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REVIEW ARTICLE

Management of Industrial Effluents: A Review of the Experiences in Kano, Northern Nigeria.

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Abstract

The paper examines the management of industrial effluents in Kano and identifies the major problems as inadequate effluent treatment facilities; unrealistic standards; non-compliance with regulations by the industries; non-enforcement of regulations by the monitoring agencies; lack of effective monitoring and evaluation facilities; insufficient economic incentives for effluent treatment; and ignorance of the affected communities. The consequences include low water quality in the Jakara and Kano Rivers which serve as sources of water supply for drinking, irrigation and fishing. The level of some toxic metals in the water from Tamburawa Water works tube-wells was above the maximum acceptable limits. Major recommendations of the paper include provision of economic incentive package to enable industries install effluent treatment facilities, review of existing effluent standards to suit the current level of Technology in the country, and public enlightenment on the danger and consequences of poor effluent management.

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Introduction

Advancements in technology and industrialization have brought with them the problem of waste management. Industrial wastes, especially, are now recognized as the greatest contaminants of water resources. Studies carried out by Anandalingam, et al (1987) and Hardoy, et al (1992) have shown that the industrialized countries of North America, Europe, and Japan are now faced with serious problem of environmental degradation and pollution of water resources. Although third world countries have a small proportion of the world's industrial production, UNIDO (1981) has indicated that there are hundreds of third world cities and city-regions with high concentration of industries and significant industrial output. These also suffer similar industrial-effluent management problems.

Various studies conducted in Asia, South America, and Africa; [CSE 1983; UNEP, 1991; Oluruntola, 1990; and Bichi, et al, 1999] indicates equally devastating water pollution problems arising from poor management of industrial-effluents. In Nigeria, industrial effluent management problems have been reported in many parts of the country [Awanda, 1987; Beecroft, et al, 1989; Nwaogozie, 1990; Jegede, 1977; Bichi, et al, 1999; and Dan'azumi, et al, 2010a, b]. The problems is probably more glaring in the

Northern parts of the country where, in some cases, untreated industrial effluents contributes up to 75% of river flows in dry season [Beecroft et al 1989; Bichi, 2000]. Not much attention has been given to the problem of industrial effluent management in Kano, despite the city being the second largest industrial city after Lagos. Studies carried out by many researchers (Bichi, et al, 1999; Bichi, 2000 and Dan'azumi, et al, 2010a, b) indicate increasing environmental problems.

This paper examines the current industrial effluent management practice in Kano; the problems associated with these practices, and suggest options towards better management.

Industrial Developments in Kano

From the trans-Saharan trades, Kano, over the years, became the centre of distribution of goods in Northern Nigeria and some parts of West Africa. Emerging Industrialization changed the pattern of activities in the city and industrial estates started emerging within the city. According to the Kano State Ministry of Trade and Commerce (1990), Kano has 320 industries distributed mainly within the three main industrial estates at Bompai, Sharada, and Challawa; and the emerging new estates at Dakata, Zaria Road, and Katsina Road.

Bompai Industrial Estate is the largest, containing more than 50% of the city's total industrial establishments. The Sharada Industrial Estate established in the 50's has over 24%, Challawa has 8%, Hadejia Road has 10% and the remaining are scattered within the other areas. Presently, Kano has more than 21 tanneries, 24 textiles, and over 43 food processing industries (Ministry of Trade, 1990). In addition, there are over 63 Aluminum, metal, and wood factories; 50 plastic, rubber, and tyre factories, and over 32 chemical and cosmetic products industries. These produce highly polluted effluents.

Composition and Character of Industrial Effluents

The creation of polluted industrial effluents usually results from a decision to use water in industry to evacuate unwanted waste. Many industrial processes necessarily require large quantities of water with the resultant large volumes of waste water production. In Kano, tanneries, textiles, food processing, and chemical and plastics constitute the bulk of the industrial establishments. These also happen to be the industries producing large quantities of waste water in the area.

Tannery effluents composed of chromium, sulphates, sulphides, chlorides, solids, and organics. Textile waste waters are generally coloured, highly alkaline, high in BOD and suspended solids and in temperature. Jorgensn (1979) noted that although the character of wastes from the food processing industry vary considerably, their common feature include high concentration of grease, proteins and/or carbohydrates; higher BOD than municipal wastes; and BOD: Nitrogen: Phosphorus ratio significantly different from the optimum 100 : 15 : 1 for biological treatment. Chemical and plastic industrial effluents contain biodegradable either monomeric and polymeric compounds, nutrients and suspended refractory compounds, and/or non-refractory compounds and toxic metals (Jorgensen, 1979).

