



## **ECOLOO: A Sustainable Toilet Solution for Urban & Rural Areas**

### **INTRODUCTION**

There are known as 2.5 billion people worldwide of 40% of the world population have no access to toilet. Open spaces, riverbanks, road and street side and the open field are some of the common places to defecate. It is also seen that the water sources is badly affected by both pit/ring and modern flush toilets. The sewage from the flush toilet badly affected the fragile environment. These practices not only pollute the environment but also contaminate the land and water resources. Terra Preta Sanitation System that we developed through ECOLOO is intended to provide a comprehensive and effective solution to the challenges raised from sanitation and food security. With the production of natural organic fertilizer generated from the human waste, the innovation of ECOLOO thus close the loop of human nutrition.

### **TECHNICAL DESIGN**

#### **System Efficiency:**

- The solid waste can be treated efficiently within 5-7 days using our special formulated bacteria.
- The use of such formula will minimize the loss of carbon and nutrients (N, K, P) in the whole system with very low use and waste of carbon, nutrients and water.

#### **Ease of Deployment:**

- ECOLOO solution has a reasonable total life cycle cost, including production, installation, maintenance and operation costs, and avoided the necessity for developing heavy infrastructures.

#### **Technical Adaptation To The Targeted Specific Situations:**

- ECOLOO comes in various designs and shapes to fit all purposes and is functional in hot or cold climates, rural or urban, indoor or outdoor, houses or buildings.
- The base of ECOLOO as shown in the centre of Figure 1-1 below can be detached from the structures and installed inside new and existing single houses or landed properties, residential and commercial buildings. Our ECOLOO can be implementable into such buildings concentrating several households in urban areas of 20,000 inhabitants, for example, by draining out the liquid fertilizer through serial connecting pipe down to the basement of the buildings by gravity pull.
- Manufacturing ECOLOO base in mass production will reduce the price of the toilet. However, each country will be given the privilege to built or install its own choice of structures as local production or installation using local materials and processes will help boost its economy and provide job or business opportunities.

#### **Sociological Adaptation To The Targeted Cultures:**

- ECOLOO has been acceptable for various population from countries like Africa, South America and ASEAN, especially the feminine users as our priority is to protect women and children's dignity.
- ECOLOO is designed to adapt to every culture through its universal toilet design that combines sitting and squatting position. Each culture will be given options to use water for hygiene purpose, toilet paper and/or eco-friendly hand sanitizer. It is as easy as pee/poo,



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wash/clean and go.

### **Adaptability Of The System To A Wide Range Of Cultural And Technical Situations:**

- ECOLOO users have an option to cover the waste with our mechanical waste cover, specially designed to hide the view of the waste inside the upper chamber. The waste cover will open when the users sit or squat on the toilet and close as soon as they step out.

### **Robustness:**

- ECOLOO requires minimal deviation of the operation of the proposed system to input parameter changes; can be demonstrated e.g. through a Failure Mode and Effects Analysis (FMEA).
- ECOLOO is made of best quality, coated fiberglass that can withstand heavy weights, floods, strong winds, vandalism, disaster, extreme cold or hot climate conditions.

### **Hygiene:**

- ECOLOO users can safely and hygienically handle their solid waste by flattening it using a special built-in mechanical device without having any direct physical contact with the human waste.

### **Sustainable Design:**

- ECOLOO is a stand-alone, decentralized closed loop system, odorless, waterless, sewage free, chemical free and energy free on-site waste treatment toilet system that employs anaerobic fermentation and biological processes to create a natural organic fertilizer rich with nutrition perfect for agribusiness.
- ECOLOO does not require any energy or minimal energy as we have installed the ventilation pipe, ventilation fan and a small solar lighting.
- By running our business as social enterprises, we help each community by providing job or business opportunities and by buying back the liquid organic fertilizer and sell it to agribusiness to replace chemical fertilizer.

### **Ergonomics & Aesthetics:**

- ECOLOO requires low effort of use with its unique universal design
- ECOLOO requires minimal change of the user experience compared to existing solutions, robustness, aesthetic attractiveness with its user friendly design
- ECOLOO is ergonomically designed for comfort, health and safety to prevent repetitive strain injuries and other common problems such as back pain, knee pain, rectal pain or weak uterus, all which can develop over time and can lead to long term disability.

### **Consistency:**

- ECOLOO is easy to be adapted by individuals with designed elements and quality of the interfaces
- ECOLOO has only one chamber with one hole and all the waste, including toilet paper, urine or wash water, will all go down naturally by the pull of gravity into the upper chamber.

