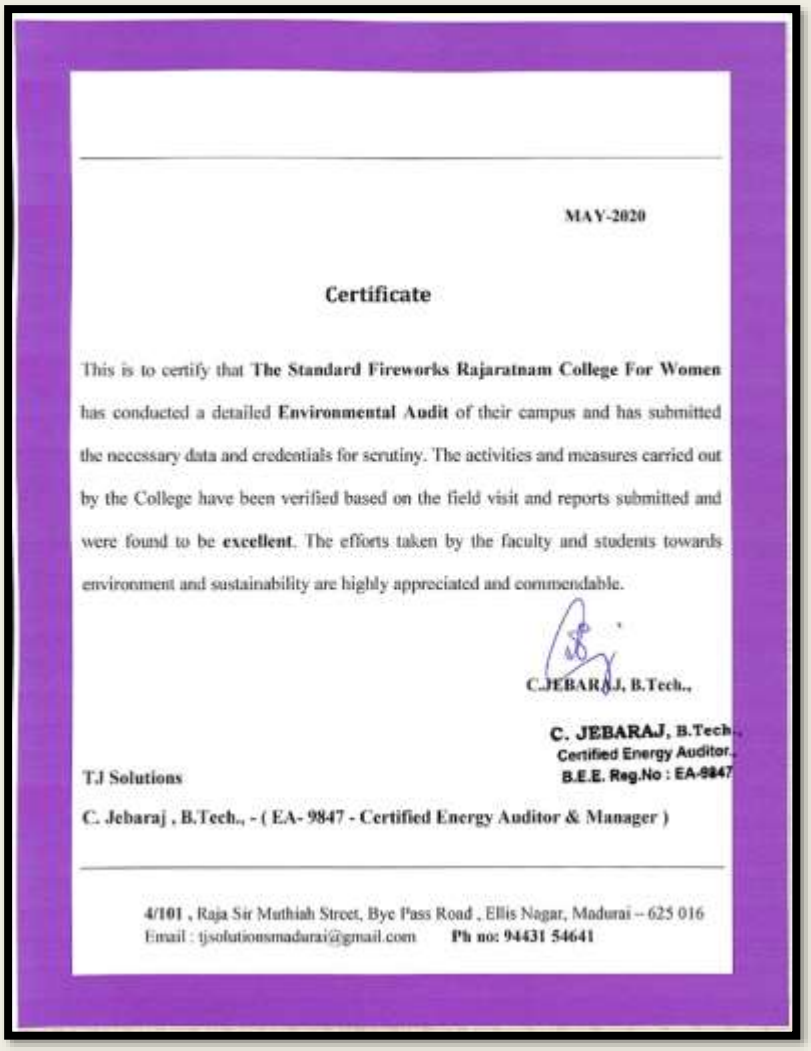
Environment Audit Report

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS), SIVAKASI – 626 123.

(Affiliated to Madurai Kamaraj University, Re-accredited with A Grade by NAAC,
College with Potential for Excellence by UGC and Mentor Institution under UGC PARAMARSH)

Environment Audit Certificate



MAY-2020

Certificate

This is to certify that **The Standard Fireworks Rajaratnam College For Women** has conducted a detailed **Environmental Audit** of their campus and has submitted the necessary data and credentials for scrutiny. The activities and measures carried out by the College have been verified based on the field visit and reports submitted and were found to be **excellent**. The efforts taken by the faculty and students towards environment and sustainability are highly appreciated and commendable.

C.JEBARAJ, B.Tech.,

C. JEBARAJ, B.Tech.,
Certified Energy Auditor.
B.E.E. Reg.No : EA-9847

TJ Solutions

C. Jebaraj , B.Tech., - (EA- 9847 - Certified Energy Auditor & Manager)

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ENVIRONMENT AUDIT REPORT

MAY-2020

SFR COLLEGE FOR WOMEN
SIVAKASI

TJ Solutions
4/101, Raja Sir Muthiah Nagar,
Bye-pass road, Ellis Nagar,
Madurai-625 016.

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ACKNOWLEDGEMENT

We at TJ Solutions, Madurai are thankful to the Principal for giving us the opportunity to carry out Environment audit THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, Sivakasi- 626123 Tamilnadu, India. TJ Solutions team is also thankful to all other supporting Officers / Staffs of the above institute for their wholehearted support, hospitality and the courtesy extended to the Audit team during the course of the visit.

