

POLICY BRIEF

Terrestrial natural capital assessment to inform territorial resilience strategies in Mauritania - a case study in Guidimakha



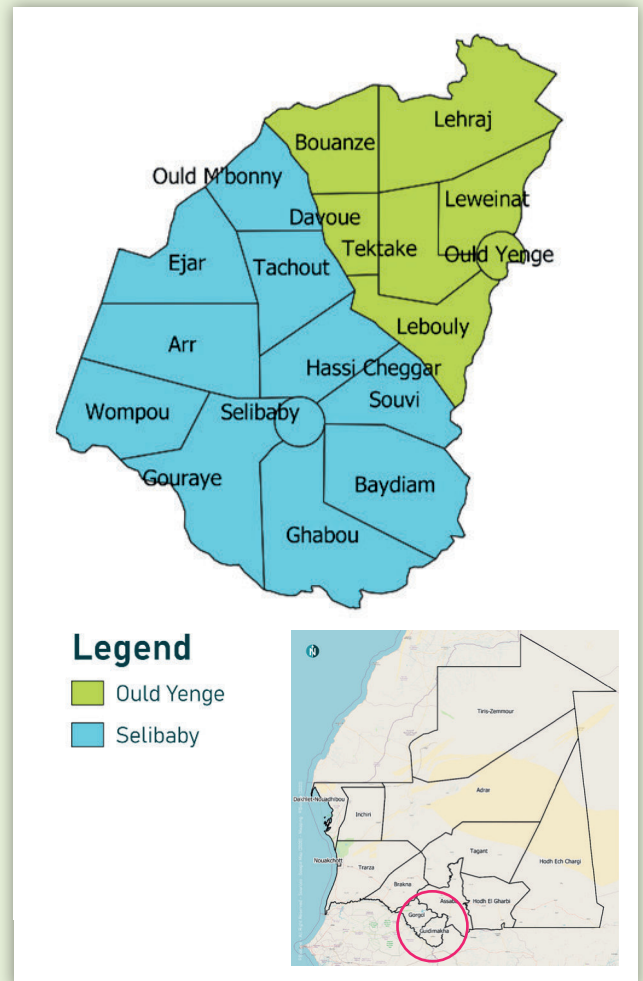
1. Introduction

Social and environmental aspects

The region of Guidimakha plays a key role in the agro-pastoral complex of southeastern Mauritania. It is an important location for transhumance and stands out due to its Sudanian-Sahelian climate with higher rainfall compared to the rest of the country, its proximity to the Senegal River, and its natural heritage such as the Gonakié forests. These characteristics have earned the region its title of “Mauritania’s granary”.

However, agro-pastoral extension and anthropogenic pressure on the landscape combined with climate change, are permanently altering the region’s soil structure and socio-ecological dynamics:

- Continuing increase in agro-pastoral pressure is exposing the Sahelian ecosystems, making them more susceptible to wind erosion, degrading the environment and increasing water runoff.
- Pressure on transhumant lifestyles and creeping modernization lead to increased sedentarization of traditional populations, who adopt extensive agricultural practices around populated areas¹. However, the unreliability of rainfed agriculture (diéri), due to significant inter-annual seasonal variations - attributed to climate change - causes widespread degradation of soils, turning them into runoff surfaces.



- Exploitation of forests for energy wood - a consequence of increased sedentarization and population growth – increases the exposure of infiltrating ecosystems².

The great Sahelian drought of the early 70's to mid 80's imposed fundamental structural changes on the region, questioning the appropriateness of certain traditional functions. Interactions between pastoral and agricultural activities became increasingly strained as available space became more limited and denser. Traditionally, transhumant pastoralists grazed the Sahelian grasslands during the rainy season, followed wadis in the dry season, and relied on crop by-products to sustain pastoral needs at the end of the dry season. However, spatial changes, sedentarization and the unpredictability of rainfall patterns disrupt this balance: agriculture is expanding and occupying more and more of the former pastoral grazing land. Rain-fed agriculture (diéri) and alluvial agriculture (walo) are replacing the pastoral vegetation landscapes inland and the floodplain expansion zone³.

While the confirmed return of rains over the past 20 years and the greening of the Sahel could initially be seen as a sign of a return to a pre-drought climate regime, changes seem to persist. On the one hand, this is due to soil impermeabilization resulting from artificialization and drought, as described above. The return of rainfall occurs in different ways, with significant inter-seasonal variability from one year to the next - monsoon delays are multiplying, and in a single year, there can be a dry the hot season and floodings in the winter (e.g. 2019). It therefore appears that changes in land use and occupation, combined with the lingering effects of drought, have an impact on the resilience of the Guidamakha region faced with climate change.

Decentralized land management

Since 2005, in order to strengthen community-based management, Guidimakha has established 25 associations for local and community management (Associations de Gestion Locales et Communautaires - AGLC) covering an area of 655,200 ha.

AGLCs are structures created to collectively manage the sylvo-pastoral areas in Guidimakha on a community basis. They have the advantage of corresponding to the agro-sylvo-pastoral realities of the area, allowing for the protection of pastoral areas and the management of forage crops, with the goal of optimizing local land management.

