

# **Socio-Economic Vulnerability of the Cunene Population in the Face of Drought: Challenges and Prospects for Spatial Planning and Sustainable Regional Development (2023–2025)**

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## **ABSTRACT**

Socioeconomic vulnerability of Cunene's population to drought represents a significant obstacle to sustainable regional development in the period 2023–2025. Dependence on subsistence agriculture and livestock, combined with water scarcity, threatens food security, exacerbates poverty, and favours internal displacement. The inadequacy of water access and the fragility of infrastructure intensify social and economic impacts, reducing community resilience. This article, grounded in mixed-methods approaches, integrates essential social and environmental policies to transform the effects of drought into opportunities for innovation and sustainability.

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## **INTRODUCTION**

The contents of this article were drawn from a master's dissertation in Economics, Spatial Planning and Regional Development, presented at the Methodist University of Angola. The work was supervised by Professor António Afonso Bindanda, PhD. Bibliographic references in English and Portuguese were consulted. The dissertation was written in Portuguese. The recurrent drought in Cunene has led to forced migration, food insecurity and the precarisation of living conditions, highlighting weaknesses in territorial planning and in the capacity of institutional response. The central problem consists in analysing how the population's socioeconomic vulnerability relates to the absence of effective policies for sustainable development and territorial management, as well as the implications of this relationship for the formulation of regional resilience strategies.

## **DEVELOPMENT**

Socio-economic vulnerability of the Cunene population in the face of drought: challenges and prospects for spatial planning and sustainable regional development (2023–2025)

Socioeconomic vulnerability describes the fragility of individuals or communities in the face of risks that affect survival and well-being, resulting from poverty, inequality, weak institutions and inadequate public policies. For the UNDP, it is the inability to withstand, absorb and recover from external shocks. In Cunene, with recurrent drought, this vulnerability takes on dramatic contours, affecting food security, access to water and household productive capacity. Drought is not merely a climatic phenomenon; it is a process that interacts with local social and economic conditions. In Cunene, reports indicate more than 2.3 million people affected between 2019 and 2021, including 491,000 children, evidencing that vulnerability is linked to social and territorial dimensions. Territorial planning (OT) groups policies to organise space, balance land uses, infrastructure and the environment. The effect of drought is modulated by the existence of effective institutional policies and by the functionality of infrastructures. Thus, vulnerability in Cunene also results from insufficient OT capable of

mitigating impacts and ensuring equitable access to water and alternative productive livelihoods. Sustainable regional development articulates economic growth, social justice and environmental preservation, in line with Brundtland: meeting the needs of the present without compromising the ability of future generations to meet their own needs. In Cunene, water management, economic diversification and strengthening institutions are required to reduce dependence on subsistence agriculture.

Regional economic development models, when integrated with climate disasters, emphasise the need to understand how territorial and productive dynamics are affected by extreme events. Regional development is viewed as socioeconomic transformation aimed at reducing disparities between regions and promoting balanced integration (Santos, 2018). Climate disasters, according to the IPCC (2022), are extreme events that cause significant damage to local populations and economies, introducing a critical variable for territorial stability. Classical models, such as Perroux's growth pole (1955), argue that development arises from dynamic centres that radiate to peripheral areas. In contexts of drought or flooding, however, this concentration of investment does not guarantee resilience to the rural areas most vulnerable. Myrdal (1957) argued that development effects tend to reproduce inequalities, which is aggravated by climate disasters, leaving poorer regions even more fragile. With environmental crises, more contemporary models emerge that incorporate sustainability. Brundtland's definition of sustainable development (1987) guides regional policies to satisfy present needs without compromising the future. Models of territorial resilience (Folke, 2016) advocate integrated adaptation and mitigation, with early warning systems, economic diversification and management of natural resources. Climate disasters affect the regional economy through losses in agriculture, infrastructure and population displacement. The World Bank (2021) estimates reductions of up to 20% of GDP in regions with strong agricultural dependence. In Cunene, recurring drought compromises livestock and farming, increasing vulnerability and demanding territorial planning that integrates water management and alternative productive activities. An integrated approach proposes combining territorial planning, social inclusion and technological innovation. The FAO (2020) emphasises participatory land-use planning, involving women and young people in setting priorities. The IPCC (2022) recommends investments in resilient infrastructure, productive diversification and social protection to reduce the impacts of extremes. Regarding major theoretical currents, endogenous growth models value local resources and can strengthen resilience through education, innovation and sustainable resource management. Sachs (2008) notes that sustainable development requires an articulation between economy, society and the environment. Growth poles, in turn, require rethinking concentration to avoid exacerbating inequalities in disaster contexts, with redistributive policies. Spatial equilibrium models offer greater potential for action in crises, promoting territorial cohesion, but require institutional capacities and resources. Therefore, climate crises challenge traditional paradigms, demanding reformulations towards integrated and resilient approaches — which link territorial planning, local capacities and multiscale governance — to turn vulnerability into opportunity and promote sustainable regional development.

