

# **THE ENVIRONMENT**

**Diagnosis report**

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## 1. MAJOR LEGAL TEXTS ON ENVIRONMENTAL MANAGEMENT

### 1.1. National legal framework

The national legal framework consists of a set of laws and regulations governing the environment. This legal framework is very rich in this field and includes, in addition to the 1996 Constitution, a set of national laws and regulations, which have been drawn up to protect the environment.

They include:

- ***The 1996 Constitution***

From the very beginning, it guarantees the right of all citizens to a healthy environment: "everyone has the right to a healthy environment. Environmental protection is a duty for all. The State shall ensure the defence and promotion of the environment";

- ***Law 96/12 of 05 August 1996 on framework law on environmental management***

It lays down principles that serve as a reference framework for more precise implementing legislation, and includes provisions that enable it to align itself with the requirements of several institutions and to deal with any environmental issue. More generally, article 36 of the Law provides that "the soil, subsoil and the resources it contains, as limited resources, renewable or not, shall be protected against all forms of degradation and shall be managed jointly and rationally by competent authorities". In addition, article 17 of the Law stipulates that "any promoter or contracting authority of any development project, structure, equipment or installation which, by reason of its size or nature, is likely to harm the environment, must carry out, in accordance with the requirements of the specifications, an impact study to assess the direct and indirect impacts of the project on the ecological balance of the siting area or any other region, the environment and the quality of life of the population and the impacts on the environment in general". This framework law is the basic legal instrument for environmental protection in Cameroon.

- ***Law No. 74/22 of 5 December 1974 on sports and socio-educational facilities***

According to this law, any development project, school or university construction, residential or industrial real estate complex must include land necessary for the installation of sports and socio-educational equipment.

- ***Law N°96/09 of 5 August 1996 establishing the charter of physical and sporting activities***

According to this law, physical and sporting activities contribute to balance, health, education, culture and the development of the individual. They are of general interest.

- ***Decree No. 2006/1577/PM of 11 September 2006 on the organization and functioning of the Interministerial Committee on the Environment***

This decree determines the composition of the Interministerial Committee for the Environment (CIE).

- ***Decree No. 2008/064 of 4 February 2008 establishing management procedures for the National Fund for the Environment and Sustainable Development***

This decree sets out management procedures for the National Fund for the Environment and Sustainable Development (FNEDD), created by the framework law on environmental management and which is under the authority of the Minister in charge of the environment. It defines the resources and expenses of this fund, creates a Special Allocation Account for the Environment and Sustainable Development, whose

financial operations ordered by MINEPDED are carried out by an accounting officer appointed by the Minister in charge of finance.

This decree also creates a Programme Committee to assist the Minister in charge of the Environment in selecting priority studies and projects eligible for FNEDD resources.

- ***Decree No. 2011/2585/PM of 23 August 2011 establishing the list of harmful or dangerous substances and the regime for their discharge into inland waters.***

It lists the prohibited harmful or dangerous substances, those subject to prior authorization, and specifies that these lists may be supplemented by those of international conventions ratified by Cameroon or, as necessary, those adopted by the Minister in charge of the environment.

- ***Decree No. 2011/2583/PM of 23 August 2011 regulating noise and odour pollution.***

This decree prohibits, among other things, noisy activities or works that disturb the neighbourhood beyond the emission values and periods provided for by the body in charge of standardization and quality.

- ***Decree No. 2011/2584/PM of 23 August 2011 laying down procedures for protecting the soil and subsoil.***

It lays down conditions for protecting the soil and subsoil and/or combating erosion and desertification, loss of arable land and pollution by chemicals.

- ***Decree No. 2011/2582/PM of 23 August 2011 setting out procedures for protecting the atmosphere.***

It defines different types of air pollutants and the means of monitoring air quality.

- ***Decree No. 2012/0882/PM of 27 March 2012 laying down procedures for the exercise of certain powers transferred by the State to municipalities in environmental matters.***

This decree specifies in its article 6 that "...promoters of small-scale projects or establishments/facilities, which are not subject to an environmental impact assessment or audit, but which could have negligible effects on the environment, shall prepare an environmental impact statement".

- ***Decree No. 2012/2809/PM of 26 September 2012 setting conditions for sorting, collection, storage, transport, recovery, recycling, treatment and final disposal of waste.***

It defines methods of waste management (household and similar waste, agricultural waste, hospital/medical and pharmaceutical waste, industrial/commercial and craft waste, inert waste) and highlights development by the municipality of a municipal or intermunicipal plan for the management of household and similar waste. This decree promotes the environmentally sound management of waste.

- ***Decree No. 2012/2808/PM of 26 September 2012 establishing conditions for the position of environmental inspector and controller.***

This text sets out powers and prerogatives of environmental inspectors and controllers, and describes the conduct of environmental inspections and controls. This decree specifies that environmental inspectors and controllers have the right to access any fixed or mobile facility to obtain any information on environmental management, and to investigate the management of natural resources.

- ***Decree No. 2013/0171/PM of 14/02/2013 setting out procedures for carrying out environmental and social impact assessments.***

This decree specifies procedures for conducting environmental and social impact assessments, including the content of the ESIA report, procedure for preparing and approving ESIA's, and procedures for environmental monitoring and follow-up. Depending on the project's nature and importance, this decree distinguishes 4 types of ESIA's: the environmental impact statement, the summary ESIA, the detailed ESIA and the strategic environmental assessment. It also sets out modalities for carrying out public consultations, which is the process of integrating opinions of population into the project implementation.

- ***Decree No. 0000001/MINEP of 03 February 2007 defining the general content of terms of reference (TOR) of Environmental Impact Studies.***

This decree defines the various elements constituting the terms of reference of an Environmental Impact Assessment: summary or detailed.

- ***Decree No. 0000001/MINEPDED of 08 February 2016 establishing various categories of operations whose implementation is subject to a strategic environmental assessment or an environmental and social impact study.***

This decree lists different categories of projects that require an environmental and social impact assessment to be conducted and classifies them according to the type of ESIA (summary or detailed).

- ***Decree No. 0000004/MINEP of 3 July 2007 setting conditions for the approval of engineering offices to carry out impact studies and environmental audits.***

It sets out conditions to be met by design offices to obtain approval from the Ministry of the Environment to carry out environmental impact studies and audits. Article 11 states that an ESIA or environmental audit report may only be received by the Ministry in charge of the environment if it has been produced by an approved consultancy firm under the conditions laid down by the legislation in force in this field.

- ***Decree No. 002 /MINEPDED of 15 October 2012 setting specific conditions for the management of industrial waste (toxic and/or hazardous).***

This decree prescribes measures for the collection and management of toxic and/or hazardous waste throughout the national territory. Operators must be approved according to specifications and a contract approved by the Minister of environment.

- ***Decree No. 001/MINEP of 03 April 2013 on the organization and functioning of Departmental Committees for monitoring the implementation of Environmental and Social Management Plans (ESMPs).***

This decree specifies, among other things, the composition and different missions of these committees to effectively apply ESIA's ESMPs.

## **1.2. International commitments for environmental management**

Cameroon has signed and/or ratified several international conventions and treaties on environmental protection and sustainable management of natural resources. These texts influence and guide national policies and strategies that govern these different sectors. The most relevant are presented in the table below.

**Table 1 :** Summary of major international conventions and treaties on environmental protection

International conventions and treaties	Overall objective
African Convention on the Conservation of Nature and Natural Resources (Algiers Convention) (1968)	It aims to improve environmental protection; promote the conservation and sustainable use of natural resources; harmonize and coordinate policies in these areas, to put in place policies and programmes that are environmentally sound, economically sound and socially acceptable
UNESCO Convention on the Protection of the World Cultural and Natural Heritage (1972). Enacted on 17 December 1975, ratified by Cameroon on 07 December 1982	The programme catalogs, names and preserves sites of exceptional cultural or natural importance to humanity's common heritage
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) or Washington Convention (1973). Cameroon acceded to the CITES Convention on 05/06/1981 and the Convention became effective in Cameroon upon its ratification on 03 September 1981	The Convention aims to ensure that international trade of species listed in its Appendices, as well as parts and derivatives thereof, does not harm the conservation of biodiversity and is based on the sustainable use of wild species.
United Nations Convention on Biological Diversity signed on 22 May 1992, and ratified in 1994.	the Convention on Biological Diversity has three main objectives: the conservation of biological diversity; sustainable use of its components; and the fair and equitable sharing of benefits arising from the use of genetic resources.
United Nations Framework Convention on Climate Change or Rio Convention signed on 9 May 1992, and ratified in 1994	The ultimate goal of this Convention and all its related legal instruments is to stabilize, in accordance with the relevant provisions of the Convention, GHG concentrations in the atmosphere at a level that prevents dangerous anthropogenic interference with the climate system.
Convention on Persistent Organic Pollutants signed in Stockholm on 5 October 2001, and ratified in 2005	The Convention on Persistent Organic Pollutants (POPs) aims to protect human health and the environment from persistent organic pollutants. This involves eliminating or controlling the use of a group of compounds that are difficult to degrade and toxic
African Convention for the Conservation of Nature and Natural Resources signed on 11 July 2003 in Maputo	This Convention adopted by the African Union Assembly of Heads of State and Government, without terminating, at least provisionally, the previous Algiers Convention of 1968, substantially amends it in order to adapt it to the evolution of scientific, technical and legal knowledge. As a fundamental principle of the Convention, Contracting States undertake to take necessary measures to ensure the conservation, use and development of soil, water, flora and fauna resources on the basis of scientific principles and taking into account the best interests of populations.
Treaty of the Central African Forest Commission (COMIFAC) on the Management of Forest Ecosystems, signed in Brazzaville on 05 February 2005	The COMIFAC Treaty aims to achieve the conservation and sustainable management of Central African forest ecosystems through sub-regional cooperation in this field. This treaty makes the commitments contained in the Declaration binding. This gives concrete expression to the High Contracting Parties' desire to develop a common vision and to work together to preserve their forests.
Voluntary Partnership Agreement "Forest Law Enforcement on Governance and Trade" (APV)	The initialling of this agreement is a "boost" to the sustainable management of tropical forests in Cameroon. It allows Cameroon's