AGLCs are monitored on their natural resources by measuring the vegetation cover index (Indice de Couverture Végétal - ICV), which is based on wood cover, herbaceous cover, and diversity of species.

Towards a socio-ecological balance in the region

In partnership between GIZ, ELD and GGKP, a study was commissioned to identify opportunities for economic and territorial interventions that promote the development of a resilient and sustainable socio-economic trajectory for Guidimakha by 2040, building on local management structures such as AGLCs.

This involves, on the one hand, proposing a sustainable trajectory that takes into account the capacity of the sometimes fragile ecosystems to support these long-term socio-ecological changes, while considering local achievements in terms of management.

And on the other hand, the study aims to leverage opportunities to improve social and human capital (such as poverty reduction and job creation) and restore natural capital through sustainable management of ecosystem services to achieve the Sustainable Development Goals (SDGs) set at national level.

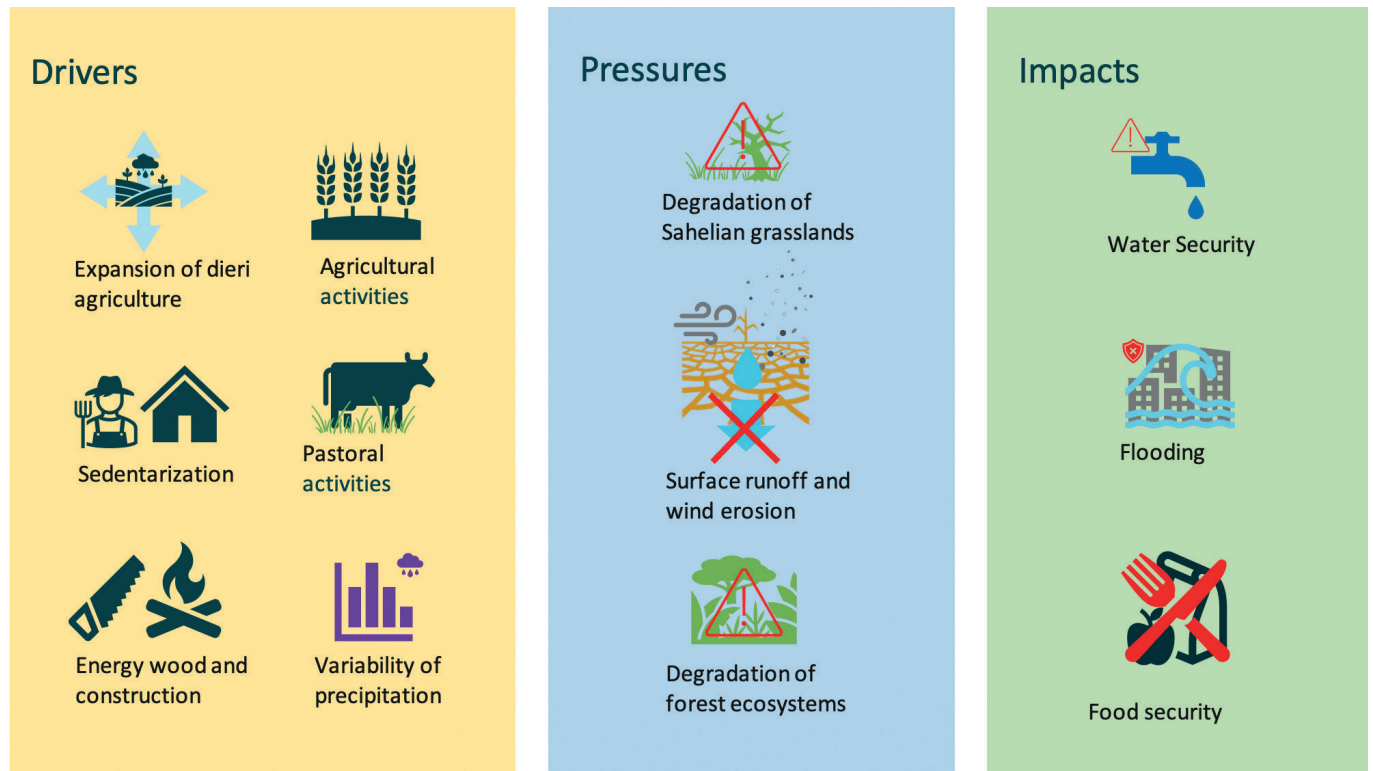
2. Methodological approach

With the aim of better understanding territorial dynamics and their link to the use and management of ecosystems a conceptual model was developed to capture the challenges Guidimakha's socio-ecological system is facing. The model helps to illustrate the relationship between changing socio-economic dynamics, climate change, changing pressures on natural resources and their impact on maintaining a range of ecosystem services⁴.

This model helps to put these challenges into context and better assess the potential for implementing a strategic response to promote a resilient and sustainable development in the region relying on preserving ecosystem services. This narrative of territorial dynamics enables us to prioritize the ecosystem services that will be assessed in the study.

