

Environmental Impacts of the Uncontrolled Depletion of Rosewood (Madrid Wood) in Taraba State, Nigeria

John, Wajim

Department of Sociology, Federal University, Wukari, 200 Katsina-Ala Road, P.M.B 1020 Wukari, Nigeria

Abstract:-Timber merchants are moving from one state to another in Nigeria depleting the Rosewood in their forests, leaving empty landscapes without minding the enduring effects of uncontrolled harvesting of the tree on the environment due to its demand over the past number of decade in China where they are used for the construction of furniture to satisfy the appetite of the country's middle class whose wealth has been on the increase. Apart from the effect on the environment, the forestry experts fear that the illegal activities of local and Chinese merchants will also have telling economic implications in the near future on many communities where the forests that grow the much sought-after tropical Woods are located. This study examined the environmental impacts of the uncontrolled depletion of Rosewood (Madrid Wood) in Taraba State, Nigeria. A cross sectional survey research was conducted to generate the research data used to answer the research questions. Both secondary sources and quantitative research approaches were combined in this study. Samples of five hundred and forty-four (544) questionnaires were administered by four trained research assistants but five hundred and seventeen (517) were duly completed and returned. The data from the returned questionnaires were analyzed with the help of Statistical package for the social sciences (SPSS). Thus, amongst other recommendations, the study recommends that Taraba State government should empower its forestry department to fully enforce the country's forestry laws and policies. The study further recommends extensive public awareness campaign on the dire consequences of deforestation to people and environment.

Keywords: Environment, uncontrolled depletion, Rosewood, Taraba, Nigeria

I. INTRODUCTION

In many West African countries, a historical driver of deforestation has been noncompliance with forest-related laws and the poor governance of the forest resource. The substantial amount of illegal activities in the sector is a symptom of this failure. In the majority of countries with large forest areas and high levels of deforestation and degradation, illegal activities – both conversions of forests for agricultural purposes, and forest degradation, particularly that is caused by illegal logging have been the most significant drivers of deforestation (World Bank, 2008). One of the major threats to all species is habitat loss and deforestation. In Africa between the years 2000 and 2010, 3.4 million hectares of forest were converted for other uses (Innes, 2010). Worldwide close to 10 million hectares was lost from the tropics in 2014 (Global Forest Watch, 2016).

Asian imports of Rosewood have increased dramatically in recent years (Wenbin, and Xiufang, 2013). According to Lawson, (2015), between the first quarter of 2010 and the first quarter of 2015, Chinese imports increased by more than 3,000-fold in value: from 21,250 US dollars (total of Chinese imports during the first quarter of 2010) to 63,943,732 US dollars (total Chinese imports during the first quarter of 2015). These imports increased by more than 1,700 in volume: from 50m³ (total Chinese imports during the first quarter of 2010) to 89,301 m³ (total Chinese imports during the first quarter of 2015). During the first quarter of 2015, nearly 30% of the total value of China's imports of Rosewood and nearly 55% of the volume of Chinese imports of rosewood came from West Africa. This quantity was negligible four years ago. He further stated that West Africa is now competing with the Southeast Asia as the main exporting region of rosewood to China.

Apart from the general views on the indiscriminate exploitation of Rosewood for commercial purposes, no research has so far been conducted specifically to reveal the Environmental impacts of uncontrolled commercial depletion of Rosewood (Madrid Wood) in Taraba State, Nigeria. Furthermore, has been stated earlier, several studies Aiyetan, (2016); Abner, (2001); Bosu, (2013 and 2015); CITES, (2015), and the European Commission (EU), (2008); Loupe, Oteng-Amaoko and Brink, (2008); Senegal CITES Management Authority, (2017); and Treanor (2015) have focused on the indiscriminate exploitation of Rosewood in Burkina Faso, Gambia, Ghana, Mali, Senegal, Togo, and Taraba State, Nigeria. However, none of the said and other existing studies on the subject matter has focused specifically on the Environmental impacts of the uncontrolled depletion of Rosewood (Madrid Wood) in Taraba State, Nigeria. The present study is designed to begin to address the latter aspect of the subject matter of interest, which will also represent the much-needed efforts that will begin to fill the void that exists in the literature.

Research Questions

The following research questions were formulated to guide the study:

- i. What is the purpose for the uncontrolled depletion of the Rosewood?
- ii. Will uncontrolled depletion of the Rosewood cause deforestation?

- iii. What are the environmental impacts of deforestation?
- iv. Will deforestation causes climate change?
- v. Will the uncontrolled depletion of the Rosewood lead to extinction of the tree in near future?
- vi. What are the control strategies for the uncontrolled depletion of the Rosewood?

Objectives of the Study

The general objective of the study is to examine the Environmental Impacts of the Uncontrolled Depletion of Rosewood (Madrid Wood) in Taraba State, Nigeria. The following specific objectives have been outlined to guide the study:

- i. To ascertain the purpose for the uncontrolled depletion of the Rosewood
- ii. To determine whether the uncontrolled depletion of the Rosewood will cause deforestation
- iii. To find out the environmental impacts of deforestation
- iv. To ascertain whether deforestation will cause climate change
- v. To determine whether the uncontrolled depletion of the Rosewood will lead to the species extinction in near future
- vi. To find out the control strategies for the uncontrolled depletion of the Rosewood.

II. CONCEPTUAL CLARIFICATION

Environment

The National Conservation and Environment Protection Act (1987) described environment to include the physical factors of the surrounding of human beings, land, soil, water, atmosphere, climate, sound, odour, taste and the biological factors of animals and plants. The Federal Environmental Protection Agency Act (1992) sees environment to include water, air, land, and all plants and human beings, or animals living there in and the interrelationships which exists among these or any of them. Environment further means a natural resource base that provides sources (material, energy etc) and performs sink functions (e.g. absorbing pollution). The term can include resources that people have relied on and no longer do (either because they are depleted or because they have been substituted by some other resource or technology). Similarly, it can include things that people do not yet use, but could with a change in knowledge or technology (Leach and Mearns, 1991).

