GREEN CAMPUS INITIATIVES

Smart Building Implementation

Water and Waste Management & Renewable Energy Sources

Preamble

As an institution of higher education and programmes in sciences, engineering, agriculture, management and media, Karunya is committed to teach and carry out research, extension and consultancy works in the areas of Sustainable Development Goals. The campus of Karunya with more than 300 acre of land serves as experimental and demonstration laboratories and to test field station and validate eco-friendly solutions to the problems in the areas of societal importance such as Water, Food, Healthcare and Sustainable energy. Most of the Technology missions of KITS also focus on research and demonstration projects in the areas related to a sound environment free from pollution sustaining the natural resources and ecosystems and conserving the biodiversity of the campus. These challenges have been recognized by the management and around 8000 students and faculty members residing in the Karunya campus right from the inception of the installation and all through the past three and half decades of existence.

Need of Green Initiatives in the campus

KITS campus is located in the foothills of Western Ghats known for its faunal and floral biodiversity. Karunya took up the challenge of conserving the natural resources, ecosystems and biodiversity of the campus restoring to the scientific and technological advancements and the commitment of its student and faculty to build a green campus.

5. Does your university report its carbon emissions in line with the GHG Protocol Corporate Standard or another commonly used standard?

Standard Used: United Nations Framework Convention on Climate Change

Please provide the total Scope 1 and 2 carbon emissions in tCO2e (tonnes (t) of carbon dioxide (CO2) equivalent (e).

a. Base line Year: 2015

Total Power Consumption: **7417799 kWh**

CO_2 Emission- **4989.8 tonnes**

b. Previous reporting year (2021-2022)

Total Electricity Consumption for the campus and residences: **3862181 kWh**

CO_2 Emissions – **2598 tonnes**

a

Vehicles:

No. of buses from KITS to Coimbatore -10

- Running 2000 km approximately per month – 10 *2000 *12 = 2,40,000 km
- **CO2 Emission – 28.68 tonnes**

No. of cars – 10

- Running 3000 km approximately per month – 10*3000*12 = 3,60,000 km
- **CO2 Emission – 49.395 tonnes**

CO_2 Emissions (Scope 1 and Scope2 together) – Previous Reporting Year (2021-2022) – **2676.075 tonnes**

Renewable Energy sources:

Sl.No	Description of Item	Qty	Power Savings/year
1	Solar Water heating system	85,600 LPD	15,45,718 kWh

Sl.No	Description of Item	Year	Qty	Power Consumption	
1	18W LED Tubelights	2019	5944 Nos	278179	3,39,997 Units
2		2020	1705 Nos	79794	97526 Units
3		2022	2860 Nos	133848	1,63,592 Units
4		2023	4089 Nos	191365	2,33,891 Units

Previous reporting year (2021-2022) = (2019+2020+2022) = 339997+97526+163592 =601115 kWh

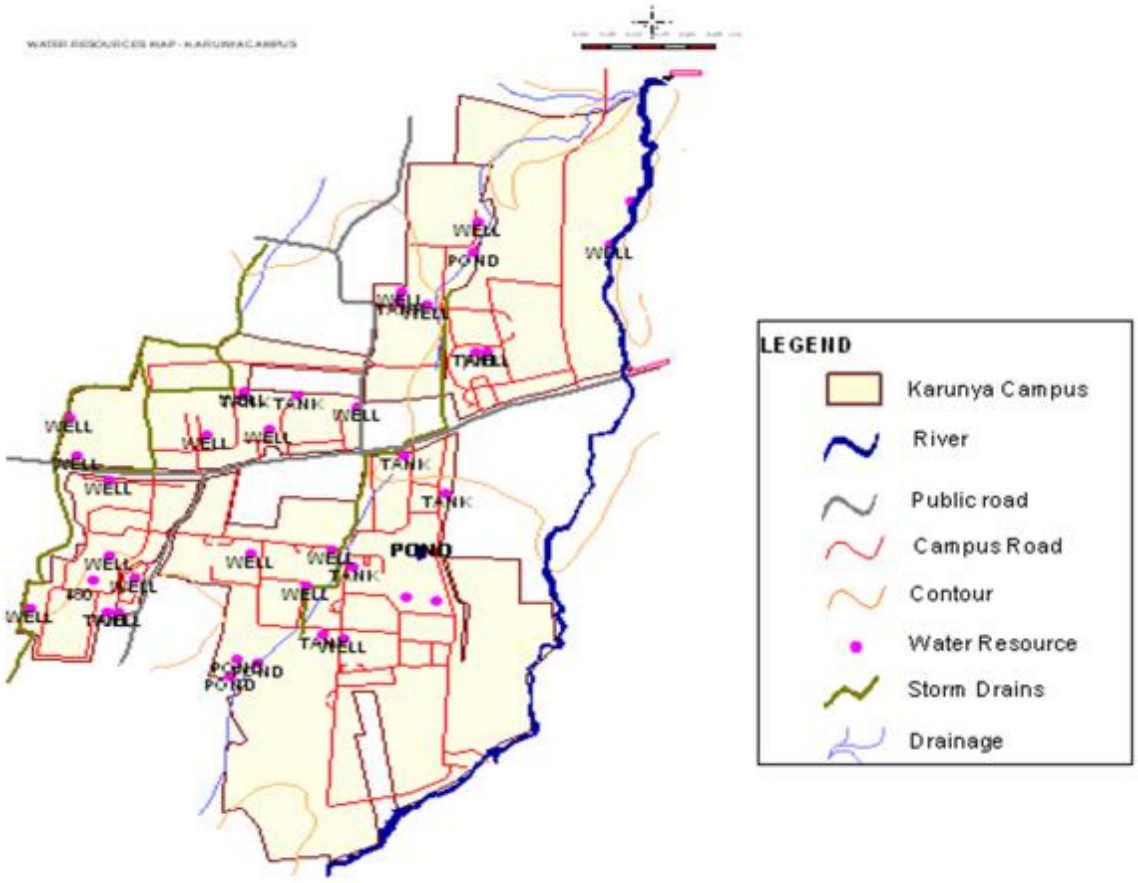
		Renewable Energy Sources (power in kWh)				
Source	**2016-2017**	**2017-2018**	**2018-2019**	**2019-2020**	**2020-2021**	**2021-2022**
Solar PV	129750	131560	129260	128720	123419	157783
Solar Water heating system	1545718	1545718	1545718	1545718	1545718	1545718
LEDs						**601115**
Total	**1675468**	**1677278**	**1674978**	**1674438**	**1669137**	**2304616**

CO_2 emission reduction – **1550.2 tonnes**

35. Water Consumption

A. Water Resource Management Strategies and Technologies

In KITS campus, there are 5 open wells and 23 bore wells which supply water to 166 storage tanks which meet the water demand of the students, faculty and staff residing in and around the campus. The campus area, residences, quarters and the agriculture land are given in the layout.