FIGURE 1

Conceptual modelling of socio-economic and environmental dynamics at the territorial level



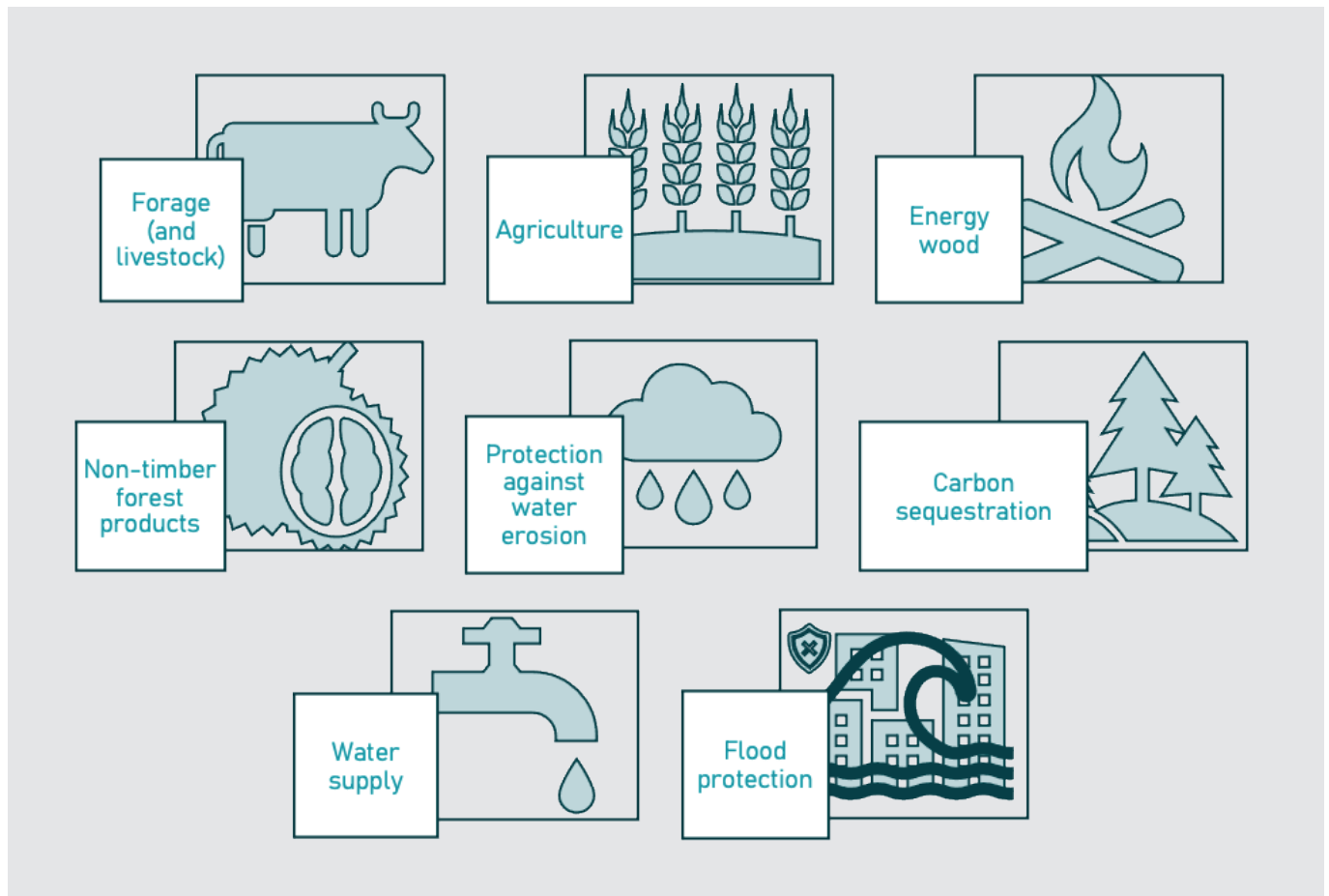
Studying these services and projecting them to 2040 according to the following hypothetical scenarios will provide us with a better understanding of the opportunities for resilience to be pursued in the Guidimakha region. The Sahel is particularly affected by the impacts of climate change, with an increase in temperature of 1.2°C above the average since 1950. In order to take these factors into account in the proposed scenarios, we use an “intermediate” climate assumption corresponding to the RCP 4.5 and RCP 6.0 radiative forcing trajectories established by the IPCC in its Fifth Assessment Report. Based on these climate assumptions, a set of 3 scenarios to support advocacy for the development of a resilient future for Guidimakha is proposed and analyzed:

- **a baseline scenario** based on socio-economic trends in the region from the current status quo, and
- **a sustainable transition scenario** focusing on a sustainable policy for the territory based on a wide range of ecosystem services
- **a “counter-scenario” of agricultural expansion and sedentarization** including territorial development

policies favoring a less diverse range of ecosystem services, and more oriented towards sedentarization of populations and expansion of agricultural activity. The purpose is to evaluate the benefits of the implemented management policies (e.g. implementation of AGLC), by contrasting them with a scenario without management.

The definition of these scenarios was discussed and revised during field workshops with stakeholders, in order to better reflect the priorities given by local stakeholders for the different services, as well as to collect complementary data to support the evaluation of ecosystem services.

The aim is to propose an action narrative - supporting the regeneration of a varied range of ecosystem services - that will be shared among decision-makers to demonstrate a sustainable trajectory for the region based on sustainable management interventions and development policies. By contrasting these scenarios, the report concludes with recommendations in terms of public policies to promote the integration of ecosystem services into land management by 2040.

