

ENHANCEMENT OF INDUSTRIAL DEVELOPMENT WHILE ENSURING SUSTAINABLE ENVIRONMENTAL PROTECTION INTANZANIA: THE NEED TO BALANCE THE OPPOSING DEMANDS

JHY Katima

*University of Dar es Salaam, College of Engineering and Technology
Department of Chemical and Mining Engineering
E-Mail: jkatima@katima.org*

Abstract

The President of the United Republic of Tanzania has made it clear that his government is building an industrial economy. His drive has seen positive responses from both public and private sector as we are witnessing many intents to construct new industries and efforts to revive the old ones. The big question that is being asked repeatedly is whether this resolve will impact environment. Recently there was a panel discussion, which was organized by the European Union, whose theme was “Impact of Tanzania’s drive to industrial development on climate change”. The debate on industrial development and environmental quality is a long-standing debate world over. Depending on the orientation/inclination of the debater one will find diverging arguments from those who believe environment should be protected at all costs – meaning even if it means stopping all development activities, industrial development inclusive, to those who argue that development should come first even if it means degrading environment and take care environmental protection later. As such seeing this debate in Tanzania’s context should not be taken negatively but rather as a point of reflection on whether it is possible to industrialize and at the same time protect environment. This paper discusses both myths, perception and reality and what Tanzania should do to ensure that she achieves sustainable industrial development.

1.0 Background

Before discussing on what Tanzania should do it is very important that to discuss the facts first.

It is an undisputed fact that:

- i) The growth of national prosperity depends on its ability to exploit its natural resources.
- ii) Extraction of natural resources and selling the same without adding value does not take the country out of poverty spiral but it makes the country continue to depend on those who buy the raw materials. They will not only dictate the price they buy the raw materials but they will also continue dictating the price they sell the needed inputs to extract natural resources. This will inevitably sustain the

spiral of poverty as they will be buying our raw materials/ natural resources cheaply and selling their produce expensively.

- iii) Industries may degrade environment in terms of depleting natural resources, emission of noxious gases and hazardous chemicals which have severe human health impacts.

The above facts require that a balancing industrial development with environmental protection is a necessary requirement. This paper tries to show why both industrial development and environmental protection are all important for a sustainable national prosperity.

2.0 Role of Industry in National Economy

World over, industrial development has contributed in many ways on adding value to natural resources and contributed to increased gross national product. The growth in gross national product is in most cases used as the seminal indicator of the health of national economy. The following points explain the role of industrial development in economic growth:

- i) **Industrial development has played a key role in modernising agriculture:** There is no way agriculture can move people out of poverty spiral if they continue to depend on hand hoe. There is evidence that the cost of production in this type of agriculture is high in terms of agricultural inputs and productivity is low. Tanzania need to modernize its agriculture in order to increase productivity. For this to happen, there is need of agricultural machinery, chemical fertilizers, pesticides and weedicides, etc. These are all industrial products. Without industrial development, these goods cannot be locally produced. Agricultural products like sisal, cotton, coffee, sunflower, sugarcane etc. are all raw materials. To prepare finished products like flex, textiles and sugar etc. there is a need of agro-processing industries. Therefore industrial development is necessary for modernization of agriculture.

- ii) **Industrial development has encouraged the development of science and technology:** It will be a complete disaster if our industrialisation drive will focus on importing and using technology without developing the capacity not only to service the technology, but also to operate, maintain and even replicate the technology. The industrial enterprises in collaboration with Research and Development Institutions should conduct research and develop new products and new industrial processes. Ethanol from agricultural waste in the form of biofuel; methanol and urea from natural gas; biodiesel from Jatropha seeds; lactic acid, citric acid and degradable plastics from sisal bole inulin; biogas may be harnessed to run not only public transport but also industrial processes, are

some of examples of industrial development that may be embarked upon to maximise the benefits from the natural resources.

- iii) **Acute deficiency of capital has been solved through modernising agriculture:** Our agriculture is mainly subsistent apart from the agricultural produce we specifically produce as cash crops i.e. those we produce but we do not consume, which is not enough to bring the needed forex for investments. Mobilisation of cash crops for export is also very difficult because of huge after harvest losses, inadequate transportation infrastructure, and huge transportation costs. Generally, in large scale industries, the surplus is very high and thus the forex income would be high, but here we should mention that the income will be even higher if we do not sell raw agricultural produce. By using external and internal economies, industry can get high profit. These profits can be reinvested for expansion and development. If we can harness better industrialisation in Tanzania, we may be able to generate needed capital, which is essential for investment into large development projects such as standard gauge railway system, expansion of our ports, modernising air transport system etc.

