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Waste management practices in urban cities of Nigeria: a case study of Ibadan metropolis

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Rapid and uncontrolled urbanization has been a common feature in developing African cities, thereby resulting in an enormous anthropogenic waste generation which in turn constitute environmental and health hazard. Nigeria is not left out in this dilemma, as its cities are also witnessing high rate of environmental deterioration and are rated among urban areas with the lowest livability index in the world mainly due to waste pollutants. The unfathomable nature and volume of waste management in Ibadan metropolis (largest city in West Africa) is the motivation of this presentation. An evaluation of parameters on waste generation and management in Ibadan as well as improved and sustainable options for waste characterization, collection and treatment shall be the focus of this presentation. In Ibadan, tons of waste are generated on a daily basis, filths are seen littering the road, clogged drainages causing recurrent flooding, empty containers with stagnant water breeding mosquitoes are common place, open defecation and animal droppings are found at most junctions within the metropolis, even more worrisome is the fact that abandoned site or building usually serves as dumping ground. The types of waste generated includes solid waste e.g. paper, metals, plastic; industrial waste; domestic waste; liquid waste like abattoir effluents, chemical/ industrial effluents; medical waste; gaseous waste e.g. quarry, cement industry etc. It has been reported that gender factors contribute to the volume of waste generated in the metropolis; also the local and city dwellers do not separate their solid waste. Besides, the mode of disposal of waste in the metropolis is unsustainable, this includes open release of gaseous waste by the quarry and cement industry leading to air pollution, asthma, acid rain and fog formation; channeling of liquid waste from households, abattoirs, and even chemical liquid waste from industries as these results in the pollution of water bodies leading to zoonotic disease e.g. typhoid, dysentery, brucellosis from abattoir waste, heavy metal accumulation in aquatic animals and subsequently man after consumption of fish from such streams. The recurrent flooding in Ibadan has also been attributed to the indiscriminate dumping of refuse into drainage, an example is the 2011 flood in Ibadan were

properties such as buildings and vehicles worth billions of Naira were damaged, with outbreaks of disease as well as loss of lives; also stagnant water formation has increased as most drainages, are clogged with refuse, breeding mosquitoes causing malaria among the populace. In Ibadan solid waste management five typical problem areas are identified, they are: Inadequate service coverage, operational inefficiencies of services, limited utilization of recycling activities, inadequate management of non-industrial hazardous waste and inadequate landfill disposal. Open dumping of refuse as landfills has resulted in air pollution and underground water pollution due to percolation of leachate. In Ibadan as in most developing cities most disposal of waste are done individually by people while unsegregated waste are heaped for government waste disposal trucks to clear to the disposal site. Public education/ enlightenment, application of scientific and technological solutions (recycle and reuse, Land fill to gas energy), biological treatment of organic waste (aerobic composting and digestion), thermal treatment, and appropriate policy and legislation on waste management are hereby suggested. I am optimistic that the summer school training on modern and sustainable technology of waste management at the summer school would enhance my knowledge on innovative solutions and better position me to adapt such solutions to the waste management challenges in cities like Ibadan, and Nigeria at large.

Waste composition and analytics for waste management concepts

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ABSTRACT

Knowledge of the quantity of waste and the composition of waste, as well as their chemical, physical and biological characteristics are the foundation for waste management strategies and concepts. These data provide the basis for the most varied measures, like collection logistics for municipal solid waste (MSW), dimensioning of waste management plants or benchmarking in waste management. Waste composition is highly influenced by factors such as culture, economic development, geographical location or climate (seasonal changes). As a country urbanizes and the population become wealthier, consumption of inorganic materials (such as plastics, paper, and aluminum) increases, while the relative organic fraction decreases. By region, the East Asia and Pacific region (EAP) has the highest proportion of organic waste at 62 %, while the Organization for Economic Co-operation and Development (OECD) countries have the least at 27 %, although total amount of organic waste is still highest in OECD countries [World Bank, 2012]. Also climate has a very high influence in waste generation. For example, in Ulan Bator (Mongolia) ash makes up 60 % of the MSW generated in the winter, but only 20 % in the summer [UNEP/GRID-Arendal 2004]. For these reasons, it is very important to make a special waste analysis to get a very detailed data about the general waste amount and composition of a special era or city. The more accurate the data on waste among and waste composition, the more accurate waste management strategies can be planned and implemented.