FIGURE 2
Services prioritized for the case study in Guidimakha


3. Results

By contrasting the sustainable transition scenario with the agricultural expansion and sedentarization scenario, the results of the study show the benefits for Guidimakha of moving towards sustainable development of the territory based on a wide range of ecosystem services, rather than turning to an economy of agricultural specialization.

The territory's sustainable transition scenario is built around four interconnected themes: improving farming techniques, controlling water resources, restoring silvo-pastoral areas and agro-pastoral management. This means examining the capacity of the area and its resources to promote socio-economic resilience rooted in sustainability.

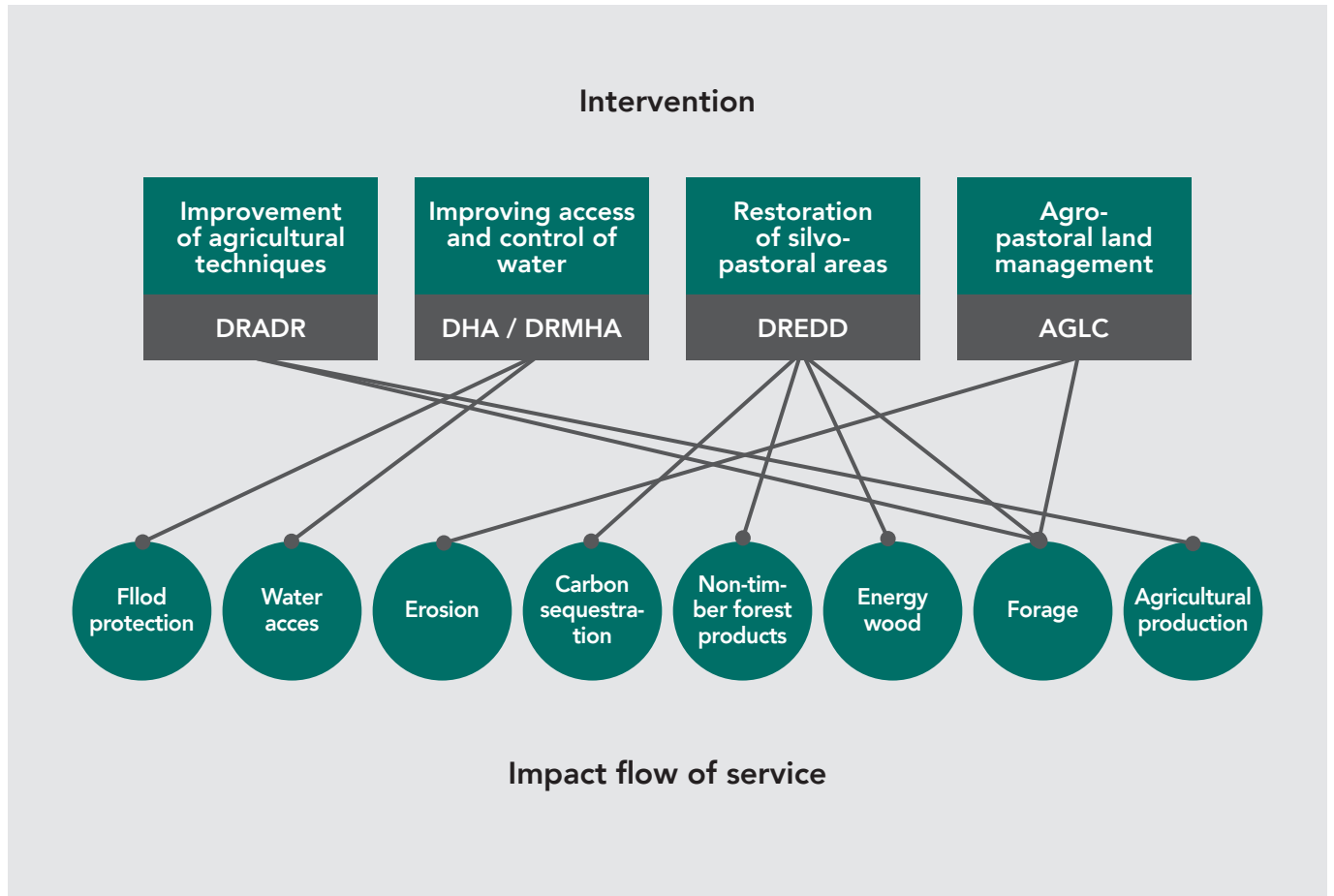
- Improving farming techniques helps to increase land productivity and reduce the risks associated with climate variability.

- Managing water resources will guarantee access to reliable water sources for agricultural and domestic activities, and contribute to flood protection.
- Restoring silvo-pastoral areas contributes to maintaining biodiversity and reducing the risk of desertification.
- Sustainable agro-pastoral management allows to maximize economic benefits while protecting ecosystems and natural resources.

This sustainable transition scenario shows the importance of managing resources to diversify economic activities in the face of climate change and to maintain the traditionally associated lifestyles. Today, over 50% of Guidimakha's population lives in the AGLCs, and over 70% depends directly or indirectly on livestock farming. A synergetic approach consisting of subsistence agriculture, fodder cultivation, livestock breeding and silvo-pastoral restoration would ensure food resilience

FIGURE 3

Chart showing the interventions of the sustainable transition scenario



of the region, while avoiding socio-economic shocks and conflicts associated with sedentarization and modernization disconnected from traditional lifestyles.

