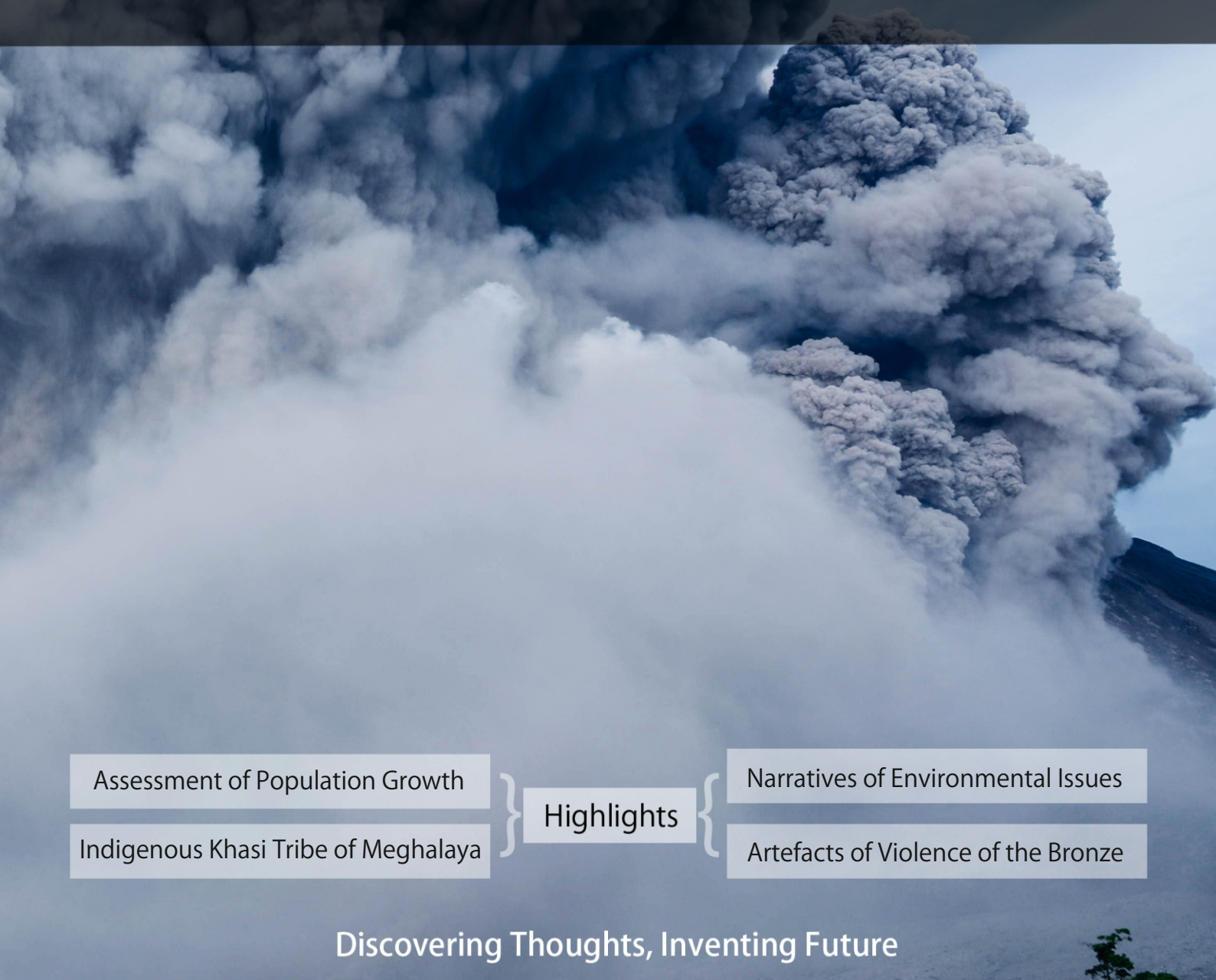
Online ISSN: 2249-460X
Print ISSN: 0975-587X
DOI: 10.17406/GJHSS

Global Journal

of Human Social Sciences: B

Geography, Geo-Sciences & Environmental Science & Disaster Management



Assessment of Population Growth

Indigenous Khasi Tribe of Meghalaya

Highlights

Narratives of Environmental Issues

Artefacts of Violence of the Bronze

Discovering Thoughts, Inventing Future

VOLUME 21 ISSUE 1 VERSION 1.0

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Volume 21 Issue 7 was originally issued as B1

Global Journal of Human-Social Science: B
Geography, Geo-Sciences, Environmental Science & Disaster Management

Global Journal of Human-Social Science: B
Geography, Geo-Sciences, Environmental Science & Disaster Management

Volume 21 Issue 1 (Ver. 1.0)

Open Association of Research Society

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United States of America
USA Toll Free: +001-888-839-7392
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Volume 21 Issue 7
Originally issued as B1



Global Journal of human-social science: b
Geography, Geo-Sciences, Environmental Science & Disaster Management
Volume 21 Issue 1 Version 1.0 Year 2021
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-460x & Print ISSN: 0975-587X

Narratives of Environmental Issues at the Pradoso's District of Vitória Da Conquista City in Bahia State/Brazil

By Vânia Mendes Da Silva Novais & Luiz Artur Dos Santos Cestari
University of Southwestern Bahia

Abstract- This research will propose the appreciation of local knowledge that came from intellectuals of tradition living at the Pradoso's district located in Vitória da Conquista-BA city, and it aims to understand an epistemology that expresses their specific aspects. It will point out the knowledge using an ecology that will take into an account at the same time the nonscientific understanding from these people and a theoretical standing against the epistemological practices from the dominant paradigm of modernity. The data were collected using narratives with older people in Pradoso's district as an empirical study of narrative inquiry about ways of life and environmental issues belonging to the culture of this peasant community. Hence, we believe the narratives offered a vital dialogue between emerged knowledge and scientific culture whose objective is describing the environmental issues at this community, valorizing traditional understanding and finding accordance with academic and scientific culture.

Keywords: *ecology of knowledge. intellectuals of tradition. narratives.*

GJHSS-B Classification: *FOR Code: 050299*



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Narratives of Environmental Issues at the Pradoso's District of Vitória Da Conquista City in Bahia State/Brazil

Vânia Mendes Da Silva Novais [α] & Luiz Artur Dos Santos Cestari [σ]

Abstract- **This research will propose the appreciation of local knowledge that came from intellectuals of tradition living at the Pradoso's district located in Vitória da Conquista-BA city, and it aims to understand an epistemology that expresses their specific aspects. It will point out the knowledge using an ecology that will take into an account at the same time the nonscientific understanding from these people and a theoretical standing against the epistemological practices from the dominant paradigm of modernity. The data were collected using narratives with older people in Pradoso's district as an empirical study of narrative inquiry about ways of life and environmental issues belonging to the culture of this peasant community. Hence, we believe the narratives offered a vital dialogue between emerged knowledge and scientific culture whose objective is describing the environmental issues at this community, valorizing traditional understanding and finding accordance with academic and scientific culture.**

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This paper resulting from grant MCTIC/CNPq (National Research Council/Brazil) Nº 28/2018 –Universal/Faixa B

Introduction

This research aims to report the intellectuals of tradition' narratives, and they refer to traditional residents with long experience of life in a community. Almeida (2017) elaborated the concept of intellectuals of tradition opposing to the restricted use of intellectual connected to a task of scientific and academic practices. She wrote her stance at the tracking of Edgar Morin's thinking seeking to critic modern science perspective and re-establish a dialogue between science and tradition.

The emergence of modern science brought a specifical logic of think in unconnected disciplines and at the same time in opposition to all forms of knowledge that was not legitimate in a discursive method that aimed to separate, test and mensurate. The concept of science, in accord with all spirit of modernity, guided a new world introducing by the enlightenment and the development of capitalism.

One of the first disruptions of modern science was the divorce between philosophy and science, speculation and experiment. As a result, the predominant thinking of science starts to support the stance of an outward scientist that can get out all influences of his subjectification such as values, beliefs, and symbolic myths. The second was the change of speculative writing by a scientific discourse resulting in variables and its mensuration. This conception of science was useful to the development of capitalism and legitimated a process of scientific naturalization that imposed the mode of knowing from Europe to all cultures around the world, undervaluing traditional knowledge of other people and specific cultures.

The historical process of modernity put in different sides, the science with an empirical, rational and logical discourse, and traditional knowledge including the philosophy that still received influences of the symbolic, mythic and magic narratives. This disruption was the base on which the way of knowing became more specialized and disciplinaries, and more useful and adequate to the modern capitalist society.

This modern way of thinking had many critical stances during the last century. Almeida (2017) pointed out authors like Ilya Prigogine, Edgar Morin, and Bruno Latour as critics of this modern knowledge. Still, she will construct her proposal based on Edgar Morin's theory of complexity. In this way, she put in emphasis on non-paradigmatic forms of academic workings accepting in its uncertainty, essays, and speculation.

Almeida (2017) augments favoring the non-hierarchy relationship between science and tradition, standing up for a different form of reading the world and using strategies that are closer to a sensitive logic. Different from academic sciences, intellectuals of tradition deliver their discourses using oral narrative, cultivating a listening and vision of physical phenomenon, animal behavior, plants, climate dynamics, and so forth. Almeida talking about this reading of the world, said that narratives be able to express what Gregory Batson named "pattern of interconnection", that is, a specific perception of this intellectual to read and make sense among things involving nature and human.

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Another argument that we bring to this research as a convergence with Almeida (2017) came from Santos (2010a, 2010b) and the demand to do justice to traditional people. The predominant and Eurocentric conception of knowledge over modern history denies all forms of knowing that do not agree with the Western understanding of the world. Santos pointed out the way out of this "epistemicide", Ecology of knowledge that considers the non-scientific comprehension of these peoples and goes against epistemological practices under the dominant paradigm of modernity.

An ecology of knowledge demands a gesture of conciliation in an intercultural approach and accepting it does not mean denying important scientific knowledge construct during the history of modern society. For instance, if you need to travel out of earth space, you must necessarily use all available technological resources. But if you will travel through the Amazon Forest, an experience of indigenous peoples makes it easy. There is no formula to this new and postcolonial thinker, only an open way of thinking and considering many experiences.

The subject of the research is the Pradoso district community located in the western portion of the Vitória da Conquista city in Bahia State/Brazil, 12 km from the municipal headquarters, with about 3,231 inhabitants (BRASIL, 2010). When we visit there, we could see signs of a devastating nature and a series of environmental disorders caused by activities such as the production of bricks, cookies, flour, other derivatives of cassava, agriculture, and livestock. Other activities are also included, such as eucalyptus culture and mineral exploration (MAIA; FONTES, 2011).

Moreover, if you look at it in detail, you can see houses constructed in an older lakebed, absence of riparian forests at the land adjacent, a worn-out soil and the sand of this lakebed removed to make bricks, no birds or other animals that are common at the rural areas, portions of sand that come from the hole resulting of excavation for a company that explores *Bentonite* - an absorbent aluminum phyllosilicate clay consisting mostly of montmorillonite.

Maia; Fontes (2011) have been studied the environmental dynamics of this place and making a reporting of environmental issues. Nevertheless, we consider older inhabitants' narrative to ascribe through the time different sceneries of this place and how nature was affected by a specific human action for a long time, reviving the feeling of these people about the devastation.

The paper aims to deliver narratives of older people of this community, including opinions, beliefs, values, representations, human and social actions from the perspective of these actors in intersubjectivity (MINAYO, 2012). The use of semi-structured and narrative interviews addressed issues of these intellectuals concerning the environment and their historical perceptions in a long coexistence with this community. Benjamin (1975) affirmed subjects are always involved with events in their narratives, and this text will offer an opportunity to express environmental issues produced by intellectuals of tradition in their community.

I. Theory and Methodological Proposal

a) *Intellectuals of tradition' narratives*

Since its beginnings, the desire to know more and more has led the human being to produce different strategies of thought. Lévi-Strauss (1976 apud ALMEIDA et al., 2013) draws our attention to the relevance of this ancestralism that preceded modern science and constituted the substrate of civilization. He considers the ability to observe and reflect continues even nowadays adapting to important discoveries.

Lévi-Strauss (1976 apud Almeida et al., 2013) pointed out knowledge of tradition is on the margins of scientific and institutional knowledge. Such as developed throughout human history, it corresponds to a "first science" closer to nature and which currently coexists with the development of technoscience in a global world. "[…] It is not, therefore, a stammering state of thought, but it is a model of understanding the world that parasitizes and constitutes the human condition" (ALMEIDA et al., 2013, p. 09)[1].

In this sense, traditional knowledge should not be understood or even reduced to an essay or a stage before a scientific explanation because these (tradition and science) express experiences based on different references and strategies (ALMEIDA, 2017). Despite all the efforts of sciences to suppress traditions, many traditional communities have not yet been co-opted by scientific culture, such as, for instance, the peasants, indigenous, *quilombolas*, riverside, seafood fisher, and gypsy communities. The permanence of tradition and their survival depends almost exclusively on its knowledge and techniques making these individuals opposite their difficulties develop creative solutions to their daily problems.

Scientific and traditional knowledge does not correspond to higher and lower levels of knowing; these only manifest different scales of readings. They express the: "[...] universality of human thought in the face of things, articulating the same operations build throughout the history: identifying, distinguishing, relating, hierarchizing, opposing, building significant sets" (ALMEIDA, 2017, p. 75, own translation). These ways of knowing used to have their strategies closer to the logic

[1] "[…] Não se trata, portanto, de um estado balbuciante do pensamento, mas trata-se de um modelo de compreensão do mundo que parasita e constitui a condição humana" (ALMEIDA et al., 2013, p. 09).

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of the sensitive (LÉVI-STRAUSS, 1976 apud ALMEIDA, 2017).

The emergent modern science failed to register it, and for this reason, it lost traditional knowledge incurred an inestimable debt with this cosmology of thought. Orality does not only precede but sustains rationality and provide an extremely fruitful dialogue among the different matrices of knowledge (VERGANI, 2002 apud ALMEIDA, 2017). It demands: "The fertility of this dialogue requires, however, that one does not reduce knowledge to the other, that one does not validate by criteria stipulated by the other, since they are different strategies for thinking about the world" (ALMEIDA, 2017, p. 114).

The advent of modern science to affirm as superior knowledge was also marked by the replacing of the "old sage" by the "modern intellectual". The magical priests were responsible for announcing sacred discourses and acting as producers and guardians of myths. Intellectuals, nevertheless, submitted all myths and sacred discourses to the proof of rational and objective criticism, becoming prophets of scientific and universal ideas (MORIN, 1986 apud ALMEIDA, 2017).

The distinction between wise and ignorant was another hierarchical division resulted in modernity. On the one hand, modern intellectuals despise all knowledge that was not considered operational or technical. On the other, the so-called illiterates who had an extraordinary understanding of animals, vegetables, fishing techniques, medicinal herbs, production of instruments, among others, had their ancient civilizations massacred by the so-called superior beings and cultures (MORIN, 1998 apud ALMEIDA, 2017).

The development of sciences produced a kind of effacement of the rural and traditional populations continuing to systematize a diverse range of knowledge to solve daily problems and building a "[...] rich corpus of symbolic and mythical understanding of the world" (ALMEIDA, 2017, p. 47, own translation)[2]. These cognitive patterns of living and knowing to express more and more complex how some people stand out for their different way of observing phenomena and creating specific method, deciphering and explaining; systematizing, reorganizing, and polishing the representations about the world.

These individuals receive different names depending on their culture and history: "[...] shamans, witchdoctor, healers, a council of elders, priests, scientists" (ALMEIDA, 2017, p. 48, own translation)[3]. Regardless of the peculiarities where they live, some of them developing with more insight and perseverance the ability to reflect, understand, and speak about the phenomena. Called intellectuals, they can handle information, transforming it into pertinent knowledge, and live-in traditional cultures.

Intellectual on this situation is not synonymous with the owner of scientific culture. He is every individual capable of systematizing information and transforming his observations into knowledge and seeks to keep curiosity about his world, who observes the different faces of the same phenomenon and refines daily his gaze on new, contradictory, and complementary information. An intellectual is one who is not satisfied with a single interpretation. (SILVA; ALMEIDA, 2007).

It is vital to say intellectuals of the tradition are not opposed to academics. They are the same but favorite some cognitive strategies over others, using specific mental models carried out by their experiences of life and how they proceed to spread their knowledge (ALMEIDA, 2017). Academic intellectuals often describe their results as common sense. However, they produce sciences that although operating through universal skills expresses different contexts, narratives, and method.

b) An ecology of knowledge

According to Santos (2010), the epistemological paradigm of modern science that emerged in the scientific revolution had scientific knowledge as the only valid form of experience based on the separation between human/nature, subject/object, nature/culture, body/psychic, as well as reducing the complexity of the world that excluded all forms of knowledge that did not rely on these and other dualisms. This vision produced a peculiar understanding of the modern world that followed the empirical-rational procedure based on experience, observation, and reason.

In this sense, the epistemological assumption of modernity excluded all disagree with cognitive-instrumental rationality, thus creating the monopoly of science in the name of colonialism, making improper other experiences and wasting wealthy perspectives present in cultural and multifaceted diversity. (SANTOS, 2010).

During the twentieth century, the advance of modern science was the expression of its limits, putting in question the sovereignty of the current epistemological model (GOMES, 2012). In this context, Santos (2010b) presents Southern Epistemologies as a rebuke of modern science. He points out the exclusion and suppression of cultures and widespread knowledge that embracing African descendants' people, peasants and indigenous, understanding the colonialism beyond the use of domination by force and comprised an extremely uneven hegemony of perception (SANTOS, 2010b).

Southern Epistemologies aim to overcome the modern Western thought as abyssal thinking through imaginary lines that divide and polarize the world into North and South, fragmenting between those who are

[2] "[...] rico corpus da compreensão simbólica e mítica dos fenômenos do mundo" (ALMEIDA, 2017, p. 47).

[3] "[...] xamãs, pajés, curandeiras, conselho de anciãos, sacerdotes, cientistas" (ALMEIDA, 2017, p. 48).

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"on this side of the line" and those who are "On the other side of the line". The division makes one side of reality disappears, becomes it non-existent or even as a result of non-existent (SANTOS, 2010).

Southern Epistemologies comprise a set of cognitive practices and knowledge validation criteria based on the experience of these social groups that have suffered and still suffer the injustices of the modern scientific paradigm. Santos proposed to discuss the social, political, cultural, and epistemological problems of society, considering our sufficient or adequate knowledge to fight consciously for global social justice that is only possible to consider a worldwide cognitive justice.

Post-abyssal thinking is a new way of thinking about society. Global cognitive justice is egalitarian, and the construction of intellectual discourse must be equitable in the world, valuing the diversity of experiences. Santos's argument in favor of an "ecology of knowledge" that implies exploring the internal plurality of science as an alternative scientific practice, providing interaction and interdependence between scientific knowledge and other types of experience (SANTOS; MENEZES, 2010).

The ecology of knowledge demonstrates that there are other valuable modes of intervention in the real. As an example, Santos (2010b) pointed out the relevant role of peasant and indigenous knowledge in preserving biodiversity, given attention to the vast, wealthy experience of these communities to made it possible and preserve "[...] ways of life, symbolic universes and vital information for survival in hostile environments based exclusively on oral tradition" (SANTOS, 2010b, p. 58, own translation)[4].

The ecology makes possible the dialogue among knowledge that can be useful for the progress of social struggles by those who intervene in them. However, it comprises a still embryonic idea that can only develop based on the different forms of experiences. To think and promote diversity and plurality, it is not auspicious that modern science is neglected, or much less refused. There is a vast constellation of knowledge that coexists with the practices of non-scientific knowledge, that have survived the epistemicide, or that have emerged in the struggles against inequalities and discrimination arising, above all, from the hegemonic epistemological model.

c) Narrative inquiry as a research method

This work is an empirical study of narrative inquiry to understand the perception of the environment. The data was collected employing semi-structured interviews with four traditional residents living over 70 years ago and have spent their entire life at the Pradoso district of the Vitória da Conquista city in Bahia State/Brazil. The interviews recorded obtained the narratives about their ways of life and environmental issues belonging to the culture of this peasant community. The dialogues were fully transcribed and, subsequently, organized in the process of analysis.

At first, we must draw attention that they did not assume any ethnic or collective identification despite many papers in human and social sciences have spread the concept of "traditional populations" referring to these social groups (DIEGUES; ARRUDA 2001 Apud ALEGARE; HIGUCHI; BRUNO, 2014). Second, Almeida (2017) presents the argument that these people can be "intellectuals of tradition". In this sense, the challenge of this working with narratives is to transform information into knowledge reporting their representations of the world, as they understand, interpret, and can only be expressed if not by themselves.

Working with narrative demands to put into question the difference between narrating and description. In an attempt of it, we will refer to Lukacs' (1965) text entitled "narrate or describe?" using its criteria to distinguish these terms in writing. Lukacs affirms that narrating is a type of intersubjective involvement that considers the life and the problems of the community, what is in our vision more adequate to intellectuals of tradition. On the other hand, the description is a more objective relationship, an observer position, because it does not directly cause an interrelationship between the facts and the subjects.

Hence, the narratives come to narrating because embracing life, and at the same time, environmental issues of these people. The text clippings are narratives that allow us to talk about their world without being assimilated into ours. Indeed, our production is still incomplete without these narratives considering the long-term experiential knowledge as a narrative of what was the environment in comparison to what it is in nowadays.

The history of the Pradoso community began with Portuguese emigrants. During the years of 1959 and 1960, the brothers José Nicolau and Domingos Rodrigues do Prado settled 12 km from Imperial Vila da Vitória that is in nowadays Vitória da Conquista city (NOGUEIRA, 1988). Since 1935, the district was known "Furado das Éguas", and it started to be called Pradoso due to the junction of the surname Prado -from that family - with the number twelve referring to the distance from the municipal headquarters (Prado + doze (12) = Pradoso, in Portuguese) (JESUS, 2012).

Pradoso is a settlement inhabited in a disorderly manner where houses, lots, and blocks are randomly distributed. The roads, with few exceptions, have no paving. Regarding public services in nowadays, it has an elementary school and a health post, building and maintained by the city hall, as well as a high school

[4] "[...] de modos de vida, universos simbólicos e informações vitais para a sobrevivência em ambientes hostis com base exclusivamente na tradição oral" (SANTOS, 2010b, p. 58).

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belonging to the educational structure of the Bahia State.

The location has a negative humidity index and the absence of a water surplus. The total annual rainfall varies between 500 and 800 mm. Despite the difficulties related to access to water, Pradoso has considerable water potential due to two streams, the Quatis and the Gameleira streams. However, without planning and public policies, the inhabitants of the Pradoso have been with a series of water situations. (ALVES; ALVES, 2007).

The empirical research works with the narratives of four old inhabitants of Pradoso and the interviews were carried out between August 2017 and February 2018. The oral and narrative interviews to map environmental issues pertinent to the local reality, emphasizing the socio-environmental aspects. We did the interviews with four retired rural workers: Mr. Jonas, 80 years old; Mr. João, knowing as "Janga", 73 years old; Mr. José "Seu Zequinha", 84 years old and a breeder of dairy cattle; Mr. Auzil called "Seu Zil" 70 years old and a small producer of curd.

II. Results and Discussion

During the interviews, we asked about the environment emphasizing the issue of water resources, the use of medicinal herbs, predominant crops, environmental degradation, flora and fauna, the relationship with nature, and observations of changing landscape throughout of time.

The interviews begun to refer to the perception of the environment, and the responses reported the water issue and the damage caused by the drought. One of them said:

> [...] I understand the terrible thing here for us [...] is the water because the drought is terrific here. [...] These lagoons dried up; some existed here in the '60s and '70s. It gushed water, today it dried, it did not add more water ... It has been 20 years since it dried [...] it did not rain here anymore [...] it rains a little, it is dry here [...] There was nothing else. We plant and the earth gives nothing (JONAS, 2017)[5].

It considers the interviewees' concern valid since the district is in a region of predominantly semi-arid climate characterized by low rainfall - on average 717 mm/year - with a concentrated rainy period between November and January (JESUS, 2011). The riverbed of the district makes part of a relevant hydrographic network. It composed the principal source of the Quati stream flowing into the Jibóia stream, an affluent of the Pardo River that makes up a federal hydrographic basin (JESUS, 2011). However, the long periods without rains and the inadequate use of water in many economic activities cause inconveniences and result in worn scenery.

The image narrative of Mr. Jonas brings a representation that disagrees with the current environment showing a relationship with the water that no longer exists. This background image is only possible if we accept it as part of Pradoso's history. We can affirm that the lack of public policies, the increase in population density, and the disordered urban expansion have implied in the degradation of the water sources in Vitória da Conquista. However, the images improved and make the scenery more concrete, expressing their sense of reality. Mr. Jonas called attention to the fact that there is a course of the river there like you can observe at the clipping's, and if you take into consideration the hydrographic network. In the past, the same river course gushed water, now it is only a dried and unproductive earth.

These aspects and low rainfall have caused a water crisis that affects the inhabitants of the municipality, including the Pradoso district, especially concerning economic and subsistence activities like agriculture, extractive, or fishing. About it, Mr. Zil nostalgically remembers:

> "[...] it didn't rain more [...] when it truly rained you would go there at night [...] with the can, a lamp and the fishes (traíras) jumped over at night [...] people said: oh, tonight I'm going to get a big fish (um trairão) at the 'moiadô' (shade in the middle of the pasture where the cattle take refuge and rest from the sun). Each one caught a huge fish [...] in all water at this low."[6].

After listening Mr. Zil, we ask if he knows one of the causes of the drought, and he replied: "[...] listen well! According to the man who studies the stars, this place here will turn to desert. Each year it rainless. In the past, the Pradoso had already filled with water."[7] .