- iv) **Industrialisation has fuelled sustainable urbanisation:** Industrialisation in a particular region brings growth of transport and communication. Schools, colleges, technical institutions, banking and health facilities are established near industrial base. While urbanisation is adding pressure to city and urban centre infrastructure, if properly managed urbanisation is an inevitable consequence of industrialisation.

- v) **Industrialisation has promoted trade:** The advanced nations gain in trade than countries who are industrially backward. This goes back to the basic imbalance and inequitable trading pattern where we sell our raw agricultural produce cheaply and import agricultural inputs expensively. The underdeveloped countries export primary products and import industrial products. Agricultural products command lower prices and their demand is generally elastic. While industrial products command higher values and their demand is inelastic. This causes trade gap. To meet the deficit in balance of payments we have to produce import substitute products or go for export promotion through industrial development.

- vi) **Industrialisation has enabled countries to benefit their natural resources:** Tanzania is rich in natural resources but due to lack of capital and technology, these resources have not been tapped and where they have been tapped it has not been in the interest of the Tanzanians. Resources should be properly utilized to transform them into finished industrial products. The developed world is taking Tanzania's cheap raw-materials for producing industrial goods in their

country, while she continue to be used as a market for their industrial products. Hence industrialisation is expected to play an important role for proper utilisation of resources.

- vii) **Poverty and unemployment have eradicated quickly through rapid industrialisation:** Experience from developed world e.g. Japan, show that poverty and unemployment can be eradicated quickly through rapid industrialisation. The slow growth of industrial sector is responsible for widespread poverty and mass unemployment, particularly when agricultural productivity is going down and when there is no agro-processing industry to process agricultural produce particularly during harvesting season. Majority of our farmers produce to waste – it is not uncommon to witness mountains of rotting tomatoes, oranges, pineapples during harvesting season. This state of affairs do not encourage people to expand or even sustain agricultural activities. With fast growth of industrial sector, surplus labour from villages can be put into use in industry, and the problem of “machinga” not having proper area to do their business may equally be diminished.

- viii) **Industrial is contributing significantly to per capita income:** The history of economic development of advanced countries shows that there is a close relation between the level of industrial development and the level of national and per capita income. For instance, the share of industrial sector to national income was 26% and the per capita income in year 2000 was 36,240 dollar in USA. The share of agriculture in the same year was only 2%. In Japan, the share of industrial sector in her GDP was 36% and her per capita income was 36,210 dollar. It can be concluded therefore that industrial development helps in the rapid growth of national and per capita income. In Tanzania due to low level of industrialisation, the contribution of industrial sector to GDP stands at 22.2%.¹

3.0 Industry and Environmental Degradation

However, the above industrialisation benefits are not without their dark side. The following are unchallenged environmental problems related to Industries:

- i) **Industries contribute to environmental degradation in many ways:** It is a fact that industrialisation has contributed to the global environmental problems we are

¹ Statistical Abstract 2013, National Bureau of Statistics, Tanzania Ministry of Finance, July 2014, accessed 22 October 2014, Archive lin

witnessing today. Issues like global warming, climate change, ozone depletion, acid rain, proliferation of persistent organic pollutants etc. are some known environmental problems associated with industrial processes. Tanzania industrialisation drive cannot ignore this fact. Depending on the development path our industrial development will not only contribute to the global burden, but also to the degradation of local environmental quality, with severe health problems to the local population. One can site example of polluted air in cities like Beijing, New Delhi, Lagos etc. (see case examples). Industrial pollution, affects the human body and results into many diseases such as cancer, lung and respiratory disease etc.