Maintaining and developing agricultural and sylvopastoral resources, means of access to water and their management, through the development of AGLCs, is estimated to produce a net benefit of 3.4 billion MRU by 2040, compared with the reference scenario.

In addition, the benefits of sylvopastoral intervention are not limited to the supply of natural resources, since they also enable the restoration of key ecosystems in the Senegal River valley, such as acacia forests, while meeting the carbon sequestration requirements set out in the National Determined Contributions.

In contrast to this sustainable transition scenario, a counter-scenario of agricultural expansion and sedentarization

FIGURE 4

Estimated benefits of the interventions (in millions of MRU)

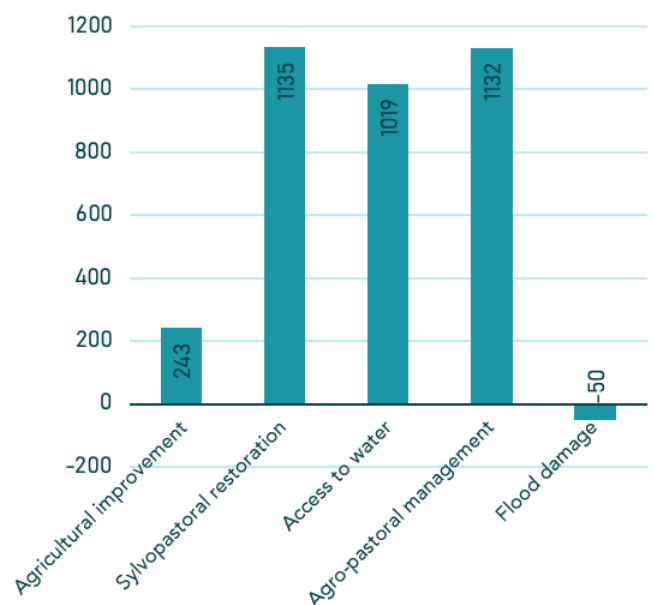
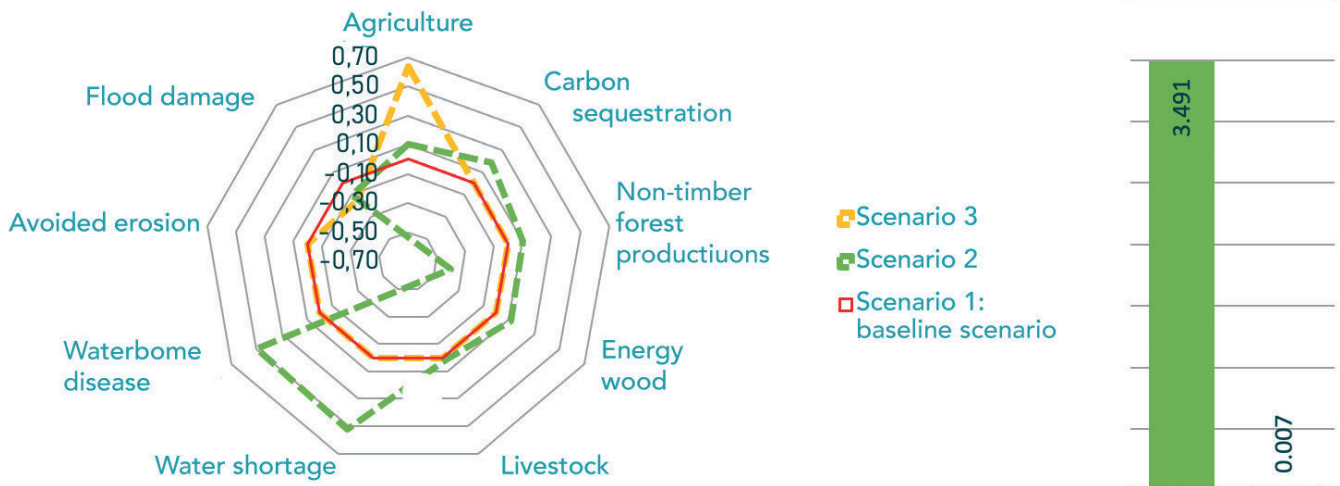


FIGURE 5

Marginal growth rate of services relative to the baseline scenario (figure on the left) and respective benefits of the different scenarios, in billions of MRU (figure on the right).



demonstrates the consequences of a socio-economic development that does not take resilience and sustainability of the territory into account. It helps to better illustrate the achievements of the management system implemented in Guidimakha and to analyze the long-term consequences of moving away from this decentralized management that aims at the resilience of the territory. In this counter-scenario, accelerated sedentarization and the concentration of the population in the expanding urban areas lead to herders turning to a semi-extensive activity combining livestock breeding and agriculture to the detriment of transhumant herders, and to farmers turning to cereal cultivation.

At first glance, this scenario confirms the significant agricultural potential of the territory: with an estimated cultivable area of about 200,000 ha and focusing on the modernization and development of agriculture by 2040, Guidimakha would generate a net profit of MRU 2.3 billion by 2040 compared to the reference scenario.

