

## WATER POLLUTION IN OJI RIVER URBAN IN VIEW OF ECO-THEOLOGY AND JUSTICE

**Afunugo Kenechi Nnaemeka (PhD)<sup>1</sup>**

**Nganwuchu Geoffrey Chiazio (Ph.D)<sup>2</sup>**

Department of Religion and Cultural Studies

University of Nigeria Nsukka

[kenechi.afunugo@unn.edu.ng](mailto:kenechi.afunugo@unn.edu.ng); [geoffrey.nganwuchu@unn.edu.ng](mailto:geoffrey.nganwuchu@unn.edu.ng)

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### **Abstract**

*The study of water pollution in view of Eco-Theology and Justice in Oji River Urban of Enugu state Nigeria has been concluded. This study focuses on water pollution and its human and environmental effects in Oji River Urban. The Oji Wonderful River which is one of the major water resources in the area was earmarked for this research. This work employed three theories pertinent to theories and concepts for human behavior in environmental preservation. Descriptive survey research design approach was used with combination of the qualitative and quantitative methods. Primary and secondary sources of data collection were espoused in this work as well. In order to achieve the purpose of this study, the area was divided into three wards, namely; Zone A, B, and C. A sample of 120 respondents were selected from each of the three wards: making a total sample of 360 between the ages of 18 and 65 years from a population of 126,587. A research designed item titled "Water Pollution in Oji River Urban in View of Eco-Theology and Justice Questionnaire" (WPORUVETJQ) was used as method for data collection. The Cronbach Alpha was used to ascertain the reliability of instruments using test-retest method which gave 0.82. Data generated were analyzed using mean and standard deviations, items with mean scores equal or higher than 2.50 were accepted while those that have less than 2.50 were rejected. In testing the hypotheses, the independent t-Test was used. If the calculated value of t (tcal) is less than or equal to the critical value of t (tcrit), the hypothesis is accepted but if the calculated value of t (tcal) is greater than the critical value of t (tcrit), the hypothesis is rejected. It was discovered amongst other findings that the majority of individuals residing in Oji River Urban are ignorant of the implications of polluting and as well as drinking from a polluted water. They equally lack the knowledge on how to avert incessant pollution of the Oji Wonderful River. Well streamlined, tactical and technical solutions on how to solve the related issues to the pollution of Oji Wonderful River accessible to Oji River Urban settlers were posited in this research.*

**Keywords:** Water supply, Eco-Theology, Justice, Pollution, Environment, Urban, Health.

## **Introduction**

Water is extremely important to the existence of humankind. Thus, the value of water to humanity can never be overemphasized. According to Maestro et al (2016), all biological organisms depend on water in order to dispense complex biochemical processes which helps in the sustenance of life on earth. Little wonder God in Jesus Christ made reference to the Holy Spirit as the living Water (John 4:10, and John 7:37, respectively). One will not be mistaken to declare that water is life; for without it, man's existence on the earth would be threatened and he would be driven almost to extinction as Dieter et al (2018), implied.

Water is an inorganic, transparent, tasteless, odorless and nearly colorless chemical substance which is the main constituent of Earth's hydrosphere, and the fluids of most living organism as Chang (2015), asserted. According to St. Fleur (2016), over 70 percent of the earth's surface consists of water and apart from the air that man breathes, water is one of the most important elements of man. However, irrespective of the fact that water covers about 70 percent of the earth's surface, the World Water Development Report (2019), recorded that only 2.53 percent is fresh water while the remaining is salt water.

It is however quite unfortunate that mankind's influence had begun to violate the limited fresh water resource available for his development. Pollution in general according to Beil (2017), is the introduction of contaminants into the natural environment that cause adverse change; or energy liable to cause hazards to human health, harm to living resources and ecological systems, damage to structures or amenity, or interference with legitimate uses of the environment. Water pollution primarily then as Krugman (2013), pointed out is the discharge of waste water from commercial and industrial wastes or domestic waste into the surface waters; discharges of untreated domestic sewage, and chemical contaminants, such as chlorine, from treated sewage; release of waste and contaminants into surface runoff flowing to surface waters (including urban runoff and Agricultural runoff, which may contain chemical fertilizers and pesticides; also including human feces from open defecation); ground water pollution from waste disposal and leaching into the ground, including from pit latrines and septic tanks: eutrophication and littering as well as consists and effects water pollution. Boretti and Rosa (2019), in this vein recorded that the

projection by the 2018 edition of the United Nations World Water Development Report which stated that nearly 6 billion peoples will suffer from clean water scarcity by 2050; as a result of increasing demand for water, reduction of water resources, and increasing pollution of water, driven by dramatic population and economic growth will be an underestimation. Thus they maintained that the scarcity of clean water by 2050 may be worse as the effects of the three drivers of water scarcity, as well as of unequal growth, accessibility, needs and the rate of water pollution are underrated.

In lieu of the foregoing, it is clear that the pollution of water championed equally by mankind who needs water the most directly kicks against the principles of Eco-Theology and Justice: for God after creating the world, handed the supervision of the created order to mankind. It is man's primary duty to see to the preservation of the environment and the natural order for his own benefit and to save humanity; and equally maintain balance in the world order. Man is expected to facilitate the positive harnessing of all the natural endowments in his habitat of which water is paramount, and bring it to its best stance and usage. Waste and violation of natural water via pollution is not justified by God and it is equally not beneficial to man. It is harmful to man and can lead to extinction of humanity which is clearly against God's design and desire.

In this research work, the relevant issues pertaining to the pollution of Oji Wonderful River in Oji River Urban of Oji River local government area in Enugu state, Nigeria was thoroughly examined. In order to come up with its effects on the individual's health, and solutions to such violation of waters purity. This work employed both the qualitative and quantitative methodological format. It effected the use of both the primary and secondary means of data collection. The theories of planned behaviour (TPB), Diffusion of Innovation and Health belief theory as relevant to the theories and concepts for Human behaviour in Environmental preservation was employed in this work. The principles of Eco-Theology and Justice were principally used in positing God's creative desire and design concerning the relationship between man and his natural environment cum preservation of the created order. This work maintained that as majority of African's and Nigeria in particular are highly religious; they ought to be disciplined enough to be caring for the created order and the natural endowment. A total of 360 respondents between the ages of 18 and 65 years participated in this research; three zones were selected from Oji River Urban: While 120 persons each were interviewed from each zone, making the total number of 360 persons as already indicated.