Keywords: MSW, waste management, waste composition, waste analysis

From Waste to Energy: A Sustainable Alternative in Municipal Solid Waste Management in Lagos and Ibadan, Nigeria

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ABSTRACT

Solid waste management and energy generation are two major problems facing Nigerian cities. The cities of Lagos and Ibadan both in south-west Nigeria with populations of 20 million and 6.4 million people respectively daily generate an estimated 9000 tons and 3200 tons of Municipal Solid Waste (MSW) respectively. The MSW end up on open dumpsites causing huge environment problems and raising public health concerns. Considering the high volume of MSW generated in these cities, Waste to Energy (WTE) technology in incinerators is applicable to MSW management in Lagos and Ibadan. It involves the transformation of energy inherent in MSW into beneficial and useable form. This is achieved through the incorporation of waste incinerators with energy recovery technology which effectively transforms the inherent energy in MSW to electricity. This technology employs four processes which include waste collection and pre-treatment, waste combustion, gas scrubbing with pollution control and electricity/steam generation. The incineration process is done in different stages which include, drying and degassing, pyrolysis, and gasification and oxidation involving the controlled oxidation of the combustible components in the waste. The organic component of MSW can be separated and anaerobically stabilized in a high-rate digester to obtain biogas for electricity or steam generation. MSW incineration technology is sustainable and limits the emission of poisonous substances into the atmosphere. This study indicates that from the 9000 tons of waste daily generated in Lagos, about 100 to 172MWh of electricity can be generated while 35 to 61MWh can be generated from the daily 3200 tons of MSW in Ibadan. This alternative waste management approach will not only address the environmental and health concerns associated with solid waste disposal in Lagos and Ibadan, but will also contribute to meeting the energy need of these cities.

Capacity Building and Fundamental Research to Develop and Implement a Mechanical Biological Treatment Facility with an Integrated Fermentation Stage in Jundiaí-SP, Brazil

Leite, Aguinaldo

Waste management has changed significantly in the last years, becoming an icon of sustainable development, contributing to environmental protection and guaranteeing the climate protection and the preservation of natural resources. In this context, Brazil passed a National Solid Waste Policy, which provides for selective collection and treatment of waste before final disposal in the whole country by 2014.

The development of technology, technical consulting and state-of-the-art machinery are necessary to implement the Policy. In addition to implementing the new policy, sustainable waste management systems must be developed to mitigate the environmental impact generated over the last few decades in the country. This poses a considerable challenge due the limited expertise available to develop the necessary technology and to streamline them into the Brazilian market, which, in its turn, results in faltering decision-making at all public levels (federal, state and municipalities) as well as other relevant stakeholders, such as funding and environmental licensing agencies.

The Project "Capacity Building and Fundamental Research to Develop and Implement a Mechanical Biological Treatment Facility with an Integrated Fermentation Stage in Jundiaí-SP, Brazil" aimed to open a multidisciplinary discussion integrating several market segments, in order to allow the design of tools for the implementation of a sustainable management of municipal solid waste.

The proposed project establishes cooperation between the Municipality of Jundiaí , TU Braunschweig , PUC -RIO , CREED , GIZ , DAAD , CAPES and DBFZ for the development of an eco-efficient management of municipal solid waste , in order to generate the following results: training of technical staff from the Municipality, qualitative and quantitative analysis of large generators , planning and implementation of a scientific laboratory for analysis of substrates and products, characterization of household waste , definition of technological routes and promotion of pilot plants from the techniques of drying and composting, market mapping of consumer products, events promotion to disseminate the information produced and intensify international cooperation .

This project also provided comprehensive knowledge about this new market for Brazil and also the construction of an inter-relationship with the sector of waste within Brazil-Germany, establishing an exchange with iconic German institutions on best practices to ensure climate protection and the preservation of natural resources, thus providing a continuous exchange of experiences, through vocational and technological education.

The partnership with the TU Braunschweig and the PUC -Rio was extremely important to increase awareness of the Municipal technical staff and academic entities involved in the i-NOPA project. The support and the dissemination of practical knowledge of German management brought to Jundiaí an innovative vision and inspiration to transform the current system in an efficient and continuous reality that meets the premises of the National Solid Waste Policy and the global trends.

