KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be University)
(Established Under Section 3 of UGC Act, 1956)
Pollachi Main Road, Eachanari Post, Coimbatore - 641 021, Tamil Nadu, India.
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7.1.16 Reports on Environment and Energy Audits

S.No.	Year	Particulars	Page No.
1	2019-2020	Report on Environment and Energy Audits	2
2	2018-2019	Report on Environment and Energy Audits	47
3	2017-2018	Report on Environment and Energy Audits	73
4	2016-2017	Report on Environment and Energy Audits	95
5	2015-2016	Report on Environment and Energy Audits	105

REGISTRAR
Karpagam Academy of Higher Education
(Deemed to be University Under Section 3 of UGC Act 1956)
Pollachi Main Road, Eachanari Post,
Coimbatore - 641 021.

KARPAGAM ACADEMY OF HIGHER EDUCATION
CBE-21

7.1.6 Reports on Environment and Energy Audits

(2019-2020)

REPORT OF
ENVIONMENTAL AND GREEN AUDIT

KARPAGAM ACADEMY OF HIGHER EDUCATION (KAHE)

DEEMED TO BE UNIVERSITY

COIMBATORE – 641 021

Submitted by

RM.MAYILERU

ACCREDITED ENERGY AUDITOR – AEA-0041

RM.MAYILERU & CO.,

256, 3rd STREET,

GANDHIPURAM,

COIMBATORE – 641 012

PH: 0422 2497455, 2494942

DATE : 28.05.2020

TABLE OF CONTENTS

ENVIRONMENTAL AND GREEN AUDIT REPORT

INTRODUCTION

Environmental Audit can be defined as systematic identification, quantification, recording, reporting and analysis of components of environmental diversity. The 'Environmental Audit' aims to analyze environmental practices within and outside the university campus, which will have an impact on the eco-friendly ambience. The major component of Environment Audit is the Green Audit. It is the process of systematic identification, quantification, recording, analyzing and reporting of flora and fauna diversity of the institution. Through Environmental Audit one gets a direction as how to improve the condition of environment and there are various factors that have determined the growth of carrying out Environmental Audit.

Moreover, it is a part of Institutional Social Responsibility (ISR) to ensure that it contributes towards the reduction of global warming through Carbon Footprint Reduction measures. Through Environmental Audit one gets a direction as how to improve the condition of environment. A clear and healthy environment helps effective learning and provides conducive learning environment.

Environmental Audit focuses on Green Campus, Waste Management, Water Management, Air monitoring, Energy Management being implemented by the Institution.

Having understood the significance of conducting the Environmental Audit, the Karpagam Academy of Higher Education vested the responsibility of conducting the audit to a Professional Agency, RM. Mayileru & Co., headed by Mr.RM.MAYILERU, the Accredited Energy Auditor and the Agency has submitted this report.

1.1 About the University :

'Karpagam Academy of Higher Education (KAHE)' is located in a sprawling, green, lush campus extending 26 acres. It has emerged from Karpagam Arts & Science College (Autonomous) a unit under the Karpagam Charity Trust established in 1989 founded by the great philanthropist, industrialist and educationist Dr.R.VASANTHAKUMAR with the vision of instilling originality in the learning minds, imparting quality and value-based education and to engage in Research and Development with the noble objective of creating unique men and women to serve and lead the society.

Karpagam Academy of Higher Education was conferred as Deemed to be University status by the Ministry of Human Resource Development in August 2008 under section 3 of the UGC Act 1956. It is a recognized Deemed to be University by the UGC. It is a member of the Association of Indian Universities. The institution has been accredited by NAAC in 2015.

The institution has 4 Faculty – Faculty of Arts, Science and Humanities, Faculty of Engineering, Faculty of Architecture and Faculty of Pharmacy. It has 25 departments offering a wide range of 84 academic programmes from graduation to doctorate level. The Institution has more than 6000 students on campus, with a strong contingent of more than 350 teaching faculty, well supported by an almost equal number of administrative and supporting staff. Faculty have got good number of research projects with financial support from various funding agencies like DBT / DST / ICMR and have filed more than 60 patents. As many as 2400 Research papers have been published by the faculty in SCOPUS. The institution has collaborated with Foreign Universities, Industries and Research Bodies for mutual benefit. The Institution ensures that education epitomizes excellence in every sphere and students are prepared to take on the challenges of the day and become the next generation leaders.

2. Objectives of the Study

General Objective:

To study the upkeep of the precincts and ascertain the development of the nature into a greener place to create an ambience for teaching and learning.

Specific Objectives:

1. To study the status of the environment more specifically relating to Water Management, Air monitoring, Energy Conservation, Waste Management and Green Area Management in the KAHE Campus.
2. To identify the areas of strength and weakness.
3. To identify the areas which require further strengthening and
4. To offer suggestions for protection and sustainable development of Environment.

3. Methodology

The following approved tests – namely :

Analysis of drinking water

Analysis of Bore well water

Ambient Air Quality Survey

Source Emission Stock Monitoring

Analysis of Sewage Water – Raw & Treated

were conducted and their reports are studied to ensure the maintenance of standards and to adhere standards on environment.

The study covered the following areas to summarise the present status of environment management in the campus:

a. Water management.
b. Air Monitoring.
    i. Ambient Air Quality
    ii. Genset Smoke Emission
c. Energy Conservation.
d. Waste Management.
e. Green Area management

4.1 Water Management:

i. Observations

There are 7 bore wells in the campus. 4 Nos. of Over Head tanks of each 190000 liters capacity and 3 Nos. of Sumps of 55000 liters capacity.

Athikadavu drinking water of 37500 liters used per day by KAHE.

RO – 5000 liters per day.

WATER ANALYSIS REPORT

Name of the sample : Drinking water
Source : RO Outlet Water
Date of collection : 28.02.2020
Quantity of sample : 2.0 liters.

S. No.	TEST PARAMETERS	UNIT	TEST METHODS	TEST RESULTS	Acceptable Limit (IS:10500 :2012)
1	Colour	HAZEN	APHA 22nd Edn 2120 C	0.0	5.0
2	Odour	...	IS 3025 PART 05-1983 RA 2012	Agreeable	Agreeable
3	Electrical Conductivity	µs/cm	IS 3025 PART 14-1984 RA 2013	114.0	...
4	Turbidity	NTU	IS 3025 PART 10-1984 RA 2012	0.0	1.0
5	pH @ 25°C	...	IS 3025 PART 11-1983 RA 2012	7.69	6.5 – 8.5
6	Total suspended solids (TSS)	mg/l	IS 3025 PART 17-1984 RA 2012	BDL (D.L:1.0)	...
7	Total dissolved solids (TDS)	mg/l	IS 3025 PART 16-1984 RA 2012	73.0	500
8	Total Alkalinity	mg/l	IS 3025 PART 23-1986 RA 2014	34.10	200
9	Total hardness(as $CaCo_3$)	mg/l	IS 3025 PART 21-1983 RA 2014	38.46	200
10	Chlorides (as Cl)	mg/l	IS 3025 PART 32-1988 RA 2014	12.59	250
11	Sulphate (as SO_4)	mg/l	IS 3025 PART 24-1986 RA 2014	2.13	200
12	Calcium (as Ca)	mg/l	IS 3025 PART 40-1991 RA 2014	6.16	75
13	Magnesium (as Mg)	mg/l	APHA 22nd Edn 3500 (Mg) B	5.60	30
14	Iron (as Fe)	mg/l	IS 3025 PART 53-2003 RA 2014	BDL (D.L:0.1)	0.3
15	Nitrate (as NO_3)	mg/l	APHA 22nd Edn 4500 (NO_3) B	0.37	45
16	Fluoride (as F)	mg/l	APHA 22nd Edn 4500 (F) D	BDL(D.L:0.1)	1.0
17	Total Coliform / 100 ml)	CFU	IS 1622 / 1996	Absent	Absent

Comments : The results indicate that the water is physical, chemical & biologically suitable for potable with respect to the parameters tested.

WATER ANALYSIS REPORT

Name of the sample: Drinking water
Source : Athikadavu Water
Date of collection : 28.02.2020
Quantity of sample : 2.0 liters.

S. No.	TEST PARAMETERS	UNIT	TEST METHODS	TEST RESULTS	Acceptable Limit (IS:10500:2012)
1	Colour	HAZEN	APHA 22nd Edn 2120 C	0.0	5.0
2	Odour	...	IS 3025 PART 05-1983 RA 2012	Agreeable	Agreeable
3	Electrical Conductivity	µs/cm	IS 3025 PART 14-1984 RA 2013	109.0	...
4	Turbidity	NTU	IS 3025 PART 10-1984 RA 2012	0.0	1.0
5	pH @ 25°C	...	IS 3025 PART 11-1983 RA 2012	7.49	6.5 – 8.5
6	Total suspended solids (TSS)	mg/l	IS 3025 PART 17-1984 RA 2012	BDL (D.L:1.0)	...
7	Total dissolved solids (TDS)	mg/l	IS 3025 PART 16-1984 RA 2012	71.0	500
8	Total Alkalinity	mg/l	IS 3025 PART 23-1986 RA 2014	38.0	200
9	Total hardness(as $CaCo_3$)	mg/l	IS 3025 PART 21-1983 RA 2014	33.10	200
10	Chlorides (as Cl)	mg/l	IS 3025 PART 32-1988 RA 2014	14.04	250
11	Sulphate (as SO_4)	mg/l	IS 3025 PART 24-1986 RA 2014	2.39	200
12	Calcium (as Ca)	mg/l	IS 3025 PART 40-1991 RA 2014	11.45	75
13	Magnesium (as Mg)	mg/l	APHA 22nd Edn 3500 (Mg) B	1.10	30
14	Iron (as Fe)	mg/l	IS 3025 PART 53-2003 RA 2014	BDL (D.L:0.1)	0.3
15	Nitrate (as NO_3)	mg/l	APHA 22nd Edn 4500 (NO_3) B	0.49	45
16	Fluoride (as F)	mg/l	APHA 22nd Edn 4500 (F) D	BDL(D.L:0.1)	1.0
17	Total Coliform / 100 ml)	CFU	IS 1622 / 1996	Absent	Absent

Comments : The results indicate that the water is physical, chemical & biologically suitable for potable with respect to the parameters tested.

WATER ANALYSIS REPORT

Name of the sample : Borewell water
Source : Borewell water
Date of collection : 28.02.2020
Quantity of sample : 2.0 liters.