## **The Concept of Eco-Theology and Justice as Against Water Pollution in Oji River Urban**

God created the world and everything therein in six days; He later rested on the seventh day as attested in Genesis chapters one and two, respectively. The idea of God creating man as the last of the created order is to make man an overseer of the whole created order. Hence, He gave man the dominion over everything created. That dominion was not intended in undue subjugation and exploitation of the created order by man; but rather to make the best use and bring all the created order including nature and animals to their best stance and at the same time maintain order and balance. This then is what Eco-Theology and Justice projects. As it is, Gnanakan (1999), pointed out that in Lunn White Jr. lectures, he submitted that Christians feel less concerned in the nature's order and that which occurs around him. They are so heavenly conscious that they loose out on that obtainable on earth. He insisted that abinitio, an "unforgivably naïve attitudes still prevail in the church" (p.3.). They keep arguing that, "environmental issues are only for government and specialized non-government agencies, not for the church" (p.3.). More often than not when they get involved, they perceive it as being good and charitable; as if it is a lending hand they are extending on the other created "orders". The idea of understanding spirituality in terms of being other worldly persists in them.

Thus, as Lynn White Jr. (cited by Gnanakan, 1999), posited in his lectures; "the crisis of ecology goes back to the Christian attitude to nature... the alleged teaching that it is God's will that man exploit nature for his proper end's" (p.4.): Is peradventure what has contributed to the present predicament of violation of man's natural Habitat.

Eco-Theology and Justice addresses the need to restore the right relationship between man and the natural order. Gnanakan (1999), calls for the traditional Christian view of human relationship to nature which is "anthropocentric", (and still persists in some Christian circles as of date), to be replaced by a "biocentric" relationship. This view encourages the welfare of all non-human aspects of nature. Thus, Biocentric urges mankind to value every living thing. To take it further, Gnanakan equally exposed that Biocentrism had equally evolved into econcentrism; which is all-inclusive and holistic in its call for a right relationship to everything in nature. Mankind at this stance should not exploit, violate nor subjugate unduely the non-human aspects of nature.

Exposing the concept of Eco-Theology, Anyacho (2004), maintained that God's intent in creating the natural order is for man to benefit from what comes from the Earth so that he will not be left in danger of scarcity of life-giving substance of the earth. Man then is placed in the center of creation at the epic of God's creation as the supreme beneficiary of the creative acts of God with specific instructions on how to manage the resources and not to exploit them.

According to Anyacho (2004), he specifically defined Eco-theology as "a reflection on God's involvement in the environment" (p.182). He posited that it is a dimension of theology which uses "biblical theme to articulate man's consciousness of the environment thereby bringing into human conscience the responsibility of man as a steward of nature" (p. 182). He insisted that it is a theology on the ecology/environment. A theology which does not capitalize on the dualism in nature but rather extends "redemption message to the physical environment" (p. 182). As justice implies a sense of equality, fairness and selflessness in treatment of individual persons; Eco-Theology and Justice then focuses on environmental justice. Borrowing a leaf from A. Leopold, Anyacho posited that the objective of Eco-Theology and Justice is in extending the "right of existence to all the living beings in the environment" (p. 183). It involves the equal treatment of the relatively less powerful member of the society with regard to environmental hazards. It strongly refers to the type of equal treatment that should be extended to the members of the eco-system. This theology brings to bear as Anyacho puts it:

The right to live which plants, animals and other partners in the eco-system deserve not only for the benefit of man but for their own sake as co-members of the eco-system whose existence makes for the sustainability of the environment; it is a new emphasis of justice which calls on man to respect the natural right other members of the eco-system have against merciless exploitation so that they can also fulfill the functions God assigned them in the eco-system. (pp.183-184).

From the above stance, Eco-theology and justice implies that any action of man which contribute to the problem of environmental degradation is a spiritual error. Thus, anyone who involves in actions capable of endangering the environment and its nature is creating a problem that can affect one's prospective generation.

It behooves from the above standpoint that the church in conjunction with the government and all human persons should be speaking out that actions that causes all forms of pollution (including water pollution in particular), deforestation, rain, acid hazards, erosion and the likes are all sinful acts against God, as well as criminal act against nature and mankind. This notion will aid in reducing the rate at which the Oji Wonderful River is polluted in Oji River Urban. Ignorance can be destructive irrespective of all odds. This is why Chinwokwu (2018), declared thus:

It is the divinely mandated responsibility given to humans as an earthly mission that makes for heavenly fulfillment. It represents Christian belief in a divine plan and purpose for humanity intended for spiritual growth and direct action for social change because Christians as followers of Jesus Christ are change agents being “the salt of the earth” and “light of the world”. We are in the world but not of the world. Infact, we are in the world on a divine mission and we are challenged to ensure that we leave the earth better than we met it. This is the hope we all most cherish and the responsibility we must share. (p.68).

This then will aid in ensuring that human kind employs the basic tenets of Eco-theology and justice in handling his natural habitat.

### **The Theory of Planned Behaviour (TPB)**

The theory of planned behavior (TPB), is a theory in psychology which connects one’s belief to such a one’s dispositions and behaviours. According to Norberg, Horne and Horne (2007), the theory states that intention toward behavior, subjective norms, and perceived behavioural control, together shape an individual’s behavioural intentions and behaviours. This concept as Amjad and Wood (2009), pointed out was proposed by Icek Ajzen to improve on the predictive power of the theory of reasoned action by including perceived behavioural control.

