

# GREEN VILLAGES



**WELCOME**

TO GREEN VILLAGES

*durable & sustainable -*

*Green Villages is a concept to make use of the  
absence of infrastructure in informal settle-  
ments to provide basic services with a  
business model starting in Namibia.*

## *At first*

In Namibia, rural to urban migration comes with challenges. Municipalities and cities are faced with an increasing number of people who move to urban areas in search of a better life and opportunities. These new citizens are forced to live in informal settlements, where living conditions are tough. Basic services like water, sanitation, electricity and proper housing are unavailable. Most municipalities and cities consider these new citizens a burden; they are seen as people who demand social services (such as a safe and healthy living environment) while not paying any taxes.

The traditional manner of city planning in Namibia seems inappropriate when aiming to meet the above mentioned basic needs. Traditionally, each household owns or rents an erf on which a house can be built, rented or bought. Through houses on these erfs, one can access services like water, sanitation and electricity. However, water is scarce in Namibia and electricity expensive. Too expensive for most households. We estimate that it will take at least twenty years before everyone in Namibia has enough income to buy or rent an a house with services. As a result, almost 500.000 people will not have access to a decent toilet, clean water and electricity at their place, for another twenty years..

A sewerage system is a big investment which will take 40 to 50 years to pay off. Besides, a lot of water and energy is needed for it to function properly, thus remaining costly for its users.

Luckily, alternatives are available that do not require big investments and are affordable to people with a low income in the informal settlements. We have come up with solutions that are affordable, sustainable and environmentally friendly. Besides, our solutions create jobs, indirectly reduce violence against women and children and decrease the necessity for medical treatment.



*Let us focus on the main basic services:  
sanitation, water, electricity and housing*

## *Sanitation*

Human waste has been used for centuries as a fertilizer, for instance in densely populated cities in China. For this purpose, human waste was collected and in those cities it was a respectable job to fulfill this task. Also in other cities, (local) governments or private companies provided this service, though only to middle and higher income classes. Those unable to access these services were forced to dispose of it in canals or on the streets. This caused a high mortality rate through the spread of contagious diseases. Due to the intervention of medical doctors and liberal entrepreneurs, governments solved this problem by introducing various systems to collect human waste. The most popular one was the sewerage system based on water: An expensive system to build and maintain but very satisfying to its users. It took over a 100 years before this system was fully functional. The Netherlands and no alternatives were needed anymore. Although The Netherlands is one of the richest countries in the world, most local governments and water boards struggle to provide this service at an affordable price. In most African countries, however, sewerage systems are largely unavailable and people often lack financial means to pay for the investment and maintenance themselves. There is an alternative, though, that offers a decent toilet for an affordable price. The key issue is the separation of urine and feces through a so-called dry toilet: A properly designed dry toilet automatically separates human waste into urine and feces. The combination of both is what makes it smelly and inappropriate for recycling. Separated, however, urine can be treated and used as a fertilizer while feces can be used as compost.

Importantly, a dry toilet allows for a mechanical collection. This is an important cultural aspect, since most people do not like to work with human waste.

### *Having a decent toilet means*

- A more dignified life
- Less contagious diseases and extend of life expectations ( in a lot of informal settlements almost 50% of newly born don't reach the age of 5 years )
- Less harassment and sexual abuse of women



## **WITH “OUR” SYSTEM YOU CAN ADD TO IT THAT IT’S**

**-LOW COST AND AFFORDABLE FOR  
ALMOST EVERYBODY**

**-NO COSTS FOR INFRASTRUCTURE  
AND OVERHEAD FOR ENGINEERS**

**-NO OR VERY LOW MAINTENANCE  
COSTS**

**-NO UNDERGROUND WATER CON-  
TAMINATION OF NITRATES**

**-PRODUCES VALUE BY SELLING  
STRUVITE MADE FROM URINE AND  
COMPOST FROM FECES**

**-CREATES JOBS**

**-GIVES OPPORTUNITIES TO GROW  
CROPS AND VEGETABLES AT LOW  
COST BY USING STRUVITE AND  
COMPOST**



EXAMPLE: OTJINENE, NAMIBIA

250 TOILETS PLACED  
INCREASE SANITATION  
LEVEL RESIDENTS  
REDUCTION IN GROUND-  
WATER CONTAMINATION  
REDUCTION OF SEXUAL  
HARASSMENT  
EXCRETION IS NO LONGER  
A WASTE PRODUCT