S. No.	TEST PARAMETERS	UNIT	TEST METHODS	TEST RESULTS
1	Colour	HAZEN	APHA 22nd Edn 2120 C	0.0
2	Odour	...	IS 3025 PART 05-1983 RA 2012	Agreeable
3	Electrical Conductivity	µs/cm	IS 3025 PART 14-1984 RA 2013	1753.0
4	Turbidity	NTU	IS 3025 PART 10-1984 RA 2012	0.0
5	pH @ 25°C	...	IS 3025 PART 11-1983 RA 2012	7.0
6	Total suspended solids (TSS)	mg/l	IS 3025 PART 17-1984 RA 2012	BDL (D.L:2.0)
7	Total dissolved solids (TDS)	mg/l	IS 3025 PART 16-1984 RA 2012	1223.0
8	Total Alkalinity	mg/l	IS 3025 PART 23-1986 RA 2014	289.0
9	Total hardness(as $CaCo_3$)	mg/l	IS 3025 PART 21-1983 RA 2014	613.18
10	Chlorides (as Cl)	mg/l	IS 3025 PART 32-1988 RA 2014	474.0
11	Sulphate (as SO_4)	mg/l	IS 3025 PART 24-1986 RA 2014	70.78
12	Calcium (as Ca)	mg/l	IS 3025 PART 40-1991 RA 2014	108.35
13	Magnesium (as Mg)	mg/l	APHA 22nd Edn 3500 (Mg) B	83.3
14	Iron (as Fe)	mg/l	IS 3025 PART 53-2003 RA 2014	BDL (D.L:0.1)
15	Nitrate (as NO_3)	mg/l	IS 3025 PART 34-1988 RA 2014	9.20
16	Fluoride (as F)	mg/l	APHA 22nd Edn 4500 (F) D	0.19

B.D.L : Below Detectable Limit, NTU : Nephelometric Turbidity Unit, D.L : Detectable Limit.

ii. Recommendations

The drinking water quality is good and needs to be maintained by monthly tests to avoid any outbreak or diseases.

4.2 Air Monitoring

I. Ambient Air Quality

Tests were conducted on 28.02.2020 on four sides of the campus and reports are furnished as follows:

i. Readings:

a. NORTH WEST SIDE:

S. No	TEST PARAMETERS	UNIT	TEST RESULTS	LIMITS	TEST METHODS
1	Particulate Matter (Size less than 10 µm) or PM_{10}	µg/m^3	68.35	100**	IS:5182 Part 23 2006 RA 2012
2	Particulate Matter (Size less than 2.5 µm) or $PM_{2.5}$	µg/m^3	26.12	60**	EPE/SOP/AA/02
3	Sulphur Dioxide (SO_2)	µg/m^3	5.82	80**	IS:5182 Part 2 2001 RA 2012
4	Nitrogen Dioxide (NO_2)	µg/m^3	24.50	80**	IS:5182 Part 6 2006 RA 2012

b. **NORTH SIDE:**

S. No.	TEST PARAMETERS	UNIT	TEST RESULTS	LIMITS	TEST METHODS
1	Particulate Matter (Size less than 10 µm) or PM_{10}	$\mu g/m^3$	55.33	100**	IS:5182 Part 23 2006 RA 2012
2	Particulate Matter (Size less than 2.5 µm) or $PM_{2.5}$	$\mu g/m^3$	18.64	60**	EPE/SOP/AA/02
3	Sulphur Dioxide (SO_2)	$\mu g/m^3$	5.50	80**	IS:5182 Part 2 2001 RA 2012
4	Nitrogen Dioxide (NO_2)	$\mu g/m^3$	21.15	80**	IS:5182 Part 6 2006 RA 2012

c. **SOUTH SIDE:**

S. No.	TEST PARAMETERS	UNIT	TEST RESULTS	LIMITS	TEST METHODS
1	Particulate Matter (Size less than 10 µm) or PM_{10}	$\mu g/m^3$	47.15	100**	IS:5182 Part 23 2006 RA 2012
2	Particulate Matter (Size less than 2.5 µm) or $PM_{2.5}$	$\mu g/m^3$	15.0	60**	EPE/SOP/AA/02
3	Sulphur Dioxide (SO_2)	$\mu g/m^3$	5.13	80**	IS:5182 Part 2 2001 RA 2012
4	Nitrogen Dioxide (NO_2)	$\mu g/m^3$	17.80	80**	IS:5182 Part 6 2006 RA 2012

d. EAST SIDE:

S. No.	TEST PARAMETERS	UNIT	TEST RESULTS	LIMITS	TEST METHODS
1	Particulate Matter (Size less than 10 µm) or PM_{10}	$\mu g/m^3$	39.0	100**	IS:5182 Part 23 2006 RA 2012
2	Particulate Matter (Size less than 2.5 µm) or $PM_{2.5}$	$\mu g/m^3$	(BDL: 15.0)	60**	EPE/SOP/AA/02
3	Sulphur Dioxide (SO_2)	$\mu g/m^3$	5.0	80**	IS:5182 Part 2 2001 RA 2012
4	Nitrogen Dioxide (NO_2)	$\mu g/m^3$	14.33	80**	IS:5182 Part 6 2006 RA 2012

National Ambient Air Quality standards prescribed by Ministry of Environment and Forests, Government of India vide Gazette Notification G.S.R.826 (E) dated 18.11.2009.

** TWA: 24 hours, TWA : Annual, TWA : Time Weighted Average, BDL : Below Detectable Level D.L : Detectable Level.

OBSERVATIONS:

All the readings suggest the emission is much under control and as such no separate measures are required. Improving or bettering up the atmosphere is always welcome by adding trees & plants rather meadows, if situation permits.

II. Genset Stack Emission Test

i. Observation:

Stack monitoring Tests on Generator Set – 125 KVA – I and II were conducted and reports are furnished herewith:

a. STACK EMISSION SOURCE : GENERATOR SET – 125 KVA-I

Instrument used : Stack Monitoring Kit : PEM / SMK10

S. No.	DESCRIPTION	UNIT	TEST RESULTS	CPCB LIMITS	TEST METHODS
1	Source Make / ID	...	Ashok Leyland	....	...
2	Stack Height from Ground Level	m	3.0	....	...
3	Stack Diameter	m	0.10	...	...
4	Ambient Temperature	°C	32.0	...	IS:11255 PART 3 2008
5	Stack Temperature	°C	117.0	...	IS:11255 PART 3 2008
6	Stack Velocity	m/sec	12.89	...	IS:11255 PART 3 2008
7	Gas Discharge	Nm^3/hr	278.33	...	IS:11255 PART 3 2008
8	Particulate Matter (PM)	g/kw-hr	0.052	0.2	IS:11255 PART 1 1985 RA 2014
9	Sulphur Dioxide (SO_2)	mg/Nm^3	5.23	...	IS:11255 PART 2 1985 RA 2014
10	Oxides of Nitrogen + Hydro Carbon	g/kw-hr	0.38	4.0	IS:11255 PART 7 2005 RA 2012
11	Carbon Monoxide (CO)	g/kw-hr	0.20	3.5	IS:13270 1992 RA 2014

BDL : Below Detectable Level, D.L : Detectable Level.

The concentrations of Parameters tested in the above Stack Emission are prescribed limits as per Environmental Protection Act, the principal rules published regarding the Emission standard for Diesel generation set upto 800 kw in the Gazette of India vide Number S.O.844 (E) dated 19th November 1986 Environment Rules vide GST 232 (E) dated 31.03.2014.

b. STACK EMISSION SOURCE : GENERATOR SET – 125 KVA-II

Instrument used : Stack Monitoring Kit : PEM / SMK10

S. No.	DESCRIPTION	UNIT	TEST RESULTS	CPCB LIMITES	TEST METHODS
1	Source Make / ID	...	Ashok Leyland	....	...
2	Stack Height from Ground Level	m	3.0	....	...
3	Stack Diameter	m	0.10	...	...
4	Ambient Temperature	°C	33.0	...	IS:11255 PART 3 2008
5	Stack Temperature	°C	121.0	...	IS:11255 PART 3 2008
6	Stack Velocity	m/sec	13.21	...	IS:11255 PART 3 2008
7	Gas Discharge	Nm^3/hr	283.61	...	IS:11255 PART 3 2008
8	Particulate Matter (PM)	g/kw-hr	0.049	0.2	IS:11255 PART 1 1985 RA 2014
9	Sulphur Dioxide ($SO_{2)}$	mg/Nm^3	5.51	...	IS:11255 PART 2 1985 RA 2014
10	Oxides of Nitrogen + Hydro Carbon	g/kw-hr	0.40	4.0	IS:11255 PART 7 2005 RA 2012
11	Carbon Monoxide (CO)	g/kw-hr	0.22	3.5	IS:13270 1992 RA 2014

BDL : Below Detectable Level, D.L : Detectable Level.

The concentrations of Parameters tested in the above Stack Emission are prescribed limits as per Environmental Protection Act, the principal rules published regarding the Emission standard for Diesel generation set upto 800 kw in the Gazette of India vide Number S.O.844 (E) dated 19th November 1986 Environment Rules vide GST 232 (E) dated 31.03.2014.

ii. Recommendation:

The results do indicate a normal scenario and continuation of such tests for periodical inspection and maintenance is only recommended.

4.3 Energy Conservation:

Separate Energy Audit is recommended.

4.4 Waste Management.

i. Observation:

Canteen:

There are 2 canteens in the campus, preparing breakfast for 150 persons and Meals for 250 persons per day.

Drinking water supply is 5000 liters per day and Bore water supply is 7000 liters per day.

Toilets

There are 218 toilets in the campus with 8 septic tanks.

Discharge quantity:

S.No.	From	Quantity (in liters)
1	Canteen	3000 per day
2	Hostel	150000 per day
3	College	15000 per day

Used water from Wash basins and wash rooms are being sent to STP recycle anaerobic method.

WATER ANALYSIS REPORT

Tests on Sewage Water - Inlet and outlet were conducted and reports are furnished herewith.

Quantity of Sample : 2.0 Liters

Sample Location : Sewage Raw water (STP)

Sl. No.	Parameters	Unit	Test Methods	Test Results
1	pH @ 25°C	..	IS 3025 PART 11 – 1983 RA 2012	7.0
2	Total Suspended Solids (TSS)	mg/l	IS 3025 PART 17 – 1984 RA 2012	210.0
3	BOD – 3 Days @ 27°C	mg/l	IS 3025 PART 44 – 1993 RA 2014	181.0

Quantity of Sample : 2.0 Liters

Sample Location : Sewage Treated Water

Sl. No.	Parameters	Unit	Test Methods	Test Results	Tolerance Limits as per TNPCB
1	pH @ 25°C	..	IS 3025 PART 11 – 1983 RA 2012	7.6	5.5 – 9.0
2	Total Suspended Solids (TSS)	mg/l	IS 3025 PART 17 – 1984 RA 2012	42.53	30.0
3	BOD – 3 Days @ 27°C	mg/l	IS 3025 PART 44 – 1993 RA 2014	41.0	20.0

ii. Recommendation:

The test results project a failure which regretted due to non continuous monitoring.

Treatment and monitoring may be entrusted to an outside agency whose job is to ensure the results, failing which he shall meet damages, by such arrangement only the parameters can always be at check.

4.5 Green Area Management.

i. Observations

'Karpagam Academy of Higher Education (KAHE)' has raised beautiful greenery in the campus and there are

47 Nos. Coconut Trees

250 Nos. Kentia Palm Trees

13 Nos. Neem Trees

5 Nos. Lemon Trees

150 Nos. other Trees and

6750 Sq. Ft. landscape area.

3 rain water collection sumps are there in the campus and no rain water is allowed to go outside the campus, charging the underground strata only. Thus, water resources are being maintained.

ii. Recommendations:

- Declare 'Litter free Campus' – Fine up to Rs.500/- for littering.
- Create an Environmental policy like "Nature is Mother & Mother is sacred".
- Review periodically the list of trees planted in the garden.
  Allot numbers to the trees and keep records.
  Assign scientific names to the Trees.
  Campus in charge to do this.
- Indoor plantation - to inculcate interest in students, Bonsai can be planted in corridors to bond a relation with nature by Department heads and Students.
- Ensure that an audit is conducted annually and action is taken on the basis of audit report, recommendation and findings by Registrar.
- Owners of premises to be segregated and assigned to department for their tree planting & up keeping. Annual competition and prize schemes may be announced.