Sustainable development indicators:

- HDI (income, education, health) as an integrated measure of quality of life; relevant for monitoring regional inequalities (UNDP, 2014).
- Ecological footprint: assessment of consumption versus the capacity of resources to regenerate; points to the need for spatial planning (Wackernagel & Rees, 1996).
- MPI (multidimensional poverty): identifies deprivations in health, education and standard of living, crucial for areas such as Cunene in the face of drought (Alkire & Santos, 2010).

Origin and function: indicators emerged from Rio-92 to operationalise sustainable development, serving as management tools and public policies (Sachs, 2002).

Literature gaps on Cunene in similar contexts

The production on Cunene—socioeconomic and environmental vulnerabilities—is scarce and fragmented. Andrade (2017) notes silences that reveal inequalities in the production and circulation of knowledge, evidencing the lack of systematic studies of the region in its territorial, cultural and environmental complexity. The tendency to focus on Lubanda? on Luanda and urban areas marginalises Cunene, hindering adequate public policies

(Oliveira, 2019) and worsening the understanding of drought and poverty, central to local sustainable development.

Literature rarely articulates Cunene with contexts from Southern Angola or Southern Africa; studies of Namibia and Botswana, for example, discuss desertification and water management, but are not compared with Angolan realities (Serrat Capdevila et al., 2021). The cultural dimension is also underexplored: traditional knowledge and community practices during drought are under-valued (Mbembe, 2001). The absence of territorial indicators, statistical data and a holistic method compromises sustainability metrics (Veiga, 2010; World Bank, 2021). Sectoral fragmentation—education, water, food security—and the limited integration between vulnerability and spatial planning constrain innovative policies (Sachs, 2002). A critical perspective that questions inequalities and proposes structural solutions is lacking (Santos, 2018). Longitudinal studies, intra-regional comparative (Cunene–Namibe–Huíla) and cross-border (Cuvelai) analyses are virtually non-existent, restricting learning and coordinated governance in light of cross-border hydrological and economic dynamics.

Cases of international lessons in drought resilience

International cases: Brazil—Programa Um Milhão de Cisternas (P1MC); Ethiopia—PSNP; Israel—drip irrigation and desalination. Briefly, these exemplify: Brazil—social technology and community participation; Ethiopia—social protection; Israel—technological innovation.

Characterisation of Cunene Province

Cunene Province, in southern Angola, borders Namibe, Huíla, Cuando Cubango and Namibia, constituting one of the country's main land and river entry points. Historically part of Huíla, it was detached on 10 July 1970. The spatial development model promoted by Angola 2025 highlights Cunene for its geostrategic location, as a sparsely populated region with agro-pastoral activities, cross-border relations and untapped tourism potential, necessitating the development of urban hubs. Rural promotion is among the strategic options, emphasising rainfed cereals, irrigated crops (from the Cuvelai river basin and the banks of the Cuvango), improvement of livestock health, animal health, and the introduction of low-cost technologies, as well as alternative fuels to reduce deforestation.