In the study of Onuoha, Norhaya, Aliagha and Ufere (2015), they indicated that the theorists of Planned Behaviour (TPB) have argued that actions contribute towards environmental preservation and conservation. This actions are propelled by the pre-conceived notions and belief systems of individuals developed and adopted over time regarding the environment. Thus they pointed out that the theory of planned Behaviour (TPB), is optimistically geared towards positing that the usefulness of attitude could be a better predictor of

environmental and ecological behaviours. The point then to be embraced here is that one's belief system can constitute one's disposition towards one's natural Habitat. It behooves then that when someone is basically ignorant of the supposed relationship that ought to be maintained between mankind and his environment in relation to God's strict injunction to man enshrined in Eco-theology and justice; such a one will keep violating God's creative order, oblivious of its implications. Ignorance then can be a strong tool behind the reason for the gross violation of the natural stance and pollution of Oji Wonderful River by Oji River Urban inhabitants.

### **The Diffusion of Innovation Theory**

This theory was developed by E.M. Rogers in 1962. It is one of the oldest social science theories. Mascia and Mills (2018), indicated that it originated in communication to account the reasons and the mode through which an ideology gains speed and spreads out through a particular population or social system. The resultant effect of this diffusion is that individuals in a given society adopt a new idea, behavior, or product. This theory equally carries with it the tactical technical and systematic study of a target population in order to understand their characteristics or peculiarities: This will equally aid in discovering their world view to ascertain belief systems that may help or hinder the adoption of any given innovation. Thus, any discovery at this stage will keep the minds of those introducing such a new concept to work around the clock in order to find out ways to break those innate beliefs and convince them to accept new ideas. Any belief system irrespective of how tenacious a peculiar society holds on to it must at the long run bow to new innovations for the greater good.

It is worthy of recording what Akintunde (2017), pointed out in lieu of diffusion theory: He insisted that the theory purports that change spreads in a population through a normal distribution of willingness to embrace an innovation. At the individual level, adoption of a new idea takes place through the stages of knowledge, understanding, persuasion, decision, application, implementation and confirmation. In diffusion theory, Sheeran and Abraham (cited by Akintunde) pointed out that behaviours are affected across a community through change agents.

Irrespective of the fact that this theory has various limitations as Wayne and Lamorte (2019), outlined like the following:

- That much of the evidence for the theory did not originate in public health; and was not developed to explicitly apply to adoption of new behaviours or health innovations.
- Does not foster a participatory approach to adoption of a public health program
- Works better with adoption of behaviours rather than cessation or prevention of behaviours
- Does not take into account an individuals resources or social support to adopt the new behavior (or innovation);

It has however been applied successfully in various fields which includes communication, agriculture, public health, criminal justice, social work, marketing amongst other fields. This theory will equally serve as a veritable tool in solving the issues related to water pollution in Oji River Urban. Once the Oji River Urban inhabitants are posited with the dangers of polluting and drinking from a polluted water source by qualified environmental health workers via public enlightenment campaigns; they, the inhabitants themselves will be at the forefront of disseminating the information which will be beneficial to them because they are being inflicted with various health challenges as a result of drinking polluted contaminated water.

### **The Health Belief Theory**

The Health Belief theory proposes that human persons whenever they realize that they are prone to a particular health ailment in lieu of some perceived environmental pollution or dirt related issues; will get involved in activities to reduce their risk of developing the health ailment. Although individuals with low perceived susceptibility may deny that they are at danger of contracting a particular illness via such stance as Siddiqui, Ghazal, Bibi, Ahmed, and Sajjad (2016), disclosed. This theory was developed in the 1950s by social psychologists at the United States Public Health Service. According to Glanz, Rimer and Viswanath (2015), it remains one of the best known, widely publicised and most widely used theories in health behavior research.

In Akintunde's (2017), research, he postulated that "Beliefs help shape behavior" (p.130). citing Janz, he continued that whereas, "enduring belief are not fixed individual characteristics, but rather are acquired through primary socialization" (p.130). He posited that this theory concentrates on two surveys of an individual's perspectives of health and behaviour which as "Threat Perception



and Behavioural evaluation". Threat perception or perceived risk appraisal, according to Zak-Pale and Stern, Rosenstock et al, and Winfield and Whaley respectively (cited by Akintunde):

Is founded on one's perceived susceptibility to illness and the anticipated severity of the consequences of such an illness. The Health Belief Model submits that, anytime there is an increase in an individual's assessed level of risk, there is an increase in the likelihood that the individual will adopt recommended prevention behaviours. Behavioural evaluation, also known as coping appraisal relates to the belief that an available course of action will be beneficial and the anticipated barriers or costs of embarking on an action do not outweigh the benefits. In addition to these core components of the model, there are demographic, socio-psychological and structural variables, as well as "cues to action". Cues to action are the stimuli necessary to initiate or trigger engagement in the desired, healthy actions. Cues could come in the form of media campaigns or the illness of a family member, relative or close friend. (p. 130).

With this in place, the pollution of Oji Wonderful River in Oji River Urban will be minimised drastically. Once the Oji River Urban settlers realized the unhealthy implications of polluting the Oji Wonderful River of which most of them use as drinking water; public enlightenment campaigns on battle and cries against water pollution in that area will smoothly flow on its own course. Their perception will serve as a caution to them before much weight will be thrown on effort to convince them on good conservation and preservation of their water resource.

In all, it is worthy of noting some of the limitations of this theory as posited by researchers like Orji, Vassileva and Mandryk (2012); they maintained that irrespective of the fact that the theory of Health Belief strives to determine health-related behaviours by registering individual differences in beliefs and attitudes; it does however not register other factors that influence health behaviours. For example, habitual health-related behaviours like smoking, seat belt buckling and the likes may become directly not dependent on conscious health-related decision making procedures. Moreover, individual persons engage in some health-related behaviours for reasons that may not be directly related to health issues; for instance, when one is exercising for aesthetic purposes. Environmental factors outside a person's charge may hinder involvement in desired behaviours: An individual living in a dangerous neighbourhood for instance may be afraid of going for a jog out doors in the

night or early morning due to safety concerns. Moreso, this theory does not consider the effect of emotions on health-related behavior. Instances point to the fact that fear may be a key factor in predicting health-related behaviour.