Although we have not found studies on a possible desertification process in the Pradoso region, Paixão et al. (2009 apud Santos and Aquino 2017) identified irregular and discontinuous patches conducive the Bahia State to desertification. Therefore, if studies or public policies are not prepared, some places like Pradoso will suffer of desertification because it already brings aspects for this process.

The interviewees remembered a socio-economic problem that causes environmental damage. One of the sources, the Bocanha lagoon is grounded,

[5] [...] entendo é a coisa terrível aqui pra gente [...] é a água, pois é uma seca terrível aqui [...] Essas lagoa secou, umas lagoa que tinha. [...] foi no ano de 60, 70. Ela ficava abanando água, hoje secou, não juntou mais água... Já faz uns 20 anos que secou [...] não choveu mais aqui [...] chove pouquinho... Aqui é seco [...] Não deu mais nada. A gente planta, não dá nada (JONAS).

[6] [...] num choveu mais [...] quando chovia mermo cê saia de noite [...] com as lata, com uma lâmpada e as traíra de noite elas malha [...] gente falava: ó hoje de noite eu vô matá uma traíra no moiadô dava cada uma traíra enorme [...] em toda essa baixa era água.(ZIL)

[7] "[...] a seca, escuta bem! Segundo os homem que estuda os astro, aqui o norte vai virar deserto. Cada ano vai chover mais pouco. A gente no Pradoso [...] e toda essa baixa era cheia de água".

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and houses are built on it. According to Mr Janga: "[...] this path over there, these places that you can see, these low-hanging houses are because it has not rained more like it used to rain in the past, but if it rains more than two hundred buildings could stay inside Water. They only ground the lagoons and making them homes."[8] .

These houses, like the other residences in Pradoso, do not have a sewage network, and residents use pits to dump their waste leading to contamination of the soil and groundwater. During rainy periods, the canal can overflow and contaminate the water besides causing flooding of the homes and collapse of the buildings.

Concerning the Mata de Cipó that is local vegetation and a transition area between the Biomes of the Caatinga and the Atlantic Forest, there is a mixture of species characteristic of the two biomes, and endemic species little known (JESUS, 2011). Over a long time, native flora has been and still indiscriminately removed for different economic activities, such as charcoal production, flour roasting, brick burning, furniture making, among others, without proper handling and the absence of reforestation practices.

About it, Mr. Jonas regrets the occurrence of deforestation. Also, he makes a relationship between the devastation of the native forest and the water crisis at the Pradoso: "[...] the people ended the liana bush here because it was bush, more bush ... The people ended it all. Only the 'capoeirão' left and the forest is gone. He says the bush pulls the rain, and the people ends it at all, it is all over in this terrible drought." [9].

Regarding the species that existed before deforestation, Mr Jonas recalls: "[...] there was the bastion, there were [...] the same wood from vines, *braúna*. There is still a *braúna* right there [...], there is an iron stick that was up there [...] in the old-time [...] my father used to say that people removed the good wood [...], *vinhático*, even cedar had everything here."[10].

Still, on the Pradoso's flora, Mr Zil recalls the fruit species that also became scarce with deforestation: "[...] there were [...] teresinha fruits, cambuí, oi de boi [...] cadela [...] grapiá, gameleira fruit [...] jatobá [...] the fruits that when we were a child, we collected them. Do you know? We harvest with a shovel."[11].

Deforestation is one of the environmental problems today because it affects socioeconomic aspects. From an ecological point of view, deforestation provides other damages with the alteration in the habitats causing disturbances for animals that used for food and or reproduction. Then, they end up driven away. About the deforestation process and its consequences for the local fauna, Mr Janga said: "[...] there was pressure in the forest, there was too much pressure to kill, there was an armadillo, there was everything [...] they opened everything and finished the bush, they still started planting eucalyptus…"[12].

Regarding the impoverishment of the soil that, according to Maia and Fontes (2011), occurred due to the lack of knowledge and adequate agricultural management techniques, the interviewees are responsible only for water scarcity for the damage caused to the land:

> The land is good. Today the land [...] depends on the rain [...] It is just like in that forest there. In this forest there, the people boast that the land is good, but it is because it rains a lot and there is a corner that it does not rain [...] It's like here, from here, from there it was raining a lot. The people used to mow and produce, the time is now very arid, but when it gets to the point of catching a rain spike, it gives us everything (JANGA, 2017)[13].

Regarding the use of medicinal herbs, Mr. Jonas told his mother used to use them frequently, showing that some practices are passed from generation to generation in the district. "[...] Then, only lemongrass and this Lapa grass and orange or a little lemon peel [...] here all my life uses it, my mother liked to plant these small plants to make tea, she cultivated and watered." (JONAS, 2017)[14]. On this subject, Mr. Zil reports: "[...] there was a wood that served as a medicine called 'for everything', another [...] called 'pigtail' when you had a bad belly, you took the bark and

[8] "[...] essa vereda aí, esses lugar que cê ver o povo aterrano essas baxada fazeno casa é porque num chuveu mais que nem chuvia antigamente, mas se chuver igual antigamente fica mais de duzentas casa den d'agua. É aterrando, aterrando as lagoa e fazeno casa".

[9] "[...] os mato de cipó aqui o povo acabou, porque era mato, mais mato... O povo acabou tudo, só ficou os capoeirãovéi, cabou a mata. Fala que o mato puxa a chuva e quando acaba o povo acabou tudo por isso essa seca terrível".

[10] "[...] tinha o bastião, tinha [...] madeira mesma de mata de cipó, braúna. Ali mesmo ainda tem uma braúna [...], tem um pau ferro que ficou lá no alto lá [...] no tempo velho [...] meu pai falava que tiravam as madeira [...] boa, vinhático, até cedro tinha tudo aqui".

[11] "[...] tinha [...] as fruta [...] teresinha, cambuí, oi de boi [...] cadela [...] grapiá, fruta de gameleira [...] jatobá [...] as fruta que quando nóis era criança no tempo agente catava. Sabe? Nois catava pá pudêalimetá".

[12] "[...] de premera nos mato tinha muito, tinha de premera é fácil demais procêmatá, tinha tatu, tinha viado tinha as coisa tudo [...] foi abrino, acabano os mato, o povo pegôprantá Eucalipto também".

[13] A terra é boa. Que hoje a terra [...] depende de ter chuva [...] É que nem nessas mata aí. Essas mata o povo gaba que as terra é boa, mas é porque chove bastante e tem canto que não chove [...] É que nem aqui, de premera aqui, de premera chovia mais bastante era constante a chuva. O povo prantava e produzia, mar agora os tempo tá muito seco, mas de chegasse ao ponto de pegar um pico de chuva aqui dá tudo quanto é coisa (JANGA, 2017).

[14] "[...] Aí só erva-cidreira e esse capim da lapa e laranja e um pezinho de limão [...] aqui toda a vida usa, minha mãe gostava muito de plantar essas plantazinhas para fazer chá, ela plantava e molhava" (JONAS, 2017).

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put it in the water and took it [...] you put it into the water, call it diffusion."[15].

Concerning economic activities, family farming with grains, vegetables and medicinal plants is of great importance. Cassava culture stood out in the local economy. However, in recent decades the local economic dynamics have changed due to drought, as explained by Mr. Janga:

The cassava is expensive, and the people were crazy to plant, the rain is always scarcer [...] there are times when it does not rain [...], and the people go to fading. Moreover, some people still have some cassava, but [...] the manioc for working here comes from outside [...] Looks, the fields here were full of manioc in the past, today they are weak. It is a little plantation. Here everything has changed, today it is no more than a factory, of biscuits, flour, *beiju* and another part a piece of the garden.[16].

During the drought, rural workers use to work with brick making. However, this activity has lost ground in the local economy due to the lack of clay, its prior raw material. Thus, workers have been looking for jobs in other activities like the mining industries, third-party farms, in family homes or local businesses, and free markets. Regarding the small reserves of clay, Mr. Jonas talked about the responsibility of anthropic action in the process of the lack of clay:

> [...] In the old days, the people did many brick masonries to make houses. [...] The people sank the pond bed by removing the clay. A million bricks came from here. [...] Today, everything ended and appeared that big block. [...] The people did not make bricks anymore. Some still do a little like this [...], but it is hard [...] The clay is over [...] The good clay is over.[17]

In general, the lack of clay from central areas of the Pradoso forces consequently the worker man moving to another mining. It results in the consequent reduction in pottery activity, increasing difficulties of the local people in periods of drought (ALVES; ALVES, 2007). About this process, Mr. Zequinha relates the lack of clay to the impoverishment of the soil:

> What did this clay become? The clay is gone. Did it not? There are many years of working. Everything is over. [...] because it was all taken away, and taking it out, it just ends. Does it not? There is the land, but it is like a flagstone, which is not for pasture. Is not? For production and to create or plant a bush, a grass, everything became hard to do.[18]

Pradoso's country person has been looking for other alternatives to life due to difficulties in developing agricultural and pottery activities. In this context, biscuit factories, small businesses, and sawmills stood out. About the origin of the wood used in carpentry and sawmills, Mr. Jonas informs us about the possible illegal removal of the wood. He said: "I do not know how they find this wood, which today is difficult, but it is there [...] he planted the eucalyptus, but they buy it there because the vine vegetation here the people ended because it was bush, more bush [...] the people finished everything".[19]

How about monthly income, many of inhabitants there are in retirement. It was of great importance for the backcountry, especially after the drought that hit Pradoso, making many economic activities previously developed unfeasible. "[...] If it weren't for retirement [...] I would be in a worse situation" (JONAS, 2017) [20].

Maia, Fontes (2011), and Jesus (2011; 2012) had already talked about the change of socio-economic dynamics at the district and the main activities carried out by young people and other economically active populations. The mining companies' jobs highlighted the positive and negative aspects of this type of activity. According to Mr. Zequinha, his children and other young people in the district have been working with: "[...] a truck in these ore things [...] like here on the side where they speak Santa Helena [...] There is also a quarry [...] ah good because it takes a lot of work for the class to be good [...] thank god!" Mr. Zil agrees with Mr. Zequinha [21]:

> "Here comes the mining firm [...] it started there; it was job damage by the people. You see a bit of a family man from here that everything used there. There Thank God! There

[15] "[...] tinha uma madeira que servia de remédio chamado 'pra tudo', outra [...] chamada 'catinga de porco', quando cêtava com a barriga ruim, pegava as casca colocava dentro da água e tomava [...] cê bota dendágua, chama difusão".

[16] A mandioca muito cara, o povo foi parano de prantá, a chuva sempre mais escassa [...] tem hora que não chove [...] e o povo vai ismureceno, mais inda dá, tem gente que inda tem umas mandioquinha por aí [...] mais as mandioca pra trabaiá aqui vem mais é de fora [...] Óia, antigamente as roça aqui era de mandioca mas hoje tá fraco. Táprantano pouco. Aqui mudou o esquema daqui aqui hoje é mais fábrica, de biscoito, de farinha, de beiju e outra parte faz horta.

[17] [...] de primeiro aqui o povo fez muito foi alvenaria de tijolinho pra fazer casa [...] O povo fundou a lagoa toda tirando o barro. Aqui fez bem um milhão de tijolo [...] Hoje acabou aquilo tudo e apareceu também esse bloco aí que é maior [...] o povo não fez mais tijolo não. Uns ainda faz um pouquinho assim [...] mas é difícil [...] O barro acabou [...] O barro bom mesmo acabou tudo.

[18] Que virô, como diz, barrero né? É porque o barro [...] cabô, gente [...] muitos ano aí trabalhano [...] cabô tudo [...] pruque o produto vai tirano, tirano só vai acabano né? Aí fica a terra aí mas fica feito lajedo coisa assim, nem pra pasto direito não sai porque há uns caso que tira, aquilo acaba né? Aquela produção e também pra criar um mato, um capim, uma coisa fica mar difícil também.

[19]: "não sei como é que eles acha essa madeira, que hoje do jeito que tá difícil, mas pega aí escondido [...] plantou o eucalipto, mas eles compra aí, porque os mato de cipó aqui o povo acabou, porque era mato, mais mato [...] o povo acabou tudo".

[20] "[...] Se não fosse a aposentadoria [...] tava aí numa pior terrível" (JONAS, 2017).

[21] "[...] caminhão nessas coisa [...] minério que tem aí como aqui do lado que eles fala Santa Helena [...] Aqui tem uma pedreira também [...] ah bom porque dá trabalho pá turma é bom [...] Graças a Deus!"

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> was no more land, in a few more bricks, this firm came up and paid the staff here, that's it." [22]

Over the past ten years, the extraction of bentonite has significantly changed the socio-economic and environmental. Still little known, bentonite comprises a mineral used in different industrial applications, namely: production of drilling fluid for drilling wells, iron ore pelletizing, sand binder for foundry, sanitary granules, animal feed, deodorization and dehydration of oils, clarification of beverages, civil construction, ceramics, cleaning material and cosmetics (TOMIO et al., 1999 apud JESUS, 2012). Besides, other activities like companies extract gravel and marble, plant, and process of eucalyptus changed the socio-economic, environmental dynamics of the district.

> [...] It is each rock saw. Here, thank God, many people are working in these jobs. These stones they take out has 30 tonnes. They are overturning the ravines of the mountain. It's not very good. [...] People use to say the eucalyptus is not good. They say it draws a lot of water, but I do not know why there is the farm that has these weirs that I had spoken. The water undermined are stronger. The tank is full (JANGA, 2017)[23].

The doubt raised by Mr. Janga about the damage of eucalyptus plantations cause to water resources corresponds to ambiguities that also exist in the academy, considering that the culture of eucalyptus has been the subject of controversial and heated debates between the agreeing positions and the contrary to the development of the culture of this exotic tree species.

We believe that the exploitation of bentonite has influence altering the local economy because hundreds of residents of Pradoso work directly or indirectly at the Companhia Brasileira de Bentonita - CBB. However, if, on the one hand, the mining is profitable because offers jobs and help to boost the local economy, on the other hand, invaluable damage resulting from it.

During the dialogues, the intellectuals of tradition did not point out negative aspects of mining. On the contrary, they have gone through many problems due to the scarcity of cassava and clay. Hence, the residents of the district see mining as a possibility of raising income every month of the year and keeping the formal work. In this way, we realized that the residents of Pradoso did not receive information from the companies, or the public authorities, regarding the damage caused by the mining industry.

Despite the impact resulting from mineral extraction, the development of traditional activities, such as pottery, agricultural production and the manufacture of flour and other derivatives of cassava is still relevant for the inhabitants of the district. However, these mining activities has changed the characteristics of working in Pradoso's district. Small producers report difficulties in hiring temporary labor at harvest times mainly in the June period, when there is a greater demand for cookies. Nevertheless, when many people who worked as day laborers on third-party properties find the opportunity to work in mining, they opt for formal employment.

These changes are still subtle, but the beginning of a new socio-economic and environmental configuration is notable with mining:

> [...] The people came up with this ore business, they are on a mountain range, and they employ many people there. There is also another piece that removes the gravel, which waters the stone, many works in this mining work. And biscuit factory, where there is about ten biscuit factory that employs many people. And another thing you have here is a sawmill. There are about eight sawmills, some are already old, but the sawmill hardly employs anyone, the owners even work (JONAS, 2017).

Another relevant point addressed was the change in the local landscape due to the socio-economic and environmental changes that have occurred in the region since the last decades:

> [...] I remember what it was like to kill the bushes, where we used to call these places where there was no house next to Vereda [...] there were no houses [...] when I was a boy [...] those down here had no home, it was just bush. When it rains, it was water for every side. [...] We used to let cattle up there [...] the cows turned here until there near that big asphalt, and there was almost no home. After, it constructed houses about here (JANGA, 2017).[24]

We ask too about the environmental problems in the district, and the causes and possible solutions for damage to nature. We realize the intellectuals of tradition are not aware of most of the environmental impacts existing in Pradoso, except for drought and deforestation. However, even if they are aware of human responsibility for some environmental damage, they do not consider themselves co-participants in the process, attributing the fault to their predecessors.

At the end of the dialogues and analysis of the narratives, we noticed our interlocutors could be

[22] Aí vem as firma de mineração [...] aí começou aí foi dano emprego po povo. Cê ver um tanto de pai de família daqui que tudo empregado lá. Aí Graças a Deus! Tinha roça acabou, num faz mais tijolo, surgiu essa firma e paga o pessoal aqui aí táviveno disso.

[23] [...] É cada serra de brita. Aqui graças a Deus trabaia muita gente empregada nesses trabai, essas pedra que eles tira [...] ela com 30 tonelada [...] eles tá dirrubano os barranco da serra pá tirá [...] O pessoal fala que o Eucalipto num é muito bom. Diz que puxa muita água, mas eu num sei não porque ali tem a fazenda que tem esses auçude que eu falo os eucalipto é até perto e a minação nunca parô. A minação forte, o tanque só vevechei (JANGA, 2017).

[24] [...] eu lembro como é que era os mato, as baxada aqui, aqui de premera a gente chamava esses local aonde é que não tinha casa do lado [...] de Vereda [...] num tinha quais casa [...] quando eu era menino [...] essas baixada aqui não tinha casa, era só mato. Quando chuvia era água pra tudo quanto é canto. [...] A gente soltava gado lá em cima [...] as vaca girava aqui até lá perto daquele asfalto grande e não tinha quase casa. Aí foi enchendo de casa (JANGA, 2017).

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designated intellectuals of tradition. They are individuals who, despite little or no schooling, had obtained throughout their trajectory a rich learning based on observations and reports. They are transmitted through oral communication and systematized as valid and relevant knowledge.

The knowledge produced by the interviewees was only possible thanks to their proximity to nature and the constant struggle for survival. These people are ready to face everyday difficulties. They remember events around them and are careful observers of the phenomena of nature, interpreting the world with consistency and lucidity.

Throughout its trajectory, Pradoso went through cycles of economic exploitation that also included cycles of environmental degradation. These cycles started with deforestation for agriculture - passing through the culture of cassava - which led to the degradation of the soil and the manufacture of bricks - with the removal of clay from the riverbed itself. Currently, the impact of the subsoil resulting of the extraction of mineral resources.

We emphasize the narratives of the older adults helped us to reach this conclusion due to the knowledge that emerged in narratives, contributing to the few scientific research on the occupation and environmental degradation in the district. Thus, we reaffirm contrary to what scientific culture talks this knowledge is a valid form and not only common sense.

One relevant question, the knowledge of tradition is not displaced from reality and separated by objects. Intellectuals of tradition approach connecting reality. For instance, they do not only deal with plants, but also with water, animals, climate, deities, among many other aspects. Their lives relate to all these elements due to the very reality in which they live so that nature appears to them as a set of interconnected factors.

In scientific and specialized culture, contrary to what occurs in the knowledge of tradition, the elements are studied in a dissociated way. When dealing with Pradoso, each academic intellectual addresses a type of problem existing in the district that draws his attention because it is more relevant to his area of expertise. One addresses the water issue, another the deforestation, and another the change in the socio-economic profile of the residents.

Developed on the margins, these traditional understanding demonstrate the existence of thought based on homologies that interconnect properties and attributes arising from different domains and orders. It is possible to promote an ecology of knowledge, and the valuation of different knowledge. The ecology of knowledge operates in a collective understanding that aims to provide social emancipation.

Despite the wisdom that emerged in the interviewees' narratives, we could notice the lack of knowledge, whether related to environmental, social, historical, cultural, or economic aspects. We emphasize that ignorance, regardless of its level, does not dismay the interviewees of the quality of intellectuals of the tradition, considering that one of the basic principles of the ecology of knowledge is the recognition of ignorance as a starting point but also as a point of arrival. Knowledge of tradition and scientific culture has gaps and limits. For this reason, it is essential to overcome epistemological barriers and dialogue between different types of knowledge with a view to environmental sustainability.

III. Conclusion

The reading of scientific publications, the observation of the landscape of the Pradoso, and the dialogue with its inhabitants allowed us to realize that the use of the natural resources of the Pradoso's district was and still do without considering its sustainability. This fact has generated a series of socio-environmental problems that disrupt the nature and compromise the sustainability of the social groups who live there.

Another important aspect is related to changes in the economic dynamics of Pradoso with the replacement of previously predominant activities, such as brickmaking, subsistence agriculture, and production of cassava derivatives, with eucalyptus culture and the mining industry. This economic change also transforms the social profile of the inhabitants and in the local landscape.

We note that the intellectuals of the tradition interviewed have remarkable knowledge about the fauna and flora of the Pradoso and its alteration due to deforestation. Another environmental aspect addressed in the interlocutions concerns the severe drought that hit the district and caused injuries to nature and the local economy.

The interlocutors also know the historical, cultural, social, and geographical aspects of the district. However, concerning human responsibility in environmental degradation, it is common for residents to state that the absence of rain and the scarcity of other natural resources is due to the divine will.

Although the absence of scientific knowledge, it is common for country people to resort to local knowledge to solve their daily problems. We noticed constraints by our interlocutors when they affirmed that they had little or no study, and for this reason, they could not contribute with us.

These initial interviewees' refusal denotes that these collaborators, like so many other intellectuals of the tradition, suffered and still suffer from the epistemicide imposed by modern science. In the name of science, it wastes the richness of the perspectives present in cultural diversity and in the multifaceted visions of the world they play. Thus, we reiterate the

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importance of developing an ecology of knowledge in favors of the valorization of knowledge systematized by traditional peoples so that they have the credibility to participate in epistemological debates with other understanding including scientific knowledge.

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Global Journal of human-social science: b
Geography, Geo-Sciences, Environmental Science & Disaster Management
Volume 21 Issue 1 Version 1.0 Year 2021
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-460x & Print ISSN: 0975-587X

Artefacts of Violence of the Bronze and Copper Ages in the South of Western Siberia

By A. P. Borodovskiy

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GJHSS-B Classification: FOR Code: 210199

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Artefacts of Violence of the Bronze and Copper Ages in the South of Western Siberia

A. P. Borodovskiy

Abstract- **In the archeological sources, the facts of violent actions are expressed at several levels. They can include peculiarities of burial traditions, traumatic effects on paleoanthropological materials, objects symbolizing weapons and images of military conflicts. By now, there has been quite a variety of such facts revealed on the southern territory of the Western Siberia (Fig.1) for the Late Bronze and Early Iron Ages (1000 BC), which require detailed consideration. They encompass violence and peculiarities of burial customs; traumatic effects on paleoanthropological materials (cutting of heads, scalping, injuries); images of cut heads; objects symbolizing weapons; pictures of military conflicts.**

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I. Main Part

a) Violence and peculiarities of burial traditions

In the Early Iron Age, depositions of representatives of "socially deprived" categories of the population are revealed in the elite [Devlet, 1976] and ordinary burial mounds [Borodovskii, 1995] of the Tagar archeological culture in the Middle Yenisei basin. In the central part of the Great Salbyk Burial Mound (Fig. 2,*1,2*), a pair deposition was located, which was covered with birch bark. One of the buried people was placed with his/her face down. Another similar deposition was revealed in the southwestern periphery of the Beregovoy-1 burial mound (Fig. 2,3). The buried person was placed in the twisted position, with his/her face down, on an ancient buried surface covered with the burial mound. There was no associated inventory in both cases. The buried people's heads faced east (Beregovoy-1), providing certain deviations from this direction (Great Salbyk Burial Mound).

According to S.V.Kiselev, such burial places were forced depositions of captives or "patriarchal" slaves who were immolated in the course of traditional funeral customs implementation.

b) Traumatic effects on paleoanthropological materials

The traumatic effects on paleoanthropological materials related to violent actions can include scalping, cutting of heads and various manipulations with them, as well as instances of injuries characterized by clear-cut marks on bone tissues.

c) Scalping

Scalping as a way of obtaining high-value military trophies used to be widely popular, though on a case-by-case basis. The existence of the scalping custom for the territory of Western Siberia can be tracked for the whole set of sources: historical, folk, ethnographical and archeological. They encompass controversial mentions of scalping during the Kazym Rebellion of 1933 [Golovnev, 1995, p. 176], folk Mansi [Gondatti, 1886, p. 64] and Eastern Khanty [Pelikh, 1972, p. 372], motives, several stories from the Ostyak heroic epos [Patkanov, 1891, pp. 45,54,66,67], indirect evidence of Minor Ioganka [Anninsky, 1940, p. 93] referred to the 14th century, effects of scalping on the skulls from the Second Pazyryk Burial Mound (5th-4th centuries BC) in Altai [Rudenko, 1948, pp. 53,54; Barkova, Gokhman, 2001, p. 80], Bystrovka-2 (6th-3rd centuries BC) in the Upper Ob valley [Borodovsky, 1997a, p. 164-169], in the Saigatino 6 Burial Mound (10th-11th centuries) from the Middle Ob valley [Karacharov, 1999, p. 164].

The ancient descriptions of the scalping custom by Scythes [Herodotus, Book 4, 64, 1972, p. 202] referred to the middle of 1000 BC are usually commented by their analogues from any synchronous Pazyryk burial mounds with frost in Altai [Stratanovsky, 1972, p. 520; Dovatur, Kallistov, Shishova, 1982, p. 302]. However, in order to preserve accuracy of such parallels, one should consider an array of various details of this custom implementation by Scythes and Pazaryks. For example, Herodotus explicitly pointed out that "the Scythian warrior brought all the heads of those killed by him during the fight to his tzar". Afterwards, the head was skinned in the following way: "a small cut was made on the head, next to the ears, and then one took the head by the hair and shook the head out of skin". Therefore, it dealt with scalping of the head that had been already cut from the body, providing that the hair coat should be removed to the highest possible extent, while the head of a scalped man from the Second Pazyryk Burial Mound was obviously cut off by robbers [Rudenko, 1948, pp. 53, 54; Barkova, Gokhman, 2001, p. 80] but not by those who scalped it. On the other hand, there are clear-cut differences in respect of the scalping technique described by Scythes and provided

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in the materials of the Pazyryk burial mounds. According to S.I.Rudenko's observations, "the front skin was cut over the forehead from one ear to the other, through a standing out bit of hair, and stripped back" [Rudenko, 1948, p. 54]. It was related both to peculiarities of the hair-do and to the fact that the head was scalped without being cut off from the body. Therefore, it is hardly possible that the parallel descriptions of this custom provided by Scythes and natives of Gorny Altai can be regarded as similar.

