

Full Length Research Paper

Status of watersheds in southeast Nigeria

Enwelu, Innocent Achonam* and Igbokwe, Edwin M.

Department of Agricultural Extension, University of Nigeria, Nsukka, Enugu State, Nigeria.

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The study assessed the status of watersheds in southeast, Nigeria. Participant observation, key informant interview and interview of heads of households were used for data collection. A total sample size of 412 respondents was involved in the study. The results of the study revealed a general decrease in various features in the watersheds. For instance, 99.5% of the respondents were of the opinion that forest trees were decreasing in the watersheds. About 96% of the respondents perceived that the population of animals was decreasing while only 67.1% of the respondents perceived the fishes were decreasing. The study found out that watersheds were low to moderately covered with forests at present but were moderately to heavily covered in the last 10 years. The study also revealed that the present status of the watersheds was threatened by unrestricted access to watershed resources by watershed dwellers and other anthropogenic activities such as collection of fuel wood (98.5%), animal hunting (95.4%), farming activities (87.6%) etc. The study again found that watersheds were close to both farms and residential homes. The study concluded that the closeness of watersheds to farm and residential houses created easy access for excessive exploitation of watershed resources.

Key words: Status, watersheds, activities, resources

INTRODUCTION

Water is one of the most important of all natural resources. It is vital for all living organisms and ecosystems as well as for human health, food production and economic development. According to Dr. Haldan Mahler former Director General of World Health Organization as quoted in WASH (1993), "the number of water taps per thousand people will become a better indicator of health status than the number of hospital beds" (Water and Sanitation for Health). Today nearly 40% of the world's food supply grown under irrigation and a wide variety of industrial processes depend on water. But even at the global level, it is becoming increasingly difficult to satisfy the collective thirst of people, industry and agriculture without damaging the world's limited resource of freshwater. This is because the availability, quantity and quality of fresh water resources depend largely on their watersheds (US EPA, 2003).

Watershed is a topographically delineated area that is

drained by a stream system, that is, the total land area that drains to some points on a stream or river. McCammon (2003) describes watershed as the divide separating one drainage area from another. That is an area in which surface water flows to a common point. But Sherbinin (1997) describes it as the boundary of a lake, river or aquifer catchments, sometimes used to refer to the upstream part of a catchment. Aquifer is an underground stratum of rock or sediment that contains water and transmits water readily. The term "catchment" and "watershed" are often used synonymously although they are actually different. A catchment is a basin shaped area from which rainwater can drain to a common outlet point or an area that catches rainfall or snow to supply a river, aquifer or lake.

Ingwu (2006) observes that the ever-increasing speed of infrastructural development has resulted in many environmental problems. These include deforestation,

streams drying up, water pollution and invariably water scarcity.

Thus the decline of forests and fresh water and concomitant agricultural activities lead to land use and land cover changes, hence the degradation of the watershed system. Also, infrastructural developments are more often than not associated with the excavation of sand and gravel. Sand and gravel are largely confined to the beds of streams and rivers and their banks and are largely indispensable in many construction projects.

Consequently, settlement encroachments close to the streams and deforestation have contributed to seasonal shortages of water. The swamp, fresh watershed and spring areas have been used for building residential houses, private schools, animal pens, saw mills etc. Sometimes, dams are built without involving the rural community in the decision (Ingwu, 2006). When the population increases, the problem of adequate water supply is compounded.

In parts of southeast Nigeria like Enugu State for instance, increase in population, increasing industrial and agricultural activities, construction work and other unsustainable environmental practices have led to watershed and environmental degradation. Environmental degradation has affected how water flows into the watershed and what flows with the water. As trees and shrubs are replaced with impervious surfaces (roads, houses etc), they increase runoff and less water sinks into the ground (affecting the ground water levels). The increased run-off leads to more flooding after rains resulting to siltation or drying up of rivers. This also results in impairment of the health of human beings who consume the water and its resources, destruction of the lives and extinction of aquatic organisms. This indirectly leads to destruction of the population that depends on these organisms for livelihood (Obiora, 2005, unpublished M.Sc Thesis).