Again, the Health Belief theory does not specify how constructs of the theory interact with one another as Carpenter (2010), indicated. Thus, different implications and details of the theoretical constructs may not be strictly comparable across studies: Research assessing the contribution of cues to action in determining health-related behaviour is limited. Cues to action are often difficult to assess, thereby limiting research in this area. For example, individuals may not report cues that prompted behavioural changes correctly. Thus cues such as a public service announcement on television may not be aware of their significance in prompting them to engage in a health-related behavior. Interpersonal influence is also difficult to measure as cues as well. Be that as it may, this theory still blends perfectly to the purpose of this work.

### **Statement of the Problem**

The Oji Wonderful River is one of the water resources in the Oji River Urban. Reconnaissance surveys conducted in the Oji River basin between January to April 2016 (cited by Uwaeme, 2016) revealed that people living in the river basin indiscriminately dump refuse into the river and also use the banks of the river as a place of convenience.

The research carried out on the Eutrophication potential of Nutrients in Oji River by Ugochukwu, Onuorah and Onuora (2019), posited that Oji Wonderful River receives waste discharges from several anthropogenic activities such as abattoir, power plants, agricultural run-off; with Abattoir and power plant-waste waters underscored by them as point sources of pollution. In the same vein, Ugochukwu, Onuorah and Onuora (2019), concluded again that the Oji Wonderful River within Oji River Urban which coincidentally was there study location cannot serve as a source of drinking water unless it is treated before consumption owing to the rate at which the water is polluted.

Ezeadi, C.I., Uwaeme, C.P. and Udegbonam, C.C. (personal communication, January 9, 2020), respectively pointed out that people living at the Oji Wonderful River downstream areas like Ojinato, Dodo, Agbaraenyi and even mile 2 of which each of them represents respectively expressed concern about the polluted nature of the Oji Wonderful River; and its unhygienic stance to be used for domestic purposes. Observations revealed that some people living in the river

basin, very close downstream defecates in the river; while some wash their farm products and soaked cassava with high concentration of starch directly in the river. Thus irrespective of the existence of laws and institutions responsible for the management of water resources in the Enugu state, pollution still persists at both the upper and lower reaches of the Oji Wonderful River.

In, addition to the fact that some residents in the River basin use the River as a place of convenience, a number of housing units that were built close to the River bank channeled their liquid waste into the river at various sections. Small scale industries like saw mills, abattoir house, automobile workshops, Oji River Power station, and palm kernel processing industries use the River as a dumping space for waste generated in their industrial processes, thereby introducing various amount of suspended solids into the River. All these pollutes the Oji Wonderful River and its resultant effects is that it is dangerous to health for those that use it for domestic purposes; as well as the fact that it is gross abuse and violation of the creative order of God.

This work attempts to posit solutions to the pollution of Oji Wonderful River inorder to restore sanity on the mode at which residents of Oji River Urban violate and exploit the river; for it to be valuable to them, for them to harness the resources therein properly to the maximum, to avoid health hazards and to equally uphold God's creative injunction of good maintenance of the environmental natural order.

### **Hypothesis**

- (1) There had not been any sensitization or awareness programme by the government or non-government organization to enlighten the people of Oji River Urban on the causes of water pollution.
- (2) The Residents of Oji River Urban are oblivious of the causes and effects of drinking from a polluted water source.
- (3) The Residents of Oji River Urban are oblivious of the preventive measures to reduce the pollution of Oji Wonderful River.
- (4) The Residents of Oji River Urban are not aware that pollution of natural water resource is a gross violation and abuse of the creative order, hence it is directly against God's injunction on good maintenance of the natural order by human kind.
- (5) Industries situated close to the River banks especially palm producing ones and abbatoirs heightens the pollution of Oji Wonderful River.

- (6) There are not enough sources of portable water supply in the study area.

### **Research Questions**

- (1) What are the sources of water supply available in Oji River Urban?
- (2) Are there industries situated close to the Oji Wonderful River banks?
- (3) What are the common causes of water pollution in the study area?
- (4) What are the level of awareness on the causes of water pollution in Oji River Urban?
- (5) What are the health effects of water pollution on the inhabitants of the study area?
- (6) What are the preventive measures to reduce water pollution in the study area?
- (7) Are you aware that pollution of natural water is against God's design and desire?

### **Methodology**

This study adopted the descriptive survey research design. The study was conducted in Oji River Urban in Oji River Local Government Area of Enugu State, Nigeria. It is a vibrant community with lots of economic activities. Oji River Urban has an area of about 403km<sup>2</sup> and a population of 126,587 at the 2006 census. Oji River Urban is constituted of a heterogenous population. Thus in order to obtain a research data for the study, the area was divided into three wards of Oji River Urban as namely; Zone A, B, and C. Utaziukwu Wards is Zone A, Uzundu Ward is Zone B and Agbalaenyi Ward is Zone C. The researcher was able to sample them randomly with relevant questionnaires to ascertain the implications associated with water pollution and drinking such polluted water in Oji River Urban District. 120 respondents were selected amongst the three wards: making a total sample of 360 respondents between the ages of 18 and 65 years.

Qualitative questionnaire based study was performed to assess the perception of participants towards the effects of water pollution in Oji River Urban in View of Eco-Theology and Justice. This was titled "Water Pollution in Oji River Urban in View of Eco-Theology and Justice Questionnaire" (WPORUVETJQ). The participants were requested to provide their feedback regarding the item contents in line with the topic under discourse. The instrument was subdivided into various clusters A to C based on the research questions. WPORUVETJQ was

designed and patterned after Likert-4-point rating scale of Strongly Agree (SA), Agree (A), Undecided (UD), Disagree (D) and Strongly Disagree (SD) with corresponding numerical values of 4, 3, 2 and 1 respectively.