5. CONCLUSION

1. The total area of the Campus is 11,49,112 Sq. Ft. i.e 26.38 acres, of which 3,13,411 Sq. Ft. is occupied by buildings & facilities, thus occupying only around 28%. Balance 72% is vacant but, neatly laid out into passages, lawns, trees and such greenery.

2. They are advised to go for specific exercise on 'Man or material behave' study and 'Water balance' study. With these studies, one will come to know the various implications done by the industry to the nation or atmosphere especially to the water, air and earth. Based on that, additional steps can be taken to protect the earth & atmosphere more purposefully and meaningfully.

3. Already 7000 Sq. Ft. Solar panels are fixed in the roof top and producing Solar energy. Advised to increase the area further and thus reduce electricity consumption in due course of time.

RM.MAYILERU
ACCREDITED ENERGY AUDITOR – AEA-0041

R.M. MAYILERU & CO. COIMBATORE

ENERGY IS LIFE
BEE
CONSERVE IT

BUREAU OF ENERGY EFFICIENCY

Examination Registration No. : EA-0774

Accreditation Registration No.: AEA-0041

Certificate of Accreditation

This is to certify that Mr./Ms. R M Mayileru having its trade/registered office at Coimbatore has been given accreditation as accredited energy auditor. The certificate shall be effective from 26th day of February 2013

The certificate is subject to the provisions of the Bureau of Energy Efficiency (Qualifications for Accredited Energy Auditors and Maintenance of their List) Regulations, 2010.

This certificate shall be valid until it is cancelled under regulation 9 of the Bureau of Energy Efficiency (Qualifications for Accredited Energy Auditors and Maintenance of their List) Regulations, 2010

On cancellation, the certificate of accreditation shall be surrendered to the Bureau within fifteen days from the date of receipt of order of cancellation.

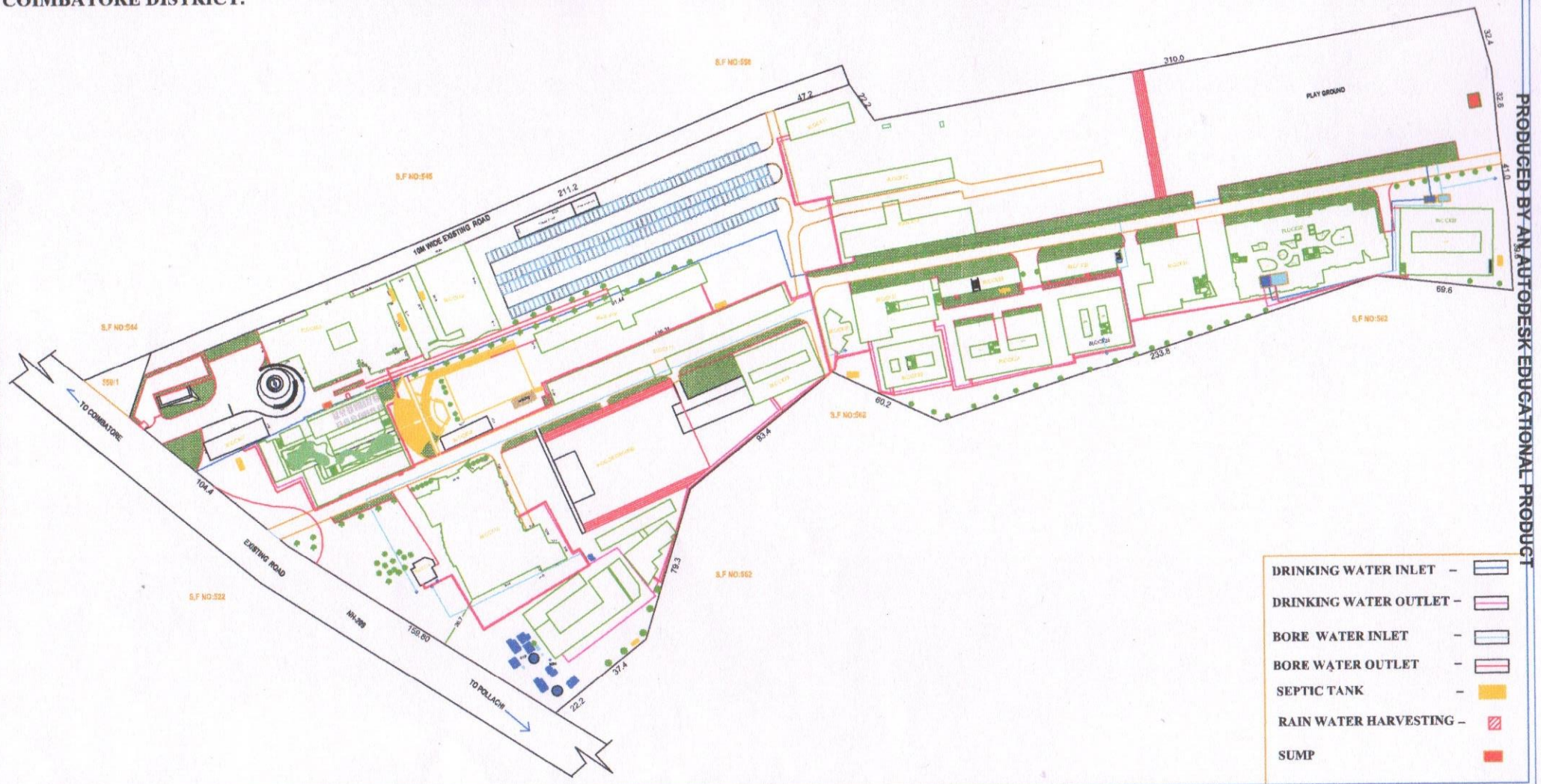
Your name has been entered at AEA No. 0041 in the register of list of accredited energy auditors. Your name shall be liable to be struck out on the grounds specified in regulation 8 of the Bureau of Energy Efficiency (Qualifications for Accredited Energy Auditors and Maintenance of their List) Regulations, 2010.

Given under the seal of the Bureau of Energy Efficiency, Ministry of Power, this 26th day of May 2014.

Secretary,
Bureau of Energy Efficiency
New Delhi

KARPAGAM ACADEMY OF HIGHER EDUCATION

PLAN SHOWING THE EXISTING BUILDINGS IN S.F. NOS:558/2,558/4,559/2B1,2B2,2C,560/1A,560/1B,2&561 OF SEERAPALAYAM VILLAGE & PANCHAYAT, MADUKKARAI TALUK & COIMBATORE DISTRICT.



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REPORT OF ENERGY AUDIT

KARPAGAM ACADEMY OF HIGHER EDUCATION (KAHE)

DEEMED TO BE UNIVERSITY

COIMBATORE – 641 021

Submitted by

RM.MAYILERU

ACCREDITED ENERGY AUDITOR – AEA-0041

RM.MAYILERU & CO.,

256, 3rd STREET,

GANDHIPURAM,

COIMBATORE – 641 012

PH: 0422 2497455, 2494942

DATE : 29.05.2020

ENERGY AUDIT CERTIFICATE

M/s.Karpagam Academy of Higher Education (KAHE) , has requested us to visit their institution to conduct Energy Audit to study and certify the present consumption and also their saving measures in order to contribute to the Nation in power saving.

Accordingly, we, Team of Engineers

1. Mr.RM.Mayileru, BE,BL – Accredited Energy Auditor AEA - 0041
2. Mr.V.K.Vasudevan, AMIE – Energy Manager – EM9787
3. Mr.C.Rajmohan, BE – Audit Member
4. Mr.P.Dinesh Kumar, BE – Audit Member
5. Mr.K.Palanisamy, D.E.E. – Audit Member

had been there on 27.02.2020, 28.02.2020 and 29.02.2020 to inspect, collect and ascertain necessary data and also energy saving measures

All necessary readings were taken in the course of 3 days and the long and short of study has been tabulated as Observations & recommendations and furnished herewith as follows:

TABLE OF CONTENTS

I. ENERGY OPTIMISATION

a. Demand Surrender Savings:

Observations:

Sanctioned Demand is 600 KVA.

During the last 6 months – August'2019, September'2019, October'2019, November'2019, December'2019 and January'2020 , demand used as per the Bills are as follows:

S.No.	Month	Actually used demand
1	August'2019	324.8
2	September'2019	345.2
3	October'2019	374.4
4	November'2019	396.8
5	December'2019	336
6	January'2020	310.4

Recommendations:

As per the EB bills produced by the Institution, Aug – Jan'2020, they have paid demand cost to EB amounting to Rs.11,34,000/- - 540 X 350 = 189000 X 6 months. (It would be Rs.22,68,000/- per year - 540 X 350 X 12 months.)

If the Institution surrenders 150 KVA demand and sanctioned demand is 450, EB will charge 90% of the SD or actual used demand, whichever is higher. If actual demand is 400, they will charge only for 405 KVA.

So, the actual charges towards demand alone will be

405 KVA X 350/KVA/Month X 12 months – Rs.17,01,000/- instead of

540 KVA X 350/KVA/Month X 12 months – Rs.22,68,000/-

There will be a saving of **Rs.5,67,000/-** per year.

We also recommend 'KAHE' to install suitable Demand controller in the MV panel (3 trips – one alarm)

b. 5 slot optimisation

Observations:

Consumption as observed during 5 different timings called 5 slots, starting from 6.00 to 9.00 am and thereon.

C1 - 6.00 am to 9.00 am - Avg Energy - 167.08 units
C2 - 6.00 pm to 9.00 pm - Avg Energy - 195.04 units
C3 - 9.00 pm to10.00 am - Avg Energy - 182.04 units
C4 - 9.00 am to 6.00 am - Avg Energy - 245.62 units
C5 - 10.00 am to 6.00 am - Avg Energy - 138.62 units

Recommendations:

Of the 5 slots, 1 or 2 slots are found to be highly consuming power, which duration need to be closely studied to reduce the load during that time, so that Energy optimisation every day will take place.

c. Commercial consumption Energy

Observations:

Power consumed by commercial establishments are found to be abnormal during the last 6 months.

S.No.	Month	Actually used demand
1	August'2019	832
2	September'2019	510
3	October'2019	6701
4	November'2019	1629
5	December'2019	7501
6	January'2020	6430

Recommendations:

This warrants a close study of those establishments and take necessary curtailing steps in order to have a uniform consumption.

If 500 units are saved, cost saving would be (Rs.8 X 500 Units) Rs.4000/- per month.

Respective authorities can take suitable steps to improve this.

d. Power Factor Maintenance:

Observations:

Power Factor is now being maintained at Unity Power 1.0, proportionate 30 volts reduced in tail end (load end) whereas at all the departments, it is very low, resulting in energy loss of 400 units, including Transformer loss - 105 units.

Recommendations:

By keeping right power factor at tail end (load end) we can save at least 200 units per day.

Power factor can be improved by means of installing small and medium capacitors at tail end.

II. LIGHTING OPTIMISATION

Observations:

There are 3300 lightings and out of this, 1200 were changed to LED – 22 Volts.

Others are 36 W – ordinary tube lights.

Balance lightings are also to be changed to LED.

Recommendations:

Currently resistive (lighting) load and inductive (motor) load are mostly done through one and the same circuit. With the result, when several motors are switched on and off, lighting flickers and it results in voltage fluctuation for pulps, rendering reduced life time for the pulps.

