



W O I M A

CORPORATION

## CASE STUDY

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WtE ECOSYSTEM  
GARISSA KENYA



WOIMA





## Background

Garissa County in north-eastern Kenya is facing several major challenges simultaneously

1. Population growth and urbanization is pushing waste management operations to its limits
2. An alien tree species (*Prosopis juliflora*), commonly known as Mathenge tree, is invading the county, especially along the banks of River Tana, and displacing local species
3. Mathenge tree is poisoning the livestock
4. Mathenge tree is also depleting the groundwater resources
5. The UNHCR refugee camps close to the Somali border are in dire need of energy, in particular for cooking
6. The nomadic lifestyle of local population is suffering



Most of the green parts of the county is covered by the invasive Mathenge tree (*Prosopis juliflora*), a dense shrub further lowering the water table, while at the same time poisoning the livestock. The pastoralist communities have lost more than 80 per cent of their livestock to recurrent droughts, which are becoming more severe by the day.

While pastoral communities have traditionally utilized systems and practices that minimize the impact of climate-related shocks, the impacts of climate change create a situation of increasing vulnerability for poor and marginalized households. The situation is particularly serious for women and the youth leading to chaotic urbanization.

Garissa County is fast becoming a desert due to the massive deforestation for wood fuel, charcoal and building materials. Not that Garissa once was a dense forest like the Mau Complex, but with its scattered shrubs, woody trees and patchy grasslands, this semi-arid lowland had a befitting ecology for browsers such as goats, camels and grazers like sheep. Now, even the few shrubs and acacia trees have disappeared, exposing the north-eastern county to undulating sand storm, and blistering heat.

Locals who could easily access water by merely drilling a 60-metre deep borehole, now have to go beyond 200 meters for the commodity.



Since development in many towns across Kenya is unplanned, rising population over-stretches the scarcely available resources such as housing, food, water and sanitation, transport, waste management and healthcare, leading to widespread disease infections and high insecurity. While the country is struggling to come to terms with the heavy impact of climate change, Garissa is already hosting two different categories of refugees; the internally displaced climate change refugees and the war refugees from neighboring Somalia. The scary nightmare about this phenomenon is that conflicts over natural resources such as wood and water are bound to arise; pitting the two needy camps against each other.

An energy situation survey conducted at the Dadaab refugee camp by Chatham House in 2016 reported that 98% of the residents use wood as their main cooking fuel, and the authorities have been unable to regulate firewood market, or to provide sufficient support to the most vulnerable. Refugees are rarely provided with energy resources by the UNHCR, the report added.

The Dadaab refugee camp, which currently hosts close to 250,000 people, was established in 1991 to accommodate Somali refugees fleeing violence, environmental and social problems caused by civil war, famine, and drought. The massive environmental degradation in the county is largely attributable to the high influx of refugees cutting trees for firewood, charcoal burning and house constructing materials.

**“ The refugees at Dadaab rely on firewood, since they are not provided with alternative energy solutions. This forces them to go out, sometimes as far as 200km away from the camp, to cut trees, which is quickly turning the whole county into a desert. ”**



## Garissa Solution

WOIMA Ecosystem is the most economical, environmentally friendly and socially beneficial solution for the challenges that Garissa County is facing. It offers a sustainable on-stop-shopping solution that will simultaneously

1. Improve the waste collection rate
2. Increase the waste recycling rate
3. Significantly reduce the waste quantity ending up at the landfill
4. Eventually eliminate the need for a landfill altogether
5. Eradicate the Mathenge tree
6. Support the restoration of the native ecosystem
7. Generate electricity for the local grid
8. Produce cooking gas for the Dadaab refugees



The *wasteWOIMA*® waste-to-energy power plant generates electricity through incineration using municipal and industrial waste streams as fuel. The waste is pre-sorted removing recyclables, non-combustibles and biowaste for biogas production. Due to its small footprint, modular structure and high level of pre-fabrication, it requires less design and engineering, has quicker permitting processes and will be up and running much faster than traditional power plants.

The plant can offer exactly the type of energy that the local community demands; electricity, steam or thermal energy as heating or cooling. Combining this with material recycling offers new SMEs a viable growth platform.

The biogas process utilizes two different feedstocks; the biowaste sorted out before the power plant and the leaves and pods of the Mathenge tree. The generated biogas is further refined into LNG and filled into cylinders for easy utilization as cooking gas. Assuming an annual demand of 5GJ per person, the feedstock produces enough gas for over 50,000 people. And the process digestate acts as solid and liquid fertilizer. The left-over tree trunks can be used in charcoal production or as building material.

The *wasteWOIMA*® plant generates electricity for close to 100,000 people, calculating with the Kenyan average consumption of 210 kWh/a/capita. Local electricity generation offers significant savings in the form of reduced transmission losses.