Location of Water Resources (wells and tanks)

KITS follows integrated water management strategy to avoid overflow of the storage tank and sump, grey and black water management, challenges of recycling and reuse of treated water and storm water management. The issues are tackled by innovative, cost-effective and eco-friendly solutions and awareness creation on water conservation and management in the campus. The strategies, techniques and measures followed for sustainable development, management and conservation of water in the campus include:

1. Development of water harvesting structures (roof-top harvesting structures – ferrocement storage tank, and underground soak pits);
2. Water conservation measures (using IoT based automated water control structures);
3. Reuse of treated grey water (after bathing, laundry and dishwashing);
4. Recovery and utilization of biogas for cooking (in hostel kitchens) from black water (wastewater that includes human faeces, urine and other materials from toilets, urinals or bidets);
5. Water quality monitoring of treated water and suggesting remedial measures;
6. Capacity building and awareness creation programs, training workshops, extension and community development activities, innovative solutions, and pilot projects through various Karunya Technology Missions on 'Water and Desalination', 'Wetland Conservation', 'Rural Development', 'Smart Technology for Precision Farming Session' and 'Food Security'.
7. Development of innovative cost-effective and eco- friendly solutions to address the water related issues like availability of potable drinking water, grey and black water treatment, groundwater remediation through Interdisciplinary Research & Development activities in the campus and bringing out products and technology.

Water Demand

The water demand for meeting the water required of the residences, quarters, cooking and cleaning in the hostel residences, gardening and irrigation, laboratories and workshop in the campus is calculated based on the standards (.150 -.200 cumec/day).

Water Resources and Supply

Water supply from borewells, Openwells and Siruvani water supply scheme

The water demand of the campus is met from available surface and groundwater resources (through 23 bore wells, 5 open wells, storm water storage in the campus and through the Siruvani water supply scheme).

Water distribution

Water is supplied from all the sources simultaneously to have 24 hours continuous supply of water in the whole campus. The main components of the water distribution system are:

- Main water supply sources
- Pump house
- Primary pipelines
- Overhead tanks
- Secondary pipelines

- End users

Details of Over Head Tank and Under Ground Sumps

S.No.	LOCATION	AREA (Feet)	CAPACITY (Lit)
A	**EVANGILINE RESIDENCE**		
1	EVR WEST TANK 1-A	13X8.5X6	18770
2	EVR 1-B	13X12.5X6	27602
3	EVR 2-A	13X8X6	17665
4	EVR 2-B	13X13X6	28706
5	EVR 3-A	13X8.5X6	18770
6	EVR 3-B	13X12.5X6	27602
7	EVR EAST 1-A	13X8.5X6	18770
8	EVR 1-B	13X12.5X6	27602
9	EVR 2-A	13X8.5X6	18770
10	EVR 2-B	13X13X6	28706
11	Oprah SIRUVANI-A NORTH	13X8.5X6	18770
12	Oprah SIRUVANI-B	13X13X6	28706
13	Oprah BOREWELL 1-A	13X12.5X6	27602
14	Oprah BOREWELL 1-B	13X8.5X6	18770
15	Oprah BOREWELL 2-A	13X12.5X6	27602
16	Oprah BOREWELL 2-B	13X8.5X6	18770
17	EVR SUMP-BOREWELL-A	15X15X8.5	54143
18	EVR SUMP-BOREWELL-B	15X15X8.5	54143
19	EVR SUMP-SIRUVANI	15X7X8	23780
B	**SUNDRARAJ BLOCK**		
20	SRR 1-A	14X8X5.25	16646
21	SRR 1-B	13X8X5.25	15457
22	SRR 2-A	14X8X5.25	16646
23	SRR 2-B	13X7.5X5.25	14491
24	SRR B-BLOCK -1	18X8X5	20383
25	SRR B-BLOCK -2	18X8X5	20383
26	SRR B-BLOCK SIRUVANI	11X9X5	14013
27	SRR SINTEX OHT		3000
C	**P R GARG BLOCK**		
28	P R GARG BLOCK-1	13.5X10X5	19109
29	P R GARG BLOCK-2	13.5X9.5X5	18154
30	P R GARG SINTEX		3000
D	**DAKSHINAMOORTHY BLOCK**		
31	DMR BLOCK 1-A	13.5X9.5X5.5	19969
32	DMR BLOCK 1-B	13.5X9.5X5.5	19969
33	DMR BLOCK 2-A	13.5X9.5X5.5	19969

