



Stakeholder's Domestic Water Harvesting Infrastructure: Resultant Conflicts and Management Strategies in the Upper Noun Valley, North West Region of Cameroon

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Many communities in developing countries face difficulties in hydrographic needs for domestic water and hence require greater investment to achieve water security. This paper examines the water infrastructure and the resultant conflicts emanating from the management of the water harvesting infrastructure put in place by the stakeholders of the water sector of the Upper Noun Valley. The study exploited secondary sources such as published and unpublished articles, reports and collected primary data. Primary data collected for this study used both quantitative and qualitative approaches. The results show that, traditional authorities, Village Development Organisations (VDOs) elites, Non-Governmental Organisations (NGOs), confessional bodies

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(Churches) and the state are main community water supply stakeholders in Upper Noun Valley. Water supply infrastructure ranges from local and manual driven to sophisticated diesel and electric power driven devices that supply water to the communities in the area. Infrastructural diversity generates imbalances in water supply over space and time within the communities in the area. The situation creates water supply shortages that usher in a plethora of water conflicts between users. The conflicts are accentuated by climate change which only makes a bad situation worse. During such periods, conflicts in the form of violence amongst water carriers on few regular sources, and with grazers on streams and rivers, are most common. The study concludes that Community Water Management Conflicts (CWMC) is mostly derived from water system's management policies by various stakeholders, the type of harvesting technology and the attitude of water users. Traditional policies (*Kwifon*, *Fon*) in the forms of beliefs and norms on water, water pricing and rationing are some strategic measures to combat water conflicts within the valley. The study recommends the need to apply a bottom up policy, the reliance on flexible technology in water harvesting, and a concerted effort in promoting an Integrated Water Management policy within the valley communities.

Keywords: Stakeholders; domestic water; harvesting infrastructure; conflicts management; upper noun valley.

1. INTRODUCTION

Water resources support ecosystem and life, including people. The right of both the people and nature to water is a foundation of sustainable economic development within the valley [1]. The lack of access to safe drinking water, sanitation is linked to conflicts between stakeholders, poverty and weak management strategies. Water resources are being degraded due to population pressure, growing climate change impacts, as water availability becomes less predictable and as extreme weather events become more common [2]. The provision of water for domestic needs becomes a greater challenge as socio-economic development and population growth place increasing demands on limited water resources [3,4]. Many communities in developing countries face difficulties in hydrographic needs for domestic water and hence require greater investment to achieve water security [5,6,2]. Goal Six of the SDGs is focused on ensuring the availability and sustainable management of water and sanitation for all. This explains why most governments have set an ambitious goal within the framework of Sustainable Development Goals (SDGs-6) to achieve an equitable access to safe and affordable drinking water for all people by 2030. The Cameroon government is primarily responsible for the supply of drinking water to her citizens in all the rural and urban agglomerations. This is done through the Ministry of Water and Energy Resources and the Rural Engineering Department or the Community Development Department (CDD). A significant proportion of the population suffers mainly due to poor water harvesting systems, management

and limited exploitation of existing water sources rather than actual water scarcity [7]. The lack of access to safe drinking water is directly related to poor harvesting systems, weak institutional management, poverty and poor health [8]. The situation is worsened by inadequacies and techno-infrastructural lapses existing between the stakeholders involved in water supply and those using available harvesting structures. Conflicts of interest and policies on inadequate and poorly function water infrastructure exist affecting the lives and sanitation of many people and children becomes vulnerable to preventable but yet dehumanising water-borne diseases. As population pressures in the Noun Valley area increase, the demand for water resources raises double fold. The challenges of meeting the increase demand, given the scarce commodity water usher in varied stakeholders of water harvesting technological systems (Ako Ako, 2022). The communities faced water scarcity as well as water governance issues [9] (PNDP-CDP, 2019). The situation lends itself to diverse conflicts arising from all stakeholders of the water sector. The Upper Noun Valley is challenged by the environment which is characterised by dissected relief structures at the watershed areas such as the slopes of the Sabga hills north west of the valley and the northern parts of Babungo, Babessi and Baba I. Moreso, the challenge is characterised by climatic oscillations that impacts on ground water recharge from precipitations in the valley matrix (Ako Ako, 2022). The communities are yet to arrive at a mechanism for evolving water governance structures fast enough to keep up with the rapid pace of change that is occurring and with the challenges that are

being created by population growth, destruction of biodiversity-based planetary life support functions, and climate change on water resources (Nchofua *et al.*, 2020) [10,11]. The objective of this work is to evaluate stakeholder's contributions on domestic water harvesting infrastructure and its resultant conflicts and management strategies in the Upper Noun Valley – North West Cameroon.

