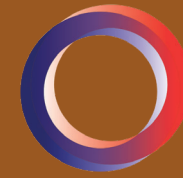




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ADAPTATION TO CLIMATE CHANGE IN THE NORTH AFRICA-SAHEL REGION



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Advocacy note

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The writers of this note are the sole responsible of the analyses and conclusions it encompasses. The findings of this note do not necessarily reflect the point of view of the Agence Française de Développement or partner institution.

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What is an advocacy for Climate Change Adaptation and why?

The Sahara and Sahel Observatory and the Agence Française de Développement (AFD) joined their efforts to produce this advocacy note which aims to help decision-makers understand the importance of adapting to climate change and fighting its effects. It was developed as part of the common capacity and knowledge building actions carried out by the two organisations.

This note focuses on adaptation measures that could contribute to the restoration of ecosystems and provides real solutions and recommendations to help all stakeholders involved in the fight against the effects of climate change and ecosystem degradation in the North Africa/Sahel region.

It also aims to explain climate change adaptation and to make a contribution in the development of more ambitious Nationally Determined Contributions (NDCs) and National Adaptation Plans (NAPs) with a focus on ecosystems, helping plan climate change adaptation projects and access climate finance and providing solutions based on ecosystems' preservation and restoration.

What is adaptation to climate change?

The IPCC defines climate change adaptation as a process of adjustment to current or expected climate conditions and their consequences. Speaking of human systems, this would imply reducing or avoiding the adverse impacts of climate change and taking advantage of its beneficial effects. For some natural systems, human intervention can help foster adaptation to expected climate conditions and their consequences.

General context

North Africa/Sahel is one of the most vulnerable regions to the climate change impacts. It is home to a great diversity of landscapes and environments rich in biodiversity and water resources. However, the area is currently facing multiple crises, such as political instability, insecurity and food crisis due to rising global energy and food prices, thus exacerbating its vulnerability to climate change.

The impacts of climate change in the region translate into extreme temperatures and more intense and frequent rainfall, increasingly numerous and severe droughts and low water periods, leading to water shortages, forest fires, land degradation, reduced agricultural production and loss of ecosystems and biodiversity. These impacts can lead to potentially devastating ecological and economic tipping points.

More impactful adaptation measures that can have positive effects on all sectors, in particular on the restoration of ecosystems in the North Africa/Sahel region have therefore become a must. This would enable people to lift themselves out of poverty, develop resilient livelihoods, improve their living conditions and face the adverse effects of climate change.

1. GENERAL PRESENTATION OF THE NORTH AFRICA/SAHEL REGION

North Africa includes Algeria, Libya, Morocco, Mauritania, Tunisia and Egypt and covers a large geographical area between latitudes 37° North and 15° South and longitudes 25° East and 17° West.

The region provides a variety of landscapes that extend from the Mediterranean coasts to the Atlas Mountains and Sahara deserts. The Sahara covers most of Algeria, Libya and Mauritania, as well as a large proportion of Morocco and Tunisia.

The climate is influenced by the Mediterranean Sea in the North, the Atlantic Ocean in the West, the Sahara in the Center South and, to a lesser extent, the Sahel in the southernmost part. The region is divided into two main parts : the northwest coast and the desert interior, both having respectively a Mediterranean and desert climate.

Due to its particular geographical location and bioclimatological nature, North Africa is home to a variety of major ecosystem types: freshwater, marine and coastal, mountainous, forest, steppe, Saharan and desert ecosystems and agroecosystems.

They include exclusive subtypes and habitats that are very representative of the region such as oases, Alfa grasslands (*Stipa tenacissima*), wetlands, temporary rivers or wadis, cedar forests and coral reefs. These environments are home to unique biodiversity, including many endemic species that contribute to the economy and human well-being (IUCN, 2020).

The Sahel region is located in West Africa and includes Burkina Faso, Mali, Mauritania, Niger and Chad. It includes the Sahelian strip, bordered by the Sahara desert to the north and by the equatorial region to the south.