In the burial mound of Bystrovka-2 of the Scythian time, three more authentic cases of scalping of buried people are recorded [Borodovsky, Tabarev, 2005]. In Burial Mound 1, Deposition 3, the pair deposition of grown-up men was characterized by clear-cut marks of scalping (Fig. 3,*6,7*). Another secondary deposition with the marks of scalping was discovered in Burial Mound 2 (Deposition 2) of this cemetery (Fig. 3,*5*). The skull and long bones of a young man (18-20 years old) were densely piled up (Fig. 3,*3,4*). The man was likely to be buried in a bag or any other container when his bones had already lost their soft connecting tissues. There are certain similar analogues in some early Tashtyk burial grounds [Vadetskaya, 1975, p. 178-180].

The samples of calibrated radiocarbon dating (SOAN-3294, 3936, 3935) of the adjacent depositions (No. 8,11,13) of Burial Mound 2, Bystrovka-2 can be included into the chronological interval of 780-400 BC, 760-390 BC, 810-540 BC [Borodovskii, Slusarenko, Kuzmin…,2003, p. 84, tabl. 2]. These data allow considering Deposition No.2 from Burial Mound 2 of the Bystrovka necropolis characterized by the marks of scalping a complex dated from the Scythian time.

Besides the scalping cuts, the skull of the second skeleton from Burial Mound 1, Deposition 3, possessed the marks of military injuries. They were represented by the marks resulted from two slashing blows dealt at the surface and base of the skull of the right side of the head. The stroke marks on the parietal part were viewed as a long cut of 3.5 x 2.6 cm, with the bladder grazing 3-4 mm deep into the compact substance of the skull bones (Fig. 3,*7*).

Another blow was dealt at the mastoid bone of the right temporal bone. It found directly the nuchal line where the boundary between the neck muscle insertion and hair growth start line lies. That blow was obviously delivered from behind for the purpose of cutting the head of the body before scalping, which is confirmed by similar cases described by ancient Scythes. Other two skulls do not possess any marks of head cutting, which could be preserved directly on the bones. However, taking into account the recurrence of Deposition 2 from Burial Mound 2, this possibility should be ruled out.

On the whole, the consequences of scalping on the buried skulls from Bystrovka-2 are represented by a set of cuts. Their length varies from 1 to 1.5 cm, and their depth – from 1 to 3 mm. They create a number of lines located on the frontal, temporal, and parietal bones of the skull (Fig. 3,*5-7*). By the way, the younger a buried person is, the longer those cuts are. It can be correspondingly tracked on the skulls from Burial Mound 2, Deposition 2 (18-20 years old) (Fig. 3,*5*) and Burial Mound 1, Deposition 3 – Skeleton 2 (25-30 years old) (Fig. 3,*6*), Skeleton 1 (45-55 years old) (Fig. 3,*7*). Such a peculiarity can be determined by age characteristics of distribution and density of the hair coat. It may be the reason why the oldest scalped person (Burial Mound 1, Deposition 3, Skeleton 1) has the shortest and shallowest cuts on the skull (Fig. 3,*7*). One should also point out other peculiarities of the mere cuts on the skull bones. Judging by their depth (0.3-1 mm) and presence of burrs in the top edge of the cuts, one can form a certain idea of the mere scalping technique. The deep penetration of the bladder into the bone tissue is determined by its fresh state [Borodovsky, 1997b, p. 26]. Simultaneously, the top location of notches on the cut testifies to the fact that the bladder was moving bottom upwards or from the right to the left while hair was pulled on during the scalping process. The burrs on the cuts are located on one (top) side, which was determined also by the turn of the victim's head in the course of scalping. It also caused a double half-spiral line covering all the surface of the skull bones from Bystrovka-2. Therefore, such peculiarities just underscore the fact that one scalped a cut head that was easy to get with. The similar method is mentioned in the Ostyak heroic epos of the Middle Ages. One should point out one story out of several legends related to the winners' intent to remove the head skin "ukh-sor" from their enemies' skulls. The author tells us how the head of the Samoyedic Prince, Sos-Turum, which was cut by the Ostyak strongman, runs away from him trying to preserve its scalp, i.e. "rainbow coloured head skin" [Patkanov, 1891, p. 67]. Therefore, the most recent mythological motives are provided with a certain factual confirmation from the archeological sources.

Another source of information related to many issues of the Siberian ancient history is represented by rock paintings. Recently, there have been an entire array of specialized works related to reflection of certain sides of the material, spiritual, and military culture of the ancient population of Southern Siberia. One of them is a publication by O.S.Sovetova devoted to possibilities of use of rock paintings as sources of military arts of the tribes of the Tagar epoch (2005). It deals with separate compositions of Kunya and Abakano-Perevoz (Fig. 3,*1,2*), which are interpreted as an image of how to grab the enemy's hair during a fight [Sovetova, 2005, p. 80, Fig.3]. In our opinion, such compositions can be also related to the scalping practice.

The historical background, with which the cases of scalping known from the archeological sources are associated, is also no less interesting.

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While for the Pazyryk burial mounds the example of such a tradition is indirectly related to the consequences of the Greek and Persian wars or the period of instability in China [Marsadolov, 1996, pp. 72,73], the burial mound group of Bystrovka-2 is likely to be associated with the expansion of Alexander the Great to Central Asia.

Undoubtedly, such historic events provided a global impact on Western Siberia and the whole of Eurasia. It is indirectly confirmed by the appearance of images of war elephants not only among imported items (the Siberian Collection of Peter the Great) but also in the decorative components of the warhorse dressing (Ob'ezdnoe-1) [Borodovsky, Telegin 2007, p. 52-62].

The dynamic events of that time could probably provide another impulse for side-spread occurrence of many specific military customs related to the heads of the defeated. In that historical situation, the south part of Western Siberia along with Black Sea Scythia is included into the set of territories where this tradition was quite popular.

d) Cut off heads

In the second part of 1000 BC, Herodotus [IV, 1972, p. 103] mentioned the Scythian custom of justice with relatives implying that once the "trial" was over, the head of the guilty person was cut off. The traitors were treated by Scythes in the same way. For example, Tsar Scyles who flinched from the Scythian customs shared the same fate ([, IV, 1972, p. 80]. The archeological materials of that epoch also contain evidence of such a custom. In the Kurdjips burial mound of the 4th century BC from the Kuban valley, there is an image of warriors holding cut off human heads by the hair on the golden cap [Galanina, 1980, p. 93]. The Scythes, Sarmatians, Huns [Bichurin, 1950, p. 93] regarded the enemy's head as an honorary military trophy. According to V.I.Ivanov, various manipulations with cut off heads in 1000 BC are likely to trace their origin to certain Eastern and Mediterranean female cults related to orgies [Ivanov, 1927, p. 120]. In Central Asia, the cut off human head was one of the attributes of the ritual activity and political culture up to the High Middle Ages [Dmitriev, 1997, pp. 212-219].

In the southern part of Western Siberia, the discovered depositions of skulls are referred to the period from the Intermediate to Late Bronze Age (2000-1000 BC) [Khlobystina, 1999]. The depositions of several dozens of skulls are recorded in one of the Krotov-Elunin graves. The depositions of skulls are known also in the Samus burial mound in the north part of the Upper Ob valley [Matyushchenko, 1961, p. 49]. The depositions of the Irmen burial mound of Kamen-1 in Bolotinsk district of Novosibirsk region include a deposition of a human skull with a vessel under the stele [Novikov, 2001, p. 62]. In the center of Burial Mound No.6 of Sapogovo-1, which is referred to the Late Irmen period and located in the Kuznetsk depression, one discovered skulls of three men, whose eyeholes faced different directions [Ilyushin, Kovalevsky, Suleimenov, 1996, pp. 12, 86].

Separate depositions of human heads are known in the sanctuaries of Western Siberia of the Early Iron Age, on the territory of ancient settlements of the Middle Irtysh valley – Bolshoi Log [Alyabina, Konikov, 1995] – and the Middle Ob valley – the ancient settlement of Sarovskoe [Chindina, 1978]. These depositions were as a rule supplemented by ceramic vessels.

On the western edge of Burial Mound 9 of Bystrovka-2, at the daylight surface level, there is a separate deposition of the heads of two young women and one man (20-25 and 30-35 years old correspondingly) recorded. The skulls were located together with ceramic vessels associated with other foreign (Kulai and Sargat) cultures (Fig. 4,*3,6,8*).

This adjacency is hardly accidental as when offering human sacrifices one frequently gave "preference" to foreign tribe representatives. For example, one of women's skulls of Burial Mound 9 of Bystrovka-2 characterized by explicit taiga features was located next to a "forest" Kulai ceramic vessel of an obviously northern origin.

According to the Siberian ethnic groups, the victim's head played one of the main roles in the rituals. Thus, Selkups regarded the head as a temporary vessel for a grave soul – *kedo*, which could not leave a late person's body until its corpse was destroyed [Pelikh, 1972, pp. 115,116]. Nganasans associated a brain or eyes with the soul. The ethnographic materials contain the evidence when certain skull manipulations were meant to facilitate the soul removal. According to some evidence, this method was used in Tuva when burying very old people. Their head was broken through. All these ethnographic parallels could possess not only an illustrative and comparative character for the deposition of skulls of the Bystrovka necropolis (Burial Mound 2, Bystrovka-2), but also a more profound meaning. The matter is that the broken bones of the skulls in the basis of eyeholes and trepanation of the skull base were obviously meant for removal of eyes and brain of the dead (Bystrovka-3) or immolated people (Bystrovka-3).

The skull trepanation of people from the burial mounds of Bustrovka-2,3 was most frequently performed by means of destroying their bases after people's death. The similar customs are identified during the Early Iron Age on the skulls from the Minusinsk Hollow, Western Mongolia, and Kazakhstan [Mednikova, 1997, p. 130-139]. The authentic marks of such an operation are identified on several skulls from Bystrovka-2 (Burial Mound 9) and Bystrovka-3 (Burial Mound 6). In two burial mounds, there are cases of homogeneous destruction of the base and symmetric damage of the lateral parts of the occipital bones (Fig.

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4,*10-14*). Nevertheless, one should pay attention to certain differences of these trepanized skulls. First of all, the holes in the skulls have different breaking natures. While the skull from Bystrovka-3 (Fig. 4,*14*) is characterized by the fact that a part of the bone is removed with the help of preliminary drilling and dusting, on all skulls from Bystrovka-2 this operation is performed with a cutting tool (Fig. 4,*10,11,12*) without any preliminary marking. Therefore, the trepanation holes from Bystrovka-3 have a more accurate geometrical shape. They are close to a square shape. On the skulls from Bystrovka-2, the similar holes are obviously larger, with uneven ragged edges. The general contour of the broken areas corresponds to ovals. The shape of the trepanation holes (an n-sided polygon) and technology of their creation, i.e. drilling (Bystrovka-3) and breaking and cutting (Bystrovka-2), allow questioning the specific traditions and variants of trepanation in the Upper Ob valley in the Early Iron Age, as well as an individual signature of the operator who performed skull breaking [Gokhman, 1989, p. 15].

The variants of interpretation of the cases of skull trepanation from the Bystrovka necropolis will be quite numerous. First of all, one should mention the fact that the shape and "functional" destination of trepanation holes in the skull bases from Bystrovka-2,3 are quite close to the so-called encephalophagy – eating of the brain of a dead person by his/her relatives. According to the Monte Circeo materials, this custom was popular even with Neanderthals and was preserved up to the ethnographic time by the isolated groups of the population of New Guinea Papuans. Both such actions and efforts to "remove and free" a dead person's soul may be wide from being the only explanations of the reasons for the skull roof destruction. Obviously, besides its sacral and ritual meaning, the head trepanation of the population that left the Bystrovka necropolis could possess some medical meaning. It is exemplified by the skull from Women's Deposition 5 (Level 1), Burial Mound 9, Bystrovka-2 (Fig. 4, *16*) with the furunculosis symptoms on the parietal roof and marks of the intravitam occipitalis trepanation. The regeneration of the bone tissue edges testifies to the fact that the woman lived for quite a long time after that complicated operation.

In the elite 11th burial mound of the Berelsk necropolis in Gorny Altai, a man's skull also possessed the marks of a similar head operation. The round cutting of the edges of the occipitalis roof, which had been obviously destroyed by a fall from the horse, was meant to remove the fragments of the skull bones to prevent cerebral edema. However, unlike that operation performed with the materials of the burial mound of Bystrovka-2, this one was not successful.

The identification of authentic signs of trepanation has a very important meaning for the studied topic of ancient violence. Firstly, in some cases actions related to this method can be directly associated with ancient violence. Secondly, sometimes signs of direct military violence [Kubarev, 1987, p. 145] are erroneously interpreted as trepanation [Grach, 1980, p. 254, Fig. 116].

On the whole, for the Bystrovka necropolis, depositions with missing heads are often a case (Fig. 4,*1,2,4*). The deposition of a man from Burial Mound 4, Cemetery 1 of Bystrovka-1 (Fig. 4,*4,5*) is regarded as the most interesting as his head was replaced with a bone point, with its edge upwards. The semantics of this fact can be interpreted in a variety of ways [Ozheredov, 1999, p. 77-119]. However, the main idea is represented by replacement of the missing head with an object possessing obviously male, military characteristics. Therefore, according to Herodotus's description, the Scythian Tsar, Ariant, wanted to learn the number of Scythes and told everyone to bring one bronze arrowhead, from which a spacious ritual vessel (pot?) was cast [Herodotus, IV, 81, 1972, p. 208].

e) Pictures of cut off heads

In the ancient time, human heads were represented by various decorations. The set of decorations of horse dressing from the burial mounds of Bolshaya Tsimbalka and Chmyreva Mogila contains different combinations of Medusa's face and a whole array of images including the serpent-footed goddess, Pan, and Heracles [Raevsky, 1989, pp. 174,175]. The degree of these images integration into the local environment could be determined by the fact that Scythes described the cases of using the skin stripped off from the human head for horse dressing decoration [Herodotus, IV, 64, 1972, p. 202].

The materials of the Siberian Collection of Peter the Great contain a golden earing with a pendant in the form of a human head [Rudenko, 1962, p. 28, tabl. XXI, 61, p. 49], which can also be associated with the abovementioned tradition. However, the closest analogy is represented by gilded wooden pendants in the form of five bearded heads (Fig. 4,7) on one of the bridles of the First Pazyryk Burial Mound and two more similar decorative pieces on the poitrel [Gryaznov, 1950, tabl. XVIII]; it is interpreted by some researchers as heads of the killed Huns [Klyashtorny, Savinov, 1998, p. 176]. According to some researchers, the picture of such military trophies is the result of violent Hun and Yuezhi wars of 4th-3rd centuries BC.

f) Destruction of skulls

Besides scalping marks and cutting of heads, the craniological materials of the Burial Groups of Bystrovka-3, 2 testify to numerous cases of artificial destructions of the facial part and brain capsule. Such defects can be classified as both consequences of military injuries and cases of intravitam or postmortem skull damage. Employing the qualitative and quantitative approach to the skull damage analysis suggested by

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N.N.Mamontova [1997, p. 108-121] and M.B.Mednikova [1997, p. 130-139], one can point out several peculiarities.

The marks of military injuries and various destructions are more often a case in the craniological materials of Bystrovka-2 than Bystrovka-3. There are also some qualitative differences recorded. Bystrovka-2 is characterized by cases of the skull part destruction, including absence of the facial skeleton, its fragments, absence of its base. The general distribution of various types of skull destruction among burial mounds and cemeteries also reflects different kinds of posttraumatic damage by the population that left these burial complexes. It is noteworthy that the highest number of solution of continuity of the face and skull base is typical of the skulls from Bystrovka-2 while those buried in Bystrovka-3 are mostly deprived of such defects at all. The character of bone damage on the skulls in both burial mounds is also different. Bystrovka-2 is characterized by injuries inflicted by a cutting object – 88.9%, while the occurrence rate of such injuries in Bystrovka-3 is just 40%. The same share is taken by knife wounds. It is interesting that, if classified by the localization of military injuries within the group of similar kinds of damage, damage related to the right halves of the facial part and bones of the skull roof is prevailing. Such a regularity is typical of the material of both burial mounds. The prevalence of military injuries in the right halves of the skull brain parts can be determined by left-handedness of those attacking the population that left the burial mounds of Bystrovka-2,3. It is interesting that, if taking into account the northern neighbors of the population that left the Bystrovka necropolis, such a feature is recorded by E.A.Sidorov by the Kulai culture bearers by means of trace evidence analysis (Kamenny Mys-1).

The fierce character of fights also reflects the occurrence of a new type of injuries. They resulted into partial or full skull destruction. Such damage can be determined by adoption of a new kind of weapons. In this connection, the abovementioned prevalence of marks left by cutting objects on the skulls from Bystrovka-2 can hardly be regarded as accidental. The matter is that from 1000 BC to the beginning of 1000 AD the Upper Ob district made up a part of the region where long forms of cutting and stabbing weapons (swords, broadswords) were actively spread [Khudyakov, 1996, p. 217-218].

The general "picture" of the military injury rate of the population that left he Bystrovka necropolis is not regarded as unique for the Early Iron Age. In the Western Siberian forest steppe, by the closest neighbors of the Ob valley population – bearers of the Sargat culture, this tendency was also represented quite clearly starting by the last third of 1000 BC. However, taking into account the known "military character" of this culture, the military injury level of the Sargat population is relatively low [Razhev, Kovrigin, Kurto, 1999, p. 139]. The Upper Ob region is characterized by a completely different situation. Taking into consideration a relatively low armament degree of the population (judging by the accompanying burial inventory), the level of the military injury rate is very significant on the whole. Such a peculiarity can serve as a basis for drawing a conclusion concerning gradual extirpation of the Ob region population in the course of military conflicts in the Early Iron Age.

The evidence of participation of the ancient population of the southern part of Western Siberia in fierce military fights includes a set of depositions referred to the Late Bronze Age, intermediate period, and Early Iron Age. Not only results of application of various weapons but also their details are clearly preserved on the buried bones.

g) Injuries inflicted by piercing weapons

On the territory of the Upper Ob region, the skulls of two men from Burial Mound 28, Deposition 1, and Burial Mound 30, Deposition 1 of Novotroitskoe-1 are broken by hatchet hammer [Rykun, 1999, p. 152,153]. The blows are dealt at the right and left parietal bones (Fig. 5,*5,6*). The bone tissue destruction is characterized by clear-cut signs of a blow delivered from top downwards and removal of the spike before the next blow. These lethal injuries could be inflicted in the course of the fight between a horse soldier and dismount warrior. Two more men's skulls with the holes made by hatchet hammers are known in Burial Mound 10, the cemetery of Biisk-1 [Zavitukhina, 1961, p. 97]. Another example of the head destruction with a hatchet hammer is a skull of a man from Tomb 2, Burial Mound 3 of the Tagar Burial Ground (4000-3000 BC) of Beregovoi-1 [Borodovsky, 1995, p. 487-522] in the Middle Yenisei region (Fig. 5,*7*). There are three holes resulted from blows delivered by a piercing weapon located in the parietal part. The hole diameter corresponds to the section of bronze hatchet hammers that were discovered in the burial mounds of Beregovoi-1 (Fig. 5,*4*).

Besides the petroglyphs of Eastern Kazakhstan (Sagyr) (Fig. 5,*3*), the fights with the use of hatchet hammers and head blows delivered by them are depicted in the rock paintings of the Tagar time in the Middle Yenisei region, close to the mountains of Kunya (Fig. 5,*1*) and Tepsei (Fig. 5,*2*) located in the vicinity of the Beregovoi-1 burial group. All these petroglyphs reproduce different stages of fights of dismount warriors with the use of hatchet hammers.

A whole array of men's skulls with the holes resulted from hatchet hammer blows is known on the adjacent territory of the Upper Ob region – in Sayano-Altai. Such cases are typical of the Pazyryk depositions of Gorny Altai (the Second Pazyryk Burial Mound, Ulandryk-2), Tuva (Sagly-Bazhi-2), and Western

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Mongolia (the Ulaangom Burial Ground) [Kubarev, 1987, p. 65]. All the blows were dealt by hatchet hammer at the parietal area. As mentioned above, such lethal injuries could result from the fight both of two dismount warriors and a horse soldier and dismount warrior. In the latter case, blows could be dealt not only at the head. In particular, there are six blows delivered by hatchet hammer recorded in the Lower Katun region, in the northern Pazyryk deposition (Chultukov Log-1, Burial Mound-38), on the left haunch bone of a man's skeleton (Fig. 5,*8,9*). The blows were delivered one after another. Judging by the location of injuries, the attacker hit the victim from the right. Two blows delivered by hatchet hammer were perforating and could be dealt with a great force (Fig. 5,*9*). The presence of the evidence of military injuries in the lower part of the buried man's body can be related to the fact that a dismount warrior attached a horse soldier. This very fight is depicted on the famous golden Scythian comb from the Solokha burial mound (Fig. 5,*10*) in the Northern Black Sea region. The deposition with injuries inflicted by hatchet hammer in the waist area from Chultukov Log-1 dated back to 4000-3000 BC, the time that is synchronous with the "Scythian" picture.

It is noteworthy that in all cases (Novotroitskoe-1, Biisk-1, Beregovoi-1, Chultukov Log-1, the Second Pazyryk Burial Mound, Ulandryk-2, Sagly-Bazhi-2, the Ulaangom Burial Ground), injuries inflicted by hatchet hammer are represented in burial groups, whose accompanying inventory contains these very weapons. The only exemption includes the Bystrovka necropolis (Bystrovka-1,2,3), whose materials encompass hatchet hammers, but no evidence of their application are identified. One still has to define the reasons for this phenomenon. Such a situation may be determined by the fact that the population that left the Bystrovka necropolis was located in the most distant northern periphery of distribution and employment of this kind of weapon. It is also interesting that all the above mentioned burial mounds characterized with injuries inflicted by hatchet hammers possess quite close dating features. It can testify either to the general strengthening of tension in the last quarter of 1000 BC in the south part of Western Siberia and adjacent territories, or to the whole series of local military conflicts resulted from the Macedonian invasion to Asia.

h) Injuries inflicted by small weapons

The facts of various injuries delivered by small weapons are widely represented in the burial complexes of the Late Bronze Age – Early Iron Age (Fig. 6). In Deposition 8, Burial Mound 3 of Ordynsky-1 (the Irmen culture of the Late Bronze Age), there is a bronze two-bladed tanged arrowhead stuck in one of the dorsal vertebras of a man's skeleton (Fig. 6,*1-4*). This heavy wound could cause the death of the buried person. The arrowhead (Fig. 6,*1*) is a dating object, which is referred to the period not earlier than the 7th century BC [Chlenova, 1994, p. 18].

In Deposition 11 (referred to the intermediate time from the Late Bronze Age to the Early Iron Age) of the phreatic burial mound of Blizhnie Elbany-14, there is a bronze two-bladed socketed arrowhead stuck in the condyle of the left thighbone of the skeleton of a man of 40-60 years old [Gryaznov, 1956, p. 66, tabl. XXI, 25] and deeply pierced in the epiphysis at the knee level (Fig. 6,*5-8*). The arrowhead (Fig. 6,*8*) stuck in the bone dates back to the 7th-6th centuries BC [Gryaznov, 1956, p. 71].

In the collective deposition of Burial Mound 2, Bystrovka-2 (Deposition 14), there is an iron three-bladed tanged arrowhead stuck close to the right blade bone of a man of 30-35 years old (Fig. 6,*11-14*). This object was likely to cause the death of the buried person. The iron arrowhead (Fig. 6,*11*) with a triangular head and blades cut at the right angle is referred to the type of the Sarmat arrowheads, which were widely spread from the 3rd to the 2nd centuries BC [Khazanov, 2008, p. 93]. In Pair Deposition No.18, Burial Mound 2, Bystrovka-2, there is a horny, socketed arrowhead split in two with a broken pin and tap discovered in the breakup of the skull of a man's skeleton (Fig. 6,*14*). The object was damaged when hitting the head of the buried person. The horny arrowheads of this type date back to the middle of 1000 BC.

Beyond the boundaries of the Upper Ob territory, the facts of hitting the head with an arrow are known in the north of the Barabin forest steppe (Fig. 6,*8-10*). In the deposition of Burial Mound 2 of the Bergul-1 cemetery (the Novochekino culture of the Early Iron Age), a bronze socketed arrowhead (Fig. 6,*9*) with a heavily swept spike was discovered inside a woman's skull [Polosmak, 1987, p. 67]. Such a distortion was caused by the impact with the interior surface of the parietal bones of the skull after the arrowhead had broken the base of one of the skull eyeholes and stuck in the interior bone roof of the skull. That shot in the head was obviously lethal for the buried woman. The arrowhead dates back to the 4th century BC [Polosmak, 1987, p. 67,91].

On the whole, all injuries inflicted by small weapons within the period from the Late Bronze to Early Iron Age are characterized by the highest possible variety of positions. They were targeted at the head (Bergul-1, Bystrovka-2), shoulders (Bystrovka-2), back (Ordynskoe-1), and legs (Blizhnie Elbany-14) of potential victims. All the shots are distinguished by quite a high level of accuracy and strength, so the arrowheads either got into the dense bone tissue (Ordynskoe-1, Blizhnie Elbany-14) or were distorted after contact with it (Bergul-1, Bystrovka-2).