On the basis of the above scenario, certain questions become pertinent as regards the state of watersheds in southeast, Nigeria: What is the current status of watersheds? What is the status of vegetative cover? What are the activities currently going on around the watersheds? What are average distances of farms and homes to the watersheds? Answers to the above questions form the basis for this research.

The overall objective of the study was to assess the status of watersheds in southeast Nigeria. Specifically, the study sought to: ascertain the current status of watersheds in southeast Nigeria; determine the status of vegetative cover; describe the activities currently going on around the watersheds and determine the average distances of farms and homes to the watersheds.

MATERIALS AND METHODS

The study was carried out in the southeast geopolitical zone of Nigeria made up of Enugu, Anambra, Imo, Abia and Ebonyi States

all of Igbo extraction. The southeast is characterized by a tropical climate with marked wet and dry seasons and mean annual rainfall of about 1700 mm (Ahamefula and Mbagwu, 2007). The three main drainage or watershed systems in the southeast have some of their major rivers and their tributaries emanating from Enugu State; some of which includes: Adada, Mwuyi (a tributary of Ajali), Oji, Mamu, Awra (a tributary of Ora), Iyoko, (a tributary of Idodo), Nyaba, Atafo, Ufam, Mvuna, Esu¹ (Asu²), and Iyikwa rivers (Figure 1).

The population of the study comprised all the watersheds and the rural people living around the watersheds/rivers in southeast Nigeria. The study concentrated on three rivers/watersheds emanating from their upper courses (sources) through their middle to lower courses. Therefore, three of such rivers/watersheds namely Esu (called Anyim River in Amasiri, Afikpo), Mamu (called Ezu River in Amansea Awka) and Imo were purposively selected. All the five states in the southeast geopolitical zone namely: Abia, Anambra, Ebonyi, Enugu and Imo were covered by the study because of the natural courses of the rivers selected. One town community each was purposively selected in each river/watershed at the upper, middle and lower courses because of closeness of such community to the watershed. This gave a total of nine town communities as follows: Esu watershed- Akpugo Nkanu (source of Esu River), Uburu and Amasiri; Mamu watershed- Enugu Maku (source of Mamu River), Enugu Abor Ufuma and Amansea Awka and Imo watershed- Umuaku Umu-Nneochi (source of Imo River), Aro-Ofeimo and Owerrenta.

Each of the selected town communities consists of village communities which are made up of clans and hamlets. Two villages were purposively selected on the basis of their proximity to the watersheds making a total of 18 villages.

A list of heads of households from the two selected villages/hamlets in each watershed was compiled based on their membership of such villages/hamlets and ownership of watershed resources as follows: Esu watershed-343; Mamu-336; and Imo-326. Thereafter, 50% of the heads of households (HOHs) was proportionately selected from the list compiled thus: Asu- 172; Mamu- 168; and Imo- 163 given a total sample size of 503 respondents. However, the number of respondents that actually completed the interview schedule for Esu watershed was 133, Mamu 139 and Imo 140 which gave a total sample size of 412 respondents for the study.

GPS (Global Positioning System) was used in determining study locations as can be seen in Table 1. This was to ensure that the actual communities in the watersheds involved in the study were located for data collection. The coordinates of the locations can make them accessible in any part of the globe. Participant observation, key informant interview and interview of heads of households were used for data collection. The researcher, aided by guides personally visited all sites including all stages of the water bodies and surrounding settlements. Notes and photographs were taken when striking observations were made. On the other hand, for interview of heads of households an interview schedule was developed for data collection based on the objectives. Focus group discussion (FGD) was also conducted to clarify certain ambiguous issues.

The status of watersheds was assessed by identifying the physical features (forest trees, fishes, animals, etc) existing around the watersheds. The respondents were provided with the list of scaled status of vegetative cover at present and 10 years ago and asked to tick accordingly (e.g. Watersheds are heavily covered with forest trees; Watersheds are moderately covered with forest trees etc). It also described the activities currently going on around the watersheds such as: sand mining, felling of trees, setting fire on the watersheds, fishing with chemicals, animal grazing, settlements

¹ Esu - Name of the river among the local population in the watershed was used in this study.