However, this scenario of economic standardization based on agricultural activity, rather than on the development of a varied range of services supported by the

management of AGLCs, risks undermining existing management mechanisms in favor of this agricultural extensification. It is estimated that the shift away from AGLC management, and the consequent deterioration in natural resource management, would represent a net loss of around 2.7 billion MRU compared with scenario 2.

The illustration below clearly shows the importance of varying interventions to maximize the future range of ecosystem services, not only for economic diversification but also for overall regional benefits.

4. Recommendations

Comparing these different scenarios highlights the importance of an integrated approach to land management, taking into account the potential for development of traditional activities, including non-timber forest products (NTFP) and transhumant livestock.

To promote a resilient strategy for Guidimakha, the report recommends the following:

TABLE 1

Study recommendations for Guidimakha's resilient and sustainable development strategy

	Priority areas for intervention	Recommendations
<p>Improve- ment of agricultural techniques</p>	<p>Legend:</p> <ul style="list-style-type: none"> ○ no potential ○ non-priority action ○ possible action ○ desired action ○ priority action 	<ul style="list-style-type: none"> ■ Installation of stone barriers and other techniques to improve yields on existing crops. ■ Systematic implementation of yield improvement techniques on new crops. ■ Encourage the development of catch crops and intercropping (or intercropping e.g. sorghum/cowpea or sorghum/groundnut) ■ Encourage the development of multi-purpose crops (e.g. soubatimi sorghum) adapted to the region ■ Develop silage and the use of preserved forage. ■ Develop synergies between agriculture and livestock: consumption of crop residues and organic animal fertilization of the soil (dung and manure)
<p>Improving access to and control of water</p>	<p>Legend:</p> <ul style="list-style-type: none"> ○ possible action ○ desired action ○ priority action ○ priority and urgent action 	<ul style="list-style-type: none"> ■ Restore traditional wells and construct modern wells (or boreholes) near settlements with 300 or more inhabitants. ■ Organize the restoration of water infrastructure, close to places of population concentration and critical infrastructure. ■ The restoration of wells and water points must be done taking into account the resilience of open-air fodder resources, in order to avoid overpressure on natural pasture.