- ii) **Industries inevitably use a lot of energy:** When fossil fuels like coal, oil, natural gases are burnt, chemicals like sulphur dioxide, nitrogen dioxides are produced, and these chemicals react with atmospheric moisture to form sulphuric acid and nitric acid. These acids are carried up in atmosphere and finally come back in the form of acid rain which is very harmful to environment. Furthermore, fossil consumption increase the release of greenhouse gases. The increase in greenhouse gases is resulting in change in climate. Global warming is increasing. Natural disasters like floods, droughts, cyclones, are becoming more common day by day.
- iii) **Industrial development is responsible for generating conservative pollutants such as plastics, micro-plastics etc.:** Due to fast changing lifestyle people find convenient to use disposable goods like thermocol plates, glasses, plastic bottles, paper cups, plates, etc. These are non-degradable. They create waste some of which are conservative waste, i.e. they are not easily degraded in the environment.
- iv) **Industry is responsible to disturb nature:** Science and technology have brought leisure and pleasure in human life. At the same time, man has been disturbing the balance of nature. Transport facilities are easy and convenient, but they result into air pollution. Textile industries provide cloth but they also degrade the environment by releasing smoke in the air. Thus with rapid industrialization and transportation there are problems of water, air, noise and soil pollution. Hazardous industrial products such as plastic packets, canes, syringe, needles, tetra packs, are non-degradable. These wastes are found in most urban waste disposal sites, in storm water drainage, on beaches, on open grounds etc.
- v) **Electric and Electronic goods are known to contain noxious chemicals such as cadmium, mercury, chromium etc.:** Modern electronic gadgets have become part and parcel of our life. Mobile phones, air conditioned machines, vacuum cleaners, mixers, TV, DVD, refrigerators, heaters, etc. are very common,

household items. Majority of these gadgets contain very toxic chemicals such as mercury, cadmium, lead, chromium etc.

- vi) **Industrial pollution affect human health:** Unfortunately industrial environment problems affect human health. It affects respiratory system leading to many problems such as headache, fatigue, drowsiness, coma and respiratory failure and ultimately death. Toxic metals such as cadmium, lead, and mercury also have dangerous effects like anaemia, dysfunctioning of brain, kidney damage, cancer, endocrine disruption etc.

Thus it can be concluded from the above discussion “industrialisation is a double-edged sword. It **brings prosperity** along with **environmental and ecological hassles too.**” The key question is should we stop industrial development and protect environment or industrialise at any cost and take environmental protection afterwards. There is no easy answer to this question.

4.0 Drivers of industrial development

- a) **Population:** It is a fact that the Tanzania’s population is increasing e.g. the population of Tanzania was 12.3 million in 1967.² The population stood at 51.8 million in 2013)³ with an annual growth rate of 2.7.⁴ The population growth is not linear as such by 2050 the population is expected to reach 137 million.⁵ With increasing population demand for various natural resources is also increasing. Exporting processing natural resources will accelerate exploitation of such resources. Industries will add value to the natural resources and hence people will get more from the resources.
- b) **Urbanisation:** There is a rapid rural to urban migration as people migrate to cities in the bid to solve economic hardships. Without industrialisation, employment opportunities are limited.
- c) **Changing lifestyle:** As people become more affluent they become more consumer oriented in which case their buying habit is not driven by needs, but prestige and competition. This habit increasing waste stream, unfortunately a stream with hazardous chemicals. Due to increasing tendency of consumption of luxurious goods, there is wasteful consumption

²<http://tanzania.unfpa.org/en/news/more-people-move-urban-areas-tanzanian-population-gallops-0>

³Aloysius C. Moshia. "The planning of the new capital of Tanzania: Dodoma, an unfulfilled dream" (PDF). University of Botswana. Retrieved 13 March 2013.

⁴A Agwanda [population growth, structure and momentum in tanzania](http://www.thdr.or.tz/docs/THDR-BP-7.pdf). www.thdr.or.tz/docs/THDR-BP-7.pdf

⁵www.tanzaniainvest.com › Tanzania Economy

of natural resources. People go on consuming even more than they actually need. However, the consumption patterns are increasing inequalities in different societies, we have those who are having three meals per day and those who are living below 1USD per day.