² Asu - Anglicized name of the river found in publications.

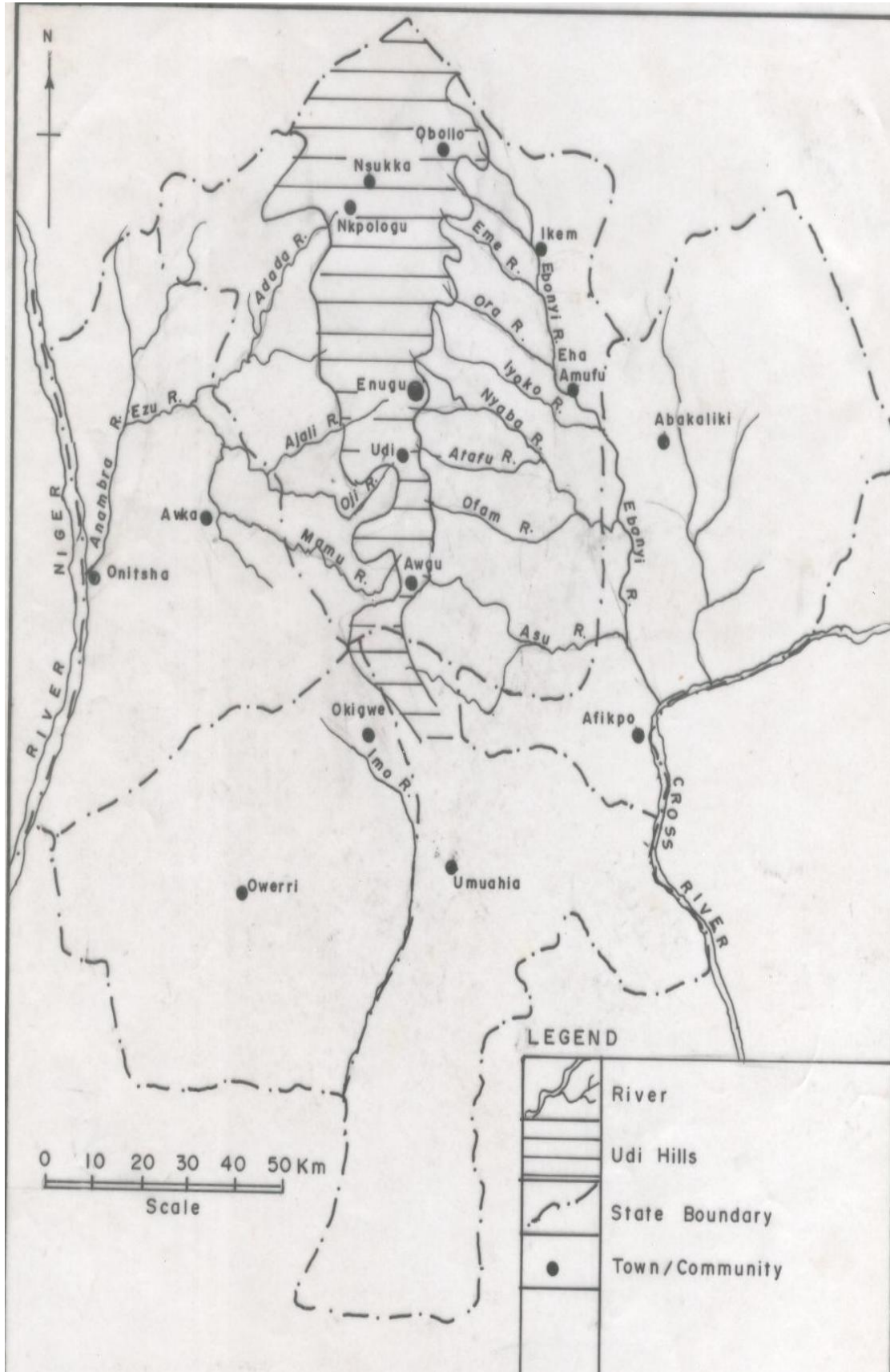


Figure 1. Map of southeast geo-political zone showing major rivers and their watersheds.