The Sahelian part presents flat topography with scattered mountains in specific areas. It is located in the hot climate area of the planet, with dry and wet seasons around the Tropics of Cancer.



Plain of Maider, Morocco

The Sahelian countries are largely dominated by arid, semi-arid and dry sub-humid environments which follow one another along a North-South gradient. The Sahelian climate features high temperatures throughout the year and strong seasonal and interannual variability.

The Sahelian part extends over a large geographical surface and presents a bioclimatic diversity. It is home to considerable ecosystem wealth : forests, savannahs, tiger bushes, steppes, deserts and humid and marine ecosystems. Besides, this region contains terrestrial or maritime transboundary ecosystems that straddle one or more borders, making it an important region for biodiversity and the ecosystem services it provides.

2. CLIMATE RISKS AND VULNERABILITY OF THE NORTH AFRICA/SAHEL REGION

North Africa/Sahel is one of the regions most exposed to the adverse climate change impacts, due to climate variability and high dependence on climate-sensitive activities, such as rain-fed agriculture and limited economic and institutional capacity to cope with and adapt to climate variability and change (Roudier *et al.*, 2011).

The pace of temperature increase that North Africa is experiencing is 20% higher than global averages. If no action is taken, such an increase could reach +2.2°C by 2040 and go up to +3.8°C in some regions in 2100 (RCP 8.5). Future climate scenarios project a decrease in rainfall in many parts of the region, leading to more marked drought episodes around the Mediterranean and North Africa.

Due to the scarcity of rainfall and prolonged periods of drought, the region will find it increasingly difficult to meet the most basic water needs and ensure its ecosystem services.

In the Sahel, climate change projections foresee a 3 to 6°C increase in average temperatures by 2100 (RCP 8.5), with a 3°C increase in coastal areas (Mauritania) and 4°C in the Sahelian region (Burkina Faso, Mali, Niger, Chad). In addition, there could be an increase in the inter-annual rainfall variability which can lead to abrupt changeover between very wet and very dry years (USAID, 2017). Periods of drought were particularly difficult in the 1910s, 1940s and from 1968 to 1993 (Descroix and Lambert, 2018). Significant floods have also affected several cities in the region, including Ouagadougou in 2009, Dakar in 2012, Bamako in 2013 and Niamey in 2004, 2010, 2012, 2013 and 2016.



Irrigated cereal crops

The precarious situation in North Africa suffering from water shortages and the Sahel facing food insecurity is exacerbated by climate change due to the direct and indirect degradation of ecosystems and biodiversity, increased occurrence of drought, desertification and floods, as well as the expected shortened rainy seasons. The sixth IPCC report came to confirm this growing fragility and underline that the scale of current and future impacts is still underestimated.

3. ADAPTATION IN THE NDCs OF THE NORTH AFRICA/SAHEL COUNTRIES

The North Africa/Sahel countries have either strategic documents for climate change adaptation planning at the national level or updated Nationally Determined Contributions (NDCs).

The quality of these documents is constantly improving thanks to the integration of climate trend data, specific information on adaptation actions by priority sector and measures for the preservation of the ecosystems and the identification of the funding needs.

Table 1 - Examples of adaptation measures

Country	Priority actions
Algeria	<ul style="list-style-type: none"> • Development of a national plan for adaptation to climate change with priority given to the protection of the populations and the preservation of natural resources and basic infrastructure against the risks of extreme phenomena; • Institutional and regulatory framework adaptation to climate change; • Institutional and human capacity building for the fight against climate change; • Establishment of a monitoring and early warning system; • Development of regional and local plans for adaptation to climate change.
Chad	<ul style="list-style-type: none"> • Development of a sector-based approach for the agro-pastoral sectors and biological agriculture; • Development of agroforestry; • Promotion of improved crop varieties; • Management of bush and forest fires; • Promotion of defense techniques; • Protection and conservation of biodiversity and protected areas; • Establishment and/or effective management of community forests; • Enhancement of indigenous know-how and knowledge; • Construction of modern wells and boreholes; • Improved knowledge of surface and groundwater resources.