The questionnaire was face validated by two experts for relevancy, appropriateness and corrections were made before administration. For the determination of the reliability of the instrument, copies of the items were administered on 20 respondents who were not part of the sample. The Cronbach Alpha was used to ascertain the reliability using test-retest method which gave 0.82. This result implies that the instrument was reliable. The administration of the instrument was done by the researcher with the help of two trained researcher assistants. A total of (360) copies of questionnaire was administered on the respondents and were correctly completed and returned successfully due to the researcher's close inspections. The returned copies were used for the analysis. In analyzing the research questions, descriptive statistic of mean and standard deviation were used. In answering the research questions, any item less than 2.50 was rejected while a mean score that is equal to or greater than 2.50 were accepted. In testing the hypotheses, the independent t-Test was used. If the calculated value of t (tcal) is less than or equal to the critical value of t (tcrit), the hypothesis is accepted but if the calculated value of t (tcal) is greater than the critical value of t (tcrit), the hypothesis is rejected.

## Result Presentation

### Research Question One

What are the sources of water supply available in Oji River Urban?

**Table I:** Mean and Standard Deviation on the sources of water supply available in Oji River Urban.

S/ N	Variables	$\bar{X}$	SD	Remarks
1	Ponds	2.81	0.87	Accepted
2	Lakes	3.01	0.69	Accepted
3	Rivers/Streams	2.98	0.82	Accepted
4	Groundwater/Well Water	2.87	0.68	Accepted

5	Harvested Rain Water	3.38	0.67	Accepted
–				
<b>Cluster Mean (X)</b>		<b>3.01</b>		

The analysis of data collected as presented in Table I to determine the sources of water supply available in Oji River Urban showed that all the items of the instrument that addressed the issue were rated positive and their ratings were above the criterion mean of 2.50. A look at the table reveals that the highest rated items were items 5 and 2 with mean scores of 3.38 and 3.01 respectively. Based on the analysis where a cluster mean of 3.0 was reached, it was established that the respondents accepted all the listed options as their means of water supply in Oji River Urban of Enugu State, Nigeria.

### Research Question Two

Are there industries situated close to the Oji Wonderful River banks?

**Table 2:** Mean and Standard Deviation on the types of industries located within Oji River Urban

S/ N	Variables	– X	SD	Remarks
06	Oil Palm producing industries	3.38	0.98	Accepted
07	Power Station	3.27	1.05	Accepted
08	Chemical industries	2.97	0.82	Accepted
09	Abattoirs	3.37	0.99	Accepted
10	Bottle/sachet water factories	2.98	0.72	Accepted
–				
<b>Cluster Mean (X)</b>		<b>3.20</b>		

The analysis on Table 2 above to ascertain whether there are industries located around Oji Urban in Enugu State of Nigeria revealed that all the listed industries

were present, their ratings positive and are above the criterion mean of 2.50. Based on the analysis, a cluster mean scores of 3.20 which was above the 2.50 criterion point was reached. This implied that all the listed industries are located within Oji Urban of Enugu state, Nigeria.

### Research Question Three

What are the common causes of water pollution in the study area?

**Table 3:** Mean and Standard Deviation on the common causes of water pollution in the study area

S/ N	Variables	$\bar{X}$	SD	Remarks
11	Are you aware that defecation (human wastes) when washed into water sources cause water pollution?	3.39	0.98	Accepted
12	Use of Pesticides on farm lands cause water pollution	2.47	1.8	Rejected
13	Industrial effluent discharge (chemicals of different forms) into the water bodies cause water pollution	2.27	1.05	Rejected
14	Disposing cans and bottled foods into the water bodies cause water pollution	2.16	1.17	Rejected
15	Use of Herbicides in controlling weeds near water bodies cause water pollution	2.32	1.89	Rejected
<b>Cluster Mean (<math>\bar{X}</math>)</b>		<b>5.52</b>		

The analysis on Table 3 above that sought to determine the common causes of water pollution in the study area showed that one out of five items of the instrument that addressed the issue were rated positive and others were below

the criterion mean of 2.50. Based on the analysis where a cluster mean of 2.52 was reached, it is established that not all the respondents are aware of the various causes of pollution to the available water sources within the Oji Urban.

#### Research Question Four

What are the levels of awareness on the causes of water pollution in Oji River Urban?

**Table 4:** Mean and Standard Deviation of the levels of awareness on the causes of water pollution in Oji River Urban

S/ N	Variables	$\bar{X}$	SD	Remarks
16	Are you aware that defecations (human wastes) if washed into the streams can pollute the sources of water?	3.44	1.22	Great extent
17	Are you aware that agricultural activities such as the use of herbicides, pesticides, etc can pollute water bodies?	2.31	0.97	Low extent
18	Do you know that industrial effluent discharge (chemicals of different forms) when discharged untreated or partially treated, can lead to water pollution?	2.37	0.99	Low extent
19	Oxygen demanding organic substances such as food wastes from cans and bottles, oils etc can cause water pollution?	2.41	0.72	Low extent
20	Plant nutrients that stimulate algae blooms such as fertilizers when washed into water bodies causes water pollution?	2.25	0.98	Low extent
<b>Cluster Mean (<math>\bar{X}</math>)</b>		<b>2.56</b>		

The results in table 4 shows that item 16-20 have mean score ranging from 2.25 to 3.44. The cluster mean is 2.56. This shows the extent of awareness on the causes



of water pollution in Oji River Urban to the residents. The result of the analysis shows that majority of the respondents are not very much aware that agricultural activities such as the use of herbicides, pesticides, etc and use of plant nutrients that stimulate algae blooms such as fertilizers could lead to water pollution.

### Research Question Five

What are the health effects of water pollution on the inhabitants of the study area?