International conventions and treaties	Overall objective
FLEGT) with the European Union (EU), initialled on 06 May 2010.	tropical timber exports to the EU to be continued and developed within a legal framework.
International Tropical Timber Agreements (ITTA). These are agreements signed under the aegis of the United Nations concerning trade in tropical timber. Three agreements were signed, the first on 18 November 1983, the second on 26 January 1994 and the last in 2006.	These agreements aim to provide a framework for effective cooperation between tropical timber-producing and consumer countries; and to encourage the development of sustainable development policies for the conservation of tropical forests and their genetic resources. Cameroon is a signatory to the first two treaties. The 1994 Treaty, which entered into force on 1 January 1997, replaces the 1983 Treaty and establishes a fund to help tropical timber-producing countries achieve objectives set out in the agreements.
Convention on Wetlands (RAMSAR).  Adoption: Ramsar (Iran) February 2, 1971	Its objective is the conservation of wetland systems by promoting their wise use and international cooperation. Parties undertake to include wetland conservation in their land use plans and to comply with a number of obligations, such as the designation of at least one wetland on the list of wetlands of international importance, the promotion of the wise use of areas throughout the territory or the establishment of wetland reserves. This Convention is the only global environmental treaty dedicated to a particular ecosystem.
Vienna Convention (1985)/ Montreal Protocol (1987). The Vienna Convention to Protect the Ozone Layer is a multilateral environmental agreement. It was approved at the Vienna Conference in 1985 and became effective in 1987.	It acts as a framework for international efforts to protect the ozone layer. However, it does not include legal constraints on targets for reducing the use of CFCs, the main ozone-depleting chemicals. These are set out in the Montreal Protocol attached to it.
United Nations Declaration on the Rights of Indigenous Peoples (DDPA)	In Cameroon, the Pygmies and Mbororo ethnic groups are recognized as indigenous peoples and their rights under the provisions of the DDPA must be preserved, particularly in terms of land rights and the loss of their ancestral territories.
Cartagena Protocol on Biosafety to the Convention on Biological Diversity	This Protocol aims to contribute to ensuring an adequate level of protection for the safe transfer, handling and use of living modified organisms resulting from modern biotechnology that may have adverse effects on the conservation and sustainable use of biological diversity, including risks to human health, with a particular focus on transboundary movements (9 February 2001).
United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa	The purpose of this Convention is to curb desertification and mitigate effects of drought in countries seriously affected by it (14 October 1994)
Kigali Agreement on the Reduction of HFC Hydrofluorocarbon Gases (Kigali Amendment to the Montreal Protocol.)	It is an international treaty to eradicate hydrofluorocarbons (HFCs) (October 2016)
Paris Agreement	Its purpose is that contributions of signatory States (which differ from one country to another) should make it possible to stabilize global warming due to human activities "significantly below" 2°C by 2100 (compared to the pre-industrial temperature) by intensifying efforts to achieve the 1.5°C target (4 November 2016)
Kyoto Protocol	It is an international agreement to reduce greenhouse gas emissions in addition to the United Nations Framework Convention on Climate



International conventions and treaties	Overall objective
	<p>Change, whose participating countries have met once a year since 1995 (signed in 1997 and became effective in 2005).</p> <p>Protocol adopted in 1997 under the UNFCCC. The Kyoto Protocol sets, among other things, mandatory targets for the reduction of greenhouse gas emissions by developed countries. The first Kyoto Protocol commitment period ended in 2012.</p>

## 2. INSTITUTIONAL FRAMEWORK

### 2.1. Institutional actors in environmental management

The Ministry of Environment, Nature Protection and Sustainable Development (MINEPDED) guides the development and implementation of the Government's environmental and nature protection policy in a sustainable development approach. At the Regional level, the implementation of this government policy is ensured by its decentralized services, namely MINEPDED Regional Delegations, which are responsible for :

- Drafting of the Regional Delegation's action programme and budget as well as the implementation of selected operations;
- Management of human, material and financial resources;
- Collection and centralization of statistical data on the environment, nature protection and sustainable development;
- Monitoring compliance with environmental, nature protection and sustainable development legislation and regulations in the Region;
- Monitoring the preparation of action programmes of Divisional Delegations and their approval;
- Monitoring projects carried out in the Region in the fields of environment, nature protection and sustainable development.

## 3. ACTIVITIES AND RESULTS OF ENVIRONMENTAL MONITORING

### 3.1. MINEPDED's annual performance programmes

In response to the major challenges identified at the national level in terms of environmental degradation, MINEPDED is implementing four main programmes, which are the main expressions of its action in the field. They include:

#### ✓ Programme 361: Fight against desertification and climate change

Under this programme, activities are more focused on the promotion and restoration of nature, biodiversity conservation and the fight against climate change. Actions undertaken by regional services revolve around:

- the promotion and restoration of nature through the planting of trees in urban areas and sites of ,
- the fight against climate change through the popularization of improved ,
- raising awareness and educating the general public about the harmful effects of climate change and the relevant ,
- strengthening environmental monitoring,

- biodiversity conservation and ecosystem restoration
- ✓ **Programme 362: Sustainable management of biodiversity**

Activities under this program focus on promoting sustainable development, strengthening environmental assessments, awareness, dissemination and education of environmental information. Actions undertaken under this programme include

- Strengthening environmental assessments, through the monitoring of the environmental compliance of classified establishments, field visits for the monitoring and evaluation of projects likely to harm the
  - strengthening environmental awareness, using the available communication channels (radio, press, markets, schools and universities, etc.
  - the promotion of sustainable development, through participation in technical discussions on the environment, support for local environmental protection initiatives, participation in consultations and public hearings on development projects;
  - the development and dissemination of environmental information, through the supervision of students and users on various environmental research themes, the supervision and animation of environmental clubs, and awareness sessions in rural ;
- ✓ **Programme 363: combating pollution, nuisances and harmful and/or dangerous chemicals**

In the framework of this programme, the officers focus on activities related to joint inspections and environmental controls, compliance control of plastic packaging, technical support provided to Decentralized Territorial Communities (CTDs) for the improvement of household waste management in the context of urban sanitation. Actions undertaken under this programme include:

- strengthening the legal and normative framework of the environment sub-sector, by disseminating the various regulatory texts and managing disputes;
  - the strengthening of the environmental police, through inspections in classified establishments, the control of the conformity of plastic packaging;
  - support for urban sanitation and waste treatment, with actions such as support to municipalities for improving waste management, participation and monitoring of public hygiene and sanitation through the "Clean Thursday" operation in the Region, examination and resolution of conflicts/complaints from local residents relating to various pollution cases,...
  - the rational management of waste and chemical, toxic and/or hazardous products by supervising the removal of waste and chemical, toxic and/or hazardous products in the Region, monitoring the traceability of this waste, collecting statistics on household waste produced and collected (22 tons of waste identified in 2015 in the Bamboutos Division), monitoring the waste management plans of Environmental Permit holders
- ✓ **Programme 364: Governance and institutional support for the environment, nature protection and sustainable development sub-sector**

As part of this programme, the Regional Delegation, through its General Affairs Department (SAG), is mainly responsible for personnel management, budget preparation and execution, ordering and monitoring equipment maintenance, incoming and outgoing mail management and building maintenance.

