



The Effects of Manufacturing Industry on the Environment: case of Atonsua-Kaase-Ahinsan in the Ashante Region of Ghana.

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Abstract

Manufacturing activities contribute a lot of toxic wastes to the environment; hence this study was carried out to investigate the effect of industrial activities on the neighbouring Surrounding Atonsua-Kaase-Ahinsan industrial/residential area in the Ashanti region of Ghana. Questionnaires were administered, interview method used in the case of the non-literate residents and the drop-and-collect method in the case of the health officials, KMA workers, literate residents and other governmental workers. The observation method was used to collect data on the level of environmental pollution. The study revealed air and water pollution as the most dominant type of pollution in the area. There is also a close association between the different types of pollutants and certain types of diseases. Water pollution is associated with water borne diseases and this is evidenced by the common diseases reported by the Atonsua-

Agogo health officer. The study also indicates that the industries adopted inadequate measures of solving environmental problems. The study recommends industries should conduct environmental impact assessment (EIA), apply the polluter pays principle, and mount educational campaigns on how to prevent environmental pollution.

Key words: manufacturing industry, environment, pollution, Ghana

INTRODUCTION

The manufacturing sector plays a crucial role in the Ghanaian economy. It earns substantial amount of foreign exchange, provides employment opportunities for both skilled and semi-skilled labor, accelerates development of otherwise impoverished communities and also contributes to the revenue generation capacity of the local authorities. However the adverse effects of these manufacturing activities on the environment cannot be overemphasized. According to Schmidheiny (1992, cited in Getis et al, 1998), a number of US power companies have bought, or planted, a chunk of forest when they have opened a new power station in order to offset the carbon dioxide emissions. Mitsubishi, which has been particularly targeted in campaigns against Japanese industrial consumption of wood from the rainforests, is now financing a major experiment in rainforest regeneration.

The Kumasi Metropolitan Assembly (KMA) oversees the administration of Kumasi Township and its environs. Over the years the KMA collected substantial amounts of revenue to help promote the development of Kumasi. Nonetheless, the proliferation and expansion of the activities of manufacturing companies has brought in its wake widespread environmental degradation issues and as a result has impacted negatively on the health of the general populace.

Industrial development has been recognized as one of the surest means of ensuring higher and sustained growth rates. Hence, African countries including Ghana pursued import substitution industrialisation in the 1960s and 1970s. The rationale was to move African economies from their agrarian state to modern industrialised economies as has been the case of the east and south-east Asian economies. Consequently, policies to promote import substitution industrialization were pursued and this led to the establishment of light industries to produce goods locally and operate behind tariff barriers. Like many African countries, Ghana's industrial strategy was meant to reduce economic dependence; hence, manufacturing industries were established to produce items that were previously imported.

The focus of this study, however, is on the natural or physical environment. Thus environment as used in this study will refer to the physical environment, though it will be realized that there is a backlash effect on the other aspects of the environment especially on the socio-economic and political aspect where the general health, employment, mortality and morbidity rates and the very basic existence of man is so dependent on the quality and soundness of the physical or natural environment.

Environmental pollution is widespread in manufacturing areas around the world. There is growing global concern about the ever increasing environmental degradation due to industrialization. The natural vegetation has been destroyed by defacing the landscape of the affected areas. The remaining parcels of land are also robbed of their nutrient content thus rendering them ineffective for production of agricultural products. Many industries discharge organic and inorganic wastes into water bodies. These may be acids, highly toxic minerals, such as mercury or arsenic, or in the case of petroleum refineries, toxic organic chemicals. Such pollution can have a variety of effects such as the water becoming unsuitable for domestic use or irrigation; or the wastes may reenter the food chain, with deleterious effects on humans (Getis et al, 1998).

Against the background of these developmental problems associated with manufacturing industries in general, it is of utmost importance therefore that such issues are well researched into with particular reference to Kumasi, a manufacturing area of the Ashanti region of Ghana to ascertain firstly, the nature and extent of the problems of manufacturing industries on the physical environment. Secondly, the crucial question of the extent to which these industries have impacted either negatively or positively on the socio-economic lives of local people, especially those in close proximity to the forest. Thirdly, remedial measures being put in place by manufacturing companies and their efforts in ensuring good environmental practices may or may not be as effective as is expected by monitoring agencies such as the Environmental Protection Agency (EPA) and other statutory regulations governing manufacturing industries in Ghana.