THE UPPER STRUCTURE IS  
ADJUSTABLE AND CAN BE  
MADE OF WOOD, PLASTIC,  
BRICKS, CONCRETE ETC.  
OF COURSE THIS WILL IN-  
FLUENCE THE COSTS

THE COST PER TOILET ARE  
APPROX. € 820. WE EX-  
PECT THAT THE ENTIRE  
PROCESS (I.E. COLLECT-  
ING URINE AND FECES, AS  
WELL AS PRODUCING AND  
SELLING STRUVITE AND  
COMPOST) WILL DEMAND  
THE EMPLOYMENT OF 3-4  
PEOPLE PER TOILET.

# *Water*

Water is life. One needs water to drink, cook, clean, grow food, garden, etc.. For a human being, the consumption of water is essential to survive. Water safety, supply and distribution is in most countries in the hands of government and delegated to government owned businesses. In Namibia, the distribution and selling of water (just like electricity) is one of the main income resources for local government. A decentralized solution for water supply is therefore not very attractive to them.

Water in informal settlements are mostly distributed through a water line and tappoints at some strategic locations. Here, local people buy water in 20 liter cans or containers and have to carry it to their homes for 100 to 500 meters. The water is relatively expensive (the price per liter through a private water connection is significantly lower) and for elderly and disabled people you need a strong social network to provide water at your house. Harvesting rain water at several levels is an affordable solution for most settlements. Introducing a low cost and low maintenance filter system can bring clean drinking water to a lot of households that are now depending on others.





# **WATERGUARD®**

Waterguard filtration systems are designed and constructed with a **standardized** and **modular** approach

## **STANDARDIZATION**

Standardized production and design ensure simplified service and decrease maintenance costs substantially.

## **UNIFORMITY**

Uniformity in products ensures confidence and increased cohesion between technology and end user

## **LOW ENERGY CONSUMPTION**

Our systems are very energy efficient making sure that the use of solar power is always an option.

## **WATER SOURCES**

Our systems are usable with all types of water sources.

## **RE-LOCATABLE**

All our systems are re-locatable, no use of traditional materials like concrete or bricks.

## **SCALABILITY**

Our systems can be scaled up and down, being able to adapt to changing needs.

## **AFFORDABILITY**

Our systems have decreased maintenance costs and due to standardized production decreased investment costs.

## **RE-USABLE**

Our systems are reusable with only slight depreciation.

## **DO IT YOURSELF**

Our systems are available in a DIY kit.

## **WORLD WIDE SHIPPING**

Our systems can be shipped worldwide from the Netherlands

# WATERGUARD®



Stand alone water purification system for piped water improvements, rainwater and clean surface water. 100 % guaranteed barrier against legionella, bacteria, micro organisms and viruses.



Modular design and the capacity is up scalable from 2 up to 7,5 m<sup>3</sup> per hour, depending on the growth of the demand. The automatic cleaning program flushes the membranes regularly and ensures the filters are working under the right pressure. The unit is nearly maintenance free and benefits from a low energy consumption.

# WATERGUARD®

Very robust and durable system, constructed in a easy to handle skid for temporary solutions. Adaptable and movable for use in situations where

a temporary water supply is needed or as a pilot to test out the UF8-64 system mechanics. Comes with a mounted backwash tank. Can produce up to 50m<sup>3</sup> of water per day.