### 3.2. Results of environmental monitoring

The following table presents physical achievements of the Regional Delegation for Environment and Sustainable Development between 2016 and 2017

**Table 2 : Physical achievements of MINEPDED-West in 2016**

N°	Actions achieved
01	Monitoring of the Degraded Land Restoration Project (15ha of restored land and 6400 trees planted) in Babouantou, Batchieu sub-division, Haut-Nkam Division
02	Distribution of tree seedlings to schools and individuals in the Noun (180 seedlings planted)
03	Support to the Friends of Nature (FN) clubs in 06 high schools in the West Region, including : - 03 Donations of technical maintenance equipment and tree seedlings, including 01 to the Famtchouet high school in the Mifi Division, 01 to the Bahouan high school and 01 to the bilingual CES of Batounta in the Highlands Division; - creation of 04 green spaces including: 01 at the Famtum High School and 01 at the Bandjoun Teachers' Training School in the Koung-Khi Division, 01 bilingual high school of Mbouda Banock in the Bamboutos Division and 01 at the Batounta Bilingual CES in the Highlands
04	Construction of a living hedge and monitoring of trees planted at the Bandjoun Teachers' Training School with the replacement of missing trees (570 cypresses planted for more than 60% success)
05	Tree planting around the Fouban municipal lake (60 royal palm trees)
06	Tree planting / Reforestation in preparation for the celebration of World Environment Day 2016 in Fouban (290 various trees planted)
07	Raising awareness among operators to take environmental aspects into account (166 establishments identified in the Menoua Division)
08	Monitoring in the Mifi Division of waste management plans of holders of Environmental Permits (14 waste management plans received and transmitted to MINEPDED)
09	Meeting with Mayors of Haut-Nkam to disseminate texts on the Environmental Impact Notice (7 Sensitized Municipalities)
10	Continued awareness-raising among population on the importance of planted trees (200 people sensitized in Haut-Nkam)
11	Production of a collection of texts on environmental and social impact assessment in the Ndé (The collection included 4 texts)
12	Joint inspections of Classified Establishments in the West Region (1081 Structures inspected and 47 PVCIs established)
13	Conformity control of packaging in the West Region during 2016 (Collected stock: 3,082.9 Kg; 3,921,000 CFA francs in fines collected; 585 visits to the field; 29 police custody)
14	Supervision of waste and chemical, toxic and/or hazardous waste and product removal operations in the Region (398 manifests of traceability of deliverables for CFAF 1,990,000 in collected costs)
15	Update of the database of classified HTAs in the West Region (More than 650 structures identified in the Region)
16	Hosting of the CRTV/West radio programme "notre environnement" (13 interviews conducted for 16 broadcasts)

**Table 3 : Physical achievements of MINEPDED-West in 2017**

N°	Actions achieved
01	05 sites reforested by the West's decentralized services (DRO and DD) for 677 trees planted
02	Follow-up of work relating to the creation of a green space in Bangou as part of the Green City operation (01 green space created)
03	Updating of the list of risk areas and degraded areas of Bamboutos, Mifi, Menoua and Noun (05 lists of identified sites available, i.e. 17 risk areas identified in the Mifi; 08 in Bamboutos, 19 in Menoua and 03 reports sent to the Divisional Officer of Noun)
04	Accompaniment of municipalities of the West Region by services of MINEPDED/West for the elaboration of lists of activities submitted to the NIE (08 available lists including 01 per Division)
05	Dissemination of new texts on the environment in the West Region (24 radio releases broadcast and 04 radio and TV interventions, and 80 texts relating to the NIE implementation distributed)
06	Joint inspections of Classified Establishments in the West Region (Establishments inspected: 1381, PVCIE prepared: 40)
07	Conformity control of plastic packaging in the West Region (Collected stock: 2085.75 Kg; 2,227,500 CFA francs in fines collected; 511 visits to the field; 33 police custody)
08	Follow-up of the 2017 PIB granted to Municipalities of Penka-Michel and Dschang (fight and collection of plastic packaging) with 908.6 kilograms of plastics collected in Dschang
09	Technical support to Mifi's CTDs to improve waste management
10	Monitoring of the tracking of chemical, toxic and/or hazardous waste in the West Region with 803 manifests of tracking of deliveries for 86,055,659.19 Kg of solid waste and 250,369 litres of liquid waste collected in the Region
11	Hosting of the CRTV/West radio programme "notre environnement" on various themes (Environmental pollution: definitions and causes ; <ul style="list-style-type: none"> <li>- Climate change in the Noun by DDEPDED/NOUN;</li> <li>- Effects of lead on health and environment;</li> <li>- Wetlands for disaster prevention</li> <li>- Wetlands for disaster prevention</li> <li>- Environmental pollution and its consequences) for a total of 07 interviews conducted.</li> </ul>
12	Hosting of the radio show "notre environnement et nous" at the Radio Communautaire de Bafoussam 2ème with 08 interviews conducted
13	Celebration of the 45th WED and 23rd WED 2017 in the West Region
14	Follow-up of the PIB 2016 granted to the three Municipalities of Mifi for the collection and control of plastic packaging with a total of 549.5 Kg of plastics received and stored at the DDEPDED/Mifi

Source: 2016 Annual Activity Report DREPDED

In addition, between 2015 and 2017, 45 ESIAs were carried out in the Region, including:

- 10 for quarrying;
- 14 for the construction of roads and bridges;
- 13 for the construction of gas stations;
- 08 for other facilities;
- And a social and strategic environmental assessment

### 3.3. Difficulties of public services in ensuring the environmental integrity of the Region

MINEPDED's decentralized services encounter difficulties in carrying out their mission, which does not facilitate environmental

- There is not enough staff
- The lack of equipment for measuring pollution indicators (air, water, soil). MINEPDED's allocation for measuring water pollution came after the reagents had already expired, and there is no budget line to replace them. As a result, the equipment, although present, cannot be used. Air and soil measurement kits are not available. There is therefore no baseline situation on which to measure environmental protection efforts.

### 3.4. Other actors in environmental management in the Region

In addition to institutional actors, other non-state actors are working on the ground to protect and improve the environment. About forty NGOs active in the environmental and social field have been identified in the Region. However, their lobbying capacity for a real change of environmental paradigm remains limited, their activities are limited to reforestation, awareness-raising, waste management and support, organic

These include municipalities and NGOs. The list of active NGOs is given in Appendix. Tables 4 and 5 below list some of the achievements of these actors in 2016 and 2017

**Table 4 :** Physical achievements of other actors for environmental protection in 2016

Establishments	Actions achieved
COMMUNES (actions carried out thanks to the PIB received from MINEPDED)	NKong-Zem: implementation of the green city operation in the municipality
	Municipalities of Bafoussam 1, 2 and 3: collection of plastic packaging in public places (quantities not known to date)
NGO	Extension of the improved stoves of the NGO ACREST and Production of green coal (4000 stoves produced)
	training of Bangang populations on environmental protection and preservation methods by ACREST (40 people trained)
	ACREST: Reforestation 01ha of raphias in Balaloum/ Bamekombou in Bamboutos together with a group of 11 farmers;
	Reforestation of 03 ha of ordinary plantations in the Bamboutos Mountains, 10 ha for the protection of slopes of the Bamboutos Mountains and 01 ha for the restoration of sacred forests
	Planting of trees for the modern slaughterhouse in Foubot by the general service company (100 pine trees planted)
	CODAS CARITAS Bafoussam: Organisation of the rural world fair to promote agriculture that respects the environment

**Table 5 : Achievements of other actors for environmental protection in 2017**

Establishments	Actions achieved
COMMUNES (actions carried out thanks to the PIB received from MINEPDED)	Repression and collection of plastic packaging banned by Municipalities of Penka-Michel and Dschang with 908.6 Kg of plastic packaging already collected by the Municipality of Dschang
	Creation of green spaces as part of the green city operation by the municipalities of Magba (Noun), Fouban (Noun) and Bangou (Highlands)
NGO	Organisation of the 1st National Innovative Forum on the Environment and Renewable Energies (FINEER) held in Bafoussam from 16 to 18 August 2017 Workshop organised by the NGO CIRPEVER
	Organization of a conference on the theme "Challenges of Sustainable Development in Africa" on the occasion of the 45th World Environment Day in Menoua; Conference organized by the Youth Action Network for Environment and Sustainable Development (RAJE-2)
	Organization of the training seminar on "Sustainable Development Objectives" as part of the project "Strong society, strong development-qualification and networking of civil society and administration in Cameroon" by the Sustainable Development Association (ADD)
	Visits in about ten Mifi schools for the distribution of garbage bins (10 bins) and the sensitization of more than 2500 students on the protection of nature by the association YEDU_ENVIRON