S.No.	LOCATION	AREA (Feet)	CAPACITY (Lit)
34	DMR BLOCK SINTEX		5000
35	DMR BLOCK 2-B	13.5X9.5X5.5	19969
36	DMR SUMP SINTEX		5000
37	DMR SUMP -1	16X13.5X9	55035
38	DMR SUMP -2	16.5X13.5X9	56754
39	DMR SUMP -3	16X13.5X9	55035
E	**SEVUGAPANDIAN RESIDENCE**		
40	SEVAGA PANDIAN BLOCK-1-A	13.5X11.5X4.5	13249
41	SEVAGA PANDIAN BLOCK-1-B	13.5X5X4.5	7006
42	SEVAGA PANDIAN BLOCK-2-A	13X8X4.5	13279
43	SEVAGA PANDIAN BLOCK-1-B	11X5X4.5	7006
44	SEVAGA PANDIAN SIRUVANI SUMP	16X13.5X9	55035
45	SHOPPING COMPLEX	9X4X4	4076
F	**EDWARD GEORGE RESIDANCE**		
46	EGR SIRUVANI-A	10X8.5X4.5	10829
47	EGR SIRUVANI-B	10X8.5X4.6	10829
48	EGR BOREWELL-WEST	13X9X5	16561
49	EGR BOREWELL-EAST(3.5X4X2)	12X12X4	17100
G	**FATHER DURAISAMY RESIDANCE**		
50	LUKE BLOCK-A	13X11X5	20242
51	LUKE BLOCK-B	12X9XX5	15287
52	MATHEW BLOCK-A	13X11X5	20242
53	MATHEW BLOCK-B	13X9X5	16561
54	FDR SUMP-1	15X15X11	70067
55	FDR SUMP-2	16.5X13X6	36435
56	FDR EXTENSION	SINTEX	5000
57	FDR EXTENSION	SINTEX	5000
H	**GROUND SIRUVANI SUMP**		
58	SUMP-1	16.5X13X6	36435
59	SUMP-2	16X13X6	35331
60	SUMP-3	16.5X13X6	36435
I	**JHONSON VICTOR RESIDANCE**		
61	JVR EAST BOREWELL-A	14X10X5	19817
62	JVR EAST BOREWELL-B	14X8X5	15854
63	JVR WEST BOREWELL-A	14X10X5	19817
64	JVR WEST BOREWELL-B	14X8X5	15854
65	JVR WEST SIRUVANI-EAST	9X4X5	5096

S.No.	LOCATION	AREA (Feet)	CAPACITY (Lit)
66	JVR WESTSIRUVANI-WEST	9X4X5	5096
67	JVR SIRUVANI SUMP-1	15X15X8	50958
68	JVR SIRUVANI SUMP-2	15X15X8	50958
69	JVR BOREWELL SUMP-1	15X14.5X8.5	52338
70	JVR BOREWELL SUMP-2	15X15X8	50958
J	**JERRY MANUAL RESIDANCE**		
71	JMR EAST-A	14X10X5	19817
72	JMR EAST-B	14X8X5	15854
73	JMR WEST-A	14X10X5	19817
74	JMR WEST-B	14X8X5	15854
75	JMR EAST-SIRUVANI	9X4X5	5096
76	JMR WEST-SIRUVANI	9X4X5	5096
77	JMR – RESIDENCE	5 X 5 X 10	7079
78	JMR – RESIDENCE	5 X 5 X 10	7079
K	**BOBARAJ RESIDANCE**		
79	BOBARAJ RESIDANCE- EAST-A	14X10X5	19817
80	BOBARAJ RESIDANCE- EAST-B	14X8X5	15854
81	BOBARAJ RESIDANCE- WEST-A	14X10X5	19817
82	BOBARAJ RESIDANCE- WEST-B	14X8X5	15854
83	BOBARAJ RESIDANCE- EAST SIRUVANI	8.5X4X5	4812
84	BOBARAJ RESIDANCE- WEST SIRUVANI	9X4X5	5096
L	**BETHANI RESIDANCE**		
85	BETHANI RESIDANCE-EAST A	14X10.75X5	21303
86	BETHANI RESIDANCE-EAST B	14X8.5X5	16844
87	BETHANI RESIDANCE-WEST A	14X10.75X5	21303
88	BETHANI RESIDANCE-WEST B	14X8.5X5	16844
89	BETHANI RESIDANCE-EAST SIRUVANI	9X4X5	5096
90	BETHANI RESIDANCE-WEST SIRUVANI	9X4X5	5096
M	**MESS- JMR CAMPUS**		
91	BOREWELL SUMP	13.5X11X7	29428
92	SIRUVANI SUMP	13X5.5X7	14169
93	LABOUR QTR SINTEX	----------	5000

S.No.	LOCATION	AREA (Feet)	CAPACITY (Lit)
N	**HEBZIBA & ANGELINA RESIDANCE**		
94	HEBZIBA EAST OHT	13X11X5	20242

95	HEBZIBA WEST OHT	14X12X5	23780
96	HEBZIBA SINTEX		5000
97	HEBZIBA SUMP	16X14X8	50732
98	HEBZIBA SUMP SINTEX		5000
99	ANGILINA OHT	17X14X5	33689
O	**COLLEGE CAMPUS**		
100	PRODUCTION OHT	14X12X5	23780
101	BIOTECH OHT	12X12X5	20383
102	MAIN BLDG-REGISTRAR OFFICE	16.5X9X4	16816
103	MAIN GATE SUMP-A	13X13X7.5	35883
104	MAIN GATE SUMP-B	13X13X7.5	35884
105	MAIN GATE SUMP-SIRUVANI	13X8X8	23554
106	S&H SIRUVANI SUMP	16.5X13X10.5	63761
107	S&H SUMP	16X13X11	64773
108	S&H OHT	16.25X14X5	32203
109	S&H OHT	14X8.25X5	16349
110	MECH SINTEX		3000
111	IT BLOCK OHT	13.5X10X4.5	17198
112	IT BLOCK SIRUVANI SINTEX OHT		2000
113	IT BLOCK SIRUVANI SINTEX GROUND		2000
114	LIBRARY OHT	11X10X4.5	14013
115	CIVIL DEPT OHT	12X11.5X6	23441
116	NEW CIVIL OHT	10X5X6	8493
117	CHELLADURAI Bldg SIRUVANI	14.5X8.5X5	17446
118	CHELLADURAI Bldg BOREWELL	13X12X5.5	24290
119	CHELLADURAI Bldg EAST-A	14X12X5	23780
120	CHELLADURAI Bldg EAST-B	14X12X5	23780
121	LIBRARY SINTEX-2		4000
122	AUDUTORIUM OHT-1 (Indoor) DGS Centre	9X8X5	10192
123	AUDUTORIUM OHT-2 (Indoor) DGS Centre	9X8.5X5	10829
P	**QUARTERS**		
124	ELIM OHT-A	8X4X5	4530
125	ELIM OHT-B	8X5X5	5662