Judging by the depth of penetration into soft tissues and bone destruction, all arrow hits were rather heavy and most frequently lethal. These features testify

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not only to a considerable deadly force of bows but also to the fact of shooting at the poorly defended enemy.

Unlike those blows delivered with hatchet hammer, the chronology of burial complexes containing the evidence of arrow injuries is characterized by wider dating (from the first half to the last quarter of 1000 BC). It is most vividly illustrated by a considerable typological variety of arrowheads (bronze, horny, iron, socketed, tanged). This peculiarity is determined by two factors. Firstly, by a wider area of small weapon application. Secondly, by rather a limited period of employment of the hatchet hammer as a type of weapons.

The main localization of ancient archeological complexes containing evidence of arrow injuries related to the Upper Ob valley is not accidental. During several historic periods, this territory encompassed the features of the trasit route and frontier zone. It is here where the facts of armed conflicts with the use of bows and arrows are recorded in very scare and poor written sources even in the 17th-18th centuries. The places of these fights are very close to the location of the abovementioned archeological complexes with the evidence of arrow injuries.

i) Objects symbolizing weapons

Violence-related weapons, which are frequently regarded as its symbol, sometimes became a decoration, an amulet or a sample for votive products (Fig. 7).

j) Pendants in the form of weapons

i. *Arrowheads*

In the Upper Ob region, in the pair deposition (No.22) from the phreatic burial ground of Blizhnie Elbany-7 [Gryaznov, 1956, p. 56, tabl. XIX, 1], the pectoral of a young woman included a bead made from a bronze, socketed arrowhead with a broken spike (Fig. 7,*7,8*). The deposition is referred to the transition period from the Late Bronze to the Early Iron Age and dates back to no later than the 7th century BC.

Certain analogues to this decoration can be found in Central Asia and Iran. The complex waist pendant (Fig. 7,*9*) from seven bronze two-bladed socketed arrowheads was discovered in Burial Mound 4 of the Saka time cemetery of Aidyn-Kul-3 [Litvinsky, 1968, pp. 89,90]. The elements of the sculpture from Persepolis (Iran) include an image depicting a pendant from five arrowheads tied to a long (leather?) cord.

ii. *Bows*

The miniature bronze images of bows of the Scythian type (Fig. 7,*12*) are known from Derbent by Scythes to Aimyrlyg in Tuva. On the territory of Western Siberia, a great number of the similar bronze models of bows (Fig. 7,*10*) is known in the Stepanovskoe "treasure" {Pletneva, 1977, p. 74, Fig. 25,17] and Berezovy Mys [Roslyakov, 2015, p. 173, Fig. 3,*7*]. They were regarded as attributes of the ancient cult places [Ozheredov, Yakovlev, 1993, p. 130]. According to the materials of the burial complexes of the Upper Ob region (Staroaleika-2), such pendants could be used as fastenings (Fig. 7,*4-6,11*) of the sheath [Kungurov, 2005]. All these items date back to no later than the middle of 1000 BC.

iii. *Swords*

The miniature bronze dagger cast in the one-sided mould (Fig. 7,*1*) is known in the materials of the cult complex of the transition time from the Late Bronze Age to the Early Iron Age – Zavyalovo-1 on the right bank of the Ob River, to the south of the city of Novosibirsk [Borodovsky, 2002, p. 84]. The total dimensions of the item allow comparing it with votive Tagar daggers of the last third of 1000 BC, but the decoration of the handle and crossguard brings the dagger closer to the samples of the Cimmerian weapons (8th-7th centuries BC). It is this historic period that is characterized with corresponding decoration of items of piercing weapons and their images on deer stones [Chlenova, 1984, p. 23, Fig. 7]. Another miniature bronze dagger belonged to the Novoobintsevo treasure (Fig. 7,*2*) located on the high bank of the Ob River, to the north of the city of Barnaul. This complex dates back to the 4th-3rd centuries BC [Borodaev, 1987, p. 111]. Another miniature bronze dagger from the Upper Ob basin originates from the accompanying inventory of the Maima-4 cemetery on the right bank of the Lower Katun (Fig. 7,*3*). This burial complex dates back to the 3rd century BC [Abdulganeev, Kireev, Kungurova, Larin, 2004, p. 253].

II. Pictures of Military Conflicts

Military conflicts in the pictures of the Scythian time are regarded as rather a rare plot. For the territory of the south of Western Siberia, one can provide just several examples (Fig. 8) from burial complexes (Bashadar, Tepsei-3) and separate decoration elements (the Siberian Collection of Peter the Great).

According to some researchers, the zoomorphic decorations of the wooden sarcophagus from the Elite Second Bashadar burial mound (Fig. 8,*2*) are regarded as picturesque reproduction of battle scenes, in which the military leader buried in it took part intravitam [Surazakov, 1986, pp. 24,25]. The figure of a tiger successively overriding a whole set of hoofed animals could convey an image of the military leader who successively "bent to submission or destroyed" various tribal groups represented by the images of a moose, sheep, and boar.

The golden items of the Siberian Collection of Peter the Great (Fig. 7,*1*) include an embossed plate depicting "a parade of warriors returning from the campaign" [Rudenko, 1962, pp. 28,49,50]. In our opinion, this composition should be interpreted as persecution of one group of warriors by the other. There

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are two warriors depicted on the left side of the plate, next to whom there are horses with dead warriors' bodies on their backs. On the right side, there is a group of three horse soldiers riding after them, shooting bows, and stabbing them with spears.

A vivid illustration of military conflicts involving both genders is represented by pictures on wooden plaques (Fig. 8,*3*) [Complex of Archeological Monuments …, 1979, p. 96] from Tepsei-3 (Tomb 1) in the Middle Yenisei region. A possibility of such events is indirectly confirmed by anthropological materials from burial monuments of the Kokel culture (Alexeev, Gokhman, 1970, p. 248) of Tuva and evidence of mass military injuries on male and female skulls in the cemetery of Bystrovka-2 in the Upper Ob region [Borodovsky, 2002, p. 113].

III. Conclusion

The archeological sources reflecting the sources of violence on the territory of Southern Siberia in the Bronze and Copper Ages are quite various and illustrative. It is related to a number of factors. First of all, to the vicinity of the Upper Ob basin to the territory of Central Asia as a region with the historically established culture of military violence. It is also noteworthy that the territory of South Siberia was not such a distant periphery, which was directly affected by the consequences of large-scale military conflicts of ancient times and migration activity of early nomads. The archeological materials related to ancient violence are more versatile and concrete than the quotable ancient descriptions, which frequently resulted from direct observation of those facts. Therefore, the thorough work aimed at summarizing such data within the framework of particular territories and certain historic periods is extremely important for reconstruction of violence traditions within the context of ancient cultures.

Acknowledgement

The study was performed under the R&D Project No. 0329-2019-0007 of the Institute of Archaeology and Ethnography of SB RAS, "Study, Preservation, and Museumification of the Archaeological and Ethno-Cultural Heritage of Siberia".

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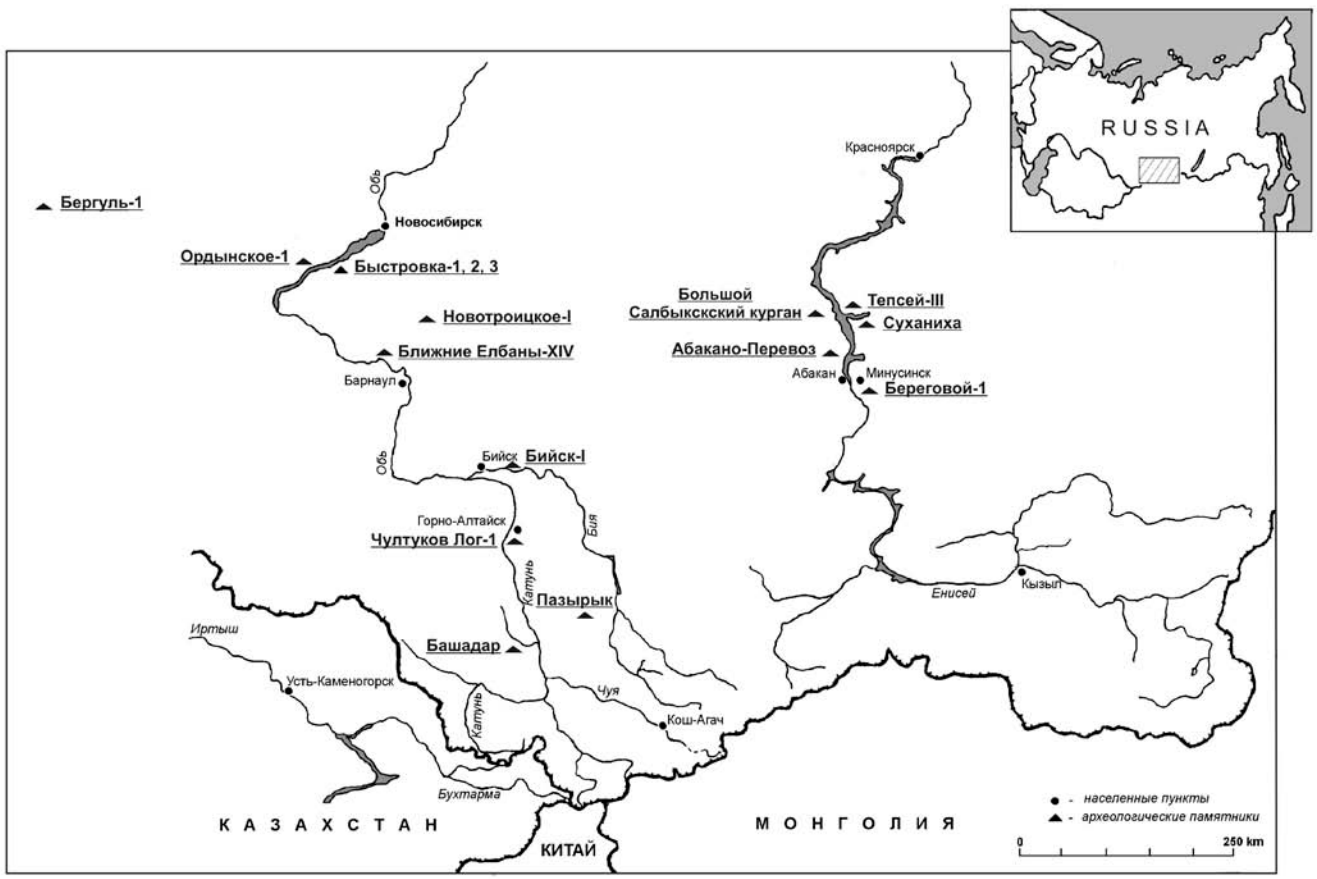


Fig. 1: Map of violence artefacts distribution in the archeological complexes of the Bronze and Copper Ages in the southern part of Western Siberia.

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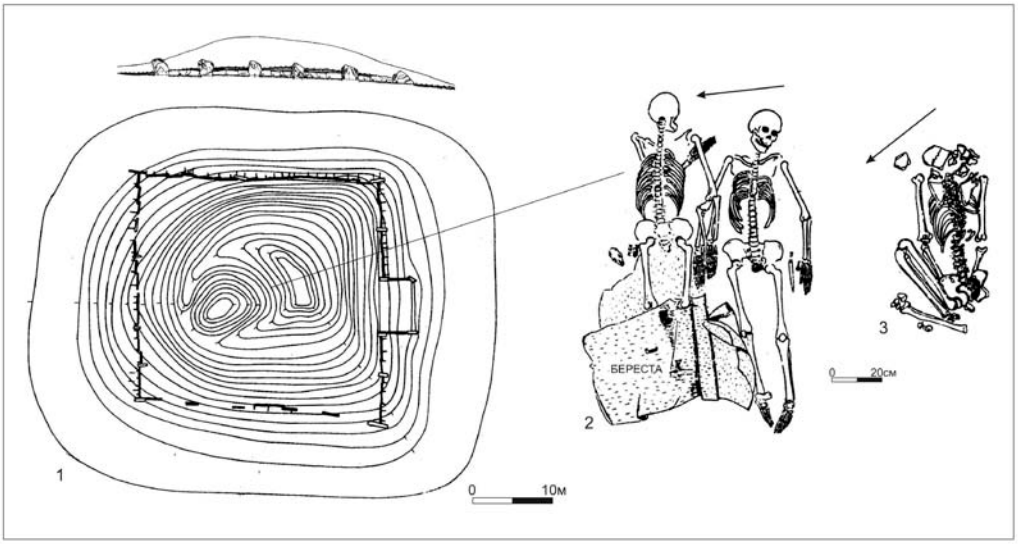


Fig. 2: Depositions of "deprived" representatives of ancient groups in the elite (Great Salbyk Burial Mound) and ordinary (Beregovoy-1) burial mounds of the Tagar archeological culture in the Middle Yenisei region (Khakasia, Krasnoyarsk krai).

1. Great Salbyk Burial Mound; 2. Inlet deposition in the Great Salbyk Burial Mound; 3. Deposition in the periphery of the Beregovoy-1 burial mound (Burial Mound 4, Deposition 1).

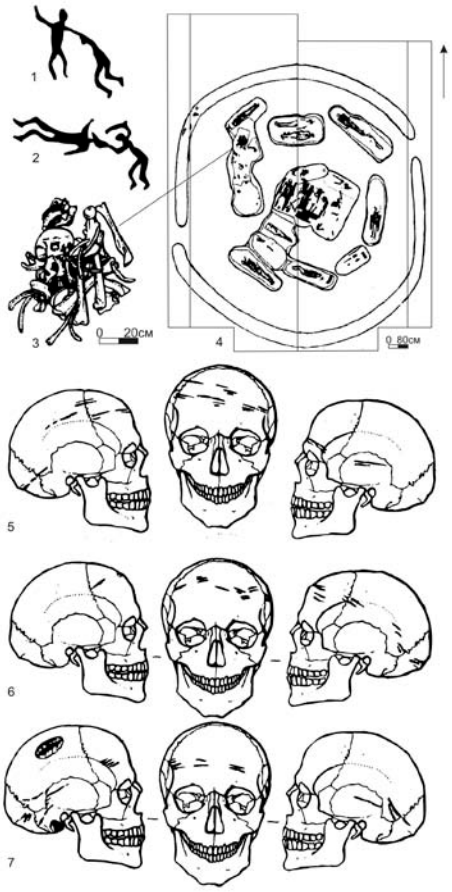


Fig. 3: Facts of scalping in the Early Iron Age on the territory of the southern part of Western Siberia.

1. A rock painting from the Kunya Mount; 2. a rock painting from Abakano-Perevoz; 3-7. Facts of scalping (Bystrovka-2, Burial Mound 1, 2); 1,2. the Middle Yenisei region; 3-7. the Upper Ob region.

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Fig. 4: Cut off heads from the burial complexes of the Early Iron Age of the southern part of Western Siberia.

1,2,4. Collective headless depositions from Bystrovka-2,3; 4, 5. A deposition without the head, which is replaced by a boney arrowhead, Bystrovka-1 (Burial Mound 4, Grave 3); 3,6,10,11,12,13,14. Cut off and trepanized skulls (Bystrovka-2, Burial Mound 9); 7. Wooden decorations of the horse bridle from the First Pazyryk Burial Mound; 8. A ceramic vessel of the Kulai archeological culture; 9. A ceramic vessel of the Sargat archeological culture; 15. A trepanized skull (Bystrovka-2, Burial Mound 10).

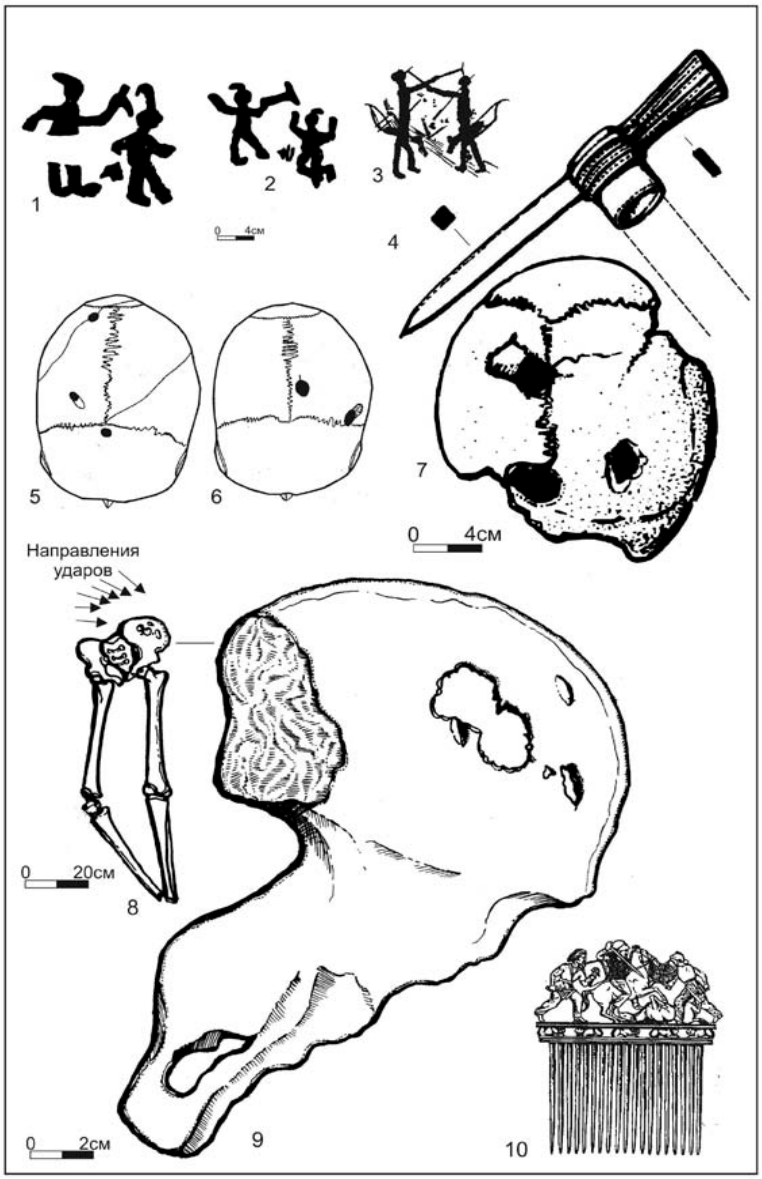


Fig. 5: Injuries inflicted by a crush weapon, i.e. a hatchet hammer (the Middle Yenisei region, the Lower Katun region)

1, 2. Petroglyphic compositions with the use of hatchet hammers; 1. The Kunya Mount; 2.2. the Tepsei Mount; 3. Sagyr (Eastern Kazakhstan); 4. a bronze hatchet hammer of the Tagar archeological culture (Beregovoy-1); 5,6. skulls with holes made by hatchet hammers from the Novotroitskoe-1 burial group (Burial Mound 28, Deposition 1, Skeleton 2; Burial Mound 30, Grave 1, Skeleton 1). 7. a skull with the traces of holes made by hatchet hammer from Burial Mound 3, Tomb 2 of the Tagar cemetery of Beregovoy-1; 8. the direction of hits delivered by hatchet hammer at the pelvic bone of the buried person (Chultukov Log-1, Burial Mound 38); 9. a pelvic bone from the northern Pazyryk deposition (Chultukov Log-1, Burial Mound 38). 10. an image of the fight between dismount warriors and a horse soldier on the golden comb from the Solokh burial mound (the Northern Black Sea region).

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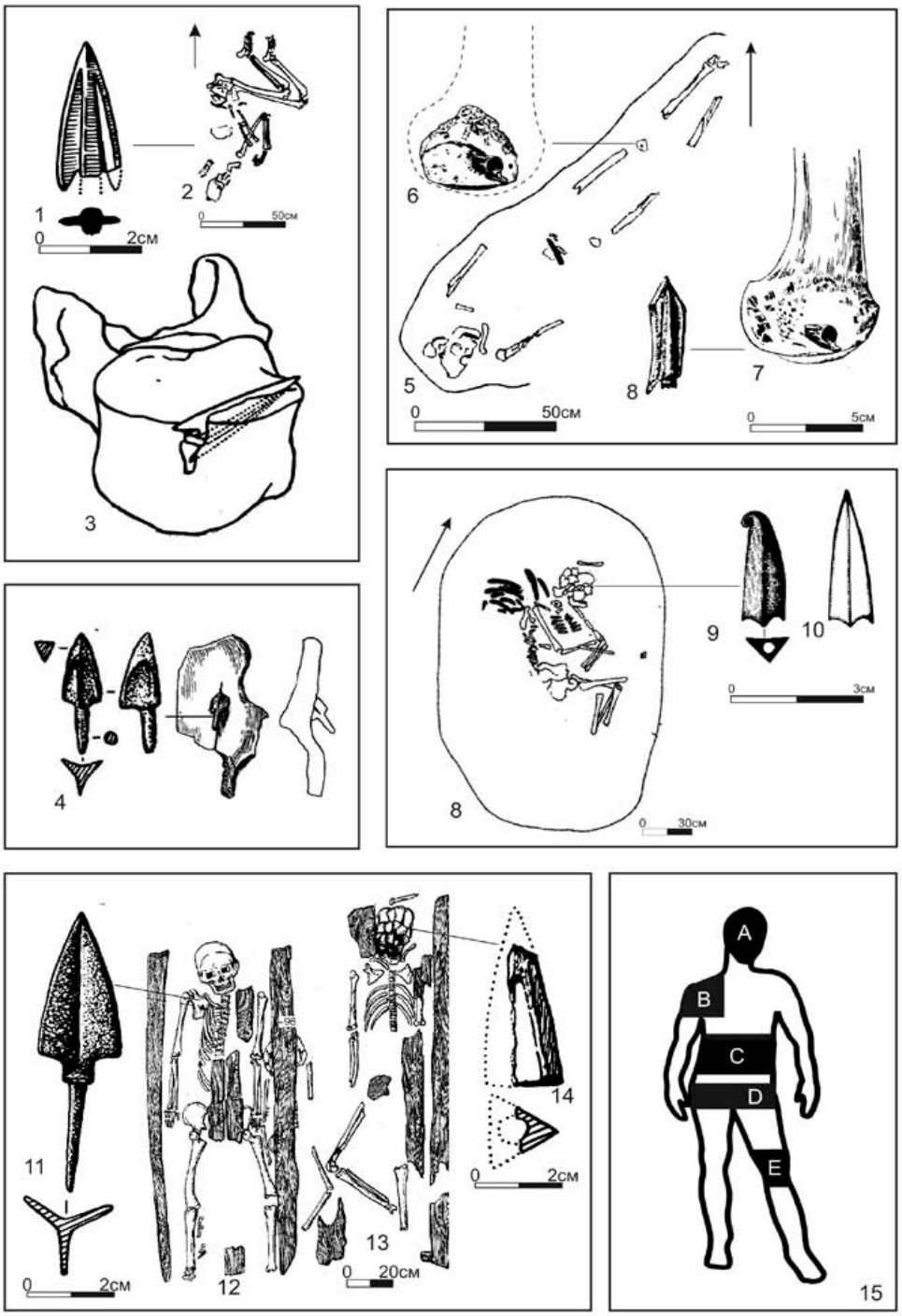


Fig. 6: Facts of arrow injuries in the Bronze and Copper Ages (the southern part of Western Siberia).

1,2,3. Ordynskoe-1, Burial Mound 3, Deposition 8 (the Irmen culture of the 9th-8th centuries BC); 4. Novotroitskoe-2 (5th-3rd centuries BC); 5,6,7,8. Blizhnie Elbany 14, Deposition 11 (the transition period from the Late Bronze to the Early Iron Age, 7th-6th centuries BC); 9,10,11. Bergul-1 (the Novochekino culture of the 4th-3rd centuries BC); 12,13,14,15. Bystrovka-2, Burial Mound 2, Depositions 14,18 (4th-3rd centuries BC); 16. Areas of arrow injuries; 1,4,7,9. Bronze; 12. Ore; 15. Horn.