Source: RADEC 2016 et 2017

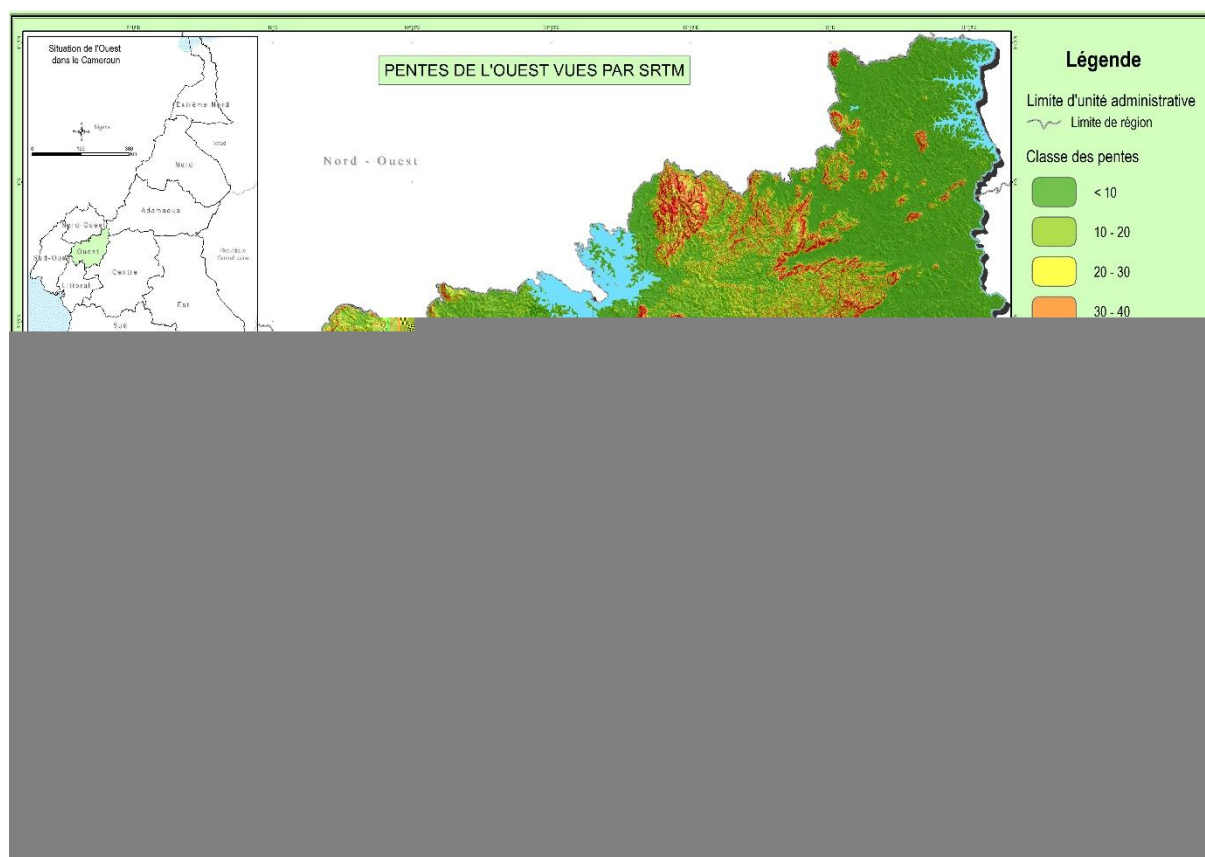
#### 4. MAJOR ENVIRONMENTAL CHALLENGES OF THE WEST REGION

The combination of geophysical and socio-economic realities of the Region creates pressures on the environment in different forms. This section lists some of the environmental challenges that arise from these realities, noting a correlation of varying degrees between these issues.

##### 4.1. Unequal relief and its consequences

The entire southern part of the Bamiléké plateau is deeply marked by significant tectonic accidents. Fractures and faults sometimes reaching an exceptional magnitude determine the major escarpments. Imposing volcanic or volcanic-plutonic devices (Bana, Fotouni, Bangou) are also at the origin of large very steep slopes. Thus, from North to South and oriented more or less East-West, the great crystalline slopes of Batié, the great walls of the old volcano of Bangou and, further south, the Bana which with its heavy domes rises to 2097m. From Batchingou to Batcha or Lembo, slopes of up to 30% are frequent (TCHAWA, 1993).

**Picture 1** : Spatial configuration and distribution of slopes in the West Region



Overall, only 20% of the region's surface area has slopes below 10°, 70% of the slopes are between 10 and 30° and 10% of the slopes above 30° (NGOUANET, 2010). Steep slopes in the West Region are cliffs (see Map 9-1):

- Of the edge of the Bamoun plateau with the Tikar plain to the north and east of Foumban;
- Of edges of massifs and ridges emerging from the Tikar Plain;
- Of massifs of Mbapit, Nkogam and Mbam overhanging in the N - S direction the Bamoun plateau ;
- Of ridges aligned NE – SW, ENE – WSW, NNE – SSW to the SE of Foumban and NE – SW to the SE of Foubot;
- the South (SW of Bangou) and East (East of Bandjoun and SE of Baham) flow edges or fronts of the basaltic bamiléké plateau, the South (SE of Bana) and West (NE of Bafang) flow edges of volcanic cover on the crystalline substratum;
- bands of crystalline massifs oriented E - W south of Bazou; N - S east of Batcha - Ndjiongze; ENE - WSW, NE - SW and W - E west of Tonga; NE - SW and NW - SE south of Bana; the area including the localities of Fomessa - Petit Diboum, Boutcha - Fonga, Makouk ; NE - SW south of Fomessa ;
- from the edge of the Mbos plain across the steep slopes of the deep valleys NE - SW of Metchié and N - S of Menoua, tributaries on the left bank of the Nkam;
- Highest slopes of the Bamboutos Mountains (see Figure 1).

This uneven configuration increases the flow rate of runoff water, which allows coarse particles to be drawn in. Sloping terrain is often the scene of mass erosion, which irreversibly shapes slopes and accumulates sediment in lowlands.

Indeed, soil characteristics, associated with steep slopes ( $>30^\circ$ ), heavy rains (1400-2500 mm) and anthropogenic action (deforestation, poor cultivation techniques, uncontrolled urbanisation, pastoral work) which favour the destabilisation of the material; are at the origin of important spatial mutations resulting in numerous mass movements of catastrophic proportions over the last three decades or so: landslides, collapses, landslides, mud flows and floods. Table 6 below summarizes natural disasters related to relief that have occurred in recent years.

**Table 6 :** Location of landslides and related damage in the West Cameroon Region

<i>Landslide location</i>	<i>Damages</i>	<i>Year</i>	<i>Reference</i>
<i>Fossong-Wentcheng (Sud–West of Dschang)</i>	6 deaths and destruction of farms	August 1978	(Tchoua 1984, 1989)
<i>Bana</i>	Farm destruction	10 September 2002	(Aboubakar et al., 2013)
<i>Bafou</i>	2 deaths	2003	(Zogning et al. 2007)
<i>Massif of Bamboutos</i>	20 deaths, hundreds of homeless, several thousand displaced persons and extensive material damage	July 2003	ZOGNING and Coll. (2007)
<i>Fondonera (SW Dschang)</i>	Farm destruction	2008	(Aboubakar et al., 2013)
<i>Kekem</i>	1 death	20 October 2007	(Aboubakar et al., 2013)
<i>Koutaba</i>	2 deaths	23 October 2011	(Aboubakar et al., 2013)
<i>Flooding of the Mbo and Ndop plains</i>	Destruction of plantations and roads	Each year in August, September and October	(Bandji 1994)
<i>Bafoussam-Bamendjo</i>	Traffic disruption	06 September 2017	

While the uneven terrain is responsible for erosion and particularly on sloping soils, it is also the flooding factor for receiving environments, in this case lowlands and localities located below the steep slopes. Santchou is an example. It occupies a swallowed position at the Dschang cliff, which makes it vulnerable to flooding. Indeed, Santchou is located about 30 km from Dschang, yet both localities have a difference in altitude of 700m. It thus receives a large part of torrential waters of localities located upstream, which makes it particularly floodable. A trip to this community in the rainy season, and we quickly realize the seriousness of the problem, with water stagnating in gutters, and rivers in full permanent flooding.

#### **4.2. Climate aggressiveness**

In general, it is considered that above 20 mm, a unit rainfall can be the cause of erosion. In the West Region, a large number of unit rains during the year exceed this erosivity threshold.

Climate agents can be very active. But this potential aggressiveness is only transformed into effective degrading energy if certain conditions are met: among them, soil exposure by an agriculture that does not succeed in revolutionizing its techniques and tools. TCHAWA, (1993) notes that it is during the month



when the soil is completely exposed by ridging that some of the most erosive rains of the year fall. Precipitations that arrive on the bare ground in large quantities cause massive movement of water nets, carrying with them whole centimetres of layers of soil.

#### 4.3. Differentiated pressure on natural plant formations

Traditionally, land use in the areas covered by mountain and semi-mountain formations was governed by the following rules during the pre-colonial period: (i) in the mountain area, the main activity encountered was pastoralism carried out by the Mbororo indigenous peoples; (ii) in the semi-mountain area, the Bamiléké bocage was found in a system dominated by dispersed habitats.

With the coffee boom in the 1950s and the boom in food crops, this period saw the end of the bocage in favour of live hedges. During this period, there was an intensification of agriculture towards the top of the hills. The latter strewn the boundaries of the agricultural parcels and served as an access corridor to the concessions. Following the massive destruction of livestock during the unrest during the maquis period, the population explosion, the creation of roads and the installation of habitats, and long fallows on the hilltops were quickly taken over or shared and then put under cultivation.

