# EARTH-UNIT

## ...a sustainable habitat

**EARTH-UNIT TOWNSHIP**
**-GREEN BUILDINGS**
**-GREEN HOMES**
**-WATER CONSERVATION**
**-SOLID WASTE MANAGEMENT**

**AUTHOR:**
**SAAF**

**ARCHITECTS:**
**STREET-HOUSE**

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## A note from the Architect

On 17th November, 2017 I was asked by the Executive Engineer of Municipal Corporation, Kota (Rajasthan) to meet Municipal Commissioner and Smart City CEO of Kota, Rajasthan Mr. Vikram Jindal (IAS) regarding the project Rejuvenation of Sajidedah nallah which is situated in close proximity to the river Chambal in the heart of the city of Kota, Rajasthan.

During the meeting he shared his views and was fascinated about the project designed by my architecture studio- STREET-HOUSE and wanted us to design its extension, Phase-II as well, before I could have thanked him there was an objection from a Lady sitting next to me raising issues related to water treatment and in-effective STP that was supposed to be proposed at Nallah and River junction as per my design. She suggested instead of STP, Green Bridge should be proposed treating storm water with eco-friendly methods will be everlasting.

To avoid any further heated debate between Mr. Vikram Jindal and the Lady, I intervened and said –"She is right, we can work on this option as well", later we shared each other's contact details and I met her same day in the evening at her office.

The meeting turned out to be a life learning lesson towards an idea of a Zero waste economy. The Lady I have been talking about is *Dr. Susan Raj,* author of the **EARTH UNIT**, inspired me to design and bring this idea on board for builders, developers, government organizations, NGOs.

