

Urban Forest Regeneration as a Catalyst to Combat Landslides in Ecologically Fragile Zones of Cameroon: The Case of the Bamenda Escarpment

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ABSTRACT

Urban forest loss in African cities is driven by rapid urbanisation, informal settlement and household energy demand. Along the Cameroon Volcanic Line, these pressures coincide with steep, weathered slopes and intense rainfall, producing recurrent landslides. This paper examines urban forest regeneration as a nature-based response to landslide risk on the Bamenda Escarpment, an ecologically fragile belt of about 8.4 km² with gradients commonly exceeding 25 %. Over the past decade, the zone has recorded at least four landslides in Sisia, six fatalities and repeated flooding of low-lying neighbourhoods, while informal occupation has expanded to more than 17,000–21,000 residents. Drawing on the Participatory Slum Upgrading Programme (PSUP), council records, partner studies and field observation, the paper documents a package of local actions: annual planting of about 2,000 trees, planned expropriation and resettlement of some 850 households from the red zone, catchment protection with water-yielding species, two community-managed nurseries, a 50-member Sisia Supervisory Committee formalised by municipal decision, and a City Green Park developed with UN-Habitat. Partnership finance from UN-Habitat, FEICOM and the councils has enabled incremental works of the order of XAF 300 million. New house construction in the high-risk zone fell from 30 units in 2018 to one unit in 2025; reported hazard deaths declined from six (2009–2020) to one (2020–2025). The Bamenda experience indicates that forest densification, when coupled with participatory land management and planned resettlement, can reduce human-induced slope failure and support climate-resilient urbanisation. The model remains incomplete: full protection of the escarpment, replacement of eucalyptus in catchments, and long-term tenure and livelihood support for relocated households still require further partnership finance and behavioural research.

Keywords: densification; informal settlements; landslides; expropriation; nature-based solutions; resettlement; resilience; urban forest regeneration

INTRODUCTION

Urban forests are a front-line instrument in the local fight against climate change. They store carbon, regulate runoff, bind soils on steep slopes and supply amenity and livelihood values (Ade *et al.*, 2026). In rapidly urbanising African cities, however, forest remnants are routinely converted to grey infrastructure. Green-planning arguments that once struggled for a hearing are now taken more seriously, yet they still compete with the short delivery cycles of roads, buildings and hard drainage. The recent mudslides in Nepal and on the Tibetan Plateau, and a cluster of slope failures along Cameroon's volcanic belt, underline the cost of treating greening as a residual rather than a structural urban policy.

The global urban population rose from 746 million in 1950 (29.6 % of the world population) to 3.96 billion in 2015 (54 %). It is projected to reach about 5.06 billion by 2030 (60 %) and 6.3 billion by 2050 (66 %), with almost all net growth occurring in less developed regions, including a substantial African share (United

Nations Population Division, 2014; UN-Habitat, 2015; Angel *et al.*, 2016). Cities occupy roughly 2 % of the Earth's land surface but account for about 70 % of global GDP, 60 % of energy use, 70 % of greenhouse-gas emissions and 70 % of solid waste (Tume and Tambe, 2026; UN-Habitat, 2016). Between 1990 and 2015, the urban population of less developed countries doubled while urban extents expanded by a factor of about 3.5, implying widespread clearance of peri-urban woodland, floodplains and agricultural land (Angel *et al.*, 2016). Small and medium cities of fewer than one million inhabitants already hold about 59 % of the world's urban population and are the fastest-growing class of settlement (UN-Habitat, 2016; Earth Negotiations Bulletin, 2024).

The Sustainable Development Goals and the New Urban Agenda frame cities as sites that must be made safe, resilient and inclusive. The Paris Agreement, to which Cameroon is a party, commits parties to holding warming well below 2°C and pursuing 1.5°C, and to strengthening adaptation (Tume and Nyuyse, 2026; Tume *et al.*, 2024). Subsequent work by UN-Habitat with Southern Denmark University and the National Urban Development Programme has argued that local governments can support nationally determined contributions if they combine infrastructure, land management and community action (Tume *et al.*, 2025 a and b). Cameroon maintains a Ministry of Environment, Protection of Nature and Sustainable Development and a National Observatory on Climate Change; after COP-26, the national discourse has emphasised net-zero pathways to 2050. Those pathways will only be credible if they are enacted in neighbourhoods.

Climate change and slum conditions are tightly coupled. Hazards that appear “natural” often have anthropogenic origins (Tume, 2022; Tani and Tume, 2019; Pickering *et al.*, 1995). Reduced or more erratic precipitation alters surface and groundwater availability (Ajani *et al.*, 2013). In Bamenda, office air-conditioning has replaced the chimneys of the 1960s; first rains that once arrived around mid-March now shift into April (Tume 2021; Tume, 2022) and are followed by dry spells; the historic “seven-day August rains” of the North-West Region have given way to mid-season drought punctuated by intense storms; hail and a brief snowfall were recorded in 2020; and floods in the Mulang basin reached roof level as recently as 2024. Locust outbreaks, fluctuating swarms of edible grasshoppers (locally minguin) and episodic congregations of bats along the escarpment further signal ecological instability (Nangsinyuy and Tume, 2025). These changes coincide with urban forest removal, blocked drains and occupation of floodplains.