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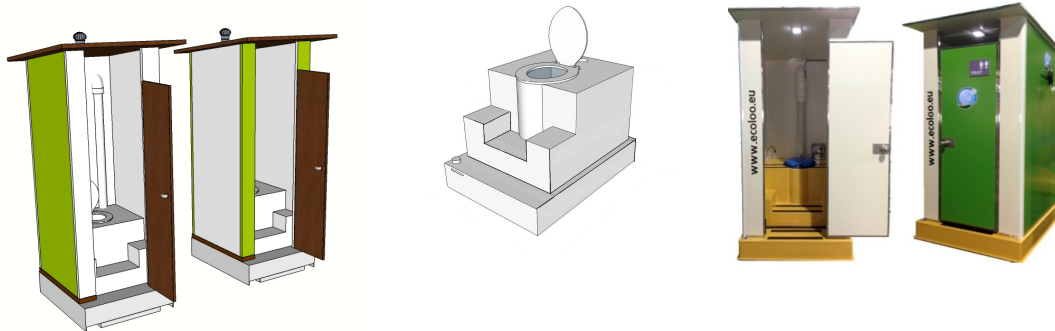


Figure 1-1: ECOLOO Sustainable Toilet Technology

### Details of Methods

ECOLOO sustainable toilet system involves the collection of waste and the treatment of both solid and liquid waste, using special formulated bacteria. Water is used for hygiene purposes instead of flushing. It can be used for both family and community in urban slum areas, public events, hospitals, schools, construction or mining sites or residential areas. It can be located both indoor and outdoor. The technology has started mass production after several years of research.

ECOLOO base is made of a 2-tier chamber: the upper chamber is where human waste including urine (not urine diversion system) is collected and treated by specially formulated bacteria whilst the lower chamber is where the natural fertilizer in liquid form is rendered to by gravity using no water to flush. The lower chamber is built with a special indicator and outlet for end users to collect the ready-to-use end product each time the lower chamber is full.

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The liquid from urine will undergo a process called nitrification, generating nitrite and nitrate that is salt, causing a natural disinfection and this will go into the permanent filter bed inside the bottom chamber. The end product is partly a brownish liquid fertilizer ( $\text{NH}_4\text{NO}_3$ -ammonium nitrite & ammonium nitrate) rich in nutrients and free from odor and pathogens (organisms generating diseases).

Everything will be treated biologically as fast as 2 weeks or less. The whole process concomitantly renders urine odor free and pathogen free and yields organic fertilizer without contamination and full of nutrients, safe and ready to be used for agriculture. In other words, the plant nutrients in our body waste will be processed without any addition of heavy metals or chemicals from sewers. The solid waste will eventually turn into ashes, killing all the pathogens.

Fresh water can be supplied to the water tank to be used for 1) hand bidet for washing or hygienic purposes (not for flushing the waste) 2) hand wash basin where water used is collected in a separate tank namely gray water, which later will be purified using a Swedish ecological purification technology. The purified water is pumped back to the water tank, which is located above the gray water tank in order to use the power of gravity to supply water to the hand bidet and hand washbasin.

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The flow chart of the eco-system of ECOLOO Sustainable Toilet Technology is shown in Figure 1-2.

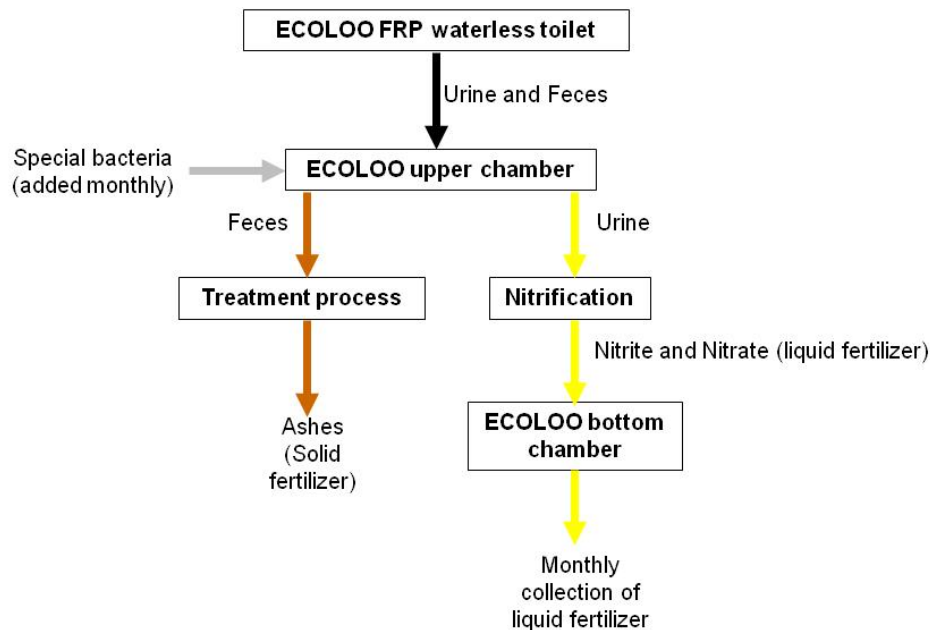


Figure 1-2: Flow Chart of ECOLOO Sustainable Toilet Technology

### BUSINESS MODEL

Motto: “make sustainable business out of shit”.