**Gaurav Chaurasia**
**(B.Arch., NIT Jaipur)**

**Principal Architect**
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## Certification

**Name:** Susan Raj
**Date:** July 30, 2018

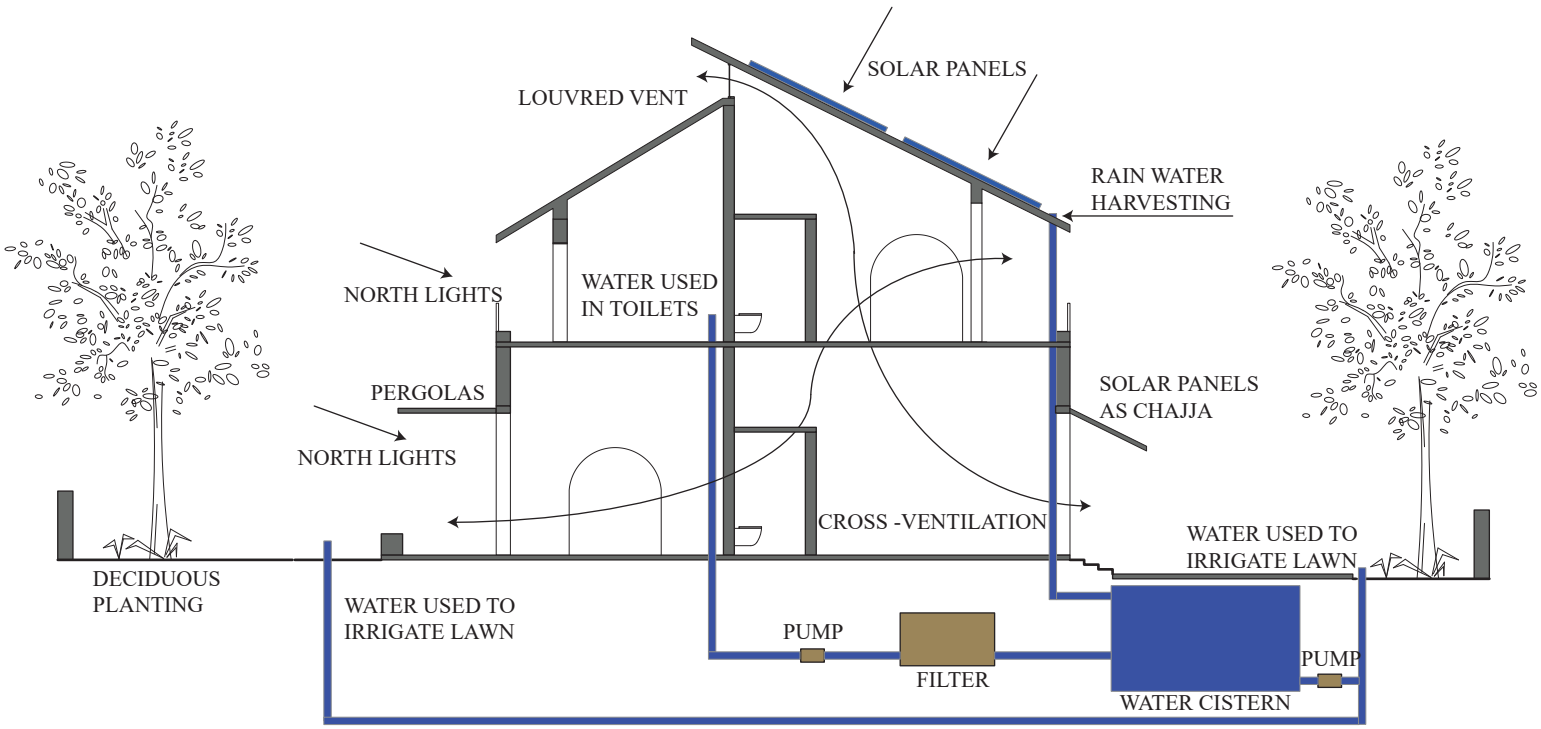
**File Image: Earth Unit Township**

# EARTH UNIT

**Definition:**
An Earth Unit is a human dwelling designed as per the earth principles of survival where every activity completes in a life cycle.
E.g., Kitchen Cycle: getting food home from the farm to reaching it back to farm as plants food.
A human goes through various activities and human dwellings are designed to accommodate these. Dining, bathing, defecating, sleeping, job/business, entertaining, etc., all must be done in cyclic motion. Materials used during these activities must complete its life cycle in such a way that the remaining part would become useful to other living beings which helps in the best survival of the user.