Collecting water can be done in several ways. One option is to use main roofs from government buildings like schools but also supermarkets to collect rainwater. Other options like private houses but also nature given solutions must be considered. Each village or settlements needs a tailor made solution. But with the standardized and modular approach each solution is available.





# *Electricity*

Depending on the request of electricity we can provide a fully scaled offer. We can start with a kit that consist of a portable solar panel, a usb power bank and small electric usb tools, such as a light and a fan. With this people can have light and charge their cellphone(s). They can also start small businesses like charging cell phones.

The second step is a solar panel, 1 or 2 batteries and a converter. With this kit, people can use a TV set and a small cooler or fridge.

The last step is multiple solar panels, a battery pack and converter. Such a kit could be used by more than one household. We are currently working on the re-use of battery packs of electric cars. ( 6 MW )



# *Housing*

Flexbuild is a special form of corrugated steel plates. The plates are 26 mm thick and have a strong coating and allows for a highly flexible and modular manner of building. Compared to traditional building materials for houses such as bricks, cement and wood, Flexbuild is light, strong and easy to transport. Besides, the material can easily be reused, once the original construction is no longer needed. Flexbuild can be used to provide::

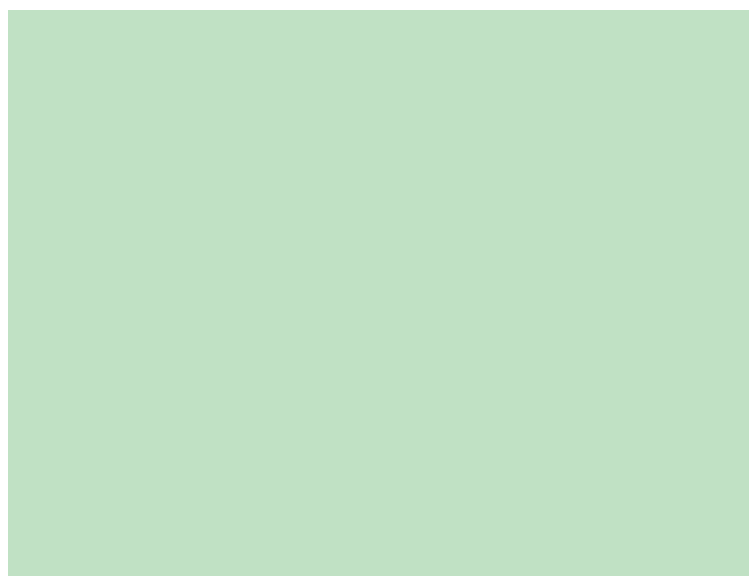
- Water supply tanks from 1,5 – 30 metres
- Manure storage ( 1,5- 30 m )
- Water treatment and purifying systems
- Silo's for seeds and wheat, unions, potatoes etc.

But it is also excellent material to build :

- Houses ( even temporarily )
- Company buildings
- Offices, schools, emergency hospitals
- Water towers
- Kiosks
- Toilets- showers
- Swimming pools