Country	Priority actions
Morocco	<ul style="list-style-type: none"> • Consolidation and optimization of the governance and strategic management of the national adaptation policy; • Support for decision-making by improving access to climate data, information and knowledge and by promoting the development of climate scientific research; • Assessment and prevention of the risks and vulnerabilities and reduction of climate impacts on safety, health and economic assets; • Strengthening the resilience of natural ecosystems to climate change as part of a strategy combining the preservation of ecosystem services and sustainable livelihoods; • Strengthening the resilience of the most vulnerable economic sectors to climate change.
Mauritania	<ul style="list-style-type: none"> • Development and management of wetlands through wetland-based adaptation; • Establishment of a flood-risk monitoring system in coastal towns; • Establishment of a climate-risk insurance system; • Development of agroecology; • Establishment of a monitoring network and strengthening of the climate/health/food security early warning system.
Niger	<ul style="list-style-type: none"> • Use of certified high-yield improved varieties and adapted genetic resources; • Support for traditional livestock farming by strengthening pastoral facilities and security capacities in the pastoral zone; • Improved knowledge and control of water resources; • Installation of windbreaks for the protection of water bodies and streams against wind erosion; • Promotion and use of climate services and information for producers.

Country	Priority actions
Tunisia	<ul style="list-style-type: none"> • Achieving the digital transition of agro-silvo-pastoral production systems, livestock, fisheries and aquaculture, improving the sharing of information, data and knowledge for better resilience of the territories and societies to the climate change impacts; • Planning and supporting the transition to climate change resilient agriculture; • Improvement of the quantity and quality management of conventional water resources to face the climate change impacts; • Integration of climate change risks and adaptation needs into local development plans and urban planning plans; • Monitoring, protection, rehabilitation and rationalization of the natural resources use, achieving land degradation neutrality and ensuring the sustainability of the goods and services provided by natural ecosystems.

The adaptation funding needs of the countries of these two regions are expressed in their NDCs. Although they are calculated in different ways and involve many uncertainties, said needs would amount to US\$66.45 billion by 2030.

Table 2 - Adaptation funding needs

Country	Unconditional contributions (US\$ billions)	Conditional contributions (US\$ billions)	Total Contributions (US\$ Billions)	Total (US\$ billions)
Burkina Faso	1.15	1.64	2.79	66.45
Chad			5.00	
Mali			8.00	
Morocco			40.00	
Mauritania	0.04	1.02	1.06	
Niger	2.40	4.34	6.74	
Tunisia			2.85	

Experiences of implementing climate change adaptation measures in the North Africa/Sahel region indicate a focus on:

- Land development;
- Pastoral development;
- Livestock development;
- Climate-smart agriculture;
- Monitoring and protection of natural resources;
- The achievement of land degradation neutrality;
- Low-carbon and climate-resilient economic development.

We can see that the globally established funding mechanisms to help countries develop and implement their national climate change adaptation policies and programs have "sidestepped" the role of decentralized local and regional authorities in the national adaptation effort. Indeed, no funding instrument dedicated to these communities has been specifically planned. A study covering the 2003-2016 period estimates that less than 10% of international, regional and national funding for adaptation to climate change was allocated to the local level (Soanes *et al.*, 2019).

Local funding for adaptation could contribute to increasing the effectiveness of national adaptation policies by reducing the inconsistencies of sector interventions, while mobilizing additional and necessary resources for adaptation. At the Cape Town Conference (South Africa, March 2010), African mayors rightly recognized that local institutions must be a core contributor to the fight against climate change. Such a statement was reinforced by the Charter of local authorities on climate change adaptation signed by more than a hundred mayors during COP17 (Durban, South Africa, 2011).