S.No.	LOCATION	AREA (Feet)	CAPACITY (Lit)
126	CANNON-A	8X7X4	6341
127	CANNON-B	8X3X4	2718
128	ELIM SUMP BOREWELL	13X6.5X5	11961
129	ELIM SUMP SIRUVANI	6.5X6X5	5520
130	BETHAL OHT BOREWELL	8X5X4	4530
131	BETHAL OHT SIRUVANI	8X3X4	2718
132	ALPHA OHT BOREWELL	5.5X4.5X4	2803

133	ALPHA OHT SIRUVANI	5X4.5X2.5	1592
134	BETHAL SUMP BOREWELL	13X6X5	11041
135	BETHAL SUMP SIRUVANI	6.25X6.25X5	5520
136	CARMEL OHT BOREWELL	8.5X8X5	9625
137	CARMEL OHT SIRUVANI	8.5X6X6	8663
138	KIDRON OHT BOREWELL	9X8X4	8153
139	KIDRON OHT SIRUVANI	8X4.5X4	4076
140	CARMEL SUMP-A	7X7X7	9710
141	CARMEL SUMP-B	7X7X8	9711
142	HEBRON OHT	12X5X6	10191
143	FRANKECENSE Quarters	11.75X4.75X5.75	9085
144	SUMP-1	13.5X12.5X6.5	31053
145	SUMP-2	14X12X6.5	30915
146	ZION RESIDENCE SIRUVANI OHT	6.5X6.5X5	5980
147	ZION RESIDENCE OHT	6.5X6.5X5	5980
148	ZION RESIDENCE SUMP	6.5X5.5X4	4048
149	SINAI QUARTERS SUMP-1	13X11.5X7	29626
150	SINAI QUARTERS SUMP-2	11.5X11.5X7	26208
151	SINAI QUARTERS SUMP-3	7X8X11.5	18232
152	SINAI QUARTERS OHT	8X8X4.5	8153
153	SINAI QUARTERS OHT	8.5X8X4	7700
154	TABOR QUARTERS OHT	6.5X4.5X4	3288
155	TABOR QUARTERS OHT	9X8.5X4.5	9746
156	PAT ROBINSON QUARTERS SINTEX	---	3000
157	PAT ROBINSON QUARTERS SINTEX	---	3000
158	PAT ROBINSON QUARTERS SINTEX	---	3000
159	HA1 QUARTERS	6 x 8 X 8	10873
160	HA2 QUARTERS	6 X 8 X 8	10873
161	HA3 QUARTERS	6 X 8 X 8	10873
162	HA4 QUARTERS	6 X 8 X 8	10873

S.No.	LOCATION	AREA (Feet)	CAPACITY (Lit)
Q	**GUEST HOUSE CAMPUS**		
163	BANK OHT	12.5X10X4.5	15924
164	POST OFFICE SINTEX	---	1000
165	G.H. TANK	2X16X8X5	28992
166	LABOUR QUARTERS-1	---	2000
167	LABOUR QUARTERS-2	---	2000
168	SUMP-1	9X7.5X7.5	14332
169	SUMP-2	9X9X7.5	17198
170	BETHSTHA OHT -BOREWELL	15X11X12	56283
171	BETHSTHA OHT -SIRUVANI	7.5X4X12	11237

R	**HOSPITAL CAMPUS**		
172	SIRUVANI-OHT	5X4.5X5	3185
173	BOREWELL-OHT	5X4.5X5	3185
174	SUMP-SIRUVANI	7X7X5	6936
175	OLD AGE HOME	SINTEX	5000
176	OLD AGE HOME	SINTEX	5000
177	OLG AGE HOME	SINTEX	500
	TOTAL		**3170641**

Water Supply and Demand

95% of water demand is met by the sustainable sources in the campus such as open wells, borewells, tanks and ponds

- Total Water Supply – 3170641 litres – 3170 m^3
- Total population in the campus and residences – 8500
- Total Water Demand (Average .165 m^3/day) = 1402 m^3

Rain Water Harvesting

Ferrocement Storage Tank (partially underground)

In the campus, a roof top rainwater structure (with capacity of 25,000 litres) made of ferrocement has been installed to collect the storm water from the roof of administrative block with an area of 1900 sq. m. The rain water that is being collected in the tank is supplied for washing purposes in the same block.