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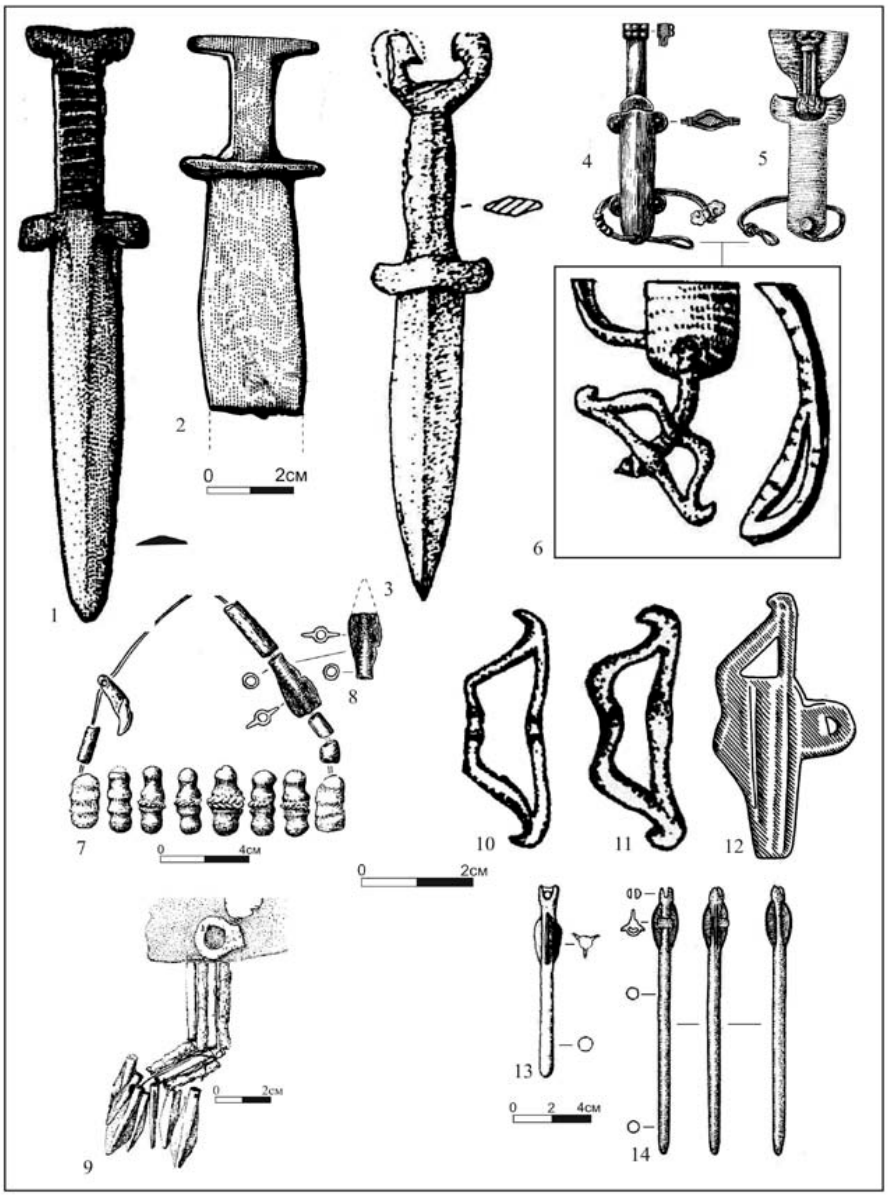


Fig. 7: Miniature weapons and use of military items as decorations and pendants.

1. Zavyalovo-1; 2. the Novoobintsevo treasure; 3. Maima-4; 4,5,6. reconstruction of the sheath fastenings from Staroaleika-2; 7,8. a pendant from a bronze arrowhead on the women's pectoral (Blizhnie Elbany 7); 9. a waist pendant from bronze arrowheads (Aidyn Kul 1, Central Asia); 10. the Stepanovo collection; 11. Staroaleika-2; 12. Aimyrlyg (Tuva); 13. Irtyash-13; 14. the Bobrovo cemetery (Kazakhstan).

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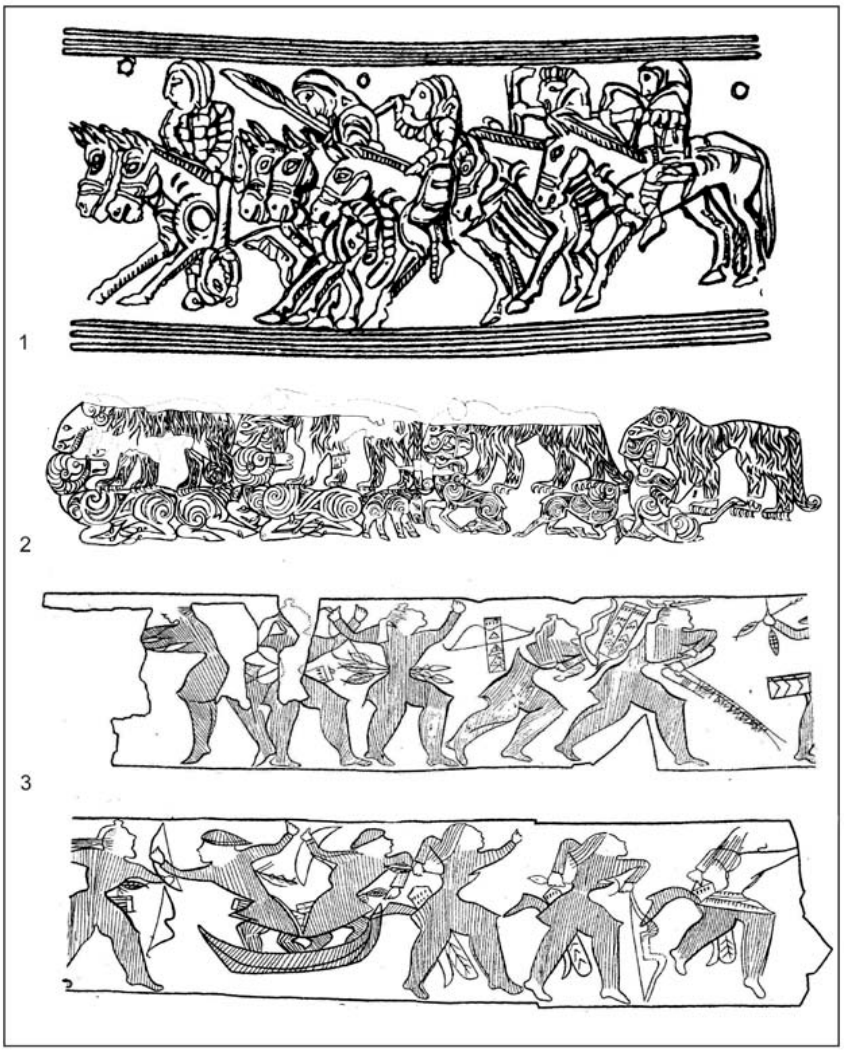


Fig. 8: Battle scenes of the Scythian and Hun-Sarmatian time of the southern part of Western Siberia.

1. A golden plate from the Siberian Collection of Peter the Great (Western Siberia); 2. decoration of a wooden carved log from the Second Bashadar Burial Mound (Gorny Altai); 3. the Tepsei wooden carved plates (the Middle Yenisei region).

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Global Journal of human-social science: b
Geography, Geo-Sciences, Environmental Science & Disaster Management
Volume 21 Issue 1 Version 1.0 Year 2021
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-460x & Print ISSN: 0975-587X

Assessment of Population Growth on Vegetation Cover in Numan, Demsa and Lamurde Lgas Areas of Adamawa State

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Abstract- This study examined the effects of population growth on vegetation exploitation in Numan, Demsa and Lamurde LGAs of Adamawa State. The primary data was obtained from the field through the used of structured questionnaire, while the secondary data includes satellite images Thematic Mapper (TM) of 1986, Enhance Thematic Mapper (ETM) of 2001 and Enhance Thematic Mapper Plus (+ETM) of 2017. Other secondary data include population data which was collected from National Population Commission Adamawa State. 383 household heads respondents were selected to represent the population, using a marginal error of 5%, and questionnaire was administered randomly to the household heads respondents. Descriptive and inferential statistics were the analytical tools used for the study, Linear and Exponential model were used to examine the pattern of change in population growth. Normalized Difference Vegetation Index (NDVI) was used to distinguish healthy vegetation from non-vegetated areas. Results of the findings revealed that there was an increase of 28.8% in the past 12 years (2006-2018) in the population of the study area. The study shows that there is a long-term inverted V-shaped curve relationship between population growth and vegetation cover, which means that the vegetation cover tends to decrease gradually over time with the increase in population growth.

Keywords: population growth, vegetation cover and exploitation.

GJHSS-B Classification: FOR Code: 040699



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Joel Eli [α], Abbas Bashir [σ], Aisha Mubi [ρ], S.Umar [ω] & Gajawa Y. [¥]

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Keywords: population growth, vegetation cover and exploitation.

I. Introduction

Rapid pace of population growth, urbanization and industrialization has led to serious environmental concerns in the developing countries. Over the past three decades natural resources especially vegetation have depleted remarkably resulting from accelerated pace of economic and social transformation. Economic changes such as large increases in population, agricultural output, industrial production, capital accumulation, and innovative technologies have transformed natural resource base, both as a source of factor inputs and as a by-product of pollution associated with economic activity. The continuously accelerated and unabated environmental degradation in Nigeria is unhealthy for people's health and livelihoods, the survival of species, and ecosystem services that are the foundation for long-term economic development (FAO, 2017).

Forest provides critical sources of food, medicine, shelter and building materials, fuel and cash income. More that 15million people in Sub-Sahara Africa earn their income from forest-related enterprise such as fuelwood and charcoal sales, small-scale saw-milling, commercial hunting and handicraft production (Kaimowtz, 2003). Forest products play important roles in supporting rural livelihoods and food security in many developing countries. Forest provides critical sources of food, medicine, shelter, and building materials, fuels and cash income. More than 15 million people in Sub-Sahara Africa earn their income from forest-related enterprises such as firewood and charcoal sales, small-scale saw-milling, commercial hunting and handicraft production. Forest resources supply nearly half total wood requirements of the country and its dwindling rapidly (Iheke and Eziuche, 2016).

There are alternative views on population-environment linkages. Most theories of population and environment are expounded primarily in relation to agricultural resource usage, the neoclassical theory contends that population growth will increase demand and thus force producers to become more efficient (Talbot, 2010). The classical theory is based on Matlthus in that resources cannot keep pace with population. Dependency theories state that the relation of developed to developing nation is that of dependence and is explosive of the environment (Okwori, Ajegi, Ochinyabo and Abu, 2015). Intermediate variable theories view population growth a proximate cause of environment degradation, but they can be applied mutandis mutatis to all types of natural resources

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(Mohsin and Usman, 2005). From the natural science perspective, humankind is one of the many species competing for the resources of the biosphere. As the resources of any ecosystem are finite, so is the latter's carrying capacity; hence, beyond a point, each additional inhabitant has a negative impact on the productivity of resources; Policy-wise, this perspective leads to advocacy for population stabilization (United Nation, 2011).

Population factors were seen, sometimes, as inhibitors of sustainable development: demographic factors, combined with poverty and lack of access to resources in some areas, and excessive consumption and wasteful production patterns in others, cause or exacerbate problems of environmental degradation and resource depletion and thus inhibit sustainable development and pressure on the environment may result from rapid population growth, distribution and migration, especially in ecologically vulnerable ecosystems (United Nations, 2010).

Man depends on the products of the natural environment for his multifarious needs, for example his food, shelter and clothing. Man exploits swamps, forest, grasslands, rocks, the atmosphere, water and other resources of his natural environment to satisfy these basic needs. The crucial role of vegetation to life has resulted to intervened advertently causing serious disturbance to natural equilibrium (Animashaun, 2002), Today, the rate of exploitation of natural resources is faster than the time it would take nature to replenish them. With increasing anthropogenic pressures at local, regional, and even global scales, an understanding of both the nature of change and the responses of natural systems to change becomes pertinent. Human beings generally have been viewed as destructive intruders to natural ecosystems; hence, this suggests stringent rules and legislation that will protect the vegetation and its resource deposit (Babagana, Mohammed and Garba, 2012). In as much as human beings are viewed this way, human population and the environment have a very strong complementary linkages or relationships. In actual fact, biodiversity conservation efforts especially vegetation can only be sustained if human beings give their support.

a) Statement of the problem

The rapid increase of human population is putting an incredible strain on our environment. While developed countries continue to pollute the environment and deplete its resources, developing countries are under increasing pressure to compete economically and their industrial advancements are damaging as well. The demands that this growth places on our global environment are threatening the future of sustainable life on earth (Population ReferenceBureau2007). More population means more space to construct houses and availability of more consumer goods. It also requires more means of transport, more consumption of fossil fuels and more pollution of air, land and water. Thus growth of population leads to exploitation of natural resources (Vegetation), land and water.

Nigeria population is currently estimated at 192 million individuals with growth rate of 2.5% against the backward growth rate of the country economy (National Bureau of Statistics, 2016). The high population growth of Nigeria is described as a “risk factor” by the Economic Recovery and Growth Plan. The Federal Government of Nigeria declares the nation’s growth as one of the unsustainable factors of the economy of the country.

Rapid population growth of Numan, Demsa and Lamurde Local Government Areas, has made it one of the fastest growing in Adamawa State. The population projection of the areas increased significantly by 25% between 2006 and 2016 (NPC 2006; National Bureau of Statistics, 2015). Concomitant with this high rate of population growth has been a noticeable increase in land cover change within the area. An enormous transition of the land from forest cover to agriculture and urban land uses is observable in the area. Urban and agricultural expansions caused by the rapid population growth in the area, are among the major drivers of vegetation change in the area (Pooter, Bonger, Kouame & Hawthrone, 2004). Other sources of vegetation disturbances in the area includes, overgrazing, fuel wood extraction, bush burning and desert encroachment all of which poses serious ecological, social and economic consequences (Mohammed, 2015).

The extent of which needs to be investigated for the sake of planning to mitigate further decline in vegetation cover. However, population growth tends to increase the pressure of population on land, leading to rise in vegetation exploitation because of the scarcity of the co-operant factors to increase demand of vegetation. This is in addition to the adverse effect that population growth has on standard of living, employment, capital formation, environment, social infrastructure and agricultural development (Jhingan, 2005). If the present population trends continue in this area, the demand for vegetation resources will also rise and the implications on the vegetation will be huge and may have ripple effects on poverty and environmental sustainability.

Cursory observation of vegetation stock in the area reveals that it is under pressure, to this extent the study is aimed at assessing the effects of Population Growth and Poverty on Exploitation of Vegetation Resources in Numan, Demsa and Lamurde LGAs of Adamawa State and to make recommendation towards poverty reduction strategies, population growth control, planning and environmental sustainability in the study area.

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II. Methodology

a) Study Area

i. Location

Numan, Demsa and Lamurde local government areas are located in Adamawa state, the northeastern Nigeria, and it is among the four administrative divisions of the state.

The study area (Numan, Demsa and Lamurde) is located within latitude 9°25'N and 9°36'N and longitude 11°47'N and 12°2'E. it shares boundary with Guyuk, Shalleng and Song LGAs in the North, Girei and Yola South LGAs in the East, Fufore Mayo Belwa LGAs and Taraba state in the south and west, Gombe state in its Northwest. According to the Federal Official Gazette of Nigeria (2009) Numan occupies about 746.38 square kilometers. (Bitrus, Nasiru, Halilu and Lynda, 2018).

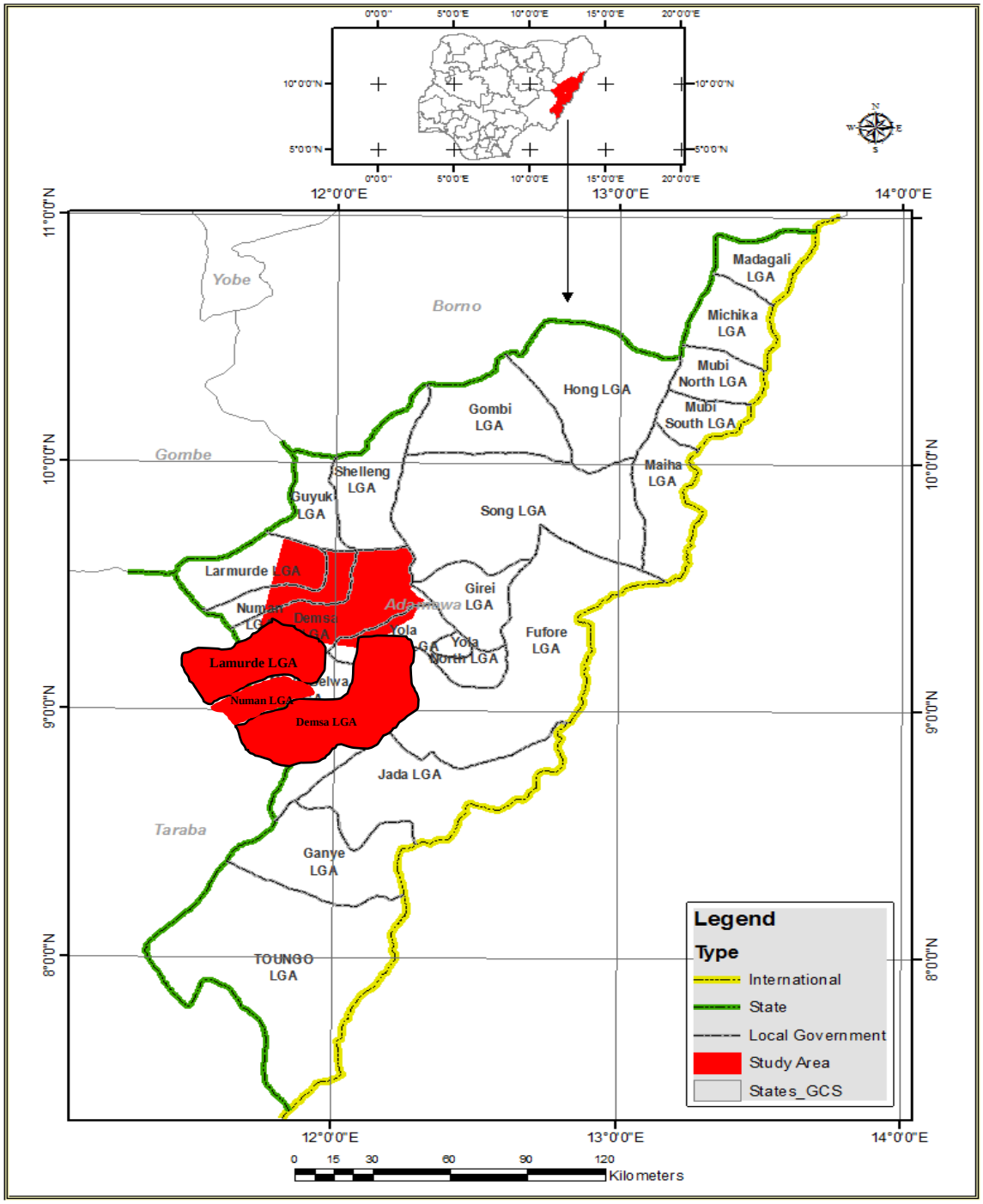


Figure 1.1: Location of Adamawa State showing the study Area

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ii. *Population and socio-economic activities*

According to the National Population Census (2006), Numan, Demsa and Lamurde LGAs had a total Population 381,120 people, with Numan 91,459, Demsa 178,407 and Lamurde 111,254 while the population projection for 2016 stand at 509,400 people with an annual growth rate of about 2.83%. The population is multiethnic, people with different shades of work, income group, cultural background, education and religion live together in the area.

Mahmud (1997) observed that the economic resource of Demsa, Numan and Lamurde LGAs centered on agriculture with crops like, cotton, groundnut, rice, cowpea, sorghum, bean, millet, maize and guinea corn, other include craft, fishing etc. It is also an important area for cattle, sheep and goat rearing. Irrigation is done along the riverbank with mostly vegetable gardening; fishing is also carried out at the riverbank. Others are employed in services such as administrative, industrial and commercial sectors. The area can be considered a very vital community to the state's economic growth and development considering the large number of the indigenes involvement in agricultural activities such as farming, fishing, cattle rearing and large number of produce made available for exportation outside the state (Khobe, Sanu and Kwaga, 2009).

The major occupation of the people of Numan, Demsa and Lamurde is farming as reflected in their notable vegetation zone Northern Guinea Savannah Zone, their cash crops are cotton and groundnut while food crops include maize, yam, cassava, guinea corn, millet and rice. The village communities living on the banks of the rivers engage in fishing. Trade also flourishes in the area with the area hosting several markets which provide platforms for the exchange of a variety of commodities. Other important economic activities in area include hunting, leather works and production of charcoal (Information Unit Numan L.G.A. 2013).

b) Types and sources of data

The primary data collected for this study include; background of the household head, occupational characteristics, income level, while the secondary data includes population data which was obtained from the National Population Commission, Adamawa state for the 1991 and 2006 census, satellite images Thematic Mapper (TM) 7 bands of 1986, Enhance Thematic Mapper (ETM) 8 bands of 2001 and Enhance Thematic Mapper+ (ETM+) 11bands of 2017. The images were used for LULC classification and NDVI. The acquisition dates of all the three images (Landsat TM 1986, ETM 2001 and ETM+ 2017) falls within December, was downloaded from the United State geological Survey (USGS).

Table 2.1: Types of Landsat used in the study

Image	Path	Row	Resolution	No. of Bands	Date of Acquisition	Data Source
Landsat Tm 1986	186	53	30 x 30	7	21st Dec. 1986	USGS
Landsat ETM+ 2001	186	53	30 x 30	8	22nd Dec. 2001	USGS
Landsat ETM+ 2017	186	53	30 x 30	11	10th Dec. 2017	USGS

Source: United State Geological Survey, 2017

c) Instruments for Data collection

ArcGis 10.2 software was used for the Land Use Land Cover (LULC) and NDVI analysis. Data collected from the questionnaire was coded in spread sheet (MS EXCEL 2010). MiniTab version 22 was used for the descriptive statistic and regression analysis.

d) Method of data Analysis

The study employed host of analytical tools based on the objectives. Descriptive and inferential statistics were the analytical tools used for the study. The descriptive tools include the used of average and percentage. The inferential statistics include Regression analysis, ArcGis 10.2 software was used for the Land Use Land Cover Analysis (LULC) and the Normalized difference Vegetation Index (NDVI) analysis.

i. *Extent and pattern of change in population growth*

Trend analysis was used to show the extent and trend of change in population growth over time in the study area, Excel Trend Function finds the linear trend to calculate the line of best fit for a supplied set of y- and x-values. The calculated line satisfies the simple straight line equation:

$$y = mx + b$$

where,

y = Change in Population distribution; (Appendix II)

x = Period (changes in population from 1986 to 2017);

m = is the slope (gradient) of the line;

b = is a constant, equal to the value of y when x = 0.

While annual rate of population growth was used to examine the extent of change in population growth in the study area.

$$r = \frac{\log(P_{t+n}/P_t)}{n * \log_0} * 100$$

Where;

r = Annual rate of population growth of Numan, Demsa and Lamurde

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P_{t+n}= 1991 census figure of Numan Demsa and Lamurde (Appendix II)

P_{t+n}= 2006 Population Census Figure (Appendix II)

n = Population Census figure of 2006 – 1991 Population Census figure

e = the natural logarithm, value of approx.. 2.718

To test the for the curve relationship between population growth and vegetation cover, a simplified cubic polynomial regression equation was used as follows:

$$V = c + \beta_1 P + \beta_2 P^2 + \beta_3 P^3 + u \quad (1)$$

Where:

V= (Normalized Different Vegetation Index of the Numan Demsa and Lamurde LGAs 1986 to 2017) is the index reflecting the vegetation cover,

P= (population density of Numan, Demsa and Lamurde 1986, 2001 and 2017) is the index reflecting the population, (see Appendix II)

c = is a constant,

u = is the random error,

The parameters β1, β2 and β3 are the coefficients of the first, second and third term of P (Population Density), respectively.

ii. *Changes in level and pattern of exploitation of forest vegetation resources in the study area.*

Land Use Land Cover Change Detection Analysis and Normalized Difference Vegetation Index (NDVI) were used to examine the changes in pattern of landuse land cover classes and the vegetation of the study area.

iii. *Normalized difference vegetation index (NDVI)*

NDVI was used to distinguish healthy vegetation from others or from non-vegetated areas using red and near-infrared reflectance values and this was integrated in the post-classification analysis to discriminate between the green cover and barren lands. The importance of the NDVI is to determine the density of green on a patch of land. Theoretically, NDVI threshold value ranges between -1 to +1. Measured value range from - 0.35 (water) through zero (soil) to +0.6 (dense green vegetation). Based on grey scale this corresponds to a pixel digital number of 135 or higher. The more positive the NDVI the more green vegetation there is within a pixel.

This research used NDVI based on the red band and near-infrared band of Landsat imageries and this was derived using expression given in Equations 1 and 2 for Landsat imageries respectively.

$$NDVI = \frac{NIR - R}{NIR + R} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

$$NDVI = \frac{TM4 - TM3}{TM4 + TM3} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where;

NIR= the spectral reflectance measurement acquired in the near-infrared region (band)

R= the spectral reflectance measurement acquired in the red region (band).

In the case of Landsat image data

TM4= near infrared band,

TM3= red band.

The 1986, 2001 and 2017 satellite images were reclassified based on the NDVI threshold values.

III. Results

a) Relationship between population growth and Vegetation cover

Results obtained from the regression analysis (Table 3.1) show that there is an inverted V-shaped curve relationship between population growth and vegetation cover. The panel regression curve of population and Normalized Difference Vegetation Index (NDVI) is shown in Figure 3.1. The first turning point, where the relationship between population density and NDVI changes from negative to positive correlation, occurs at the population of 198,243 in 1986 while the NDVI is 0.423 (48%) of the total Land area. The second turning point, where the relationship between population density and NDVI changes from positive to negative correlation, occurs at the population of 297,350 in 2001 with NDVI of 0.325 (32.5%) of the total land area cover.

The study shows that there is a long-term inverted V-shaped curve relationship between population growth and vegetation cover, which means that the vegetation cover tends to decrease gradually over time with the increase in population growth.

The influenced of population growth on vegetation cover in the study area can be considered as two effects, one is the consuming destruction effect. Population growth is inevitably resulting in increasing demands for life necessities. To meet these demands, large areas with good vegetation cover were being exploited for construction of houses, roads, factories and shops, and the vegetation resources were plundered, resulting in a vegetation cover decrease. Vegetation is an essential element for human development, and it can help improve the living environment as well as providing productive materials and a source of energy for humans. With the population growth, the demands for the ecological functions provided by vegetation in the study area have increase. Evidence from this study shows that rapid population growth, in combination with other factors, contributes to increasing vegetation exploitation. Growing populations mean increased demand for food, and a corresponding need to convert forests to agricultural land. Land shortages in traditional farming areas result from the combination of several factors among them a growing

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number of people, a high population density, and the accumulation of previous population growth.

Table 3.1: Regression analysis to show relationship between Vegetation cover and population

Dependent Variable: NDVI

Equation	Model Summary					Parameter Estimates
	R Square	F	df1	df2	Sig.	Constant
Linear	.695	2.278	1	1	.373	.459

The independent variable is Population.