Rosewood (Madrid Wood)

Rosewood is locally known as Madrid Wood while, its botanical name is *Pterocarpus erinaceus*. "*Pterocarpus*" means "winged fruit," from the Greek "pteron" (wing) and "karpos" (fruit). *Pterocarpus erinaceus* belongs to the *Fabaceae* (legumes) family and *Papilionaceae* subfamily. *P. erinaceus* is a Rosewood species, a deciduous legume

tree of African savannahs and dry forests famous for producing one of the finest Woods in its native region (Bosu, 2013). It is a deciduous tree with a high, open, few-branched crown; usually growing at a height range of 12-15m tall with some specimens reaching 25m (Burkil, 2004). It has a trunk diameter averaging between 1.2 and 1.8m. It comprises of a rough dark grey bark, which covers the trunk, the branches which are usually light grey, (Babalola, 2012). The showy and attractive golden-yellow flowers that is considerable potential as an ornamental which are visible from December to February in its natural range of which it cover the full canopy during flowering (Balarabe, 2011). The fruit which presents winged outgrowths has in fact given its name to the species since "*pterocarpus*" literally means "winged fruit" in Greek. It also produces leafy fodder high in protein, which makes an excellent animal feed crucial for the survival of livestock during the dry season (Hutchinson *et al*, 1958).

The species is found in open dry forests of West African semi-arid and sub-humid lands where mean annual rainfall is between 600 and 1200 mm. *P. erinaceus* is drought tolerant. Once established, adult specimens can survive long dry seasons that characterize the range (up to 9 months). The species is one of the species that survived the disappearance of former dense dry forests that covered the Sudanian zone. (Barnekow, *et al*, 2000). The range covers the West Africa and parts of Central Africa, from Senegal in the west to the Central African Republic to the east. Specimens have been described up to the 14°N from this natural limit, *Pterocarpus lucens* takes over and becomes more abundant (Beamon, and Cargill, 2007). Southward, the native range extends to the limit of the humid forest in Cote d'Ivoire and up to the humid coastal savannahs in Guinea, Togo, and Benin. *Pterocarpus santalinoides* is then found in the gallery forests common along rivers and temporary watercourses (Butyko, 2005). The species is not known to have been introduced outside its native region (Burgess, *et al*, 2011).

III. USES OF ROSEWOOD

In Nigeria, there are different plants noted for several pharmacological and medicinal utilization of which Rosewood tree is not an exception. Several ethno-botanical studies of the plant have been reported by researchers in management of some ailment. Naturally, this type of vegetation is endemic to trypanosomiasis (sleeping sickness). A number of studies demonstrated the importance of *pterocarpus erinaceus* in other pharmacological and medicinal uses for yellow fever and antimicrobial treatments (Enabor, 1981). These include the use of leaves, in particular as a febrifuge to treat fever, the bark would help to fight against oral infections (for tooth and mouth troubles) and the bark decoction has also been used for the treatment of tumours of the gland, urethral discharges and as restorative (Irvine, 1961). The decoction of the stem bark resin as astringent for severe diarrhoea and dysentery and as an

ingredient in abortifacient prescriptions. The grated root is mixed with tobacco and smoked in a pipe as a cough remedy (Hutchinson *et al.*, 1958; Sandrine, 2006). It is also used as a dressing on ring worm of the scalp and chronic ulcers (Dalziel, 1948).

In the various regions where Rosewood grows naturally, the species is known for its multiple utilizations. Rosewood timber is one of the most sought-after in West African dry forests, both for its colour (varying from pink-red to dark brown, with dark streaks) and its technological qualities that make it an ideal wood for furniture manufacturing, decorative panels, flooring and various utensils. (Bowling, 2000). The species has also been used locally as construction lumber (heavy construction) and for exterior joinery including doors and windows (Burkil, 2004).

It is worth noting that the resin is used for dyeing traditional fabrics, giving them a dark purplish colour much appreciated. Rosewood is also harvested to be transformed into coal because of its excellent calorific value. The species also plays a key role in animal feeding. The foliage of Rosewood is a nutritious fodder for farm animals. Indeed, the leaves, once dried, provide fodder of high nutritious quality (energy-rich, rich in proteins and minerals such as phosphorus). For this reason, farmers usually prune trees and integrate leaves in their agro-pastoral system, enabling the livestock to survive the dry season. This fodder is highly sought in the major urban markets of the region. Mali has an active market for this which is in high demand by sheep farmers for fodder (Hutchinson *et al.*, 1958). Thus, in Bamako (capital of Mali), more than 1400 tons of Rosewood fresh leaves are reportedly sold each year to feed livestock in urban areas, especially sheep. This supply does not meet the high demand, which was estimated at about 8,000 tonnes per year (Central Intelligence Agency, World Fact Book, 2007).

Due to its various local utilizations and despite the plasticity of the species, the first signs of overexploitation of the populations of Rosewood have been described in several countries in the region, including Benin, Burkina Faso, Ghana and Togo (Effects of Deforestation, 2010). However, despite the importance devoted to this multi-purpose species, many countries of the range do not have adequate information on the current state of natural populations, especially in order to develop appropriate management strategies of the resource.

IV. THEORETICAL FRAMEWORK

Neo-Malthusian Theory

Neo-Malthusianism was adopted for this research work. It emphasizes on the causes and solutions of environmental degradation. The causes of environmental degradation on the adopted theory includes increase population and selfishness or self-interest on common pool of

resources such as air, water, forest, the ocean and other general conditions. Individuals are more concern about themselves than the interest of the society at large, they are also more mindful of short term economic benefits for their survival from the resources available without considering the reciprocal anthropogenic-environmental negative impacts. Individuals are more or less particularistic and not universalistic. Increase of human population also serve as one among the impetuses of deforestation because as population increases the more demand for natural resources to meet the people's needs. Individuals are illegally harvesting the timber resources for themselves without selective exploitation. The government ministries, departments, and other agencies bestowed with the responsibilities for sustainable forest management or control are less concern or laissez-faire in executing their duties effectively because some of them are also into the trade or gaining from it directly or indirectly due to self-interest at the detriment of the public, which is tantamount to what Hardin (1968) elucidates in the adopted theory. This is also an indication to prove that most of the government functionaries are after themselves and not the country by not strictly enforcing the regulations for forest control and timber merchants too are only after their monetary reward.

V. VICES OF UNCONTROLLED DEPLETION OF ROSEWOOD ON ENVIRONMENT AND BIODIVERSITY

In most West African countries where there is large scale exploitation of Rosewood serious environmental problems were created such as in Mali, Burkina Faso and Gambia where shortage of fresh leaves from the species used for fodder has been reported to (CITES, 2015). This has made some West African countries like Senegal to write to convention on International Trade in Endangered species of Wild Fauna and Flora (CITES) requesting for the inclusion of Rosewood in the list of endangered species of Flora (CITES, 2015).