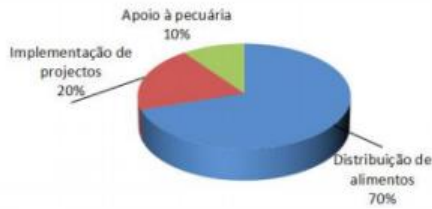
Education in the region shows low performance, with significant illiteracy compromising knowledge development and the economy. In 2013, the school network comprised 832 establishments, 94.9% primary, 4.3% first-cycle secondary, and 1.3% second-cycle secondary. In health, there are 156 units (107 posts, 42 centres and 7 hospitals), with higher concentrations in Kwanyama (37.8%), Ombadja (24.4%), Cuvelai (12.2%) and Namakunde (10.9%). Between Cahama and Curoca there is a lower density of units. Data from the 2014 census indicate a substantial population increase in Cunene, raising projections from 616,487 inhabitants (2012) to a sharp jump to around 373,000 in 2016. Climate and drought reinforce vulnerability: the cacimbo (May to September) brings intense dryness, with cold peaks in the central plateau (around 5 °C) and reduced pasture availability; the rainy season (October to April) aids water recharge and agriculture, but can cause erosion and floods. Cunene is particularly affected by extreme drought events, requiring strategies for water-resource, agricultural, and rural-tourism management. Sustainability depends on agricultural modernisation, extension of the cold chain, health and sanitation improvements, and strengthened education and health infrastructure to reduce vulnerabilities.

## RESULTS

Between 2023 and 2025, the socioeconomic vulnerability of Cunene's population to drought emerged as one of the major impediments to regional sustainable development. Water scarcity undermined subsistence farming, the main source of income and food, creating food insecurity and worsening poverty. The lack of infrastructure for water capture and distribution, coupled with reliance on traditional agricultural practices, intensified social and economic fragility, prompting communities to migrate to urban centres such as Ondjiva and putting pressure on territorial planning. The survey conducted among 500 households in the urban and peri-urban communities of the municipalities of Cuanhama, Ombandja and Cahama—involving farmers, herders and local managers—helped to clarify the challenges and perspectives in relation to drought. The phenomenon is concluded to be multidimensional: it affects not only the environment but also the local economy, health, education and the

environment, requiring integrated strategies that combine emergency measures with structural projects, value community participation, and strengthen institutional capacity.

**Gráfico 6. Quais são as políticas públicas e projectos de combate à seca no Cunene no período de 2023-2025?**



Fonte: Autor, 2026.

**Gráfico 1. Quais são os impactos da seca na economia familiar e comunitária no período 2023-2025?**



Fonte: Autor, 2026.

The results indicate that potable water is the central challenge, reflecting the severity of water scarcity and its direct impact on the survival of families. Loss of livestock and crops represents immediate consequences, undermining the local economic base, while forced migration emerges as an extreme response, evidencing the inability of many to remain in their home territories. The study offers pathways to sustainable and transformative solutions, aiming to reduce vulnerabilities and promote a more resilient future in Cunene. Source: Author, 2026.

In the second question, the lack of potable water emerges as the main challenge, compromising human and animal survival. The scarcity also causes loss of livestock and crops, evidencing that the local economy is heavily dependent on agro-pastoralism; forced migration demonstrates the severity of the situation.

In the third question, agriculture is the sector most vulnerable due to its dependence on rainfall and water; livestock farming suffers from animal deaths and pasture shortages, while trade is indirectly affected by the drop in production and households' purchasing power. The fourth question identifies climate change as a decisive factor in socioeconomic vulnerability, compounded by the lack of basic infrastructure (water catchments and storage facilities) and structural poverty with high unemployment, heightening the population's fragility in the face of drought.