The research is relevant on the basis that it will serve as an empirical foundation for further research work into environmental management problems in the Kumasi Metropolis. It will also sensitize Environmental Protection Agency (EPA) to act decisively to solve the environmental problems facing the inhabitants of Atonsu. This may lead to the dredging or desilting of the water bodies and consequently improving upon its ecological and sanitary problems. The health hazards of the residents of this community can be brought under check. Many groups and individuals who have a stake in the environment sometimes are not aware of what is happening to the environment elsewhere. This research will therefore provide data and information on the environment for these stakeholders. Finally the study will enable the health authorities to design pragmatic policies that will help in a long way to improve upon the health status of the inhabitants within the area.

The objectives of the study include the following:

1. To assess the effects of manufacturing industries' activities on the physical environment
2. To assess the extent and nature of damage caused by manufacturing industries activities on the socio-economic lives of the people of Kumasi.
3. To find out the remedial measures being put in place by manufacturing companies on the effects of the environment.

A major limitation to this study was the unwillingness of some personalities, organizations, institutions and companies to grant interviews and other assistance. Some manufacturing companies simply did not allow the author to study their activities let alone evaluate their impact on communities. Others however granted the permission but were likewise unwilling to provide certain information vital to the study. Some institutions were willing to give information only if the author was prepared to pay for them. This is exacerbated by the fact that most companies and institutions do not keep effective records of their activities. Gathering secondary data was just too difficult and nearly impossible to come by.

Also, some residents in the communities refused to provide information voluntarily. Others were willing to provide information at certain prices. While some utterly refused to give information some gave wrong and unreliable information. Companies were also not willing to provide certain information relevant to the study with reasons that their policies do not permit it. However, the aforementioned constraints did not adversely affect the validity of the findings of the study.

LITERATURE REVIEW

State of the environment

Ghana's effort at industrialisation started with the construction of the Akosombo dam and the Tema Harbour. Thereafter, industrial activity in Tema became very vibrant with its attendant waste generation. The coastal zone now has over 60 per cent of the industrial establishments in Ghana. During the initial periods of industrial growth, environmental impact assessment was not a requirement; therefore industries were established mainly based on financial feasibility. Although some industries implemented programmes to manage wastes, it was optional. That was the beginning of industrial pollution along the coastal zone.

Industrial water pollution is a 'moderate' to 'high priority issue in 6 out of 21 coastal districts. An assessment of the extent of industrial pollution as an environmental problem along the coast of Ghana was based on information from District Environmental Plans (DEPs) and Local Environmental Action Plans (LEAPs).

According to the assessment, while only 3 districts, Accra, Tema and Secondi-Takoradi fell within 'high' or 'extreme' pollution range in 1994, at least 13 districts are projected to fall within this range by 2020. These districts include Nzema East, Ahanta West, Ahanta East, Gomoa, Afantseman, Accra, Ga, Tema, South Tongu and Denu-Dzodze. Small-

scale industries, which are difficult to regulate also contribute to industrial water pollution. Currently most new and medium-large scale industries are located within planned industrial estates. However in the past, a vast majority of small-scale industries sprung up in complete unplanned and congested areas in response to market and social factors. Many were located in residential neighbourhoods and even in houses.

Consequently, they often do not have access to adequate infrastructure, including drains, sewage and solid waste collection outlets, thus increasing health and environmental risks. Many of these industries dispose of wastes into drains to be flushed out during heavy rains. While monitoring and enforcement of pollution standards is slow in the case of large industries, it is often difficult to monitor small-scale industries as most of them operate in the informal sector. The situation constitutes a health hazard, as heavy metal concentration in some polluted coastal lagoons have been found to exceed WHO Standards, whilst the hitherto heavily polluted Korle lagoon is undergoing a restoration programme.