The following officers from TJ Solutions under the guidance of Mr. C. Jebaraj, B.Tech., have carried out the Environment Audit.

Name	Qualifications	Certification Number
Mr. C. Jebaraj	B.Tech., PDGEM., DIS., Certificated Energy Auditor, Water, Energy, Environment and 5S Consultant	EA-9847
Mr. N. Tamil selvan	BSc.,	-

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Summary of Environment Audit

Environment audit of THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN, Sivakasi was carried out by TJ solutions. Audit team has gone through the data related to Water and Electrical Energy, Waste generation , Waste Management, Waste Recycling and Reuse and Green Belt Development . The team also carried out the study of Renewable energy utilisation, Pollution abatement measures, Rainwater harvesting, Water and Energy Conservation measures taken to reduce the pollution, noise level, Green house emission and maintain Ambient Air quality

During the visit it is observed that cleanliness in the campus is well maintained through proper disposal of wastes, utilization of eco-friendly supplies and effective recycling program. The concept of eco-friendly culture is disseminated among the students through various seminars/workshops and community-oriented programs. The Institution strictly follows reduce, reuse and recycle method to limit energy usage and replace non-renewable energy sources with renewable energy resources.

The environment audit report is a very powerful and valuable communications tool to use while working with various stakeholders who need to be convinced that systems and procedures in place are suited to cope with natural changes and modifications.

It is hoped that the results presented in the environment audit report will serve as a guide for educating the college community on the existing environment related practices and resource usage at the college as well as spawn new activities and innovative practices.

The audit outputs and recommendations are summarised as follows:

- Total water consumption for SFR COLLEGE and Hostel – 85 KL/Day
- Electrical Energy consumption in the year 2019– 4,01,958 units
- Green House Gas Emission per year -551.7 t CO_2e
- Air pollution impact on Ambient Air quality is negligible since the quantity of fuel used for combustion in the institution is very less
- Noise levels inside the campus are within the prescribed limit.
- Green Belt Development inside the campus, by the Institution are highly appreciable.
- GOOD waste management system is followed by the Institution. Very good initiative is taken by the institution to reduce paper consumption

- Food waste and other degradable bio-waste is converted into bio-compost and bio-fertilizer.
- Rainwater harvesting is installed in all the blocks
- Rainwater collected from the Administrative block, IT block, Computer block, M.C.A. block and Indoor stadium are diverted into the well.
- Lot of initiatives are taken to conserve Water and Energy by the Institution.
- Flow meters are to be provided for better water management
- Waste water management has to be improved to reduce the water consumption.
- Solar PV Power plants shall be planned to utilise renewable energy.

We are happy to submit this detailed environment audit report to the SFR COLLEGE FOR WOMEN.

TJ Solutions
Madurai

1. Introduction

1.1Environmental Policy

THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN has well formulated Environmental and Energy Policy to guide all its activities.

POLICY HIGHLIGHT that **"Energy conservation is a smart way of protecting environment"**

The main objectives are as follows

- Practice energy saving methods in every way possible
- Make the stakeholders be aware of the ill effects of energy depletion
- Conscious purchase of power conserving devices.
- Frequent servicing of all the energy consuming objects.
- Immediate action on wastage of resources.

Measures taken:

- Water is conserved through RAINWATER HARVESTING.
- BIOGAS is used as fuel for cooking
- Hot water from 500LPD SOLAR WATER HEATER is used for cooking
- Solar PV panels are used for street lights
- Auto -tripping air conditioners are used
- Computers are switched to sleep mode or hibernate mode automatically when not in use
- Students are encouraged to commute by bicycles instead of coming by own vehicles
- Bus service is provided to minimise vehicle usage
- Food waste is converted into compost
- Instruction boards on energy conservation are posted on required places

2. WATER

- ❖ Water purchased from outside source - 60,000liters/Day
- ❖ Quantity of water pumped from well – 25,000liters/day

2.1 Water usage at College

No of students-3426
No of Teaching staff -165
No of non-teaching staff -130
Total no of stake holders-3721

Sl. No	Place	Quantity litres / Day
1.	Rest room, lab & other activities	32 000
2.	Drinking	5500
3	Garden	12000
4	Vehicle Cleaning	500
5	Canteen	6000
Total		56000

Water usage per stakeholder-15 litres/day

2.2 Water usage at Hostel

No of students in the Hostel -350

Sl. No	Place	Quantity litres / Day
1.	UG Hostel	15000
2.	PG Hostel	8000
3	New Hostel	6000
Total		29000