**Table 5:** Mean and Standard Deviation on the health effects of water pollution on the inhabitants of the study area?

S/ N	Variables	$\bar{X}$	SD	Remarks
21	Reduction of water quality	3.38	0.98	Accepted
22	Causes water-borne diseases such as Typhoid, Malaria, Cholera, etc	2.27	1.05	Rejected
23	Destruction of ecosystem	2.47	0.82	Rejected
24	Destruction of aquatic life	2.37	0.99	Rejected
25	Reduction in plant production	2.48	0.72	Rejected
<b>Cluster Mean (<math>\bar{X}</math>)</b>		<b>3.20</b>		

The analysis on Table 5 above to determine the health implications of water pollution on the inhabitants of the study area, the analysis revealed that one out of the five was rated positive with mean score of 3.38 while the rest had ratings below the criterion mean of 2.50. From the table it could be observed that the highest rated item in the table was item 21 with a mean score of 3.38. This implies that majority of the respondents are not aware of the fact water pollution destroys the water quality, causes water-borne diseases such as Typhoid, Malaria, Cholera, and destroys the ecosystem among others.

### Research Question Six

What are the preventive measures to reduce water pollution in the study area?

**Table 6:** Mean and Standard Deviation on the preventive measures to reduce water pollution in the study area

S/ N	Variables	$\bar{X}$	SD	Remarks
26	Public awareness campaigns on the reuse or recycle of plastic cans and bottles instead of disposing them into the environment can control water pollution?	3.38	0.67	Accepted
27	Proper disposal of chemical cleaners, oils, and non-biodegradable items to keep them from ending up down the drain.	2.98	0.76	Accepted
28	Proper maintenance of cars to avoid oil leakage, antifreeze, or coolant.	2.81	0.87	Accepted
29	Proper landscaping of our residential areas to reduce runoff water	2.87	0.68	Accepted
30	Avoid or reduce to minimal the use of pesticides and herbicides and fertilizers close to water bodies can reduce water pollution?	3.00	0.82	Accepted
– <b>Cluster Mean (X)</b>		<b>3.04</b>		

The analysis of data collected as presented in Table 6 to determine the preventive measures to reduce water pollution in the study area showed that all the items of the instrument that addressed the issue were rated positive and their ratings were above the decisive factor mean of 2.5. A look at the table reveals that the highest rated items were items 45 and 46 with mean scores of 3.38 and 3.05 respectively. The item 28 argued that public awareness campaigns on the reuse or recycle of plastic cans and bottles instead of disposing them into the environment can control water pollution while item 30 indicates that avoidance or reduction of use of pesticides, herbicides and fertilizers close to water bodies can reduce water pollution.

### Research Question Seven

Are you aware that pollution of natural water is against God’s design and desire?

**Table 7:** Mean and Standard Deviation on pollution of natural water as against God’s design and desire

S/ N	Variables	$\bar{X}$	SD	Remarks
31	Are you aware that it is of God’s will that man exploit nature for his proper end’s?	3.16	1.17	A
32	Are you aware that God’s intent in creating the natural order is for man to benefit from what comes from the Earth so that he will not be left in danger of scarcity of life-giving substance of the earth	3.39	0.99	A
33	God teaches equal existence and treatment to the ecosystem, especially of the relatively less powerful member of the society with regard to environmental hazards.	2.98	0.72	A
	<b>Cluster Mean</b>	<b>3.20</b>		
<b>(X)</b>				

The results in table 4 shows that item 31-33 have mean score ranging from 2.98 to 3.39. The cluster mean is 3.20. This show the respondents are aware that pollution of natural water is against God’s design and desire.

### Statistical Test of Hypotheses

**H<sub>01</sub>:** There had not been any sensitization or awareness programme by the government or non-government organization to enlighten the people of Oji River Urban on the causes of water pollution.

**Table 8:** t-Test Analysis on mean scores of sensitization or awareness programme by the government or non-government organization to enlighten the people of Oji River Urban on the causes of water pollution

Group	N	X	SD	df	tcal	tcrit	Remark
Rejected	298	3.43	0.91				
				309	-2.11	1.960	Accepted
Accepted	62	2.01	0.62				

Accept Ho if  $t_{cal} \leq t_{crit}$ , else Reject

Since the calculated value of t (tcal) is less than the critical value of t (tcrit), the null hypothesis that there had not been any sensitization or awareness programme by the government or non-government organization to enlighten the people of Oji River Urban on the causes of water pollution is accepted while alternate is rejected. Hence, there had not been enough sensitization or awareness programme by the government or non-government organization to enlighten the people of Oji River Urban on the causes of water pollution

**HO<sub>2</sub>:** The Residents of Oji River Urban are not ignorant of the causes and effects of drinking from a polluted water source.

**Table 9:** t-Test Analysis on mean scores of Residents of Oji River Urban being aware of the causes and effects of drinking from a polluted water source

Group	N	X	SD	df	tcal	tcrit	Remark
Rejected	318	3.04	0.92				
				309	2.61	1.960	Rejected
Accepted	42	2.22	1.80				

Accept Ho if  $t_{cal} \leq t_{crit}$ , else Reject

Since the calculated value of t (t-cal) is greater than the critical value of t (tcrit), the null hypothesis that Residents of Oji River Urban are not ignorant of the causes and effects of drinking from a polluted water source rejected, the alternate hypothesis is accepted. Hence, the residents are ignorant of the causes and effects of drinking from a polluted water source.

**HO<sub>3</sub>:** The Residents of Oji River Urban are not ignorant of the preventive measures to reduce the pollution of Oji Wonderful River.

**Table 10:** t-Test Analysis on mean scores of Residents of Oji River Urban are not ignorant of the preventive measures to reduce the pollution of Oji Wonderful River

Group	N	X	SD	df	tcal	tcrit	Remark
Rejected	300	3.04	0.72	309	2.73	1.960	Rejected
Accepted	60	2.21	0.81				

Accept Ho if  $t_{cal} \leq t_{crit}$ , else Reject

From the t-test table above, the value of t (t-cal) is greater than the critical value of t (tcrit), the null hypothesis that which says that Residents of Oji River Urban are not ignorant of the preventive measures to reduce the pollution of Oji Wonderful River is rejected, the alternate hypothesis is accepted. Meaning that the Residents of Oji River Urban are ignorant of the preventive measures to adopt in reduce the pollution of Oji Wonderful River.

