

Environmental issues in the tea value chain

Macharia, A.

The National Environment Management Authority, P.O. Box 67839-00200, Nairobi, Kenya.

INTRODUCTION

The Director EEIPP's presentation pointed out that tea production is important for Kenya's economy in several ways. These include: direct and indirect contribution to GDP and exports dependency; Source of employment; and, Food security. However, there are environmental concerns in the tea sector. The Environmental Concerns can be summarized into three: i) Concerns during construction of tea factories and associated infrastructure; ii) Concerns during tea manufacturing process; and iii) Concerns in tea agriculture.

CONCERNS DURING CONSTRUCTION OF TEA FACTORIES AND ASSOCIATED INFRASTRUCTURE

Environmental components that are potentially affected by construction of tea factories and associated infrastructure include: air, soil surface geology, landscape, noise pollution and vibration, clearing vegetation, habitat, and increased utilization of water.

In construction of tea factories and associated infrastructure, the potential to cause air pollution comes in the form of dust from excavation, from movement of project vehicles, as well as from other dusty operations. Smoke is emitted by diesel-operated construction machinery and those used for mixing of concrete.

Construction processes have an invasive effect on the soils and surface geology of an area. During excavation there is removal of soil and stones. Excavation also breaks the soil structure, which predisposes it to agents of denudation. In addition, compaction of soil affects soil aeration and drainage. Negative impacts can also result from oil spills and other hazardous chemicals.

Noise pollution and vibrations coming from machinery such as concrete mixers, metal grinders and construction materials delivery vehicles also have environmental implication.

Clearing of vegetation is a negative irreversible impact since vegetation will not regenerate at the built site, except for minimal re-vegetation that will be done during landscaping after the project is completed.

Landscape construction alters the morphology and aesthetic aspects of the landscape. This is by way of putting up of the new buildings. Poor management and handling of construction waste also alters the aesthetics of the landscapes. Soil disturbance destroys habitat for different forms of biodiversity and construction increases the demand for water. This leads to a negative cumulative impact as there will be increased demand for water at the operation stage of the factories.

Construction work generates soil and debris which result in solid waste. Often this is not properly disposed of or reused, causing negative environmental impacts. Waste categories expected to be generated during construction phase include: i) Construction waste such as construction wood, stone chips, paper, broken glasses, waste metals, packaging wastes, roofing material remnants. Other waste will include excess soil from excavation activities; and ii) Biomass waste including organic waste resulting from activities such as site clearance. If not properly handled

and disposed, it can create negative impacts by lowering water quality through increase in BOD, COD, turbidity, and nutrient loading.

CONCERNS DURING TEA MANUFACTURING PROCESS

Environmental concerns during tea manufacturing process are related to energy, waste, and waste water.

Energy

Tea processing is energy intensive process; using as much energy per kilogram of made tea as the production of steel. Depending on process and equipment efficiencies, energy can make up as much as 25% of the total cost of tea production. Sources of energy in tea production include electricity, firewood and fossil fuels. Electricity is used for light and motor power in tea factories. It accounts for 15% to 20% of total energy requirements, the major part (around 80%) being for drying and curing of tea. Because of the high cost of electricity, most factories use firewood.

Most tea factories use wood-fired steam boilers to generate heat in order to reduce cost in tea production. They end up consuming large quantities of the wood, for instance Iriaini Tea Factory needs 20,000 to 25,000 trees or 20 to 25 acres of fuel wood on a yearly basis. It is important to note that it takes eight to ten years for newly planted trees to be ready for fuel production. Eucalyptus is the common tree species used in the factories. This tree species is known to consume ground water, a concern that is enhanced when grown in large proportions. Diesel is used in the factories to run some machines such as generators; burning of diesel is highly polluting through emission of greenhouse gases (GHGs).

Solid waste

This type of waste includes dust that is collected from the packaging and sorting area and the dry leaves from the weighing section in the factories. The highest amount of solid waste is generated from the withering stage due to spillages, and at the offloading area. Solid waste generated from factories may be poorly disposed and not segregated (different types of wastes are not disposed separately). The biodegradable and non-biodegradable waste is collected together and has no clear tracking of the amount of wastes generated.

Waste water

Liquid waste is generated majorly from the cleaning processes in the factory. It is estimated that during major clean-ups in the factories 40 m³ of waste water is produced. Most tea factories lack Effluent Treatment Plants (ETPs) and the water is discharged into nearby rivers causing pollution. For example, an empirical analysis of wastewater for Nyansiongo Tea Factory found out that BOD₅ levels measured 150 mg/L while the COD levels measured 505.5 mg/L against the NEMA recommended maximum discharge limits of 30 mg/L and 50 mg/L respectively.

ENVIRONMENTAL INCIDENTS

Other environmental concerns that are a nuisance to the neighbouring community include noise and smoke emissions.