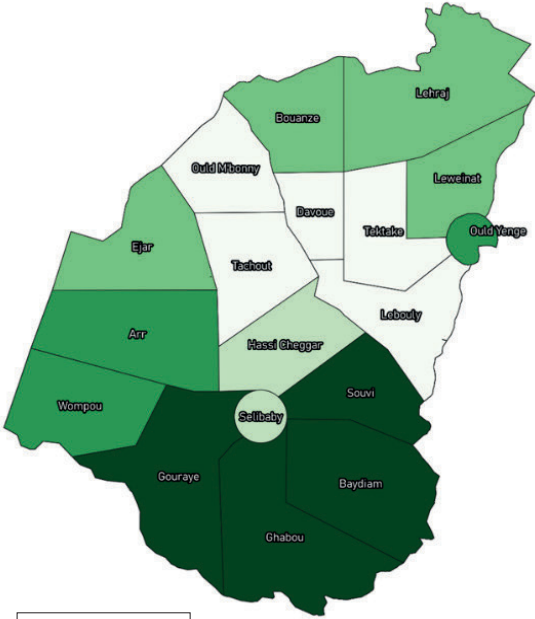
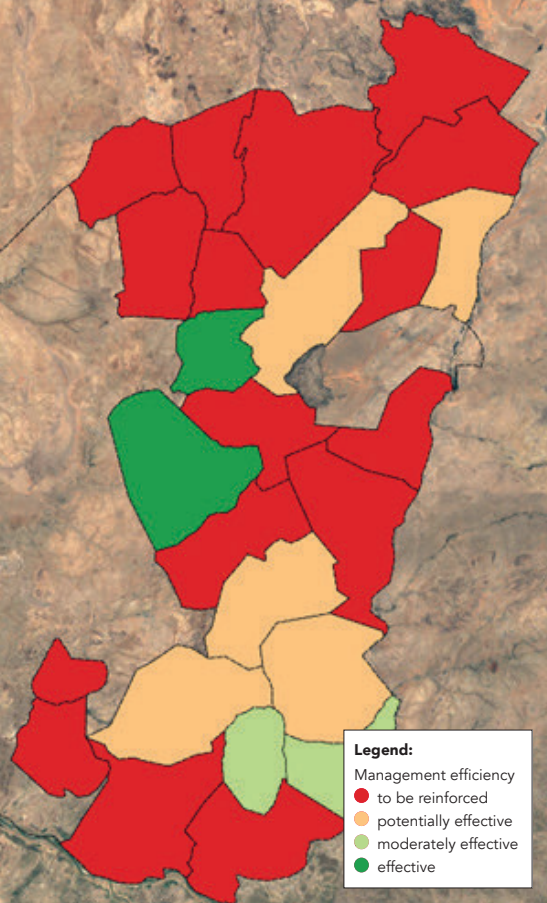
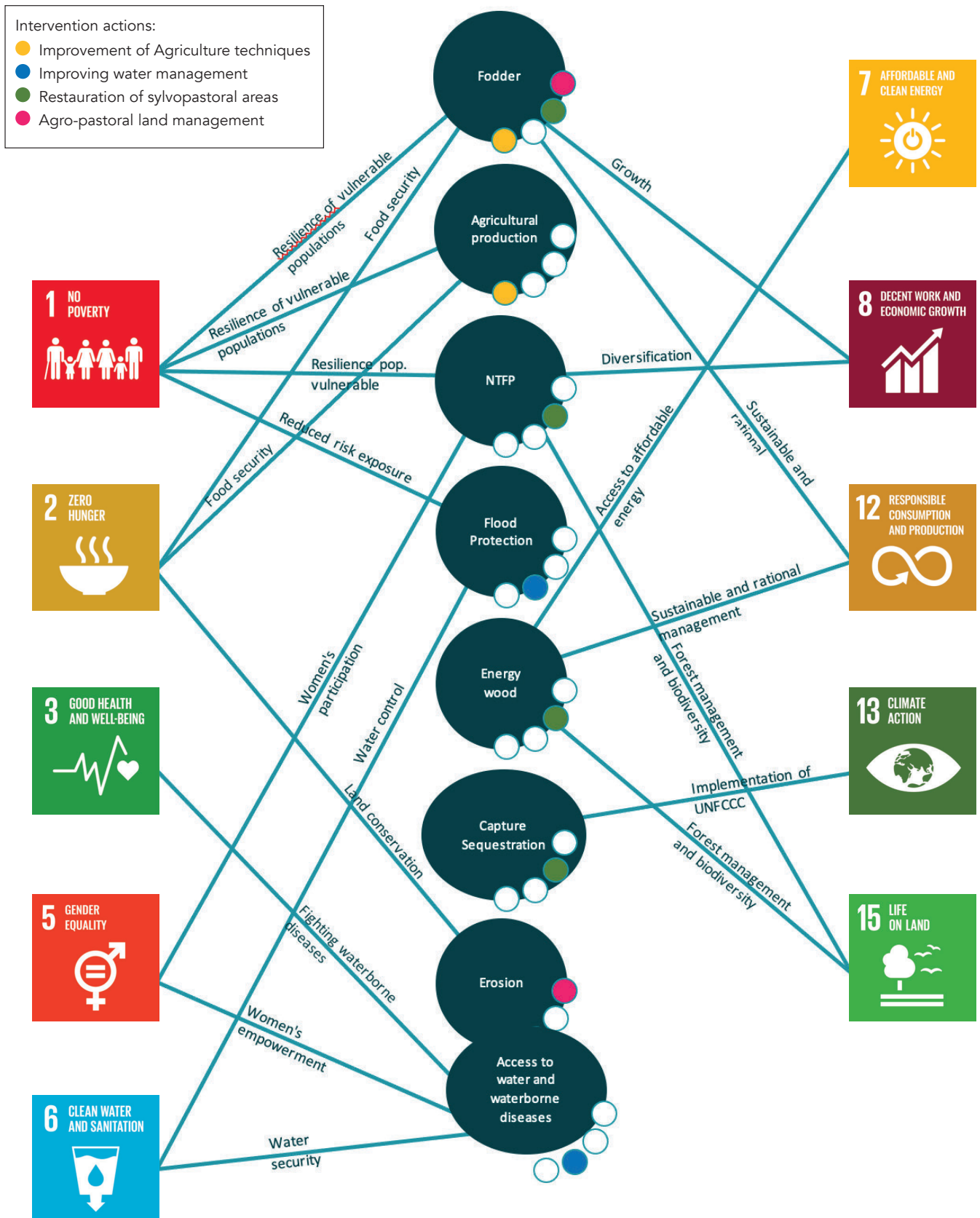
	Priority areas for intervention	Recommendations
<p>Restoration of silvo-pastoral areas</p>	 <p>Legend:</p> <ul style="list-style-type: none"> ○ no potential ○ non-priority action ○ possible action ○ desired action ○ priority action 	<ul style="list-style-type: none"> ■ Prioritise the restoration of forest areas at the heart of biodiversity, corresponding to the historic forests of the Gonakiers of the river valley ■ Restore silvo-pastoral and agricultural areas by taking into account the non-timber potential of the species, including the potential for NTFPs and the potential for forage wood. ■ Implement sustainable management of timber production, ■ Facilitate charcoal processing and the implementation of improved cookstoves to reduce energy consumption ■ Develop and organize NTFP operating cooperatives ■ Develop sectors derived from livestock farming, including the dairy sector, which represents a significant potential to meet the needs of peri-urban areas.
<p>Agro-pastoral land management</p>	 <p>Legend:</p> <p>Management efficiency</p> <ul style="list-style-type: none"> ● to be reinforced ● potentially effective ● moderately effective ● effective 	<ul style="list-style-type: none"> ■ Establish a standardized indicator for monitoring the management of AGLCs over time based on the ICV, in order to better track the effectiveness of the management of AGLCs. ■ Organize exchanges between the managers of the different AGLCs in order to more effectively draw on feedback ■ Improve the integrated management and governance system for local statistical monitoring, herd movements, land management and resource use. ■ Manage the exploitation of silvo-pastoral areas between the harvesting of non-timber products, fodder use and timber use. ■ Improve warning and response systems for climate events such as bushfires, thus warning of and preventing land degradation ■ Leverage the governance and management structure of AGLCs to catalyze investments in restoration programs to ensure implementation in line with resilience objectives.

