

The Loop

Regeneration Service Station

Summary of concept

The regenerative service station aims to connect the human body and experience to the cycles of life, and give the human a role to manifest bio-diversity. We live in shame of our bodies and our natural systems, and our societies does it's best to hide the very natural part of a ecosystem that is pee and poo. The Loop takes great care of this resource, and with its help, we can see life spread around us.

The service station takes care of human daytime needs. We need to eat, pee, poo, keep ourselves clean, meet people and enjoy our place in the world.

Our toilets dehydrates feces, and after a few months, pathogens have died off, and it's ready to fertilize our tree plantations. Our pee is mixed with water and pumped as fertilizer through the hydroponic gardens, stationed along the top of the wall, that swirls through the landscape. Water runs down to a sludge bed that filters out any large parts, then to be collected in a filtration pond, from where it is recirculated through the hydroponic system and kept healthy.

Solar power provides pumps, kitchen, light and network with electricity. Sensors and automation is tweaked to make the system act like a living organism that regulates it's intakes and outputs.

Meals are prepared in the kitchen and people enjoy time eating and being together in the shade of the wall, among the intricate gardens that surrounds it. Food scraps go to compost, dish water to the filtration pond, and every resource is reused and recirculated.

The wall of itself is a brush stroke, a path of a snail traveling over the land, an abstract geometry of both movement and stillness. Made with straw and clay, built to stand for generations, the swirling wall befriends the land it rests upon, merging in harmony with the dry sand.

And from this wall, life starts to grow.

Materials and dimensions

Wall structure

Footprint: 83m x 33m

Height: 6m peak (excl tower)

Width: 3m

Greenhouse

150m²

Gardens

2000m²

Technology used in design

Dehydration toilets

A solar heater warms air that is pumped by fan down into the container under the toilet seat to dry the faeces over 6-24 months. Air outlet's through a chimney. Pee is separated into a container that is connected by plumbing and a pump to rooftop garden. The toilets are illuminated by sunlight through small tunnel windows during the day, and led lights during the night.

Hand Washing station

Above each of the several basin there is a pipe with a valve that the user twists to let the water flow over the hands down into the basin. Eco friendly soap dispensers are placed by each basin. The basins have a drainage pipe leading to the greywater treatment ponds. The water comes from the water reservoir on top of the wall.

Reservoirs

1# 1m³ well water for kitchen, dishes and hand washing

2# 1.5m³ filtered pond water for bath house

3# 0.5m² Urine for plant fertilization

The wall

The main building material for The Loop is a straw-clay construction supported by wooden joists. 80% of the volume of a straw-clay construction is straw. Then low quality sand/soil and water that can be harvested locally, maybe even at the Fly Ranch property, at low costs. We are planning to use a specific quality of clay and wood that needs to be bought from building vendors. This technique is cheap but needs lots of hands and uses heavy machinery such as concrete mixers, water/clay pumps, tumblers, scaffolding and an excavator. The thickness of walls will vary between 25-50cm in different places in the building. The wall houses the toilets, kitchen, data central, storage et.c within itself.

Plumbing

There are four different water systems.

1# From filtration pond to greenhouse section 1.

2# From filtration pond to greenhouse section 2.

3# From natural pond to bath house.

4# From well to cistern above kitchen

5# From baths, dish washing and hand washing to sludge bed and then to water filtration pond.

6# Urine from toilet to reservoir on top of wall.

1#, 2#, 3#, 4# & #6 have separate pump stations

Power

Solar panels are mounted on the southern walls of the wall. A battery park is stored within the wall. Used for illumination, water pumps, charging stations and power outlets.

Automation, network and data

Water and urine pumps are calibrated and automated to match the demand from each module. Sensors are equipped in the green houses, gardens, water filtration pond, urine storage, bath house and other necessary places. Data is collected and compared user rates, weather, crop yields, climate and other usable factors to analyze and improve automation. Wifi is provided within the area.

Gardens

Water from the water filtration pond is pumped to the gardens through pipes. Flower beds and bushes sourced mainly from local flora stretches out and surrounds the wall and stretches further and further into the wilderness each year.

Trees

Same as gardens, but also creates shade and spaces for activities. Provides fruits.

Sludge reed bed

1# On the ground by the filtration pond. Takes care of greywater from dishwashing, bathing, hand washing and other sources 2# & 3# On top of the wall, filtering water before it goes into the greenhouse.

Water filtration pond

Collects water that is being circulated through sludge beds and greenhouses.

Greenhouse

Contains hydroponic plantations of edible crops. Situated on top of the wall. Built in irregular geometric shapes. Roof of polycarbonate and steel/aluminium. Water is mixed with urine, goes through a sludge bed, a filter, and then to hydroponics.