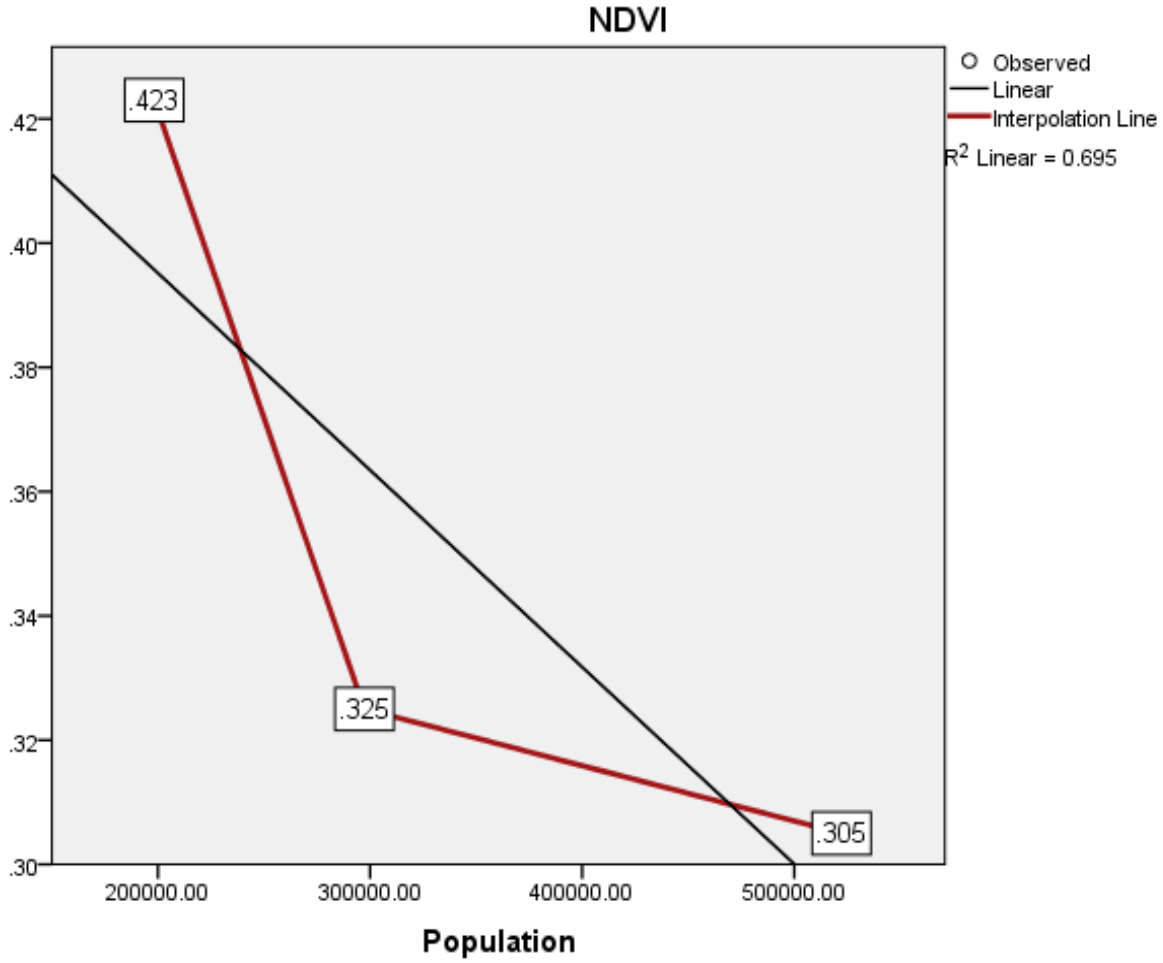


Figure 3.1: Relationships between Population Distribution and Vegetation Cover

Based on the results shown in figure 3.1 two effects, Conceptual model was constructed as follows: the long-term relationship between population growth and vegetation cover can be separated into two stages in the study area where there are frequent human activities and the influence of climate change on vegetation cover changes. At the first stage, there is an inverse relationship between population growth and vegetation cover. As the vegetation cover is relatively high and the public facilities are imperfect at the early stage of population growth, the vegetation cover decreases fast with the population growth when the consuming destruction effect is much stronger than the planting construction effect. While the second stage, there is an inverse relationship between population growth and vegetation cover. With the population continuing to expand beyond a certain limit, the consuming destruction effects surpass the planting construction effect, and then vegetation cover tends to decrease with population growth.

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b) Comparison of NDVI results of 1986, 2001 and 2017

An image differencing technique was used whereby NDVI values from three images were subtracted from each other to obtain changes in NDVI. This was subsequently converted to a NDVI (representing vegetation density). Thus, by using the NDVI result of three different years' image (1986, 2001and 2017) vegetation changes were calculated with NDVI= (NIR-RED) / (NIR+RED). Where NIR is the near infrared band response for a given pixel and RED is the red response. Green and healthy vegetation reflects much less solar radiation in the visible (channel 1) compared to those in the nearinfrared (channel 2). More importantly when vegetation is under stress, the channel 1 value may increase and the channel 2 values may decrease.

The interpretation of the NDVI image results, revealed an irregular pattern of vegetation cover in Demsa, Lamurde and Numan LGAs. Periods of remarkable vegetation decrease as well as increase have been identified.

The maximum values of the vegetation index were decreases from 0.423 in 1986 to 0.325 in 2001and decreases to 0.305 in 2017. From 1986 to 2017 there was by far reduction in the NDVI value by 23.1% figures 3.2a, Figure 3.2b and Figure 3.2c respectively.

Generally, the result of the NDVI values shows that the vegetation cover in general was reduced and the forests in particular ware depleted, the trend shows there was depletion of natural vegetation but an increase in agricultural activities which were associated with increasing participation in out-grower, non out-grower activities of the pre and post Savanna sugar scheme and the increasing irrigation activities, rice and maize farming throughout the year in part of Numan and Lamurde LGAs as the dark green colour can be seen in area closer to the riverbank where irrigation and agricultural activities are mostly found. The major reason for depletion of the vegetation in general and natural vegetation in particular is due to high deforestation rate, and high population pressure. Similar the increased in the pixel value were concentrated around area of higher irrigation activities and along the river Benue through, the increasing NDVI between 1986 to 2001 only reflected increasing in green vegetation resulting from irrigation activities, the present of river Benue through and the Savannah sugar farm and factory, but studying the results of the NDVI shows a significant decrease of trees cover and scrubs toward the southern part of the map.

Table 3.2: NDVI statistics of 1986, 2001 and 2017

NDVI Value	1986	2001	2017
Maximum Pixel Value	0.423	0.325	0.305
Minimum Pixel Value	-1	-1	0.060

Source: Analysed from 2017

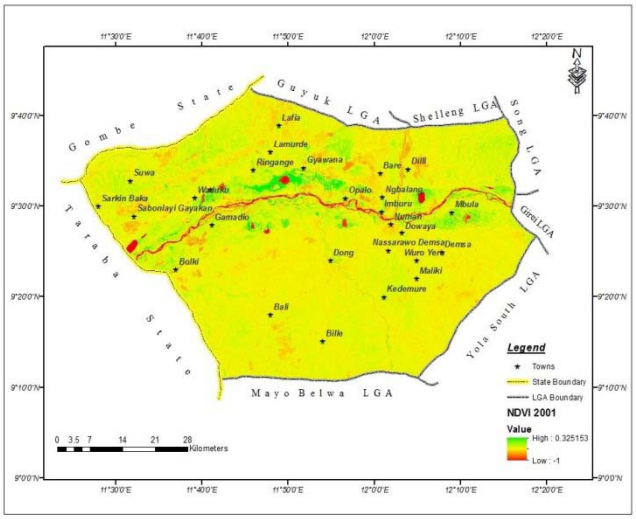


Figure 3.2 a: NDVI analysis of 1986

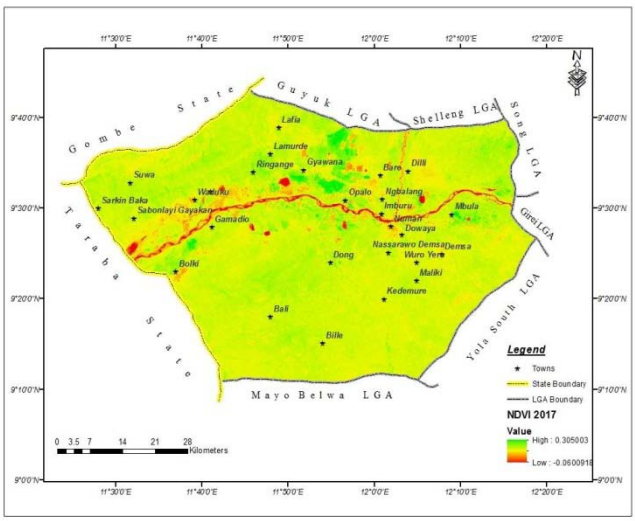


Figure 3.2 b: NDVI analysis of 2001

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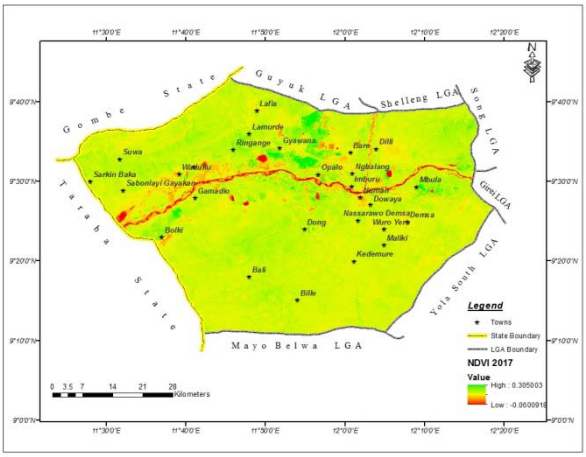


Figure 3.2 c: NDVI analysis of 2017

c) Impact of population growth and poverty on vegetation

Relationship between population growth and poverty on Vegetation exploitation, multiple regression analysis was used in determining the factors influencing vegetation in form of collection of vegetation for wood, roofing materials, fencing, herbs, fuelwood consumption, farming, irrigation activities and building of houses in the study area.

There exists a direct relationship between human population and poverty on vegetation demand, hence, the cutting down of wet wood can be said to be on the increase. The rate of consumption of fuel wood in study area exceeds the rate of production. It is therefore right to say this renewable source of energy would sooner or later be scarce, should these form of exploitation continue.

On the issue of vegetation exploitation in the study area the result shows that 73.1% exploited the vegetation for fuel wood, 11.2% uses the vegetation for roofing and fencing of their houses, 7.0% uses the vegetation as sources of vegetable for cooking in their houses, 4.7% exploited the vegetation and used it as fencing pole to fenced their houses and 3.9% of the respondents uses vegetation for fruits and served as medicinal for cure of various ailment (herb). The distribution of households by types of energy used, 65.3% which constituted majority of the respondents used firewood exclusive, 0.3% used charcoal exclusive, 5% of the respondents used both firewood and charcoal, 26.9% used firewood and kerosene, 0.5% used gas as source of energy for cooking.

The household size has direct linkage with the quantity of fuel wood exploitation. This implies that larger families exploit more fuel wood than their counterparts with smaller families. occupation and gross annual income are the prominent economic resources which have direct link with the household fuel wood exploitation. This implies that the households who are fully involved in farming and having considerable gross annual income exploit more fuel wood than the households who are not fully involved in farming and have low gross annual income. The dependency on fuel wood for household energy security is higher among proximate families than the distant families. Similarly, the higher the forest resource possession in the households lower is the dependency on forests for fuel wood. Access to alternative energy sources is the crucial variable having direct impact on fuel wood exploitation, hence, the families who have higher access to alternative energy sources have lower dependency on fuel wood.

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Table 3.3: Multiple regression analysis of socio-economic factors influencing vegetation (fuel-wood) Consumption

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.392	.528		.741	.459
	Income	2.628E-6	.000	.029	.515	.607
	Gender	-1.556	.306	-.358	-5.080	.000
	Marital status	1.019	.170	.426	5.989	.000
	Education	-.006	.113	-.003	-.052	.959
	Occupation	.149	.084	.085	1.773	.077
	Household	.159	.036	.209	4.371	.000

a. Dependent Variable: Expenditure on Fuelwood

The result of the multiple regression analysis in table 3.3 indicated that the determinant factors *viz.*, household size, occupation, education, marital status, gender and income, forest resource possession and access to alternative energy source had significant contribution to the fuel wood exploitation and thus, were the potential predictors in explaining the variation in the fuel wood exploitation. The positive Coefficient of number per household, occupation, marital status and income implies that the more the number of married people in a population the higher the consumption of vegetation and vice versa.

Number of people in households tends to increase the demand for fuelwood, the implication is that as the family increases the demand for fuelwood also increases, the use of fuelwood is a cost-saving mechanism to cope with prevailing economic realities so that the limited funds can be used to meet other basic family needs. Education was found to inversely affect the consumption of fuelwood in the area. For every increase in income of household heads, fuelwood consumption decreases. Increase in income increases the purchasing power of people; hence, households may increase the consumption of other alternative sources of domestic fuel such as kerosene and gas, thereby reducing the consumption of fuelwood while decrease in income level of the head of households tends to increase the use more wood fuel to meet their domestic requirements. A critical implication here is that more pressure is brought to bear on the patchy vegetation and, as time goes on, the movement of wood fuel in the form of commercially processed charcoal will intensify, bringing much pressure on the largely overexploited forests in the study area.

The rural people exploit enormous quantity of fuel wood mostly from the forests and their farms and utilize same for cooking, fencing, vegetable, and roofing. Households' dependency on fuel wood as a source of energy is overwhelming. The fuel wood is chief, exceptionally preferred and cheap energy source because the area is characterized by resource poor, low income and peasant farmers with inadequacies of socioeconomic and biophysical infrastructure. The analyses herein suggest that varying degree of household's fuel wood exploitation is primarily driven by several socioeconomic and biophysical conditions. The study has evidently shown that there is a huge pressure on natural forests for fuel wood to meet household energy security resulting in deforestation and degradation of the natural environment.

High rate of poverty in the country contributes connects much to deforestation, reason because 73.1% exploited the vegetation for fuel wood, as a result of it, high numbers depends on wood fuel widely known as Charcoal in the country for their live hood for people in the rural areas and urban areas with its modern constructed charcoal burners. With the high demands of this product called charcoal which is been produced through cutting down of forest trees comes high rate of deforestation, also another source of income for many people. This charcoal production has severe effects to our forest reserves. Over consumption of this wood fuel has led to deforestation and habitat loss with its combustion that generates emission impact to the climate change.

The growth in population affects economic growth, leads to a decline in per capita income and deepens poverty. This mismatch which results in the population-poverty cycle also has imminent consequences on environmental degradation and raises concern about sustainable development and human welfare.

Diversification of alternative energy sources, reduction of the prices of alternative energy sources, provision of rural infrastructure, development and promotion of low-cost technologies for reducing fuel wood consumption, implementation of afforestation programmes, substitution of fuel wood and awareness

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development towards environmental protection and biodiversity conservation will have a significant impact on reducing pressure on natural forests in the study area.

IV. Conclusion and Recommendations

The findings of this research revealed that, the population of the study area is increasing at an alarming rate with an average increase per year of 11608 that is an increment of 2.2% per year. Further increase in population will lead to increase in demand for natural resources (land, pasture, water etc) that may inadvertently lead to over exploitation of the vegetation resources and inexorable degradation of the environment.

The NDVI status of the vegetation cover shows both decrease and increase in the pixel value which was associated with the pre and post establishment of the Savannah sugar factory and the increased in irrigation activities toward the river Benue through as the darker green pixel value were seen concentrated at Savannah.

Finally, vegetation resources play multiple roles at global as well as local levels. vegetation are sources of economically valued products like industrial wood, fuel-wood, non-wood forest products such as fibre, food, medicines. In essence it is a source of income and employment. It also provides maintenance of biological diversity (habitats, species and genetic resources), and controls against climate change. Burgeoning population affects forest stock. People living around the forest reserve exploit the forest reserve for survival and livelihood. However, the rapidly growing population has mounted a lot of pressure on the reserve which is not well protected thereby leading to rapid depletion of forest resources in the reserve. Based on these findings, it is therefore recommended that: Government should address and check population expulsion, through; birth control, educating the populace, as well as restricting the number of immigrants from neighboring countries.

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Global Journal of human-social science: b
Geography, Geo-Sciences, Environmental Science & Disaster Management
Volume 21 Issue 1 Version 1.0 Year 2021
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-460x & Print ISSN: 0975-587X

Analysis of Water Quality for Domestic use in Lafia Town, Nasarawa State, Nigeria

By Iliyasu M Anzaku & Garba Umar
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Abstract- Lafia is a town in the middle belt of Nigeria, located within Latitude 8° 25W and 8° 35W and Longitudes 8°28'E and 8°34'E. Lafia covers an area of about 258km2 and has a population of about 330,712 inhabitants. This population caused environmental pollution as a result pressures exerts on the available water sources. It is against this background that this study is carried out to analyze the water quality for domestic use in Lafia town with the aim of examining the water quality status of the area compared to the World Health Organization permissible guidelines for portable water. The method adopted involves the use of reconnaissance survey. Data were collected from both primary and secondary sources and subjected to descriptive and laboratory analysis. The result shows that stream water source is the most polluted in Lafia with colour concentration of 10.5pt/co, turbidity of 8.5NTU and temperature of 26.4°c. The chemical properties for all the water sources sampled were slightly above the World Health Organization permissible guidelines. The result also shows that none of the water sources met the permissible guidelines in terms of chemical and microbiological properties. It was recommended amongst others that Nasarawa state water board should be provided with modern facilities for efficient address of domestic water use in Lafia. Clear water for everyone in Lafia for sustainable development.

Keywords: *water, quality, domestic, uses, chemical.*

GJHSS-B Classification: *FOR Code: 090508*



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Analysis of Water Quality for Domestic use in Lafia Town, Nasarawa State, Nigeria

Iliyasu M Anzaku [α] & Garba Umar [σ]

Abstract- Lafia is a town in the middle belt of Nigeria, located within Latitude 8° 25W and 8° 35W and Longitudes 8°28'E and 8°34'E. Lafia covers an area of about 258km^2 and has a population of about 330,712 inhabitants. This population caused environmental pollution as a result pressures exerts on the available water sources. It is against this background that this study is carried out to analyze the water quality for domestic use in Lafia town with the aim of examining the water quality status of the area compared to the World Health Organization permissible guidelines for portable water. The method adopted involves the use of reconnaissance survey. Data were collected from both primary and secondary sources and subjected to descriptive and laboratory analysis. The result shows that stream water source is the most polluted in Lafia with colour concentration of 10.5pt/co, turbidity of 8.5NTU and temperature of 26.4°c. The chemical properties for all the water sources sampled were slightly above the World Health Organization permissible guidelines. The result also shows that none of the water sources met the permissible guidelines in terms of chemical and microbiological properties. It was recommended amongst others that Nasarawa state water board should be provided with modern facilities for efficient address of domestic water use in Lafia. Clear water for everyone in Lafia for sustainable development.

Keywords: water, quality, domestic, uses, chemical.

I. Introduction

Water is a universal solvent that is chemically made up of two molecules of hydrogen atoms (H_2) and one molecule of oxygen atom (0) combined to form the compound, H_20 (water). Water is a major constituent of every living matter and it is very essential for life sustenance on earth. Water supports plant and animal lives, and is equally a very important raw material for industries. Without water, life and industry cannot function. All Living organisms are composed of cells that contain at least 60% of water (Enger and Smith, 2002). About two- third of human body is made up of water (Ayoade and Akintola, 1999). According to the National Health and Medical Research Council (NHMRC)(2006) the human brain contain 95% water, heart 73%, blood 83%, bone 22%, liver 96%, lungs 86% and muscles 75%. In the mechanics of the body water is a very valuable substance that regulates body temperature and also helps to alleviate constipation by circulating food through intestinal tracts and eliminating waste from the body. All the cells and organs that make up entire anatomy and physiology of human body depend on water for their proper functioning.

Water has no substitute; however, due to its abundance mankind uses it extensively for various purposes. The different uses of water affect both quality and quantity of the available water supply. Proper management practices therefore plays an important role in local, national and international polices on water supply quality (Chaplin, 2008). According to Eziashi (1997), much of the earth's water is in the ocean (97%) or rock as ice (18%). The largest volumes of fresh water are stored as underground water accounting for about (0.6%). Only a tiny fraction (0.01%) is present as fresh water in lakes, streams and rivers. It is this proportion of water on earth that is important for many of the terrestrial ecosystems, including man for several uses such as domestic, commercial and industrial use. Some countries of the world have abundant supply of water from deep wells and underground springs. Others have to make extensive use of rivers, lakes and other sources. The supply of drinking water derives from these sources must not constitutes danger to both health of consumers either through infectious organisms (bacteria, virus protozoa) or through the presence of toxic waste inorganic or radioactive materials (Maud, 1990).

The quality of water is very important as its quantity. Many human activities and their bye- products have the potential to pollute water, as well as large and small industrial enterprises, water industry, urban infrastructure, agriculture, transport, discharges from abandoned mines, deliberate or accidental pollution incidence, all affects water quality. Pollutants from the aforementioned may enter surface or underground water directly or indirectly, or may affects atmospheric water quality such pollution may arise as point sources such as discharges through pipes, or non-point sources and hence more dispersed and diffused.

Water must be substantially free from dissolved salts, plants and animal waste, and bacterial contamination to be suitable for human consumption. The ocean which covers approximately 70% of the earth's surface contains over 97% of water. However, saltwater is not suitable for human consumption and some industrial process. Freshwater is devoid of salt

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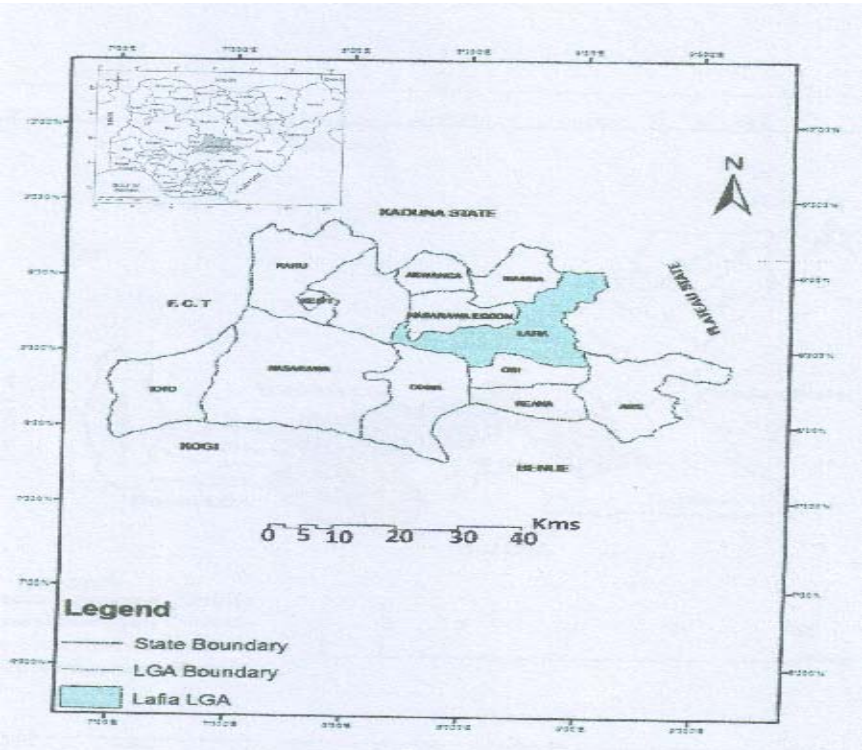
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found in ocean water. Unpolluted freshwater suitable for drinking is known as potable water. Early human migration routes and settlement sites were influenced by availability of drinking water. During the ancient time clean freshwater supplies were considered inexhaustible. But in recent times, despite advancement in drilling, irrigation and purification, the location, quantity, quality and control of potable water becomes an important factor for consideration. It is only recently that man began to understand that all the useable water supply could probably be exhausted because of the rapid world population increase compared to available water supply. This resulted to increased demand for water supply for industrial, agricultural and personal needs. The present shortage of water supply the world over can be attributed to human negligence in water management policies, population increased and climate change. Water pollution has negatively affected water supplies throughout the world for example Rivers in Poland, Latin America and Asia are severely polluted as a result of high population density and industrial activities. Aquifers used as sources of drinking water in many parts of the world are becoming contaminated with pesticides, herbicides and hazardous organic chemicals.

In China for instance, 41 large cities get their drinking water from polluted water sources. During the passage of water through hydrological cycle, water is usually polluted by sediments, washed from the land into surface water by erosion and farming activities, mining, grazing construction works, excess nutrients from soil erosion, human and animal waste and effluent from sewage treatment plants pathogens from sewage and livestock waste, and hazardous chemicals produced by industrialized nations. All these categories of waste are increasing because of rapid population growth and industrialization.

