

# WASTE to ENERGY in Belize

*Don't trash your Energy!*



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Picture: [www.roswithastein.de](http://www.roswithastein.de)

## 1. Sources of Waste accumulated in Belize

- Waste from lumber yards (60% of the cut lumber is wood waste in form of bark, sawdust, chips, branches)
- Waste from citrus and banana production (leftover from processing)
- Waste from sugar production (bagasse)
- Waste from households (mix of plastics, glass, metals, paper, Styrofoam, used tires, batteries and other hazardous waste and wet waste from vegetables and food left overs)
- Waste from chicken production (manure)
- Waste from slaughtering houses (bones, fat, giblets)
- Waste from market days (vegetables)

### Total of Household Waste 2015 in metric tons:

Belize City	Corozal	Orange Walk	San Ignacio	Belmopan
19,326	3,002	3,088	7,226	6,530
Dangriga	Punta Gorda	San Pedro	Caye Caulker	Est. increase in 5 yrs
2,026	1,071	5,400	2,200	30 – 40 %



Picture: [www.lwf.bayern.de](http://www.lwf.bayern.de)



Picture: [www.orangefiber.it](http://www.orangefiber.it)



Picture: [www.cdn.phys.org](http://www.cdn.phys.org)



Picture: [www.bar-blog.de](http://www.bar-blog.de)



Picture: [www.badische-zeitung.de](http://www.badische-zeitung.de)



Picture: [www.newsofthesouth.com](http://www.newsofthesouth.com)



Picture: [www.nola.com](http://www.nola.com)

## 1.1. Waste disposal practices in Belize

Belize has one Sanitary Landfill <http://belizeswama.com/waste-transfer/#sanitarylandfill> on the George Price Highway, Mile 24 for Belize City, Burrel Boom, San Ignacio and Santa Elena, San Pedro and Caye Caulker. An extension of this landfill is approved to start operation in 2018 for Corozal, Orange Walk, Belmopan, Dangriga, Placencia and Punta Gorda.

All the other towns and villages have their own landfills, which are regularly burned; many villages have wild dumping areas or burn the waste in private backyards. Construction waste is sometimes used for property fillings or road fillings.

## 1.2. Hazards of identified waste disposal practices

The following list includes categories often applied to household hazardous waste. It is important to note that many of these categories overlap and that many household wastes can fall into multiple categories:

- Paints and solvents
- Automotive wastes (used motor oil, antifreeze, etc.)
- Pesticides (insecticides, herbicides, fungicides, etc.)
- Mercury-containing wastes (thermometers, switches, fluorescent lighting, etc.)
- Electronics (computers, televisions, cell phones)
- Aerosols and other chemicals, like cleaning agents
- Batteries (e.g. lead acid, lithium, nickel cadmium, or button cell batteries)



Picture: [www.natur.de](http://www.natur.de)



Picture: [www.stimme.de](http://www.stimme.de)

Most of these hazardous waste materials in Belize end up in dumping areas, leading to contamination of the ground water.

Poisonous gases are released by burning plastics, styrofoam and used tires, leading to pollution of the air, thus leading to health problems like asthma, skin conditions, lung conditions, cancer, and contributing to greenhouse gases and climate change.

### 1.3. Waste preparation and separation, getting rid of hazardous materials

The biggest challenge is the household waste. Other types of waste are mostly single waste products.

All organic material has to be separated from the waste for composting.

Hazardous waste needs to be disposed as controlled waste.

Metal and glass can be recycled as well as plastic and paper.

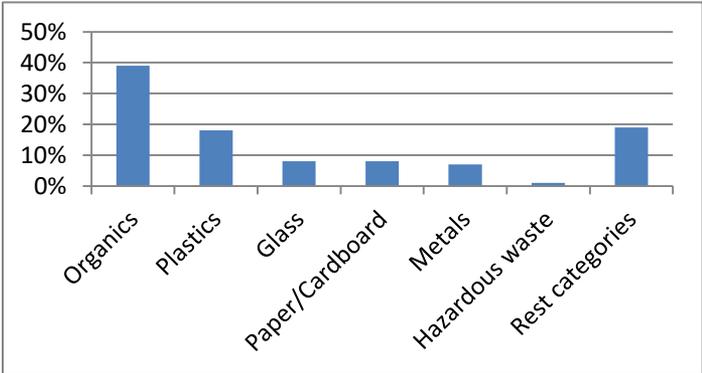
Some recycling companies in Belize take care of the reusable materials.