Critical Issues of Land and Water Pollution

In the 1960s complacency about problem of land and water pollution gave way to current alarming proportions of the general deteriorating quality of the world's environment and the urban environment in particular. This led to the emergence of environmental movements and a new personality called the 'ecoactivist'. Other writings about the same problem were on how to manage the urban environment effectively to avert, solve or minimize this problem. Dasmann, for example, described the causes and characteristics of the different types of pollution which he said are land, water and air pollution (Dasmann, 1959). The main pollutant in each case is improperly disposed waste, that is solid waste, gases (including smoke), liquid waste and sewage from industries and from domestic sources.

On the macro-scale air pollution, according to Dasmann, is caused by smoke released from the exhaust pipes of automobiles, chimneys of factories, burning of refuse and domestic fires using biomass as fuel or using fossil fuels such as coal and peat. Air pollution is also caused the release of toxic gases from production processes of factories (Dasmann, 1959; Berry and Horton, 1974). Factories are however the major air polluters in industrial cities because they release more smoke, toxic gases, fumes and particulate matter into the air than all other polluters put combined.

Land pollution in cities, especially littering and accumulation of solid waste, is also a major problem in most medium and large cities, especially in Tropical Africa. Although much of this problem is caused improper refuse disposal and littering of refuse from domestic sources, industries contribute their quota as a result of improper disposal of industrial solid waste and toxic waste on the land from factories (Dasmann, 1959, Berry and Horton, 1974).

Berry and Horton (1974) again point out that water pollution in cities is believed to be caused by various activities of man and by industries. The main causes are disposal of

refuse, sullage and sewage from domestic sources into natural water courses and release of liquid pollutants (chemicals, dyes and so on), solid waste, particulate matter, waste water and hot water by factories into natural water courses (Berry and Horton, 1974). Nikoi (2004) cited examples that, the polluted nature of the Odaw River and the Korle lagoon in Accra and the Chemu and Sakumo lagoons in Tema has been polluted by pollutants of all types from all sources including those from the many factories at the northern and western parts of Accra and from the many factories in Tema.

Nikoi (2004) said there is a close association between water pollution and certain types of diseases. He observed that there is a high incidence of water-borne disease in areas where the natural water courses are choked by solid waste which has created pools of stagnant water. Such areas tend to have high rates of cholera, dysentery, diarrhea, typhoid fever, worm infection, malaria, yellow fever and filaria (Nikoi, 2004)

Noise pollution is also intense in industrial cities (and also in all medium and large cities) especially in areas where medium and heavy industries are concentrated and where there are traffic jams most of the time during the day.

Todaro (1992) has stated that movement of people from the areas to the burgeoning cities has brought about prolific growth of huge slums and shanty towns, such make shift communities have been doubling in size every five to ten years. These shanty towns constitute at least one third of urban population in third world cities. "Governments do not recognize these people as city builders. They usually refuse to recognize that they are citizens with legitimate rights and needs for public infrastructure and services essential to health and well being-pipe water (or other forms of sanitation), drains, all weather roads, electricity, health care to be supplied by government to the areas they call illegal settlement" (Guglor 1997; p. 266).

Environmental related diseases or accidents remain among the major causes of illness, injury and premature deaths in many urban centres or in poorer districts within urban centres (Guglor; 1997) Most of these diseases are caused by biological pathogens in water, food, air or soil. Diarrhea diseases, acute respiratory infections, tuberculosis, malaria, dengue fever and measles are some of the diseases they cause. Some such as intestinal worms and filariasis are not major causes of death but tens of millions of urban dwellers suffer severe pains from them (Anderson, 1992).

From the various contributions given by the different authors on the subject matter, it can be said that there is no one cause for environmental problems. Allotey (2006) related environmental problems to poverty as he captioned his article 'Poverty and the environment'. Dasmann (1959), attributes the problems of the environment to automobiles, factories, domestic fires the like. It can therefore be concluded from the foregoing discussion that, the most dominant factor responsible for environmental problems is anthropogenic i.e. due to human activities.

METHODOLOGY

A descriptive research design was employed for the study and the type of data analysis includes both quantitative and qualitative data.

Both primary and secondary data was used for the study. The primary sources of data were from residents, the Atonsua-Agogo Hospital staff and the Kumasi Metropolitan Assembly (K.M.A). Secondary data were also obtained from books, relevant articles from journals, magazines, reports on previous researches conducted on the impact of pollution on the residents of urban centers.