II. Study Area

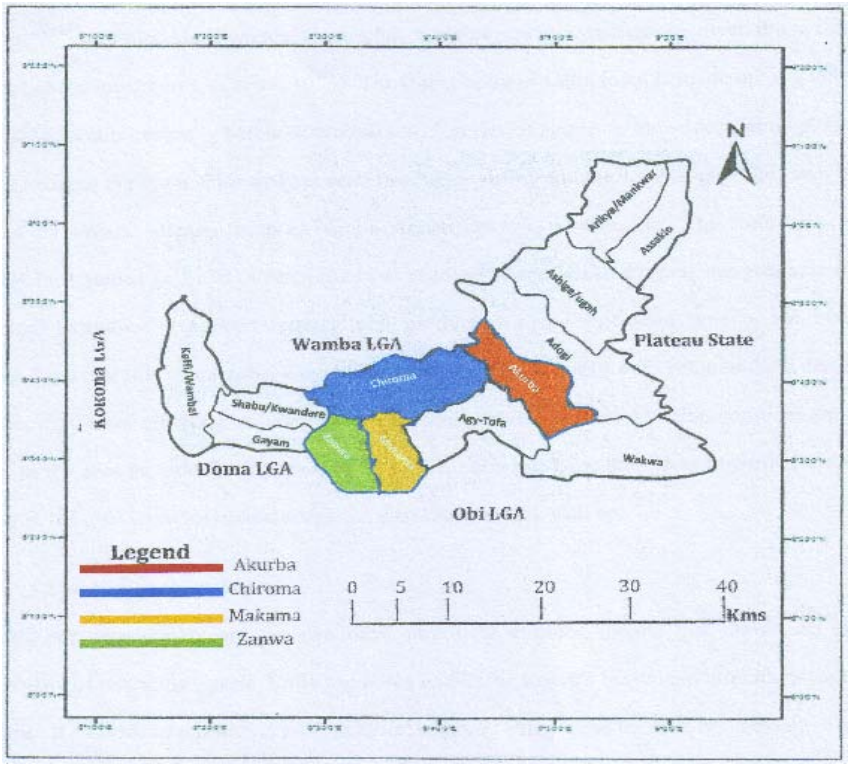
Lafia town being the study area is located in Middle Belt, Nigeria. It is the capital city of Nasarawa state and is one of the 13 Local Government Areas in Nasarawa state. Lafia Local government Area was carved out of the then Benue-Plateau state in 1976, later Plateau state and now Nasarawa state, created on 1st October 1996. Globally, Lafia is located within latitudes 8°25' N and 8°35' N and longitudes 8°28'E and 8°34'E. the Local Government Area covers an area of about 258Km^2, extending over an area of about 18km from North to south and 14km from East to West. The town is located about 195km from Jos (in the north) and about 90km from Makurdi (in the South). Also Lafia town is accessible through Akwanga Abuja road in the North, Doma Road to the West and Obi-Keana road to the south. Lafia is bounded to the North by Shabu, to the West by Dorna to the East by Assakio and to the South East by Daddere. The town has a population of about 330,712 inhabitants (2006 census). The map of Nasarawa state showing location of Lafia is presented in Figure 1 and 2 below.



Source: NAGIS, 2019

Fig. 1: Nasarawa State Showing Lafia LGA

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Source: NAGIS 2019

Fig. 2: Lafia showing wards

The geology of Lafia town is made up of Basement Complex rocks. The geological setting of the area offers limited numbers of good aquifers as they are found far below underground. As a result, availability and reliability of surface and ground water in terms of both quality and quantity is uncertain, since yields from such aquifers are not enough to meet the water demand of the inhabitants, (Carter, 1953). The topography of Lafia town is made up of gentle undulating terrain generally below 400 metres with series of slopes to the wider Benue plain. This is because the town is located between the Benue valley and the Jos plateau. The town is drained by several streams such as Amba stream, Akurba stream, etc. The soils type is tropical ferruginous soil and is categorized as reddish brown which suggest the presence of microbial activities. It supports agricultural production. The vegetation type is Southern Guinea Savanna; it is characterized by discontinuous canopy, shrubs with luxuriant and dense grasses with tress attaining an average height of about 15 to 30 metres. The common tress found in the area includes locust bean, Shea butter, palm trees, etc. the Most important crops grown in the area includes maize, sorghum, cassava, cowpea, yarn etc.

a) Materials and Methods

This study employs volumetric techniques in analyzing physical and chemical parameters of the sampled water. In addition, microbiological analytical techniques were employed for biological parameters namely fecal coli form count and total coli form count. The two techniques are chosen because of the availability of reagents required for the analysis which also reduced the cost of the analysis.

Using laboratory analysis, the physical, chemical and microbiological properties of the water collected from the different five sources were analysed. The analysis involves the measurement of the presences of group of contaminant and their properties. Also analyze was the physiochemical parameters such as colour, turbidity, H, temperature, hardness and presences of sulphate, lead, chlorides, iron, copper, and total dissolved solids (TDS). Analyses were equally done with regards to microbiological characteristics which measures total coli form count (TC) and coli form organization unit. The instruments used in carrying out the analysis include:

- TDS conditional meter (HACH) model 446000.00
- Titrernetry Digital Titrator (HACH) model 1699.01
- Spectrophotometer (HACH) model DR 2000
- Palm test parameter.

The results generated from the laboratory analysis were presented in tables, figure and graphs.

III. Results and Discussion

The data gathered from various sources for this study were presented in tabular forms. Graphs and figures and analyzed as follows

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a) Physical Properties of Sampled Water

Table 1 below shows the concentration of physical properties of the sampled water as shown in Table 1.

Table 1: Physical Parameters of Sampled Water in Lafia

S/No	Water parameter	WHO Std	Sample water sources				
			Borehole	well	Rain	Stream	Tap
1	Colour (pt/co)	5(pt/co)	6.0	6.4	2.0	10.5	4.0
2	Turbidity (NTU)	5NTU	3.0	4.5	1.4	8.5	2.9
3	Temperature (°C)	25°C	22.5	23.4	15.4	26.4	20.5

Source: Field survey, 2019

Table 1 shows physical parameter of sampled water sources in Lafia. The values in Table 1 are used to represent a clear graph shown in Figure 3 to further illustrate the concentration of the physical parameters with reference to WHO permissible guidelines. Below is the graphical representation of concentration of physical parameter in sampled water shown in Figure 3.

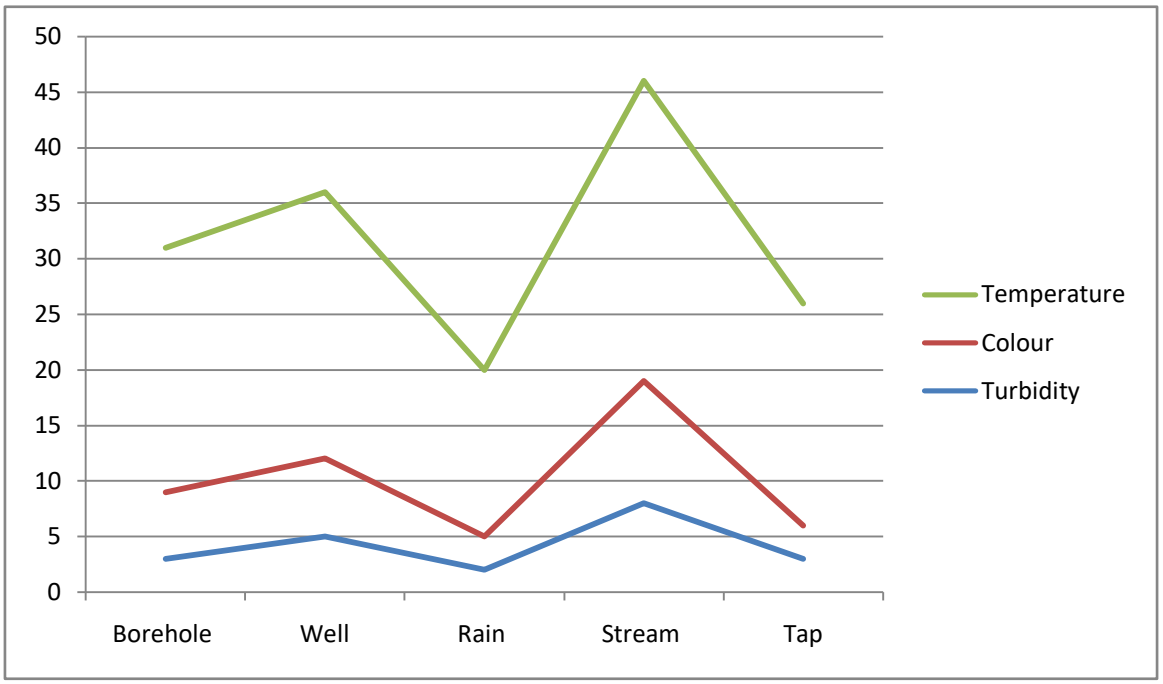


Figure 3: Concentration of Physical Parameters.

Figure 3 shows that colour concentration was highest in stream water 10.5pt/Co and lowest in rain water 2.0pt/Co the range was 8.5 well water sample 6.4pt/Co, and borehole water 6.0pt/co was above the guidelines value of 5pt/co for potable water include tap water, 4.0pt/Co and rain water 2.0 pt/Co which recorded colour concentration below the guideline value of WHO. High colour concentration in stream water can be attributed to dissolved coloured materials in stream due to surface exposure. The range is therefore wide by this result. In terms of turbidity. stream water recorded 8.5NTU highest above WHO guideline and rain water 1.4 NTU lowest below the guidelines and the range was 7.INTU a wide range). Hence only stream water recorded turbidity concentration above the WHO guideline for potable water. Well water with 4.5 NW, borehole 3.0 NW and tap 2.9 NUT turbidity concentration fall below/WHO guideline value for potable water. The high turbidity in stream was due to suspended material in water brought about by human activities such as swimming; eroded materials from the land through run- off and other natural processesin the case of temperature, the result shows that stream water has the highest temperature 26.4°C above the guideline value of WHO for potable water other samples are, well water23.4°C, borehole water 22.5°C, tap water 20.5°C rain water 15.4°C below the permissible guidelines of WHO for portable water. The range in temperature was 11°C. High temperature in stream water can be attributed to the heat of the day.

Health implication of the findings: Colour if holmic substances are present in water such as Arsenic-rich water over a long period of time, it results in skin problems also if the colour is associated with red phosphorus it renders the water fairly unreliable for other organisms.

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Turbidity: Health implication of turbidity is simply aesthetic for human and on other organisms; it renders the inability of fish gills to absorb dissolved oxygen.

Temperature: Implication of temperature on human health is not direct; however, temperature alters the rate of microbiological activities in water.

b) Chemical Properties of Sampled Water

i. *pH, Calcium, Nitrates, Chlorides, and sulphates) of sampled water in Lafia.*

The above properties ranges are presented in Figure 4 below as drawn from Table 2.

Table 2: Chemical parameters (pH, calcium, nitrate, chlorides, and sulphates) In Lafia

S/No	Chemical parameter	WHO Std	Different Water sources				
			Borehole	well	Rain	Stream	Tap
1	pH	7	6.2	7.5	6.9	6.8	6.3
2	Calcium (mg/1)	100(mg/1)	101	105	109	106	102
3	Nitrate (mg/1)	25(mg/1)	22	28	30	40.5	27
4	Chlorides (mg/1)	25(mg/1)	26.1	23.2	22	20.0	21.5
5	Sulphate (mg/1)	25(mg/1)	22.5	21.0	20.5	28.3	23

Source: Field survey, 2019

Table shows the concentration of chemical properties; the values in the table are used to represent a bar graph as shown in Figure 4 illustrating concentration of pH, Calcium, Nitrates, and Sulphates below.

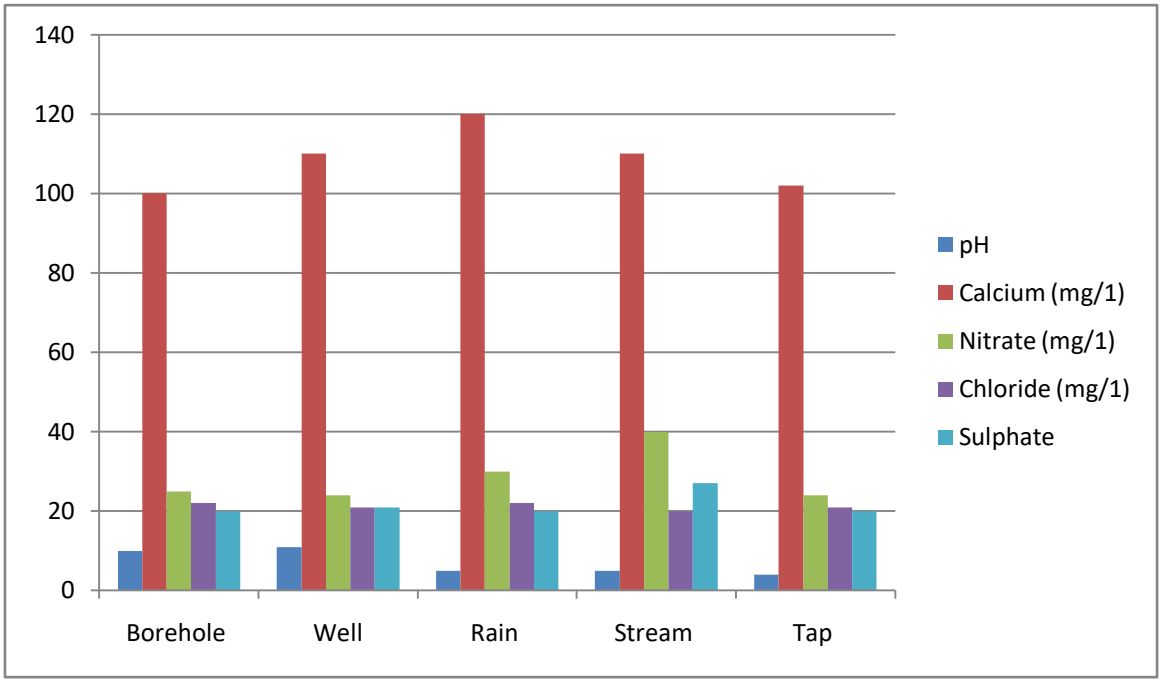


Figure 4: Concentration of Chemical Parameters

Figure 4 show that, pH of the five different sources of water falls within the guideline value of WHO. However, pH concentration in well water was highest with 7, 5 and lowest in tap water 6.3. This implies that water in wells was slightly alkaline and borehole, rain, streams and Tap water were, weekly acidic in Lafia. Calcium concentration is highest in rain water 109mg/l. However, the five water samples fall above WHO guidelines. Nitrate concentration was highest in stream water 40.5mg/i and lowest in borehole water 22mg/l. Below WHO guidelines rain, tap, and well water slightly fall above the standard in the cases of chloride, borehole water has the highest concentration of 26.1mg/l above WHO permissible guidelines for potable water and the least was rain Water 20.5 mg/l. however, borehole, well and tap water falls below the guideline value.

ii. *TDS and Hardness of sampled water in Lafia.*

The data gathered concerning chemical properties (TDS and Hardness) from five water sources sampled are presented and analyzed in figure 5 below, been drawn from Table 3.

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Table 3: Chemical properties (TDS and Hardness) of water sources in lafia

S/No	Chemical properties	WHO Std	Difference Water Sources				
			Borehole	Well	Rain	Stream	Tap
2	TDS(mh/1)	500	280	302	42	406	273
2	Hardness (mg/1)	100	134	140	105	136	107

Source: Field survey, 2019.

Table 3 presents chemical properties in the table are further represented concentration of the properties with shown below. (TDS and Hardness) of water samples. The values in bar graph in Figure 5 to show the distinct reference to the WHO permissible guide lines, shown below

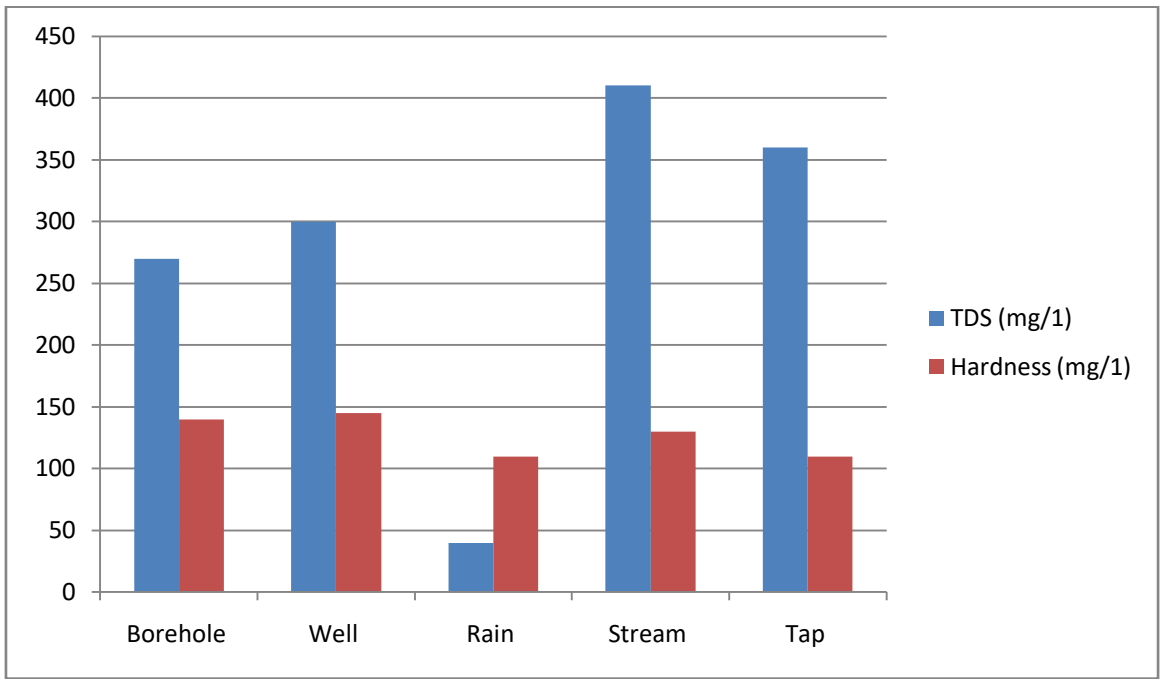


Figure 4.5: Concentration of Chemical Properties (TDS, Hardness)

Figure 5 shows that stream water has the highest concentration of TDS of 406mg/l and lowest in rain water 42mg/l. However, the five water sources have TDS concentration below WHO guidelines. With regards to hardness, the aforementioned water source has the hardness concentration above WHO acceptable guidelines. Well water has the highest hardness 14mg/l and the lowest rainwater 105mg/l among the different water sources.

iii. *(Lead, Copper and Iron) of Water samples in Lafia.*

The data obtained with regards to chemical properties (lead, copper, and iron) from five water sources were analyzed and presented in Table 4 as represented in Figure 6 below.

Table 4: Chemical properties (lead, copper and iron) from water sources in Lafla

S/No	Chemical properties	WHO Std	Different Water Sources				
			Borehole	well	Rain	Stream	Tap
1	Lead (mg/1)	0.05	0.04	0.03	0.01	0.02	0.08
2	Copper (mg/1)	1.0	0.2	0.1	0.01	0.3	0.4
3	Iron (mg/1))	0.5	0.4	0.7	0.3	0.8	0.6

Source: Field survey, 2019

Table 4 shows the chemical properties (lead, copper and iron). The table values are represented in graphical form in Figure 6 indicating concentration levels in each of the water sources as shown in Figure 6 below.

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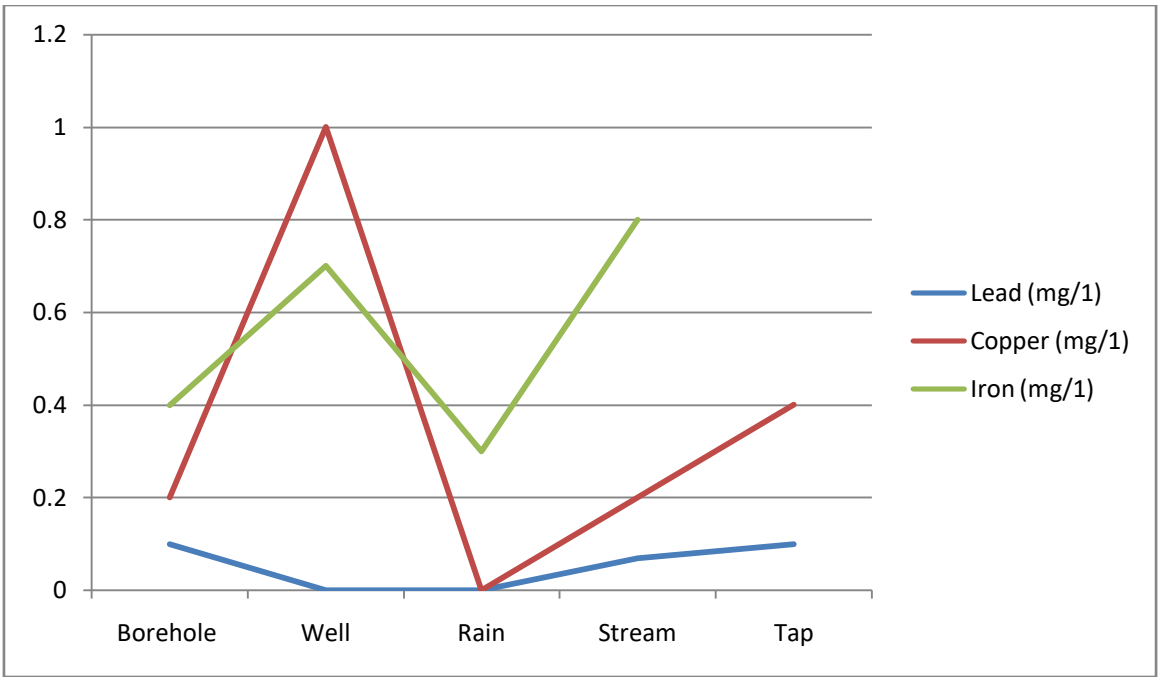


Figure 6: Concentration of Chemical Properties (Lead, Copper and Iron)

Figure 6 shows that, lead concentration was highest in tap water 0.08mg/l above WHO guidelines. The other four sources of water (borehole 0.4 well, 0.03mg/l rain, 0.01mg/l and stream 0.02mg/l) fall below WHO permissible guidelines for potable water. Rain water shows the least lead concentration 0.01mg/l. Copper shows high concentration of 0.4mg/i in tap water and lowest in rain water 0.01mg/i. However, the five water sources (borehole, stream and tap lies above the WHO permissible guidelines for potable water while well and rain water sample fall below the WHO guidelines. In the case of iron, stream water has the highest Iron concentration of 0.08mg/i follow by well water 0.7mg/l, tap water 0.6mg/i while borehole 0.4mg/i and the rain 0.3mg/l lies below WHO guidelines. The health implication of high concentration of led in water inhibit oxygen and mental development in babies and children, hence, children arc mostly prone to health effect of lead. Iron and copper: excessive dose of iron and copper leads to severe mucosal irritation, gastrointestinal irritation disorder of the respiratory mechanism, liver and kidney disorder. Based on this finding and health implication association with these trace elements, proper water treatment and mitigation measure should be adopted against those trace elements event thought the different is not significant.

c) Microbiological Parameter of Sampled Water in Lafia

The data gathered from five different water sources concerning microbiological parameters ofwater are presented and analyzed in Table 5 and the graph is shown in Figure 7 below.

Table 5: Microbiological characteristic of Sample Water sources

S/No	Microbiological parameter	WHO Std	Water sources				
			Borehole	Well	Rain	Stream	Tap
1	F.coli form (MPN/100ml)	0	0.03	0.04	0.01	0.05	0.02
2	T.coli form (MPN/100ml)	0.3	0.5	0.4	0.1	0.7	0.2

Source: Field survey, 2019

Table 5 shows the microbiological characteristics of sample water sources with reference to WHO permissible guide lines. The table values are further presented in bar graph to clearly illustrate the concentration level of the microbiological properties as shown in Figure 6 below.

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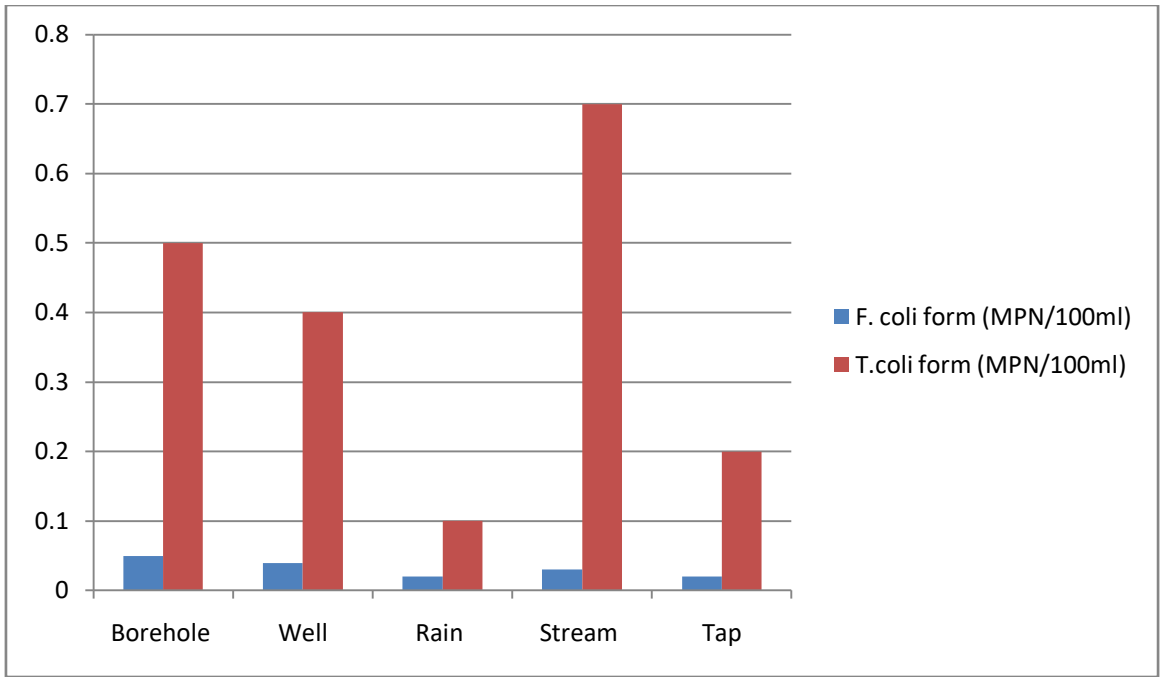


Figure 6: Microbiological Parameter of Sampled Water

In figure 6, it is evident that none of the five water sources meet the maximum allowable concentration faecal coli form of count of 0 count/100ml set by WHO and NAFDAC, the highest concentration of faecal coli form was observed in stream water 0.05 count/100ml, other samples have the following concentrations well water 0.04MPN/100ml, borehole 0.03 MPN/100ml, tap 0.2 MPN/100ml and the lowest rain 0.01 MPN/100ml.In the case of total coli form, stream water has the highest T. coli form count of 0.7 Count MPN/100ml followed by borehole 0.5MPN/100ml, well 0.4MPN/100ml, Tap 0.2MPN/100ml and rain 0.1MPN/100ml. Hence none of the five water sources meet the WHO permissible guidelines for potable water.