Rosewood faces a diversity of worldwide threats, including illegal logging, forest conversion for agriculture, increasing frequency and severity of forest fires. Threat impacts vary from direct to indirect. For example, increasing atmospheric acidification caused by global climate change can reduce the ability of these species to recover from disturbances (Aber, 2001). Loupe, Oteng-Amaoko, and Brink, (2008) opined that in 2008, Rosewood did not feature in international trade, and was only used domestically. They further stressed that in 2014, China alone imported 830 million³ of Rosewood logs from West Africa of which the majority is estimated to this species. In 2014, rosewood imports reached an all-time high, following its trajectory since 2010. Rosewood species import proportion is increasing, now making up approximately 35.1% of all hardwood imports into China. The reliance of China on African nations for Rosewood species is increasing with a 70% increase since 2010 (Treanor, 2015 and Senegal Cites Management Authority, 2017).

The high exploitation of Rosewood is like a rush gold in which the activity is highly organized in a co-ordinated network that has challenged all existing forestry regulations in the state. Aiyetan (2016) asserted that Taraba State may be the next State to suffer total depletion of its rosewood resources in the country due to the perpetual illegal and indiscriminate exploitation of the Rosewood. He further stated that, timber merchants working for Chinese business men are moving from one State to another in Nigeria depleting the Rosewood resources in the forests, leaving blighted and raped landscape without minding the enduring effects of unrestrained harvesting of the product on the environment.

The Chinese demand, coupled with both extensive timber extraction and intensive has not only threatened extinction of this highly valued Rosewood but also given rise to complex, organized crime networks that facilitate this trade with impunity, Aiyetan added. Bosu (2013), opined that the harvesting and trade in rosewood involves a complex web of actors and trade value chains, coupled with a weak forest regulatory frameworks as well as weak monitoring and enforcement regimes evidenced in most West African Countries and Nigeria in particular. He further opined that Rosewoods are being hunted by the local community members because of the monetary reward associated with the exploitation. Where ever the species is found, it is felled irrespective of the distance and difficult terrain. The selective logging of Rosewood has led to the depletion of almost mature tree stand in the local community where it is produced. The exploitation of the specie is spreading fast like wild fire. Bosu posits that the depletion of this important specie of tree with multiple uses is a serious threat to the physical environment and human populations within the State and Country at large. This has a multiplier effects on animal feed availability to support the growing livestock population and indirectly increasing conflict between crop farmers and cattle rearers. It will also lead to loss of medicinal values associated with the plant.

Illegal logging has been identified as the main driver of degradation and loss of forest resources throughout the world (European Commission, 2008). In addition, deforestation translates into a loss of the many environmental services that forest ecosystems provide (Bosu, 2013). He also said, a lot of deforestation and degradation has occurred within the short period that this activity has lasted, and large forest areas have been opened up by this indiscriminate exploitation of logs. Rosewood trees constitute an important shade tree in woodland savanna landscape and as such, targeted felling of this tree will mean high surface area temperatures in places previously shaded by these trees, with implications for wildlife and fuel high fire intensity. Several numerical experiments on deforestation have shown that temperature rises significantly and precipitation decreases as a result of deforestation.

According to Bosu (2015), many small areas of forests which hitherto serve as habitat for wildlife species have now been destroyed by the indiscriminate log wood exploitation. The Rosewood logging activities has also left behind a lot of residual waste because the merchants are only interested in just about six metres bole length of the tree. The residual waste will serve as ready fuel for the fires during dry season. Fire intensity in these districts is likely to increase with its attendant social, economic and ecological impacts. He elucidates that the indiscriminate exploitation of Rosewood in the state has the potential of curtailing the carbon sequestration capacity of the woodland savanna ecosystem, increasing carbon emissions and reducing carbon sinks in this fragile ecosystem (Bosu 2015). He further reveals that this will increase the problem of climate change already been faced in the state. Once the various populations of Rosewood are commercially exhausted at the local level, there is concern that commercial networks will focus on other endemic Rosewood species, such as *Diospyros Crassiflora* or *Dalbergia Melanoxylon*, triggering new vicious cycles of intensive exploitation of the resource and expansion of illegal practices. Treanor (2015) reveals that China imports of Rosewood logs from Nigeria ranked the country second only to Lao in 2014, with the volume of 221,995 m³ and value of 157.6 million USD.

In Nigeria, where forestry matters are handled by state governments because they own all the forestry estates in the country, therefore traders have free access to the forests across the country because of poor regulations, monitoring and local corruption. From a net importer of timber in 2011 and a marginal exporter of rosewood logs in 2013, posting a mere 30,866m³, Nigeria was by the end of 2014, according to Chinese Customs records, exporting 242,203m³ of Rosewood to China, and 18 fold increase. Socio-economically, most rural communities depend almost entirely on the forest as a source of livelihood – their food, drugs, weaponry, shelter etc. So, deforestation threatens the existence and prosperity of these communities; he added that plants (trees) take in carbon dioxide to make their food and release oxygen. Carbon gasses are the greenhouse gasses that cause global warming that leads to climate change. Trees therefore, act as a sink for carbon dioxide and other greenhouse gasses. So deforestation destroys trees that would otherwise act as a carbon sink and curb climate change (Aiyetan, 2016).

VI. METHODOLOGY

The study adopted the cross-sectional research design. This design was selected because of its suitability for the study since it permits the researcher to obtain useful data in a short period of time from a sample as well as generalization of research result to the entire population of the study. Yamane's (1967) formula for determining sample size was adopted which resulted to a sample size of 544. The study also adopted probability sampling techniques; Simple random sampling served as sampling techniques in generating the data via questionnaire. The study was anchored on both secondary

sources and quantitative method of data collection which is questionnaire. The combination of these methods is considered appropriately since no single source can be dependent upon to elicit the required spread and depth of information. The questionnaire was open and close ended. The open ended items gave the respondents an opportunity to express their own views on the subject matter of interest or give additional information to the one already provided in the options. While close ended items specifically restricted the respondents to choose from the option provided in the questionnaire.

Four research assistants were recruited and trained by the researcher to help in the administration of the instruments. In addition to coding the data and subjecting them to Statistical package for the social sciences (SPSS) treatment, tables and bar charts were drawn to indicate the various responses on different questions raised in the questionnaire. Simple frequency percentages were used to capture the study's findings from the substantive issues of the research.