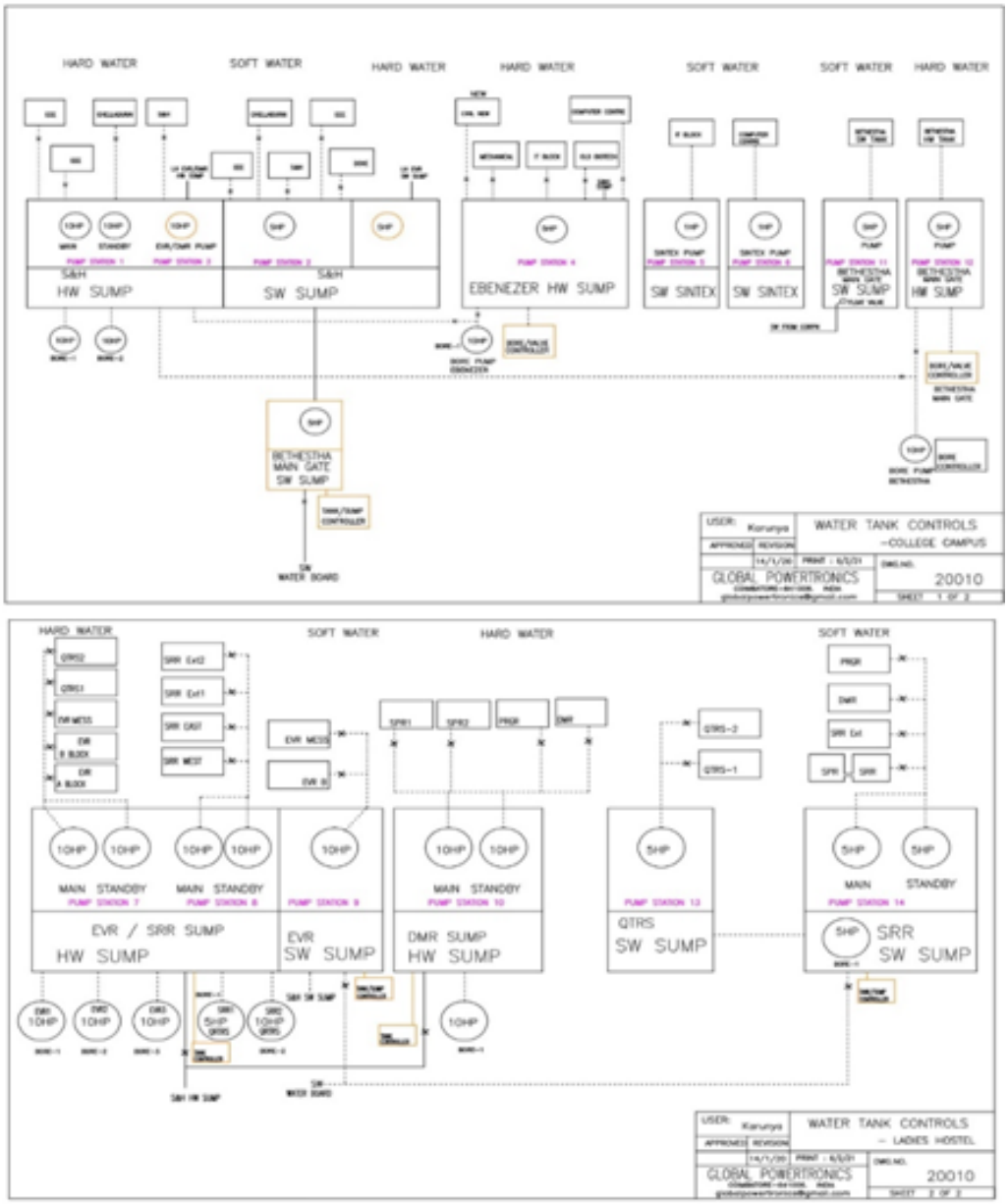
Soak Pit

Around 33 soak pits (3 m depth with 1.8 m diameter) are used to harvest roof top water, which are located in front and backside of all the academic departments and student residences. These structures improve the groundwater recharge in the campus and augment the groundwater potential. The details of locations of these structures and the area of catchment are furnished along with a photographs of (a) few of the structures.

Soak pits located at (a) Administrative block (b) Aero space lab (c) Civil lab (d) Guest house (e) Hepzibah hostel and (f) Father Duraisamy Residence hostel

IoT Enabled Water Conservation

The wastage of water due to the overflow in the storage tanks and sumps is controlled by using sensor-based pump operating system. The sumps in the campus and student residences are connected to ensure water supply at all times in the case of any reduction in groundwater level or mechanical failure of pumps in the borewells. Three IoT enabled automated water controllers have been installed in the overhead tanks and sumps by which 20% of water and energy are saved.