Cameroon's urban share now exceeds 58 % of a population of about 25 million (Acha and Tume, 2025). Sisia and adjoining parts of the Bamenda Escarpment held only scattered houses and fewer than 200 people in the early 1970s, with no recorded landslides despite the inherent fragility of the slope. Today, the same belt supports on the order of 17,000–21,000 residents. Grey surfaces have reduced infiltration and increased runoff; water is forced into constrained drainage lines; and when channels are encroached upon or used as wasteways, disasters follow. Ndikebeng *et al.*, (2023) have long argued that although landslides can occur without human trigger, construction, farming on weathered scoria and regolith, road cuts, deforestation and overgrazing commonly combine with geology and rainfall to produce failure (Lambi, 2004; Ngapgue *et al.*, 2020; Afungang *et al.*, 2017).

The 2019 General Code of Regional and Local Authorities devolves urban management to councils, with deconcentrated ministries providing technical support. For the urban poor, however, the first imperative is shelter and fuelwood. Cutting a tree without forestry authorisation is an offence even when the cutter planted it; that legal fact is weakly known and weakly enforced on the escarpment. Sisia grew from about 10,000 inhabitants in 2005 to about 20,000–21,000 by 2020. Tree cover has been removed, slopes excavated, and wood harvested. These actions, superimposed on volcanic soils and slopes steeper than 25 %, are remote causes of the landslides and floods that claimed more than six lives between 2009 and 2020.

Under the slogan of leaving no one behind, an initial preference for slum clearance was recast, through UN-Habitat's PSUP, as slum upgrading with a resettlement component and urban forest regeneration (Ngonga and Tume, 2015). The Bamenda Escarpment lies on the Cameroon Volcanic Line that runs from Mount Cameroon into the Atlantic. Comparable failures have been recorded at Limbe (2001, 2018), Bamumbuh (2009), Sisia (2020), Ngwashie (2023), Dschang (2024) and Mbatu in Bamenda (2024). The pattern justifies concerted settlement control and tree planting along the weak belt.

Eucalyptus, a common species on the escarpment, has deep roots that can bind soil but consumes an estimated 40–90 litres of water per mature tree per day and is therefore poorly suited to spring catchments. Continued conversion of forest to plots both raises landslide frequency and exposes catchments to evaporation, reducing spring yields and the city’s carbon-capture capacity (Tambe *et al.*, 2019). This paper is a practice-based account of nearly a decade of slum-upgrading and climate work undertaken with UN-Habitat and local partners. Its purpose is to show how urban forest regeneration, embedded in participatory land and water management, can reduce landslide effects on an ecologically fragile urban escarpment.

ANALYTICAL FRAMEWORK

The analysis sits at the intersection of three literatures: urban political ecology of informal settlement on hazardous land; disaster-risk reduction and nature-based solutions (NbS) for slope and catchment management; and the multi-level governance of climate action after the Paris Agreement, the New Urban Agenda and SDGs 6, 11, 13 and 17 (Figure 1).