VII. DATA PRESENTATION AND ANALYSIS

Table 1: Distribution of Respondents on the Purpose for the Depletion of Rosewood (Madrid Wood) by Percentage

Purpose for the depletion of Rosewood	Frequency	Percentages (%)
Commercial purpose	476	92.1
Residential purpose	17	3.3
Medicinal purpose	24	4.6
Total	517	100.0

Source: Field survey (2018)

Table 1 reveals that 92.1% of the respondents believed that the uncontrolled depletion of Rosewood was for commercial purpose, 3.3% of the respondents believed that the depletion was for residential purpose and 4.6% of the respondents believed that the purpose for the uncontrolled depletion of the Rosewood was for medicinal use. Their respective frequencies were 476, 17 and 24. The respondents that affirmed that the uncontrolled depletion was for commercial purpose were highest in number while those that agreed that the rapid depletion of the Rosewood or Madrid Wood was for residential purpose were lowest in number.

Table 2: Distribution of Respondents based on deforestation as a result of uncontrolled depletion of Rosewood (Madrid Wood)

Deforestation due to its uncontrolled depletion	Frequency	Percentages (%)
Strongly Agree	268	51.8
Agree	164	31.7
Disagree	30	5.8
Strongly Disagree	55	10.6
Total	517	100.0

Source: Field survey (2018)

From table 2, 51.8% of the respondents strongly agreed that uncontrolled depletion of the Rosewood is capable of

causing deforestation, 31.7% of the respondents agreed that uncontrolled depletion of the Rosewood is capable of causing deforestation, 5.8% disagree that uncontrolled depletion of the Rosewood can cause deforestation, while 10.6% strongly disagree that uncontrolled depletion of the Rosewood can cause deforestation. Their respective frequencies were 268, 164, 30 and 55. The respondents that strongly agreed that uncontrolled depletion of the Wood is capable of causing deforestation were highest in number while those that strongly disagree that uncontrolled depletion of the Wood can cause deforestation were lowest in number.

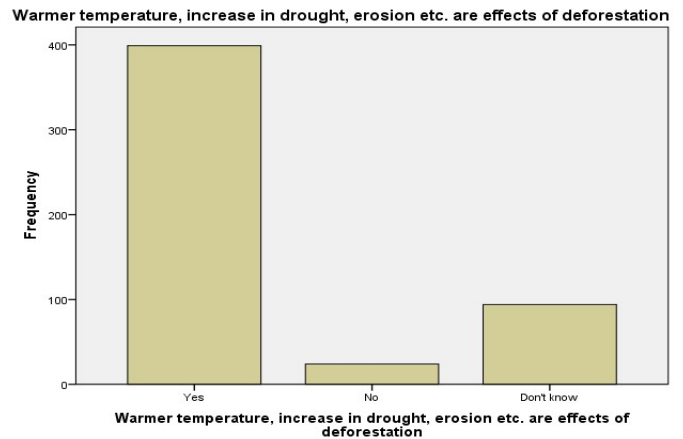


Figure 1: Distribution of Respondents on the effects of Deforestation such as warmer temperature, increase in drought, erosion etc.

Figure 1 reveals that 77.2% of the respondents agreed that Warmer temperature, increase in drought, erosion etc. are effects of deforestation, 4.6% don't agreed that Warmer temperature, increase in drought, erosion etc. are effects of deforestation and 18.2% don't know if Warmer temperature, increase in drought, erosion etc. are effects of deforestation. Their respective frequencies were 399, 24 and 94. The respondents that agreed that Warmer temperature, increase in drought, erosion etc. are effects of deforestation were highest in number while those that don't agreed that Warmer temperature, increase in drought, erosion etc. are effects of deforestation were lowest in number.

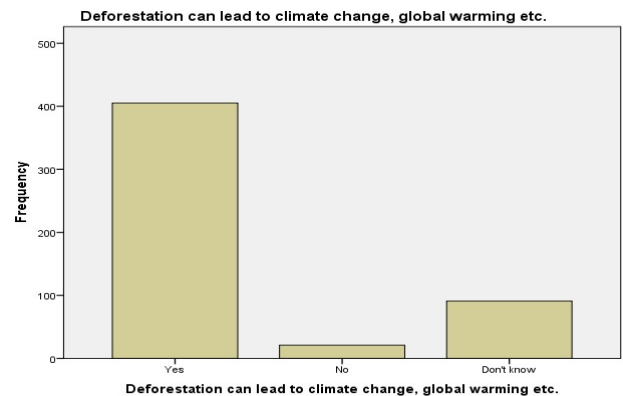


Figure 2: Distribution of Respondents on Deforestation as factor that can lead to Climate Change, Global Warming etc.

Figure 2 indicates that 78.3% of the respondents agreed that deforestation can lead to climate change, global warming etc., 4.1% don't agreed that deforestation can lead to climate change, global warming etc. and 17.6% don't know if deforestation can lead to climate change, global warming etc. Their respective frequencies were 405, 21 and 91. The respondents that agreed that deforestation can lead to climate change, global warming etc. were highest in number while those that don't agreed that deforestation can lead to climate change, global warming etc. were lowest in number.

Table 3: Distribution of Respondents on the extinction of the Rosewood (Madrid Wood) due to uncontrolled depletion

Extinction of the Rosewood due to its uncontrolled depletion	Frequency	Percentages (%)
Yes	434	83.9
No	83	16.1
Total	517	100.0

Source: Field survey (2018)

From table 3, 93.2% of the respondents agreed that uncontrolled depletion of the Rosewood will result to its extinction, while 16.1% of the respondents don't agreed that uncontrolled depletion of the Rosewood will result to its extinction. Their respective frequencies were 434 and 83. The respondents that agreed that rapid depletion of the Rosewood will result to its extinction were highest in number, while those that don't agreed that uncontrolled depletion of the Rosewood will result to its extinction were lowest in number.