2. THE STUDY AREA AND METHODOLOGY

The Upper Noun Valley region of the North West Region of Cameroon is a unique geographical region in the Western Highlands of Cameroon. It lies between latitudes 5°40'N and 6°11'N. Longitudinally, it lies between 10°15'E and 10°50'E of the Prime Meridian. Located between average altitudes of 1,140 to 1200m above sea

level. It covers a total surface area of about 1.126 km². It is bounded to the north by Boyo and Bui Divisions, in the west by Mezam Division and to the east and south by the West Region. It has a projected population of about 305.525 inhabitants, from the National Census figure (BUCREP, 2005) and is spread in three sub-divisions (Babessi, Balikumbat and Ndop Central) that make up the Upper Noun Valley in North West of Cameroon. Administratively, the Upper Noun Valley portion of the North West Region that constitutes the study area is occupied by Ngoketunjia Division created by Decree N°. 92/186 of 1st September 1992. Geographically, the area extends beyond the limits of the administrative division to part of the Sabga hill in Tubah Sub-Division, the south facing slopes of the Oku highlands and Wianamah hill which are all extensions of the Western High Lava Plateau along the Cameroon Volcanic Axis (Fig. 1).

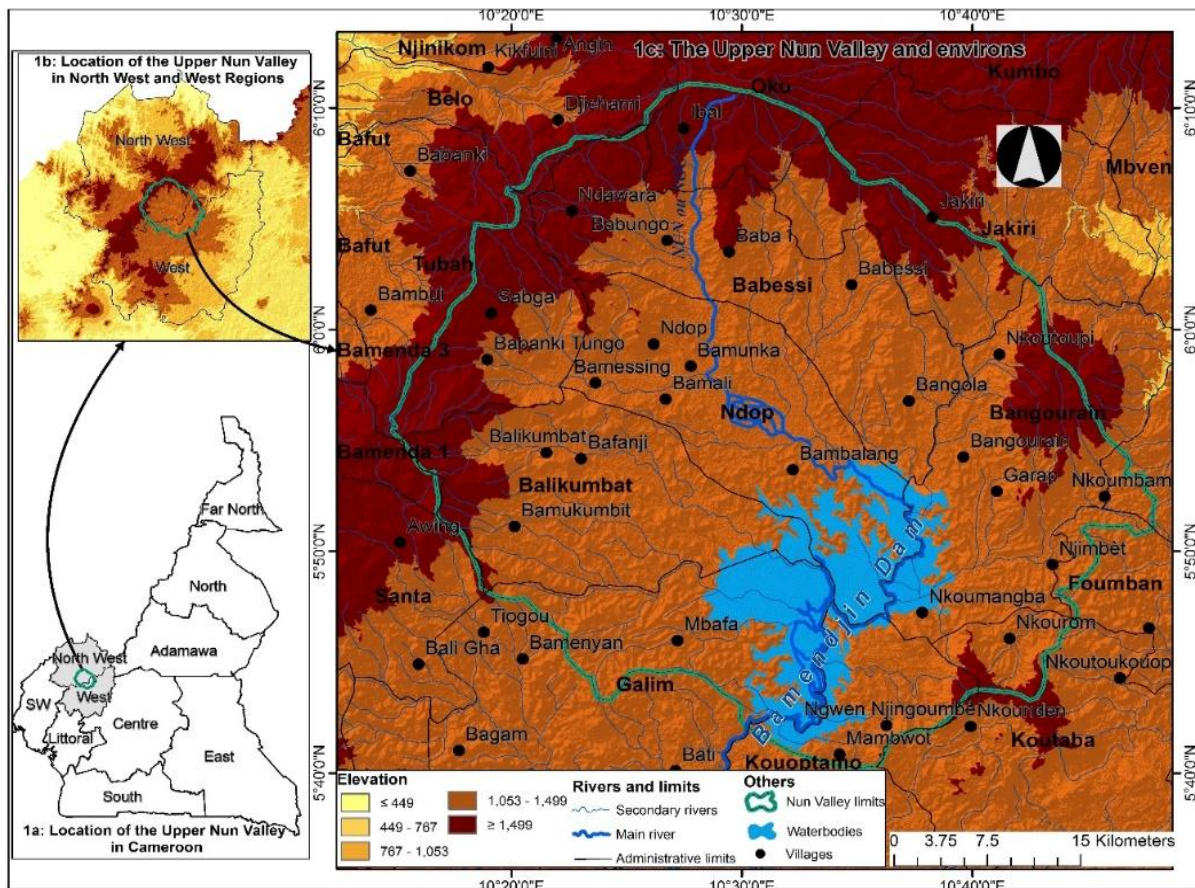


Fig. 1. Location of the upper Noun valley (study area)