The random sampling method was used because it includes different variables of the target population in terms of years of residence, socio-economic classification. From the target population a sample size of 80 respondents was selected. This ensured that every element/member had equal chance of being selected.

Questionnaires were administered, interview method used in the case of the non-literate residents and the drop-and-collect method in the case of the health officials, KMA workers, literate residents and other governmental workers. The observation method was used to collect data on the level of environmental pollution.

DATA ANALYSES, PRESENTATION AND DISCUSSION

Assessment of the effects of manufacturing industries on the environment

The respondents were asked whether the industries create any problems and/ or disturb them. The analysis of the responses to this question revealed that the industries do create and give a lot of problems to the residents. This is evidenced that the numbers and percentages of 'Yes' responses far outweighed the 'No' responses in the area. As shown in figure 1, 86.0% of the sample responded 'Yes' while 14.0% responded 'No' to the question. Much of the 'Yes' response may be due to the concentration of industries and therefore the intensity of industrial pollution in the area.

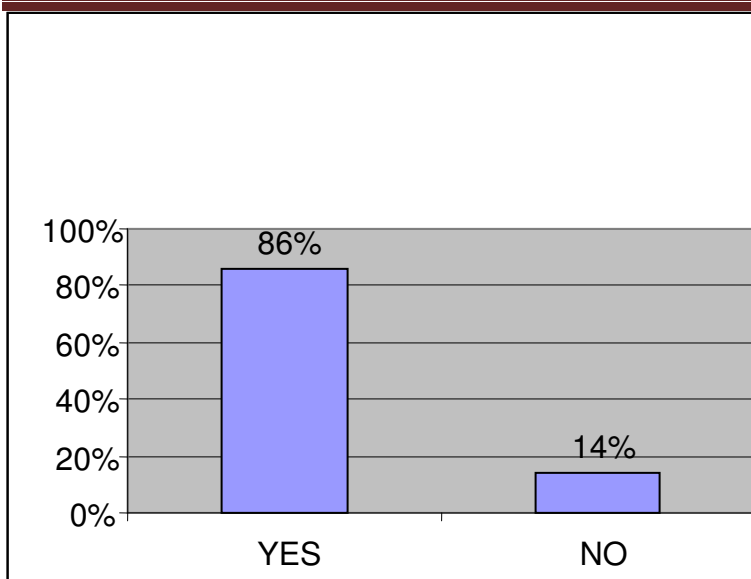


Figure 1: Respondents awareness of environmental effects of manufacturing industries

Source: Survey data, 2014

Again, 86.0% of Yes responses showed that majority of the people in the area are aware of the effects of manufacturing activities on the environment. Some of the effects of manufacturing industries on the environment identified by the residents include environmental pollution (air, water, noise and land), sanitation problems, improper disposal of waste, accidents, unemployment and the like as shown in table1,. Of all these problems, pollution, sanitation and improper waste disposal were revealed as the major problems in the area. Pollution was as high as 30% of the sample with air and water pollution being the next most dominant respectively. Sanitation and improper disposal waste account for 18% and 16% of the environmental problems respectively. Residents also complained of accidents in the area which accounts for 10% of the sample respondents. It was also observed that the main causes of pollution were from the industries, motor vehicles and the abattoir at Ahinsan- Kaase area.

Table 1: Effects of manufacturing activities on the environment

Effects	Frequency	Percent
Pollution(air,water,land,soil)	15	30.0
Sanitation and noise pollution	9	18.0
Improper waste disposal	8	16.0
Bad ordours from waste products	1	2.0
Accidents due to factories trucks	5	10.0
Unemployment	4	8.0
Stagnant waters which breed mosquitoes	2	4.0
Housing problems	4	8.0
Migration of people	2	4.0
Total	50	100.0

Source: Field survey, 2014

Impact of manufacturing operations on socio-economic development

Despite the negative effects of manufacturing activities on the environment, they contribute meaningfully to the socio-economic development of Ghana. When respondents were asked whether manufacturing industries contribute in any to the socio-economic development of the country, the 'Yes' responses were much higher than the 'No' responses. 78.0% of the total sample (50 respondents) answered 'Yes' and 22.0% answered in favour of 'No'. Some of the contributions mentioned include employment opportunities, provision of social amenities, revenue creation, infrastructural development and trade promotion. Employment opportunities (jobs) topped the list of contributions given by the respondents with 32.0%. Infrastructural development placed second position with 24.0%. Trade promotion and revenue to government both came third with 8.0%. The 78.0% 'Yes' respondents showed a good sign of contribution of manufacturing industries at Atonsua and the country at large. Table 2, provides details of the residents' perceptions of the contribution of manufacturing industries on socio-economic development.