Water usage per stakeholder-83 litres/day

3. Electrical Energy

Sl. No	Service no	Block	Consumption - units year 2019
1	072390013024	IT	56312
2	072390014383	Admin Extn	49144
3	072390011926	Admin + Computer	69162
4	07239001488	Main	79020
5	07239001645	Main Extn	28930
6	072390011927	Hostel	110830
7	07239001486	Canteen	4210
8	072390011928	Principal House	4350
Total			401958

Total Electrical Energy consumption in the College & Hostel -4,01,958 units

4. Fuel Consumption

4.1 LPG Consumption

Number of commercial Gas cylinders used in the Hostel per year -360

Number of commercial Gas cylinders used in the canteen per year -60

4.2 BIOGAS

- Biogas plant installed at Hostel to generate biogas from human excreta
- Energy equivalent to 24 cylinders of LPG is saved per year
- Biogas generation per year-1085 M^3

5. Waste Generations and Management

Waste Generation

Liquid waste

Waste water generation in the college - 38 KL /day

Waste water generation in the Hostel – 29 KL /day

Solid Waste

Food waste-20-30 Kg /day

Plastic Waste-<1 Kg/day

Polythene cover (Milk Cover)-2.0 Kg /month

Waste Management

5.1 Liquid waste Management

- Laboratory waste water is being sent through public sewer drainage system after proper dilution as per Material Safety Data Sheet norms.
- Waste water generated from washing, urinals, bathrooms are sent through public sewer drainage system.

5.2 Solid waste Management

5.2.1 Bio-degradable Waste Management

- Separate dustbins are kept to collect the waste food and used plates.
- Bio-Degradable and non-biodegradable waste are collected in separate bins provided.
- Food waste and vegetable waste from Hostel & canteen are sent to compost yard
- Withered leaves are collected and used for composting

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5.2.2 Plastic Waste Management

- The college has been declared as a 'Plastic Free' zone.
- Use of polythene bags is avoided.
- Snacks and food sold in the canteen is wrapped in leaves and butter papers.
- Plastic waste comes in through lab equipment's package, empty chemical containers etc are disposed periodically
- Use of Jute bags encouraged: Jute bag making machines are purchased and students are trained in jute bag making.

5.2.3 Other Solid Waste Management

- Solid wastes generated from damaged furniture, paper waste, paper plates – to Municipal waste collection system
- Glass waste from Broken glass wares are disposed periodically through municipal waste collection system
- Napkins are burnt in the incinerators
- Advantages of using Cotton sanitary pads is imparted by organizing awareness program

5.3 Used Battery Management

- Used batteries are disposed through "Go For Green Policy"

5.4 e-Waste Management

- All Computers and electronic machinery is purchased under Buy-Back agreement
- In the computer laboratories, the computers that turn to be less memory spaced are used for storing less memory-spaced programmes like MS-Office, Corel Draw and Paint and are used for summer vacation classes.
- They are also used in computer installation, trouble- shooting laboratories and for demos for the Computer Literacy students.
- The used CDs are creatively employed in Art from Waste Competition.

- Electronics contingency items like resistors, capacitors, diodes, transistors, etc., which are worn-out are used as demo models in the classrooms or for extension activities.
- Parts of worn-out equipment are used as spares for other equipment.
- Discarded Computer parts (Monitor, CPU, Keyboard, Mouse, Speakers), Printers, Projectors, Refrigerators, Air Conditioners, UPS, Batteries, Vacuum Cleaners, Switches are collected from all the departments and are stockpiled.
- The collected E-waste is disposed through authorized e-waste recycler

5.5 Hazardous Waste Management

- Green Chemistry is followed in the lab.
- To get rid of toxic fumes in the Chemistry laboratory, a separate fume hood and industrial exhaust fans are installed.