Source: Geological Sheet of Western Cameroon and Adamawa at 1/1000000 and Office of Scientific and Technical Research Overseas (ORSTOM, 1975)

A number of methods were employed in the collection, analysis and presentation of findings on stakeholder's domestic water harvesting infrastructure and its resultant conflicts and management strategies in the Upper Noun Valley Communities. Data was collected from primary and secondary sources. Secondary data were obtained from reviews, research publications, policies and framework documents of related institutions on water harvesting systems and infrastructure in Cameroon, Africa and the world. For primary data collection, it was done through practical field work in the form of on-the spot appraisal, counting, measurements, interviews with key resource persons and simple structured open and close ended questionnaires administered in the field. The questionnaires were structured to suit the identification of water infrastructure and its efficiency, water conflicts and stakeholder's management policies. The questionnaires were directed to randomly selected population from various villages of the Upper Noun Valley. Direct observations were carried out to identify water project sites, evaluation its efficiency and effectiveness. Observations were also carried out in catchment areas to obtain the magnitude of anthropogenic activities and level of encroachment into protected catchment areas leading to conflicts. This was closely complemented with the use of the Global Position System (Gamin-5) in the mapping of water resource systems and infrastructure. Microsoft Excel (2016) and the Special Package for Social Sciences (SPSS version 20) permitted and ease the study to establish the degree of variance, work out percentages, and establish bar charts results for the different stakeholders [12-14].

3. RESULTS AND DISCUSSION

3.1 Stakeholders of the Water Sector

Varieties of stakeholders are involved in water harvesting, supply and management trends in the Upper Noun Valley. Their role play is based on financial, material and technical assistance in the provision of domestic water supply infrastructure. They range from the state, confessional bodies, traditional, elites and NGOs stakeholders (Table 1).

The state and few NGOs support large scale conventional projects following their top down development plan rather than minor community bottom up policy on water supply and its infrastructure. The state is the dominant

stakeholder and has the responsibility of providing water for its citizens. This distinguishes her in the provision of 49 water projects (Table 1). The NGOs and the population (through VDOs and Village Development Associations (VDAs) provide 12 water supply infrastructures each in the area for domestic livelihoods. Foreign Corporations and organisations such as defunct SCANWATER, HELVETAS, African Development Bank, PLAN Cameroon, and NAHKAH FOUNDATION has harnessed and developed 10 water infrastructures through varying harvesting systems. These NGOs in partnership with many Village Development Organisations/Associations of the Upper Noun Valley in villages of Bamunkumbit, Bamessing, Babessi, Bangolan, Bafanji, Balikumbat, Bamali, Bamunka and Bambalang has provided water infrastructures for the population. PLAN Cameroon in 2006 harnessed a spring source at Agheplih through pressure pipes to the quarters of Alumndi, Akoumoun, and Melafi in Bamunkumbit and in Balikumbat and Baligashu villages by a United States of America based foundation called "NAHKAH FOUNDATION" donated two boreholes for these villages in 2015 and 2016 respectively. While SCANWATER and the Cameroon Industrial and Civic Contractors (CIACC) technological infrastructure were applied in Mid 1980s as a panacea for domestic water supply shortages in Balikumbat, Bangolan and Babessi, Baba I and Bafanji [15-17].

In addition, private individuals (politicians and wealthy economic elites) are not left out in the chain of domestic water provision activities with 10 projects. The political and economic elites involved in providing water are empirically observed in the villages of Babungo, Bamali, Balikumbat and Babessi. The Presbyterian Missionaries at Bafanji developed a borehole in the Health Centre in 2003 costing 3.100.000 FCFA to curb water scarcity in the area and which also serves the water needs of the centre. The Saint Monica Sisterhood based in Baba I harnessed a spring source that has been distributed through pipes to their convent and four stand taps built on the same line for the inhabitants of the neighbourhood. The traditional organisation led by the village elders and the *Fon* declares most water catchment areas as shrines wherein people are forbidden to trespass. In Bamunkumbit, Babungo, Bamessing, Balikumbat and Baligansin the *Quifon* equally supervises the actions of the Village Water Management Committee and melt sanctions on members. The activities of these stakeholders on water

management dropped with the Anglophone Crisis that started in 2016 creating greater insecurity within the communities.