FIGURE 6

The study's recommendations and their contribution to the sustainable development goals



Contributions to the Sustainable Development Goals

The development of agricultural and pastoral activities contributes to the goals of poverty reduction (SDG 1) as well as food security (SDG 2). These activities also contribute to the region's economic growth of the region (SDG 8).

Improving the management of water resources contributes to the reduction of water-borne diseases (SDG 3), the reduction of exposure to flood risks (SDGs 1 & 6), as well as the empowerment of women, who are often in charge of fetching water (SDG 6).

The restoration of sylvo-pastoral areas contributes to carbon sequestration (SDG 13), as well as to the protection of terrestrial biodiversity (SDG 15) and the resilience of the territory through the sustainable use of natural resources (SDG 12). The management of timber stocks enables the production of accessible energy for vulnerable populations (SDG 7).

Finally, improving the agro-pastoral management of the territory allows the reduction of erosion, and the improvement of the quality of grazing areas, making it possible to further secure agricultural and pastoral production (SDG 2) as well as the growth of these key sectors (SDG 8).

The contributions to the SDGs are summarized in the chart on the previous page.



5. Strategic levers

The study demonstrates the multitude of benefits linked to the preservation of natural heritage and associated ecosystem services. In addition to the above recommendations for management, local intervention, public dialogue and disaster preparedness at the local level, public authorities have a dual role to play: firstly, as drivers of public policy implementation and, secondly, as enablers of strategic levers to catalyze local investment and action in order to achieve local and national objectives:

- The **Nationally Determined Contributions (NDCs)**⁵ proposing concrete measures to combat climate change, including the improvement of agricultural techniques and the restoration of forest and agro-sylvo-pastoral areas. The proposed resilience scenario builds on the restoration targets set out in this document to establish a target for forest restoration in Guidimakha.
- The development of a **System for Monitoring and Exchange of Environmental Data at the initiative of the MEDD**⁶ supported by the German cooperation allowing the integration of data related to the management of natural resources and their dissemination to actors in charge of land management and public policies. This system allows the monitoring of the environmental parameters of the territory as well as the sharing and dissemination of data on an inter-regional scale. The geospatial data digitized and analysed for Guidimakha in the report can be integrated into the system in order to strengthen it.
- The strengthening of the **natural resource management system implemented by the AGLCs** based on the ICV makes it possible to measure the effectiveness over time of the management measures put in place. The combination of the ICV tool and the Inter-AGLC Union system, based on an umbrella structure, makes it possible to capitalize on successful management experiences and extend them organically across the territory. This system also supports the development and implementation of agro-pastoral charters promoting harmonious relations between farmers and breeders.
- The **Great Green Wall Investment Program 2021-2030**⁷ is based on the implementation of priority im-

Endnotes

- ¹ Charles Toupet and Pierre Michel, 'Sécheresse et Aridité: L'exemple de La Mauritanie et Du Sénégal', *Revue Internationale de Géologie, de Géographie et d'écologie Tropicales* 3, no. 2 (n.d.): 137–57.
- ² Charles Toupet, 'L'eau et l'espace au Sahel : l'exemple de la Mauritanie', *Géocarrefour* 58, no. 3 (1983): 277–85, <https://doi.org/10.3406/geoca.1983.4003>.
- ³ Abdallahi Ould Mohamedou Laurent Barbiero, and Sônia Furian, 'Soil erosion as a function of soil system in the Diawling, Mauritania', *Science and Global Change/Drought* 12, no. 3 (2001): 183–86.
- ⁴ Les actifs naturels fournissent un panier de services écosystémiques dérivé des caractéristiques et processus écosystémiques de l'actif. La composition du panier dépend du type d'écosystème, de l'étendue, de l'état et de l'emplacements de l'actif, ainsi que des modes d'utilisation par les acteurs économiques (e.g. ménages, entreprises et gouvernements).
- ⁵ MEDD and PNUD, 'Contribution Déterminée Nationale Actualisée - 2021-2030', Résumé exécutif et rapport de synthèse (République Islamique de Mauritanie, 2021), https://unfccc.int/sites/default/files/NDC/2022-06/CDN-actualis%C3%A9%202021_%20Mauritania.pdf.
- ⁶ MEDD, 'Système de Suivi et d'Échange Des Données Environnementales', *Système de Suivi et d'Échange des Données Environnementales*, 2023, <https://www.si-medd.mr/>.
- ⁷ PAGGW, 'Initiative Grande Muraille Verte - Plan d'Investissements Prioritaires Décennal (2021-2030) PIPD/GMV' (PAGGW, 2021), <https://www.grandemurailleverte.org/images/FR-PIPD.pdf>.
- ⁸ MEDD, 'Stratégie Nationale de l'Environnement et Du Développement Durable et Son Plan d'Action Pour La Période 2017 - 2021' (République Islamique de Mauritanie, 2017).
- ⁹ MEDD, 'Programme Prioritaire Élargi Du Président' (République Islamique de Mauritanie, 2020).

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