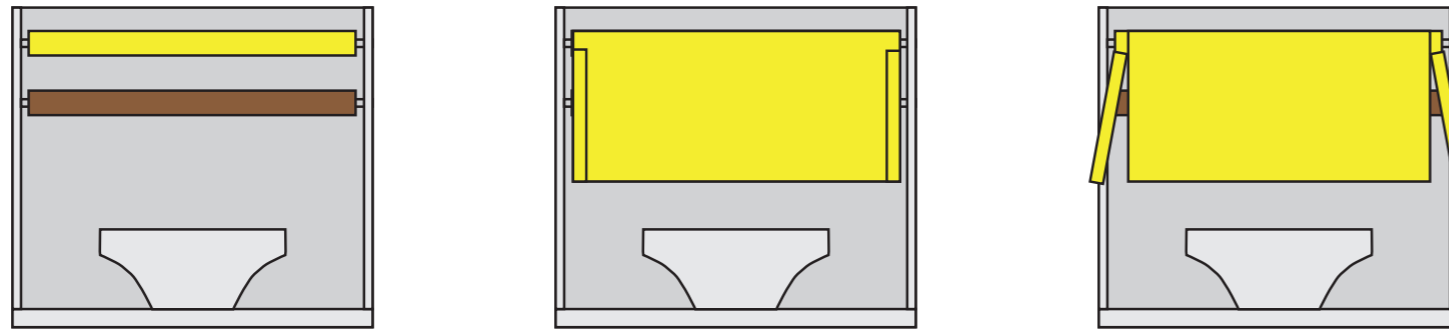
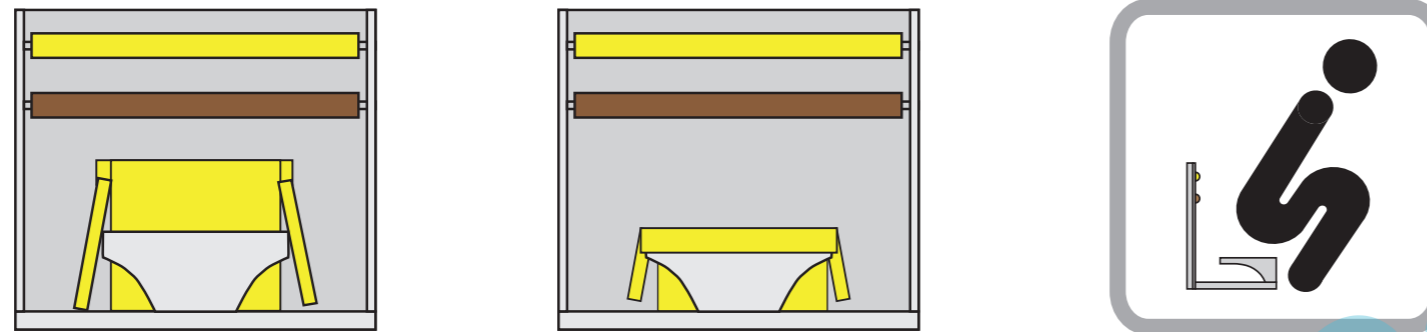