**HO<sub>4</sub>:** The Residents of Oji River Urban are not aware that pollution of natural water resource is a gross violation and abuse of the creative order, hence it is directly against God’s injunction on good maintenance of the rural order by human kind.

**Table 11:** t-Test Analysis on mean scores of Residents of Oji River Urban are not aware that pollution of natural water resource is a gross violation and

abuse of the creative order, hence it is directly against God’s injunction on good maintenance of the rural order by human kind

Group	N	X	SD	df	tcal	tcrit	Remark
Rejected	288	3.53	0.81				
				309	2.17	1.960	Rejected
Accepted	72	2.21	0.73				

Accept  $H_0$  if  $t_{cal} \leq t_{crit}$ , else Reject

Since the calculated value of t (tcal) is greater than the critical value of t (tcrit), the null hypothesis that Residents of Oji River Urban are not aware that pollution of natural water resource is a gross violation and abuse of the creative order, hence it is directly against God’s injunction on good maintenance of the rural order by human kind is rejected while alternate is accepted. Hence, Residents of Oji River Urban are aware that pollution of natural water resource is a gross violation and abuse of the creative order, hence it is directly against God’s injunction on good maintenance of the rural order by human kind but ignorance has been their challenge.

**H<sub>05</sub>:** Industries situated close to the River banks especially palm producing ones; abbatoirs does not heighten the pollution of Oji Wonderful River.

**Table 12:** t-Test Analysis on mean scores of Industries situated close to the River banks especially palm producing ones; abbatoirs does not heighten the pollution of Oji Wonderful River

Group	N	X	SD	df	tcal	tcrit	Remark
Rejected	308	3.71	0.99				
				309	2.19	1.960	Rejected

Accepted  
d            52            2.21            0.82

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Accept  $H_0$  if  $t_{cal} \leq t_{crit}$ , else Reject

Since the calculated value of  $t$  ( $t_{cal}$ ) is greater than the critical value of  $t$  ( $t_{crit}$ ), the null hypothesis that Industries situated close to the River banks especially palm producing ones and abattoirs does not heighten the pollution of Oji Wonderful River is rejected while alternate is accepted. Hence, Industries situated close to the River banks especially palm producing ones and abattoirs are mainly responsible for the water pollution of Oji Wonderful River.

### **Effects of Oji River Water Pollution on the Residents of Oji River Urban**

There is no gainsaying the reality that irrespective of the fact that Oji River residents may not be completely aware of the dangers of polluting and drinking or making use of a polluted water source. It still cannot avert its dangers which are as follows:

- (1) It reduces the quality of the water being carried by the river. Research by Adejumo, Babatunde, Oluyori, Adelani-Akande, Adewumi and Oreofe (2018) posited that 95% of all sewage is discharged untreated into rivers, lakes or the ocean in the less developed countries of South America, Africa and Asia. A large part of Oji Wonderful River is contaminated sufficiently that it has reduced drastically the quality of water thereof, to such extent that it is basically dangerous to human health. From the research findings of this work, it is obvious that the effects of the degradation of a water resource are not limited to the area of discharge but could have widespread implication for the entire watershed.
- (2) The research carried out on Oji River Wonderful by Ugochukwu, Onuorah and Onuora (2019), and Ugochukwu, Onuorah and Onuora (2019), respectively, posited that heavy metals top the list of inorganic pollutant with wide range of negative effects on aquatic organisms, plants, and human. Heavy metals as Adejumo, Babatunde, Oluyori, Adelani-Akande, Adewumi and Oreofe (2018), posited are released into the environment through various channels like industries, mining activities, agricultural activities and so on. Bioavailable metals present in the soil

may be absorbed by plants resulting in dangerous plant metabolic dysfunctioning. High heavy metal ion concentrations also damage the cell membrane, affect enzyme involved in chlorophyll production, thus reducing photosynthesis rate as well as affect plant reproduction via decrease in pollen and seed viability. Little wonder U.C. Nwozor (personal communication, January 9, 2020), respectively exposed that their farm products are no longer yielding as expected.

Furthermore, E.O. Nkemmelo (personal communication, January 9, 2020), pointed out that the residents of Oji River Urban that often drink the water and equally use it for domestic purposes especially in cooking complains of ill-health such as mild eye, nose and skin irritations, severe headache, stomach ache, diarrhea, hematemesis, vomiting, dizziness, cirrhosis, necrosis, low blood pressure, hypertension and gastrointestinal distress. Thus the Oji River urban settlers are more often than not exposed to heavy metal toxicity through the food web as well; direct consumption of water containing metal or via inhalation. Heavy metals easily bioaccumulates in vegetables and enters into man and animal through food chain. The truth still remains that irrespective of the fact that some heavy metals also called essential elements as Adejumo, Babtunde, Oluyori, Adelani-Akande, Adewumi, and Oreofe (2018), explained, are required for various biochemical processes in minute amount in the body; others such as lead, cadmium, arsenic, and mercury are of serious danger and considered foreign in the body.

It is worthy to note that water pollution via strong acidic chemical substances that serves as wastes from industrial facilities can render the water dangerous for the fishes in the water. It can kill them as well. This of course is strictly against God's design and desire.

### **Solutions on how to Prevent the Pollution of Oji Wonderful River**

In lieu with the findings from the field research of this work, Eco-theology and justice; and from the standpoint of the basic theories employed in this work: The following solutions can be helpful in reducing the rate at which Oji River Wonderful is being polluted; viz:



- (1) The principles of Eco-Theology and Justice succinctly posits that God is so much involved in the created order: He however, made man care takers, to be incharge on His behalf. God's will on the relationship between the created order and man as the chief is for man to be "a steward of nature" (p.20), as Anyacho (2013), puts it. In this sense, mankind is expected to start taking remedial actions, which will forestall further environmental degradation (of which pollution of Oji Wonderful River is one of such), and seek for ways of remedying the damages already done. Eco-theology and justice emphasizes on fairness and equality in existence of all the created order. The chief objective being to extend the right of existence to all the living being in the environment. Thus, mankind must ensure the equal treatment of the relatively less powerful members of society with regards to environmental hazards.