Table 4: Distribution of Respondents based on the control strategies for the uncontrolled depletion of Rosewood (Madrid Wood) in Taraba State

Control strategies for the uncontrolled Depletion of Rosewood in Taraba State	Frequency	Percentages(%)
Avoidance of illegal logging	39	7.5
Strict implementation of forest policy and punishment of offenders	58	11.2
Replanting of logged trees by loggers and traders	279	54.0
Eco-forest/selective exploitation	19	3.7
prosecution of corrupt govt. officials in charge of forest management	15	2.9
Orientation of the general public on the effects of deforestation	107	20.7
Total	517	100.0

Source: Field survey (2018)

Table 4 shows that 7.5% of the respondents agreed that the control strategies for the uncontrolled depletion of the Rosewood should be by avoiding illegal logging, 11.2% of the respondents affirmed that it should be by strict implementation of forest policy and punishment of offenders,

54.0% of the respondents suggested that the control strategies should be via replanting by loggers and traders, 3.7% of the respondents agreed that eco-forest/selective exploitation should be the control strategies for the uncontrolled depletion of the species, 2.9% of the respondents agreed that corrupt government officials in charge of forest management should be prosecuted, and 20.7% of the respondents responded that if the general public will be enlighten on the effects of deforestation the uncontrolled depletion of the Rosewood will be curtailed. Their respective frequencies were 39, 58, 279, 19, 15 and 107. The respondents that agreed the control strategies for the uncontrolled depletion of the Rosewood should be by replanting of logged trees by loggers and traders were highest in number, while those that agreed that it should be by the prosecution of corrupt government officials in charge of forest management were lowest in number.

Discussion of Findings

This study determined the Environmental Impacts of the Uncontrolled Depletion of Rosewood in Taraba State, Nigeria. Data for the study were gathered through the distribution of 544 questionnaires of which 517 were duly completed and retrieved. Results of the findings indicate that the uncontrolled depletion of the Rosewood will result to the extinction of the tree in near future, and it will cause deforestation in addition to that it will also alter climate. Ahmed, Oruonye, and Ayuba, (2016) asserted that about 30 trailer loads of Rosewood or more are transported from a single site in Mayo-kam, Taraba State weekly. This gives an estimated 2,250 stands of Rosewood trees that are felled weekly and 132,600 stands felled annually invariably, not less than 400,000 stands of Rosewood trees have been felled in this single site in the last three years that the activity has thrived in the area. According to them, these exploitative activities are also taking place in Garba-chede, Gassol, Bali, Gashaka, Kurmi, Ardo-kola, Mutum-Biyu and Takum LGAs of Taraba State.

Aiyetan (2016) unravelled that smart Chinese businessmen are exploiting Nigeria forest resources due to the country's weak regulations on forest resources, and lack of government policy and direction as well as official corruption by government officials accord more strength to the timber merchants to drive an illegal trade into the country's forest to deplete Rosewood in large quantities without minding the grave consequences for both the environment and the country. Bosu, (2013) also added that the harvesting and trade in Rosewood involves a complex web of actors and trade value chain, coupled with a weak forest regulatory frameworks as well as weak monitoring and enforcement regimes evidenced in most West African countries and Nigeria in particular..

Other findings indicate that the control strategies for the uncontrolled depletion of the Rosewood are to replant trees to replace the logged ones, embark on public campaign awareness on the effects of deforestation, and prosecute corrupt government officials and offenders among others.

European Commission (2008) stressed that illegal logging has been identified as the driver of degradation and loss of forest resources throughout the world. Aber, (2001) stated that Rosewood face a diversity of worldwide threats including illegal logging, forest conversion for agricultural purposes, increasing frequency and severity of forest fires which may also cause increasing atmospheric acidification as a result of global climate change that can reduce the ability of these species to recover from disturbances. Bosu, (2013) unmasked that the indiscriminate exploitation of the Rosewood tree as started causing a lot of deforestation and degradation. He further articulated that in 2015, many small areas of forest which hitherto serve as habitat for wildlife species have been destroyed by the indiscriminate exploitation of the tree. Therefore, the uncontrolled depletion of the Rosewood ought to be properly controlled in order to avert the dire consequences of deforestation.

VIII. CONCLUSION

Based on the findings of the study it was observed that the uncontrolled depletion of the Rosewood was for commercial purpose, and it impact negatively on the environment. It was also discovered that massive reduction of the species may likely result to deforestation which is capable of causing erosion, flooding and global warming. Furthermore, it will result to extinction of the tree in the near future. According to the Federal Ministry of Environment cited by Babalola (2012), 400 out of 1000 of forest land are deforested every year and only 26 hectares of these are forested thus leaving 374 hectares deforested. International Institute of Tropical Agriculture (IITA) (2011) Stated that Nigeria is ranked the worst country with the highest deforestation rate.

Butler (2012) articulates that rainforest help in maintaining the climate which is achieved by regulating atmospheric gases, stabilizing rainfall and protecting against desertification. Butler also stressed that deforestation can therefore deprive the planet of these functions thus constituting a serious threat to human existence. And more carbon is released into the atmosphere through deforestation, climate changes take place and soil is exposed to rainfall thus promoting erosion. Effects of Deforestation (2010) unveiled that trees are the oldest, reliable, very useful and widely used raw materials that play a crucial role in oxygen supply and absorption of greenhouse gasses. It further unveiled that deforestation has caused the loss of 50 to 100 animal and plant species each day, and many of these species are now at the verge of extinction even with their significant importance to humans, especially in the area of medicine.

IX. RECOMMENDATIONS

- Based on the findings of the study, it is recommended that the ban should be placed on the uncontrolled depletion of the species in order to avoid deforestation and extinction.

- Government should empower the forestry department to fully enforce the forestry laws and policies in Taraba state, and to prosecute any corrupt government official and offenders.
- Public awareness campaign should be created on the effects of deforestation on environment and human's lives.
- Employment opportunities and skills development programmes should be created for the unemployed youths in order to curtail the uncontrolled depletion of the Rosewood which is for the purpose of income generation.
- Special security forces should be trained and deployed to guide Nigerian forests.