Table 2: Perception of respondents on the socio-economic contribution of Manufacturing industries versus types of contribution

Types of Contributions	Contributions of Manufacturing Industries On Socio-Economic Development		Total
	Yes	No	
Employment opportunities	32.0%	0%	32.0%
Provision of social amenities	6.0%	0%	6.0%
Revenue to government	8.0%	0%	8.0%
Infrastructural development	24.0%	0%	24.0%
Trade promotion	8.0%	0%	8.0%
No contributions	0%	22.0%	22.0%
Total	78.0%	22.0%	100.0%

Source: Field survey, 2014

To verify the manner in which manufacturing industries impacted on development, factory workers were asked to rank the level of development in terms of very good, good, average and poor. The analysis of this indicated that the over contribution of manufacturing industries to nation building is good and need to be supported. Of the 50 sample respondents, 27 times (54%) answered in favour of good, 12 times (24%) for very good, 5 times (10%) for average and the rest answered poor. Refer to figure 2 for details.

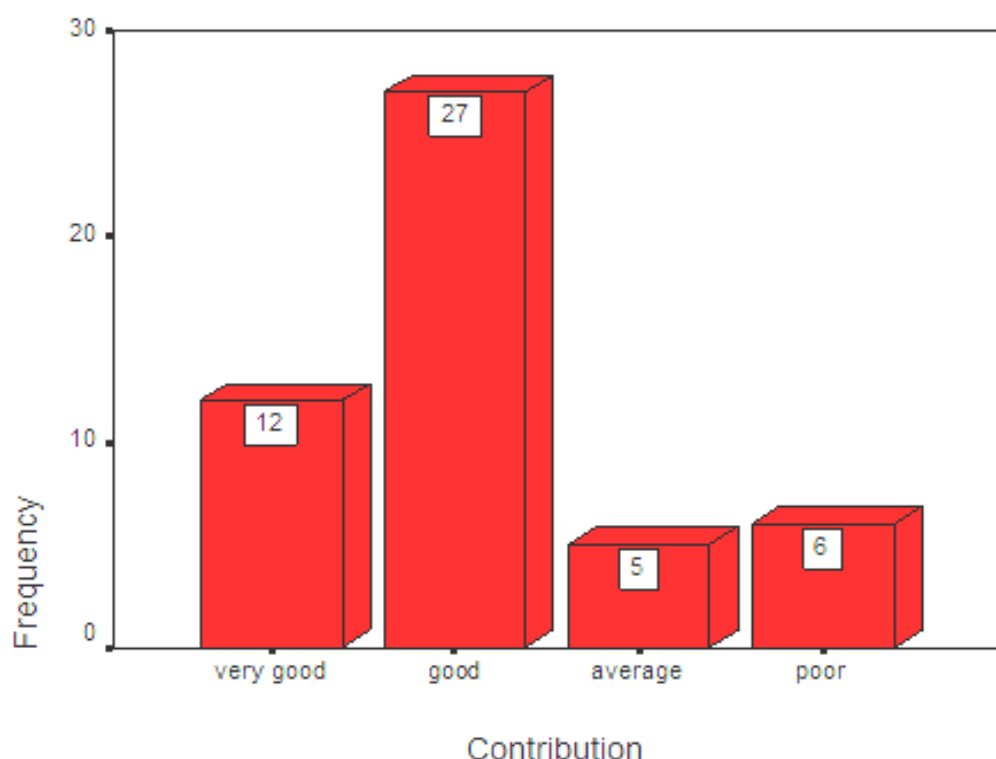


Figure 2: Company's Contribution to Development

Effects of manufacturing operations on the health of residents and factory workers

As indicated earlier, the residential areas are heavily polluted as a result of release of industrial waste into the environment by the factories in the industrial area. Because environmental pollution does have an effect on the health of man and all living organisms the research investigated the effect of industrial pollution on the health of residents and factory workers. They were asked to state the diseases common with them before the research.