3.2 Community Water Supply Infrastructure

Water infrastructure dates back to several centuries and has been evolving from indigenous to modern infrastructures. The communities of the Upper Noun Valley through the ages employ varied water infrastructure and technology for the harvesting of water for domestic production. The communities depend on natural, low and modern water harvesting infrastructure (Table 2).

Natural infrastructure includes streams, rivers, ponds and springs that oozes out on foothills and swamps. Low infrastructure for domestic water harvesting such as dug wells covered with metal sheets and wooded materials, springs captured with pipes in between rocks where it oozes out and is collected few metres down slope (not on stand taps) is used by 68.91% of the population while modern infrastructure (boreholes, equipped wells and harnessed springs with stand taps) is used by 31.09% of the population (Fieldwork Collection, October 2022). This clearly portray that the communities depend largely on natural and low technology infrastructure (Table 3). They cling to the system due to its reliability, accessibility, availability and nearness to their homes.

In the Upper Noun Valley Area, Zero Technology Infrastructure (ponds and streams) is used more (37.52%) by the communities of Balikumbat Sub-Division than communities of the other Sub-Divisions. Local Tools Technology (LTT) is used more (38%) by communities in Ndop Central. The least area where this local technology of water harvesting is used is observed in Babessi

Sub-Division (27.45%) in terms of absolute number of households. This is in function of the availability of surface water in the sub-divisions. Equipped concrete wall wells with hand pumps and solar/diesel powered boreholes are found in the health centre at Bafanji, Njang - Bangolan and Messi in Bamunka. The revolutionary change in water harvesting infrastructure type has played a positive role in augmenting the quantity of water available for domestic uses [18-20].

3.2.1 Distribution of water supply infrastructure

Water harvesting infrastructure is unevenly distributed over the village communities of the Upper Noun Valley (Fig. 2). The communities closed to water sourcing regions have few sophisticated infrastructures than those far away from the source. The latter require advanced sophisticated technologies and systems that could be able to supply domestic water for the needy population. The suburbs of village communities depend largely on zero/low infrastructure. It is observed that as one moves from the central place of villages to the periphery modern/high water infrastructure put in place for domestic needs decreases giving way to the use of ponds, streams and local wells for domestic activities. The situation is worsened by the lone state parastatal (CAMWATER) that supplies only a few households in Ndop centre. Many homes far away from Ndop Centre are not beneficiaries of the CAMWATER facility.

The distribution of both indigenous and modern water infrastructures by village is largely uneven in the Upper Noun Valley communities. This is due to relief characteristics, population sizes, funding and stakeholder's perception and desires that varies from one village to another in the valley area (Table 4).

Table 1. Community water supply stakeholders and projects per village

Stakeholders	Number of projects per sub-division			Total
	Babessi sub-division	Balikumbat sub-division	Ndop central sub-division	
The State	15	20	14	49
Non-Governmental Organisations (NGOs)	02	05	05	12
Confessionals	01	02	01	04
Foreign Corporations	03	04	03	10
Population/Community	03	04	05	12
Private Individuals	04	05	01	10
Traditional Organisation (Fon/Quifon)	02	02	03	07

Source: Fieldwork, July 2022

Table 2. Types of community water infrastructure

Year	Babessi Sub-Division			Balikumbat Sub-Division			Ndop Central Sub-Division		
	2000	2010	2020	2000	2010	2020	2000	2010	2020
Natural	-	-	-	-	-	-	-	-	-
Local Infrastructure	19	28	37	22	35	48	25	36	50
Modern Infrastructure	07	13	31	11	19	26	15	28	49
Total	26	41	68	33	44	74	40	64	99