REFERENCES

- [1]. Aber, J. et al (2001). Forest Processes and Global Environmental Change: Predicting the Effects of Individuals and Multiple Stressors. *Bioscience*, Vol. 5 (2), pp. 732-751.
- [2]. Adebayo, A. A. (2010). Federal University of Technology Yola 8th Inaugural Lecture: *Climate: Resource and Resistance to Agriculture* 48:15-22.
- [3]. Agency (CIA) *World Fact Book*. (2012). Retrieved from www.allcountries.org/wfb2007/haiti/haiti_economy.html.
- [4]. Ahmed Y.M, Oruonye E.D and Ayuba H.K. (2016). *Socio-economic Impact of Commercial Production of Rosewood (P. erinaceus) in Taraba State, Nigeria*. Journal of Agriculture and Ecology Research International 7(3): 1-9.
- [5]. Aiyetan, D. (2016). *How China Fuels Deforestation In Nigeria West Africa*. International Centre of Investigative Research (ICIR). www.icirnigeria.org.
- [6]. Ajibade, S.A (2002): *The use of GIS in Environmental Protection and Monitoring: A case study of utility management*. NIS 37th Annual General Meeting (AGM) Alexander, D. (1993). *Natural disasters* Kluwer Academic Publishers, London pp 650.
- [7]. Ali, A.M.S (2009) *September 2004 flood events in South West Bangladesh: A study of its Nature, Causes, Human Perception and adjustment to New Hazards*. *Natural Hazards* 40: 89-111.
- [8]. Analysis of the International Trade in Pterocarpus Erinaceus and its Consequences in West Africa. Information Document for Twenty Second Meeting of the Plants Committee Tblisi (Georgia), 19-23.
- [9]. Andrade, M. I., Scarpati, O.E. (2007). *Recent changes in Flood Risks in Gran La Plata, Buenos Aires Province Argentina: causes and management strategy*. *Geo-Journal* 70: 245-250.
- [10]. Angelsen, A. (2006). *A stylized model of incentives to convert, maintain or establish forest*. Background Paper for World Bank Policy Research Report entitled "At Loggerheads: Agricultural Expansion, Poverty reduction and Environment in the tropical forests- 2007".
- [11]. Angelsen, A. and Kaimowitz, D. (2001). *Agricultural technologies and tropical deforestation*. CABI Publishing, Wallingford, United Kingdom.
- [12]. Atta-ur-R, Amir, N.H. (2011). *Analysis of Flood Causes and Associated Socio-Economic Damages in Hindukush Region*.
- [13]. Babalola, F. D. (2012). Charcoal business hurting forest communities. Retrieved from <http://premiumtimesng.com/http://premiumtimesng.com/metro/5020>.
- [14]. Babbie, E. (2007). *The Practice of Social Research*. (11th ed.). USA: Wadsworth.
- [15]. Babbie, E. (2010). *Practice of social research*. Belmont: Wadsworth.
- [16]. Balarabe, L.Y. (2011). *Tackling deforestation problems*. Retrieved from allafrica.com/stories/201106031011.html.
- [17]. Barnekow, L.J.P; Dhakal, P; Kjaer, E.D; Nathan, I and Shrestha, R. (2000). *Conservation of Trees Through the use by Local People*

