

# Strategy for Promoting Effective Management of Environmental Effects from Brewery Industries at The Ninth (9<sup>TH</sup>) Mile Corner Industrial District of Enugu State

Arthur Efeoghene Essaghah<sup>1</sup> & Alabi Michael Oloyede<sup>2</sup>

<sup>1</sup> Department of Urban and Regional Planning, Enugu State University of Science & Technology, Agbani, Nigeria

<sup>2</sup> Department of Geography and Planning, Kogi State University, Anyigba, Nigeria

Correspondence: Alabi Michael Oloyede, Department of Geography and Planning, Kogi State University, Anyigba, Nigeria. Tel: 234-806-272-5944. E-mail: Alabimo06@Yahoo.Com

Received: January 10, 2013 Accepted: October 12, 2013 Online Published: November 22, 2013

doi:10.5539/eer.v3n2p176

URL: <http://dx.doi.org/10.5539/eer.v3n2p176>

## Abstract

Related studies on the environmental effects of poor brewery effluent management at the 9<sup>th</sup> Mile Corner industrial area have indicated that the Nigeria Bottling Company (NBC Plc) is not effectively monitoring liquid wastes from its production operations. There is need to investigate and explore these issues and take effective remedial action before the negative impact of its activities become widespread and elicit adverse reactions from the community. It is the intention of this paper to explore related issues and articulate a framework for effective monitoring of industrial effluents and management of Brewery wastes at the 9<sup>th</sup> Mile Corner using the Nigeria Bottling Company plant as case study. The research design combined desktop and social survey. Past studies on the environmental effects of the Nigerian Breweries activities were reviewed and analyzed. The company premises and surroundings were surveyed for evidence of industrial effluents flowing from the plant into residential areas. It was found that industrial effluents treatment facilities of the company are old and dilapidating causing effluents to escape outside the plant waste management system. Against this background the paper outlines the type of monitoring and auditing, as well as, relevant organization/agencies that should participate in the implementation of the proposed revised environmental management plan(s) for the factory. Adoption of this strategy for the management of environmental effects of the company effluent would undoubtedly enthrone sound best practices in the management of brewery plants operations in 9<sup>th</sup> Mile Corner and other industrial districts in Nigeria.

**Keywords:** post impact assessment, effluent management, environmental management

## 1. Introduction

Undesirable industrial effluent characteristics from breweries and distilleries like soluble organics, suspended solids, heavy metals, as well as, nitrogen, phosphorous, colour and turbidity may be completely removed through primary and secondary treatment processes (Azard, 1976; Eckenfelder, 2000; Wong & Pfarrer, 1995; Patterson, 1985; Lankford & Eckenfelder, 1990) before discharge into acceptable media. However, if such treatment processes are poorly handled and or not performed by operator(s) before discharge into open surface water bodies, it contaminates or pollutes the receiving media. When such happens, periodic sampling, monitoring and subsequent treatment of the receiving media is necessary to guarantee that applicable critical physico-chemical parameters do not rise above acceptable thresholds (Bausmith & Neufeld, 1996; Ford, 1998).

A number of studies have shown that Brewery industries at the 9<sup>th</sup> Mile Corner have not been successful in safely disposing off their industrial effluents and wastes without environmental and social hazards (Planscape Associates, 2005; Onwe, 2004). These studies have all reported that industrial effluents and or wastes from brewery plants at the 9<sup>th</sup> Mile Corner flow freely from company's premises into residential compound(s) and street(s) in the town in flagrant disregard for standard procedures for disposal of industrial emissions, effluents and wastes as specified by the World Bank Environmental Guidelines (1988), Federal Ministry of Environment (Former Federal Environmental Protection Agency (FEPA S.1.8, S. 1.9 and S. 1.15) regulations on effluent limitations, pollution abatement in industries and management of wastes (FEPA) 1991a & b). These clearly indicate failure of existing company's environmental management procedures and practices.

It is the intention of this paper to explore related issues and articulate a framework for effective monitoring of industrial effluents and management of Brewery wastes at the 9<sup>th</sup> Mile Corner using the Nigeria Bottling Company plant as case study. The rest of the paper is structured into four parts. Section 2.0 examines the study area and methodology while the direct and indirect effects of the poor disposal of the company's effluents are discussed in section 3.0. Section 4.0 determines and outlines the structure and essential features of the management strategy for enthrone effectiveness in the monitoring of environmental effects of the NB Plc plant at the 9<sup>th</sup> Mile Corner and the study is concluded in section 5.0.