Table 1. GPS reading showing the coordinates of the village communities selected for the study.

Watersheds	Village communities	GPS reading	
		North	East
Esu	Akpugo Nkanu: Upper course		
	Ihunekwoagu	0620'26.27506"	0734'20.82230"
	Obinagu Uno	0619'56.95358"	0734'25.42690"
	Uburu: Middle course		
	Urobo	0603'12.59720"	0744'30.33601"
	Umuchime	0602'42.10670"	0744'34.51344"
	Amasiri: Lower course		
	Ohachara	0558'01.56555"	0754'10.03555"
	Ndukwe	0557'34.36249"	0752'06.69022"
Mamu	Maku Awgu: Upper course		
	Ihite Amagu	0607'18.26008"	0727'57.29130"
	Enugu Maku	0607'23.39447"	0727'01.40179"
	Enugu Abor Ufuma: Middle course		
	Omako	0605'37.40387"	0714'25.44285"
	Agu Owa	0606'09.92685"	0714'28.08300"
	Amansea: Ezu river Lower course		
	Amaowelle	0615'05.86739"	0708'21.68037"
	Egbeagu	0616'16.91631"	0707'34.01516"
Imo	Umuaku: Upper course		
	Umuaku	0600'38.22041"	0721'20.38960"
	Nneato	0559'48.54172"	0719'47.35256"
	Aro-Ofeimo: Middle course		
	Ndiokonkwo	0548'15.94631"	0715'38.63583"
	Ndibe Obah	0547'57.66188"	0716'22.78189"
	Owerenta: Lower course		
	Waterside	0518'36.47701"	0717'32.71558"
	Amudo	0518'18.17276"	0717'19.74266"

GPS = Geographical positioning system.

close to the watersheds etc. Furthermore, GPS was used to determine the approximate distances of watershed to farms and residential homes in order to highlight the effects of human settlements and activities on the status of the watersheds. Data collected were analyzed using percentage and mean scores.

RESULTS AND DISCUSSION

Current status of watersheds

Data in Table 2 reveal that nearly all the respondents (99.5%) were of the opinion that forest trees were decreasing in the watersheds. This finding was observable in all the watersheds. The situation might have led to decrease in population of animal as was also perceived by 96.3% of the respondents in all the watersheds. As regards current status of fishes in the

watersheds, about 67.0% of the respondents perceived that the population of fishes were decreasing. This could be so because there was little or no visible water at the source of Esu watershed (river) at the time of the study (Plate 6). Consequently, 19.1% of the respondents perceived that fishes did not exist in their watersheds. However, 13.5% of respondents in all the watersheds perceived that fish population was increasing while only 0.3% said there was no change in fish population. About 50% of the respondents were of the opinion that volume of water was decreasing in the watersheds. Thirty-three percent said there was no change in the volume of water while 17.4% said the volume of water was increasing. The fact that volume of water was generally decreasing was established through focus group discussion (FGD).

The percentage (95.5%) decrease in forest trees has serious implications on the status of watersheds (Table

Table 2. Percent distribution of respondents' perception of current status of watersheds.

Current status of watersheds		Watersheds			Overall %
		Esu % (n = 133)	Mamu % (n = 139)	Imo % (n = 140)	
Forest trees	Decreasing	99.9	99.9	98.7	99.5
	No change	0.1	0.1	0.7	0.3
	Increasing	0.0	0.0	0.6	0.2
	Not existing	17.4	26.4	13.5	19.1
Fishes	Decreasing	74.7	54.9	71.7	67.1
	No change	7.9	18.0	13.9	13.3
	Increasing	0.0	0.7	0.9	0.5
Animals	Decreasing	98.1	92.1	98.7	96.3
	No change	0.0	0.9	0.0	0.3
	Increasing	1.9	7.0	1.3	3.4
Volume of water	Decreasing	39.3	48.9	60.6	49.6
	No change	31.3	38.7	29.7	33.2
	Increasing	29.4	12.4	9.7	17.2

Overall= the average % of the three watersheds.

Table 3. Respondents' perceived rating of status of vegetative cover of watersheds at present and 10 years ago.