**Purpose and Need of the Project:**

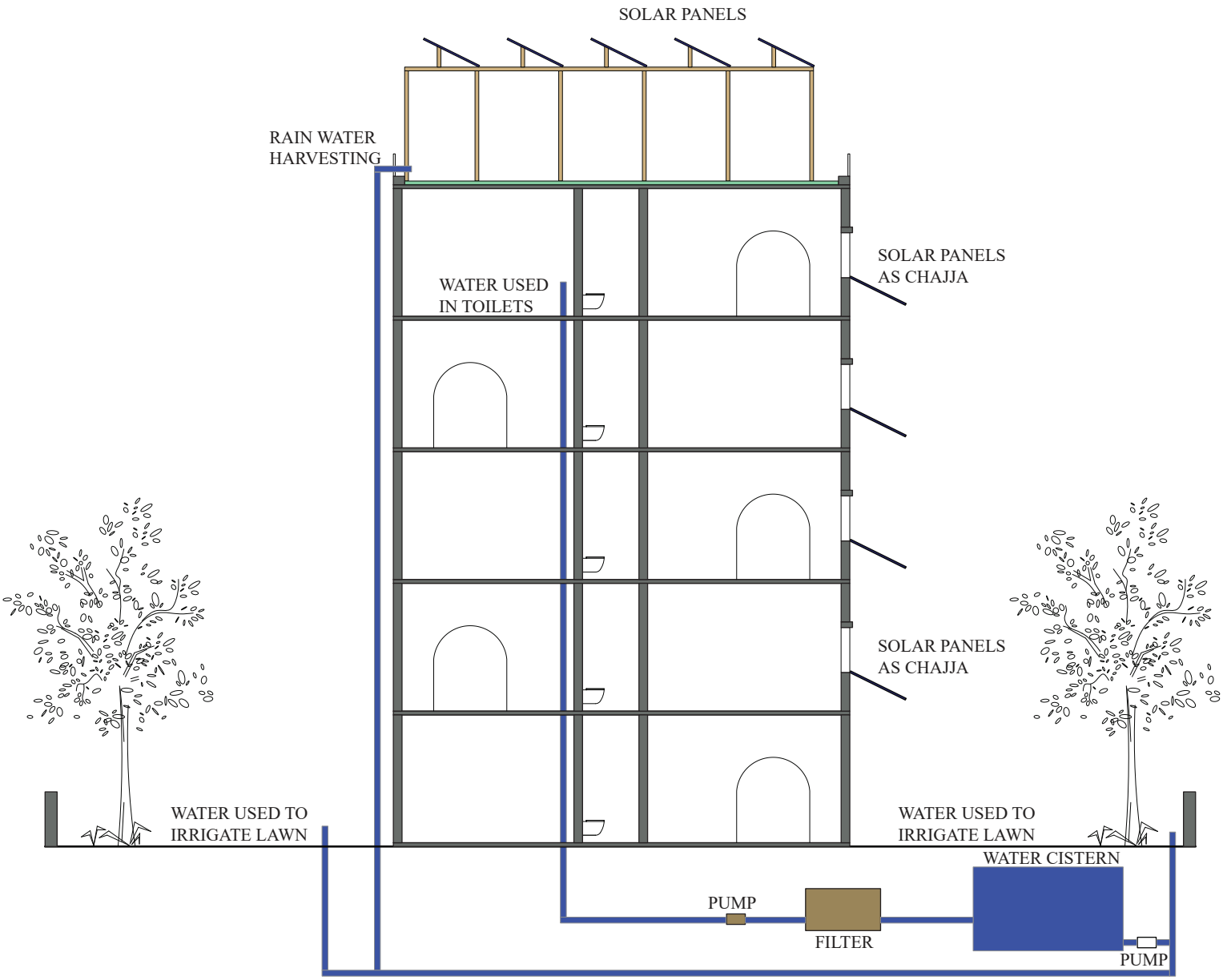
1. To reverse damage done to the environment due to various human activities happening, in the faulty designs of dwellings.
2. "Water cycle" - design of the dwelling ensures water recycling with soil scape filters or green bridges, water harvesting, and ground water recharging.
3. "Energy cycle" - all non-biodegradables and non-recyclables are used for energy production by Biomethanization/ pyrolysis. Here energy can be used as CNG or feeding back to grids. Combined with Solar, wind and tide energy also, as per its availability.
4. "Kitchen cycle" has kitchen designed for: washing, cutting, cooking, eating, grinding of remaining material, putting in bio-digester, which provides cooking gas back to kitchen, composting slurry gives a kitchen garden and the vegetable goes back to kitchen.