Pictures: [www.spec.bc.ca](http://www.spec.bc.ca), [www.lakelandgov.net](http://www.lakelandgov.net)



### Household Waste Streams in %



## 2. Technologies to convert Waste to an Asset

### 2.1. Biogas

Anaerobic digestion is a biological process breaking down living material into bio-gas, rich in methane gas. The methane can be burned to generate electricity. Waste from households, industry, and agriculture can be used as a resource.

Waste streams in Belize: chicken, cow and pig manure, food and vegetable waste

Advantage: renewable source of energy, non-polluting, reduces landfills, and reduces Greenhouse Effect. High valuable by-products are natural fertilizer and digestate for agriculture purposes.

Disadvantage: Big scale Biogas plants need well-skilled technicians for production and maintenance.

The levelized cost of energy is approx. 0.36BZ\$/kWh but the by-products have an additional high value. 3 -4 t of natural fertilizer can replace approx. 1 t of chemical fertilizer.

### 2.2. Gasification

Gasification is a thermal process that heats the waste with little or no oxygen in order to produce a chemical reaction, which produces synthetic gases, used to turn a turbine, which spins a generator to create electricity. Gasification is a much more efficient way of producing electricity compared to burning waste, like incinerators do.

Waste streams in Belize: Wood Waste, Bagasse from Sugarcane

Advantage: The by-products of this technology are a highly nutritional, rich fertilizer or Biochar, which is an excellent soil enhancer. Because Biochar retains nitrogen, emissions of nitrous oxide (a potent greenhouse gas) may be reduced. Turning agricultural waste into biochar also reduces methane. It improves water quality by helping to retain nutrients and agrochemicals in soils for use by plants and crops.

Disadvantage: Gasification is a complex and sensitive process, and the technology is still in research phase. There could be problems with humidity in the tropics.

The levelized cost of energy is approx. 0.26BZ\$.

### 2.3. Incineration

Incineration focuses on the controlled burning of waste at high temperatures.

Waste streams in Belize: Solid waste for the landfills

Advantages: Harmful emissions can be reduced if the incinerators operate at high temperatures of around 1,000 degrees centigrade. Metals can be reused and the ash can be used in construction materials for the chemical industries.

Disadvantage: Exhaust gases contain residues that can pollute the environment, and ash contains toxins.

The levelized cost of energy is approx. 0.26BZ\$.

## 2.4. Composting & Box Fermentation

Composting is the biological decomposition of organic waste such as food or plant material by bacteria, fungi, worms and other organisms under controlled aerobic conditions. The end result is organic matter called humus.

Waste streams available in Belize: Food and vegetable waste, yard, park and farm waste as well as manure.

Advantage: soil-building, cheap nutrient-delivering for garden and agriculture, reducing chemical fertilizer use, reducing landfill waste and emissions.

Disadvantage: Methane is not captured

## 3. Synergy and Advantages for Belize to use Waste in a positive way

### *Don't trash your energy!*

Improper practices of waste disposal lead to pollution of the environment, the water, the earth and the air and create many serious health problems. Awareness starts with shopping. All the plastic bags and Styrofoam boxes taken home from the market, stores and restaurants and many chemicals end up in the household waste, often burned on the roadside, releasing gases that are the cause of bronchitis, allergies, skin and lung diseases and cancer. These practices contribute to greenhouse gases and climate change.