## 2. Area of Study and Research Methodology

The Ninth Mile Corner is one of the fastest growing settlements in Enugu State. The 2006 population census put its population at 25,000 people. From its beginning as a transit camp for travelers between the eastern and the northern regions of Nigeria in the early 1930, it has developed into a sprawling industrial settlement locating important industries like the Nigerian Brewery Plc Plant, AMA Brewery Plant, Seven-Up Bottling Company Production Plant, Nigeria Bottling (NB) Company Plant and other associated concerns. Increasingly a sizeable number of medium and high income earners have relocated from Enugu urban to the area. It is today the industrial hub of Enugu State with bustling environmental and social activities and a revenue spinner for Udi Local Government Council, Enugu State and Federal Governments in Nigeria. Unfortunately, its environmental resources like Ajali River (the Ajalli River is the only source of water for domestic and agricultural purposes), vegetation and soils are being degraded by industrial effluents from the various Brewery plants in the area. There is need to protect these vital ecological resources from degradation by industrial effluents and wastes in order to ensure sustainable socio-economic development and ecological integrity of biological environments in the area.

The research design combined desktop and social survey. Past studies on the environmental effects of the NB Plc plant including a post-impact assessment study of the company's effluents management by Planscape and Associates (2005), Essaghah and Ugwu (2010) and AMA Brewery Plant Environmental Impact Assessment (EIA) report were examined to determine the company's environmental commitments and undertakings vis-à-vis environmental regulations and standards regarding management of effluents and industrial wastes. Thereafter the company premises and surroundings were surveyed for evidence of industrial effluents flowing from the plant into residential compound(s), streets and surface water bodies. Finally the company's staff and residents of the area were interviewed to determine why NB Plc plant's effluents are allowed to flow freely through dense residential neighbourhood(s).

## 3. Direct and Indirect Effects of Poor Disposal of Industrial Effluents from the Nigerian Bottling Company Plant at the 9<sup>th</sup> Mile Corner

Laboratory analysis of physico-chemical and micro-biological parameters of collected water and soil samples by Planscape and Associates (2005) revealed that values of critical portable water parameters were found to be above maximum thresholds. Critical parameters like Conductivity, Total Solids (TSS), Sulphates ( $\text{SO}_4^{2-}$ ) Manganese (Mn), Coliform were found not to be within World Health Organization (WHO) permissible limits. It was revealed that numerical values of metallic cations in the effluent samples were high for calcium, sodium, magnesium, potassium, copper and zinc ranging between 200–250 mg/l and 897.64 mg/L – 906.60 mg/L for substances like sulphates. Total microbial plant counts were found to range between 29mg/L – 49.0 mg/L. A similar study by Essaghah and Ugwu (2008) indicated that no significant differences between values of physico-chemical and micro-biological parameters of the 2005 study by Planscape & Associates. In particular conductivity and sulphates values were found to significantly higher ranging between  $1.2\text{--}2.3 \times 10^3 \mu\text{m}^3$  and 901.2–1107 mg/L respectively. Also values of manganese, nitrates and total solids were found to be extremely high ranging from 150–380 mg/L. Effluent samples were found to be highly pungent with intense colouration.

Considering the deleterious and destructive effects of sulphate compounds on ordinary concrete and sand-crete blocks as used for the construction of residential and industrial buildings in the area, there are indications that the strength of some building foundations may have been affected. Similarly considering the effect of heavy metallic cations on the leaching of soil nutrients and related soil fertility, declining yield of farmed crops in the area was implicated. For a water body that was found to be highly conductive (that is, with high conductivity), contamination of Ajalli River by Brewery effluents and other industrial activities in the area cannot be underestimated.

It was not surprising therefore that a number of direct and indirect effects or impacts were identified (Table 1).