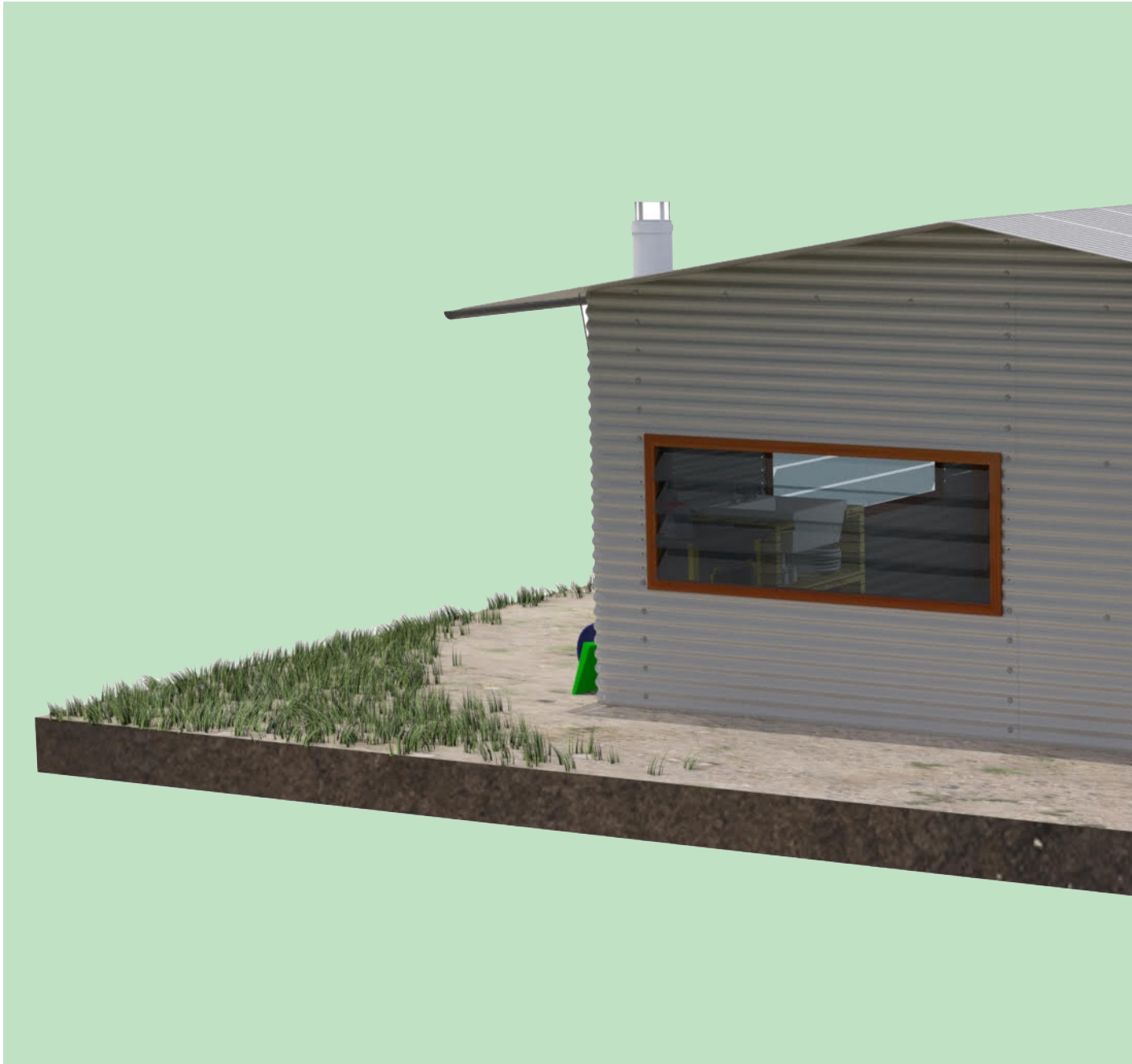
Flexbuild has many advantages compared to traditional solutions, such as (but not limited to):

- Fast delivery
- Build yourself package
- Fast building time
- Removable , expendable
- Easy to clean
- Fire proof
- Very affordable
- Durable and wind-storm proof
- With ecological ventilation system
- Possibility for chimney
- Possibility for isolation