Source: Divisional Delegation of Water and Energy - Ngoketunjia, 2022

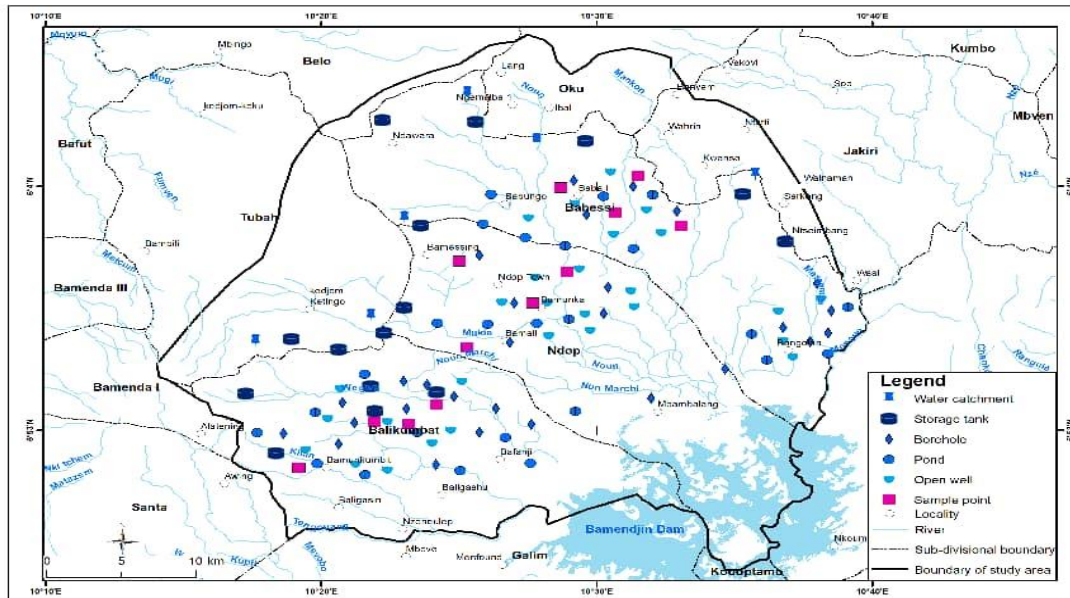


Fig. 2. Spatial distribution of water harvesting infrastructure

Source: National Institute of Cartography, 2022 and Fieldwork Data Collection, 2022

Table 3 presents a general overview of the quality of infrastructural development by stakeholders of the water sector in the Upper Noun Valley. It is observed that most of the technology used for procuring domestic water for the population is largely low or indigenous (73.64%) than the high or modern technological infrastructure. It was also observed that, 38% of springs in the valley area are being harnessed as pipe borne sources. Few wells (19%) are equipped with modern devices and most of the wells (81%) are operated manually in the process of water collection. Ponds are not developed into high technology systems and it is use locally with little or no technology applied. Fig. 3 presents the types of domestic water harvesting infrastructures.

3.3 Water Conflicts, Consequences and Management Strategies

The conflicts on domestic water procurement by the population in the Upper Noun Valley are

unevenly distributed. Most upstream communities benefit most in catchment management. They turn to look at the catchment as a private entity. This ideology creates a spatial conflict between the upstream and downstream human agglomeration. The villages of Bamessing, Babungo, Balikumbat, Bamunkumbit, Babessi and Baligansin fall within the realm of upstream villages. Most water catchments in the study area are found in these villages. Balikumbat, Bamunkumbit and Baligansin gain their water catchment thanks to the portion of the Bamboutos range and the Lamissang Escarpment. Bamessing, Babungo and the northern parts of Bamunka benefits their natural right to water catchment from the Sabga Hills that stretches via the Ngoketunjia Hill through the Oku highlands to the Wainamah Hills. It is within this geographic space that the Upper Noun Valley boost of its water sources, though lowland communities remain in conflicts with upland villages when it concerns surface water provision. The lack of socio-political will to

corporate by riparian communities in the valley area is the number one source for which water conflicts arise in the water sector. Though many of the conflicts are uniform in nature and characteristics, their occurrence and magnitudes vary. The conflicts on water infrastructure vary from one community/village to another and this affects the quantity and quality of domestic water used by each household. Conflicts arise on who owns the catchment. Individuals, households, quarter or the community are fall within the scope. Downstream villages such as Bamali, Bambalang, Bafanji, Baligashu and Bamunka often wage up conflicts with the upstream village communities such as Bamunkumbit, Baligansin, Balikumbat, Bamessing and Babungo that are located near water catchments. Apart from such water sourcing conflicts, many others were observed in the area (Table 5).