Table 1. Some direct and indirect effects of the NBC plc effluents

S/N	Direct Effects	Indirect Effects
i.	Contamination of the air in the building and outdoor environment(s)	Weakening of building foundation(s) and cement screed floor(s) of nearby buildings.
ii.	Progressive development of earth gullies across compound(s)	Weakening of structural stability of buildings
iii.	Contamination of soil and surface water bodies (the Ajalli River is implicated)	Increased building maintenance cost and incurred medical bills directly related to effects of the effluent; and
iv.		Enhanced financial, emotional and psychological problems

Source: Planscape & Associates (2005), Essaghah & Ugwu (2008).

Table 1 shows that the direct effects of the NB Plc effluents are not limited and localized but widespread affecting air, surface and underground water bodies negatively while the indirect effects represent social, economic, emotional and health costs to individuals and the entire section of the residents living near the plant. A participatory rapid appraisal (RAP) study by Essaghah and Ugwu in 2008 also showed that residents living near the production plant complained of the effluents from the brewery destroying their building foundations, polluting their sources of domestic water and accelerated corrosion of building walls, roofing sheets, utility pipelines and structures. It was also observed that most of these complaints were localized since residents living far away (more than 200 m) from the plant showed indifference. On the aggregate level 65% of residents interviewed corroborated these assertion(s), while majority of company staff surveyed refuted these allegations. It was argued by residents that the company industrial effluents treatment facilities are too old and dilapidating thereby allowing poorly treated waste water escape out of the plant production waste management system.

Management staff of the company maintained that all effluents of the factory are treated before disposal and as such, the said effects could not have resulted from its industrial waste operations. All these indicate that the management of brewery plants at the 9<sup>th</sup> Mile Corner appears not to be monitoring the effluents from its industrial operations to mitigate the adverse impacts of their production activities. There is a clear need to start doing so before the negative impacts from plant production activities become widespread and elicit adverse public reactions from host community. This issue is discussed in the next section.

#### 4. Organisational Framework for Effective Monitoring and Management of Environmental Effects of Industrial Effluents

A starting point for effective monitoring of industrial effluents and effective management of the environment effects of the NBC Plc plant production operations is to re-examine, review, revise and update the existing Environmental Management Plans (EMP) drawn up by the Environmental Impact Assessment (EIA) study preparatory to the construction and operational use of the existing plant. All EIA studies recognize that projects' EMP contains all undertakings and commitments for ensuring compliance with regulatory requirements, means for continuous self assessment of the predictive accuracy of impacts, as well as, strategies and procedures for implementing mitigation measures prescribed for identified impacts (FEPA, 1993; World Bank, 1988).

The review, revision and updating of the brewery plants' EMP should be *data driven*. The Nigerian Brewery Plc is a big player in the Nigerian economy in general and Enugu State and Udi Local Government Council Area in particular. It should not shy away from its responsibilities to the host community, the nation at large and the international community by ensuring that its activities conform to best international practices in engineering production operations. The NB Plc should subject the 9<sup>th</sup> Mile Corner Brewery Plant to International Standards Organization ISO 14000 audit scheme based on the Environmental Management Systems EMS 14001 criteria to identify operational inadequacies, deficiencies and lapses in the management of the plant industrial effluents and wastes. Result of this audit should form the basis for drawing up a new EMP for the company's operations and activities.

Monitoring and auditing of EMP address the pertinent question of "how do we assure that the EMP is properly implemented as laid and as agreed"? Tables 2 and 3 summarize the list of agencies/organizations that should be

involved in the implementation of the revised EMP and the types of monitoring required for its effective implementation respectively. An Environmental Management Plan (EMP) Team should be set up with the sole responsibility of implementing the new waste and environmental management plans. Membership of the EMP management should be drawn from staff of the company with 2 members each selected from EIA consultants and waste management experts to be appointed by Federal Ministry of Environment (FMNEV).

Table 2. Proposed list of agencies to be responsible for implementing of the new or revised EMP

S/N	Agencies/Organization	Status
1.	Federal Ministry of Environment, Abuja	Regulator
2.	Enugu State Waste Management Board	Regulator
3.	Enugu State Ministry of Environment	Regulator
4.	Enugu State Ministry of Lands, Housing and Urban Development	Regulator
5.	Udi Town Planning Authority	Regulator
6.	Nigerian Brewery Management Staff at the 9 <sup>th</sup> Mile Corner Plant	Operator
7.	Community Based Organization(s), Non Governmental Organization (NGOs)	Observer
8.	An EMP Management Team	Consultant

Table 2 above reveals that multi-sectoral and multilateral approaches may be needed to make the implementation of the revised EMP more transparent, accountable and democratic. Involvement of regulatory agencies, and related department NB staff, company consultants and experts, an independent EMP management team, as well as, Non Governmental Organisations (NGOs), Community Based Organisations (CBOs) and development stakeholders/partners will ensure that every aspect and related issues are covered and in the process mainstream sound international best practice.