Here follow the eight adaptation principles that were identified at the local level:

- Hand over decision-making to the most appropriate local level;
- Address structural inequalities faced by women, youth, children, disabled and displaced persons, indigenous peoples and marginalized ethnic groups;
- Provide "patient", predictable and more accessible funding;
- Invest in local capacities to create an institutional heritage;
- Have a good understanding of climate risk and uncertainty;
- Be flexible in programming and learning;
- Ensure transparency and accountability;
- Act and invest in partnership.

4. WHAT IS ECOSYSTEM-BASED ADAPTATION?

Ecosystem-based adaptation is “the use of biodiversity and ecosystem services to help people adapt to the adverse effects of climate change as part of a comprehensive adaptation strategy” (CBD, 2009).

Ecosystem-based adaptation activities can contribute to the conservation and sustainable use of biodiversity and create many social, economic and cultural benefits for the communities. They also can be used on a regional, national and local scale. There are many examples of ecosystem-based adaptation interventions on:

- The conservation and restoration of the forests and other natural cover, to stabilize the slopes, prevent landslides and regulate water flows to avoid flash floods (Pramova *et al.*, 2012);
- The establishment of diversified agroforestry systems to cope with the increasing variability of climate conditions (Pramova *et al.*, 2012);
- The wetland and floodplain management to prevent flooding and maintain water flow and quality in the face of changing rainfall patterns (Colloff *et al.*, 2016 ; Iacob *et al.*, 2014).

Adequate implementation of this strategy will help countries meet their adaptation expectations. All North Africa/Sahel countries have referred to ecosystem-based adaptation measures in their NDCs.

It is hard to translate the countries’ theoretical commitment to ecosystem-based adaptation into clear objectives and to know whether the objectives will make it possible to meet the adaptation needs of the affected communities and ecosystems.



Overgrazed Zean Oak Forest

IN THE NORTH AFRICA/SAHEL REGION

The OSS and AFD efforts in the dissemination of knowledge and good practices for the preservation of ecosystems in North Africa and the Sahel have actually brought convincing results through ongoing initiatives/projects. These adaptation actions could be consolidated within the framework of the following interventions:

- The **PACTE** project in Tunisia (Program for climate change adaptation in rural areas), implemented by AFD since 2016, for an 8-year period, is the true application of reviewed approaches to rural development and targets a rational and sustainable management of natural resources, while contributing to the economic development of territories and the improvement of local governance;
- The **AdaptAction** initiative, launched by AFD in 2017, aims to support 15 countries and regional organizations that are particularly vulnerable to the climate change impacts, by helping them implement their adaptation strategies and by providing them with technical and capacity building activities to better consolidate their climate governance;
- The **Copernicea** project (Regional COoPEration for New Indicators of Ecosystem Natural Capital Accounting - ENCA - in Africa), financed by AFD and coordinated by the OSS, aims to establish a national and regional network for sharing and exchanging information and data that are useful and necessary for the ENCA. The pilot project will produce results likely to be duplicated in other countries of the region;
- The **AdaptWAP** project (Integration of climate change adaptation measures in the coordinated management of the W-Arly-Pendjari - WAP transboundary complex), implemented by the OSS since 2020, with the Adaptation Fund financial support, over a 4-year period, aims to strengthen the resilience of ecosystems and improve the livelihoods of the populations within the WAP Complex in a context of climate change, through the establishment of a multi-risk early warning system and the implementation of concrete adaptation measures;
- The **GMES&Africa** project (Earth Observation for Sustainable Land and Water Management in North Africa) is implemented by the OSS and extends over the 2018-2025 period. It aims to support decision-making in the field of sustainable management of water and natural resources through the provision of products and services developed from Earth Observation data and techniques.