**Gráfico 7. Qual é o papel da comunidade local na gestão da seca?**



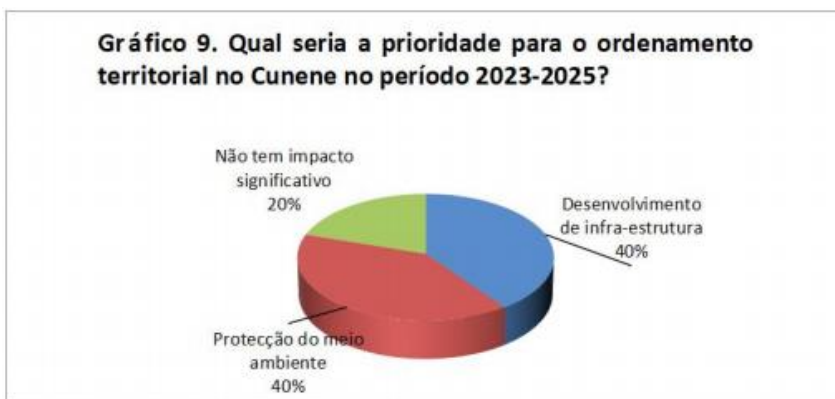
Fonte: Autor, 2026.

In the fifth question, health impacts highlight malnutrition and hunger as serious effects; respiratory and skin diseases appear, but are secondary in the face of nutritional deficiency that compromises child development and community health.



Fonte: Autor, 2026.

Regarding the responses, the distribution of food and water has been an emergency measure, insufficient in the long term. Irrigation projects and support for livestock farming are medium- to long-term strategies to expand and integrate, with emphasis on the Cafu Canal, the Calucuve Dam, and other projects to mitigate vulnerability in Cunene.



Fonte: Autor, 2026.

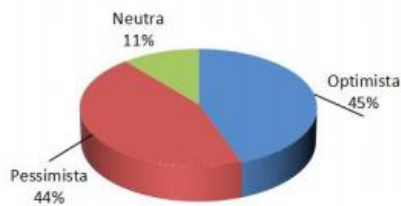
In the seventh question, the community actively participates in the implementation of projects and resource management, essential to adapting solutions to cultural and territorial realities, complementing governmental actions.



Fonte: Autor, 2026.

The eighth and ninth issues identify insufficient funding, environmental degradation and institutional fragility as the main obstacles, in addition to the need for spatial planning alongside environmental protection and sustainable agriculture.

**Gráfico 11. Qual é a perspectiva para o desenvolvimento regional sustentável no Cunene?**



Fonte: Autor, 2026.

In the tenth, drought increases school dropout rates and difficulties in accessing schools, undermining human capital. Finally, the outlook is optimistic, provided there are stable policies, community mobilisation, and support from partners.