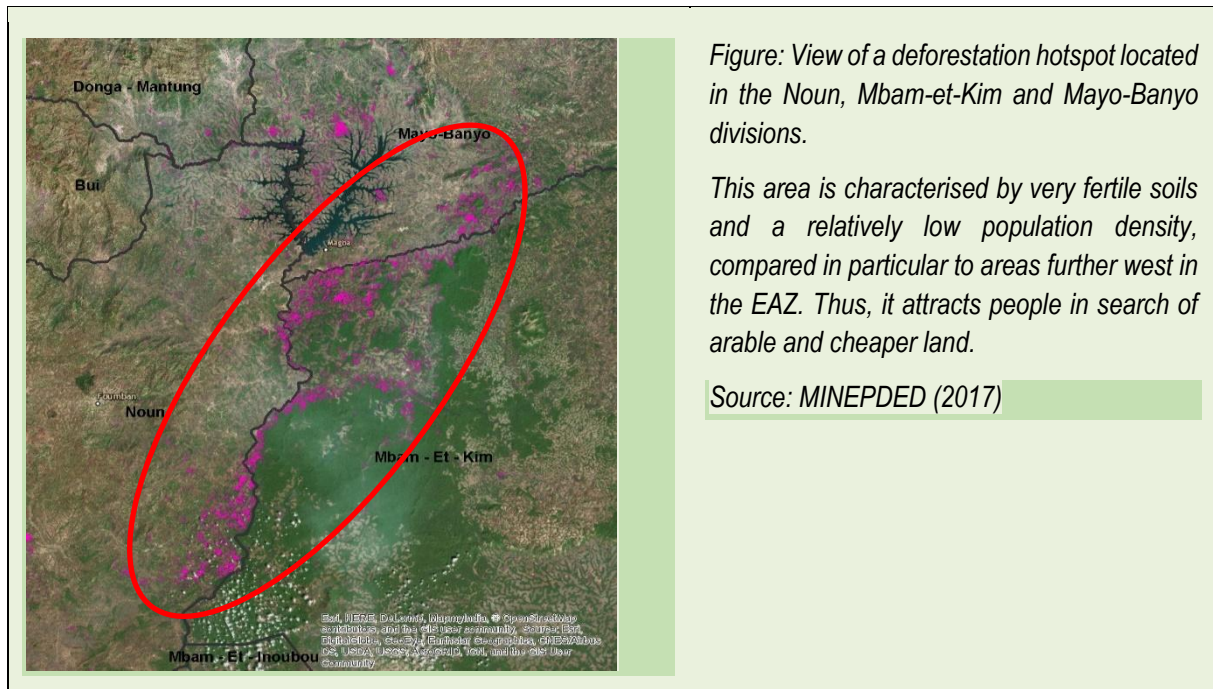
Some parts of the mountain ranges, such as the slopes and ramparts of the caldera, have thus been cleared of their forests and meadows in favour of the settlement of settlers from the foothills and bottoms of the caldera, with English-speaking migrants overflowing the latter to descend to the Bamiléké side. This situation was particularly observed in the Bamboutos Mountains and Mount Mbapit.

The extension of agriculture on the hillsides has contributed to the sedentarization of Mbororo herders, who used to migrate seasonally to the plains/valleys. In response to the reduction of pastoralist areas, pastoralists have invested in the practice of bushfires, which drastically reduce the trees that used to grow on the tops of the hills.

Clearing of a multitude of small cultivated area units (<1 ha) is by far the most common, with more than 90% of total conversions taking place in all Divisions except Ndé, Noun and Haut-Nkam. It is in these three Divisions that medium-scale conversions play an important role. From the multi-date analysis of high-resolution images, it appears that in the southern part of the Ndé Division, palm oil tree is grown by "elites" on plots of up to 20 ha. The development of palm groves is the main factor behind deforestation in this area. In the Noun, medium-scale clearings are also observed along the Mbam corridor. These clearings are carried out in conjunction with the planting of associated annual crops (maize and beans). The last clearing corridor is located in the Bangangté-Tonga - Kekem axis for coffee, maize and cocoa cultivation.

**Box: The deforestation hot spot around the Mbam River.**

*The Noun Division is undoubtedly the deforestation hotspot in the West Region with more than 14,000 ha of deforestation, and a deforestation rate more than double the average for the Highlands EAZ (0.14% compared to 0.06% per year for the entire EAZ). The vast majority of forest conversion activities have taken place in the eastern part of the Division, where there is a deforestation corridor of about 18,000 ha consisting of former gallery forests located on both sides of the Mbam River, which marks the boundary between the West and Centre Regions. Although this area appears isolated at first glance, the inspection of high-resolution images reveals a dense network of roads and tracks.*



The western and southern escarpments of the Bamiléké country and the Grassfields that carry dense forests or dripping nebelwalds are cleared by the inhabitants of the neighbouring chiefdoms. On the "cliffs" of Fontem and Foréké, between 1400 and 1600 m, there are many food fields in which there is cocoyam associated with plantain, and to some extent coffee.

Soil forest formations are not spared by off-season agriculture, which has been booming over the past two decades. In the raffia, the basic elements of social relations that provide wine, rachis, palms, etc., farmers produced market gardening and potatoes, before grubbing up palm trees and woody trees for full development. The impact of these agricultural activities on the water environment is not the same in the different Divisions and varies according to speculation. Thus, the most affected Divisions are Noun, Menoua, Ndé, Bamboutos for the cultivation of market gardening; Menoua and Bamboutos for the production of potatoes. Some villages such as Batié have specialized in cabbage production all year round. Over the past decade, market gardening has been developing in the Department of Ndé, around the city of Bangangté, where a permanent market has developed. Total marsh conversion tends to become more widespread in the West Region, with the increasing use of off-season agriculture.

**Box: Increased anthropogenic pressure on the Bamboutos Mountains**

*The Bamboutos range is an integral part of the highlands of West Cameroon. With its 2740m height, Mount Bamboutos is the third highest peak in Cameroon, after Mount Cameroon and Mount Oku. Covering an area of 218 km<sup>2</sup>, it covers 4 Divisions, Bamboutos (100.60 km<sup>2</sup>, or 46%) and Menoua (33.50 km<sup>2</sup>, 16%) in the West Region, then Lebialem (81.10 km<sup>2</sup>, 37%) in the South-West Region, and Mezam (2.60 km<sup>2</sup>, 1%) in the Northwest Region. This mountainous massif is characterized by a very high population density (357 inhabitants per km<sup>2</sup> in the West Region, with peaks in Batcham (865 inhabitants per km<sup>2</sup>), Mbouda (630 inhabitants*

*per km<sup>2</sup>), Nkong-Ni (581 inhabitants per km<sup>2</sup>) (TALLA, 2014)*

*Several environmental and socio-economic investigations were conducted on the Mount's right-of-way, which identified the following main environmental problems:*

- *clearing the vegetation cover to make way for farming;*
- *deforestation and clearing for fuelwood;*
- *the progress of human settlements;*
- *hunting, livestock and increasing grazing;*
- *bushfires and inappropriate cultural practices;*
- *Eucalyptus forestry;*
- *landslides;*
- *the rapid growth of population, which leads to an increase in land needs. (KFA, 2005)*

*In July 2003, within a few hours, a series of catastrophic landslides and mudslides occurred in the Bamboutos Mountains, killing more than 20 people, leaving hundreds homeless, several thousand displaced and causing extensive material damage. A study by ZOGNING et al. (2007), intended to identify the causes and factors of this disaster, highlights the fragility of this mountain ecosystem, ever-increasing human pressure at the base and sides of the massif, and the heavy rains that fell in the area for two days before the tragedy.*

*NODEM's (2015) work on land and water use dynamics on the southern slope of the massif has highlighted an ancient occupation, unfair land use competition on the slopes of the mountain between the financial elite of surrounding localities, industrial groups and poor local populations, as well as the scarcity of water resources, which could become irreversible due to uncontrolled use and unsustainable farming*

*As a solution to ensure the sustainability of the Mount Bamboutos ecosystem, some authors propose the development of a clear management policy, based on good governance, clear knowledge on the value of mountain ecosystems, conservation and integrated development, as well as the creation of quality infrastructure to meet the needs of populations. Other recommendations are to materialize the defended areas and make them known to all stakeholders, then replace the controversial Eucalyptus species with another species that can play the same role without damaging water reserves on the mountainside (A.M TALLA, 2014; KFA, 2005). Reforestation initiatives have failed successively, due to the non-appropriation of the concept by riparian stakeholders. It is therefore important to adopt an educational approach and to promote a collective awareness of the future of this mountainous massif of national*

#### 4.4. Pressure on protected areas

##### 4.4.1. Forest reserves and reforestation perimeters

In the West Region, some thirty forest reserves had been delimited by the forestry administration, with the objective of restoring the forest heritage in order to meet the needs of the population on a sustained basis and to fight against erosion on sloping land. These forest reserves and reforestation areas are now threatened by bushfires and frequent intrusions by local populations, leading to illegal logging, farming practices, etc.

Bushfires degrade forest reserves by favouring only pyro-resistant species (pine begins to resist fires from the age of 10 years, while eucalyptus trees are vulnerable throughout the life of the stand). These bush fires are often started by local people to clear agricultural land or regenerate pastures. Some fires emanate from poachers of lesser effort in search of game or from clever people who seek to cause the death of trees first in order to justify their subsequent felling.

With the absence of permanent management to make wood products available to the population, they regularly attack forest reserves in order to satisfy their needs for wood products (energy wood, service wood, artisanal wood and timber) and non-wood products (medicinal plants, raffia wine, etc.). Nowadays, most of these reserves are practically occupied by food fields and even by dwelling houses. A survey carried out by MINFOF in 2016 reveals encroachments that vary between 10 and 100% for both reserves and reforestation perimeters.