It is now advised to separate the lighting and motor loads by separate circuits, so that lighting circuits can be connected with a Servo Stabilizer, (after converting all the fittings to LED with an output of 180 Volts), which will lessen the power consumption in the lighting circuit. By this way there will be a saving of 50 units per day.

Because of unbalanced load, Neutral current is to be brought down to near '0' for safety purpose.

All street lights are to be connected to one single LDB control board through clock time operation.

III. Transformer Voltage Optimisation:

Observation:

At present MV Panel side 425 V and Load end voltage – 375 – 400.

Recommendation:

After improving the Power factor at Tail end, we may reduce through OLTC, voltage at Power house to 400 V, which is the best voltage for energy saving in all equipments.

Savings would be 50 units per day.

IV. EARTHING VALUE OPTIMISATION

Observation:

Individual earth pit values are found higher, which is to be maintained correctly.

Recommendation:

Additional Earth pits and lightning arrestors are to be planned and installed in all the blocks immediately.

V. SOLAR ENERGY OPTIMISATION

Observations:

Solar Energy generated is not used to the full extent.

Energy loss per day 80 to 100 units.

Solar Off – Energy per hour – 46.53 Units

Solar On – Energy per hour – 22.55 units

Solar Energy per hour – 23.98 Actual.

Solar Energy panel recorded per day 170 units instead of 300 units.

Energy loss per day is 80 units and per month – 2400 units.

Cost loss per month – approximately Rs.20,000/-

Recommendations:

i. It is advised to interlink Solar panels with SCADA monitoring system, to get minute by minute energy.

ii. Net metering to be planned after discussing with TNEB officials.

iii. Proper maintenance schedule to be followed with proper Technician.

VI. WIND MILL POWER GENERATION:

Observation:

The entire power supply is only from EB and no other renewable energy except Solar is there, notably Wind power.

Recommendation:

It is advised to have at least 25% of the current consumption namely 500 KW from wind grid, whose cost as of today works out to Rs.5.50/- as against the current payment of Rs.8/- per unit to EB.

VII. HOSTEL ENERGY OPTIMISATION

Gents & Ladies Hostel.

Observation:

Present tariff of the Hostel is HT II.

Recommendation:

It is advised to change the tariff from HT II to LT1A, which will result in a saving of Rs.3000/- per day. Per Month – Rs.90,000/- and per year Rs.7,20,000/-

Ladies Hostel:

1. Switch outgoing in 2 phases are found in melting condition. Flash over may occur at any time and it is to be attended immediately. Already informed the Electrical In-charge.

2. Neutral current flows – 49.42 Amps, which is very high to be attended immediately.

Gents Hostel:

1. Actual voltage found – 373 Voltage incoming and cable is found in joined and opened condition, which is not safe.

VIII. UPS LOAD SHARING AND OPTIMISATION

Observations:

Existing UPS load utilisation – 30 % to 40%

In this condition, Power factor is very low 0.45 to 0.55.

Recommendations:

Option : 1

Some of the UPS loads to be shifted to other UPS.

Balance ideal UPS can be shifted to other sister concern units.

Option : 2

All UPS can be converted to modular type parallel retardant UPS – 2 nos. To achieve the following:

1. Higher power factor
2. Easy maintenance
3. Battery cost saving
4. Back up timing is more
5. Charging energy is very less
6. Occupying less space
7. No need for switch gear

IX. AC LOAD OPTIMISATION.

All Air conditioners to be connected through stabilizer with single push switch / MCB.

At the present, stabilizer is always in on position, which is consuming more power.

Separate sub board – block wise to be planned to identify the Energy consumption and stabilizer voltage should be maintained at 200 Voltage.

AC temperature to be maintained at 25 deg. which is best for human health and energy saving.

For DUCTABLE AC, controller is to be maintained.

Proper log book to be maintained for all AC cleaning & servicing.

X. BORE WELL PUMP ENERGY OPTIMISATION:

Observations:

Total Bore well Pump Motors are

10 HP Pump – 4 Nos.
7.5 HP Pump - 2 Nos.

Out of 6 motors, Water level controller is fixed in 3 motors.

Power factor is found very low.

Recommendations:

Water level controller to be fixed for 3 bore well motors.

Also, suitable capacitors are to be installed in the panel board to improve the power factor.

According to total water requirement, a separate plan to be worked out to use all the bore wells equally, fixing hour meter and running hours should be recorded in the log book.

XI. GENERAL POINTS TO BE FOLLOWED

1. In front of every panel, to place an electrical safety rubber mat.
2. Backside of main panel, fix the floor checker plate permanently.
3. First Aid & Fire Extinguisher training plan.
4. Separate fire water tank to be full of water at any time.
5. In case of any emergency, mark emergency exit with mock drill awareness.
6. All electrical equipments identification marking is important for electrical safety.
7. Energy conservation awareness to be planned for all staff and students.
8. Fire extinguisher is not adequate.
9. Preventive and Maintenance schedule for all electrical systems to be planned and maintained based on check list.
10. Unbalanced load to be planned with balanced load for energy saving and reduce the Temperature and load.
11. Disposal materials (Failed electrical components) are found very high in many places like Power house, MV Panel back side, UPS rooms and Hostel panel rooms.
12. Lighting and Fan control line through Stabilizer to avoid failure of Fans (Coil burnt fans are found very high)
13. Should maintain the cost control activity in all areas.

XII. EXPECTED SAVINGS

S.No.	Description	Per month	Per Year
			Rs.
1	Demand Surrender 405 instead of 540 X 350 /SD (540 - 405 = 135 X 350 = 47250 X 12 months)		567000
2	Commercial Consumption Energy - (500 X Rs.8)	4000	48000
3	Power factor maintenance 200 units per day X 30 X 12 X Rs.8		576000
4	Transformer voltage optimisation 50 units per day X 30 X 12 X Rs.8		144000
5	Solar Energy optimisation	20000	240000
6	Hostel - Tariff Change	90000	720000
	Total Savings		**2295000**

RM.MAYILERU

ACCREDITED ENERGY AUDITOR - AEA - 0041

Date : 30.05.2020

RM. MAYILERU & CO. COIMBATORE

ENERGY IS LIFE
BEE
CONSERVE IT

BUREAU OF ENERGY EFFICIENCY

Examination Registration No. : EA-0774

Accreditation Registration No.: AEA-0041

Certificate of Accreditation

This is to certify that Mr./Ms. R M Mayileru having its trade/registered office at Coimbatore has been given accreditation as accredited energy auditor. The certificate shall be effective from 26th day of February 2013

The certificate is subject to the provisions of the Bureau of Energy Efficiency (Qualifications for Accredited Energy Auditors and Maintenance of their List) Regulations, 2010.

This certificate shall be valid until it is cancelled under regulation 9 of the Bureau of Energy Efficiency (Qualifications for Accredited Energy Auditors and Maintenance of their List) Regulations, 2010

On cancellation, the certificate of accreditation shall be surrendered to the Bureau within fifteen days from the date of receipt of order of cancellation.

Your name has been entered at AEA No. 0041 in the register of list of accredited energy auditors. Your name shall be liable to be struck out on the grounds specified in regulation 8 of the Bureau of Energy Efficiency (Qualifications for Accredited Energy Auditors and Maintenance of their List) Regulations, 2010.

Given under the seal of the Bureau of Energy Efficiency, Ministry of Power, this 26th day of May 2014.

Secretary,
Bureau of Energy Efficiency
New Delhi

7.1.6 Reports on Environment and Energy Audits

(2018-2019)

ACKNOWLEDGEMENT

The green audit conducted by the Karpagam Academy of Higher Education is an External audit which aims to promote a clean and safe environment. The initiative is taken up to foster the concept of environmental sustainability. Sincere thanks to all for providing us necessary amenities and co-operation during the audit to make it a successful one.

Audit Key Steps

Planning completed	July 2018
Field work completed	December 2019
Draft report completed and sent for management response	April 2019
Management response received	June 2019
Final report completed	July 2019
Report presented to the Management	August 2019

ENVIRONMENTAL AND GREEN AUDIT REPORT

INTRODUCIION

Environmental Audit can be defined as systematic identification, quantification, recording, reporting and analysis of components of environmental diversity. The Environmental Audit aims to analyse environmental practices within and outside the university campus, which will have an impact on the eco-friendly ambience. The major component of Environment Audit is the Green Audit. It is the process of systematic identification, quantification, recording, analysing and reporting of flora and fauna diversity of the institution. Through Environmental Audit one gets a direction as how to improve the condition of environment and there are various factors that have determined the growth of carrying out Environmental Audit.

Moreover, it is a part of Institutional Social Responsibility (ISR) to ensure that it contributes towards the reduction of global warming through Carbon Footprint Reduction measures. Through Environmental Audit one gets a direction as how to improve the condition of environment. A clear and healthy environment helps effective learning and provides conducive learning environment.

Environmental Audit focuses on Green Campus, Waste Management, Water Management, Air monitoring, Energy Management being implemented by the Institution.

Having understood the significance of conducting the Environmental Audit, the Karpagam Academy of Higher Education vested the responsibility of conducting the audit to a Professional Agency,

About the Institution

Karpagam Academy of Higher Education (KAHE) s located in a sprawling, green, lush campus extending 26 acres. It has emerged from Karpagam Arts & Science College (Autonomous) a unit under the Karpagam Charity Trust established in 1989 philanthropist industrialist and educationist the great founded by Dr.RVASANTHAKUMAR With the vision of instilling originality in the learning minds, search and imparting quality and value-based education and to engage Development with the noble objective of creating unique men and women to serve and lead the society.

Karpagam Academy of Higher Education was conferred as Deemed to be University status by the Ministry of Human Resource Development in August 2008 under section 3 of the UGC Act 1956. It is a recognized Deemed to be University by the UGC It is a member of the Association of Indian Universities. The institution has been accredited by NAAC in 2015.

The institution has Faculty of Ats Science and Human Faculty of Engineering, Faculty of Architecture and Faculty of Pharmacy. It has 25 departments offering a wide range of 84 academic programmes from

graduation to doctorate level. The Institution has more than 6000 students on campus, with a strong contingent or more than 350 teaching faculty, well supported by an almost equal number of administrative and supporting staff. Faculty have got good number of research projects with financial support from various funding agencies like DBT/ DST/ ICMR and have filed more than 60 patents. As many as 2400 Research papers have been published by the faculty in SCOPUS. The institution has collaborated with Foreign Universities, Industries and Research Bodies for mutual benefit. The Institution ensures that education epitomizes excellence in every sphere and students are prepared to take on the challenges of the day and become the next generation leaders.

PRE-AUDIT STAGE

The green audit practically involves energy conservation, use of renewable resources, rain water harvesting, efforts of carbon sequestration methods, planting trees, waste management including hazardous and e-waste. This requires data collection and efforts for clarification of environmental policies. Green auditing includes systematic identification, recording and analysis of components related to sustainable development of an educational institution to preserve for future generations. The process has three important stages such as pre audit stage, audit stage and post audit stage.

MANAGEMENT'S COMMITMENT

The Management of the institution has shown the commitment towards the green auditing during the pre-audit meeting. They were ready to encourage all green activities. It was decided to promote all activities that are environment friendly such as awareness programs on environment, campus farming, planting more trees in the campus etc. after the green auditing.