Status	Watersheds			Overall %
	Esu %	Mamu %	Imo %	
Status of vegetative cover at present				
Watersheds are moderately covered with forest trees	32.3	43.3	51.9	42.5
Watersheds are lightly covered with forest trees	67.7	56.7	43.1	55.8
Status of vegetative by 10 years ago				
Watersheds are heavily covered with forest trees	48.2	65.6	58.8	57.5
Watersheds are moderately covered with forest trees	36.9	34.4	39.7	35.3
Watersheds are lightly covered with forest trees	15.0	0.0	0.7	5.2

Overall= the average % of the three watersheds.

2). This is because forest trees provide habitats for other living organisms (including animals) in the watersheds. This fact was buttressed by Elevitch and Wilkenson (2009) when they stated that forest trees protect land from erosion, provide habitat for wildlife, support diversity of soil micro life, and reduce carbon dioxide pollution and global warming. Forest trees also help in maintenance of water quality and quantity. Through FGD it was confirmed that the use of sophisticated instruments in clearing of forest trees, hunting of animals and fishing compounded the decreasing status of watersheds. These study findings are synonymous with earlier reports by Akolade and Issa (2009) as well as Ukpong (1994) which state that destructive logging of forests, flooding and wind

erosion menace, overgrazing, over-cropping of arable lands, land degradation with pesticides and fertilizers, improper resource management, forest clearance for agricultural development, urban growth, industrial expansion and general pressure from increasing population have reduced the extent, diversity and stability of Nigerian forests to protect the watersheds. These activities can also lead to reduction in volume of water.

Status of vegetative cover in the watersheds

Data in Table 3 show that 55.8% of the overall respondents' perceived rating of the watersheds as being

Table 4. Percentage distribution of activities going on around the watersheds.

On-going activities	Watersheds			
	Esu % (n = 133)	Mamu % (n = 139)	Imo % (n = 140)	Overall % (n = 412)
Collection of fuel wood	96.0	99.6	99.9	98.5
Animal hunting	91.8	95.4	99.0	95.4
Washing/bathing	77.1	97.5	94.8	89.8
Farming activities	94.8	99.6	68.4	87.6
Lumbering	66.3	96.0	78.0	80.1
Animal grazing	91.8	87.3	42.9	74.0
Road construction	58.2	96.0	67.8	74.0
Fishing with hook/net	77.1	69.9	69.3	72.1
Setting fire on watersheds	66.9	69.3	70.5	68.9
Sand mining	59.7	69.9	69.3	66.3
Worshipping of gods/goddesses	82.2	59.1	55.2	65.5
Defecating/urinating	56.7	72.9	64.2	64.6
Fishing with chemicals	66.0	37.5	75.6	59.7
Processing of food	40.2	72.0	65.4	59.2
Building close to watershed	28.5	35.7	33.6	32.6

Overall= the average % of the three watersheds.

lightly covered with forest trees at present, while about 43% rated them to be moderately covered with forest trees. No respondent rated the watersheds to be heavily covered with forest trees at present and none said that they were not covered with forest trees at all. On the other hand, 10 years ago, about 58% of the overall respondents rated the watersheds to be heavily covered with forest trees, 33.3% rated them to be moderately covered with forest trees while only 5.2% rated them to be lightly covered as against the current rating of 55.8%.

It is obvious from these findings that watersheds in the southeast are threatened and gradually being degraded at present. Ingwu (2006) shares the same view when she states that watershed exploiters remove vegetative cover in order to create depots and roads for watershed resources like sand, gravel and timber trunks. And so, the consequences of removal of forest trees around the watershed are enormous: land use changes are changing watershed landscape patterns, ecosystem functions and climate dynamics; affect biodiversity and hydrology and transport of latent heat, carbon dioxide, nutrients and road construction (74.0%); animal grazing (74.0%); fishing with hook/net (72.1%); setting fire on watersheds (68.9%); sand mining (66.3%); worshipping of gods/goddesses (65.5%); defecating/urinating (64.6%); fishing with chemicals (59.7%); processing of food (59.2%) and building close to the watersheds (32.6%).