Kitchen

A relatively simple outdoor kitchen large enough to cook for 100 people. Induction heating stoves, ovens, pots, pans, utensils, storage shelves, cabins, boxes. Large enough for a staff of 7 people.

Furniture

Foldable chairs, tables and permanent benches and tables enough to seat 100+ people. Parasols, clothes hangers, storage areas with cabins, shelves etc.

Dish washing station

The dish washing station can care for 100 people plus kitchenware. It consists of basins, drying shelves, water inlet and outlet, bio degradable soap, spray bottles, natural fibres for removing oil, spray bottles for applying water and soap. Accommodates 4 people at a time.

Bath

The bathhouse resides within the wall by the pond. It is circular in shape and can hold up to 20 people at a time. At daytime water is heated through solar heating. At night it is heated through a large wood burning stove. Water from ponds are filtered. Contains 8 showers.

Rainwater harvesting

Rainwater is harvested, filtered and used for dish washing or taken through a uv/solar disinfection process to produce drinking water. .

Recycling station

Waste materials are divided and stored for reuse and repurposing. What cannot be used is recycled in the traditional way of the state.

Compost

Food scraps from the kitchen and dead plant material from the greenhouse and other non-toxic organic material is composted.

Fertilizer

Compost is mixed with dried faeces to fertilize trees, flowers and bushes. Urine is mixed into water to fertilize all plantations.

Well

A well is dug close to the kitchen area to provide clean water for cooking et.c.

Town Bell

A tall tower on top of the wall in the kitchen end of the space. Pull a rope to ring the bells and bring everyone in for food.

Operation and maintenance

- Compile and analyze data from systems. Adapt system to weather, climate, usage rates and unforeseen events.
- Manually mix and distribute fertilizer.
- Gardening, evaluation and improvement of bio-diversity.
- Hydroponic planting and harvesting
- Event management
- IT service
- Power system service
- Plumbing service
- Checkups at least every third is necessary, but every day is recommended.

Activities the design supports

- Bathing
- Cooking
- Peeing
- Pooping
- Washing hands
- Meetings, workshops, conferences
- Eating
- Growing food
- Shelter
- Gardening

Strategy for prototype implementations

We will test a few main function of the system by constructing a clay toilet, small hydroponic greenhouse, sludge reed bed, filtration pond, hand washing station and a small bath or shower. The toilet includes solar powered dehydration system and storage for urine and faeces. Including pumps and plumbing.

System data & budget

Power		
kW use per day	5.55	
Solar capacity	3kW, 700A, 24V	
Budget	Construction	
\$Total	657500	
Fluids & solids	Average per day	m3 per year
Created		
Faeces	40	15
Greywater	5320	1942
Dehydrated faeces	12	4
Urine	150	55
Cycled		
Cycling water	15000	5475
Output		
Watering gardens and trees	4000	1460
Evaporation	200	73
Consumed by cooking	560	204.4
Excess - to natural pond	550	200.75
Intake		
Well	3320	1211.8
Natural pond	2000	730
Rainwater	50	18
Yearly greenhouse yield kg	2100	
Yearly fruit yield kg	990	
Total edible yearly yield	3090	

Environmental impact

The Loop as a concept, construction and management has been designed as a regenerative system, integrated with the surrounding ecosystem.

Building materials

The main building material is sand-soil, clay, straw and wood. 75% of the mass is sand-soil that can be harvested from Fly Ranch, that reduces energy for transportation to a minimum. Clay, straw can be from the local market. Wood and other materials need to be supported from a national market. Over a long period of time, the energy production of The Loop will surpass that of the energy used in constructing it.

Increasing local biodiversity.

Local and non invasive plants are used. The goal is to significantly increase biodiversity in both flora and fauna by adding nutrients, water and plants to the land and keeping them alive. This is the main “payback” to the environment, to increase biomass, and surpass the amount of biomass sacrificed in the creation of the construction materials used.

Running operations.

The operation of The Loop is a open-looped regenerative cycle. Water is harvested and cleaned, used and cleaned again before going back to nature. Nutritions from food-waste, pee and poo become fertilizers for trees, hydroponic and perma-cultural gardening. The energy used for drying the poo is from solar-energy, likewise electricity needed is coming from solar-panels.

Discontinuation

All “artificial” materials can be removed easily, leaving only the wall, which can stand for hundreds of years. Or be demolished into gravel.

Construction phase

During construction heavy machinery and many feet will need to move across the land. A 300m rudimentary road will appear to connect The Loop with road 34. Hopefully we can gather a huge amount of volunteers to build the wall together, and somewhat decrease the need of machinery.

Ground scars

Since large amounts of sand-soil will be extracted from the local area, ground scars in one form or another will be inevitable. The location of where and how to harvest sand-soil will be determined so that it has a minimal impact on the land. Collection of sand-soil can be made in collaboration with project that needs to remove soil to construct fundament for buildings et.c.