In lieu of the above stated fact, the Oji River Urban inhabitants should be sensitized on this principle. It is obvious from the research that they are oblivious of the fact that pollution of water is a crime against humanity, nature and God; it is actually a sin against God and should be discouraged vehemently. When Oji River Urban settlers understands this; they will be conversant with conservation, which in turn deals with the sustainable use of the biosphere and its management so that it can yield great sustainable benefit to the present and future generation; according to Anyacho (2013), exposition. This will avert death of fishes in the river, various ill health and health hazards accrued from the polluted river; while ensuring that the waters purity is sustained always.

- (2) The theory of planned behavior employed in this work posit to the for that ignorance is one of the reasons that enforces the pollution of Oji Wonderful River by the Oji River urban settlers. Insight on basic informations of health, life and God's plan for humankind and his environment is very vital. Information is knowledge, wisdom and power combined: when the Oji River urban settlers are well informed on the dangers of drinking from a polluted water source, on the fact that pollution of water sources is against God's design and desire, and finally on the truth that conservation of the Oji Wonderful River's water purity and standard is their primary responsibility as human kind, it will go a long way in redirecting their conception on the mode of dumping of refuse, industrial and agricultural waste etcetera and general pollution of Oji Wonderful River. They will all be focused on making plans to ensure the preservation of the rivers good quality.

- (3) The government of Enugu state should ensure that well trained health personnel officers are sent to Oji River urban to understudy the terrain and come up with the mode through which they can easily convince the inhabitants to accept the fact that Oji Wonderful River should not be polluted irrespective of all odds; that polluting the Oji Wonderful River will be detrimental to their health and will equally affect them and future generation. This will easily foster the acceptance of innovations regarding policies, bye laws and bills on the usage of Oji Wonderful River and penalties placed on pollution of the River.
- (4) Handbills and posters detailing the dangers of polluting and drinking from a polluted water source should be produced and handed out to all and sundry within Oji River Urban terrain as part of the sensitization process. This will easily aid in making an average resident of Oji River Urban to be conversant with the health implications of drinking from a polluted water source. As seen from the Health Belief theory, people will definitely not get involved with that which will endanger their health and life as well. Thus, this will reduce the pollution of Oji Wonderful River drastically.

## **Conclusion**

This study having assessed the water pollution in Oji River Urban in view of Eco-Theology and Justice, has unraveled to the surface that a good number of individual's residing within Oji River urban are quite oblivious of the fact that polluting Oji Wonderful River is a crime against humanity and nature; and thus a sin against God as well. The ugly truth is that even a greater part of human persons in the world at large are ignorant of the fact that mankind ought to explore the natural order within his given environment in fairness and in the mindset of harnessing its available endowments for the greater good, devoid of exploitation.

Again, majority of the people in Oji River Urban are not completely aware of the implications of polluting the Oji River Wonderful, how it affects them adversely, and ways of preventing the effects. The populace dumps their wastes indiscriminately on the ground near the river banks and even inside the river as well because of lack of awareness on the effect of such acts on their lives. Some industries especially palm producing ones and Abattoir settings were cited

illegally close to Oji Wonderful River thereby polluting it with all sorts of wastes ranging from human, agricultural, toxic to other various forms of man-made wastes.

In all, good number of the residents of Oji River Urban equally use the water from Oji Wonderful River as domestic water supply thereby drinking polluted water which is detrimental to their health. The solutions posited in this work as well as the knowledge of the Eco-Theology and Justice, and the theoretical expositions from the environmental health study employed in this work will go a long way in aiding the Oji River Urban residents to take the right and firm stance and desist from polluting the Oji Wonderful River at all costs.

### **Recommendations**

In lieu of the findings of this study, the following recommendations are hereby made to help reduce the pollution of Oji Wonderful River in Oji River Urban of Oji River Local Government Area, Enugu State and its effects on the health of the residents:

- There is need for provision of enforceable laws guiding against indiscriminate dumping of wastes on environment in Oji River Local Government Area as it pollutes water resources.
- Subjects on Eco-Theology and Justice should not be restricted to students studying Religion or a related course in the higher institutions alone. It should be introduced into the academic curriculum from primary to post primary level of education in Enugu state and Nigeria at large. This will help in keeping the environment clean: It will equally improve the effort by citizens during the monthly environmental sanitations.
- There is need for regular cleaning and clearing of bushes, shrubs and other unwanted wastes by the Oji Wonderful River banks and the water body at large, in order to help reduce the pollution of the water therein.
- There is need for provision of appropriate wastes dump at strategic places so that people will be dumping their waste: Agencies involved in evacuation of these wastes should be highly functional in order to maintain a clean environment as these will aid in keeping Oji Wonderful River clean as well.

- Abattoir settings and palm producing industries should be monitored and appropriately located away from the water body: dumping of animal wastes inside the water should be discouraged.
- The use of pesticides and weed killing chemicals at farm lands located near the river banks should rather be an alternative measure at extreme cases. Agriculturists should engage on manual labour and natural means of keeping pests off farmlands in order not to pollute the water body with chemical substances.
- Finally, the Government should find a solution to Manage overcrowding in the cities/urban settings. The problem of environmental pollution and pollution of Oji Wonderful River is equally as a result of too much persons settling in Oji River Urban without corollary enough housing for so much population of persons. Infrastructures, industries and other social amenities that will make life better in the rural areas should be provided by the government to reduce too much migration to the urban areas by individual. Little wonder Wilber (2000), insisted that problems pertinent to environmental pollution result from overcrowding in the cities: Yet city planners especially in African countries and Nigeria in particular are often years behind the population growth and demand for public services.

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