6. Pollution abatement measures

6.1 Waste Reduction

- Micro scale laboratory is implemented in Chemistry Department to reduce the usage of chemicals.
- Students are instructed not to waste paper while writing examinations.
- In order to reduce the use of paper the following initiative were taken
  - Part of the library is changed as E-learning centre
  - Public announcement system is used for making all announcement to the students and faculty
  - Online exams are conducted for Environmental Studies, Computer literacy to reduce the paper usage.
  - Use of ICT is promoted through e-content cell functioning in the college.
- Paper disposed in the year 2019-2805 kgs
- Paper disposed in the year 2018-2930 kgs

Quantity got reduced from 2930kgs to 2805 kgs

6.2 Waste Recycling

- The waste water from the RO plant is stored in a tank and is used in the chemistry lab for washing purposes and also used for gardening throughout the year.
- Recyclable papers are collected and kept and disposed as mixed waste to paper mills through authorized Vendors.
- Paper of 2805 kgs disposed for recycling in the year 2019

6.3 Waste Reuse

- Reuse one sided paper
- Reuse Envelopes

6.4 Waste to wealth

- Biogas generation from waste through Biogas plant
- Dry leaves are converted into bio fertilizer
- Waste papers are sent for recycling

6.5 Water Conservation initiatives

- Press type water taps are installed to reduce the wastage of water.
- Leaky water taps are attended as soon as possible
- Water conservation awareness programs are conducted regularly to create awareness among the students about the importance of water conservation

6.6 Energy conservation

- The fans, lights, air-conditioners and other electronic and electrical equipment are switched off when not in use.
- Computers are switched to sleep mode or hibernate mode automatically when not in use
- Electrical equipment like CROs, Oscillators, Sodium lamps are switched off in the laboratory when the students complete their observations.
- At the end of every practical session, Computer monitors and UPS are switched off.
- Periodical maintenance and overhauling of generators is being carried out
- Soft copies are maintained instead of hard copies, to reduce power consumption and paper

7. Greenbelt Development

The campus is enriched with different types of trees, shrubs and herbs.

- Special initiatives are taken by the department of Botany and new saplings are planted every year. Altogether, there are **1329** trees in the campus.
- The fountain, lily pond and **162** potted plants add to the aesthetic beauty.
- A lily pond and green lawns enrich the beauty of the campus
- Herbal garden is maintained by the Department of Botany and the students are made aware of the traditional medicinal practices.
- The Department of Botany has cultivated medicinal plants with a focus on good health.
- The list of trees and the arrival of new saplings are recorded every year.
- A full time horticulturalist takes care of the trees, herbs and shrubs in the campus.
- Greenery and shade area of the campus occupies 70% of the total campus area.
- The eco-friendly ambience of the campus is a noteworthy feature of SFRC.

Routine Green Practices

- The Green campus drive is an initiative of the college to protect the environment.
- The college has been declared as a 'No Plastic' zone.
- The campus protects age old trees in addition to several new trees and plants planted.
- The campus is lush green with gardens, lawns, flowers and plants wherever there is open space.
- The N.S.S and N.C.C wings of the college take special care to keep the campus neat and green.
- Poster/ painting competitions are conducted for the students on the theme "Green S.F.R.C campus" in order to alert the students of their duty to maintain a green and clean campus

- **Clean Green day**- No Vehicle day is observed to instil conservation of fuel.
- Students, faculty members and non-teaching fraternity are motivated to come by walk, bicycles or public transport once in a semester to instil the concept of reduction in usage of fuel.
- Students will be honoured with a small **GO GREEN BADGE** to motivate them to come to college by bicycles or battery-operated vehicles to do their part in protecting the environment
- Tree plantation programmes are organised regularly in adopted villages
- Rallies were conducted in adopted villages to say 'No to Plastics".
- Paper bags prepared by the students were distributed to the people of adopted villages to reduce usage of plastics

Plants inside the campus

Sl. No.	Botanical name	Tamil name	Family	Number of plants
1	*Acacia auriculiformis* A.Cunn. *ex* Benth.	பெல்சில்மரம	Fabaceae	1
2	*Annona squamosa* L.	சீதா	Annonaceae	1
3	*Azadirachta indica* A. Juss.	வேப்பு	Meliaceae	20
4	*Bauhinia purpurea* L.	மந்தாரை	Fabaceae	2
5	*Bauhinia tomentosa* L.	திருவாதி	Fabaceae	1
6	*Caesalpinia pulcherrima* (L.) Sw.	மயில்கொன்றை	Fabaceae	2
7	*Cassia fistula* L.	சரக்கொன்றை	Fabaceae	1