Layout of automatic waterflow control units

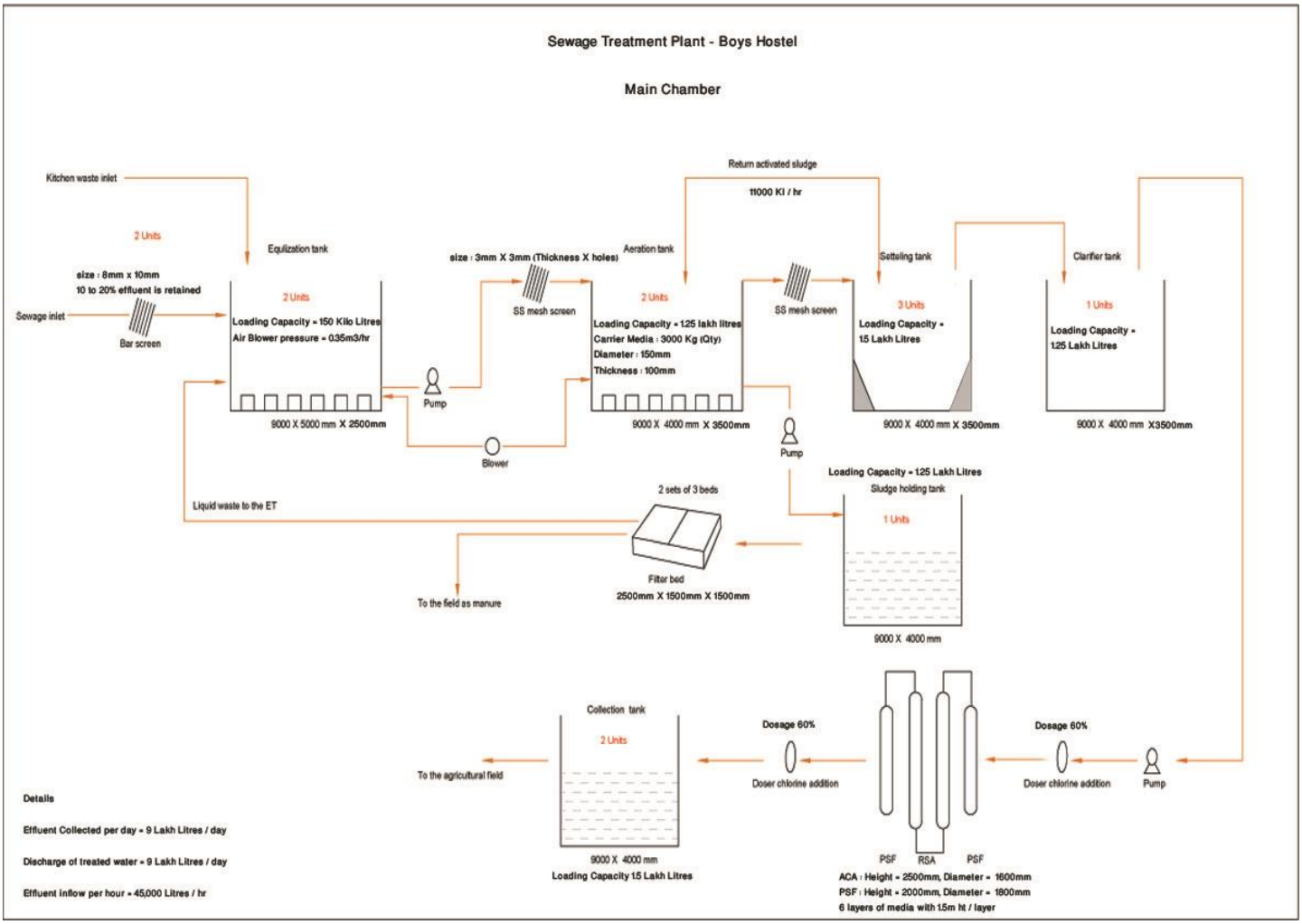
Automatic Waterflow Control Units

Recycling and reuse of greywater treatment:

- Five Sewage Treatment Plants (STP) are available in the Student Residences to treat the grey water.
- Four Biogas Plants are available in the Students Residences to treat black water and recovery of biogas to substitute two to three commercial cylinders for cooking everyday.
- Treated or recycled wastewater is reused for gardening (from 118 STP treated water outlets)

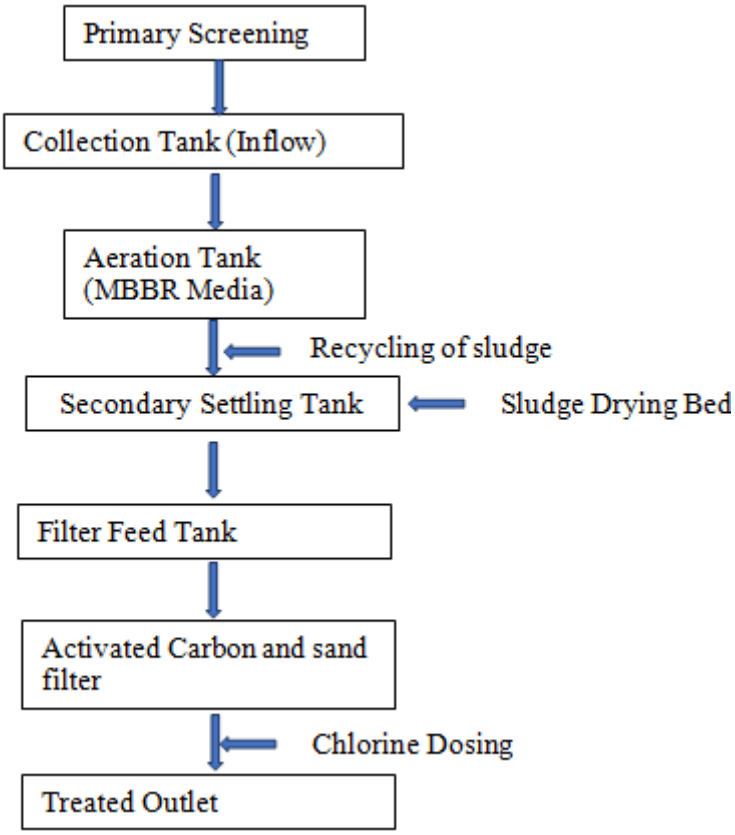
Table showing the details on the capacity of each STP and the inflow rate with the quantity of treated effluent

Average Treated water Output from STP's in KITS Campuses				
Sl.No	Location	Capacity of STP	Wastewater Flow Rate in STP	Output (Treated Water)
1	JMR STP	1000 KLD	650 KLD	600 KLD
2	FDR STP	400 KLD	250 KLD	240 KLD
3	Ladies Hostel STP	450 KLD	250 KLD	220 KLD
4	PR GARG STP	600 KLD	350 KLD	320 KLD
5	Bethesda STP	8 KLD	4 KLD	4 KLD



Layout of Sewage Treatment Plant

General Process and Functions:



Steps involved in treatment process

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 reactors

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.

Filtration system

Sludge drying bed:

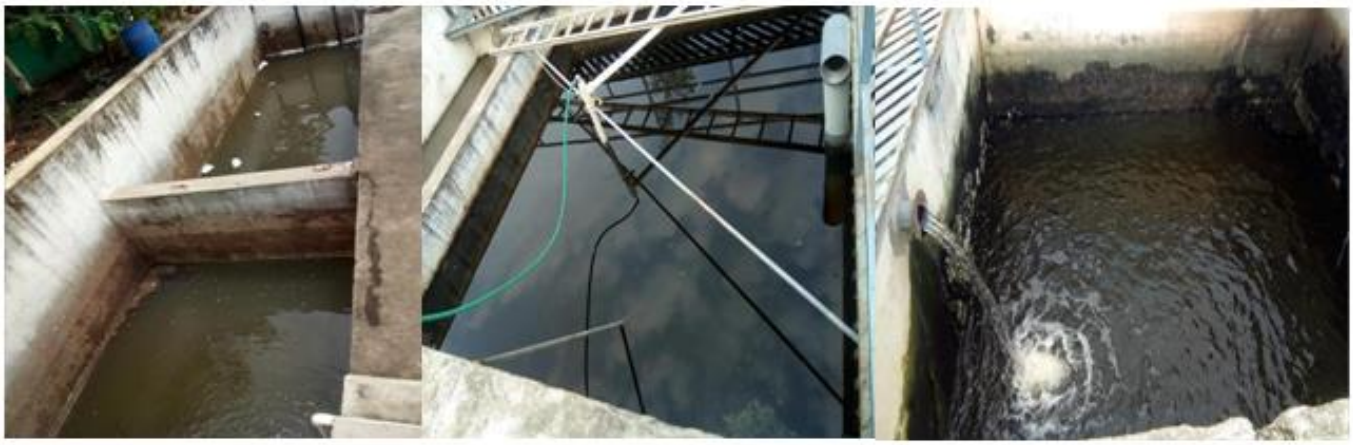
The generated sludge is allowed to dry by evaporation and excess water is drained over a period of several weeks depending on the climatic condition.