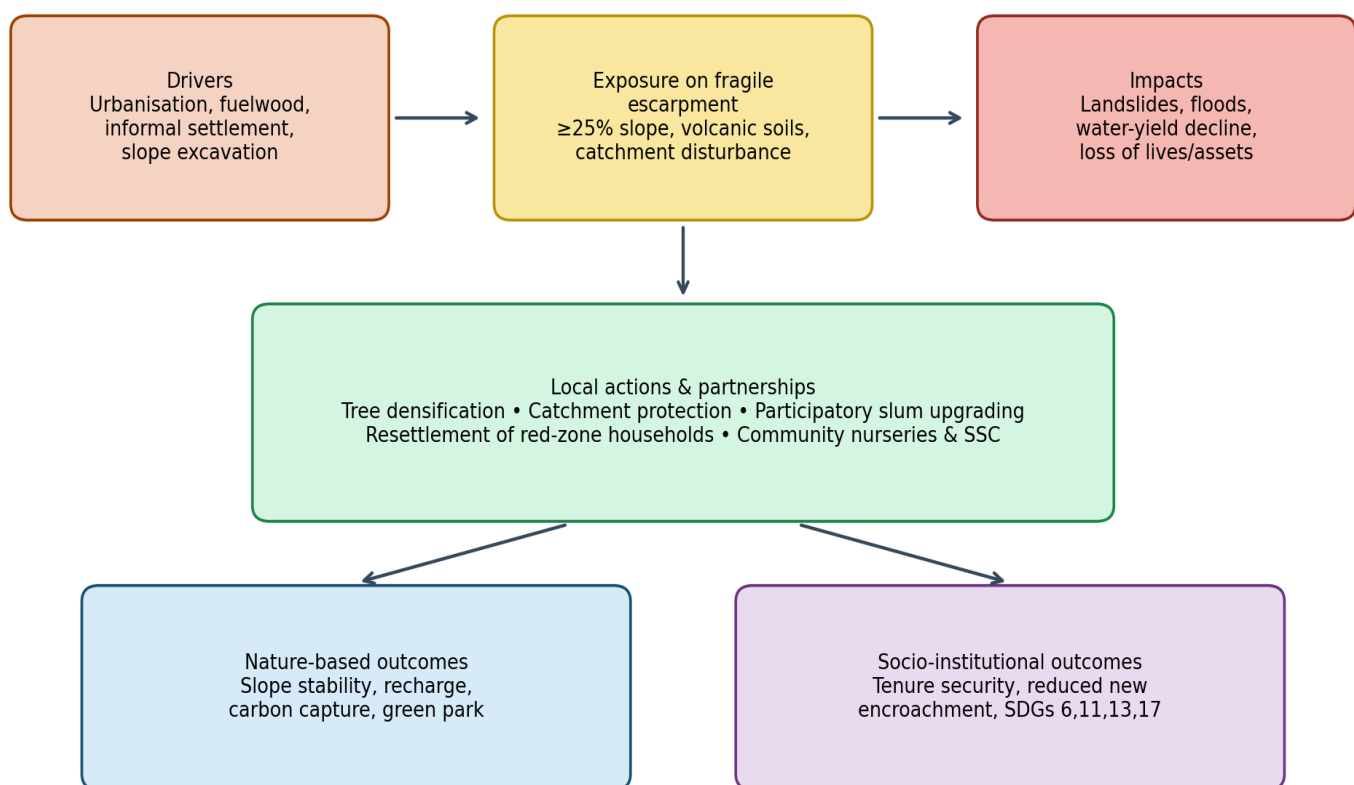


Figure 1. Analytical framework linking drivers, escarpment exposure, impacts and partnership-based local actions.

Source: authors, synthesised from PSUP documentation, council deliberations and the literature cited.

First, informal occupation of the Bamenda Escarpment is treated not as a residual planning failure but as a structured outcome of cheap informal land markets (plots of about 150 m² historically leased for around XAF 200,000), weak development control, and more recently internal displacement linked to the socio-political crisis in the North-West and South-West Regions. Vulnerability is therefore produced: hydrostatic pressure from rainfall above 1,500 mm yr⁻¹, a fluctuating water table, weathered volcanic materials and anthropogenic loading interact (Ngapgue *et al.*, 2020; Afungang *et al.*, 2017; Lambi, 2004).

Second, urban forest regeneration is framed as an NbS that operates through several mechanisms: canopy and litter interception; root reinforcement of colluvium and residual soils; improved infiltration and reduced peak runoff; catchment shading that limits evaporative loss; and, at city scale, incremental carbon sequestration and amenity (the City Green Park). These biophysical effects are necessary but not sufficient.

Without tenure reform, red-zone clearance and alternatives to fuelwood, planting campaigns are reversed by the same drivers that removed the previous stand.

Third, the governance argument follows UN-Habitat's PSUP logic. Slum conditions are addressed through changes in urban policy, land management and planning, with participation as the operational principle. Infrastructure (water, sanitation, drainage, lighting), security of tenure, and social organisation (quarter councils, the Sisia Supervisory Committee, water-management committees) are treated as co-determinants of slope stability. Local action is nested in national decentralisation law, ministerial declarations of public utility, City–Ministry contracts and external finance (UN-Habitat, FEICOM).

The resulting framework is a simple causal chain. Urbanisation, energy demand and informal land markets drive forest clearance and slope disturbance. On an already fragile volcanic escarpment, these pressures raise exposure. Impacts appear as landslides, floods, declining spring yields and carbon-sink loss. Partnership-based local actions—densification with appropriate species, catchment protection, planned resettlement, community nurseries and surveillance—feed back to reduce exposure and to generate co-benefits for health, tenure and the urban economy. The paper's working proposition is that urban forest regeneration reduces landslide effects along the Bamenda Escarpment when it is implemented as part of this package rather than as a stand-alone planting exercise.

Goal and objectives

The goal of the paper is to demonstrate how urban forest regeneration can reduce landslide effects along ecologically fragile urban zones, using Bamenda as a working case. Four objectives follow: (i) identify local actions that deplete urban forest on the escarpment; (ii) identify the impacts of unsustainable exploitation and of climate variability on resident populations; (iii) analyse local goals and partnership efforts as a catalyst for city-level climate action; and (iv) present the Bamenda situation, documented practices and next steps.

STUDY AREA AND METHODS

Study area

Bamenda is a City Council under an elected City Mayor, composed of three Sub-Divisional Councils (Bamenda I, II and III). The 2019 decentralisation code places each sub-council under an elected mayor; urban forestry, planning and sanitation that cut across the three areas are coordinated by the City Council. All three council areas share boundaries with the ecologically fragile escarpment. The Sisia resilience project, located in Bamenda III, is implemented under the City Mayor and the Bamenda III Mayor, with technical support from the Divisional Delegations of Housing and Urban Development (MINHDU), Environment (MINEPDED), Water and Energy (MINEE), Forestry and Wildlife (MINFOF) and Lands (MINDCAF).

The North-West Region had a population of 1,728,953 at the last full census baseline used here; Cameroon's population is projected at about 25 million. Bamenda covers 1,076 km² across seven villages and is projected to have more than 700,000 inhabitants (about 18.6 % of the regional total), of whom roughly 70 % are urban. Strong urban–rural linkages mean that fuelwood, food and water circuits extend well beyond the built-up area.

Sisia lies in Bamenda III at a mean altitude of about 1,327 m, on the faulted step that separates Up Station from the downtown basin (approximate metric coordinates 629,684 E, 658,915 N in the project mapping). Approved planning instruments zone the escarpment as a protected area because of: slopes exceeding 25 % in the upper belt; repeated encroachment and landslides (most recently in 2020); six principal spring catchments with declining yields; downstream floods that have killed children (2018, 2024); and unauthorised parcelling that has destroyed council plantations, leading to prosecutions with MINFOF and fines in the High Court of Mezam.