One of the major activities currently going on in all the watersheds in southeast Nigeria was exploitation of fuel wood (98.5%). It has become such a booming business to the extent that live trees are cut and left to dry for fuel wood. The problem of scarcity and high cost of petroleum products like kerosene is compounding the situation.

pollutants (Huber et al., 2005). The implication of this finding is that even 10 years ago the watersheds have come under attack which is likely to continue if urgent steps are not taken to manage the watersheds sustainably. Nevertheless, over a decade ago, more watersheds were still covered with forest trees than at present. Similar view was held by Ingwu (2006) who stated that in the past, words and actions were in the direction of conservation, respect, good husbandry and efficient use of environmental resources. Then, there were rules to protect trees and streams and rivers as well as a governing council who oversaw the management of natural resources.

Activities currently going on around the watersheds

The activities currently going on around all the watersheds (Table 4) were as follows: collection of fuel wood (98.5%); animal hunting (95.4%); washing/bathing (89.8%); farming activities (87.6%); lumbering (80.1%); Again washing/bathing (89.8%) in some of the rivers in the watersheds was observed. It was confirmed through FGD that people actually wash/bath in some rivers within the watersheds. This activity affects the quality of water in the watersheds because phosphate based detergents and bathing soaps contain harmful chemicals.

Another major activity observed in most of the watersheds was the fact that people farm very close to the watersheds in spite of the effects of occasional and/or regular overflow of the river banks (Plates 1 and 2). It was also discovered through FGD that they apply modern agro-inputs like fertilizers, herbicides and pesticides

whenever they are available and affordable. Franti and Tonn (2005) emphasized that farming, recreation and construction can significantly affect a watershed. Soil erosion and loss of nutrients from farm fields and construction sites can lead to siltation of rivers/streams and death of aquatic organisms. Furthermore, pesticide use typically takes place during a limited spray season; some compounds persist long enough in soils to load continually throughout the year via suspended sediments in surface run off down to the watersheds (<http://www.epa.gov/watertrajin/agent>). In a nutshell, tilling of soil around the watersheds and addition of nutrients like fertilizers are some of the causes of water impairment due to agriculture.

Animal grazing (74%) around the watersheds was another activity currently going on around the watersheds. This is a source of conflicts between Hausa/Fulani cattle rearers and some communities around the watersheds in the southeast. It was established through FGD that livestock grazing around the watersheds had unlimited access to river channels and banks thereby polluting them with faeces and urines. This is one of the most significant rural sources of non-industrial pollution. Although they often make-up a small percentage of grazing areas by surface area, riparian zones are particularly attractive to cattle that prefer the cooler environment and lush vegetation found alongside rivers and streams. This can result to increased sediment and debris input into river/stream due to "hoof shear", trampling of vegetation with resultant drop in the water table, loss of fisheries and direct deposition of wastes into the waterways (<http://www.epa.gov/watertrajin/agent>). Also, Asadu et al. (1999) in Asadu (2009) confirmed the consequences of overgrazing on the soil physical properties in south-eastern Nigeria.

Setting fire on watersheds (68.9%) was another activity going on in some of the watersheds. The State Edict against bush burning was observed to be grossly ineffective in controlling this activity probably because the rural communities (village/town development unions) were not involved in formulation of the edict. The village/town development unions would have been very useful in the enforcement of the edict if they were initially involved. Again, bush burning and "slash and burn" practice continue to damage watershed resources except in circumstances where the river/stream cannot allow it. According to Gallopin (2006), land clearing method such as "slash and burn" aggravate greenhouse effects by the burning bio-matter into biochar which directly releases greenhouse gases (carbon dioxide, methane, nitrous oxide etc) and particulate matter such as soot into the air.

Again, worshipping of idols (65.5%) was still observed in some watershed communities especially communities at the sources of the rivers (Akpugo Nkanu, Enugu Maku, Umuaku, Uburu, Amansea). The traditional religious institution had contributed immensely in conservation of watershed resources through sustainable practices like

reservation of sacred forests, animals and fishes. On the contrary, the Christian religion seems to undermine these sustainable practices by clearing sacred forests, animals and fishes (Enwelu, 2002 Unpublished M.Sc. Thesis).