5.0 What could cause industrial pollution?

- i) **Lack of or weak regulatory regime to control pollution:** Lack of effective regulatory regime and lack, weak or poor enforcement drive will allow many industries to be installed and operated without due regard to pollution control which will inevitably result in mass scale pollution that affected lives of many people.
- ii) **Unplanned Industrial Growth:** If the current disregard of urban planning, where industries are found in almost all neighborhood, including residential area is left to continue in the drive of industrialization, it will be a health disaster. Experience from other countries show that where industrial townships, unplanned growth has taken place wherein the industries were left to flout rules and norms pollution consequences in terms air and water pollution has been very severe.
- iii) **Use of Outdated Technologies:** If we are not careful, some industries will use old technologies. This is because, there is no mechanism or regulations to vet the technologies that will be brought in the country, this has happened in some developing countries, and in Tanzania we have such examples (without mentioning names). Outdated technologies are prone to environmental pollution.
- iv) **Presence of Large Number of Small Scale Industries:** While, I am not discouraging development of small scale industries, we have to appreciate that majority of small scale industries and factories, always do not have enough capital to run their day-to-day businesses often escape environment regulations and release large amount of toxic gases in the atmosphere. Unless we develop mechanisms of assisting these small scale industries to protect environment, we should expect that environmental burden will increase as these small scale industries increase.
- v) **Inefficient Waste Disposal:** Current waste disposal in Tanzania industrial waste inclusive is weak or poor. The consequence of this is water pollution and soil pollution. Most of Long term exposure to polluted air and water causes chronic health problems, making the issue of industrial pollution into a severe one. It also lowers the air quality in surrounding areas which causes many respiratory disorders.
- vi) **Leaching of Resources from Our Natural World:** There is a saying that you cannot eat your cake and keep it, while we need to exploit natural resources we should be careful that there are renewable and none renewable natural resources. None

renewable resources will be depleted e.g. natural gas, gold, diamond etc. Therefore prudent and efficient utilization of such resource is very key to sustainable industrial development. For example extracting high value chemicals from natural gas will be more beneficial than combusting natural gas for energy. Extraction of minerals from beneath the earth, natural gas can cause soil pollution when spilled on the earth. Leaks from vessels can cause oil spills that may prove harmful for marine life.

6.0 Sustainable Industrial Development

It can be seen from the above discussion, that while industrial development is essential for our socioeconomic development, if not done properly, it may result into damages to the environment and human health. In the long run it may not be sustainable. Tanzania therefore should strive as far as possible to develop sustainable industrial development regime. This might be seen as an impediment of fast industrial growth, but this will be less costly and if well planned and all stakeholders are fully engaged in the process, it will eventually be the best option. The following cases demonstrate why it is very important to tackle industrial development at the same time taking cognizant of environmental protection.

Case one: Pollution in China⁶



Beijing and other parts of China have already become notorious for their incessant clouds of smog, which present very real health risks to anyone not wearing dust masks. In January 2017, smog levels in China reached historic levels; as many as 32 cities were under “red alert,” the country’s most severe pollution warning. This followed two other red alerts in Beijing in December 2016, which resulted in closures of schools and factories; half of the capital’s cars were banned from roads.

Case two: Pollution in India⁷

⁶Hepeng Jia and Ling Wang (2017). Peering into China's thick haze of air pollution.

<http://cen.acs.org/articles/95/i4/Peering-Chinas-thick-haze-air.html>

⁷https://en.wikipedia.org/wiki/Air_pollution_in_India



Air pollution in India is quite a serious issue with the major sources being fuelwood and biomass burning, fuel adulteration, vehicle emission and traffic congestion. India has a low per capita emissions of greenhouse gases but the country as a whole is the third largest after China and the United States. A 2013 study on non-smokers has found that Indians have 30% lower lung function compared to Europeans.

Case three: Pollution in Florida⁸



In 2016 Floridians were inexcusably left in the dark after a pair of environmental calamities: the release of 150 million gallons of sewage and wastewater from St. Petersburg into Tampa Bay; and the leak of at least 200 million gallons of contaminated water through a sinkhole into the Floridan Aquifer, the main drinking water source for Central and North Florida. The public didn't hear about the bay release for five days, and the aquifer leak for almost three weeks.

Case four: Pollution in Nigeria



Case five: Pollution in Tanzania

⁸www.orlandosentinel.com/.../os-ed-alert-public-to-pollution-20170107-story.html



The central concept behind sustainable industrial development is the industrial development that do not impair the biosphere to supply "environmental services" to the population. This can be achieved through making use of renewable resources and processes, through minimization of waste generation and maximizing natural environment, maximizing the cycling of materials and energy. For our industrial development to be sustainable, the following attributes should guide the process:

- a) **Industries that use local natural resources:** Priority should be given to industrial production that are based on renewable local materials (particularly agro-industries). This is important because, apart from the fact that these industries are less polluting, they will provide sustainable market for local agricultural produce from more than 70% of Tanzanians who depend on agriculture. Industries that are aimed at adding value to locally produced natural resources, should be promoted.
- b) **Polluting technologies** should not be allowed.
- c) **Industries that do not use non-renewable resources** or minimum use of non-renewable resource should be encouraged.
- d) **Industries that do not have effluent treatment facilities** should not be allowed to operate. No industry should be allowed to discharge untreated effluent into the environment.
- e) **Industries should be encouraged to conserve water.** This can be achieved through rain water harvesting, water recycling, and wastewater reuse (e.g. improved treatment of domestic wastewater will generate large quantities of treated effluents at a quality which will enable industrial reuse, particularly in applications that do not require virgin water e.g. watering gardens, toilet flushing etc.). Use of sensors to control water usage.
- f) **Industrial plants that emit noxious gases or particulate matter** should not be allowed to operate unless they are equipped with exhaust air cleaner.
- g) **Industries should be encouraged to conserve energy.** This may be achieved through use materials which consume less energy, such as bulbs or refrigerators; use sensors to control electricity lighting.
- h) **Industries using less polluting fuels** such as renewable energy (solar, wind), natural gas and electricity should be promoted.

- i) **Technologies that reduce material use should be encouraged.** Cleaner production principles consider waste as raw materials that could not end up into useful product. Examples - the quantity of aluminum now used in beverage cans is one-third less than a decade ago, while the quantity of steel in motor vehicles has been significantly reduced over the past two decades.
- j) **Industries that are using non-toxic materials should be promoted.** Industries that produce degradable products should be encouraged.

Alongside with the above technological interventions it should be noted that attitude of planners, production personnel and industrialists, towards environmental protection is not that positive. There is a need of embarking on awareness campaign to different stakeholders in the industrial development chain.

While regulatory enforcement is necessary, it should be noted that enforcement increase, industry's drive to bare minimum to comply with the law, mainly through end-of-pipe treatment. This is not enough – since cumulative impact from industries cannot be solved through command and control but rather from continuous improvement of environmental performance – a requirement of Environmental Management System.

Under EMS, industry implements steps that make it more efficient, less expensive and more environment-friendly. Experience has shown that reduced emissions may actually save money in production expenses, in payments for waste disposal and in insurance costs.

Legal Measures

In addition to statutory requirements for end-of-pipe treatment, Environmental Management Act Cap 191 requires environmental impact assessment to be conducted for new industrial plants. Unfortunately, implementation of environmental mitigation measures is still a challenge. Follow ups are lacking as such EIA is only used to get an environmental certificate not to protect environmental degradation. In order to achieve sustainable industrial development there is a need to make EIA a management tool as such Environmental Management Plan should be implemented, Environmental Audits should be carried out as per the law.

EIA normally focus on individual plant, it does not address cumulative impacts on industries in a given industrial zone. Strategic environmental assessment should be carried out for a cluster on industries to identify the cumulative effect of the individual plant and the industrial zone on the environment, and measures for reducing cumulative impacts be implemented.

Economic Measures

While environmental policy has traditionally been implemented through legislation and enforcement (e.g. the command and control approach), new methods could be introduced

and developed to promote pollution prevention. One of the most effective is the use of economic measures, especially taxes and levies, to make pollution economically unfeasible. For example, in the Nordic Countries, there fiscal incentives for city busses that use biogas instead of fossil fuel, compressed natural gas is subsidized, bioethanol is selling cheaper than petrol etc.

Industry-Government Cooperation

Sustainable industrial development can be achieved through industry-government cooperation. For example, industries need guidelines on the scope of improvements required by environmental policy. For example, in Japan administrative agreement are used to promote environmental conservation. The agreements are voluntary with the status of binding contracts in civil law. The aim of the agreement is to guarantee that the environmental goals which are formulated in local and national legislation and in international agreements will be implemented according to an agreed timetable.

7.0 Conclusion

Industrial development is inevitable if Tanzania is to achieve its Vision 2025, i.e. becoming a middle income country. Without industrial development Tanzania will continue to serve a market for the products produced by other countries. However, it should be noted that environmental protection should be not regarded as an afterthought activity. Experience has shown that sustainable development cannot be achieved if the environment is degraded. Experience from those countries that have ignored environmental protection while planning and implementing their industrial development have ended up using more money to correct the mistakes.