



[4] Water (WR)

Response: - 100% of wastewater is recycled and reused through 4 STPs (greywater) and 4 Biogas plants

[illegible]



Wastewater Treatment Plants
(Primary units, Aeration, Inlet and Outlet flow monitor, STP outlet water pipe in garden)





Biogas Plant for Black water treatment

Response: > 100% of wastewater is recycled and reused

Campus population – 7035 students and 665 faculty and staff

Total Wastewater generation – **387,022 m³**

RECYCLING AND REUSE OF GREYWATER TREATMENT

In KITS, for effective recycling and reuse of greywater from sinks, showers, washing of utensils in the kitchen and washing machines, five Sewage Treatment Plants (STP) have been constructed in the Student Residences. In addition to that, to treat the black water from all the student residences, four Biogas Plants are available to treat black water and recovery of biogas to substitute two to three commercial cylinders for cooking every day. The treated or recycled wastewater is reused for gardening (from 113 STP treated water outlets). The details on the capacity of each STP and the inflow rate with the quantity of treated effluent

Source	Annual Output (m ³)	Utilization	Monitoring
JMR STP	132,525	Irrigation & Gardening	Flow-Meter Flow-Meter Flow-Meter Flow-Meter
FDR STP	79,729		
Ladies Hostel STP	61,778		
PR GARG STP	111,171		
Total STP Reuse	385,204		
RO Plants	1,818	Drinking & Cooking	AMC / TDS Monitoring
Total Treated Water Used - 387,022 m ³			

Primary, Secondary and Tertiary Unit Operations and Functions



Primary screening:

Screening essentially involves the removal of large non-biodegradable and floating solids that frequently enter the wastewater systems, these constitute of rags, paper, plastics, tins, containers, and wood.



Primary Screening Unit

Fluidised bed bio-reactor:

The sewage is brought into a biological aeration basin where it is degraded by naturally occurring bacteria. After an “extended” period,

typically 24 hours of detention time, the mixed liquor (ML) is sent to a clarifier, where it is allowed to settle. Secondary effluent (SE) is drawn off the clarifier and the settled biomass is returned to the head of the plant



Fluidized Bed Bio-Reactor

Settling tank:

In the settling tank, the sludge settles down in the hopper and is sent back to aeration tank to retain the biomass in the aeration tank.



Settling Tank



Filtration system:

The filtration unit, that comprises of pressure sand filter and activated carbon filters, removes suspended matters such as flocs, micro-organisms, algae etc.



Sludge drying bed:

The generated sludge is allowed to dry by evaporation and excess water is drained over a period of several weeks depending on the climatic condition.



Storage tanks for treated water (before reuse in the garden)



Reuse of the recycled/treated/new water from STP for gardening

Reuse of Greywater for irrigation and gardening (Outlet Points)

S. No	No. of outlet locations
Student Residences /Hostel	88
Campus	25

B. BIO-GAS PLANTS FOR TREATING BLACK WATER

Blackwater: The wastewater from toilets that contains faecal matter and urine.

i) Bio-gas – An overview

- A **biogas plant** is a decentralized energy system, which can lead to self-sufficiency in heat and power needs, and at the same time reduces environmental pollution.
- Biogas is a gas mixture which is generated when organic compounds are fermented in the absence of air (anaerobic fermentation). This gas mixture is mainly made of carbon dioxide (CO₂) and methane (CH₄). Methane is a combustible gas, which means it can be burned. It can be used as a sustainable renewable fuel for cooking and lighting.
- Organic matter such as manure (human or animal) is composed and used to feed the plant. The process of anaerobic fermentation will then take place here, to generate biological gas (biogas).

ii) Bio-gas plants in Karunya Campus

Since being a residential campus, blackwater in the hostel zones (both ladies and gents) of Karunya Campus are treated by biogas plant installed in the following location



S.No.	Location	Capacity of the Bio-gas Plant	Year of Installation	Savings in terms of LPG Cylinders (19Kg) /Day
1	FDR Campus	100m ³	2017	2 Nos.
2	JMR Campus	80m ³ (Multifeed)	2010	2 Nos.
3	Ladies Hostel (PRG Campus)	100m ³	2017	2 Nos.
4	Ladies Hostel (EVR Campus)	80m ³	2017	1.5 Nos.

- The treated effluent from biogas plant is diverted to the STP for storage and utilized for irrigation/gardening. This will reduce the organic load coming to two STPs of capacity 6 and 4.5 lakh litres of sewage and their operational & maintenance cost.
- The biogas produced from the plant can be utilized for cooking, and the residual dung or the digested slurry left after generating *biogas* can be used as manur for agricultural purposes