Industrial Effluent Management Practice

The current practice with industrial waste disposal generally in Nigeria is that industries discharge untreated effluents into the nearest water bodies [Jegede, 1977; Nwaogazie, 1990; Bichi, et al, 1999; and Bichi, 2000]. In Kano, most of the industries do not have waste water treatment facilities and thus discharge their untreated effluents into the adjoining receiving water bodies. River Getsi collects all the wastes from Bompai Industrial Area and joins river Jakara (which drains the entire old city area) on its way to the Jakara dam reservoir. Rivers Yarkuto and Salanta receive the effluents from Challawa and Sharada Industrial Areas and discharge into rivers Challawa and Kano (Bichi, et al, 1999).

Despite the gross pollution in these water bodies, they are extensively being used for portable water supply, irrigation, fishing, and recreational activities (Bichi, et al, 1999; and Bichi, 2000). Rivers Kano and Jakara are extensively being used for irrigation of crops and vegetables along their entire lengths. River Kano is also the source of water for the Tamburawa water works with the intake works located just downstream of the effluent discharges into the river. Wudil water works also draws from the Kano River much further downstream. The Jakara dam reservoir is used for irrigation and fishing. The health consequences of these on the affected communities can thus be considerable.

In order to ensure proper waste management and the protection of the environment, the Nigerian Government established the Federal Environmental Protection Agency (FEPA) through decree 58 of December 1988 and amended by Decree 59 of 1992, and subsequently, the Ministry of Environment. In Kano, the pollution control section of the Ministry of Environment is responsible for the management of industrial effluents in the state. Despite the existence of these agencies, the indiscriminate effluent discharges still continue unabated.

Problems with the Existing Practices

Although there are a number of problems with the current industrial effluent management practice in Kano, few are identified here:

- *Most of the industries do not have adequate waste treatment facilities
- *There are no sufficient economic incentives for industries to install effluent treatment facilities
- *FEPA effluent standards are yet to be acceptable, and implementable, to the industrialists
- *Laws controlling effluent discharges are not being complied with, by industries, or being enforced by the regulating agencies
- *There are no effective monitoring and evaluation facilities
- *The affected communities are not sufficiently aware of the dangers of improper effluent management and hence it's environmental and public health consequences.

Discussions

Poor industrial effluent management has far reaching implications on the people and the local environment. The use of polluted waters, for example, ensure the transfer of various pollutants, especially toxic substances (Pb, Cd, Co, Hg, etc) into plants, animals, and man, with devastating consequences. Aikman (1983) for instance reported that high concentration of heavy metals in irrigation waters can

result in death of crops, interfere with uptake of other essential nutrients, or form objectionable deposits on fruits and render the edible portion of plants toxic to human and grazing animals. These substances could also find their ways into aquatic animals which serve as a source of food for humans. For instance, Ibok, et al (1989) has found heavy metals in fish caught from some streams at Ikot Epena, Nigeria.

Of equally serious concern is when these substances filter into drinking water supplies. According to Gidding (1973), the single most serious implication of toxic metal pollution of water is that, at high levels of concentration, they are toxic and have lethal effects on man, animals, and plants. Many deaths and disablements have been reported in various parts of the world [Hardoy et al 1992]. Bichi, et al (1999) indicated that the Kano River is receiving considerable pollution from Sharada and Challawa industrial areas. Dan'azumi and Bichi (2010a, b) found that the mean level of some heavy metals and other physico-chemical parameters discharged in to river Kano has exceeded the maximum permissible limit set by PEPA and WHO. Furthermore, these pollutants were found to be present in the Tamburawa tube-wells water which is used as a source of water supply to metropolitan Kano.

Another problem of poor effluent management is that the receiving water courses provide breeding grounds for various insect vector and pathogenic organisms. Bichi (1993), for instance, has reported increasing cases of water-borne and water related diseases in areas draining industrial effluents in Kano.

Conclusion and Recommendations

From the examination of the effluent management practices in Kano, it can be concluded that:

- *Industries discharge untreated effluents into adjoining water courses
- *The receiving water courses are now grossly polluted
- *The polluted water courses are extensively being used for water supply, irrigation, fishing, and recreation.
- *The level of some toxic chemicals in Tamburawa tube-well water has exceeded the maximum permissible limits set by PEPA and WHO.
- *There are no effective monitoring facilities

In order to ensure better effluent management in Kano, the following steps are recommended:

- i) The existing effluent standards should, for the mean time, be reviewed to enable their compliance based on our current level of technology.
- ii) The Authorities should prepare an economic incentive package to enable industries install effluent pre-treatment facilities
- iii) The Authorities should expedite action towards the establishment of a central wastewater

treatment plant for secondary effluent treatment

iv) The regulating agencies should establish an effective monitoring and evaluation unit to ensure compliance with regulations and punishment for non-compliance

v) The general public should be enlightened on the dangers of poor industrial effluent management, and its inherent public health and environmental implications.

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