Uncontrolled disposal of human waste (64.6%) were observed in some of the watersheds (Asu, Mamu and Imo). This may be probably because of the spatial nature of the watersheds/rivers which makes it difficult to manage watersheds with such magnitude. However, from FGD, it was found out that local streams/spring water which are sources of drinking water in the communities were protected from indiscriminate disposal of human wastes. This was not possible in large water bodies probably because of the far distances of the water bodies to residential homes especially in the middle and lower courses of the watersheds.

About 60.0% of the respondents in the watersheds reported that fishing with chemical was going on. Also, during the FGD (Plates 3 and 4) some community leaders confirmed that the activities were actually going on secretly. However, in Enugu-Abor Ufuma (Anambra State), fishing with chemical was minimized by the fear of Mamu water goddess. On the other hand, a serious ban on fishing with chemical in Ogwu Uburu (Ebonyi State) helped reduce the activity.

However, one activity reported by the fewest number of the respondents was erecting building very close to the watersheds. From FGD it was found out that there was no rule/regulation prohibiting such activity. Nevertheless, some communities like Amansea (Amaowelle, 16 m), Akpugo Nkanu (Obinagu Uno, 22 m), Umuaku (church building, 73 m), Maku 43 m etc actually built very close to the watersheds (Plate 5).

Average distances of farms and compounds to the water bodies

The overall average distances of farms and residential homes to the water bodies at the upper, middle and lower courses of Esu watersheds were 150 and 291.2 m respectively. In case of Mamu watersheds, they were 140 and 575.5 m respectively while Imo watersheds were 97.5 and 209 m respectively (Table 5).

Normally, the upper courses of a river are on high elevation. Surprisingly, the upper course of Esu watershed (at Akpugo Nkanu) is a flat land which encourages many people to live very close to the watershed. The community however managed to protect a patch forest at the very source of the river which serves as recreation centre, film location and shrine of the Esu goddess (Plate 6).

At the middle course of Esu River (watershed), the average distances of farms and residential homes to the water body were 345 and 575 m, respectively while the average distances of farms and residential homes at the lower course were 79.5 and 229 m, respectively. The

Table 5. Average distances of farms and compounds to the water bodies in the watersheds (Data generated through GPS).

Watershed	Upper course		Middle course		Lower course		Overall average distance	
	Average farm distance (m)	Average residential distance (m)	Average farm distance (m)	Average residential distance (m)	Average farm distance (m)	Average residential distance (m)	Farm distance (m)	Residential distance (m)
Esu	25.5	69.5	345	575	79.5	229	150	291.2
Mamu	35.5	202.5	65	650.5	320	879.6	140	575.5
Imo	198	316	51.5	65	43	246	97.5	209

**Plate 1.** Farm close to watershed at Uburu (0601' 25.06851" N 0744' 40.48553" E).

residential houses at the lower course of Esu (Anyim) river/watershed were actually farm houses built by some members of the community who were farmers and outsiders who paid land rates to the communities. The rest of the communities actually live very far away from the watershed. The average distances at the middle and lower courses of Esu-River for both farms and residential homes to the water body are relatively farther than the upper course. It was found out through FGD that living a little away from the watershed was a precautionary measure against incessant overflow of Esu-River.

At upper course of the Mamu watershed (0607' 37.61662" N 0726' 53.48133" E), the average distances of farms and residential homes to the water body were 35.5

and 202.5 m, respectively. The short distance (35.5 m) of farms to the water body relative to the residential homes (202.5 m) was because farmers were skilfully engaged in terrace farming through converting of rocky hills into farm lands around the watershed. Despite the land use change activities a patch of forest (Plate 7) is protected. At the upper course of Mamu watershed, the volume of the river is not yet large enough to sustain most watershed resources like fishes, animals, etc. Also, the topography of the area did not allow people to build houses very close to the watershed thereby forcing them to seek residential areas on the plateaux of the hills (Plate 8).

At the middle course of Mamu watershed (0606'



Plate 2. Farm close to watershed at Amansea Awka (0615' 03.68557" N 0708' 54.95693" E).