- and Decentralized Seed Distribution Supported by a tree seed. Retrieved from <http://bc706.blogspot.com/2007/03/consequences-of-deforestation.html>.
- [18]. Barraclough, S. and Ghimire, K. B. (2000). *Agricultural Expansion and Tropical Deforestation*. Earthscan.
- [19]. Beamon, C. and Cargill, C.J. (2007). *Deforestation and Desertification*. Retrieved from <http://www.munfw.org/archive/45th/csd1.htm>.
- [20]. Bevan, D., Collier, P. and Gunning, D. W. (1989). *Peasants and Government*. Clarendon, Oxford.
- [21]. Bosu, D. (2013). *Operation Halt' chainsaw in Northern Ghana: Alarming trends and reactive responses*. www.opinion.myjoyonline.com. Published on June 11, 2013.
- [22]. Bowling, J. (2000). *A worker's view on sustainable forestry Managing forest in the Ecosystem Sustainable forest management: In Von Gadow, Pukkala and Margarida*. Kluwer Academic publishers, Dordrecht, Netherlands. pp 121.
- [23]. Bruijnzeel, L. A. (2004). *Hydrological functions of tropical forests: not seeing the soils for the trees?* *Agriculture, Ecosystems and Environment* 104: 185-228.
- [24]. Bruijnzeel, L. A.; Bonell, M.; Gilmour, D. A. and Lamb, D. (2005). *Forest, water and people in the humid tropics: an emerging view Forest. Water and People in the humid tropics*, eds. Bonell, M. and Bruijnzeel, L. A. Cambridge University Press, Cambridge.
- [25]. Burgess, R.; Hansen, M.; Olken, B.; Potapov, P. and Sieber, S. (2011). *The Political Economy of Deforestation In The Tropics*. Retrieved from www.illegal-logging.info/approach.php?a_id=201.
- [26]. Burkil, H. M. (2004). *The Useful Plants of West Tropical Africa*. Royal Botanic Gardens; Kew Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (2015).
- [27]. Buteyko, K.P. (2005). *Carbondioxide: Health effects, uses and benefits*. Retrieved from <http://www.normalbreathing.com/CO2.php>.
- [28]. Buttel, Frederick H. and Craig R. Humphrey. (2002). "Sociological Theory and the Natural Environment." pp. 33–69 in *Handbook of Environmental Sociology* edited by Riley E. Dunlap and William Michelson, Westport, CT: Greenwood Press.
- [29]. Cause and Effect of Deforestation. (2012). Retrieved from Study Mode. <http://www.studymode.com/essays/Cause>.
- [30]. Central Intelligence Agency (CIA) *World Fact Book*. (2007).
- [31]. Chomitz, K. M. and Griffiths, C. (1996). *Deforestation, shifting cultivation and tree crops in Indonesia: nationwide patterns of smallholder agriculture at the forest frontier*. Research Project on Social and Environmental Consequences of Growth-Oriented Policies, Working Paper 4. World Bank, Washington DC.
- [32]. Chomitz, K. M.; Buys, P.; Luca, G. D.; Thomas, T. S. and Wertz-Kanounnikoff, S. (2007). *At loggerheads? Agricultural expansion, poverty reduction and environment in the tropical forests*. World Bank Policy Research Report. World Bank, Washington DC.
- [33]. Convention on International trade in Endangered Species of Wild Fauna and Flora (CITES), (2015).
- [34]. Dudley, N. and Stolton, S. (2003). *Running Pure*. World Bank and WWF, Washington DC.
- [35]. Dunlap, Riley E., and William Michelson (eds.) (2002). *Handbook of Environmental Sociology*. Greenwood Press, ISBN 0-313-26808-8.
- [36]. Dunlap, Riley E., Frederick H. Buttel, Peter Dickens, and August Gijswijt (eds.) (2002). *Sociological Theory and the Environment: Classical Foundations, Contemporary Insights*. Rowman & Littlefield, ISBN 0-7425-0186-8.
- [37]. Effects of Deforestation (2010). Retrieved from StudyMode.com. <http://www.studymode.com/essays/Effects-Of-Deforestation-498391.html>.
- [38]. Effects of Deforestation. (2010). Retrieved from StudyMode.com <http://www.studymode.com/essays/Effects-Of-Deforestation-498391.html>.
- [39]. Environmental Investigation Agency (EIA) (2014). *Rosewood and the Ongoing Illegal Logging Crisis in Belize*.
- [40]. European Commission (2008).
- [41]. Fakoya, O. (2010). *Haiti and Nigeria: Case studies in failure of Human*. Retrieved from www.nigeriansinamerica.com/articles/3937/1/Haiti-and.
- [42]. Federal Environmental Agency Act (1992) Cap. F. 10. *Laws of the federation of Nigeria*.
- [43]. FAO, (1979). *Production Yearbook*. FAO, Rome.
- [44]. FAO. (1993). *Land and Environmental Degradation and Desertification in Africa*. United Nations Food and Agriculture Organisation, Corporate Document repository No. X5318.
- [45]. Food and Agriculture Organization. (2005). *Annual Rate of Deforestation*. Retrieved from http://green.wikia.com/wiki/Deforestation_in_Nigeria.
- [46]. Global Forest Watch (2016) "*Global Forest Watch*". World Resources Institute. Available: www.globalforestwatch.org.
- [47]. Global Witness and environmental Investigation Agency (us). (2010). *Investigation into the Global Trade in Malagasy Precious Woods: Rosewood*. Ebony and Pallisander.
- [48]. Global Witness (2013). Retrieved from <http://www.medindia.net/patients/lifestyleandwellness/health-effects-of-global-warming>.
- [49]. Goldsten, H. (1968). *The Detection of Errors in data From Longitudinal Studies*. Proceedings of Annual Reunion of Child Growth Studies. Brussels. Centre International de L'afance, Paris.
- [50]. Goncalves, M.P.; Panjer, M.; Greenberg, T.S. and Magrath, W.B. (2012). *Justice for Forests: Improving Criminal justice efforts to combat illegal logging*.
- [51]. Haggett, P. (2001). *Geography: A Global Synthesis*. Pearson Education Limited, Upper Saddle River, New Jersey, pp. 321 and 349.
- [52]. Haidet, A. (2003). *Final Paper: The Medicinal Value of the Rainforest*. Retrieved from <http://jrscience.wcp.muohio.edu/fieldcourse03/PapersCostaRicaArticles/FinalPaper.TheMedicinalVa.html>.
- [53]. Hardin, G. (1968). The Tragedy of the Commons. *Science*. 162 (3859): 1243-1248.
- [54]. Houghton, R. A. (2005). *Tropical deforestation as a source of greenhouse gas emissions*. In: *Tropical deforestation and Climate change*, eds. Moutinho, P. and Schwartzman, S. Pp 13-20. Amazon Institute for Environmental Research, Belem Brazil. <http://www.who.int/mediacentre/factsheet/fsl34/en/print/html>.
- [55]. Hunter, N.M., Horritt, M.S., Bates, P.D., Wilson, M.D., Werner, M.G.F. (2005) *An adaptive time step solution for raster-based storage and cell modelling of floodplain inundation*. *Advance Water Resource* 28: 975-991.
- [56]. Hutchinson J., Dalziel J.M., and Keay R.W.J.(1958). *Flora of West Tropical Africa*. Agents for Overseas Government and Administration, London 1: pp531.
- [57]. Hutchinson, J., et al. (1958). *Flora of west tropical Africa*. Vol. 1, part 2. Crown Agents for Overseas Governments and Administrations, London.
- [58]. Innes, J. L (2010) Madagascar Rosewood, Illegal Logging and the Tropical Timber Trade. *Madagascar Conservation and Development, Vol. 5* (1) pp. 6-12.
- [59]. Irvine, F.R. (1961): *Woody Plants of Ghana*. Oxford University Press. London pp 868.
- [60]. Kant, S. and Redantz, A. (1997). *An econometric model of tropical deforestation*. *Journal of Forestry Economics* 3: 51-86.
- [61]. Lawson, S. (2015). *The Illegal Rosewood Boom in West Africa: How Chinese demand is Driving Conflict, Corruption and Human Rights Abuses*. Presentation to Chatham House Illegal Logging Stakeholder Update Meeting, 25th June, 2015.
- [62]. Lawton, R. O.; Nair, U. S.; Pielke Sr., R. A. and Welch, R. M. (2001). *Climatic impact of tropical lowland deforestation on nearby Montane Cloud Forests*. *Science* 294: 584-587.
- [63]. Leach, M. & R. Mearns (1991). *Poverty and the Environment in Developing Countries: An Overview Study*. Report to ESRC Society and Politics Group, Global Environmental Change Programme and the Overseas Development Administration.