**File Image: Green-Homes-Concepts**

**How can we help you in making your building Green.....**

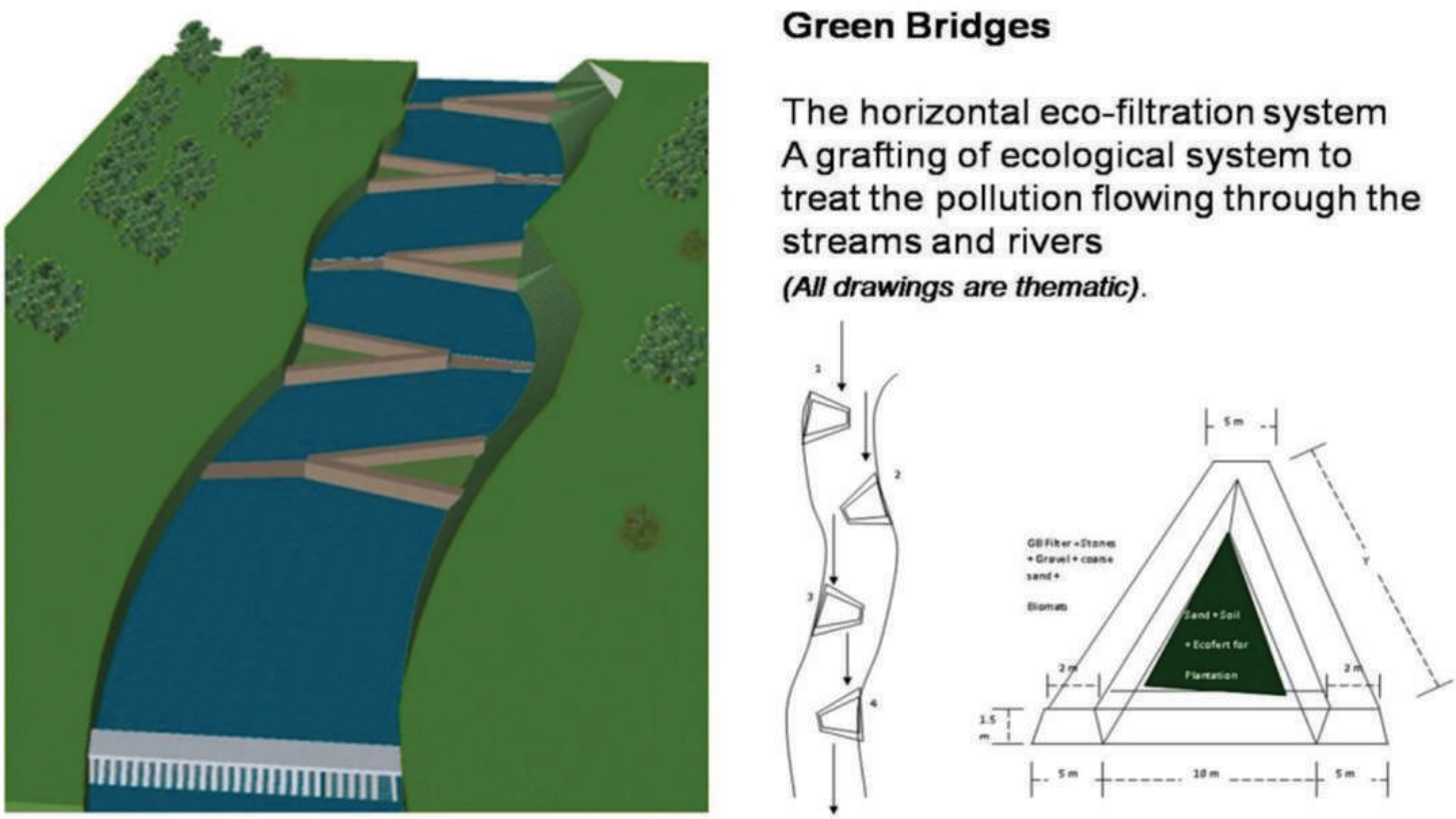
1. Rain Water Harvesting system on the roof can collect water to be used to flush toilets and watering plants in the garden.
2. Solar panels on the roof can be used to generate electricity and solar water heater can heat bath water.
3. Consider your house orientation to the sun to harness energy or to shield it from heat.
4. Rain water channelled into water butts can be used to water plants/ wash cars.
5. Use composting to reduce waste and help your garden at the same time. Most food scraps and biodegradable material produce nutrients rich fertilizers.
6. Wind turbine on the roof can be used to generate electricity.
7. A rain garden can help reduce storm water run-off.
8. Native landscaping requires less irrigation and maintenance.
9. Non-toxic paints should be used on the walls. These use water rather than petroleum based solvents and do not emit smog producing pollutants.
10. Use compact fluorescent light bulbs(CFLs) which use 20% less energy than incandescent bulbs.
11. Dual flush toilets help conserve water with controlled water outlet options.
12. High efficiency insulated glass windows reduce energy use.
13. Motion detectors can be used to switch off lights if there is no one in the room.
14. Energy efficient appliances reduce power use.
15. Use gray water from bath sinks, kitchens and washing machines to flush lavatories.