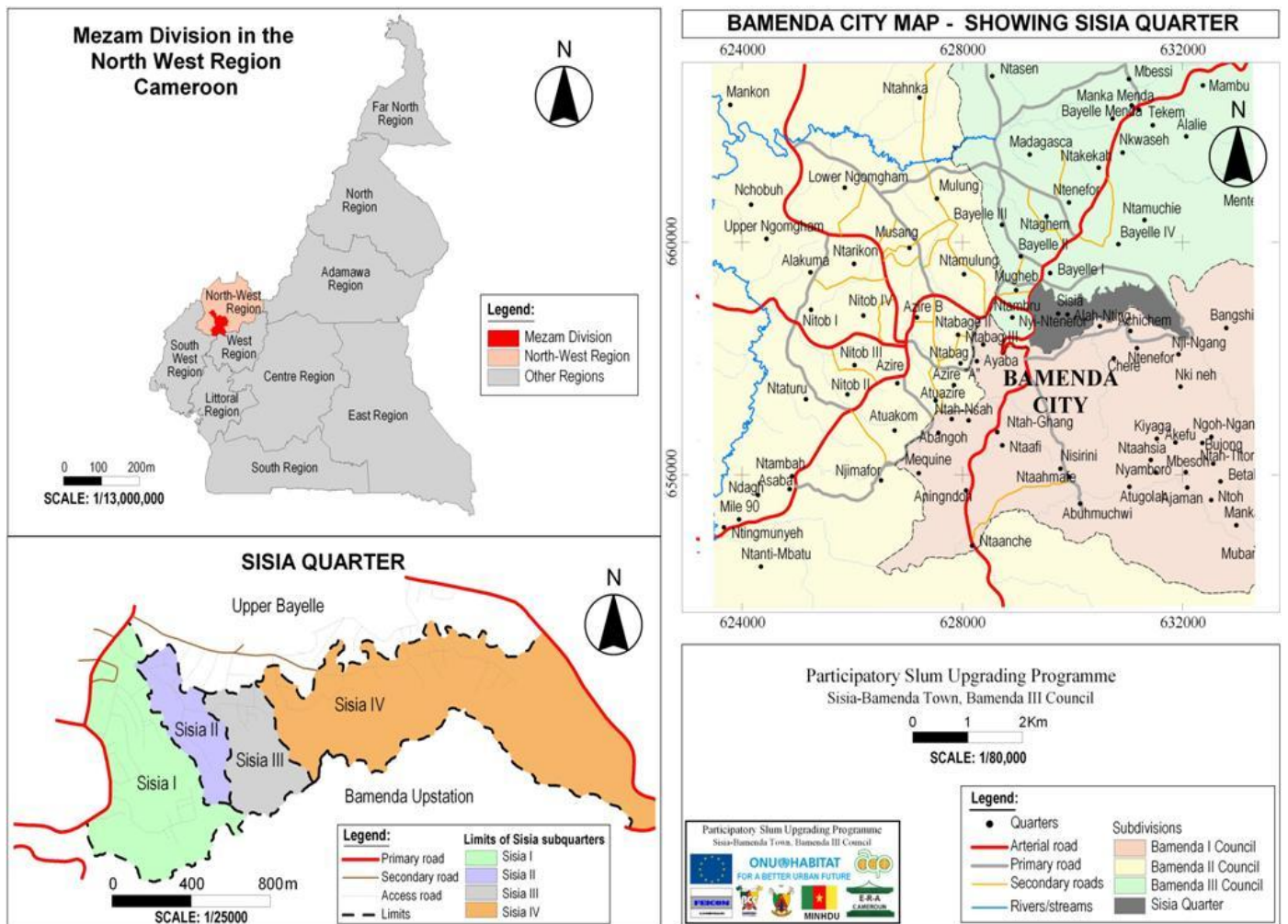


Figure 2. Location of Sisia in the national, regional and city setting, with sub-quarter limits.

Source: Participatory Slum Upgrading Programme / ERA Cameroon and Bamenda III Council mapping.

Previous geotechnical work attributes failures on the escarpment to the combination of heavy rainfall, water-table fluctuation, agriculture, quarrying and construction with geomorphology and soil mechanics (Ngapgue et al., 2020; Afungang et al., 2017). Clearing the forest that previously bound the soil is therefore both a land-use and a geotechnical event.

Methods

The paper is a practice-based synthesis rather than a controlled experimental study. Evidence is assembled from: (i) approved planning documents (Bamenda Master Plan 2017–2027; Land Use Plan 2019); (ii) PSUP Phase II studies by ERA Cameroon and detailed surveys by Polygon SARL (2020); (iii) municipal deliberations and decisions, including Bamenda III Municipal Decision No. 062/BIIC/2015 constituting the Sisia Supervisory Committee; (iv) ministerial declarations of public utility and the reservation of a 72 ha resettlement site at Mbung; (v) council budget lines and partner contract lots (RIKON International; COMINSUD); (vi) a simple comparative count of landslides in Abangoh, where housing was halted after the first failure, versus Sisia, where occupation continued; (vii) household duration-of-stay and population series from PSUP fieldwork; and (viii) field observation of planting, floods and community voting between 2018 and 2025. A 2022 reconnaissance sample of two households in each of 40 blocks was used to estimate the increment associated with internal displacement (about 3 %). Water-yield change is reported as observed by managers and residents; it has not been instrumented in this study and is flagged as a limitation.