- [64]. Lewis, L. A. and Coey, W. J. (1985). *The continuing deforestation of Haiti*, *Ambio*, XIV, 158±160.
- [65]. Library of Congress-Federal Research Division. (2008). *Country Profile*. Retrieved from memory.loc.gov/frd/cs/profiles/Iran.pdf.
- [66]. Loupe, D. Oteng-Amoako, A. and Brink, M. (2008) *Plant Resources of Tropical Africa*. Wageningen and Leiden: PROTA Foundation/Backhuys Publishers, pp. 704.
- [67]. Maathai, W. (2012). *Deforestation, Water Crises, and Rural Hunger*. Retrieved from en.wikipedia.org/wiki/Maathai.
- [68]. Mahapatra, K. and Kants, S. (2003). *Tropical Deforestation: A Multinomial Logistic Model and Some Country-Specific Policy Prescriptions*. *Journal of Forest Policy and Economics* 7 (2005), Elsevier, pp.1-8.
- [69]. Mangave, H. R. (2004). *A study of Elephant population and its habitats in the northern West Bengal, North East India*. M. Sc. Thesis, Bharathidasan University. Unpublished.
- [70]. Myers, N. and Mittermeier, R. A. (2000). *Biodiversity hotspots for conservation priorities*. *Nature* 403: 853-854.
- [71]. National conservation and Environmental Protection. *Act No 5 of 1987*.
- [72]. Nayak, S. (2008). *The Causes and Effects of Deforestation*. Retrieved from www.studymode.com/...Effects-Of-Deforestation-1319342.html.
- [73]. Nigeria Population Commission NPC, (2006) *Official population census result Federal Republic of Nigeria*. Office of Statistics, Abuja Nigeria.
- [74]. O'Connor, A. M. (1991). *Poverty in Africa: A Geographic Approach*. Belhaven, London.
- [75]. Oguntala, I. A. (2000). *Oyo state in Nigeria: A people United, a Future Assured*. Survey of States vol. 2.
- [76]. Okoro, N. (2001). *Mass communication Research Issues and Methodologies*. Nsukka; A.P. Express Publishers.
- [77]. Peacock, J. (2013), *May this Day Live, Deforestation: Nigeria Ranked Worst in the world*. Retrieved from www.illegal-logging.info/content/deforestation-nigeria.
- [78]. Pimentel, D. (2006). *Study: Soil Erosion Threatens Human Health*. Retrieved from <http://phys.org/news12033.html#jCp>.
- [79]. Pinker, R. (1980). *The microclimate of a dry tropical forest*. *Agricultural Meteorology* 22: 249-265.
- [80]. Raw Material Research and Development Council, (2003).
- [81]. Raw Material Research and Development Council, (2009).
- [82]. Sahney, S., Benton, M.J. & Falcon-Lang, H. J. (2010). *Rainforest collapse triggered Pennsylvanian Tetrapod Diversification in Euramerica*. *Geology* 38 (12). Pp.1079–1082. 10.1130/G3118doi:2.1.
- [83]. Sands, R. (2005). *Forestry in a Global Context*. CABI Publishing.
- [84]. Sanusi, L. (2011). *Sanusi Predicts Increase in Nigeria's Poverty Level*. Retrieved from saharareporters.com/Article/cbn-poverty-sanusi-lamido.
- [85]. Schnaiberg, Allan. (1980). *The Environment: From Surplus to Scarcity*. New York: Oxford University Press. Available: <http://media.northwestern.edu/sociology/schnaiberg/154302-environmentsociety/index.html>.
- [86]. Secretariat of Convention on Biological Diversity, (2009). *Sustainable forest management, Biodiversity and Livelihoods: A Good Practice Guide*.
- [87]. Senegal CITES Management Authority (2017). *CITES Cop17 Proposal (57- Pterocarpus erinaceus)*. Johannesburg: Convention on International (Trade in Endangered Species).
- [88]. Shepherd, G. (1989). *An Evaluation of the Village A deforestation Project, Mwanza, Western Tanzania*. ODI for International Institute fur Zusammenarbeit, Vienna.
- [89]. Silver, C. S. and DeFries, R. S. (1990). *One Earth, One Future*. National Academy Press, Washington DC.
- [90]. Terminski, B. (2012). *Current Dynamics of Deforestation in Africa*. Retrieved from www.thenigerianvoice.com/...of-deforestation-in-africa.html.
- [91]. The Effects of Deforestation on Our Environment (2012). Retrieved from www.studymode.com/essays/The-Effects-Of-Deforestation-On-Our-1314880.html.
- [92]. The Free Encyclopedia, (2007).
- [93]. The International Institute of Tropical Agriculture (IITA). (2011). *Deforestation: Nigeria ranked worst in the World*. Retrieved from <http://www.thisdaylive.com/articles/deforestation-Nigeria-ranked-worst-in-the-world/103321>.
- [94]. The Causes and Effects of Deforestation. (2012). Retrieved from www.studymode.com/essays/The-Causes-And-Effects-Of-Deforestation-1319342.html.
- [95]. The Free Encyclopedia (2007). *Deforestation*. Retrieved from <http://en.wikipedia.org/w/index.php?title=Deforestation&oldid=111799234>.
- [96]. The Free Encyclopedia (2007). *Wangari Maathai*. Wikipedia, Retrieved from http://en.wikipedia.org/w/index.php?title=Wangari_Maathai&oldid=113003501.
- [97]. The Free Encyclopedia. (2007). *Arbor Day*. Wikipedia, Retrieved from http://en.wikipedia.org/w/index.php?title=Arbor_Day&oldid=111158566.
- [98]. Transparency International (2011). *Building Judiciary Integrity to Combat Illegal Logging*. Retrieved from www.illegal-logging.info/approach.php?a_id=201.
- [99]. Transparency International. (2011). *Tackling Political Corruption to Combat Illegal Logging*. Retrieved from www.illegal-logging.info/approach.php?a_id=201.
- [100]. Trendsupdates.com (2012). *Killer Inhabitants of the Rainforests'' Killer Inhabitants of the Rainforests''* Retrieved from www.coolsocial.net/sites/www/trendsupdates.com.html.
- [101]. Treanor N. B. (2015). *China Hongmu Consumption Boom: Analysis of the Chinese rosewood Trade and Links to Illegal Activity in Tropical Forest countries*. *Forest Trends*, Washington D. C.
- [102]. Tunde, A. (2017). *Nigerian Tribune*, January 4, 2017.
- [103]. Ukali, D. U. (2013). *Bush Burning, Deforestation, contributing to Food Crisis, Global Warming*. Retrieved from <http://africaproject2020.com/?p=83>.
- [104]. United Nations Earth Summit in Rio Janeiro, (1992).
- [105]. United Nations Earth Summit in Rio de Janeiro. (1992). *Conference on Environment and Development*. Retrieved from www.un.org/geninfo/bp/enviro.html.
- [106]. Van Kooten, G. C. and Bulte, E. H. (2000). *The economics of nature: managing biological assets*. Blackwells.
- [107]. Wenbin, H. and S. Xiufang (2013). *Tropical Hardwood Flows in China: Case Studies of Rosewood and Okoume*.
- [108]. World Bank (2011). *World Bank and Deforestation in Current Events Forum*. Retrieved from www.bloomberg.com/apps/news?pid=newsarchive&sid=aFxG.0_m.LGA.
- [109]. World Bank (1990). *Sub-Saharan Africa: from crisis to sustainable growth*. World Bank, Washington DC.
- [110]. World Bank (2008).
- [111]. World Health Organization (2003). *Traditional Medicine*. www.allcountries.org/wfb2007/haiti/haiti_economy.html Central Intelligence.
- [112]. Yamane, Taro (1967). *Statistics: An Introductory Analysis*. 2nd Edition, New York: Hamper and Row.
- [113]. Yin, H. and Li, C. (2001). *Human impacts on floods and flood disasters on the Yangtze River*. *Geomorphology* 41: 105-109.