A recent "discovery" of some fraudulent smallholders, many of them children, has been to mutilate standing pines at ground level about 50 cm from the ground, by cutting with a machete wood fragments intended to light wood fires in households. These resin-rich wood fragments are a perfect substitute for kerosene, the price of which is no longer within everyone's reach. The windfall subsequently caused by these mutilations is recovered and transformed in situ, either into firewood by small sellers or into draft statues by craftsmen (Njoukam et al., 2008).

##### **Box: Human pressures on forest reserves**

*State forest plantations have certainly been successful in terms of species introductions with the resulting mastery of silvicultural techniques. But with hindsight, it can be noted today that the initial design of the reforestation was strewn with gaps that later formed the seeds of the destruction of these plantations. Several reforestation projects were imposed at the time for (but without) the populations. They have not been fully sensitized and have been expropriated from the areas to be reforested, most often without substantial compensation or supervision in the new village thus created. These populations, living near the reserves, have gradually turned into saboteurs, practising fraudulent logging and setting off bush fires. In addition, the organization in charge of reforestation has always favoured the extension of planted areas at the expense of the care to be given to standing trees. Plantations, apparently abandoned on their own, are therefore under pressure from the surrounding populations.*

**Njoukam et al<sup>1</sup>, 2008**

<sup>1</sup> Article summary: In West Cameroon, farmers preserved the trees in their fields, while the state allowed the trees it had planted in its reserves to burn. Article published in International IUFRO Conference on Traditional Forest-related Knowledge and Sustainable Forest Management in Africa

#### 4.4.2. Santchou Wildlife Reserve

Created by Decree No. 262 of 29 July 1947, the Santchou Forest Reserve, which initially covered an area of 7,000 ha, became a wildlife reserve in 1987. The main objective of creating this reserve was to protect the elephants, dwarf buffaloes and other animal species that inhabited the forest of this region; and which have now migrated to the South-West (locality of Mbeta) and on the slopes of Mount Manengouba, due to human pressures and interference.

Santchou Wildlife Reserve, long a wildlife habitat, now hosts a multitude of local populations, divided into two main groups; non-indigenous and indigenous. The natives occupied the reserve before it was created. Information on the settlement of the reserve by key informants highlights the fact that during the Second World War in Cameroon in the 1940s, people from other parts of Bafang and Menoua migrated and took refuge in this forested area. The local population is mainly agricultural; practising market-oriented agriculture based on cocoa and coffee.

The presence of this population and its activities have severely degraded the natural habitat of wildlife. Changes in forest cover and the extinction of protected species are now so common that they are considered the norm rather than the exception in this reserve. Human interference is aggravated by the seasonal arrival of transhumant in search of pasture, and the periodic use of bushfire. Grazing in this protected area leads to the destruction of flora, the destruction of wildlife habitats, attacks on animals and the risk of disease transmission (Mbanga and Gonne, 2013)

#### 4.5. Demographic pressure and its consequences

Population growth, all other things being equal, leads to an intensification of the exploitation of the natural environment by increasing pressure on space and natural resources for livelihoods on the one hand and increasing waste generation and pollution on the other.

Beyond the effect of population on the environment, there are also the consequences of the spatial distribution of the population, which dictates, among other things, the organization of pressure fronts on natural resources, waste management and the location of public transport networks. This section describes the environmental problems caused by human activities at different scales.

With 13,892 km<sup>2</sup>, or 3% of the territory, the population of the West Region is estimated in 2017 at 2,076,055 inhabitants, for a density estimated at 142.9 inhabitants per km<sup>2</sup>. In the same period, the national average is estimated at 48.9 inhabitants per km<sup>2</sup>. The West Region is therefore three times more populated than the national average, as recalled in the section of this document on demography.

This demographic excess at the national level has a series of consequences, including increased pressure on natural resources. Indeed, a strong population means a strong demand for basic necessities, such as land, water, wood and other local resources. This demand leads the actors to a high production effort, and to an export rate of products higher than the production capacity of the land. This leads to an accelerated impoverishment of the land, which is only controlled through a massive supply of agricultural inputs. In addition, the lack of land due to the almost systematic occupation of the area means that there is no recourse to fallow land. Some agricultural areas have been exploited for more than a hundred years without rest

In these areas with high population densities and subject to strong land pressures at the origin of the often integral occupation of the viable space, therefore unable to play on yields by new technologies, the rush towards marginal environments and defensive areas (mountainsides, large escarpments, ecologically



fragile areas and on protected areas, sacred forests, wetlands,...) becomes the most accessible way to land ownership.

#### 4.6. Waste management

Urban waste is managed in different ways depending on the municipalities in the West Region. In Dschang for example, there is an initiative to transform household waste into compost. In Bangangté, a contract was signed between MINDUH and HYSACAM for the collection and removal of urban waste. Contacts are also being established with the commune of Mbouda, and it is planned to sign a contract for the sanitation of the city in the near future. In Bafoussam, a contract links the urban community and HYSACAM, for the sanitation of the city. The sanitation of Bafoussam is a serious challenge, and it has been closely examined, given its particularly high demographics compared to other cities in the Region. Major obstacles that slow down good waste management in Bafoussam include:

a) Accessibility of waste collection points

Waste collection agents face the problem of accessibility of collection points, with the very deteriorated roads that do not allow trucks to cover all neighbourhoods

b) Incivility of populations

Populations do not respect the collection points, and dump waste outside the bins, and outside collection points. In the rainy season, torrent carries most of this waste to shallows and rivers, which contributes to their silting up. Plastic waste is entrained and will block water drainage

c) Contract issues

The contract between the urban community of Bafoussam and HYSACAM sets a daily tonnage to be collected. This tonnage was 197 tons in 2013 and 2014, 243 tons in 2015 and 2016, and 267 tons in 2017. This contract is adapted to the waste flows produced by the city, and this is closely linked to the demographic weight of the city. With population growth, waste production has increased, and despite compliance with (and sometimes even exceeding) the contractual tonnage set, the city does not achieve the desired level of cleanliness. The following table shows in tons quantities of waste collected by HYSACAM between 2013 and 2017

**Table 7 :** Annual quantities (in tons) of waste collected between 2013 and 2017

YEAR	PURPOSE	ACHIEVEMENT	GAP	RATE (%)
2013	61601.17	66771.1	5169.93	108.39
2014	61601.17	69525	7923.83	112.86
2015	74844	78184.69	3340.69	104.46
2016	74844	94856.78	20012.78	126.74
2017	83037	99548.48	16511.48	119.88

To counter the incivility of the population, HYSACAM has undertaken, in collaboration with the urban community, awareness campaigns at three levels:

- awareness-raising in schools (nursery, primary, secondary), to enable children and adolescents to adopt good practices from an early
- awareness in markets, which are areas of high waste production;

- raising awareness among households, to encourage them to respect collection points and to dump waste inside

d) Difficulties in managing special waste

There are shortcomings in the management of special waste, such as medical waste or industrial waste. Medical waste incinerators are not built to standards, and classified facilities discharge effluents into the environment, often without pre-

e) Non-compliance of the waste landfill

At the landfill level, we can notice:

- the lack of landfill development
- Waste disposal
- Sporadic methane explosions and releases
- The landfill is located on a slope, with a stream below, and the cultures of the local populations. Risks of contamination of water and soil are high
- The land problem of the storage site does not encourage HYSACAM to invest in it and to develop it. Indeed, the expropriation process has not yet been completed, and the populations have not yet been

#### **4.7. Mining operations**

Mining is an activity that causes severe damage to the immediate environment of excavation site. The huge holes dug for mineral extraction are left open by miners, and there is no real restoration of sites, as recommended by ESMPs of the various extraction projects. Excavations for pozzolana in the Noun, or stripping of hills for sand in Dschang are examples of this situation

Negative effects of quarrying in the West Region also include degradation of surface water and air quality, increased soil erosion, with occasional landslides causing loss of human life; silting of rivers, destruction of vegetation and wildlife cover, landscape modification through open excavations in massive rocks and soil without site restoration. In the commune of Bafoussam 3 (Bamougoum), the populations of Tchipou, near the Chinese company (China Longteng Sarl) operating a stone quarry, complain about the pollution of the atmosphere, water resources and the earthquakes that are affecting their homes.

#### **4.8. Agriculture**

Population growth is pushing people in the West Region in search of new land to meet local needs. In parallel with the high surrounding rural densities, the demand for food products for urban agglomerations (Dschang, Bafoussam, Nkongsamba and especially Douala and Yaoundé) continues to increase. Currently, thanks to the Customs Code of the Economic and Monetary Community of Central Africa (CEMAC), which exempts them from customs duties, these agricultural products are marketed beyond national borders (Bangui in the Central African Republic, Libreville in Gabon, Brazzaville in Congo), giving agriculture in the West Highlands a highly commercial character. As a result, agriculture is at the centre of all sub-regional challenges for food production (Kuété & al, 2003), maintained by profit users.