SCOPE AND GOALS OF GREEN AUDITING

A clean and healthy environment aids effective learning and provides a conducive learning environment. There are various efforts around the world to address environmental education issues. Green Audit is the most efficient and ecological way to manage environmental problems. It is a kind of professional care which is the responsibility of each individual who are the part of economical, financial, social and environmental processes.

It is necessary to conduct green audit in institution campus because students become aware of the green audit, its advantages to save the planet and they become good citizen of our country. Thus, Green audit becomes necessary at the institution level. A very simple indigenized system has been devised to monitor the environmental performance of Karpagam Academy of Higher Education, Coimbatore. It comes with a series of questions to be answered on a regular basis. This innovative scheme is user

friendly and totally voluntary. The aim of this is to help the institution to set environmental examples for the community, and to educate the young learners.

BENEFITS OF THE GREEN AUDITING

1. Empower the organizations to frame a better environmental performance
2. More efficient resource management
3. Benchmarking for environmental protection initiatives
4. To provide basis for improved sustainability
5. To create a green campus
6. To enable waste management through reduction of waste generation, solid- waste and water recycling
7. To create plastic free campus and evolve health consciousness among the stakeholders
8. Recognize the cost saving methods through waste minimizing and managing
9. Point out the prevailing and forthcoming complications
10. Authenticate conformity with the implemented laws
11. Enhance the alertness for environmental guidelines and duties
12. Impart environmental education through systematic environmental management approach and improving environmental standards Karpagam Academy of Higher Education, Coimbatore.
13. Financial savings through a reduction in resource use
14. Development of ownership, personal and social responsibility for the institution and its environment
15. Enhancement of institution profile
16. Developing an environmental ethic and value systems in youngsters.
17. Green auditing should become a valuable tool in the management and monitoring of environmental and sustainable development programs of the institution.

TARGET AREAS OF GREEN AUDITING

Green audit forms part of a resource management process. Although they are individual events, the real value of green audits is the fact that they are carried out, at defined intervals, and their results can illustrate improvement or change over time. Eco-campus concept mainly focuses on the efficient use of energy and water; minimize waste generation or pollution and also economic efficiency. All these indicators are assessed in process of "Green Auditing of educational institute". Eco-campus focuses on the reduction of contribution to emissions, procure a cost effective and secure supply of energy, encourage and enhance energy use conservation, promotes personal action, reduce the institute's

energy and water consumption, reduce wastes to landfill, and integrate environmental considerations into all contracts and services considered to have significant environmental impacts. Target areas included in this green auditing are water, energy, waste, green campus and carbon footprint.

General Objective:

To study the upkeep of the precincts and ascertain the development of the nature into a greener place to create an ambience for teaching and learning.

Specific Objectives:

1. To study the status of the environment more specifically relating to Water Management, Air monitoring, Energy Conservation, Waste Management and Green Area Management in the KAHE Campus.
2. To identify the areas of strength and weakness,
3. To identify the areas which require further strengthening and
4. To offer suggestions for protection and sustainable development of Environment.

The study covered the following areas to summarise the present status of environment management in the campus

a. Water management
b. Air Monitoring
    i. Ambient Air Quality
    ii. Genset Smoke Emission
c. Energy Conservation
d. Waste Management.
e. Green Area management

AUDITING FOR WATER MANAGEMENT

Water auditing is a method of quantifying water flows and quality in simple or complex systems, with a view to reducing water usage and often saving money on otherwise unnecessary water use. Water is life; virtually everything we do or use each day involves water. Yet, we do not give it the importance that is due to it. India will soon be a water-stressed country and we all need to work towards our water security. There is an increasing awareness around the globe of the centrality of water to our lives. This awareness crosses political and social boundaries. In many places people have difficult access to drinking water. Often it is polluted. We need use water wisely to ensure that drinkable water is available for all, now

and in the future. Water auditing is a mechanism for conserving water, which will grow in significance in the future as demand for water increases. It is conducted for the evaluation of facilities of raw water intake and determining the facilities for water treatment and reuse. The concerned auditor investigates the relevant method that can be adopted and implemented to balance the demand and supply of water. It is therefore essential that any environmentally responsible institution examine its water use practices.

Water Management:

Observations

There are 7 bore wells in the campus. 4 Nos. of Over Head tanks of each 190000 litres capacity and 3 Nos. of Sumps of 55000 litres capacity.

Athikadavu drinking water of 34500 litres used per day by KAHE.

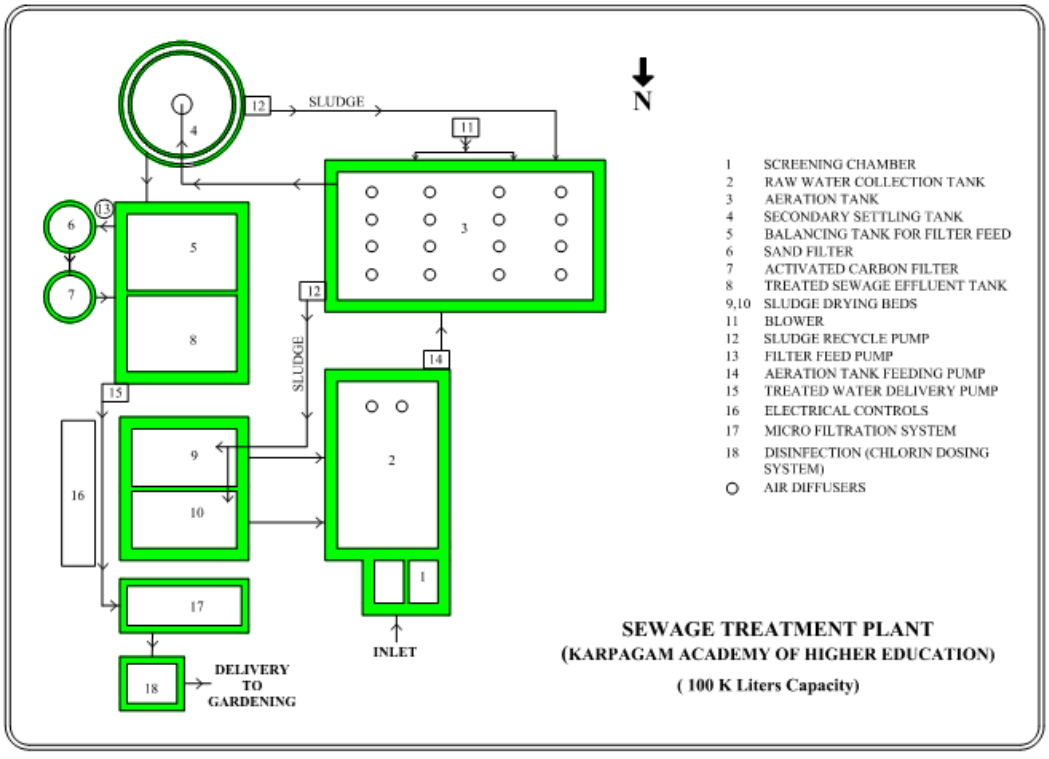
RO 4500 Litres per day

3 rain water collection sumps are there in the campus and no rain water is allowed to go outside the campus, charging the underground strata only. Thus, water resources are being Maintained.

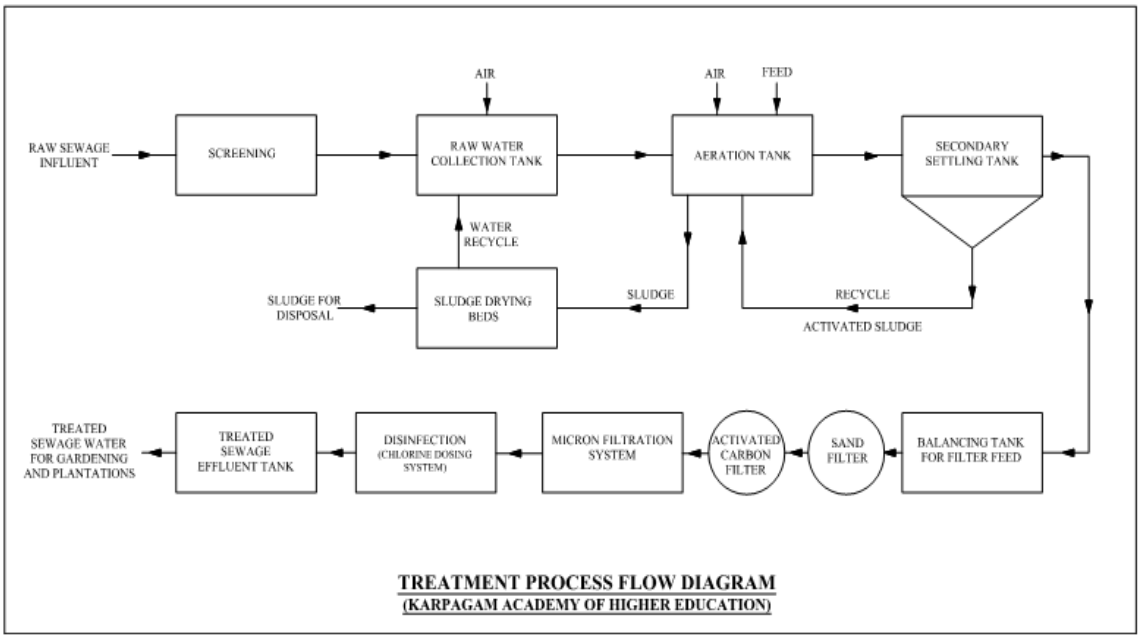
WASTE WATER TREATMENT

Water recycling is reusing treated wastewater for beneficial purposes such as agricultural and landscape irrigation, toilet flushing, and replenishing a ground water basin. Water recycling offers resource and financial savings. Wastewater treatment can be tailored to meet the water quality requirements of a planned reuse. Waste water treatment is a process of removing contaminants from waste water or sewage and to convert it into an effluent resource. The treatment process takes place in a Sewage Treatment Plant (STP). The institution has installed Sewage Treatment Plant (STP) with a processing capacity of 1 lac litre per day. The treated water is disposed properly through various pipe lines for growing the trees, plants and grass. By using treated water, the campus is now Green Campus. The sludge settled in the STPs is removed 4 times a month and used as bio-manure for the garden. Excess treated water is discharged to the ground through Rain Water pit. Thus, the entire waste water generated in the campus is treated and used.

LIQUID WASTE MANAGEMENT Sewage Treatment Plant



Layout of Sewage Treatment Plant



MAIN WATER USES IN THE CAMPUS

- Drinking purpose.
- Toilets and Wash areas (including hostel and canteen).
- Labs.
- Gardening and agriculture.
- Construction purpose.
- Cooking purpose in hostels and canteen.

REASONS FOR WATER WASTAGE

- Leakages from taps
- Over use of water

AUDITING FOR ENERGY MANAGEMENT

An energy audit is an inspection of energy flows for energy conservation in an institution or system to reduce the amount of energy input into the system without negatively affecting the output. Energy management (audit) approach is understanding energy costs, bench marking, energy performance,

matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, and fuel and energy substitution.

OBJECTIVE

The objective of Energy Audit is primarily to assess the viability of implementing an energy efficiency mechanism prior to investing extensive resources in procuring an Energy Performance Contract (or Energy Performance Related Payment), including a subsequent Investment Grade Audit, for a project which is not commercially viable

DESCRIPTION OF SITE & SCOPE OF ASSESSMENT

Karpagam Academy of Higher Education is having a landscaped green campus extending to a total area of 25 acres with aesthetic ambience accommodating administrative and academic blocks. Academic blocks include separate blocks for Arts and Science, Engineering and Architecture and pharmacy programmes covering a total floor area of nearly 102401 square meters.