The comparative landslide count is summarised (Table 1). Abangoh's population rose from about 6,000 (2000) to 8,000 (2022) with one recorded landslide after development control tightened.

Table 1. Population change and recorded landslides in two escarpment settlements

Settlement	Population, 2000	Population, 2022	Landslides in the period
Abangoh	6,000	8,000	1
Sisia	15,000	22,000	4

Source: municipal statistical office and field compilation by the authors.

Sisia rose from about 15,000 to 22,000 over the same period and recorded four landslides. The contrast is consistent with, though not proof of, a human-loading effect on an already fragile slope.

RESULTS

Causes of urban forest depletion on the escarpment

The principal proximate cause of forest loss is informal occupation of Sisia and adjoining high-risk slopes. Development control did not keep pace with settlement. Municipal attention sharpened after a landslide buried a child in September 2009. The area was declared a risk zone in which land titles and building authorisations would not be issued. Occupation nevertheless continued because households lacked alternative sites. Resilience studies later divided Sisia into a Green Zone, where settlement may be regularised, and a Red Zone, where it may not. Social-policy constraints have prevented immediate forced eviction despite administrative quit orders. The operational path has been declaration of public utility, detailed census of households to be moved, and planning of a resettlement site (Figure 3-6).

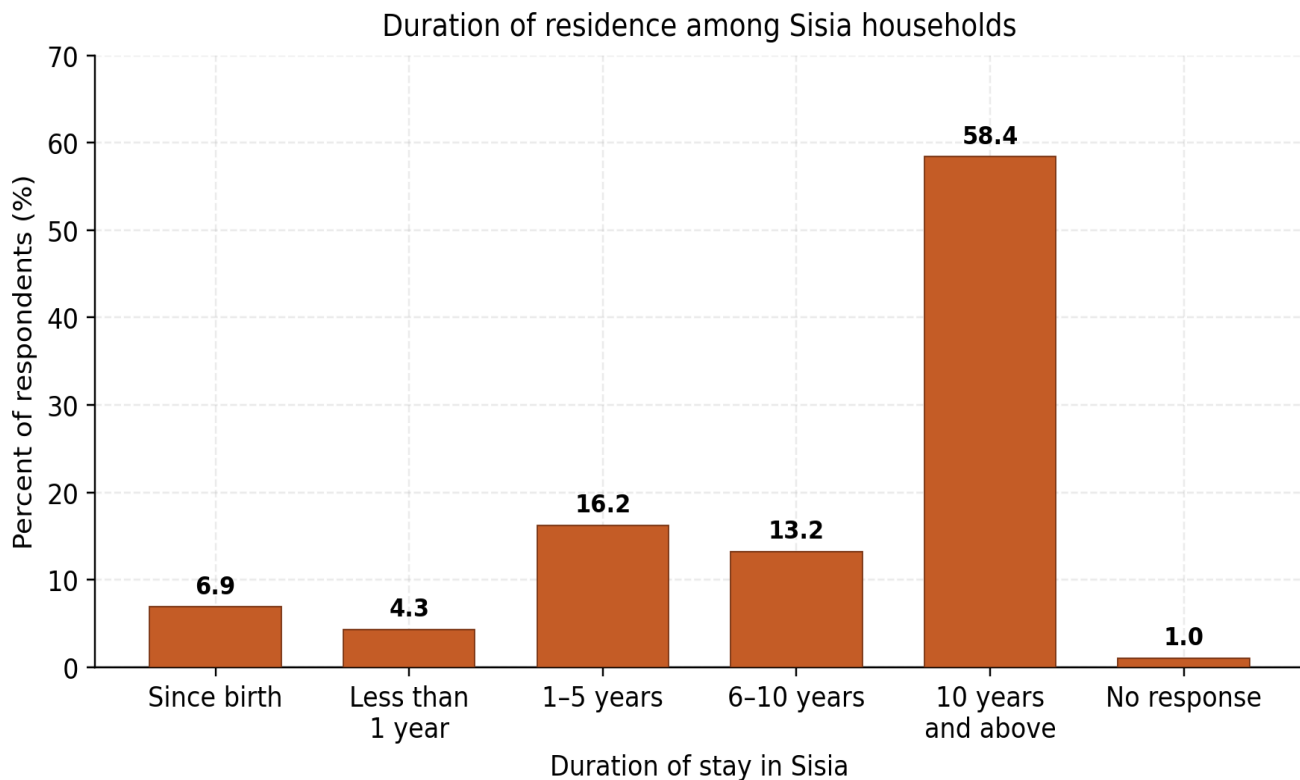


Figure 3. Duration of residence among Sisia households.

Source: ERA Cameroon, PSUP Phase II.