**File Image: Green-Building-Concepts**

## FIGURE CONSCIOUS:

1. Energy Savings in green buildings could range from 20%- 30%.
2. Water Savings from 30% to 50%.
3. A Green Building can cost between 5% to 10% more to build than a regular building but then costs can be recovered in just 4 years in power and water savings.




**File Image: Green Bridge Technology- SERI**

## WATER CONSERVATION: RECHARGING, HARVESTING AND RECYCLING

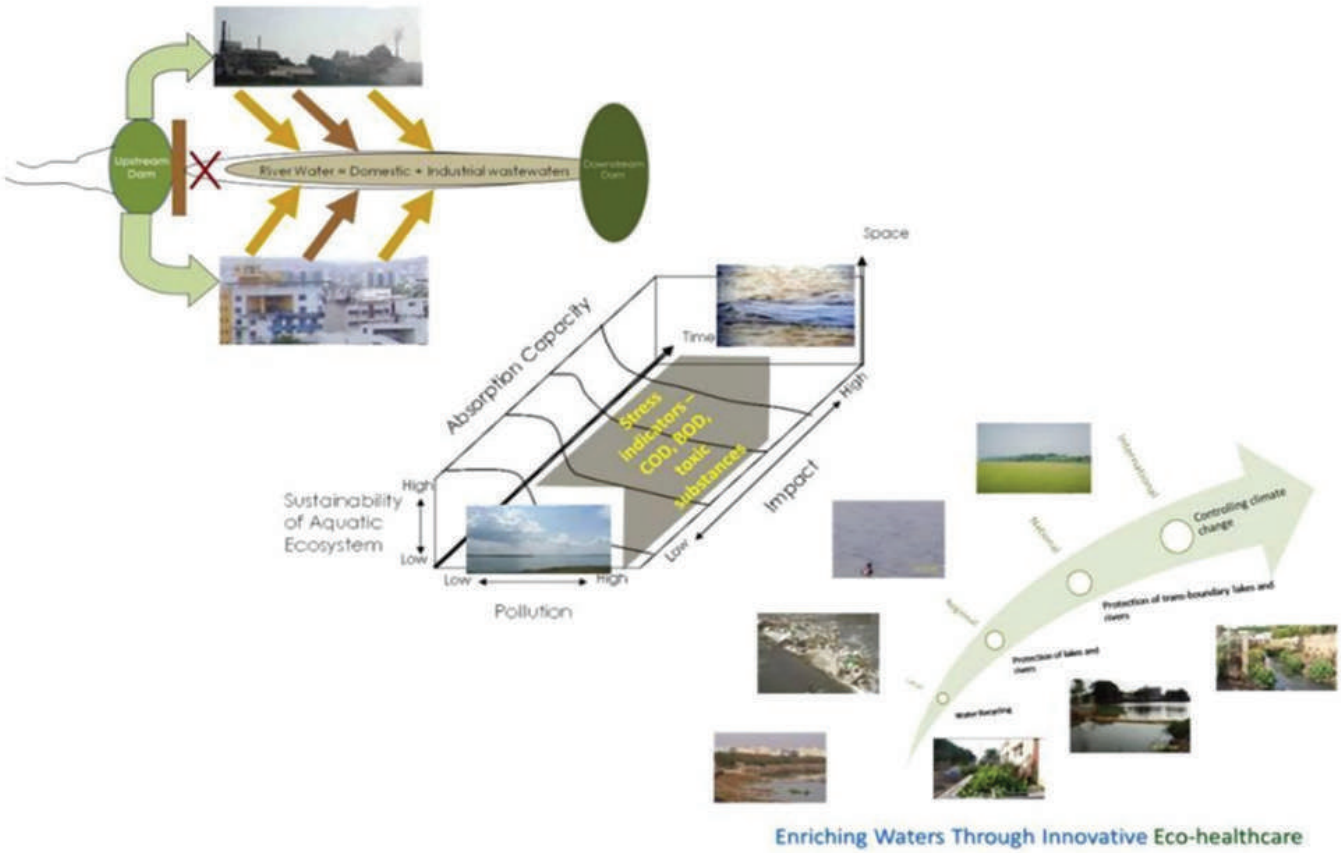
Eco-restoration of rivers and lakes is the revitalization of natural self-purification processes of water body by harnessing ecological systems with interactions and interrelationships of all biotic and abiotic factors of the defined microcosm destabilized by wastes generated by humans.