Plate 3. Key informant interview at Uburu.



Plate 4. FGD at Uburu.



Plate 5. House very close to watershed at Amansea Awka (0615' 08.02345" N 0708' 52.05414" E).



Plate 6. Patch forest at source of Esu River (Akpugo Nkanu) (0620'12.21085" N 0734' 33.84293" E).



Plate 7. Patch forest at source of Mamu River (Enugu Maku) (0607' 37.58228" N 0726' 53.0880" E).



Plate 8. Enugu Maku excavation site (0607' 37.73849" N 0726' 52.60929" E).

06.71162" N 0715' 38.34572" E), the average distances of farms and compounds to the water body were 65 and 650.5 m, respectively. The people were previously living away from the watersheds but presently new sites are being acquired towards the watersheds and some new buildings are springing up. There is no restriction in place since there is no rule and regulation against people building close to the watershed (Enwelu, 2011 Unpublished Ph.D Thesis). At the lower course of Mamu (Ezu) river/watershed (0615' 09.55982" N 0708' 53.11501" E), the average distances of farms and residential homes to the water body were 320 and 879.6 m, respectively. Naturally these distances are high at the lower course. The reason for the long distances of farms and residential homes to the water body may be, because, one of the village communities (Egbeagu) is traditionally located close to another stream which is far away from the watershed under study unlike Amaowelle village community which is situated very close to the water body (Plate 5) . However, just like the trend in the middle course, the people of Egbeagu village community have started some building projects towards the watershed.

In Imo watershed at the upper course (0600' 16.32843" N 0721' 20.88055" E), the average distances of farms and residential homes to the water body were 198 and 316 m, respectively. The longer distances of farms

and residential homes to the water body at the upper course might be as a result of deep valley observed at the source of Imo River/watershed (Plate 9).

Another reason why some people may be living a little far away from the watershed at the upper course could be as a result of fewer watershed resources available at that stage because of little or no water at the source of the water body. In the middle course, the average distances of farms and residential homes to the water body were 51.5 and 65 m, respectively. People are majorly living close to the watershed and are engaged in activities such as fishing, sand mining, logging etc. On the contrary, although the average distances of farms to the water body reduced to 43 m at the lower course of Imo watershed (0518' 26.85196" N 0717' 18.29556"), the average distances of residential homes to the water body increased to 246 m. The reason may be similar to earlier observation at the lower course of Mamu watershed. The longer distance may be as a result of close location of Amudo village community to the community stream which is far away from the watershed under study like the Waterside village community of Owerenta that is situated close to the watershed (Plate 10).

On the whole, the longest overall average distance of farm to the water body was 150 m and the shortest was 97.5 m. Also, the longest overall average distance of residential house to the water body was 575.5 m and the



Plate 9. Deep valley at source of Imo River (Umuaku Umu-Nneochi ($0600'16.23058''$ N $0721' 20.82561''$ E).



Plate 10. Sand mining at Owerenta waterside ($0518' 31.92799''$ N $0717' 15.98328''$ E).

shortest was 209 m. The implication of this finding is that average distances of both farms and residential homes to the water body are not up to one kilometre away from the watersheds. This may seem normal at present but adequate control measures must be put in place to maintain the distances because development activities have the tendency of moving towards the watersheds. Presently, some watersheds are at risks of potential threat and devastation and when one considers the present rate of population increase and population density in the southeast, the poverty level, food insecurity and worsening unemployment situation, the future condition of the watersheds is bleak.

CONCLUSION/RECOMMENDATION

Based on the findings of the study, the following conclusions could be drawn in respect to status of watersheds in southeast Nigeria. The watersheds are perceived to be low to moderately covered with forest trees at present, but in the last 10 years, they were perceived to be moderately to heavily covered with forest trees. The physical features of the watersheds (forest trees, fishes, animals and volume of water) are decreasing as a result of activities currently going on around the watersheds such as excessive collection of fuel wood, farming, lumbering etc. The closeness of watersheds to farm and residential houses created easy access for exploitation of watershed resources. The study recommended adding watershed development and management as a course/discipline in the Nigerian universities' curriculum.

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