The analysis of the responses to this revealed that the most common diseases which residents contracted varied in kind. These included trauma (32.0%), malaria (26.0%), tuberculosis (T.B (14.0%), hypertension (10.0%), hernia (6.0%), others (12.0%). Others include diarrhoea and other respiratory diseases. It therefore indicated that respiratory tract diseases put together are higher in the area. Other respiratory tract diseases include asthma, colds and catarrhs, coughing and the like. Refer to table 3, for a summary of the common diseases.

For expert data the medical officer at Atonsu-Agogo Government Hospital was interviewed. According to him the environmental pollution-related diseases which both factory workers and residents reported most often at the hospital were upper respiratory

tract infections, trauma, malaria and gastro-enteritis (diarrhoea diseases). This affirmed the result from the views of the residents. A comparison of the medical officer's finding and the residents' views revealed that respiratory tract infections are high in the two cases. However, the medical officer said trauma cases were high as compared to malaria from factory workers.

Table: 3: Common Diseases among factory workers and residents.

Diseases	Frequency	Percent
Malaria	13	26.0
Trauma	16	32.0
Tuberculosis(TB)	7	14.0
Hypertension	5	10.0
Hernia	3	6.0
Others	6	12.0
Total	50	100.0

Source: Field Survey, 2007

Remedial measures for controlling environmental problems in the area

To control, minimize or prevent environmental problems, various measures are used by residents, government organizations and the manufacturing industries. In the three areas, the research revealed that majority of the residents' remains unconcern about the activities of manufacturing although they are aware of the manufacturing effects on the environment and their health. Some of the residents said they use the following as measures; covering their noses anytime air pollution is at its' peak, regular cleaning of surroundings, self medication and use of traditional herbal medicine for curative measures.

To ascertain what measures government organizations are taking to combat environmental problems created by manufacturing industries in the area, the Environmental Protection Agency (EPA) officer was interviewed. When interviewed what punitive measures EPA put in place to control the activities of manufacturing industries on the environment, the programme officer (EPA) for Ashanti Region said there are laws in Ghana to control the emission of waste products into the environment by industries. He stated some of the general laws to include the EPA Act 490 (1994) and LI. 1652 (1999). According to the officer, the EPA has general environmental quality standards for industrial/facility effluents, air quality and noise levels. He said, 'For controlling the disposal of both solid and liquid waste the District Assembly Bye-Law/ Sanitation Policy and EPA Act 490 (1994) are applied. He further added that though the EPA has not conducted any EIA of the effects manufacturing industries on the environment in Ahinsan-Kaase-Atonsu industrial area in Kumasi, it does conduct regular environmental quality monitoring in this area. 'Polluter pays 'principle is not practiced in Ghana at the moment, said the officer.

To verify the remedial measures put in place by the manufacturing industries, the management of the factories was asked to state how they dispose of their waste. Of this, 60% of them claimed they recycle their waste while 40% do not recycle at all. It was observed that waste had been littered on the land and along river banks. According to management of factories, the waste products are used to make furniture parts, some of the by-products burnt in the factory furnaces to produce heat for kiln drying of sawn timber or run the machinery in the timber processing industries. Some of the waste products are sold or burnt in the open air as a way disposing off the waste. Nevertheless, it was observed that the smoke from the burning of the wood residue is released into the air both from the chimneys of the factories and from the open fires. Guinness Ghana Brewery Groups' public relation officer said there is occasional effluents check to ensure environmental cleanliness. He added that a special effluents plant was built for chemicals, waste malt, yeast, and spilled products to pass through in order to disinfect them before getting them discharged into nearby streams.

CONCLUSIONS

Effects of manufacturing industries on the environment

Environmental problems in cities especially Atonsu-Ahinsan-Kaase industrial area in Kumasi is believed to be caused by various activities of man and by industries. The pollution of the Sisa River which takes its source from Duase and runs through Akrom, Anloga, Atonsu, Kaase and Asago where it meets the Oda River was observed to be high. This could be attributed to urbanization and rapid population growth in the area. As urbanization becomes more intense with a high rate of population, pollution of water bodies becomes more serious.