This is not an infrastructure project by any means as understood by all. This system – grafted ecosystem starting from detritivores - goes beyond the mechanistic approach of absolute values to purify the sewage and/or any toxic waste stream with breathing soils.

The crux of the ecological restoration processes is the eco-conversion of wastes into resources or by-products to be assimilated in the natural cycles of nutrients and energy, i. e. one's waste is another's food!

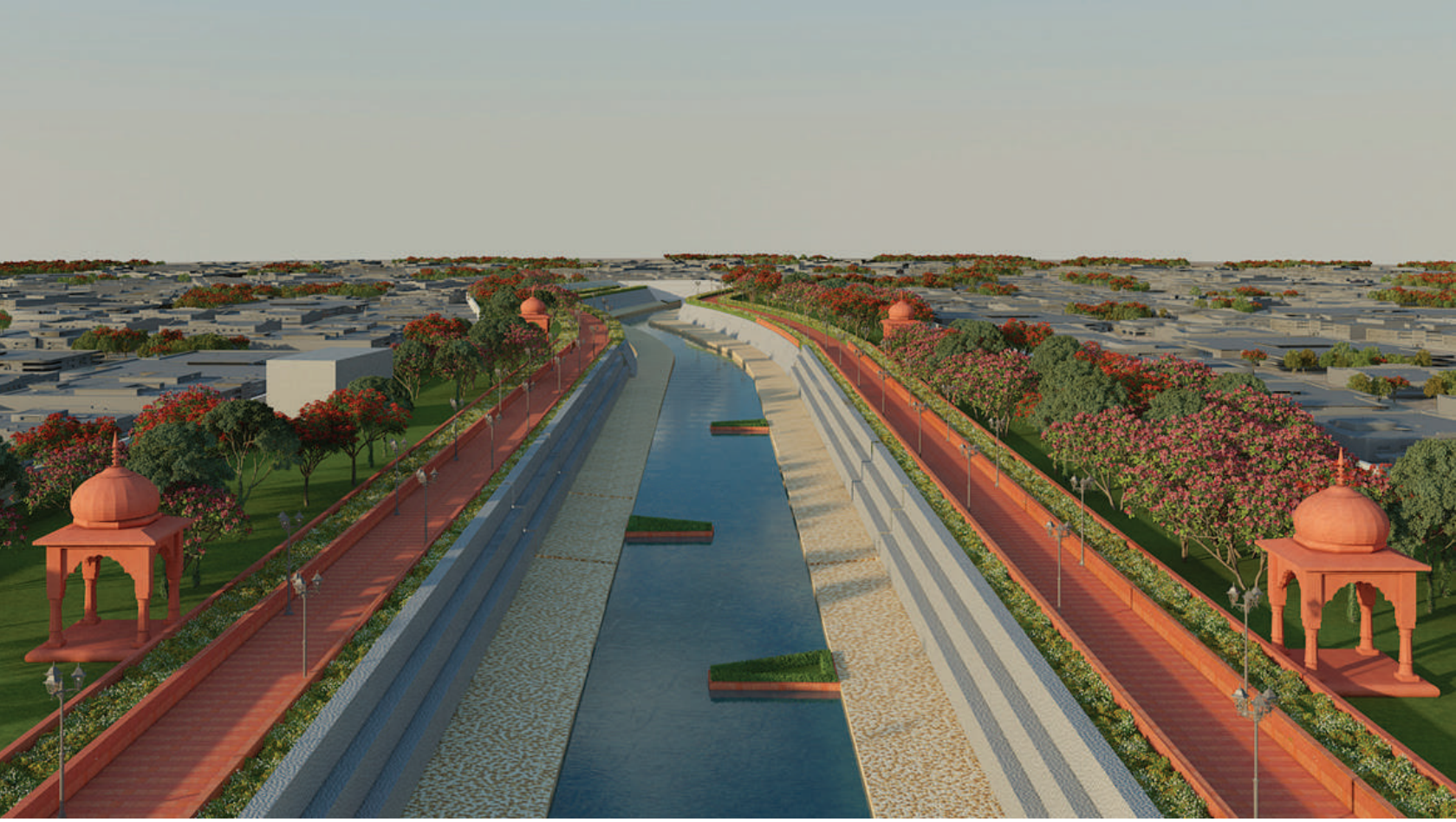
Ecological restoration of rivers and lakes using Green Bridge Technology deals holistically with the accumulation of the waste streams in the water body and not with individual streams in its catchment separately.