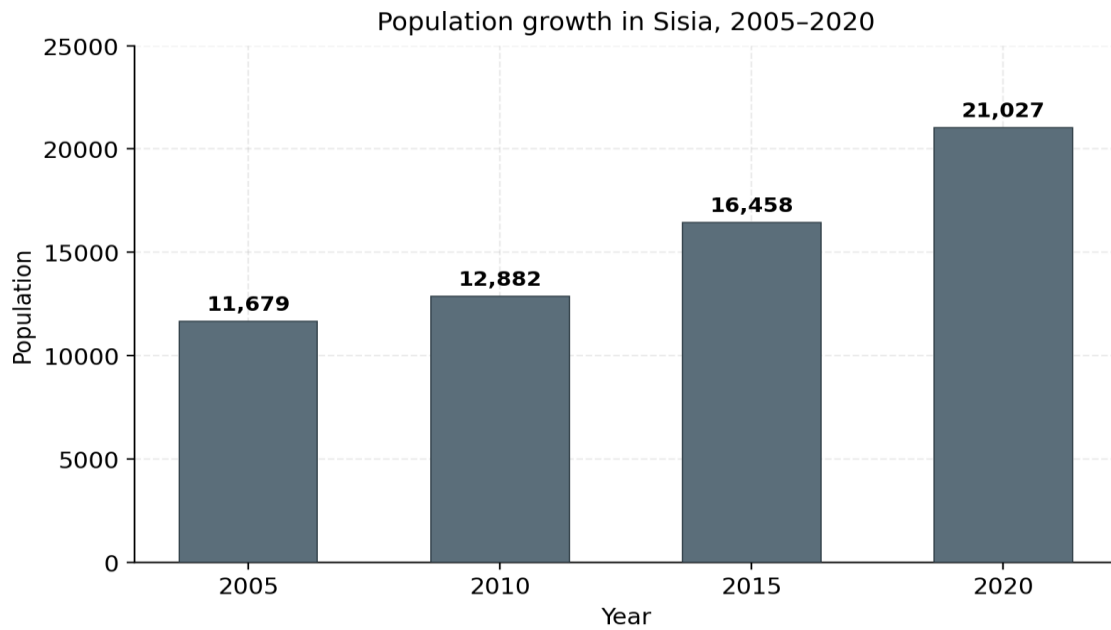


Figure 4. Population of Sisia, 2005–2020.

Source: ERA Cameroon, PSUP Phase II.



Figure 5. Slope failure destroying a dwelling in Sisia (left) and floodwaters in a lower-Sisia lane (right).

Photo credits: field documentation compiled for the resilience programme (including Pope Jones).



Figure 6. Recent landslides along the Cameroon Volcanic Line: Ngwashie (left) and Dschang (right).

Photo credits: Cameroon News Agency and BBC, as compiled by the authors.

Cheap informal leases and, since the crisis, an estimated 3 % increment from internally displaced persons have sustained demographic pressure. Twenty new houses were built directly on water sources between 2014 and 2022. Fuelwood harvesting over the same period is judged by field observation and community surveillance to have been a major contributor to stand loss. Floodplains that should have remained green have been converted to houses. The last major landslide in Sisia occurred in 2020; floods recur in the lower belt.

Council and community actions

Repeated disasters have shifted local norms. Residents increasingly accept a community duty to protect the slope and recognise their insecure tenure. The neighbourhood was divided into 40 blocks, from which selected members of the Sisia Supervisory Committee (SSC) were chosen. The SSC is charged with resilience-building and works with Bamenda III and the City Council. It was formalised by Bamenda III Municipal Decision No. 062/BIIC/2015 of 30 June 2015. A separate Water Management Committee, also backed by an administrative act, is mandated to plant water-yielding species in catchments as well as to operate the gravity-fed fountains (Figure 7).

Priority voting under PSUP, designed so that vulnerable residents could vote without peer pressure, placed climate-linked deficits at the top of the list: poor water sources, poor lighting and insecurity, and inadequate drainage. That ranking created a mandate for tree planting as a landslide measure. Two nursery sites have been selected as a prelude to a community forest on land to be vacated by resettled households. Quarter heads and the SSC now watch for dumping in streams and unsustainable fuelwood cutting. NGOs have provided environmental education.



Figure 7. Participatory priority voting with token bowls (left) and a community assembly in Sisia (right).

Source: ERA Cameroon, PSUP Phase II field documentation.

Most Sisia residents work in the informal economy and commute to Nkwen market. Pre-existing quarter-head structures were strengthened by PSUP and the SSC. The City Council budgeted XAF 30 million (about USD 54,500) for the project in 2022; Bamenda III has also opened budget lines. Annual planting on the escarpment has been of the order of 2,000 trees (2021), with the number doubled in 2022 and a further 2,000 trees in 2024, supported by MINFOF protection of young stands. The City maintains a two-hectare council farm at the administrative precinct and budgets about XAF 5 million a year for clearing and fire prevention on the escarpment.

Two implementing contractors under the resilience project (RIKON International and COMINSUD) have planted about 1,000 water-yielding trees in catchments. Eucalyptus within catchment limits is being removed and replaced. The community target is at least 5,000 catchment trees over two years, supplied from the new nurseries. Gravity-fed fountains have reduced reliance on untreated shallow wells. Partner mobilisation of about XAF 300 million has financed bridges, catchment works and potable-water supply. Some 850 households (mean household size about seven persons) are programmed for relocation from the red zone, catchments and floodplains to a 72 ha site at Mbung planned for 5,346 inhabitants at about 198 persons per hectare. No waterborne disease case originating in the area has been reported from the Nkwen health district in the two years following the new supply.

Formal instruments already adopted

The following instruments and assignments are in place. A ministerial decision has declared specified parts of Sisia for public utility, enabling removal from the most fragile slopes, flood belts and sites reserved for community facilities; the Senior Divisional Officer for Mezam has amplified the decision locally. A companion ministerial decision reserves the Mbung resettlement land. One work lot was awarded to RIKON International for tree planting, catchment demarcation and water supply. Lot 3 was awarded to COMINSUD to deepen community participation, nurseries, densification of all water sources, local floodplain protection and the prospective community forest. Councillors have voted on deliberations on the Sisia project, the City Park, an Environmental Action Plan for Sisia and the city's public-space strategy, each of which contains an urban-forestry component.