.Sludge drying bed

*Reuse of Treated Water**:*** The treated water is reused for gardening and in the agricultural farm.

JMR Details:

JMR collection tank, settling tank (after filtration)



FDR collection tank, settling tank (after filtration)

LH collection tank (after filtration)

PRG collection tank, settling tank

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

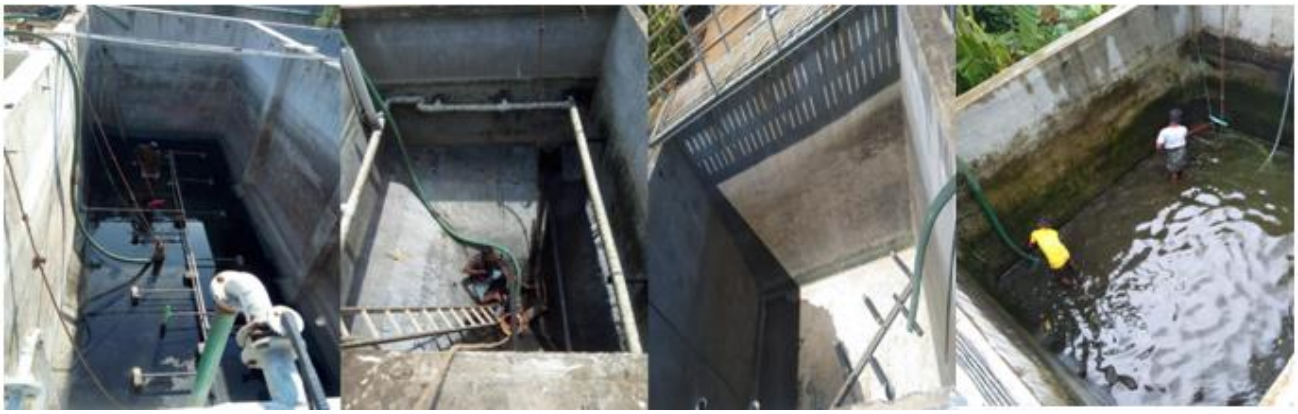
JMR and LH STP – aeration tanks

Outlet for the recycled wastewater from STP

Cleaning of tank:

JMR STP cleaning – Collection tank, settling tank, filtered water tank and reuse water storage tank

FDR STP Cleaning – Collection tank, settling tank, filtered water tank and reuse water storage tank



LH STP Cleaning – Collection tank, settling tank, filtered water tank and recycled water storage tank

PRG STP CLEANING – Collection tank, settling tank, filtered water tank and reuse water storage tank

B. Solid Waste Management

Based on the study conducted by 'M/S Hand in Hand India Ltd.' in Karunya Campus, it is estimated that an average of 7,500 kg of waste is generated daily, the breakup is given below:

i) Food waste (37%)

ii) Recyclable waste (27%)

iii) Other organic waste (36%).

Collection and Segregation of bio-degradable and non-degradable waste materials:

- For the purpose of segregation of waste (organic, recyclable, non-recyclable and e-waste) at source and collecting the same, Waste Bins (3,000 numbers) have been placed at designated locations in the Karunya Campuses, viz. KITS, EMHSS, KCS, Students Residences and Staff Quarters and Guest House.
- A Contractor, namely, M/s Metro Support Services, Coimbatore**,** has been engaged for the collection, segregation and shifting of waste materials generated in the Campus.
- Organic compost is generated from biodegradable wastes in Karunya North Farm.

Details of the waste management practices in Karunya Institute of Technology and Sciences are highlighted below:

1) Bio-degradable waste handling
2) Paper recycling plant
3) Bio-gas plants (4 Nos.)
4) Disposal of e-Waste

Biodegradable waste handling

1. Food waste: A portion of food waste is being pulverized and used in the bio-gas digester

2. Organic waste like dry leaves, vegetable cuttings, etc are sent for bio-composting.

Paper recycling plant

Around 150 - 200 kg (45,000 – 60,000 kg for 300 days in a year) of wastepaper is segregated from waste generated in the Campus daily. To recycle the segregated wastepaper, an Eco-friendly Paper Recycling Plant has been installed in the campus to produce 25 – 30 tons of paper board every year. Products like files, folders and decorative articles are made using the paper boards.

Processing of wastepaper to produce paper boards (grey boards)

1. Pulping

Hydro Pulper

Raw material (waste paper) is fed into the hydro pulper and wet grinding is done for 30 minutes.

2. Refining

Disc Refiner

The paper pulp is refined by the Disc Refiner and pumped into the pulp chest. Here, the agitating impellers agitate the pulp for constant consistency. Then the pulp is mixed with back water and pumped into the regulating tank of the flow mold wet-end paper making machine.

3. Board making (wet boards)

In this process, the pulp is molded as layers by the molding wire cloth, picked up by the couch roll and transferred to the press part through the conveyer. In the press part, the wet layer is squeezed between the press rubber roller and the heavy metal cutting drum. Wet paper boards are collected from the cutting drum and transferred to the drying shed.

Cutting drum

Rubber Roller

4. Drying

In the drying process, the wet boards are allowed to dry in the sunlight (sundry) for 8 hours.

Sun Drying

5. Calendaring and Cutting of Paper Boards

   The dried papers are polished by the Calendaring machine followed by edge trimming and cutting into desired size and packed.

Roller Mold

Edge Trimming

Final Board

Biogas project

Biogas – an overview

- A biogas plant is a decentralized energy system, which leads to self-sufficiency in heat and power needs, and at the same time reduces environmental pollution.
- Biogas is a gas mixture of carbon dioxide (CO_2) and methane (CH_4), which is generated when organic compounds are fermented in the absence of air (anaerobic fermentation).
- Organic matter such as manure (human or animal) is composed and used to feed the plant.