# Lentic-Lotic Water Systems Problems & Solutions




**Why Ecotechnology?**

1. No chemicals
2. No machinery
3. No electricity
4. No hazardous waste generated
5. 99% odour free treatment
6. 99% control of mosquitoes and flies
7. Helps reduce climate change (Green house effect)
8. Enormously space saving
9. Low investment
10. Minimal maintenance
11. Minimal operating cost
12. Short lead time
13. Fast return on investment
14. Single stage process, tailor made solution



**File Image: GREEN BRIDGE proposal for Sajidedah Nallah in Kota-Rajasthan**

## Ecotechnology in Water Conservation?

**A. Application of ecological principles to control or treat water pollution**

**B. Comparatively cheaper than conventional aerobic and anaerobic technologies**

**C. Phytoremediation - Use of green plants to remove, degrade and detoxify pollutants**

**D. Bioremediation - Use of microorganisms to degrade, convert, transform and detoxify pollutants**

**E. Ecotechnologies –**

1. **Soil Scape Filter (vertical filtration)**
2. **Hydrasch Succession Pond**
3. **Ecoscade**
4. **Green Channel for Point Sources & Green Bridge**
5. **Green Lake**
6. **Lake in Lake**
7. **Stream Ecosystem**
8. **Benthic Eco-system Treatment (BEST) SPOT for Non-point Sources of Pollution.**

**File Image: Birds eye view of the proposal for Sajidedah Nallah in Kota-Rajasthan**


URBAN IMPROVEMENT TRUST KOTA
PROJECT: REJUVENATION OF SAJIDEDA NALLAH
ARCHITECT: STREET-HOUSE

**File Image: Master Plan: Sajidedah Nallah in Kota-Rajasthan**

# SOLID - WASTE MANAGEMENT@ RESOURCE RECOVERY PARK

In Earth Unit Township includes a well designed Resource Recovery Park for a capacity of 1500 to 2000 Families.
For managing resource recovery a single such unit requires,
Vehicles: 8 Nos + 2 No (Spare);
Number of Workers: 32 Persons;
Number of Unit In charges: 8 Persons,
Number of Project In charges: 7 Persons;
Number of Project Head: 1 Person;
Dairy farm, poultry/Duck farm,
is connected to Resource Recovery Parks.
Dry Cows are shifted to adjacent shed where it continues to work for reducing bulk remains from the farms, vegetable markets and parks, into dung. All excess farm, forest residues, cattle shed wash, poultry droppings, non-vegetarian market remains etc. are reached to the biomethanization plant. Dead animal carcasses also are taken. The products from this plant are, animal and fish food, fertilizer (liquid & solid), and biogas which is scrubbed into bio CNG. Depending on the demand and supply, CNG can be used in vehicles or it can be used to produce electricity as additional with solar and other sources of renewable energy. A resource recovery park will have following varieties of production.