Observed outcomes to date

Placing communities at the front of project conception has improved delivery and the prospect of post-project stewardship. Construction deep into the escarpment is reported to have fallen by about 80 % from 2022 levels. Dumping in streams is reported to have fallen by about 50 % from 2019 levels. A volunteer has established a plastics collection point at which materials are bought, cleaned and reused. Between 2022 and 2025, field managers report that further human-induced landslides of the 2020 type have been averted (Figure 8).

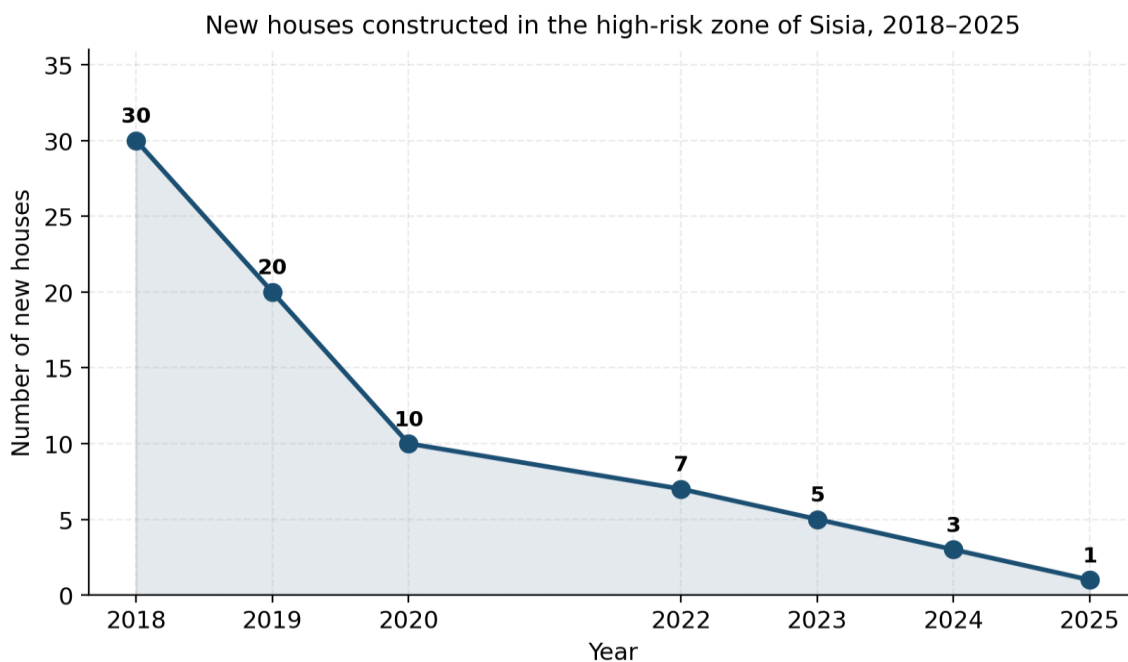


Figure 8. New houses constructed in the high-risk zone of Sisia, 2018–2025.

Source: field monitoring compiled by the authors from council and SSC surveillance.

From a long-term project envelope often cited at about XAF 21 billion, less than 1 % has been committed, yet escarpment cover has been increased by more than 60,000 trees over four years. The City Green Park is advancing, though encroachments remain visible (Table 2).

Table 2. Selected monitored outcomes of the Sisia resilience and greening package

Indicator	Baseline / earlier period	Recent status
New houses in the high-risk zone	30 (2018)	1 (2025)
Reported hazard deaths (landslide/flood)	6 (2009–2020)	1 (2020–2025)

Deep-escarpment construction	Pre-2022 trend	≈80% reduction from 2022
Dumping in streams	2019 practice	≈50% reduction
Trees planted on the escarpment (4 years)	Depleted cover	>60,000 stems
Annual council planting target	Limited	≈2,000 trees yr ⁻¹ (higher in 2022)
Households programmed for resettlement	Red-zone occupation	850 households
Resettlement land reserved at Mbung	None	72 ha; 5,346 planned residents
Partnership works finance mobilised	Unfunded priorities	≈ XAF 300 million
Waterborne disease reports from the area.	Recurrent risk	None recorded in 2 years (Nkwen HD)

Source: authors' compilation from PSUP, council budgets, contractor reports and health-district feedback. Several indicators remain manager-reported rather than instrumented.

In 2021, Bamenda signed a five-year, renewable City Contract with MINHDU that commits annual resources, some of them for climate action city-wide. Catchments are being demarcated and declared public property. Private eucalyptus inside those limits has been ordered to be cut and replaced. Improved waste practices, better access and fewer flood events have reduced disease burden and strengthened the neighbourhood's contribution to the urban economy. Taken together, the package addresses elements of SDGs 6 (water), 11 (cities), 13 (climate) and 17 (partnerships).