Building Area

S.No.	Block	Area in m^2	S.No.	Block	Area in m^2
1	A	6482.53	16	M	382.58
2	B	1757.72	17	N	5165.64
3	C	5005.55	18	O1	1407.47
4	E	5070.03	19	O2	1504.82
5	F	2627.00	20	O3	1452.44
6	H	5614.06	21	O4	1531.26
7	I	22402.06	22	O5	181.41
8	J	2857.68	23	P	8778.61
9	K1	2151.24	24	Q	235.78
10	K2	1279.84	25	R	810.38
11	K3	1749.72	26	S1	1610.28
12	K4	4708.50	27	S2	1153.84
13	K5	6739.68	28	S3	3829.06
14	K6	2167.35	29	T	1984.4
15	L	822.18	30	U	937.98
Total					**102401.1**

This assessment includes the following network utilities:

- [Electricity]

Karpagam Academy of Higher Education is having a maximum demand of 600 kVA Tamil Nadu Electricity Board 22kV HT Line is available and is backed up by four numbers of 125 kVA generators.

Data Analysis

- Data analysis was used to generate reports of block, application and location wise analysis.

- The database was prepared and the results have been graphically represented, which helped to identify the areas with maximum energy saving potential.

Recommendation

Energy as well as cost analysis of different appliances were performed and recommendations were made based on the capital cost recovery time.

Following were the steps involved in this process:

- The capital cost involved in replacing an appliance and/or process was estimated.
- The energy saving by the move was calculated in terms of price of energy per year.
- Some other recommendations were also made which are based on lighting intensity, AC insulation etc.

Main Energy Consumers

The main energy consumers at the site that have been quantified for this assessment are summarized as follows:

APPLICATION WISE ANALYSIS OF CAMPUS:

Application wise analysis of overall campus has been carried out to find out the application areas with relatively higher power consumption. The results of the application wise analysis of power consumption in KU campus have been summarized in the following chart:

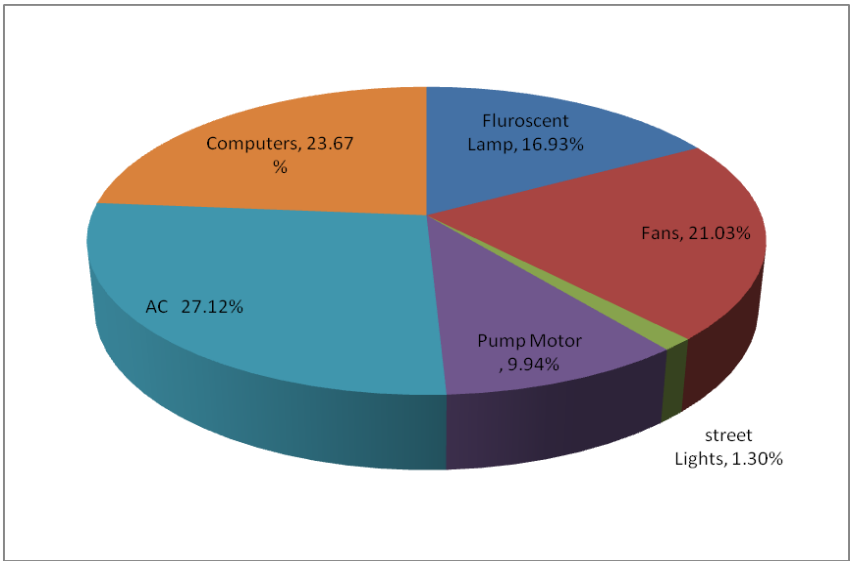


FIGURE: 3 :- APPLICATION WISE ANALYSIS OF OVERALL CAMPUS

As % of total consumption of 795.844 kWh.

It is important to state here that this equipment wise analysis has been carried out by ignoring a large number of appliances having consumption less than 1% to make the analysis work simpler. Air conditioners are found to be consuming as much as 27.12% of the total power consumption in KAHE Campus. Computers account for 23.67% of total power consumption in KAHE Campus. Fans have shares of 21.03% power consumption of KAHE Campus. Conventional tube lights have shares of 16.93% respectively in the total power consumption of KAHE Campus. Pump motor have shares of 9.94% respectively in the total power consumption of KAHE Campus.

STREET LIGHT:

Following table summarizes the street lighting details:

CATEGORY	POWER(W)	NUMBER	HR/DAY	DAY/YEAR	TOTAL POWER (kWh)
CFL	40	10	10	365	1460
Metal Halide Lamp	400	25	9	365	32850
Total					34310

Water Pumping

There are 10 water pumping stations in our Campus, the details of which are as follows:

Sl. No.	Location	Rated Power (HP)	Measured Power(kW)
1	Animal house	10	7.47
2	Ladies Hostel Back Side	7.5	5.60
3	Ladies Hostel 1	7.5	5.60
4	Ladies Hostel 2	7.5	5.60
5	Ladies Hostel 2	3.5	2.61
6	Canteen	5	3.73
7	Main office	5	3.73
8	H1 Hostel	7.5	5.60
9	H3 Dining Hall	10	7.47
10	H3 Back Side	7.5	5.60
11	UM Block 1	5	3.73
12	UM Block 2	7.5	5.60
13	UM Block 3	7.5	5.60
14	UE Block 1	7.5	5.60
15	UE Block 2	7.5	5.60

The measured powers are, however, at certain instant when the measurement was performed and in no way reflect the average power consumed by that pump.

RECOMMENDATIONS FOR BETTER ENERGY EFFICIENCY

Based on the analysis of the power consumption data, certain steps have been recommended for improving energy efficiency of the campus.

REPLACING TUBE LIGHTS WITH ELECTRONIC BALLAST:

- Total No. of Fluorescent Tube Lights = 3369
- Average Power of conventional Ballast[Choke] FTL = 56W
- Average Power of electronic Ballast[Choke] FTL = 44W
- Power saved per FTL = (56-44)W =12W
- Total Power saving = 3369 *12W = 40428W = 40.428kW
- Average Use of FTL per year = 270*7h=1890h
- Total Energy saved per year = (40.428*1890) kWh = 76408.92kWh
- Saving in Rs. Per year = 76408.92*6.35 = Rs. 485196.64
- Average Cost of Replacing each FTL = Rs. 150
- Total Cost of Replacing all Conventional Ballast[Choke]

  FTLs = 3369*150 = Rs.505350

  - **Capital Cost Recovery time = (505350)/(485196.64) = 1.04 years**

REPLACING TUBE LIGHTS WITH LEDs:

- Total No. of Fluorescent Tube Lights = 3369
- Average Power of Electronic Ballast[Choke] FTL = 44W
- Average Power of LEDs= 8W
- Power saved per LEDs = (44 - 08)W = 36W
- Total Power saving = 3369 *36W = 121284W = 121.284 kW
- Average Use of LEDs per year = 270*7h=1890h
- Total Energy saved per year = (121.284*1890) kWh = 229226.76 kWh
- Saving in Rs. Per year = 229226.76 *6.35 = Rs. 1455589.926
- Average Cost of Replacing each Electronic Ballast[Choke]FTL with LEDs = Rs. 150
- Total Cost of Replacing all Electronic Ballast[Choke]

  FTLs = 3369*500 = Rs.1684500

- **Capital Cost Recovery time = (1684500)/(1455589.93) = 1.16 years**

	LED	CFL	INCANDESCENT
Average Life (hrs)	50,000	10,000	1,200
Power (Watts)	6 – 8	13 - 15	60
Light Output (Lumens / Watt)	100	50	10
Heat Emitted (Btu/hr)	3.4	30	85
Electricity Use (kWh)1	350	700	3,000
Bulbs Need for 50,000 hrs of Use	1	5	42
Mercury Content	None	Contains 1 mg to 5 mg	None
Sensitivity to low temperatures	None	Yes - may not work under negative 10oF or over 120oF	Some
Sensitive to humidity	None	Yes	Some
On/off Cycling	No Effect	can reduce lifespan	Some
Turns on instantly	Yes	Some delay	Yes
Durability	Very Durable	Fragile	Fragile

Suggested Opportunities for Energy Savings

The simplest measure to immediately improve lighting energy-efficiency is to ensure that lights are only switched ON when necessary, depending on the levels of natural daylight present. Ensure that students and staff know where light switches are, and encourage them to adopt energy-efficient practices.

AUDITING FOR WASTE MANAGEMENT

A waste audit is a methodically thought-out process which can be used to determine the amount and types of waste that are generated by an organization. Information from these audits can help the organization to determine how we can reduce the amount of waste that an institution generates. In most work places, cardboard, paper, plastics, metals and food constitute the majority of what goes in the garbage. Pollution from waste is aesthetically unpleasant and results in large amount of litter in our communities which can cause health problems. Plastic bags and discarded ropes and strings can be very dangerous to birds and other animals. Solid waste can be divided into two categories: general waste and hazardous waste. General wastes include what is usually thrown away in homes and schools such as garbage, paper, tins and glass bottles. Hazardous waste is waste that is likely to be a threat to health or the environment like cleaning chemicals and petrol.

WASTE MANAGEMENT

- Total Plastic ban on campus.
- Recycling and reuse of plastic at some departments.

- In all functions the plastic mineral water bottles, tea cups, straws, bouquets and gifts with plastic covering, decorations, etc. unnecessary plastic use is avoided.
- Use of one-sided papers in all departments.

SOLID WASTE MANAGEMENT

Improper disposal of solid waste can create unsanitary conditions, and these conditions in turn can lead to pollution of the environment and to outbreaks of vector-borne disease (i.e.) diseases spread by rodents and insects. They also pose a wide variety of administrative, economic, and social problems that must be managed and solved. Thus, Proper solid-waste collection is important for the protection of public health, safety, and environmental quality. Hence, for proper disposal of solid wastes dust bins are provided throughout the campus. Students and faculty are advised to dispose the food wastages, paper, metals, plastics, etc. in the degradable and non-degradable dustbins. Degradable wastages are disposed to local panchayat collection centres. Every day all the academic buildings and other surrounding area in the campus are cleaned by sweepers. The branches of trees are regularly trimmed and the dried leaves of plants are properly disposed as garden waste. In order to prevent environmental pollution, garden waste, food wastages, papers and metals collected are either (**converted into manure through the process of decomposition or converted into biogas via the biogas plant)**

E-WASTE MANAGEMENT

- Our institution has a “maintenance room” where all the maintenance of computers, tube lights and other electrical equipment is done. The useful material from the faulty equipment is utilized to repair some other equipment as a part of E Waste management.
- E-waste includes discarded desktop computers and accessories, compact fluorescent lights, printer cartridges which are collected through separate waste streams and disposed to Authorized recyclers for which our University have a MoU with Green Era Recyclers, Coimbatore.

AUDITING FOR GREEN CAMPUS MANAGEMENT

Green Campus is an environment which improves energy efficiency, conserving resources and enhancing environmental quality by educating for sustainability and creating healthy, living and learning environments. Green Campus rewards long term commitment to continuous environmental improvement from the campus community. Green institutions make a point to account for sustainable living when designing and operating their buildings. Many of their facilities incorporate natural lighting, improve air quality, and reduce energy and water use. Trees play an important ecological role within the urban environment, as well as support improved public health and provide aesthetic benefits to cities. Planting trees without consideration for their species, location, and maintenance will not result in all of their wished-for benefits. It is essential to plan where the trees are planted and to plan their ongoing maintenance in order to maximize future benefits and to ensure long-term tree survival and growth. Trees in a institution yard improve air quality and can reduce temperatures with their cool shade. They are a small environmental investment that will pay dividends for decades to come. So, while you are

busy studying and working on earning those good grades, all the trees on campus are also working hard to make the air cleaner for us. Trees on our campus impact our mental health as well; studies have shown that trees greatly reduce stress, which a huge deal is considering that many students are under some amount of stress.