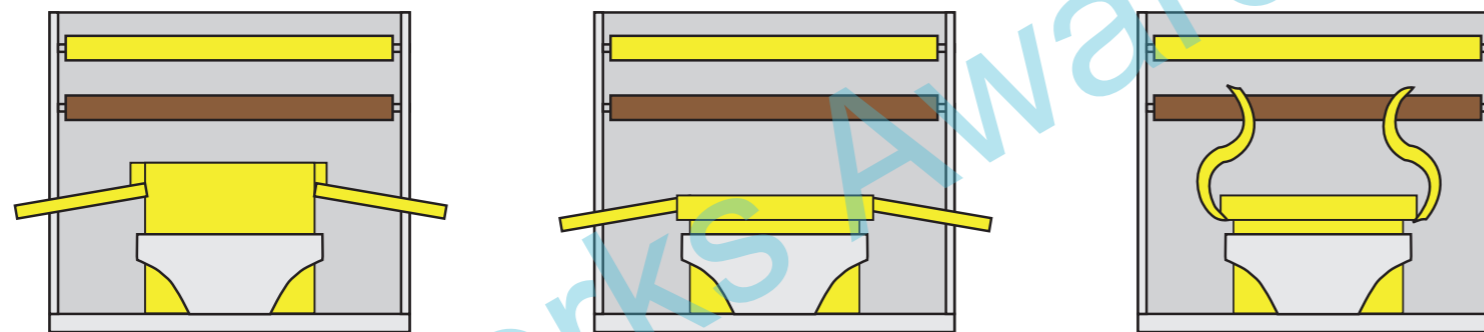
# Human waste management



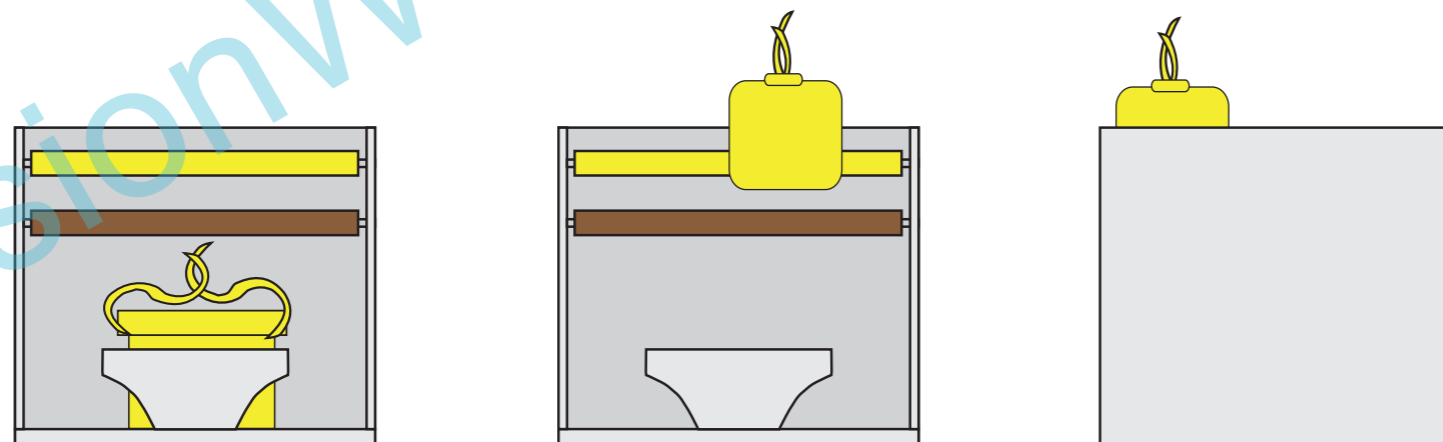
Two separate roles of bags, 1 for urine, 1 for faeces, are attached at the top with the help of rods. When required the appropriate bag is pulled down and separated along the perforated arms/extensions.



The bag is laid around the frame while the arms remain on the outside. After the finished business..



..the arms are pulled so that the bag encloses the contents. Now the upper edge can be firmly wrapped around itself with help of the arms/extensions and the bag securely tied up.



There is no contact with the inside of the bag and it is safely sealed. The full bag are kept in a bucket and handed over to the collection service.

## How to realize ecological sustainable logistics?

### Place of scene

Kibera in Nairobi, Kenya is the second largest slum in Africa. Its population is estimated to be anything between 600,000 and 1.2 million.

The ground in much of Kibera is literally composed of refuse and rubbish. Open sewage drains, in addition to the common use of flying toilets, also contribute to contamination of the slum with human faeces. A flying toilet is a facetious name for the use of plastic bags for defecation, which are then thrown on the roadside, or simply as far away as possible. Some of them burst open upon impact and/or clog drainage systems. In the rainy season, drainage including excrement often enters residences. Such close contact leads to fears of diseases such as diarrhoea, skin disorders, typhoid fever and malaria.

According to a report from the United Nations Development Programme launched in Cape Town on November 9, 2006, „two in three people in Kibera, identify the flying toilet as the primary mode of excreta disposal available to them.“

The UNDP report blames a taboo against bureaucrats and politicians discussing toilets, while others see a reluctance among the Nairobi authorities to formalize what they characterize as an „illegal settlement.“

The practice of defecating outside, away from one's house, especially in the dark, causes concern for one's personal safety as well, especially among girls and women.

### Collection of excrements:

For the collection of excrement, suitable dry toilets will be distributed to every household. They enable basic hygienic conditions. The traditional squatting position is assumed. Urine and faeces are collected separately in biologically degradable bags and are collected each day at the same time through collection service. In return each family receives an adapted equivalent in the form of money. In addition, compostable waste such as banana skins can also be disposed of in the excrement bag.

### Material requirements

The toilet should be made through injection molding with an antibacterial surface in order to simplify the cleaning process and ensure hygienic conditions.

- The biologically degradable plastic bags in the collection tanks must display different characteristics:
- The collection bags for urine as well as faeces have to seal their contents and be tearproof
- After the transport to the urine tank, and/or the biological gas facility they are to dissolve completely to supplement the process and without affecting the resulting products in a negative way.
- After they have been filled appropriately, they should, through a reaction between the bag and the contents, become non-transparent. This will enable a free handling of the filled bags and will avoid any misuse

### Example calculation with urea for the exchange value

1 Family (2 adults, 4 children)

Minimum 5 litres of urine a day = 150g of urea (46% nitrogen) = 55Kg per year

Nitrogen fertilizer = 833.00Euro per ton

0.13Cent per family per day for nitrogen only.

# Human waste management

## How to realize ecological sustainable logistics?

The urgency for action in the sanitation sector is obvious, considering the 2.6 billion people worldwide who remain without access to any kind of sanitation, and the 2.2 million annual deaths caused mainly by sanitation-related diseases and poor hygienic conditions.

Over the course of a year, the average individual expels roughly 50Kg of faeces and 500 litres of urine.

For cities with millions of inhabitants, this is a huge amount of rubbish, if considered as such.

### Introduction to ecological sanitation

Ecological sanitation, also known as ecosan, is a new paradigm in sanitation that recognises human excreta not as waste but as resources that can be recovered and reused in a continuous cycle. Ecosan systems enable the recovery of nutrients from human faeces and urine for the benefit of agriculture, thus helping to preserve soil fertility, assure food security, minimize water pollution and recover bioenergy.