Thus, the experience of sharing is not limited to the executing team, it spreads through society that had its horizons expanded when it had access to information which outlines new practices of waste management and mainly enters into a common commitment for environmental preservation and climate protection for the benefit of future generations.

Santa Catarina Project for Brazil: challenges, opportunities and lessons learned

Author: Luciana Camargo Castro

Santa Catarina State is known as the land of smallholders in the south region of Brazil. That is one of the reasons why it has been promoted and implemented a sustainable development in terms of production systems and solutions to the waste management for rural and urban areas. Thus, since 2011, the federal and the state governments are engaged in a project known as “Santa Catarina Rural” (SC Rural), which is supported, by the World Bank. The objective of such project is to increase the competitiveness of organizations of family agriculture producers while providing support for an improved framework of structural competitiveness inducing public services activities along the territory. The project has three components. One of them is financing public goods activities that are crucial for the sustained competitiveness of those organizations, and for the implementation of sectorial activities, such as water resource management; ecosystems and corridor management; environmental monitoring and education; rural infrastructure (sustainability of waste management); regulatory framework compliance; rural technical assistance and extension, sanitary and phyto-sanitary services; and rural and urban tourism. That component is also dealing with the river basin committees, who are groups of people that live in a certain river basin area and are responsible for the interaction between society and the government in federal, state and municipal levels concerning the water resources management. Nowadays, SC Rural is incentivizing the realization of the water river basin plans in the ten river basins in order to implement the water resources tools along the state and improve the waste management as well. Moreover, there is also the promotion of educational services (capacity building) to the local communities to enhance the understanding of waste management, and to deal with this issue concerning treatment of domestic sewage, stabilization pounds and water reuse. This kind of management emphasizes the role of all stakeholders and state/local governments in the process of solving environmental issues in urban, and especially in rural areas.

The application of the Municipal Law 8408 issued in 1999 by AGEFIS, the agency that inspects and monitors the disposal of solid residues in Fortaleza, in the control of urban business waste.

José Wilmar da Silveira Neto

Key words: urban business waste, supervision, municipal law

The city of Fortaleza is situated in the northeast of Brazil. It is the fifth most populous city in the country, with an estimated population of 2,592,000 inhabitants. AGEFIS was created to inaugurate an integrated and coherent management system devoted to ensure a thorough supervision of the cycle of solid residues in its various stages (planning, management, execution, processing and monitoring). The law previously mentioned regulates in a proper manner the disposal of the waste produced by local merchants that are the main object of the considerations of this text, especially those merchants which are classified as large generators of solid residues, those which daily produce more than one hundred liters of common waste, fifty liters of civil construction waste or any quantity of waste with a risk of environmental or biological contamination. These are responsible for the defrayal, packaging, transport, storage, collection, treatment and destination. This work shows the action of the supervision of urban solid residues by the AGEFIS supervisors in these businesses. The methodology of the choice of commercial establishments to be inspected, the supervisors´ work methodology, and the diverse articles of Law 8408 and each of their inherent penalties are described. Also described is the use of the environmental education tools and the technical clarification to the merchants investigated on the part of the supervisors. It is apposite to point out that, based on the Law 8408, the inspectors of AGEFIS significantly contribute to break the chains of transmissions of diseases and to promote the process of donations of solid residues to recycling industries. These are important achievements for the environment that derives from the educational and technical tools inbuilt in the legislation that combines an intelligent

set of penalties with adequate methodological references for the choice of the establishments to be monitored and investigated. The most important types of fines regulated by the Municipal Law 8408 and destined to punish those who mishandle waste are related to: 1) Willful Presentation of false documents or information; 2) Improper packing of waste; Implementation of project disrespecting the managerial plan of waste disposal approved the municipal agency; 3) Transport of waste with people and companies that are not accredit by the local authorities; 4) The placement of stationary waste containers in areas that risk undermining the public health and 5) Actions devoted to render difficult the inspections of the agents of AGEFIS. The afore mentioned fines are classified in four different levels so as make the punishment of those who disobey the law proportional to the level of harm their actions cause to the environment.