The different types of pollution and the pollutants associated with them pose different health effects on man. Therefore, there is a close association between the different types of pollutants and certain types of diseases. Water pollution is associated with water borne diseases such as Malaria, schistosomiasis, cholera, typhoid, yellow fever and others.

The research revealed that the butchers of the old Kumasi abattoir, who are still in operation despite the new abattoir, dump raw animal waste like horns, hooves, animal intestines, animal dung and meat waste into the sisa stream. This method of disposal of waste has polluted the stream to such an extent that it gives off bad and unpleasant smell. These butchers also prepare their animal carcasses by burning the hair in open fires which produces thick palls of black smoke. This method of preparing animal carcasses for sale has heavily polluted the air in the area around the old abattoir at Kaase. The burning of wood waste (including sawdust) as a method of disposal of industrial waste by the saw mills and the plywood and veneer factories discharge more smoke into the air than the abattoir which causes a major source of heavy air pollution in the Atonsu-Ahinsan and Kaase areas. During the period of the fieldwork for this study, it was observed that puffs of thick black or white smoke emanate almost regularly from

the chimneys of the wood processing factories every day. This again fills the air with smoke and hence pollutes it.

Another source of air pollution, especially at Ahinsan, is smoke from the exhaust pipes of motor vehicles because there is an almost incessant traffic jam here. This usually occurs between the bridge over the Sisa River, which relatively makes the boundary between Atonsu and Ahinsan, and the Asokwa traffic light. Consequently, the air at Ahinsan and Kaase is almost always polluted, evidenced by the poor visibility of the surrounding.

Apart from burning as a method of disposing some of the industrial waste such as sawdust, it is conveyed by tipper trucks out of the industrial area to be sold or dumped elsewhere. Since the sawdust in the tipper trucks is most of the time uncovered the wind always blows some of it into the air. This, together with some of the sawdust which comes out of the wood processing factories, fills the air with sawdust particulate matter thus further polluting the air, making it unsafe for breathing.

When factory workers were asked whether the residents in Atonsu, Ahinsan and Kaase complain about the operations of the factories, with particular reference to causing pollution, 50 % of the respondents answered 'NO', 20% answered 'YES', but the rest did not answer the question at all. Apart from the reasons to explain their response that it is about livelihood and lack of alternative area for relocation, Guinness Ghana Breweries Group public relation officer said that there is routine effluents check which is done by a group of experts before released into the environment.

RECOMMENDATIONS

Based on the key findings regarding the operation of manufacturing industries and their effects on the environment, the authors recommend the following:

- (a) There is the need to mount education campaigns on how to prevent/minimize environmental pollution in industrial cities. People living in the industrial areas such as Ahinsan-Kaase-Atonsu area, should be educated about measures which they should use to minimize or prevent the impact of pollution on their health. The management and owners of industries should also be educated, through seminars, on the effects of industrial pollution on the health of urban dwellers and on how they can prevent or reduce environmental pollution by their operations.
- (b) Since none of the industries surveyed had conducted an Environmental Impact Assessment (EIA), they should be compelled to conduct EIA as an imperative measure to check environmental problems. Similarly, industries should prepare Environmental Management Plans (EMPs) to serve as guidelines for their operations.

- (c) On the issue of cleaning up the environment of pollutants and other wastes by the industries, an EIA analysis should be done and backup with the precautionary and polluter pays principles to prevent limit and require strict liability or insurance coverage industries based on their likely harms. The industries in the Atonsua-Ahinsan-Kaase area are not taxed to raise revenue to clean up the pollution. This is because the 'polluter pays' principle is not applied currently in Ghana. However, these industries should sometimes be given tax rebates to treat their waste products before disposal into the environment.
- (d) It is also recommended that the concept of 'sustainable development' be applied in minimizing or preventing environmental problems caused by manufacturing industries. Sustainable development is a challenge facing all countries. It is possible for Ghana to conceptualize and operationalize an alternative model of development to allow for sustainable management of different capital assets on which we rely. There is therefore the need to aim at environmental sustainability in order to maintain ecosystem integrity, carrying capacity and biodiversity.

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