GREEN AREA MANAGEMENT OBSERVATIONS

"Karpagam Academy of Higher Education (KAHE)' has raised beautiful greenery in the campus and there are 450 Various trees from 6750 Sq. Ft. landscape area.

AUDITING FOR CARBON FOOTPRINT

Microcosms of the world at large, institution campuses are great test beds for environmental change, and many students are working hard to get their administrations to take positive action. The initiatives that are emerging are models for the larger society, and the students pushing for them will be taking these lessons with them, too, as they enter the work force after graduation. Foremost on the minds of green-leaning students today is global warming, and many are joining hands to persuade their institutions to update policies and streamline operations so that their campuses can become part of the solution. Commutation of stakeholders has an impact on the environment through the emission of greenhouse gases into the atmosphere consequent to burning of fossil fuels (such as petrol).

The students and faculty of Karpagam Academy of Higher Education, who stay in far-away areas, are encouraged to use public transportation facility. It is economical and it benefits the environment too. Since the inception, the college provides transportation facilities for faculty and students. This has greatly reduced the usage of private transportation by the students which immensely helps in reducing the carbon imprints inside the campus. These kinds of practices help not only in cutting off the expenditures but in providing an environment which is clean and safe.

AIR POLLUTION

Air is considered to be polluted when it contains certain substances in concentrations high enough and for duration long enough to cause harm or undesirable effects. As per the Air (Prevention and Control of Pollution) Act, 1981, the term "air pollutant" refers to any solid, liquid or gaseous substance present in the atmosphere in such concentration that may be or tend to be injurious to human beings or other living creatures or plants or property or environment.

Sources of air pollution are natural as well as manmade. Natural sources are majorly the volcanoes, forest fires and dust storm while the manmade sources are emission from industrial units like

power-plants, refineries, sponge iron manufacturing, and combustion of fuel in vehicles as well as households and road dust suspension. Pollutants can originate from point, non-point and mobile sources. Stationary objects which release pollutants are classified as point sources (Example - factories, smoke stacks), non-point sources include residential, hospitals, waste disposal and agriculture operations while the mobile sources include transportation vehicles-cars, trucks, tractors, boats. Air pollutants are classified as

1) Primary pollutants: Primary air pollutants are the ones that are emitted directly into the atmosphere by the sources (power-generating plants).

2) Secondary pollutants: Secondary air pollutants are the ones that are formed as a result of reactions between primary pollutants and other elements in the atmosphere.

The National Ambient Air Quality Standards for five principal pollutants set by CPCB (Central Pollution Control Board) include – Sulphur dioxide, nitrogen dioxide, carbon monoxide, $PM_{2.5}$ and PM_{10}. The effects of these criteria pollutants have been drafted in Table No. 1. Air pollution is global issue contributing many diseases such as ischemia, myocardial infarction, stroke, chronic obstructive pulmonary disease and cancers.

Table 1: Major air pollutants, their sources and their effects on humans

Pollutants	**Sources**	**Effects**
Nitrogen dioxide (NOx)	Combustion processes (heating, power generation, and vehicles)	• Bronchitis in asthmatic children. • Reduced lung function
Particulate Matter (PM2.5, PM10)	Vehicles, industrial sources, domestic fuel burning, road dust re-suspension,	• Cardiovascular and respiratory diseases, • Lung cancer, • ALRI (Acute Lower Respiratory Infections)
Carbon monoxide (CO)	Incomplete fuel combustion (as in motor vehicles)	• Reduces the oxygen carrying capacity of blood, • Causes headaches, nausea, and dizziness • Can lead to death at high levels
Sulphur dioxide (RSPM)	Burning of sulphur containing fuels for heating, power & vehicles.	• Affects respiratory system and lung function. Coughing, mucus secretion, asthma and chronic bronchitis. • Causes acid rain.

Ambient air quality monitoring at Karpagam Academy of Higher Education, Coimbatore

Overview

With over 8500 students and staff residing within the University campus during working hours and about 3000 students and staff staying within the University campus during non- working hours, the university aimed at providing a healthier environment to its students. Real time monitored critical ambient parameters in real-time within the campus and displayed the data to the students and staff for their awareness. It provided data-driven better healthcare suggestive actions.

Purpose

Pollution free campuses are common concepts nowadays. Air quality and ambient atmosphere are among the key criteria in choosing the healthier environment to reside. An average person spends 8-10 hours of his day at campus. It is necessary to ensure that it is in a clean, dust-free, and healthy environment. With increased environmental pollution, people are more inclined towards being aware of its impact on their health. Increased urbanization and auto mobilizing have made it prominently essential to keep their outdoor activities in check during peak pollution hours. However, the lack of outdoor air quality monitors to spread awareness and adequate information about the surrounding environment restricts them from taking appropriate actions.

Location

Ambient Air Quality Monitoring Device

- ✓ Airveda Air Quality Monitor

Measurement

- ✓ Measurement parameters: PM2.5, PM10, NOx, CO and RSPM
- ✓ Minimum resolution of < 0.3 μm
- ✓ Relative error Maximum of ±10%
- ✓ Measures every second when on battery, once every minute when on power. Interval is configurable.

Working Principle

Using laser scattering principle: Light scattering can be induced when particles go through the detecting area. The scattered light is transformed into electrical signals and these signals will be amplified and processed. The number and diameter of particles can be obtained by analysis because the signal waveform has certain relations with the particle's diameter.

NATIONAL AMBIENT AIR QUALITY STANDARDS CENTRAL POLLUTION CONTROL BOARD NOTIFICATION, New Delhi, the 18th November, 2009

No.B-29016/20/90/PCI-L—In exercise of the powers conferred by Sub-section (2) (h) of section 16 of the Air (Prevention and Control of Pollution) Act, 1981 (Act No. 14 of 1981), and in super session of the Notification No(s). S.O. 384(E), dated 11th April, 1994 and S.O. 935(E), dated 14th October, 1998, the Central Pollution Control Board hereby notify the National Ambient Air Quality Standards with immediate effect, namely: -

NATIONAL AMBIENT AIR QUALITY STANDARDS

S. No.	Pollutant	Time Weighted average	Concentration in Ambient Air		Methods of Measurement
			Industrial, Residential, Rural and Other Area	Ecologically sensitive area (notified by Central Govt.)	
(1)	(2)	(3)	(4)	(5)	(6)
1	Sulphur Dioxide (SO_2), □g/m^3	Annual*	50	20	• Improved West and Geake • Ultraviolet fluorescence
		24 hours**	80	80	
2	Nitrogen Dioxide (NO_2), □g/m^3	Annual*	40	30	• Modified Jacob & Hochheiser (Na-Arsenite) • Chemiluminescence
		24 hours**	80	80	
3	Particulate Matter (size less than 10 □m) or PM_{10}□g/m^3	Annual*	60	60	• Gravimetric • TOEM • Beta attenuation
		24 hours**	100	100	
4	Particulate Matter (size less than 2.5 microns) or $PM_{2.5}$ □g/m^3	Annual*	40	40	• Gravimetric • TOEM • Beta attenuation
		24 hours**	60	60	
5	Ozone (O_3) □g/m^3	8 hours **	100	100	• UV photometric • Chemiluminescence • Chemical method
		1 hour **	180	180	
6	Lead (Pb) □g/m^3	Annual*	0.5	0.5	• ASS / ICP method after sampling on EPM 2000 or equivalent filter paper • ED – XRF using Teflon filter
		24 hours**	1.0	1.0	

(1)	(2)	(3)	(4)	(5)	(6)
7	Carbon Monoxide (CO) mg/m^3	8 hours**	2	2	Non Dispersive Infra RED (NDIR) Spectroscopy
		1 hour**	4	4	
8	Ammonia (NH_3) □g/m^3	Annual*	100	100	• Chemiluminescence • Indophenol blue method
		24 hours**	400	400	
9	Benzene (C_6H_6) □g/m^3	Annual*	5	5	• Gas chromatography based continuous analyser • Adsorption and desorption followed by GC analysis
10	Benzo (a) Pyrene (BaP) – particulate phase only ng/m^3	Annual*	1	1	Solvent extraction followed by HPLC / GC analysis
11	Arsenic (As) ng/m^3	Annual*	6	6	AAS / ICP method after sampling on EPM 2000 or equivalent filter paper
12	Nickel (Ni) ng/m^3	Annual*	20	20	AAS / ICP method after sampling on EPM 2000 or equivalent filter paper

***** Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

****** 24 hourly or 8 hourly or 1 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

Note: Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigation.

23/10/2018

Project : Ambient air quality analysis at Karpagam Academy of Higher Education

Sample Description : Ambient air

Sampling Location : Karpagam Academy of Higher Education Campus

Instrument Used : Airveda Air Quality Monitor

Analysis Duration : 12/10/2018 – 16/10/2018 Ambient Temperature : 27°C

Results								
S. No	Parameter	Test Standard	Location					NAAQ Standard as per CPCB, New Delhi.
			L1	L2	L3	L4	L5	
1	$PM_{2.5}$ ($\mu g/m^3$)	IS:5182 (Part-23)	32	28	25	31	25	60*
2	PM_{10} ($\mu g/m^3$)	IS:5182 (Part-23)	48	45	38	47	40	100*
3	SO_2 ($\mu g/m^3$)	IS:5182 (Part-2)	15	12	11	14	11	80*
4	NO_2 ($\mu g/m^3$)	IS:5182 (Part-6)	25	21	18	23	20	80*
5	CO (mg/m^3)	CO Analyzer	0.5	0.3	0.3	0.4	0.3	02**

L1- Near campus main gate, L2 - Near life science block, L3 - Near science block, L4 - Near engineering block, L5 - Near Pharmacy block.

* 24 hours data, **8hours data

As per Ambient Air Quality Standard for Residual, Industrial, Rural & Other area

Ambient Air Quality Monitoring Report for September 2020

25/09/2018

Project : Ambient air quality analysis at Karpagam Academy of Higher Education

Sample Description : Ambient air

Sampling Location : Karpagam Academy of Higher Education Campus

Instrument Used : Airveda Air Quality Monitor

Analysis Duration : 14/09/2018 – 18/09/2018

Ambient Temperature : 28°C

Results								
S. No	Parameter	Test Standard	Location					NAAQ Standard as per CPCB, New Delhi.
			L1	L2	L3	L4	L5	
1	$PM_{2.5}$ ($\mu g/m^3$)	IS:5182 (Part-23)	30	25	25	29	25	60*
2	PM_{10} ($\mu g/m^3$)	IS:5182 (Part-23)	45	42	39	44	38	100*
3	SO_2 ($\mu g/m^3$)	IS:5182 (Part-2)	13	11	10	12	11	80*
4	NO_2 ($\mu g/m^3$)	IS:5182 (Part-6)	24	18	18	21	19	80*
5	CO (mg/m^3)	CO Analyzer	0.4	0.2	0.2	0.3	0.2	02**

L1- Near campus main gate, L2 - Near life science block, L3 - Near science block, L4 - Near engineering block, L5 - Near Pharmacy block.