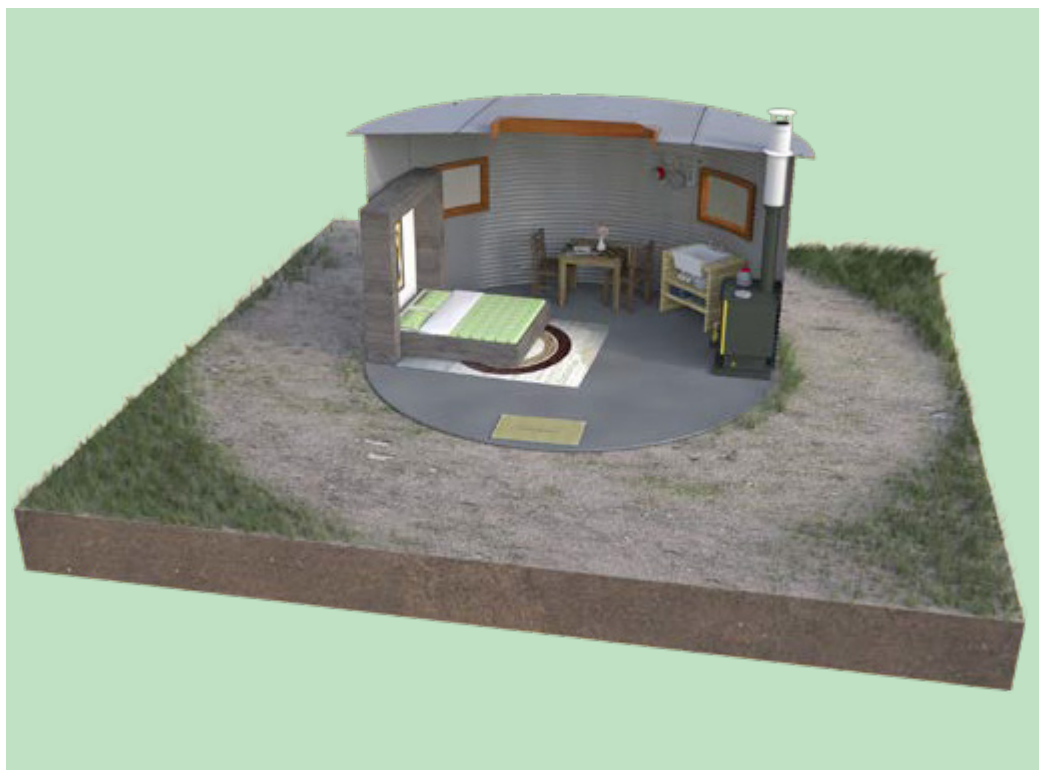
### *Example 3 - Square house, single floor (36m<sup>2</sup>)*





Building houses generates a lot of employment and economic activity. The houses we offer are very basic and need to be customized to the needs and possibilities of the owner. Doors, windows, beds etc can be made locally, which has the potential to create jobs.

## *Example - Round house single floor*



## Example 2 - Round house double floor





## *In addition*

We already mentioned the grow of crops. Groups of people can start their own garden and grow vegetables for their own use or for the purpose of selling them. A well developed system is functioning in Namibia with plastic bags containing soil and a dripping system. Growing crops in regular soil is difficult. With controlled water supply and healthy soil its possible for a community to be self sufficient with regard to food.

Another very usefull application is a wood-stove (Ezystove) . Currently, people cook their meals on open fires. This is very inefficient and unhealthy. See the figures of the benefits of a woodstove in the appendix. It saves lives, lots of wood and time .





# A BUSINESS PLAN

*We believe on the basis of experience that people in Namibia prefer to buy houses and are willing to invest when they have legal security of their property.*

*Municipalities and villages own most of the land suitable for housing. They also have a strategic reason to be part of this green village concept. The future holds decentralized power- and water production. Namibia has excellent opportunities for renewable energy like solar and wind energy. When this energy is generated privately, local government will lose its main source of income. The same goes for the income through the provision of water, should this be privately produced.*

*Our aim is to create a small village that can be seen as an example and can be copied and pasted easily. We want to start with 50 or 100 houses in different types and prices.*

*We aim to reach the income group with a monthly income of N\$ 1000 – N\$ 3000. We believe this group will include 75% of the population now unable to buy a house with a loan from the bank.*

*Prices depend on the location (transport costs) and depend on the currency rate changes. Also costs for instructing, layout and .... vary between € 1000 - € 2000*

*project Greenvillage*

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