8	*Casuarina equisetifolia* L.	சவுக்கு	Casuarinaceae	1
9	*Delonix regia* (Boj. *ex* Hook.) Raf.	செம்மயிற்கொன்றை	Fabaceae	10
10	*Eucalyptus globules* Labill.	கற்பூரமரம	Myrtaceae	1
11	*Ficus religiosa L.*	அரசு	Moraceae	1
12	*Guazuma ulmifolia* Lam.	தேன்மரம்	Sterculiaceae	1
13	*Hibiscus rosa-sinensis* L.	செம்பருத்தி	Malvaceae	1
14	*Ixora coccinea* L.	இட்லிபூ	Rubiaceae	1
15	*Lawsonia inermis* L.	மருதாணி	Lythraceae	1
16	*Limonia acidissima* L.	விளாமரம்	Rutaceae	1
17	*Libidibia coriaria* (Jacq.) Schltdl.	இங்கிமரம்	Fabaceae	1
18	*Manilkra sapota (L.) P. Royen*	சப்போட்டா	Sapotaceae	1
19	*Melaleucacitrina*(Curtis) Dum.Cours.	பாட்டில்பிரஷ்	Myrtaceae	1
20	*Melia azedarach* L.	மலை வேம்பு	Meliaceae	1
21	*Millettia pinnata* (L.) Panigrahi	புங்கை	Fabaceae	4
22	*Millingtonia hortensis* L.f.	பன்னீர்	Bignoniaceae	8
23	*Mimusops elengi* L.	மகிழமரம்	Sapotaceae	1
24	*Moringa oleifera* Lam.	முருங்கைமரம்	Moringaceae	1
25	*Muntingia calabura* L.	சீனிபழமரம்	Muntingiaceae	1
26	*Murraya koenigii* (L.) Sprengel	கருவேப்பிலை	Rutaceae	1
27	*Nerium oleander* L.	அரளி	Apocynaceae	2
28	*Nyctanthes arbor-tristis* L.	பவழமல்லி	Oleaceae	1

29	*Odina wodier* Roxb.	ஓடி	Anacardiaceae	2
30	*Parkinsonia aculeata* L.	சீமை	Fabaceae	1
31	*Peltophorum pterocarpum* (DC.) K.Heyne	பெருங்கொன்றை	Fabaceae	4
32	*Pentalinon luteum* (L.) B.F.Hansen & Wunderlin	மணிவிலர்	Apocynaceae	1
33	*Phyllanthus acidus* (L.) Skeels	அரிநெல்லி	Euphorbiaceae	1
34	*Pisonia alba* Span.	லட்சகட்டகீரை	Nyctaginaceae	1
35	*Pithecellobium dulce* (Roxb.) Benth.	கொடிக்காய்	Fabaceae	1
36	*Plumeria rubra* L.	இல்லத்தரளி	Apocynaceae	1
37	*Polyalthia longifolia* Sonn.	நெட்டிலிங்கம்	Annonaceae	1
38	*Psidium guajava* L.	கொய்யாமரம்	Myrtaceae	1
39	*Punica granatum* L.	மாதுளை	Punicaceae	1
40	*Tamarindus indica* L.	புளியமரம்	Fabaceae	1
41	*Tecoma stans* (L.) Juss. *ex* Kunth	தங்கரளி	Bignoniaceae	1
42	*Terminalia catappa* L.	நாட்டுவாதுமை	Combretaceae	4
43	*Thespesia populnea* (L.) Sol. *ex* Correa.	பூவரசு	Malvaceae	1

8. Renewable Energy

8.1 Solar Water Heater

- Solar water heater capacity of 500 LPD installed in the hostel for preheating purpose in the hostel mess.
- Grid electrical energy (equivalent) saved due to Solar water heaters is 7,500 units/year

8.2 Biogas

- Biogas generation from the food waste during in the year 2019 is 1085 M^3
- Grid electrical energy (equivalent) saved due to Biogas is 6,308 units

Renewable Energy usage- Breakup

Sl. No.	Renewable Energy	Electrical Energy/Equivalent Electrical Energy
1	Solar Thermal	7,500 units- Equivalent Electrical Energy
2	Biogas	6,308 units- Equivalent Electrical Energy
	Total	13,808 units

9. Rainwater Harvesting

The college is located in a drought prone area and is affected by the scarcity of water.

The following measures are taken in the campus:

- Rainwater harvesting is installed in all the blocks
- Rainwater collected from the Administrative block, IT block, Computer block, M.C.A. block and Indoor stadium are diverted into the well.
- Rainwater collected from the Main block is stored in three tanks and it is used for science laboratories.