In the Upper Noun Valley Area, domestic water users and farmer-grazers orchestrate the highest percentage ((52.4%) of conflicts. The grazers most often are on transhumance during the dry season and always get their herds to water points where the animals drink from the same source with humans. Conflicts between villages on domestic water infrastructure are minimal (8.1%) of all conflicts on water resources in the area. Domestic users and industrialist (4.1%) are ranked the least in terms of generating conflicts on water management and its infrastructure. This form of conflict is low perhaps due to the fact that within the study matrix the level of industrial activities is too low or near absent in most village communities. Other conflicts arise once the mandate of the steering team of the VDOs elapses. The sustainability of some water

projects carried by them collapses. This phenomenon was evident with the Balikumbat Development Organisation (BADO) water schemes executed by BADO in 2004. The sum of 42 million French Currency for Africa (FCFA) contributed by the villagers were buried in the scheme and the community had clean water only for one month. Since then the water scheme has remained dysfunctional due to its unsustainable management policy and conflicts amongst the new bureau of management and the care taker committee. Moreso, covered wells with hand pumps provided by Grassfield Participatory Development Programme (GP-DERUDEP) between 2005 and 2009 within the study area in villages of Bamunka, Bamali, Bamessing, Bangolan, Balikumbat, Bafanji, Baligashu and Baligansin were abandoned due to conflicts of either inadequacy in location space, technical prescription or insufficient funding from the donors or the beneficiary communities.

The distributive trend of domestic water in the Upper Noun Valley is another source of water conflict. The lone public domestic water supply company, CAMWATER and Camerounaise Des Eaux (CDE) exist only within Ndop town and is inadequate in its service provision in the entire town. The villages are not benefiting from its services. VDOs/VDAs, traditional authorities, NGOs, Confessionals, private bodies, charitable agencies and individuals involved in the water sector all have conflicts of interest when it comes to extraction, distribution and management of water schemes donated or provided to the population. Here not all quarters in the villages are favoured and this ushers in conflicts between the donors and a proportion of the population.



Fig. 3. Types of domestic water harvesting infrastructures in the upper noun
 Source: Fieldwork Collections, July 2022

Table 3. Indigenous and modern community water supply infrastructure

Infrastructure			Sub-divisions in the upper Noun valley			
			Babessi	Balikumbat	Ndop central	
Indigenous Infrastructure	Zero infrastructure	Ponds	147	185	163	
		Streams	07	09	06	
				29.79%	37.52%	32.69%
	Local tools infrastructure	Local wells	118	192	208	
		Springs tapped with Indian bamboos	13	17	21	
Rainwater collected locally		345	390	430		
			27.45%	34.55%	38%	
Modern Infrastructure	Intermediate infrastructure	Stand taps fed by springs	284	327	251	
		Rainwater collection (in large tanks)	10	07	13	
		Equipped concrete wall wells with hand pumps	11	13	16	
				32.73%	37.26%	30.01%
High tech infrastructure	Solar / Diesel powered boreholes	07	10	19		
			19.44	27.78%	52.78%	

Source: Fieldwork, July 2022

Table 4. Spatial distribution of water supply infrastructure by village

Sub-Division	Village	Indigenous Infrastructure	Modern Infrastructure	Absolute Difference
BABESSI	Babessi	29	11	18
	Baba I	38	12	26
	Babungo	31	15	16
	Bangolan	40	10	30
BALIKUMBAT	Balikumbat	41	19	22
	Bafanji	47	11	36
	Bamunkumbit	32	13	19
	Baligashu	23	09	14
	Baligansin	19	06	13
NDOP CENTRAL	Bamunka	45	21	24
	Bamessing	37	14	23
	Bamali	27	10	17
	Bambalang	38	09	29
Total		447	160	287
		73.64 %	12.36 %	

Source: Divisional Delegation of Water and Energy - Ngoketunja, 2022

Table 5. Actors involved in water management conflicts

Actors in Conflicts	Frequency	Percentage
Farmer-grazer	140	35.4
Inter villages or communities'	32	8.1
Domestic users and farmer-grazer	207	52.4
Domestic users and industrialists	16	4.1
Total	395	100.0

Source: Fieldwork, July 2022

The local councils (Babessi, Balikumbat and Ndop) located within the valley matrix each has a

water committee setup in its structure headed by a skilled plumber. Some elites especially politicians have developed pipe borne water schemes around their villas and few stand taps are extended for community's usage. Conflicts sets in amongst the donors and the population who claimed the donated projects is the election promises made and dissident groups who feel it's their rights to have access to domestic water at short distances in a locality surrounded by giant watersheds. The political elites have individual care taker teams mostly make up of those working and living in their premises since they spent most of their days out of their villages. Most often these care takers block the

functioning taps for weeks at the detriment of the people to weird their authority over them. In addition, the Public Investment Budget for water and the Parliamentary micro project grants for covered wells with hand pumps are most often politically designed and located. In some cases, they are allocated to grab some support during major elections or to fulfil election promises. Insofar as the schemes or projects have a political motive once the scene is over, the scheme is abandoned or allowed in the hands of nature for its sustainability. This brings in conflict as to who takes charge of maintenance. The situation becomes precarious when the mandate of such donor is over and the successor has a divergent political ideology. Here, conflicts of personality and political ideology sets in thus leading to a collapse or redundancy of the project and impacting negatively on the management skills of the beneficiary community.