6. PROSPECTS AND RECOMMENDATIONS

Despite the climate change impacts, the North Africa/Sahel region has several achievements and assets enabling it to achieve more prosperous development and to preserve its ecosystems and biodiversity. Thus, several actions can be undertaken in order to improve the adaptation capacities of the countries and to promote the action of all and improve their effectiveness, in particular:

6.1. STRATEGIES AND POLICIES

The integration of quantified and standardized adaptation targets in national laws, policies, strategies, plans or related documents submitted to the UNFCCC. This helps evaluate the impact of climate change adaptation actions and assess their effect on ecosystems at the local, national or project level.

The development of effective and sustainable adaptation strategies which must include the restoration of ecosystems, the protection of sensitive coastal areas and the establishment of early warning systems for extreme weather events.

The establishment of institutional arrangements necessary to ensure synergy between all sectors in the management of natural resources and the protection of ecosystems and biodiversity.

6.2. ADAPTATION FINANCE MOBILIZATION

The promotion of national and international funding to monitor biodiversity and ecosystem mode of operation, using appropriate, simple, low-cost, routine tools that can be adapted to different land use objectives.

The mobilization of innovative funding at the level of institutions and existing financial models which must include a special portfolio in order to meet the needs of an inclusive economy, based on the restoration of ecosystems and the sustainable natural resources management.

6.3. STRENGTHENED COMMUNICATION

The promotion of local know-how would improve the protection of ecosystems and help create economic opportunities and green jobs for the benefit of the most vulnerable populations and reduce the pressure on ecosystems.

Capacity building particularly in terms of project development and implementation, search for new partnerships and sharing of the teachings.

Raising the awareness of decision-makers and populations through the development of the appropriate mechanisms to reach populations so that they have timely climate information. This information should also be used by policy makers and international partners to prepare for possible crises, such as food shortages.

The promotion of dialogue between regional African institutions in order to identify the concerns and the regional strategies to improve the coordination and effectiveness of adaptation activities at the ecosystem level. The support of international partners to the efforts of developing regional action plans and political responses to climate change and their contribution to the exchanges based on the defined priorities have proven to be highly relevant.

6.4. IMPROVED ACCESS TO INFORMATION

Improving access to information on the extent of ecosystem degradation and its consequences. It is necessary to keep improving models and their resolution, cooperation between national and regional centres, access to internationally available data and observation capacity.

Monitoring biodiversity and ecosystem functioning would allow a better understanding of the role of biodiversity and contribute to improving the integration and conservation of ecosystems.

Carrying out/strengthening vulnerability studies particularly at the local level, in order to define the appropriate measures for climate change adaptation.

Technology transfer through actions aimed at fostering and accelerating the development of innovative climate technologies to provide an effective and long-term response to the impacts of climate change and to promote economic growth and sustainable development.

6.5. SOCIAL SPECIFICITIES

Consideration of social, cultural and gender dimensions with the aim of promoting ecosystem protection decisions that take into account social and cultural factors and their impacts, including vulnerable groups and gender issues.

Applying participatory community approaches to increase ecosystem resilience and adaptive capacity.

CONCLUSION

The North Africa/Sahel region is vulnerable to climate change that has devastating impacts on ecosystems. Several adaptation actions are carried out and some are planned in the different countries. These actions will contribute to achieving the Sustainable Development Goals and those of the strategic plans of the three Rio conventions, at the same time as they will promote the preservation, good management and restoration of ecosystems and their services and the conservation of the biodiversity.