The health implication of the finding is that presence of micro-organisms in stream water can lead to number of disease which can be transmitted by pathogenic microorganisms. This could lead to outbreak of several water-related diseases such as typhoid fever, cholera, acute diarrhoea, bacillary dysentery etc. This renders stream water unsuitable for human consumption unless proper water treatment strategies is adopted otherwise stream water is not suitable for human consumption in Lafia.

IV. Conclusion

Water quality in simple terms pertains to the physical, chemical and microbiological characteristics of water relative to its specific use. The study found that stream water source was the most polluted source of water as a result of exposure to different materials making it prone to high concentration of physical, chemical and microbiological properties. By way of qualitative description, stream water has the highest concentration of physical and microbiological properties of water. However, by statistical analysis, the five sources of water in Lafia have no statistical significance difference from the WHO permissible guidelines for potable water. It is therefore the collective responsibility of both private and public sectors for ensuring effective management of water sources for greater sustainability. Furthermore, the research has provided explanatory information statistically and descriptively on the quality status (Physical, Chemical and Microbiological) parameters of five common sources of water for domestic uses in Lafia.

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Global Journal of human-social science: b
Geography, Geo-Sciences, Environmental Science & Disaster Management
Volume 21 Issue 1 Version 1.0 Year 2021
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-460x & Print ISSN: 0975-587X

Indigenous Khasi Tribe of Meghalaya and Environmental Sustainability: A Study

By Dr. Sinchini Kundu
Raiganj University

Abstract- In the era of modernization and globalization climate changes and environmental degradation are the big threat for all the species of earth and their sustainability. The indigenous ecological knowledge and behaviour of the tribal people towards nature is generally based on sustainability, productivity and optimum balanced utilization of available land and other natural resource. In India the total tribal population is 8.6% of which 89.97% live in rural areas. This subcontinent is the largest tribal populated country where different ethnic groups co-exist in a same territory with their diversified traditional culture. A Major portion of tribal people inhabits in the northeast part of India and Khasi is one of them. They live in different states of India such as in Meghalaya, Assam, and Manipur but the major portion of the total Khasi population is found in north east forest region of Meghalaya. They are the ecological components of this forest ecology. Their intra and interconnection with nature is always symbiotic. But due to the globalization, the influence of modern culture, intermingling and cultural hegemony, most of the tribal cultures are in the way of extinction. Rural people tend to imitate the modern culture without thinking the effects and want to get shifted in urban areas for better facilities and livelihood opportunities.

Keywords: globalization, modernization, climate changes, ecological culture, khasi tribe, sustainable development.

GJHSS-B Classification: FOR Code: 040699

INDIGENOUSKHASITRIBEOFMEGHALAYAANDENVIRONMENTALSUSTAINABILITYASTUDY

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Indigenous Khasi Tribe of Meghalaya and Environmental Sustainability: A Study

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Keywords: globalization, modernization, climate changes, ecological culture, khasi tribe, sustainable development.

I. Introduction

India is one of the colorful countries in the world where around 705 scheduled tribes are notified with their distinct culture and as per census 2011 they constitute 8.6% of the total population. Among them, 89.97% live in rural areas and most of them, live in hilly forest areas. They experience increased vulnerability to changing weather pattern and climate impacts due to loss of traditional subsistence practices. In India there are 75 vulnerable primitive tribal groups (VPTGs), declared by the government and major cause of their vulnerability is the impacts of climate change because of their dependence on and interconnection with the natural environment for their culture, health and livelihoods. Many tribal communities face difficult socio-economic conditions that may be exacerbated by climate change. Modernization, globalization and environmental changes are constantly changing human life and their cultures. In this context, we need to value the tribal culture and to study the *ecological culture* and *ecological behaviour* of the khasi tribe for environmental sustainability.

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II. Objectives

- To highlight on the changing scenario of socio – economic and cultural condition of the tribal people of the study area.
- To find out the new challenges in the livelihood of the Khasi tribe due to climate change.
- To highlight on the ecological behaviour of khasi tribe.

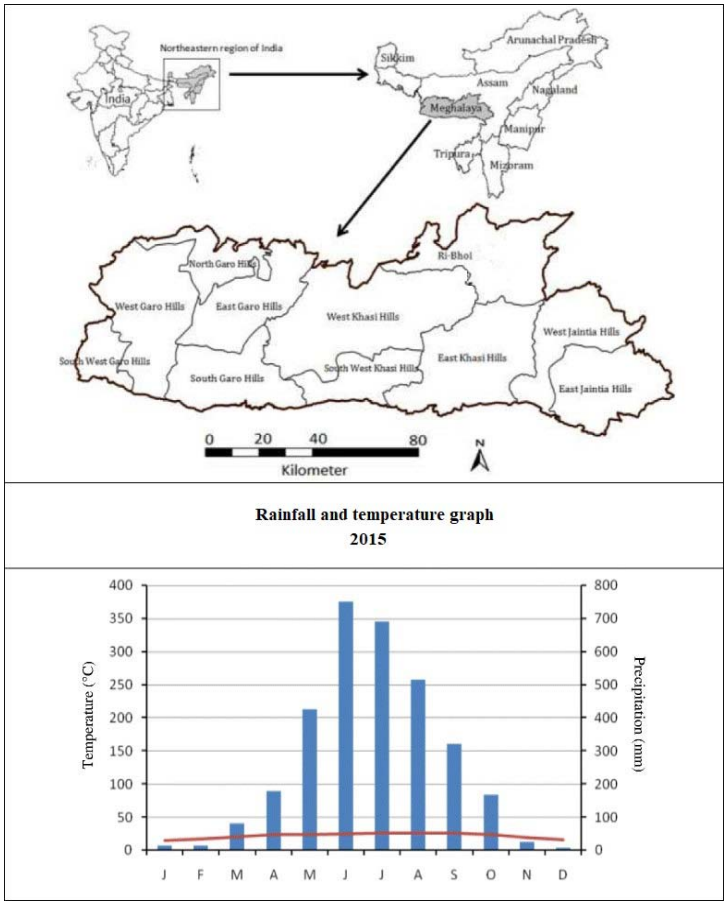
III. Hypotheses

- Value based socio-economic and cultural conditions of Khasi tribes become changed.
- Khasi tribes face challenges due to climate change.
- Khasi tribes have their own Ecological culture.

IV. Khasi Tribe: A Geographical Identity

In India broadly the tribal people inhabit within two distinct geographical areas – the Central India and North Eastern Area. The Khasi tribes are an indigenous ethnic group of north- eastern India. They are mainly found in Assam, Khasi Jaintia hills in Meghalaya, Punjab, Uttar Pradesh, Manipur, and Jammu and Kashmir. They are called by the different names such as Khasi Paris, Khuchia, Khashi and Khasa. Most of the Khasi people are mainly located in the north- eastern part of Meghalaya with around 48% of the total population of Meghalaya. It is said that the choices were earliest immigrant tribes who came from Myanmar, and settled down in the plains of east Assam. Location map Of the Khasi tribe and the rainfall and temperature graph of the RI - Bhoi district are shown below:

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Source: https://www.researchgate.net/figure/Geographical-location-of-11-sampled-transects-in-Ri-Bhoi-district-of-Meghalaya-The_fig1_269697899

Figure 1

Though the maximum rainfalls are found in the month of June, July and August but rainfalls occur more or less in all the season and the difference between the highest temperature and the lowest temperature of the year is very little. Khasi tribes are the largest indigenous community with around 48% of the total population of Meghalaya and before the arrival of the Christian missionaries they practiced indigenous tribal religion. Tribes are the worship of nature and their value based religious practices now are in the way of abolishing. Now around 85% have embraced Christianity. Very few of them still follow their age old indigenous religion. Khasi uses English and own Khasi language for communication. Society is Matri-lineal. The main occupation of Khasi tribe is agriculture and tourism but now they are migrating from their primitive habitation area to the outside places for a better job opportunity. The major crops produced by Khasi tribes are betel leaf, Areca nut, deal, local Khasi Rice, vegetables and oranges. Like other forest dweller tribes, they broadly depend on forest resources and their acquired Tribal Ecological Knowledge (TEK) over a thousand and more than a thousand years. This knowledge is transmitted from one generation to another by oral method and play a vital role to develop ecological behaviour.

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Plate 1: and Plate 2: Depict the changing house pattern of Khasi Tribes.

During Survey, it is found that the indigenous building techniques and house pattern of Khasi tribes which are directly connected with nature and climatic condition are now replaced by modern building pattern and techniques. It is said by a village council member that in his childhood days during summer monsoon, it rained at least once for nine days and nine nights without a break and he has an opinion that the change in rainfall affects the quality and quantity of crops. Orange is no longer sweet as it was. Meghalaya is a part of the Indo- Burma bio- diversity and most threatened hot spot areas in India due to climate change. It is the critical or endangered or vulnerable rain forest so the tribes, trees and wild animals who are the part of this ecosystem are also threatened. According to 2017 Indian Institute of Technology declared that the average temperature rose 0.031 degree C every year over 32 years. This is very much significant for the changes in the Meghalaya forest region. Due to migration and cultural contact with modernized and globalized Earth, they have lost their moral values, beliefs and ecological culture. "Ecological culture is a survival ethical and moral imperative of ecological commandments for society as a whole and the individual in particular. It provides support through the process of the formation of ecological world view of every human, his/her self improvement (change the inner nature of the individual) as ecologically conscious and ecological social attitude towards nature." (N. Ridei, Yuliya Rybalko, Yuliya Kycherenko, Svitlana Palamarchuk, 2013: p14-23). The conjunction and filtering process of cultural ecosystem, ecological behavior (ethics, moral values, rituals, etc.) and ecological culture (education, awareness, consciousness), of Khasi tribe that help to protect the environment)"

ECOLOGICAL CULTURE		
ECOLOGICAL EDUCATION	ECOLOGICAL CONCIOUSNESS	ECOLOGICAL AWARNESS
The continuous process of learning, training and development.	Relationship and linkage between environment and society in the modern era.	The knowledge of the laws of nature and the integrity of the system of laws.

The ecological behavior and techniques that they follow in their livelihood, thousands of years, help to grow their ecological culture. In the modern world it is necessary to discuss their ecological culture in the context of environmental degradation and environmental sustainability. Wrapping and taking of food, vegetables in newspaper is a common practice in India. According to Food Safety and Standard Authority of India (FSSAI) the printing ink causes of cancer, severe health problem. Wrapped aluminium foil has more illness causing bacteria like Staph and Bacillus Cereus which are rapidly growing on open air. The tribal people like choices use tree leaves to give food in the replacement of unhygienic newspaper or foil paper. Where most of the people are habituated to throw waste materials here and there, in every small Khasi shop or besides the roads people can watch their handmade eco-friendly dustbins.

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Plate 3: Khasi woen are busy to selling out of their foods in left hand side.



Plate 4: Khasi women serve food in a tree leave in eco- friendly, handmade dustbin besides shop.

Living Root Bridge in Meghalaya is a simple suspension bridge, constructed trough rubber plant and by using ecological knowledge. At the age of modernization and Globalization, when people destroy forests to build cultural landscape and help to increase the temperature of the earth, they produce greenhouse gases. The hanging root bridge is the symbol of traditional tribal Ecological knowledge, and it is necessary to imply these technologies more and more in development and constructional field.





Plate 5 and 6: The Famous living root bridge in Meghalaya, denotes the ecological technique of khasi tribes.

There is a belief among khasi tribes that God had originally distributed the human race in 16 heavenly families. However, seven out of these 16 families are stuck on earth while the other 9 are stuck in heaven because a heavenly ladder resting on the sacred forest mountain area (located in the present-day Ri-Bhoi district). They are enabled people to go freely and frequently to the heaven whenever they pleased until one day they were tricked into cutting a divine tree which was situated at Lum Diengiei Peak, a grave error which prevented them access to the heavens forever. They were tricked into cutting a divine tree which was situated on Lum Diengiei Peak, a grave error which prevented them access to the heavens forever. This mythological story is often seen as a metaphor of how nature and trees, in particular, are the manifestation of the divine on Earth and destroying nature and trees means severing our ties with the Divine. The Cleanest Village Mawlinnong in Asia is also introducing the Ecological behaviour and Ecological Culture of Khasi Tribe and the village is instance of value based culture of tribes in the whole world.

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Plate 7 and Plate 8: Depicts the scenario of the cleanest village of Mowlinnong.

V. Conclusion

Khasi village areas, living root bridge, and beautiful scenario of Meghalaya attracts tourists, but due to lack of ecological culture and behaviour forest region and climate are badly affected by their activity. The environment is also affected by unethical behaviour and development of tourism without following ecological culture. So it is necessary to aware the tourists as well as modern people of the whole world about indigenous culture and technologies of different tribes. In this field the engagement and guidance of tribes may create job opportunity for tribes in Meghalaya as well as a community based activity for developing ecological behaviour make a positive impact on environmental changes and help to change the behaviour of all people in India. It's also necessary to protect the Indigenous tribal culture as well as their Ecological technique has to be followed in the modern construction. The mechanical system of famous living root bridge is must be used in building construction. It's the duty of the all people to protect and follow the tribal ecological culture for the sustainability of the environment as well as for the sustainability of Human civilization.

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Associates of FSSRC/ASSRC are scientists and researchers from around the world are working on projects/researches that have huge potentials. Members support Global Journals' mission to advance technology for humanity and the profession.

FSSRC

Fellow of Social Science Research Council

FELLOW OF SOCIAL SCIENCE RESEARCH COUNCIL is the most prestigious membership of Global Journals. It is an award and membership granted to individuals that the Open Association of Research Society judges to have made a 'substantial contribution to the improvement of computer science, technology, and electronics engineering.

The primary objective is to recognize the leaders in research and scientific fields of the current era with a global perspective and to create a channel between them and other researchers for better exposure and knowledge sharing. Members are most eminent scientists, engineers, and technologists from all across the world. Fellows are elected for life through a peer review process on the basis of excellence in the respective domain. There is no limit on the number of new nominations made in any year. Each year, the Open Association of Research Society elect up to 12 new Fellow Members.

Benefit

To the institution

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A FSSRC member gets access to a closed network of Tier 1 researchers and scientists with direct communication channel through our website. Fellows can reach out to other members or researchers directly. They should also be open to reaching out by other.

Career | Credibility | Exclusive | Reputation



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Certificate, LOR and Laser-Momento

Fellows receive a printed copy of a certificate signed by our Chief Author that may be used for academic purposes and a personal recommendation letter to the dean of member's university.

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Career | Credibility | Reputation

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Career | Financial



GJ Account

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Associate	Fellow	Research Group	Basic
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Certificate, LoR and Momento **2** discounted publishing/year **Gradation** of Research **10** research contacts/day **1 GB** Cloud Storage **GJ** Community Access	**Certificate,** LoR and Momento **Unlimited** discounted publishing/year **Gradation** of Research **Unlimited** research contacts/day **5 GB** Cloud Storage **Online Presense** Assistance **GJ** Community Access	**Certificates,** LoRs and Momentos **Unlimited** free publishing/year **Gradation** of Research **Unlimited** research contacts/day **Unlimited** Cloud Storage **Online Presense** Assistance **GJ** Community Access	**GJ** Community Access

Preferred Author Guidelines

We accept the manuscript submissions in any standard (generic) format.

We typeset manuscripts using advanced typesetting tools like Adobe In Design, CorelDraw, TeXnicCenter, and TeXStudio. We usually recommend authors submit their research using any standard format they are comfortable with, and let Global Journals do the rest.

Alternatively, you can download our basic template from https://globaljournals.org/Template.zip

Authors should submit their complete paper/article, including text illustrations, graphics, conclusions, artwork, and tables. Authors who are not able to submit manuscript using the form above can email the manuscript department at submit@globaljournals.org or get in touch with chiefeditor@globaljournals.org if they wish to send the abstract before submission.

Before and during Submission

Authors must ensure the information provided during the submission of a paper is authentic. Please go through the following checklist before submitting:

1. Authors must go through the complete author guideline and understand and *agree to Global Journals' ethics and code of conduct,* along with author responsibilities.
2. Authors must accept the privacy policy, terms, and conditions of Global Journals.
3. Ensure corresponding author's email address and postal address are accurate and reachable.
4. Manuscript to be submitted must include keywords, an abstract, a paper title, co-author(s') names and details (email address, name, phone number, and institution), figures and illustrations in vector format including appropriate captions, tables, including titles and footnotes, a conclusion, results, acknowledgments and references.
5. Authors should submit paper in a ZIP archive if any supplementary files are required along with the paper.
6. Proper permissions must be acquired for the use of any copyrighted material.
7. Manuscript submitted *must not have been submitted or published elsewhere* and all authors must be aware of the submission.

Declaration of Conflicts of Interest

It is required for authors to declare all financial, institutional, and personal relationships with other individuals and organizations that could influence (bias) their research.

Policy on Plagiarism

Plagiarism is not acceptable in Global Journals submissions at all.

Plagiarized content will not be considered for publication. We reserve the right to inform authors' institutions about plagiarism detected either before or after publication. If plagiarism is identified, we will follow COPE guidelines:

Authors are solely responsible for all the plagiarism that is found. The author must not fabricate, falsify or plagiarize existing research data. The following, if copied, will be considered plagiarism:

- Words (language)
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- Findings
- Writings
- Diagrams
- Graphs
- Illustrations
- Lectures

- Printed material
- Graphic representations
- Computer programs
- Electronic material
- Any other original work

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1. Substantial contributions to the conception and acquisition of data, analysis, and interpretation of findings.
2. Drafting the paper and revising it critically regarding important academic content.
3. Final approval of the version of the paper to be published.

Changes in Authorship

The corresponding author should mention the name and complete details of all co-authors during submission and in manuscript. We support addition, rearrangement, manipulation, and deletions in authors list till the early view publication of the journal. We expect that corresponding author will notify all co-authors of submission. We follow COPE guidelines for changes in authorship.

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Appealing Decisions

Unless specified in the notification, the Editorial Board's decision on publication of the paper is final and cannot be appealed before making the major change in the manuscript.

Acknowledgments

Contributors to the research other than authors credited should be mentioned in Acknowledgments. The source of funding for the research can be included. Suppliers of resources may be mentioned along with their addresses.

Declaration of funding sources

Global Journals is in partnership with various universities, laboratories, and other institutions worldwide in the research domain. Authors are requested to disclose their source of funding during every stage of their research, such as making analysis, performing laboratory operations, computing data, and using institutional resources, from writing an article to its submission. This will also help authors to get reimbursements by requesting an open access publication letter from Global Journals and submitting to the respective funding source.

Preparing your Manuscript

Authors can submit papers and articles in an acceptable file format: MS Word (doc, docx), LaTeX (.tex, .zip or .rar including all of your files), Adobe PDF (.pdf), rich text format (.rtf), simple text document (.txt), Open Document Text (.odt), and Apple Pages (.pages). Our professional layout editors will format the entire paper according to our official guidelines. This is one of the highlights of publishing with Global Journals—authors should not be concerned about the formatting of their paper. Global Journals accepts articles and manuscripts in every major language, be it Spanish, Chinese, Japanese, Portuguese, Russian, French, German, Dutch, Italian, Greek, or any other national language, but the title, subtitle, and abstract should be in English. This will facilitate indexing and the pre-peer review process.

The following is the official style and template developed for publication of a research paper. Authors are not required to follow this style during the submission of the paper. It is just for reference purposes.

Manuscript Style Instruction (Optional)

- Microsoft Word Document Setting Instructions.
- Font type of all text should be Swis721 Lt BT.
- Page size: 8.27" x 11'", left margin: 0.65, right margin: 0.65, bottom margin: 0.75.
- Paper title should be in one column of font size 24.
- Author name in font size of 11 in one column.
- Abstract: font size 9 with the word "Abstract" in bold italics.
- Main text: font size 10 with two justified columns.
- Two columns with equal column width of 3.38 and spacing of 0.2.
- First character must be three lines drop-capped.
- The paragraph before spacing of 1 pt and after of 0 pt.
- Line spacing of 1 pt.
- Large images must be in one column.
- The names of first main headings (Heading 1) must be in Roman font, capital letters, and font size of 10.
- The names of second main headings (Heading 2) must not include numbers and must be in italics with a font size of 10.

Structure and Format of Manuscript

The recommended size of an original research paper is under 15,000 words and review papers under 7,000 words. Research articles should be less than 10,000 words. Research papers are usually longer than review papers. Review papers are reports of significant research (typically less than 7,000 words, including tables, figures, and references)

A research paper must include:

a) A title which should be relevant to the theme of the paper.
b) A summary, known as an abstract (less than 150 words), containing the major results and conclusions.
c) Up to 10 keywords that precisely identify the paper's subject, purpose, and focus.
d) An introduction, giving fundamental background objectives.
e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition, sources of information must be given, and numerical methods must be specified by reference.
f) Results which should be presented concisely by well-designed tables and figures.
g) Suitable statistical data should also be given.
h) All data must have been gathered with attention to numerical detail in the planning stage.

Design has been recognized to be essential to experiments for a considerable time, and the editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned unrefereed.

i) Discussion should cover implications and consequences and not just recapitulate the results; conclusions should also be summarized.
j) There should be brief acknowledgments.
k) There ought to be references in the conventional format. Global Journals recommends APA format.

Authors should carefully consider the preparation of papers to ensure that they communicate effectively. Papers are much more likely to be accepted if they are carefully designed and laid out, contain few or no errors, are summarizing, and follow instructions. They will also be published with much fewer delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and suggestions to improve brevity.

Format Structure

It is necessary that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

All manuscripts submitted to Global Journals should include:

Title

The title page must carry an informative title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) where the work was carried out.

Author details

The full postal address of any related author(s) must be specified.

Abstract

The abstract is the foundation of the research paper. It should be clear and concise and must contain the objective of the paper and inferences drawn. It is advised to not include big mathematical equations or complicated jargon.

Many researchers searching for information online will use search engines such as Google, Yahoo or others. By optimizing your paper for search engines, you will amplify the chance of someone finding it. In turn, this will make it more likely to be viewed and cited in further works. Global Journals has compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Keywords

A major lynchpin of research work for the writing of research papers is the keyword search, which one will employ to find both library and internet resources. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining, and indexing.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy: planning of a list of possible keywords and phrases to try.

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning searching. Think about the most important concepts related to research work. Ask, “What words would a source have to include to be truly valuable in a research paper?” Then consider synonyms for the important words.

It may take the discovery of only one important paper to steer in the right keyword direction because, in most databases, the keywords under which a research paper is abstracted are listed with the paper.

Numerical Methods

Numerical methods used should be transparent and, where appropriate, supported by references.

Abbreviations

Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

Formulas and equations

Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

Tables, Figures, and Figure Legends

Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.

Figures

Figures are supposed to be submitted as separate files. Always include a citation in the text for each figure using Arabic numbers, e.g., Fig. 4. Artwork must be submitted online in vector electronic form or by emailing it.

Preparation of Eletronic Figures for Publication

Although low-quality images are sufficient for review purposes, print publication requires high-quality images to prevent the final product being blurred or fuzzy. Submit (possibly by e-mail) EPS (line art) or TIFF (halftone/ photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Avoid using pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings). Please give the data for figures in black and white or submit a Color Work Agreement form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

For scanned images, the scanning resolution at final image size ought to be as follows to ensure good reproduction: line art: >650 dpi; halftones (including gel photographs): >350 dpi; figures containing both halftone and line images: >650 dpi.

Color charges: Authors are advised to pay the full cost for the reproduction of their color artwork. Hence, please note that if there is color artwork in your manuscript when it is accepted for publication, we would require you to complete and return a Color Work Agreement form before your paper can be published. Also, you can email your editor to remove the color fee after acceptance of the paper.

Tips for writing a good quality Social Science Research Paper

Techniques for writing a good quality homan social science research paper:

1. Choosing the topic: In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. Think like evaluators: If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

3. Ask your guides: If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

4. Use of computer is recommended: As you are doing research in the field of homan social science then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

5. Use the internet for help: An excellent start for your paper is using Google. It is a wondrous search engine, where you can have your doubts resolved. You may also read some answers for the frequent question of how to write your research paper or find a model research paper. You can download books from the internet. If you have all the required books, place importance on reading, selecting, and analyzing the specified information. Then sketch out your research paper. Use big pictures: You may use encyclopedias like Wikipedia to get pictures with the best resolution. At Global Journals, you should strictly follow here.



6. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

7. Revise what you wrote: When you write anything, always read it, summarize it, and then finalize it.

8. Make every effort: Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

9. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

10. Use proper verb tense: Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.
Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

19. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

20. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

21. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

22. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

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Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.



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Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

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The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

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Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

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Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

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- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.



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The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
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- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

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Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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ISSN 975587

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