rights as community members to participate in forest restoration' resulted in similarly high levels of positive responses. These responses indicate that forest restoration projects have a firm legal and customary basis, in most communities, to fully involve women.

Asked about women's role in forest restoration, many leaders stated that women were mostly important in forest restoration due to their useful labour; some said women had 'no capacity' to play a major role in restoration. These responses suggest that the project will have to work carefully and strategically to ensure that women are able to play a role in planning as well as in implementation.

For systems actors, there was a high level of variation in responses regarding women's capacities. In the Loh Djiboua Landscape (Côte D'Ivoire), actors tended to respond that women had low capacity, while participants in Wassa Amenfi (Ghana) emphasized that "women can own land".

9. Discussion and Recommendations

Understandings of NbS

The baseline survey responses seem to reflect a fairly narrow understanding among many local actors of NbS, with a significant focus on tree-planting in most responses. Engaging with actors in the agricultural sector, conservation sector, and others may help the project identify other NbS which are appropriate for stakeholder's needs. The role of charcoal and firewood in local economies – particularly women's livelihoods – should be examined further. If their livelihoods are heavily reliant on charcoal production, this could undermine project outcomes, unless managed. There are other challenges with some solutions suggested by participants. For example, clearing areas of undergrowth reduces risks of bushfires, but may have negative impacts on biodiversity. These should be discussed with experts and community members throughout the project.

Tree planting, Agroforestry, and Forest management

Some responses suggest that women are often involved in reforestation or forest conservation in a secondary way (e.g. as providing 'labour') rather than as primary decision-makers. There is a need to ensure that local women are included from the earliest planning stages of project implementation.

Literature suggests that, "programs providing trees that suit economic needs are often more successful" (Martin et al, 2021: 10). While it is important to meet economic needs of men and women, it's important to prioritize environmental considerations into decision-making as well, including natural regeneration and conservation of trees in protected areas: "the sole use of agroforestry systems will not be enough to maintain diversity and ecosystems services" (Martin et al, 2021: 10).

As noted, different organizations have different definitions of what constitutes agroforestry (number of shade trees/hectare, % canopy cover of forest trees, etc). While the NbS project has its own targets, it may be useful to reference these other definitions in project planning, and monitoring, evaluation, research and learning (MERL) so that project outcomes and approaches could be more readily integrated into national and global-level programmes and datasets; however, governments in the three countries may have different preferences. While participant preferences and appropriateness to local context should be prioritized, some broad project awareness of these different standards could be beneficial.

It is important that materials supplied to participants (e.g. seedlings) are not used to convert existing forest to farmland. Where forest is degraded, it is important to consider legal, ecological, and other criteria before it is (re)planted with species that have livelihood benefits; e.g. researchers recommend that "cocoa agroforestry should be implemented in current cocoa plantations only, except in classified forests that are more than 75% degraded, where it can be implemented in agricultural lands" (Critchley, 2021: 11).

While cocoa dominates in many of the landscapes, the project should avoid focusing only on the cocoa sector. Chocolate and cocoa companies are already heavily involved in 'climate smart cocoa' and theNbS Guinean Forests should provide complementary options for farmers, and perhaps anticipate livelihood diversification in cocoa producing areas due to climate-change.

The baseline survey only represents a preliminary investigation of the levels of types of local knowledge of biodiversity. Results suggest a range of understandings amongst participants, with some focusing on on-farm biodiversity (including agro-diversity) while others associate the term with off-farm environments. Project communication strategies could benefit from identifying and using locally-specific terms, and examples of biodiversity, as they are understood by both men and women.

Participants identified bushfires (originating from use of fire to clear fields) as a problem. However, participants did not mention restricting burning as NbS. This is worth discussing with key stakeholders, including in the context of local climate adaptation plans.

Some stakeholders expect (or hope) that project participants will be paid to participate in reforestation. Literature also indicates that incentives may be needed to motivate reforestation and agroforestry. It is possible that expectations need to be managed or reforestation activities clarified, with regard to sustainability of project approaches.

The project could clarify local understandings of where trees should be planted, and rights of ownership/ use. Trees are used in many customary tenure systems to indicate ownership of land. Some trees may be seen as 'women's trees' and others as men's, which could have implications for gendered claims to land. More could be done to identify any (unintended?) consequences to land tenure patterns, including land disputes, of gendered approaches to tree-planting. Additionally, there is evidence that in cases where trees become commercially rewarding, men may take over the incomes or other benefits derived from them (Schroeder, 1999). The project should consider this as a risk and put in place mitigation strategies to prevent this.

Protected Forest Conservation

Participants in baseline research were not prompted by enumerators to provide more details of the role of local protected areas in livelihoods, as this is a politically, legally and socially sensitive topic. It is recommended that more data is collected on this issue through key informants, in a conflict-sensitive way. In some places forest conservation takes on coercive and violent forms, and the project should avoid supporting or being associated with coercion.



Conclusions

Preliminary research findings indicate that there are significant gender and age related differences in issues around forests, rights to natural resources, and environmental protection. The inclusive approach of the NbS Guinean Forests project is therefore appropriate. The project represents a significant opportunity to support local organizations, particularly women's groups, in reforestation and conservation efforts, while also benefiting rural livelihoods. The project also represents opportunities to foster stronger collaboration between state institutions and traditional authorities in planning and implementing NbS.

The project should actively look for, promote, and replicate local autonomous strategies for climate adaptation, as long as they are gender-sensitive and benefit the environment. However, in some cases potential project activities involve trade-offs - and these should be identified and carefully considered using data collected through research (as well as existing scientific data). Further efforts are needed to identify the (gendered) land tenure consequences of approaches to tree-planting and related activities.

The project has six landscapes, all unique. In particular, there are major differences between sites like the Taï National Park area, dominated by cocoa production, and those such as Lake Bosomtwe, where other land uses predominate. It therefore offers an opportunity to exchange knowledge between different contexts and avoid relying completely on what has been described as a 'climate-smart cocoa' model (Maguire-Rajpaul et al 2022). Moreover, while focusing on smallholders, the project should address other threats to forests (e.g. illegal commercial logging) and advocate for these issues as needed.

The project's targets tend to focus on processes and perceptions of participants, such as perceived vulnerability to climate change, and the proportion of community members in targeted communities who indicate that trees selected for reforestation meet women's economic needs. These are appropriate as they are likely to capture the overall impacts of the project. In conjunction with partner organizations and key stakeholders, the project could also establish monitoring systems for more quantitative indicators such as survival rates of planted trees, diversity of tree species planted, etc. To enhance integration with local and national planning and policies, systems such as MERL, should incorporate indicators and standards that align with existing frameworks and key stakeholders.

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