Table 3. Types of monitoring for the proposed EMP

S/N	Types of monitoring	Description
a.	Effects monitoring	Repetitive, systematic measurement of environmental parameters in effluents, wastes and emissions
b.	Compliance monitoring	Periodic sampling or continuous measurement of environmental parameters to ensure that regulatory requirements are observed and standard met.

Source: Essaghah & Ugwu (2008).

The only way to prevent the company's effluents being disposed off into streets and residential compounds is to ensure that both compliance and effects monitoring are regularly conducted on all operations, tasks activities of the factory (Table 3). Periodic sampling and continuous measurement of environmental parameters will achieve compliance with regulatory requirements as well as, ensure that immediate corrective measures are devised when necessary. Similarly effects monitoring will provide feedbacks on impact predictions, accuracy and effectiveness of mitigation measures including environmental benefits targets contained in the new or revised EMP. In order for these monitoring activities to be effective, the following roles and responsibilities should be assigned to the various stakeholders (Table 4).

Table 4. Proposed roles and responsibilities for implementing revised EMP

S/N	Entity	Role and Responsibilities
i	NB Plc Factory EIA Audit team, EMS 14001 Audit consultants, Environmental Management Team (EMP Team), EIA Consultants, Waste Management Experts and Professionals	Co-ordinate preparation of revised EMP components and endorsement
ii	Federal Ministry of Environment (FMNEV), Enugu State Ministries of Environment and Lands, Housing and Urban Development	Approval of new EMP
iii	Proposed EMP Management Team	Implementation of the new EMP
iv	Federal Ministry of Environment (FMNEV) Enugu State Ministries of Environment and Lands, Housing and Urban Development including Enugu State Waste Management Board and Udi Town Planning Authority.	Internal monitoring and auditing of EMP operations and activities.
v	Environmental Management Experts, NGOs, CBOs, (Community Based Organisation), Civil Society, Interested Parties and Groups	External monitoring and audit of EMP operational activities

Table 4 above reveals that the specific role and responsibility that each stakeholder concerned with sustainable management of environmental effects of industrial activities and operations should perform. The proposed NB Plc factory EIA Audit team, the new EMP Management Team and EIA consultants that prepared the existing factory EMP including waste management experts and professionals should jointly collaborate to prepare the new EMP. Regulatory and relevant government agencies should approve the revised EMP after due consultations, panel reviews and considerations. Once new EMP is approved, constituted EMP management team and contractors should implement the environmental management plan. While implementation of the EMP is on-going, the various regulatory and or supervisory agencies of government should monitor and audit relevant tasks and assignments of EMP management team to ensure that results are delivered as scheduled. The role of Non-Governmental Organizations (NGOs), Community Based Organisations (CBOs) and Civil Society cannot be over emphasized in this regard. They should take responsibility for external monitoring and audit of EMP implementation activities and operations. Participation of these stakeholders in project implementation procedures and management of environment effects will promote checks and balances, transparency and accountability, and mainstream best practices in the various waste management operations and activities between the actors involved. Although participation of these stakeholders in the process will undoubtedly cause extra financial burden (which should be borne by the company), no account of money is too much to pay for prudent management of natural ecological capital and resources, as well as, promotion of human welfare in a developing economy like Nigeria.

## 5. Conclusions

This paper has examined some environmental, socio-economic and health related issues and problems that has resulted from the poor handling of industrial effluents from Nigeria Bottling Company production plant at the 9<sup>th</sup> Mile Corner. It has also highlighted relevant direct and indirect effects resulting from the poor management of industrial effluent from the plant with a view to mainstreaming a more democratic, multi-sectoral and multi-lateral approach to the management of factory production effluents and ensuing environmental effects at the 9<sup>th</sup> Mile Corner that is fast assuming an industrial district status in Enugu State. To this end, the paper proposed a management strategy for promoting sound and effective monitoring and auditing of the factory's production operations and activities.