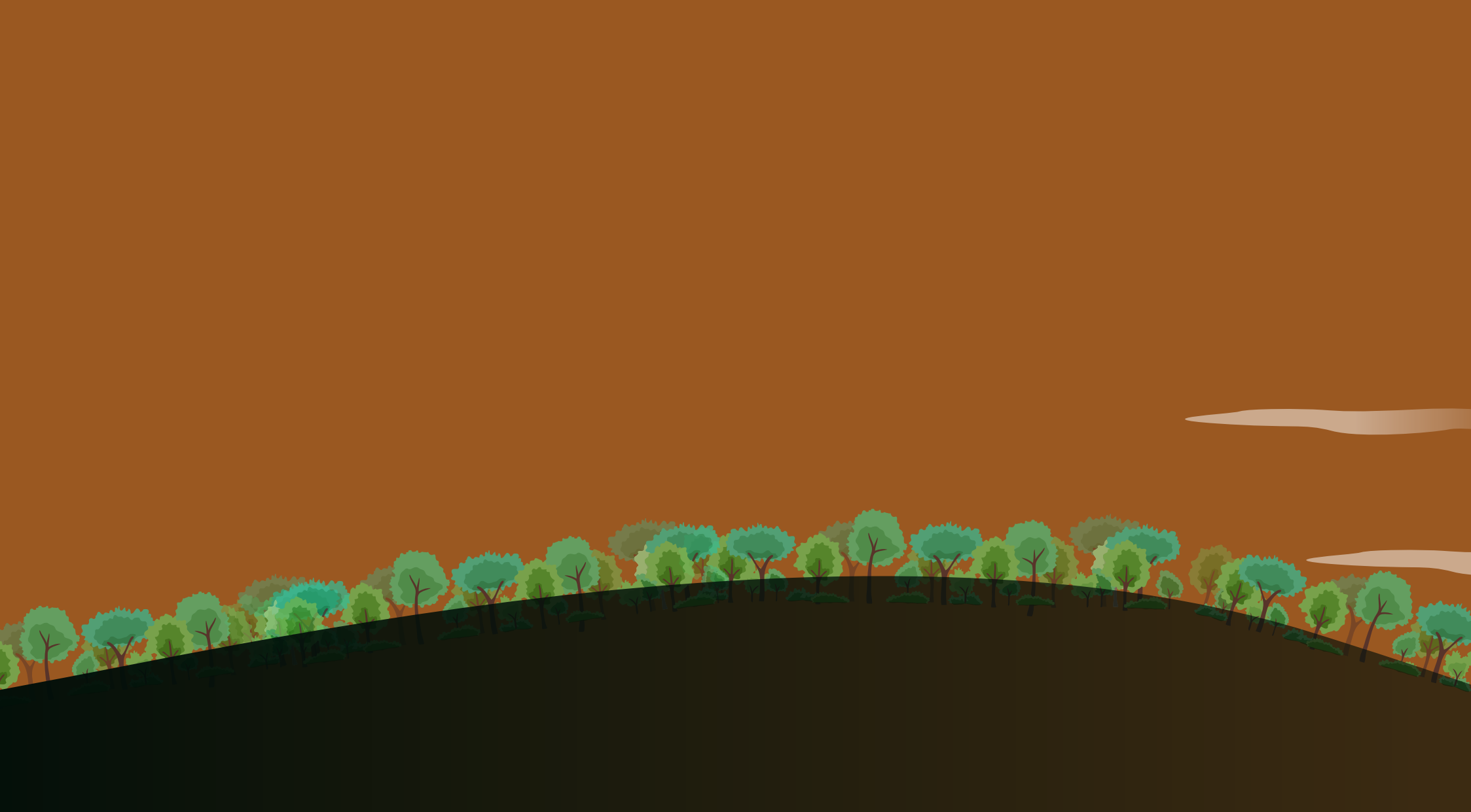
However, given the extreme climate change events and the considerable needs of the countries to deal with them, it is important that decision-makers, at various levels, become more aware and make more efforts to strengthen climate governance and partnerships and to grasp the various technical, technological and financial opportunities and use them in climate change adaptation.

The results of the ecosystem funding showed a hiccup pattern with limited and inadequate impact for the countries. Finance for adaptation and ecosystems should be better structured and planned to maintain and/or improve ecosystem services in order to strengthen food security and increase the resilience of ecosystems and the populations that rely on them.

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