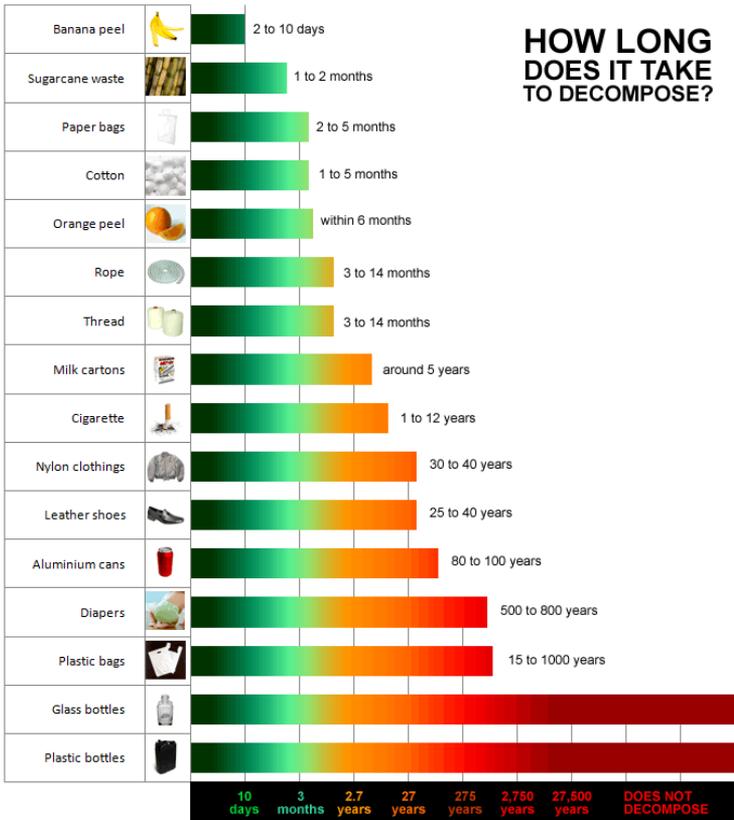
Mindful consumption, reuse of materials, recycling, and proper waste disposal is the way to go. As the natural resources of our planet are limited, the need to preserve them by using recycled products is becoming more and more important. Let us care for our health and the future of our children and grandchildren by creating a safe and healthy environment for us, for the people of our country, and for our planet.

For the same price or less, you can help improve the environment by using recycled materials. You may also be surprised at the additional credibility your project can gain by using more sustainable recycled materials.

Waste is an asset and can be utilized to create energy independence. Producing electricity from biogas, gasification or incineration would reduce the electricity imports to Belize significantly. It can help the country to save millions of dollars up to complete energy independence. Composting for garden and agriculture fertilisation reduces chemical use for healthier food and cheaper production.

Support the initiatives of the Belize Solid Waste Management Authority and the Department of the Environment.

#### 4. Decomposition timeline



Source: <http://socyberly.com/issues/strange-trash-facts/>

**Improved Waste Management:** Until a few years ago, the uncontrolled dumping and burning of garbage, as a form of final disposal throughout Belize, was quite common and still is in the rural areas. Such practices, compounded by inadequate waste collection systems and the lack of technical and environmental controls have impact on the health of the population and pollute the soil and the waters, thereby affecting coral reefs and affecting the livelihood of thousands of Belizeans whose livelihoods are directly and indirectly linked to fishing and eco-tourism. The overall goal is to implement a National Integrated Waste Management Programme including programmes to reduce, reuse, recover and recycle solid waste and reduce greenhouse gas emissions into the atmosphere.

## 5. Project Visibility & Partners



**Caribbean Community  
Climate Change Centre**

This flyer concept was developed by the renewable energy department of the CCCCC. The CCCCC coordinates the Caribbean region's response to climate change, working on effective solutions and projects to combat the environmental impacts of climate change and global warming. CCCCC is repository and clearing house for regional climate change information and data and provides climate change-related policy advice and guidelines to the Caribbean Community (CARICOM) Member States through the CARICOM Secretariat. In this role, the Centre is recognised by the United Nations Framework Convention on Climate Change (UNFCCC), the United Nations Environment Programme (UNEP), and other international agencies as the focal point for climate change issues in the Caribbean. For more please visit: [www.caribbeanclimate.bz](http://www.caribbeanclimate.bz)

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