**A - Biodegradable items (more than 20 items)**
**B - Non-biodegradables (more than 120 items)**

**A - Biodegradable items (more than 20 items)**

**I. Products:**

1. Organic fertilizers (Liquid & Solid)
   Food production – from soil
   -Harvesting
   -Sorting
2. Transporting
3. Fresh supply
4. Storage – Weekly, Monthly, quarterly, half yearly, yearly, perennial storage
5. Packing
6. Supply chain – Bulk & Retail - Consumer
7. Soil preparation – Disinfection, inoculation of useful fungi
8. Plant nursery at Green-domes
9. Cultivation

**II. Food production from animals and birds**

a. Dairy and meat (Various mulching animals as per the regions)
b. Poultry & eggs (Various birds as per the regions)

**File Image: Birds eye view of the proposed Resource Recovery Park**

**III** **Energy production** :Fuel Pallets, Fuel Bricks, Biogas for direct cooking, Biogas for CNG bottling used in vehicles, Biogas to electrical power transferred to grids

**IV.** Single use bio degradable items

1. Cups, plates, glass, etc. made from sugarcane pulp, areca nut palm,
2. Edible spoon and plates

**B – Non-Biodegradables: (more than 120 Items)**

1. Raw material for factories :Variety of polymers – reusable and recyclable
   --Farming items: polythene sheets, nets, buckets, seed trays, bags etc.
   --Household items: Bricks for building houses, Insulation panels, Plastwood (Mix of plastic and wood), Pavement & roof tiles (Mix of plastic with sand), Road (Mix of plastic with bitumen)
2. Paper & cardboard
3. Metal (Variety of metals)
4. Textiles: Reuse and recycle: Rope making, Felt clothes and mattress
5. Glass: Reuse & Recycling
6. Electronic Items:
   --Energy production: Refuse derived Fuel for electricity production, by pyrolysis, either oil or CNG, for vehicle or electricity supplied to grids. Combining Solar, wind, water and waste for electricity production. Pure carbon can be extracted from all hydrocarbons.
7. All non-biodegradables which have no further life cycle goes for energy production: Multilayer packaging, Thermocol and foams, Rexene, sponges, Textiles

# TEAM

**Dr. Susan Raj,**
**Sustainable Arogya Awas Foundation, Rajnandgaon,**
**Chhattisgarh**

Susan is a behaviour specialist, passionate about changing "Use and throw" behavior of humans, by creating concept to change the current designs of human habitats, which has polluted the rivers, soil, air and oceans.

She is the Author of the, EARTH- UNIT: a zero waste economy township, the idea is to create an environmentally and economically sustainable habitats and change the disastrous design called "Cities".
**Role in project: Her role will be in monitoring the design of the project.**

**Mr. Gaurav Chaurasia,**
**Principal Architect, M/s STREET-HOUSE**

Gaurav graduated as an architect from the Malaviya National Institute of Technology Jaipur (NIT- Jaipur) in 2012. He has a short stint as an Intern at Pritzker Laureate Balkrishna Doshi's studio Vastu Shilpa Consultants, Ahmedabad from 2010- 2011.

After few years working in Mumbai, he has started his design studio: 'STREET-HOUSE' in 2016 in his hometown Kota, Rajasthan.

He is a co-author of the research project: EARTH-UNIT - a zero waste economy township.
**Role in project: Complete design and development of the project.**

**Dr. Sayali Joshi**
**SERI, Pune**
**Water Conservation experts: Green Bridge Technology- patent project.**

**Mr. Nilesh Inamdar**
**Partpert Technologies**
**Expert: Solid Waste Management: Resource Recovery Park**

**Mr. Anil Gokarn**
**Re Charkha**
**Expert: Solid Waste Management: Resource Recovery Park**