##### **4.8.1. Erosive cultural practices**

In the West Cameroon Highlands, the occupation of the upper parts and slopes for agriculture is widespread. This is mainly due to demographic pressure. In addition, livestock farming, which once

occupied the upper third of the slopes, has disappeared, making this occupation easier. Under these conditions, ridging, which is very often carried out in the direction of the steepest slope, constitutes one of the most serious human threats to soil conservation. It is through this type of development that water erosion finds optimal conditions and releases all its energy.

Many aggravating factors are added to this type of development and their juxtaposition results in rapid soil degradation. From the outset, the role of short-cycle weed plants (maize, groundnuts) is essential. In their first month of growth, their recovery rate is less than 25%. Not only are they cultivated according to the direction of the slope but also on slopes greater than 7%. In the southern part of the West Region, it is precisely maize and groundnuts that are grown on the upper third of the slope, leaving cocoyam, taro and other vegetables in the wet lowlands. In addition, it is rare that these plants are grown under woody trees. All these factors together constitute the optimal conditions for exercising the aggressiveness of the climate. In addition to maize and groundnuts, beans, sweet potatoes and, to a lesser extent, potatoes also pose a dangerous threat to the soil. Because they require a land prepared in the middle of the rainy season.

These factors are exacerbated by the reluctance to adopt less erosive cultural practices, as they are the result of secular practices. Campaigns to popularize new techniques have been initiated, but they have not had the desired response.

#### 4.8.2. Irrigation and crops in lowlands



Although irrigation in the West Region is not enjoying intensive prosperity, it is still practiced sporadically by agricultural elites in some low-lying areas, on Mount Bamboutos for market gardening and potatoes. Irrigation practices allow for two annual crop cycles per year, but poorly calibrated water flows often result in wasted water and reduced stream flow, damaging downstream populations and living organisms.

**Picture 2:** Water pumping for agricultural irrigation

In addition, consequences of the occupation of lowlands and swamps can be seen from three angles:

- Degradation of riverine ecosystems along watercourses:

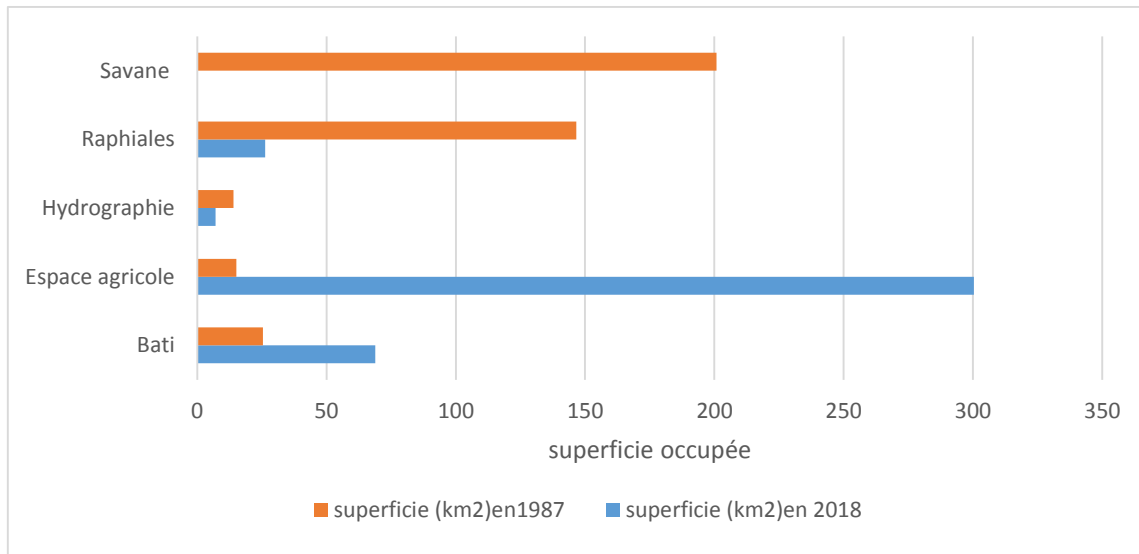
Wetlands in the West Region are areas where specific animal and plant biodiversity develops, which is difficult to find in other ecosystems. Most hydromorphic plant species, and amphibious and aquatic animal species (molluscs, crustaceans, fish, etc.) find the optimal conditions for their development. Vegetable formations that are dependent on rivers are now in a state of severe degradation, like the raffia, those plant columns that once characterized the plant landscape of the West Region, and which today, made accessible by an agriculture that is increasingly voracious in space, has been overexploited for crafts, furniture and packaging (crates) for tomatoes.



The diachronic study of the evolution of raffia in the Mifi Division reveals that its vegetation cover has been profoundly modified by the evolution of the population of the urban area. Indeed, the comparison of Landsat images (following figures) from 1987 and 2018 leads to the following deductions:

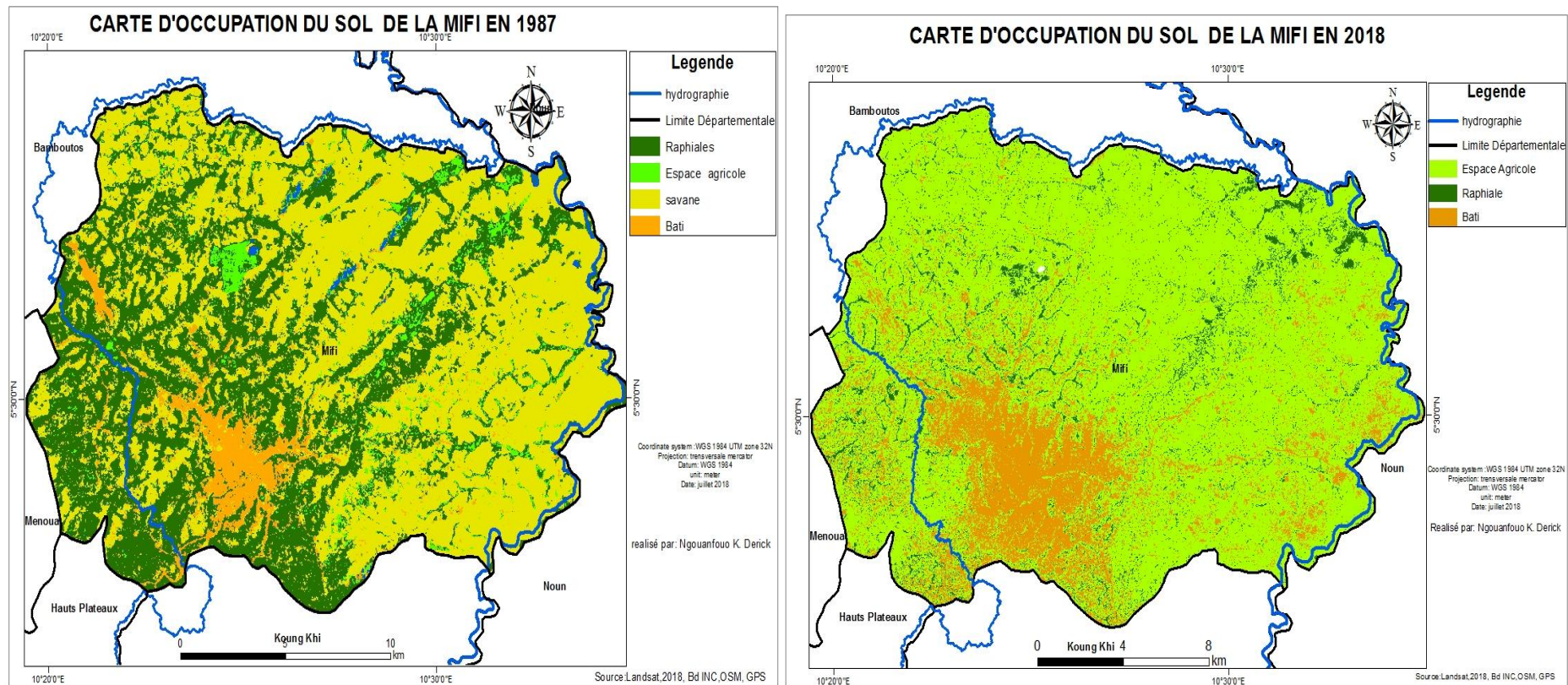
- the area occupied by raffia in 2018 compared to 1987 decreased by about 30%;
- the agricultural area and the building sector have increased in area by 71 and 11 respectively%;
- water bodies that in 1987 occupied 4% of the Division's total area now occupy only 2%, while savannahs that occupied 50% of the total area in 1987 have almost completely disappeared.

**Figure 1:** Change in surface areas between 1987-2018.



Indeed, it can be seen from the figure that the areas of natural formations (Raffias and Savannahs) have declined, in favour of the areas occupied by human activities (agricultural land, buildings). Figures below illustrate these changes.