The capacity of the Cameroon Water Utilities Corporation (CAMWATER) which is the national water authority is not sufficient enough to cater for the population of the thirteen village communities. The distribution of CAMWATER facilities is limited to a minute fraction of the population living in semi urban Bamunka village (Ndop town). The rest of the villages in the valley area have no CAMWATER utilities. This has led to domestic water problems and conflicts especially in the dry season when surface water bodies are also experiencing a massive decrease in water volume. Field work observations identified some major recurrent conflicts on community water supply infrastructure as illustrated on Table 6.

Table 6. Recurrent conflicts on community water supply infrastructure

Types of Conflicts	Frequency	Percentage
Violent fight amongst users	15	3.80
Dichotomy in stakeholder's perception	28	7.09
Vandalism on stand taps and storage tanks	139	35.19
Refusal to pay annual subscription	213	53.92
Total	395	100.00

Source: Field work, October 2022

Conflicts on water supply infrastructure amongst the communities of the Upper Noun Valley are dominated by the refusal to pay annual

subscription for maintenance 53.92% of the population is involved. The population believed such projects are financed from tax payer's money and maintenance needs to come from the same source of sponsor. Dichotomy in stakeholder's perception and violent fights are the least conflict observed during field work with 7.09 and 3.80 percent respectively.

3.3.1 Consequences of conflicts

In the absence of a formal protocol on water basin management and apportionment amongst the riparian communities in the Upper Noun Valley, continuous, regular and adequate domestic water supply systems is difficult to attain. This is because the valley area is composed of varied communities that depend on some stream and river sources that traverse the valley but with diverse tradi-cultural water harvesting systems, practices and infrastructure. The consequences of water conflicts within the communities of the study area is illustrated on Table 7.

Table 7. Consequences of water conflicts on the community

Consequences of Conflicts	Frequency	Percentage
Material loss	287	72.66
Human lost	14	01.27
Psychological trauma	94	26.07
Total	395	100.0

Source: Fieldwork, October 2022

Water conflicts observed in the Upper Noun Valley Communities show that material loss (72.66%) during such conflicts affects most of the inhabitants. These material losses are in the form of properties, financial and infrastructure damages. It is rare to observe such conflicts on domestic water lead to loss of live that why it observed the least (1.27 %). Many at times, people sustain injuries especially during the dry season when water supply drops. This situation is typical amongst water carriers who are the youths of both gender and had to trek for long distance in search of the white gold.

3.3.2 Conflicts management

Traditional policies (*Kwifon*, Fon) in the forms of beliefs and norms are used to preserve the water resources in all the village communities of the Upper Noun Valley. Most traditional policies on water are linked to conservation and conflict

management regulations. The communities implant sacred groves at catchments of water bodies, where the chief and elders go once a year during festivals to perform traditional rites for the gods. Ancestral reverence and belief in the spiritual power embedded in water resources has contributed largely in ensuring traditional policy on water catchment and customary environmental protection in all the village communities of the Upper Noun Valley. Consequently, the population prevents such water catchments through the prohibition of unauthorized entry or exploitation of such areas. This traditional policy has greatly enhanced the supply of water for domestic uses and has gone a long way to resolve conflicts emanating from water resource management. Believes and rules that prohibits fishing on ponds and that which do not allow livestock watering at spots where water is fetched for domestic purposes. In the villages, it is observed that the traditional authorities (*Ngumbah*) and priests/priestesses perform incantations for the gods to bless and prevent their water sources from getting dry. In some villages like in Bamessing, Babungo, Babessi, Bamunkumbit, Balikumbat and Baligansin certain days are declare as taboo days for some ponds, springs and rivers where washing of clothes and drawing of water for domestic use is not allowed. Such day is believed that the pond, spring and river gods could be seen by anybody fetching water.