## WOIMA Ecosystem Solutions

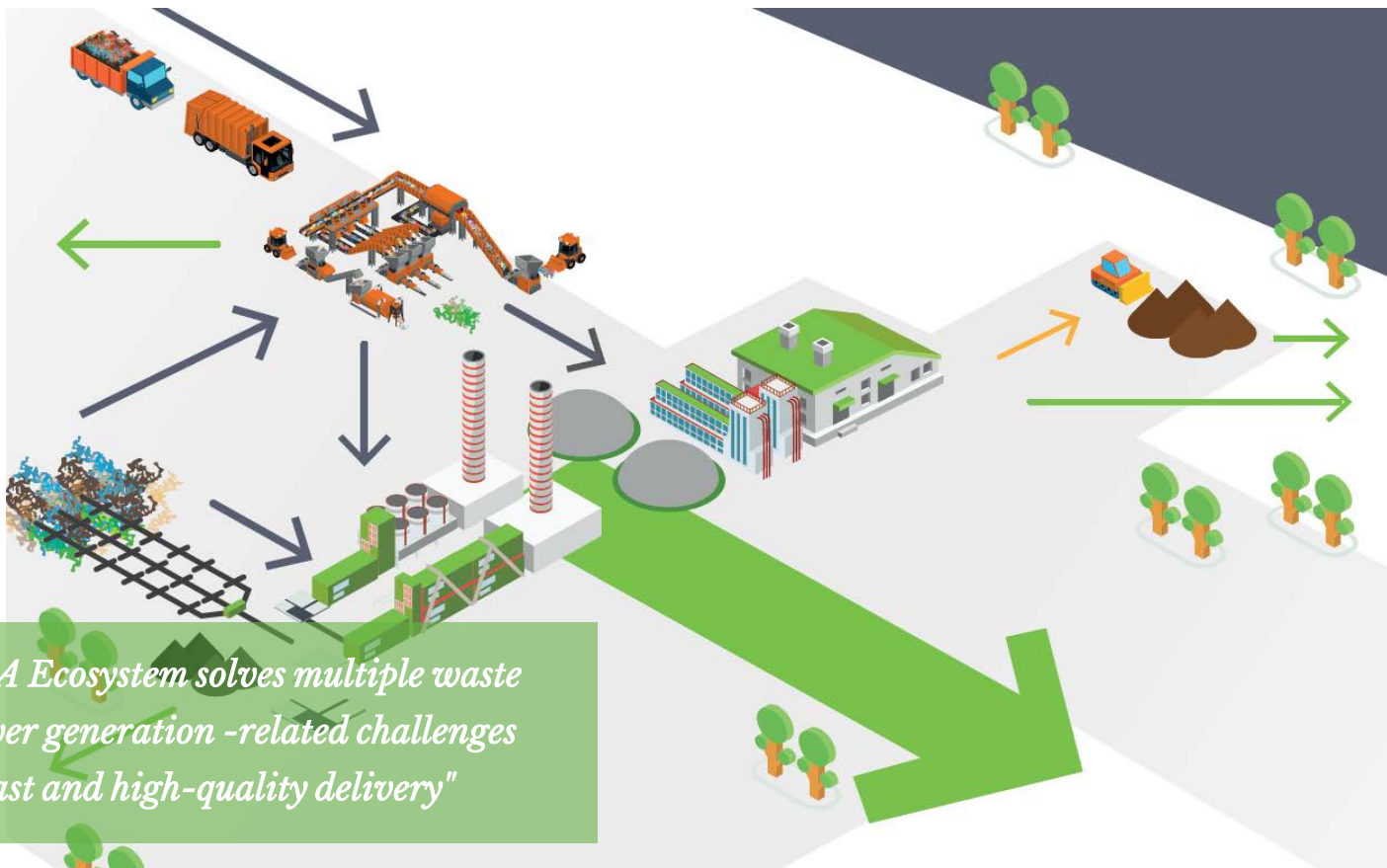
WOIMA Ecosystem Solution combines the best available technologies (BAT) in the fields of recycling, material recovery, waste-to-energy and waste-to-fuel. These solutions increase local resource efficiency by utilizing each waste fraction to its full potential and thus saving locally scarce virgin raw materials and fossil fuels. Even existing landfills can act as fuel sources; either as waste material or as landfill gas to increase the efficiency of the Ecosystem. All of the WOIMA Ecosystem solutions are fully scalable to cater to the needs of both small communities and large metropolises.

All the WOIMA Ecosystem solutions are modular and pre-fabricated. This offers three significant advantages. First, the Modules are easy and cost-effective to deliver onto the site. Second, the different Ecosystem Modules have flexible interfaces allowing for the best combination for each customer case. Third, the individual technology containers are easy and cost-effective to maintain, or replace to prolong the lifespan of the whole Ecosystem.

WOIMA Ecosystem is the most sustainable solution environmentally, economically and ecologically for all types of waste fractions. It deducts the maximum amount of energy out of the feedstock, while reducing the remaining material into usable ashes and fertilizers. Over 97% of the original waste quantity is utilized one way or another. It has huge revenue-generation potential through energy and material sales, as well as high job-creation potential on-site, upstream and downstream.

WOIMA Ecosystem Solution offers the following key benefits

- easily scalable technical solution
- capable of utilizing every kind of waste stream
- catering to customer's exact needs
- generating a variety of different energy commodities
- supporting circular economy principles
- high ROI and short payback time



*"WOIMA Ecosystem solves multiple waste and power generation -related challenges with a fast and high-quality delivery"*



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