**Figure 2:** Comparison of land use in the Mifi Division between 1987 (left of the image) and 2018 (right of the image)



- Erosion of stream banks

The occupation of stream banks by off-season crops increases the erosion of stream banks, and causes siltation of stream beds, thereby jeopardizing their survival. The destruction of the stabilizing vegetation cover of the banks exposes them to lateral erosion and widening of the watercourses, which increases in width and depth, also increasing the risk of flooding during flood

#### 4.8.3. Fertilization and use of pesticides

When chemical fertilizers and pesticides were introduced in the Region, populations thought they were strictly intended for coffee trees. Today, farmers in this area have adopted a completely different attitude towards the use of these products. In addition to the lack of land, it is due to the fact that, on the one hand, coffee revenues have deteriorated, while on the other hand, food revenues continue to grow, due to demand from large cities. Thus, in order to improve their production in food crops (maize, beans, groundnuts, etc.) and market gardening (tomatoes, peppers, potatoes, cabbage, etc.), farmers tend to use more and more chemical fertilizers and pesticides, although they do not always control their use. In addition to depleting land, these chemicals are a source of degradation of the quality of water resources. One of the aggravating factors for environmental contamination in the West Region is the lack of a plant protection product destruction centre. Farmers leave pesticide residues out in the open and incinerate empty packaging.

Environmental consequences of the misuse of pesticides as a crop protection solution can be seen from three angles: (1) on producers during improper handling, (2) on consumers through pesticide residues (3) contamination of water resources (surface and groundwater) and aquatic wildlife.

**Box: Assessment of environmental risk factors related to pesticide misuse by market gardeners in Balessing**

*Market gardening is endangered by pests that alone destroy a third of the crops. To overcome this problem, market gardeners use chemicals, often abusively, to protect crops. This study aims at highlighting risks of environmental pollution due to the wrong use of chemicals in Balessing, West Cameroon. The study conducted through surveys of 108 market gardeners shows that users have a high level of education, but despite this, leaving pesticide residues out in the open and burning empty packaging are the preferred disposal methods. The proximity of watercourses used mainly for the preparation or dilution of pesticides causes contamination by different routes. The most commonly used types of pesticides are fungicides and insecticides, with bird deaths, aquatic animal deaths, deaths of other non-target terrestrial vertebrates and invertebrates as the main environmental indicators of their action. To preserve the environment, training programmes in pesticide management and safety can be designed and delivered to the public. Their relatively high level of education may facilitate the process*

**NGAMENI et al.<sup>2</sup>, 2017**

Risks of pesticide residues in crops are likely due to the questionable quality of the pesticides used, given their sometimes unapproved sources of supply, with levels of active ingredients exceeding the maximum

<sup>2</sup> Article summary: Assessment of environmental risk factors related to pesticide misuse by market gardeners in Cameroon: the case of Balessing in the West Region. Article published by Afrique SCIENCE 13(1) (2017) 91 - 100

standards accepted by FAO and WHO. This situation is worsened by the reduction in fallow time, or even its elimination, due to the excessive fragmentation of arable land.

The presence of nitrates strongly represented in the groundwater of the city of Fouban shows that this water is degraded by human activities (Mfonka, 2015). Similarly, the high concentrations of nitrates in groundwater on the Bamoun Plateau identified by Mouncherou et al (2011) is an indicator for diagnosing anthropogenic activity on water quality, particularly in agriculture.

#### 4.9. Livestock

The main risk of extensive livestock is poor regulation of livestock load in space and time, which can cause damage in the event of overgrazing. Pruning for fodder, usually in the dry season, is an activity that eventually devitalizes trees and causes a decline in biodiversity.

#### 4.10. Loss of biodiversity

The vast majority of biodiversity loss in the West Region is attributed to land clearing for agriculture, and to a lesser extent to the extraction of fuelwood and timber for domestic use, bush fires and carbonization. These latter activities disrupt species phenology and natural regeneration. The Noun Division is undoubtedly the hot spot for deforestation in the Region (see Box 1). In the western part, major fronts of deforestation pressure are found in the Ndé, in the Santchou wildlife reserve, and around Mount Bamboutos.

Besides, growing areas of Eucalyptus plantations in the Region not only lead to the decline of other species because of their allelopathic properties, but also to the decrease in groundwater resources and the disappearance of plant species that are typical of these areas (see box).

#### Box: Eucalyptus, an emblematic and problematic culture in the West Cameroon Region



The West Cameroon Region is densely populated (149.2 inhabitants per km<sup>2</sup> according to estimates). This is the reason for the intense use of a space where trees traditionally occupy a privileged place, both for domestic use (firewood), and semi-industrial use (furniture, formwork, scaffolding, etc.), and for bio-fertilization. In this landscape that considers tree as a component in its own right, Eucalyptus is a species whose socio-economic role has grown steadily since its introduction during the colonial period. However, the many advantages it offers (very rapid growth, wind breaker, land demarcation, land reserve, supply of firewood, poles for house frames and for electricity transport, timber for furniture manufacture...) barely conceal the growing unease of rural people regarding its predominant presence in the landscape. Some of the grievances attributed to Eucalyptus are listed below:

Faced with the energy of raindrops, eucalyptus has a poorly protective crown. Measurements indicate that more than 90% of the precipitation falling on tops of these woody plants is not intercepted. (Rougerie, cited by Tchawa, 1991; Poore and Fries, 1985). Its role in protecting the soil against erosion would only be minor, in a context of climatic aggressiveness.

Studies on the identification of allelopathic effects (Maclaren, cited by Poore and Fries, 1985) suggest inhibition by chemical production of germination or growth of some species under eucalyptus trees. This reflects the incompatibility of crops associated with Eucalyptus.



Tchawa et al. (2002), After a study of three sites in the West Region (Bangam, Bapu and Baleng), reached the following conclusions about Eucalyptus cultivation: Firstly, eucalyptus woodlands do not contribute to increasing the level of organic carbon and organic matter in soil surface horizons (0 - 15 cm). Secondly, growing Eucalyptus contributes to the depletion of soil bases, which leads to the acidification of these soils. Third, the generally high C/N ratios reflect poor incorporation of organic matter into the mineral fraction of soil bearing eucalyptus. Added to this, a rather acidic pH, one could logically attribute the degradation of soil structure to eucalyptus afforestation, as Pouomogne (1983) noted.

Several observations have established a close link between the presence of Eucalyptus and the depletion of water resources in adjacent catchment areas. This is mainly due to the fact that due to its rapid growth, water requirements of Eucalyptus are much higher than those of other species. Tsayem (1996)

These facts undoubtedly indicate that eucalyptus is likely to harm the environment. As for farmers, they have found a trick to maintain Eucalyptus only on sites of zero agronomic value or by using it only in hedges on the periphery of fields. However, with demographic pressure, we have situations where Eucalyptus is competing with plots that can be attributed to agriculture. The most rational option remains the implementation of a land use plan developed in a participatory manner, taking into account specific socio-economic issues of each locality.

## 5. Table: SWOT Analysis of the West Region Environment situation

**Table 8:** SWOT Analysis of the West Region Environment situation

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> <li>- Existence of a regulatory framework for environmental management;</li> <li>- the strong presence and dynamism of NGOs and associations active in the field of environmental management and local development;</li> <li>- The operationalization of the procedures for the preparation of the Environmental and Social Impact Statement (NIES) for small-scale projects in all departments;</li> <li>- Major decentralized cooperation initiative for the recovery of household waste in the city of Dschang;</li> <li>- Experiences of CIPCRE, ADEID, ACREST and other civil society organizations in promoting approaches to nature protection, renewable energy promotion and climate change.</li> </ul>	<ul style="list-style-type: none"> <li>- Insufficient staff for environmental monitoring;</li> <li>- Lack of pollution monitoring systems;</li> <li>- Departmental committee for the monitoring of ESMPs not operational;</li> <li>- Weak inter-sector collaboration for environmental management;</li> <li>- Weak popularization of national and international texts on environmental management;</li> <li>- Risk and ecologically fragile areas identified but not developed or defended;</li> <li>- Non-compliance with laws by certain stakeholders (mining craftsmen, municipalities in relation to building permits, etc.);</li> <li>- Low traceability of industrial waste throughout the Region;</li> <li>- Absence of a centre for the destruction of plant protection products in the Region;</li> <li>- Low ownership of the principle of carrying out environmental and social assessments (ESIAs, SESAs, SEAs) by private projects;</li> <li>- Devastating effects of savannah fires on biodiversity;</li> <li>- Erosive cultural practices;</li> <li>- Various types of pollution (pesticides, poultry waste, etc.).</li> </ul>
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> <li>- The implementation of environmental preservation projects with the support of technical and financial partners (GEF-RA/MINEPDED project);</li> <li>- Implementation of the REDD+ pilot project in intermunicipal cooperation;</li> </ul>	<ul style="list-style-type: none"> <li>- climate change;</li> <li>- anarchic occupation of ecologically fragile areas;</li> <li>- disappearance of the mountain ecosystem and its biodiversity;</li> <li>- landslides and floods (Mbo plain);</li> </ul>

<ul style="list-style-type: none"> <li>- <i>Implementation of the data collection project by the Cameroon Climate Change Observatory and specialized research bodies;</i></li> <li>- <i>Presence of the University of Dschang with training courses in environmental sciences.</i></li> </ul>	<ul style="list-style-type: none"> <li>- drying of once perennial springs in the dry season, giving way to reddish ferruginous streams;</li> <li>- drastic and/or complete decrease in water levels in wells during the dry season.</li> </ul>
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