## DISCUSSION

The discussion of the results reveals a socio-economic vulnerability in Cunene that goes beyond mere water scarcity, constituting a multidimensional phenomenon that links demographic, economic, environmental, and institutional factors. The quantitative data indicate a young, rural, impoverished population with high levels of food insecurity and low educational attainment (INE, 2024; UNDP, 2023). The qualitative evidence corroborates this portrait, describing how drought affects daily life: women and children travel long distances to obtain water; farmers lose crops; livestock keepers see herds decimated (FAO, 2023; UNICEF, 2023). Methodological triangulation shows that the numbers translate real experiences of suffering and adaptation, not merely abstract phenomena. Documentary analysis reinforces this reading by highlighting failures of public policy and infrastructural fragilities. International reports point to the need for sustainable water management and economic diversification; without this, vulnerability increases with every dry season (World Bank, 2022). Territorial planning emerges as a central instrument to articulate rural and peri-urban areas, in light of population dispersion and disorderly urban growth. Protective factors—community networks, access to water, and welfare policies—play a decisive role in resilience. Water infrastructure reduces forced migration and enhances stability; its absence exacerbates disaster risks (FAO, 2023; UNDP, 2023). Thus, vulnerability in Cunene is dynamic and multidimensional, with drought acting as a catalyst for structural inequalities rather than simply an isolated climatic event. Integrated public policies capable of turning territorial planning into instruments of resilience and social justice become urgent, under threat of recurrent humanitarian crises and the perpetuation of poverty (FAO, 2023; INE, 2024; UNDP, 2023; UNICEF, 2023; World Bank, 2022). The provincial government survey reveals a consensus that potable water is the principal challenge, with drought seen as a direct threat to human, animal, and plant survival. Agriculture and livestock are the most affected sectors, reinforcing the need for economic diversification and policies that reduce subsistence dependence. Climate change, coupled with poor infrastructure and structural poverty, broadens vulnerability, exposing institutional fragilities. Health impacts—malnutrition and hunger—confirm the link between drought, food insecurity, and human development, highlighting school drop-out and the erosion of human capital. The government’s response combines emergency relief (food/water) with structural investments (irrigation, support for livestock) and territorial planning initiatives. Community participation, via resource-management committees, is valued but dependent on funding and strengthened governance. Education and environmental protection appear as crucial components for medium-term viability. The outlook is optimistic: coherent policies, adequate investments, and community engagement can turn adversity into innovation and social inclusion. It is recommended to redesign public policies, governance, and local practice to address Cunene’s socio-economic vulnerability in the face of drought, aligning national macro-policies with community practices in the local micro-environment. Drought is seen as a catalyst for structural inequalities, requiring integrated and sustainable responses.

Public policy: invest in critical infrastructure, especially water-related facilities, with dams, irrigation systems and distribution networks. Diversify the economy to reduce dependence on subsistence farming and cattle rearing, expanding basic services (health, education) and promoting social inclusion. Sustainable water

management is central to avoiding a worsening of food insecurity, in line with international recommendations. Governance: strengthen coordination between levels of government and international partners, reducing fragmentation and duplication. Implement participatory governance mechanisms that involve local communities in decision-making, increasing legitimacy and effectiveness. Transparency in resource management and institutional accountability are crucial to mitigate implementation risks. Community practice: reinforce networks of solidarity and local cooperatives, linking them to public policies and capacity-building in sustainable land and water management. Encourage agroecological practices to curb environmental degradation and support water-finding and food-assistance initiatives, recognising that, alone, they are not enough against the scale of the drought. Synthesis in three axes: (1) Structural public policies — water infrastructure, economic diversification and social services; (2) Integrated and participatory governance — coordination, transparency and community engagement; (3) Sustainable community practice — support networks, cooperatives and sustainable resource management. Implemented in an integrated way, they can transform territorial planning into an instrument of resilience and social justice, reducing vulnerability and promoting sustainable regional development.

## CONCLUSION

Final Considerations highlight a drought response in Cunene that combines immediate mitigation with long-term readaptation, rather than isolated emergency actions. Proposes an articulated set of measures that integrate environmental management, territorial planning and strengthening of local capacities, aiming to reduce acute impacts and foster lasting resilience. In mitigation, emphasise actions to address water scarcity and food insecurity: community irrigation systems, small dams, rainwater harvesting, and water collection; complemented by food and health assistance for children and vulnerable groups. In readaptation, advocate economic diversification (local industries, trade, services) to reduce dependence on natural resources and create jobs. Inclusive urban planning is seen as crucial to absorb rural migration, avoiding irregular settlements and pockets of poverty. Sustainable land management (agroecology, reforestation, soil conservation) helps combat desertification and increases productivity, aligning with territorial planning policies. Participatory governance—community water and land councils and transparency in resource use—is presented as a cross-cutting condition for success. On investment priorities, five axes are recommended: water, transport, health, education and inclusive urbanisation, with integration of community practices and good governance. Water infrastructure (dams, cisterns, boreholes, irrigation) is the absolute priority, followed by transport, resilient health and education services, and urban planning that absorbs rural migration. Finally, multi-sectoral governance (inter-institutional coordination, community participation, inclusive territorial planning and integrated monitoring) is advocated to transform drought response into a development strategy for sustainable development and social justice.

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