The decentralisation process in Cameroon entrust Local Councils to play primordial role in the management of water resources within their council. The state also prescribes standards and guidelines for water harvesting systems and supply programmes. This is embedded in Law No. 98/005 of 14th April 1998 to lay down regulations governing water resources and Decree No. 2005/493 of 31st December 2005 laying down the procedures for delegating public drinking water and liquid sanitation services in urban and sub urban areas in Cameroon. This law ensures sustainability of water for domestic services (harvesting systems), delivery and conflict management policies in rural communities and small towns such as in the Upper Noun Valley. The local councils play a primordial role in the management of water resources within their council. The elaboration of a Local Council water resource management policy and strategy was first elaborated in the Cameroon Constitution Article 55 and Article 1 of the 1974 council law. Following the provision of these articles and the current provisions of the

law on decentralisation, the councils have strong legal instrument to negotiate with any supervisory authority and external support agencies or stakeholder in matters of domestic water harvesting and management.

4. CONCLUSION AND RECOMMENDATIONS

The relationships between stakeholder's participation policies as it triggers on water conflicts is calculated using Pearson's Correlation Coefficient at 0.01 significant level at a 2-tailed test. The results show a strong positive correlation between the variables of the study. From the correlation matrix it is observed that, stakeholder's participation policy is positively related with water conflict at a value of 85.4%, which is significant at 1% and indicated by the value (0.000). The relationship that exists between water conflict and stakeholder's participation with a value of 31.2% is also significant at 1%. Conclusively, the relationship between water conflict and all the policies of stakeholder are positive (weak) irrespective of the fact that stakeholder participatory policies has a higher and stronger relationship than water conflicts. To corroborate this result, spatio-temporal policies of stakeholders in the water sector (state, NGOs, Community, VDOs, Confessionals, political and economic elites and water users) in the Upper Noun Valley both contribute positively in creating diverse conflicts that hinders the smooth and sustainable harvesting of water resources for domestic needs. These stakeholders have diverse objectives, policies, systems, funding sources, technologies and monitoring mechanisms that go a long way to propagate diverse conflicts on water harvesting in the Upper Noun Valley. The study makes the following recommendations for a sustainable water management in the Upper Noun Valley.

Raising awareness at all levels is widely acknowledged to support the successful implementation of water (conservation) programs and management activities and is closely linked to capacity building. The communities of the Upper Noun Valley should raise awareness around the importance of water management, pollution management and the need to conserve water for the future generation. The lack of awareness in sustainable water management by water users in the study area has resulted in vandalism of water infrastructures and stealing of water pumps. The vandalism is exercised mostly

by the adolescents who spend all day long fetching water for their homes. More of these actions are manifested by the fact that there exist few functional stand taps and boreholes. Consequently, long queue observed at stand taps couple with the low flow of the systems. There is a general lack of awareness within the communities of the Upper Noun Valley regarding water scarcity, water pollution and the general economic value of water. Without adequate capacity building and awareness raising, the sustainability factor of water infrastructures suffers regularly.

Water need to be on the political agenda of the politicians not only to supply the population with abundant water, but also in order to address the critical development challenge of doing so in a safe and sustainable manner without compromising water resources that are essential to ecosystem services and functions. Water harvesting systems must be seen as more than just extraction technology. Other aspects linked to domestic water such as environmental impacts, livelihood mechanisms, conflict resolutions and enabling policy put in place by the stakeholders must be considered as primary as need to have water for the community's daily uses. These aspects are less regarded when it concerns water issues yet the indicators have a crucial bearing on the success or failure of any water harvesting system. The water supply systems, technology and related services for domestic needs in the Upper Noun Valley are averagely secured. It is generally observed that, projects in which the government finances, operates and administers are far less successful than those, which train the communities as the future managers and involve them directly in the management process. Such bottom up, self-reliance and the population centred systems technology and policy will sustainably guarantee water supply services and hence yielding to the water demands of the population.

The Bororos and Fulani community of Mayomate and Pihlimboh range land should adopt and implement time allocation to all categories of water users within their locality. Night hours and early mornings should be allocated to wild animals, mid-morning to before midday be allocated for domestic use (fetched by women and girls), whereas midday and the rest of the afternoon for their livestock. This program will ensure that all parties have access to water and reduce conflicts in water access particularly between humans and domestic livestock. The

practice will greatly encourage the sustainability of water sources around Lamissang, Pihlimboh, Mayomate, Gahsamn and Baligansin.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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