DISCUSSION

The Bamenda case supports a qualified proposition: urban forest regeneration can reduce landslide damage on an ecologically fragile urban escarpment, but only as part of a wider political and spatial settlement. Three points follow. First, the biophysical mechanism is plausible and consistent with earlier Cameroonian work. Tosam *et al.*, (2025); Tosam and Tume (2024); Lambi (2004); Afungang *et al.*, (2017) and Ngapgue *et al.*, (2020) locate failure in the interaction of rainfall, weathered volcanic materials and anthropogenic loading. Removing canopy and excavating toes of slopes is a loading and hydrology change; replacing canopy with deep-rooted, catchment-appropriate species is the reverse operation. The contrast between Abangoh (development arrested after one failure) and Sisia (occupation continued; four failures) is only a natural experiment, yet it points in the expected direction. The subsequent fall in new houses inside the red zone (Figure 8) and in recorded deaths after 2020 is contemporaneous with planting, surveillance and PSUP mobilisation. Causality cannot be isolated—rainfall series, slope instrumentation and a control neighbourhood are lacking—but the direction of change is coherent.

Second, species choice matters as much as stem count. Eucalyptus binds soil but mines catchment water. A planting programme that merely multiplies eucalyptus on springheads would trade one risk (slope failure) for another (yield collapse and evaporative exposure). The decision to remove eucalyptus from demarcated catchments and to substitute water-yielding species is therefore central, not ancillary. Equally, fire prevention and post-planting protection, budgeted by the city and supported by MINFOF, determine whether the 60,000 stems become a stand or a mortality statistic.

Third, the institutional design is the distinctive contribution of the Bamenda package. Declaration of public utility, a mapped red/green partition, a 72 ha resettlement site, a municipalised supervisory committee, water committees, NGO and contractor lots, and a City–ministry contract convert a planting campaign into a land-management reform. UN-Habitat's shift from clearance to upgrading with resettlement is what made community cooperation possible. Without an exit option, quit orders on a slope that still offers the cheapest plots in the city are not self-enforcing. The same point limits replication: councils that plant trees but cannot finance resettlement or alternative fuel will recreate Sisia's 2005–2020 trajectory.

The results also speak to climate policy. Cameroon's NDC and the net-zero horizon of 2050 will be delivered, if at all, in places such as Sisia rather than only in national inventories. Urban forests on volcanic escarpments are small in area relative to humid-forest concessions, but they sit where people, water and

slope risk coincide. Carbon capture is a co-benefit, not the primary local rationale; slope stability, spring yield and disaster-risk reduction are. Framing the City Green Park as both recreation and landslide control is consistent with that hierarchy.

Limitations must be stated plainly. Water-yield recovery is asserted from observation, not gauged. Tree-survival rates are not published here. The 80 % and 50 % reduction figures for construction and dumping are manager estimates. Population figures for Sisia vary across sources (17,000, 20,000, 21,027, 22,000) because informal settlements are hard to enumerate. The abstract figure of “USD 547” for partnership funds is not internally consistent with the XAF 300 million works envelope and should be treated as a drafting remnant; the XAF figures from budgets and contracts are the usable magnitudes. Finally, the paper does not model rainfall intensity–duration thresholds against slope factor of safety. Those gaps define a research agenda rather than invalidate the practice record.

CONCLUSION

Local climate action on the Bamenda Escarpment is beginning to protect an ecologically fragile volcanic belt that had been treated as residual land for informal housing and fuelwood. Community awareness since the slum designation and the certification of the escarpment as a risk zone has changed household calculations: many residents now accept that their own activities threaten both their lives and the city’s water and slope systems, and they support densified urban forest on land to be vacated. The resilience package—planting, catchment reform, participatory organisation, public-utility declarations and planned resettlement—offers an adaptation sequence that other settlements on the Cameroon Volcanic Line can examine, not copy mechanically.

The situation on the volcanic line must not be treated as a series of isolated accidents. Early warning from climate and rainfall data, risk mapping and restraint on new loading of steep weathered slopes are required if the country is to avoid producing climate and disaster refugees along this belt. Bamenda’s contribution is to show that nature-based slope management can be organised from a city council, a sub-divisional council and a neighbourhood committee, provided national land instruments and partnership finance are aligned with them.

The following recommendations are addressed to urban managers, sector ministries, partners and researchers.

1. Complete red-zone resettlement before densification is reversed. The 850 households and the 72 ha Mbung site should be fully planned, serviced and occupied, with livelihood support so that vacated slopes are not re-invaded.
2. Treat the vacated red zone as a dedicated community forest, not as residual open land. Title, fencing, species plans and SSC stewardship rules should be gazetted with MINFOF.
3. Finish the eucalyptus-to-water-yielding conversion inside all six catchments and instrument springs so that yield claims can be tested.
4. Sustain the planting rate (at least 2,000 trees a year city-wide on the escarpment) and publish survival audits after the first and third dry seasons.
5. Scale fire prevention, waste-stream control and drain protection as co-equal with planting; blocked drains and burning undo root reinforcement.
6. Protect the City Green Park from encroachment through the public-space strategy already adopted by councillors.
7. Use the City Contract with MINHDU and FEICOM windows to move from the present <1 % draw-down of the long-term envelope to a sequenced multi-year investment plan.
8. Replicate the red/green zoning, municipal supervisory committee and nursery model in other volcanic-line settlements (Mbatu, and analogue sites at Dschang, Ngwashie and Limbe) only where resettlement land can be identified first.

9. Commission research on fuelwood demand, behavioural drivers of re-encroachment, and the correlation between slum upgrading and measured slope stability, including rainfall and piezometric monitoring.
10. Integrate indigenous and local knowledge of slope and water management into the Environmental Action Plan, following the adaptation logic set out by Ajani et al. (2013), without treating it as a substitute for geotechnical standards.

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