❖ Excellent Rainwater collection system is implemented to harvest the rainwater

10. Ambient Air

10.1 GREEN HOUSE GAS EMISSION

The college promotes the usage of public transport by issuing government bus passes. Rather than using individual vehicles, the college arranges buses from various places to the college so as to minimize the emission of carbon.

No of students-3426,
No of Teaching staff -165,
No of non-teaching staff -130

A Radius of Sivakasi town -7 KM

Average distance travelled by staff and students per day from home to College and back to home=10 KM

No of Four wheelers being used by students and staff =183
No of Two wheelers being used by students and staff =532
Average No of days vehicle used for college per year-220 days

Average Fuel efficiency of Four wheelers = 20KM/ Lit
Average Fuel efficiency of Two Wheelers = 60KM/ Lit

Average Petrol consumption by Four wheelers per year	20130 Lits.
Average Petrol consumption by Two wheelers per year	19506 Lits.
Total Petrol consumption per year	39636 Lits
Diesel consumption by college vehicle per year	36720 Lits
Diesel consumption by DG sets per year	2400 Lits
Total Diesel Consumption per year	39120 Lits
LPG consumption(Hostel & canteen) per year	7980 KGs
Total electrical power consumed from Grid in the year 2019	4,01,958 units
Green House Gas emission due to petrol	93542.5 kg CO_2e
Green House Gas emission due to diesel	104450.4 kg CO_2e
Green House Gas emission due to LPG	24179.4 kg CO_2e
Green House Gas emission due to Grid power	329605.6 kg CO_2e
Total GHG emission per year	551777.9 kg CO_2e
Total GHG emission per year	551.7 t CO_2

10.2 Ambient Air Quality

Flue gas emission sources

- LPG combustion at hostel, canteen and labs
- BIOGAS combustion at hostel boiler
- Diesel generator at College and Hostel

Fuel consumption per year

- LPG – 7980 Kg
- BIOGAS-1085 M^3
- Diesel for generator -2400 litres

Fuel consumption per day

- College workings days -220
- Hostel occupied with students -300 days
- Average LPG consumption per day-26 kgs
- Average BIOGAS consumption per day-3.6 M^3
- Average diesel consumption per day-10 litres

Combustion of LPG and BIOGAS is NOT CONTINUOUS

DIESEL Generator will run only when TNEB grid power fails

Considering the above situation, the quantity of flue gas emission and the impact on ambient air quality from the above combustions are negligible

10.3 Noise level

Noise level inside the campus

Sl. No	Location	Max value in dB	Average Value in dB
1	Near Main Building	52.1	49.2
2	Near MCA Block	53.9	51.6
3	Near Admin	52.9	49.7
4	Near ATM Entrance	63.5	60.8
5	Near Main Entrance	66.2	62.6
6	Near Generator Room	62.0	59.2

- Diesel Generators (DG) sets do not run on a continuous basis. Only during power failure, DG sets are operated on College working hours.
- Generally Power failure occurs for a very short duration.
- During planned shutdown hours, DGs run continuously based on the load
- Noise disturbance at class rooms due to DG set is negligible since class rooms are located far away from DG room
- All buildings are far away from the Highway. Noise disturbance from the highway is not appreciable.

11. Audit Findings & Recommendations

Findings

- **Excellent Rainwater collection system is implemented to harvest the rainwater**
- Total water consumption for THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN and Hostel is 85 KL/Day.
- Water usage per day per stakeholder in the college-15 litres.
- Water consumption per day per stakeholder in the hostel -83 litres
- Electrical Energy consumption from TNEB GRID alone is 4, 01,958 units.
- Renewable energy utilisation(SOLAR WATER HEATER AND BIOGAS)-13,808 units (equivalents).
- Green House Gas Emission -551.7t CO_2e.
- Air pollution impact on Ambient Air quality is negligible since the quantity of fuel used for combustion in the institution is very less
- Noise levels inside the campus are well within the limit,
- Green Belt Development in the inside of the campus by the Institution is highly appreciable.
- Excellent waste management system is followed by the Institution. Very good initiative is taken by the Institution to reduce paper consumption and collection of waste paper and disposal
- Food waste and other degradable Bio-waste are converted into Bio compost and Bio fertilizer
- Lot of initiatives are taken to conserve water and Energy by the Institution.

Recommendations

- Flow meters are to be provided at source to know the water consumption and for better water management.
- Waste water management has to be improved to reduce the water consumption.
- Plan for more GREEN ENERGY - SOLAR PV POWER PLANTS to reduce energy drawn from TNEB Grid