Biogas plants in Karunya Campus

Being a residential campus, the night soil and food waste generated in the Student Residences of Karunya Campus are treated in the biogas plant installed in the following locations:

Sl. No.	Location	Capacity of the Bio-gas Plant	Year of Installation	Cost of the Plant (in Lakhs)	Savings in terms of LPG Cylinders (19Kg) /Day
1	FDR Campus	$100m^3$	2017	32.0	2 Nos.
2	JMR Campus	$80m^3$	2010	26.0	2 Nos.

		(Multifeed)			
3	Ladies Hostel (PRG Campus)	$100m^3$	2017	32.0	2 Nos.
4	Ladies Hostel (EVR Campus)	$80m^3$	2017	26.0	1.5 Nos.

- The treated effluent from the biogas plant is diverted to the STP for storage and utilization for irrigation/gardening. This reduces the organic load coming to two STPs of a capacity of 6 and 4.5 lakh litres of sewage and their operational and 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 is used as manure for

Renewable Energy Sources (Solar)

Solar Water Heating System In Karunya University Residences

Hostel / Specifications	Angelina Residence	Hephzibah Residence	Father Duraisamy Residence	Edward George Residence	New JVR Residence	New JMR Residence	New BRR Residence	New Bethany Residence
System Model	TWINWALL model Solar system							
Type of Collector	Flat Plate Collector							
System Capacity	3500 Lts per day	2500 Lts per day	3500 Lts per day	2500 Lts per day	3500 Lts per day	3500 Lts per day	3500 Lts per day	3500 Lts per day
No. of Units	2 Units	3 Units	1 Unit	2 Units	2 Units	2 Units	2 Units	2 Units
System Temperature	60®c	60®c	60®c	60®c	60®c	60®c	60®c	60®c
No. of Solar Collectors	1 set, 28 Collectors	1 set, 20 Collectors	1 set, 28 Collectors	1 set, 20 Collectors	1 set, 28 Collectors	1 set, 28 Collectors	1 set, 28 Collectors	1 set, 28 Collectors
Circulation and its Space	Natural Gravity Circulation System Space required 60 m^2 for 3500 LPD System and 45 m^2 for 2500 LPD System							
Application	Hot Water							
Electrical back-up heater	Auxiliary Heating With Electrical Supply of 4 Kw with thermostat							
Tank Capacity	3500 Lts with air vent provision	2500 Lts with air vent provision	3500 Lts with air vent provision	2500 Lts with air vent provision	3500 Lts with air vent provision	3500 Lts with air vent provision	3500 Lts with air vent provision	3500 Lts with air vent provision
Tank Type	Stainless steel storage tanks insulated with Glass wool Cladded with aluminium, Cage type Stainless steel Heat exchanger							
Support stands for tank and collector	Mounted on Concrete floor with steel frame and Anchoring bolts							

Hostel / Specifications	Sevugapandian Residence	Sundararaj Residence	P R Garg Residence	Dakshinamoorthy Residence	Oprah Residence	Evangeline Residence
System Model	VESAT Solar Products					
Type of Collector	Flat Plate Collector					
System Capacity	3500 Lts per day	3500 Lts per day	500 Lts per day	3500 Lts per day	3500 Lts per day	3500 Lts per day
No. of Units	2 Units	2 Units	1 Unit	1 Unit	1 Unit	2 Units
System Temperature	60®c	60®c	60®c	60®c	60®c	60®c
No. of Solar Collectors	1 set, 28 Collectors	1 set, 28 Collectors	1 set, 28 Collectors	1 set, 28 Collectors	1 set, 28 Collectors	1 set, 28 Collectors
Circulation and its Space	Natural Gravity Circulation System Space required 60 m^2 for 3500 LPD System					
Application	Hot Water					
Electrical back-up heater	Auxiliary Heating With Electrical Supply of 4 kW with thermostat					
Tank Capacity	3500 Lts with air vent provision	3500 Lts with air vent provision	3500 Lts with air vent provision	3500 Lts with air vent provision	3500 Lts with air vent provision	3500 Lts with air vent provision
Tank Type	Stainless steel storage tanks insulated with Glass wool Cladded with aluminium, Cage type Stainless steel Heat exchanger					
Support stands for tank and collector	Mounted on Concrete floor with steel frame and Anchoring bolts					

95 KW GRID TIED SOLAR POWER PLANT IN MAIN BUILDING

The 95 kW Grid – Tied Solar Power Plant was installed on July 1st 2016 in admin Block of the Karunya Institute of Technology and Sciences. The type of Solar panel is Poly crystalline and around 312 panels are connected through four inverters to the Distribution Board from where the Power is drawn to the load. In addition, the Power generation is monitored through online monitoring unit from the inverters.

Salient Features of Solar Power Plant.

1. Grid – Tied 95kW Photo Voltaic Poly Crystalline Solar Power Plant
2. 25 kW Capacity of Inverter of 4 Nos – Make – SMA
3. No of Inverters – 4 Nos
4. No of Strings in each Inverter – 4 Nos
5. No of Solar panels connected in each inverter – 84 Panels (Except 4th inverter - 60 Nos)
6. Total No of Modules (Panels) – 312 Nos (Each – 310 Watts) – Make – EMMVEE

20 KW GRID TIED SOLAR POWER PLANT IN LADIES HOSTEL [EVR BLOCK] BUILDING

Salient Features of Solar Power Plant.

1. Grid – Tied 20kW Photo Voltaic Poly Crystalline Solar Power Plant
2. 25 kW Capacity of Inverter of 1 No – Make – SMA
3. No of Inverters – 1 Nos
4. No of Strings in each Inverter – 4 Nos
5. No of Solar panels connected in each inverter – 66 Panels
6. Total No of Modules (Panels) – 16 Nos (Each – 310 Watts) – Make – EMMVEE