Environmental concerns in tea agriculture

Habitat destruction

Conversion of natural habitats, most of which are rich in biodiversity, into vast tracks of tea plant monocultures result in decreasing the biodiversity of plant species. Planting of tea in Kenya has also been associated with habitat destruction especially clearing of forests to cultivate

tea. Examples in Kenya are the Nyayo Tea Zones and Kiptagich Tea Factory found in the Mau forest complex.

Regulation and interventions

In Kenya today, various regulations and interventions have been put in place to address the environmental concerns. The National Environment Management Authority (NEMA), is established under the Environmental Management and Co-ordination Act No. 8 of 1999 (EMCA) as the principal instrument of the Government in the implementation of all policies relating to environment. EMCA 1999 was enacted against a backdrop of 78 sectorial laws dealing with various components of the environment, the deteriorating state of Kenya's environment, as well as increasing social and economic inequalities, the combined effect of which negatively impacted on the environment. The supreme objective underlying the enactment of EMCA 1999 was to bring harmony in the management of the country's environment. Some of the regulations include:

Environmental Impact Assessment for new projects

Environmental Impact Assessment (EIA) is a critical examination of the effects of a project on the environment. The assessment identifies both negative and positive impacts of any development activity or project, how it affects people, their property and the environment. EIA also identifies measures to mitigate the negative impacts, while maximizing on the positive ones. EIA is basically a preventive process. It seeks to minimize adverse impacts on the environment and to reduce risks. If a proper EIA is carried out, then the safety of the environment can be properly managed at all stages of a project (planning, design, construction, operation, monitoring and evaluation as well as decommissioning).

Annual environmental audits for all facilities

NEMA reviews annual environmental audit (EA) reports submitted by businesses and other listed facilities under the Environmental Impact Assessment/Audit regulations, 2003. It issues improvement orders to proponents who have not met specific environmental requirements. Initially, facilities are required to submit an initial audit undertaken by a NEMA authorized environmental expert. Thereafter, facilities may conduct self-audits.

Annual discharge license for all facilities (currently 70 per cent compliance levels)

NEMA issues a wide range of environmental licenses and permits under various environmental regulations. These include licenses on: Environmental Impacts Assessment (EIA); Effluent discharge; Waste Management, transporters, incinerators and recyclers; and, Import/Export for controlled substances. Permits are issued for: Access of genetic resources; Trans boundary movement of waste; and, Sand harvesting, sale and transportation.

INTERVENTIONS

Specific interventions put in place to address Environmental Concerns in Tea Agriculture include:

Greening the Tea Industry

Greening the Tea Industry in East Africa (GTIE) is a project by UNEP aimed at addressing the energy challenges facing the tea companies. The project specifically aims at installing six small hydropower plants (SHPs) with a cumulative capacity of 10 MW that will generate 105,000 MWh by project end; about 84,000 tons of CO₂ equivalent are expected to be mitigated over the project duration. The project is in line with UNEP's strategy of reducing carbon footprints and at the same time increasing productivity and income.

Increased electricity supply to tea production factories extensively reduces the entire industry's production and energy costs. This ultimately enhances the competitiveness of East African tea companies in the global market. Greenhouse gases that are produced from tea processing plants are also limited through renewable power generation. Factories that implement green projects receive incentives via carbon credits, offered by the UNFCCC (United Nations Framework Convention on Climate Change). Surrounding communities also gain from rural electrification, thanks to the new sources of power. One of the success stories of the GTIE project was the commissioning of the 0.85 megawatt Tagabi Small Hydropower Station in May 2011. The fully operational plant in Kericho, Kenya, has to date saved the tea company an estimated US\$613,833 and generated 6,445,277 kilowatt-hours of electricity. Other such hydro-power plants have been installed by Ken-Gen at Mathioya in Kenya.

Other green initiatives adopted include the use of biomass in place of wood fuel. For instance, Iria-ini Tea Factory uses of biomass compressed into briquettes (the briquettes are made of organic matters like leaves, sawdust, maize cobs, coffee husks and twigs and branches that are compressed). These are used together with wood fuel thus reducing the amount of wood that would be required to run their processes.

In conclusion, the assistance offered by NEMA and Kenya National Cleaner Production Centre results in reduced company's costs and pollution, as well as improved company's bottom line and enhanced reputation. However, in spite of regulations and interventions that have been put in place, there are gaps in addressing environmental issues in general and specifically those that emanate from the Tea Industry. There is need for more green initiatives similar to GTIE. It is important to develop ETPs that can generate energy to be used by the factories. Implementation of EMPs as prescribed in EIA/EA reports is also another area of concern. It is clear that the Tea Industry is crucial for economic development but there is need to run the industry sustainably. The industry has negative impacts on the environment which need mitigation and compliance to EMCA. Innovations aimed at greening the sector should be prioritized by universities and other research institutions.