Finally, the paper outlines the type of monitoring and auditing, as well as, relevant organization/agencies that should participate in the implementation of the proposed revised environmental management plan(s) for the factory. Adoption of this strategy for the management of environmental effects of the company effluent would undoubtedly enthrone sound best practices in the management of brewery plants operations in 9<sup>th</sup> Mile Corner and other industrial districts in Nigeria.

## References

- Azard, H. S. (1976). *Industrial Wastewater Managements Handbook*. New York: McGraw-Hill.
- Bausmith, D. S., & Neufeild R. D. (1996). *Proceedings WEF, Vol. 3*. Donaldson E. C. Dallas.
- Eckenfelder, W. W. (2000). *Industrial Water Pollution Control*. Boston: McGraw-Hill Higher Education.
- Enville Environmental Consultants Limited. (2000). *Environmental Impact Assessment of the AMA Brewery Project at Amaeke Ngwo, 9<sup>th</sup> Mile Corner*. Draft Report.
- Essaghah, A. A. E., & Ugwu, L. N. (Mrs) (2008a). Management Strategy for Monitoring And Auditing of Environmental Effects of Brewery Industries in Nigeria: The Case for the Nigerian Bottling Company Plant at the 9<sup>th</sup> Mile Corner, in Enugu State, Nigeria. *Journal of Ecology, Politics and Environment*, 1(1).
- Federal Environmental Protection Agency (FEPA). (1958). *Health Laws Further Amended in 1963*. Federal Government Press Lagos, Nigeria.
- Federal Environmental Protection Agency (FEPA). (1988). *Harmful Wastes (Special Criminal Provisions) Act. Cap 165 LFN 1990*. Federal Government Press Lagos.
- Federal Environmental Protection Agency (FEPA). (1991a). *National Interim Guidelines and Standard for Environmental Pollution Control in Nigeria*. Federal Government Press Lagos.
- Federal Environmental Protection Agency (FEPA). (1991b). *Federal Environmental Protection Agency (Amended) Act*. No. 59 of 1993 FEBA, Abuja.
- Federal Environmental Protection Agency (FEPA). (1991b). *National Environmental Protection Regulations*. The Federal Government Press, Lagos Nigeria.
- Federal Environmental Protection Agency (FEPA). (1994). *Draft Procedural Guidelines for Environmental Impact Assessment in Nigeria*. FEPA, Abuja.
- Federal Environmental Protection Agency (FEPA). (1995a). *Draft Procedural Guidelines for Environmental Impact Assessment in Nigeria*. FEPA, Abuja.
- Federal Republic of Nigeria. (1988b). *Federal Environmental Protection Agency Act. 58 of 1988*. Federal Government Press Lagos.
- Federal Republic of Nigeria. (1992). *Environmental Impact Assessment Act. No. 86 of 1993*. Official Gazette, No. 72, Vol. 79, Lagos.
- Ford, D. L. (1998). *Toxicity Reduction-Evaluation and Control* (2nd Ed.). Lancaster: Technomic Publishing Company.
- International Standard Organisation (ISO). (14000). *International Standard Organisation Management Audit System for Organization*, Geneva.
- Lankford, P. W., & Eckenfelder W. W. (1990). *Toxicity Reduction in Industrial Effluents*. New York: Van Nostrand Reinhold.
- Onwe, F. O. (2004). *The Environmental Effects of Brewery Industries at the 9<sup>th</sup> Mile Corner of Enugu State* (Unpublished Dissertation thesis). Department of Geography, Enugu State University of Science and Technology (ESUT).
- Patterson, J. W. (1985). *Industrial Wastewater Treatment Technology* (2nd Ed.). Boston: Butterworth.
- Planscape & Associates. (2005). *Environmental Impacts Assessment of Effluents on Mr. Ugwu's compound and environs at Ngwo 9<sup>th</sup> Mile Corner, Udi L.G.A. of Enugu State*.
- Wong, G., & Pfarrer, R. (1995). *Proceedings 50<sup>th</sup> Purdue Industrial Waste Conference*. Ann Arbor Press, Ann Arbor Michigan.
- World Bank. (1988). *Environmental Guidelines*. Environment Department. Washington D. C.: The World Bank.

## Copyrights

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/3.0/>).