**Our innovative approach** is educational, entrepreneurial, environmental and socio-economical.

**Our business approach** creates sustainable business opportunities as social business investors put their profit or return of investment from the business back into the business and support sanitation causes. At the same time, ECOLOO will reduce poverty through the creation of job or business opportunities to the local producers and service providers through maintenance services and organic fertilizer buy-back sell-back recycling system that lead to environmental and socio-economical sustainability.

ECOLOO also gives toilet owners passive income from the maintenance services, toilet advertisements (inside and outside ECOLOO), fertilizer buy-back and attached convenient store with our kiosk and shelter concept.

Our inclusive social business model will have positive domino effect when investors put their profit or return of investment from the business back into the business to provide the support for sanitation causes and help reduce poverty through our job or business opportunities and natural fertilizer buy-back system and achieve environmental and socio-economical sustainability.

Producing our sustainable sanitation system in developing countries such as South Asia will have a significant added value to all parties, creating more jobs, business and export opportunities and economical growth, taking into consideration that water, sanitation and hygiene (WASH) are increasingly required globally.



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**Our educational approach** will educate individuals especially those in the rural areas through awareness campaigns, green activities, train the trainers, WASH & ECO related training and camps, exhibitions, seminars and workshops on the importance of waste, water, sanitation, hygiene (WASH) and environment.

Our cost to produce the eco friendly toilet with added value is minimal compared to others especially those in the developed countries such as Australia, New Zealand, Europe and North America.

We have identified an esteemed fiberglass manufacturer in Malaysia to make this happen and we shall start designing, purchasing moulds and producing 200 up to 1000 units a month based on the demand we received after we did our presentations across the developing countries such as Malaysia, Indonesia, Myanmar, Vietnam, Mongolia, Philippines, Kenya, Somalia, Uganda, Botswana, Peru, Nepal, India and Canada.

To manufacture new master patterns (from updated design) new LRTM moulds with the price inclusive of the outlay of the new master patterns and moulds spread out over either 500 or 1000 parts. The entire mould is estimated at RM50,000 up front with cheaper parts. Spreading the cost of moulds over the production run is much more cost effective.

The FRP parts come to estimated total of USD 500 per toilet if mould cost is over 1000 but with minimum orders need to be made. This method can achieve high numbers in short time frame with better product being supplied to the end user. Total gains from the product sales including fertilizer can go up to USD 1 Million.

It has been our vision and mission to contribute a better environment by offering affordable sustainable toilet solutions and services to every household and generating passive income with the help of our social business partners, CSR companies, non-profit organizations and big foundations.

Installations of our sample units have been done and running successfully worldwide in Sweden, Malaysia, Mongolia, Nepal, Kenya, Korea and Germany (TOI TOI).

## **RESULTS AND CONCLUSION**

### Summary

Our sustainable sanitation technology is based on innovative, unique development that current competitors never implemented in their solutions. It is a permanent, long term, non-polluting and on-site waste treatment solution, and the best alternative to flush toilets, sewers and 'sewage treatment'. Our eco toilet saves 90% of the cost of waste transportation that helps reduce carbon emission. There is no odor, no sewage or toxic sludge and no water required or polluted. Our sanitation system provides an alternative and ultimate solution to the world's sanitation issues.

### Our Findings

Our process in our products is 20-30 years and the life cycle is almost 60 years. Disposal of the products after 60 years will have a minimum impact on the environment, thanks to the environmental friendly raw material used in the production, which is viable economically, and sustainable environmentally.



## ECOLOO: A Sustainable Toilet Solution for Urban & Rural Areas

Other relevant research findings show that there are other sanitation solutions around the world as our competitors. However, most of the systems in the market may be very expensive, require maintenance, consume lots of energy and/or water, or use ineffective biologic process or worms to treat the waste. In locations like China and India, their sanitation issues are still unsolved.

### The significance and implications of the work reported

We strongly believe that our sustainable sanitation solution we offer is going to have a huge potential and a positive domino impact on environment, poverty, health, water, energy, women, dignity, organic agriculture, food security and quality society, well being and stability in many ways; especially if we engage social entrepreneurs, CSR companies, NGOs, NPOs, UN, development programs and banks, and many others on top level, in the process.

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