* 24 hours data, **8hours data

As per Ambient Air Quality Standard for Residual, Industrial, Rural & Other area

Ambient Air Quality Monitoring Report for August 2020

21/08/2018

Project : Ambient air quality analysis at Karpagam Academy of Higher Education Sample Description : Ambient air

Sampling Location : Karpagam Academy of Higher Education

Campus Instrument Used : Airveda Air Quality Monitor

Analysis Duration : 10/08/2018 14/08/2018 Ambient Temperature : 28°C

Results								
S. No	Parameter	Test Standard	Location					NAAQ Standard as per CPCB, New Delhi.
			L1	L2	L3	L4	L5	
1	$PM_{2.5}$ ($\mu g/m^3$)	IS:5182 (Part-23)	30	21	24	25	25	60*
2	PM_{10} ($\mu g/m^3$)	IS:5182 (Part-23)	42	38	37	36	38	100*
3	SO_2 ($\mu g/m^3$)	IS:5182 (Part-2)	12	10	10	11	11	80*
4	NO_2 ($\mu g/m^3$)	IS:5182 (Part-6)	22	17	16	17	18	80*
5	CO (mg/m^3)	CO Analyzer	0.3	0.2	0.2	0.3	0.2	02**

L1- Near campus main gate, L2 - Near life science block, L3 - Near science block, L4 - Near engineering block, L5 - Near Pharmacy block.

* 24 hours data, **8hours data

As per Ambient Air Quality Standard for Residual, Industrial, Rural & Other area

Water Management

- Damaged water taps may be replaced and install sensitive taps is possible.
- Construct more number of rain water harvesting pit in the campus
- Automated taps may be employed thereby water usage may be minimized

- Periodical maintenance of water taps and water bodies to be carried out in order to prevent the leakage or wastage of water

GREEN CAMPUS MANAGEMENT

- Trees may be mentioned with their botanical names
- Beautify the college building with indoor plants
- Provide funds to nature club for making campus more green

ENERGY MANAGEMENT

- Install more number of solar panels for generating more renewable energy
- Conduct more save energy awareness programs for students and staff.
- Install more energy efficient or power consuming fans in the campus
- Erect sensor based automatic power switch off facility to avoid unnecessary energy wastage

WASTE MANAGEMENT

- A model solid waste treatment system to be established.
- Practice of waste segregation to be initiated.
- Reusable wastages may be utilized for lab purpose and non reusable wastages may be disposed through authorized agency

CARBON FOOTPRINT

- Staff and students may be encourage to make use bicycles and public transport
- Install modernized cooking system at canteen to conserve usage of LPG
- Monitor that newly construction buildings are in compliance with green standards.

Air Pollution

In order to contain air pollution, following steps have been initiated at KAHE campus.

- Entering of vehicles are strictly prohibited within the campus
- Sufficient number of trees have been planted with the campus
- Ban on using of firewood for cooking at canteen
- Avoid burning of leaves, trash and other materials (i.e.) Wastages are properly disposed without spoiling the environment
- Turning off light and appliances when they are not in use
- Using energy efficient light bulbs and appliances.
- Students are motivated to make use bicycles within the campus

7.1.6 Reports on Environment and Energy Audits

(2017-2018)

ACKNOWLEDGEMENT

The green audit conducted by the Karpagam Academy of Higher Education is an External audit which aims to promote a clean and safe environment. The initiative is taken up to foster the concept of environmental sustainability. Sincere thanks to all for providing us necessary amenities and co-operation during the audit to make it a successful one.

Audit Key Steps

Planning completed	August 2017
Field work completed	January 2018
Draft report completed and sent for management response	March 2018
Management response received	April 2018
Final report completed	July 2018
Report presented to the Management	August 2018

ENVIRONMENTAL AND GREEN AUDIT REPORT

INTRODUCIION

Environmental Audit can be defined as systematic identification, quantification, recording, reporting and analysis of components of environmental diversity. The Environmental Audit aims to analyse environmental practices within and outside the university campus, which will have an impact on the eco-friendly ambience. The major component of Environment Audit is the Green Audit. It is the process of systematic identification, quantification, recording, analysing and reporting of flora and fauna diversity of the institution. Through Environmental Audit one gets a direction as how to improve the condition of environment and there are various factors that have determined the growth of carrying out Environmental Audit.

Moreover, it is a part of Institutional Social Responsibility (ISR) to ensure that it contributes towards the reduction of global warming through Carbon Footprint Reduction measures. Through Environmental Audit one gets a direction as how to improve the condition of environment. A clear and healthy environment helps effective learning and provides conducive learning environment.

Environmental Audit focuses on Green Campus, Waste Management, Water Management, Air monitoring, Energy Management being implemented by the Institution.

Having understood the significance of conducting the Environmental Audit, the Karpagam Academy of Higher Education vested the responsibility of conducting the audit to a Professional Agency,

About the Institution

Karpagam Academy of Higher Education (KAHE) s located in a sprawling, green, lush campus extending 26 acres. It has emerged from Karpagam Arts & Science Institution (Autonomous) a unit under the Karpagam Charity Trust established in 1989 philanthropist industrialist and educationist the great founded by Dr.R.VASANTHAKUMAR With the vision of instilling originality in the learning minds, search and imparting quality and value-based education and to engage Development with the noble objective of creating unique men and women to serve and lead the society.

Karpagam Academy of Higher Education was conferred as Deemed to be University status by the Ministry of Human Resource Development in August 2008 under section 3 of the UGC Act

1956. It is a recognized Deemed to be University by the UGC It is a member of the Association of Indian Universities. The institution has been accredited by NAAC in 2015.

The institution has Faculty of Ats Science and Human Faculty of Engineering, Faculty of Architecture and Faculty of Pharmacy. It has 25 departments offering a wide range of 84 academic programmes from graduation to doctorate level. The Institution has more than 6000 students on campus, with a strong contingent or more than 350 teaching faculty, well supported by an almost equal number of administrative and supporting staff. Faculty have got good number of research projects with financial support from various funding agencies like DBT/ DST/ ICMR and have filed more than 60 patents. As many as 2400 Research papers have been published by the faculty in SCOPUS. The institution has collaborated with Foreign Universities, Industries and Research Bodies for mutual benefit. The Institution ensures that education epitomizes excellence in every sphere and students are prepared to take on the challenges of the day and become the next generation leaders.

PRE-AUDIT STAGE

The green audit practically involves energy conservation, use of renewable resources, rain water harvesting, efforts of carbon sequestration methods, planting trees, waste management including hazardous and e-waste. This requires data collection and efforts for clarification of environmental policies. Green auditing includes systematic identification, recording and analysis of components related to sustainable development of an educational institution to preserve for future generations. The process has three important stages such as pre audit stage, audit stage and post audit stage.

MANAGEMENT'S COMMITMENT

The Management of the institution has shown the commitment towards the green auditing during the pre-audit meeting. They were ready to encourage all green activities. It was decided to promote all activities that are environment friendly such as awareness programs on environment, campus farming, planting more trees in the campus etc. after the green auditing.

SCOPE AND GOALS OF GREEN AUDITING

A clean and healthy environment aids effective learning and provides a conducive learning environment. There are various efforts around the world to address environmental education issues. Green Audit is the most efficient and ecological way to manage environmental

problems. It is a kind of professional care which is the responsibility of each individual who are the part of economical, financial, social and environmental processes.

It is necessary to conduct green audit in institution campus because students become aware of the green audit, its advantages to save the planet and they become good citizen of our country. Thus, Green audit becomes necessary at the institution level. A very simple indigenized system has been devised to monitor the environmental performance of Karpagam Academy of Higher Education, Coimbatore. It comes with a series of questions to be answered on a regular basis. This innovative scheme is user friendly and totally voluntary. The aim of this is to help the institution to set environmental examples for the community, and to educate the young learners.

BENEFITS OF THE GREEN AUDITING

1. Empower the organizations to frame a better environmental performance
2. More efficient resource management
3. Benchmarking for environmental protection initiatives
4. To provide basis for improved sustainability
5. To create a green campus
6. To enable waste management through reduction of waste generation, solid- waste and water recycling
7. To create plastic free campus and evolve health consciousness among the stakeholders
8. Recognize the cost saving methods through waste minimizing and managing
9. Point out the prevailing and forthcoming complications
10. Authenticate conformity with the implemented laws
11. Enhance the alertness for environmental guidelines and duties
12. Impart environmental education through systematic environmental management approach and improving environmental standards Karpagam Academy of Higher Education, Coimbatore.
13. Financial savings through a reduction in resource use
14. Development of ownership, personal and social responsibility for the institution and its environment
15. Enhancement of institution profile
16. Developing an environmental ethic and value systems in youngsters.
17. Green auditing should become a valuable tool in the management and monitoring of environmental and sustainable development programs of the institution.

TARGET AREAS OF GREEN AUDITING

Green audit forms part of a resource management process. Although they are individual events, the real value of green audits is the fact that they are carried out, at defined intervals, and their results can illustrate improvement or change over time. Eco-campus concept mainly focuses on the efficient use of energy and water; minimize waste generation or pollution and also economic efficiency. All these indicators are assessed in process of "Green Auditing of educational institute". Eco-campus focuses on the reduction of contribution to emissions, procure a cost effective and secure supply of energy, encourage and enhance energy use conservation, promotes personal action, reduce the institute's energy and water consumption, reduce wastes to landfill, and integrate environmental considerations into all contracts and services considered to have significant environmental impacts. Target areas included in this green auditing are water, energy, waste, green campus and carbon footprint.

General Objective:

To study the upkeep of the precincts and ascertain the development of the nature into a greener place to create an ambience for teaching and learning.

Specific Objectives:

1. To study the status of the environment more specifically relating to Water Management, Air monitoring, Energy Conservation, Waste Management and Green Area Management in the KAHE Campus.
2. To identify the areas of strength and weakness,
3. To identify the areas which require further strengthening and
4. To offer suggestions for protection and sustainable development of Environment.

The study covered the following areas to summarise the present status of environment management in the campus

a. Water management
b. Energy Conservation
c. Waste Management.
d. Green Area management

AUDITING FOR WATER MANAGEMENT

Water auditing is a method of quantifying water flows and quality in simple or complex systems, with a view to reducing water usage and often saving money on otherwise unnecessary water use. Water is life; virtually everything we do or use each day involves water. Yet, we do not give it the importance that is due to it. India will soon be a water-stressed country and we all need to work towards our water security. There is an increasing awareness around the globe of the centrality of water to our lives. This awareness crosses political and social boundaries. In many places people have difficult access to drinking water. Often it is polluted. We need use water wisely to ensure that drinkable water is available for all, now and in the future. Water auditing is a mechanism for conserving water, which will grow in significance in the future as demand for water increases. It is conducted for the evaluation of facilities of raw water intake and determining the facilities for water treatment and reuse. The concerned auditor investigates the relevant method that can be adopted and implemented to balance the demand and supply of water. It is therefore essential that any environmentally responsible institution examine its water use practices.

Water Management:

Observations

There are 7 bore wells in the campus. 4 Nos. of Over Head tanks of each 190000 litres capacity and 3 Nos. of Sumps of 55000 litres capacity.

Athikadavu drinking water of 32500 litres used per day by KAHE.

RO 4000 Litres per day

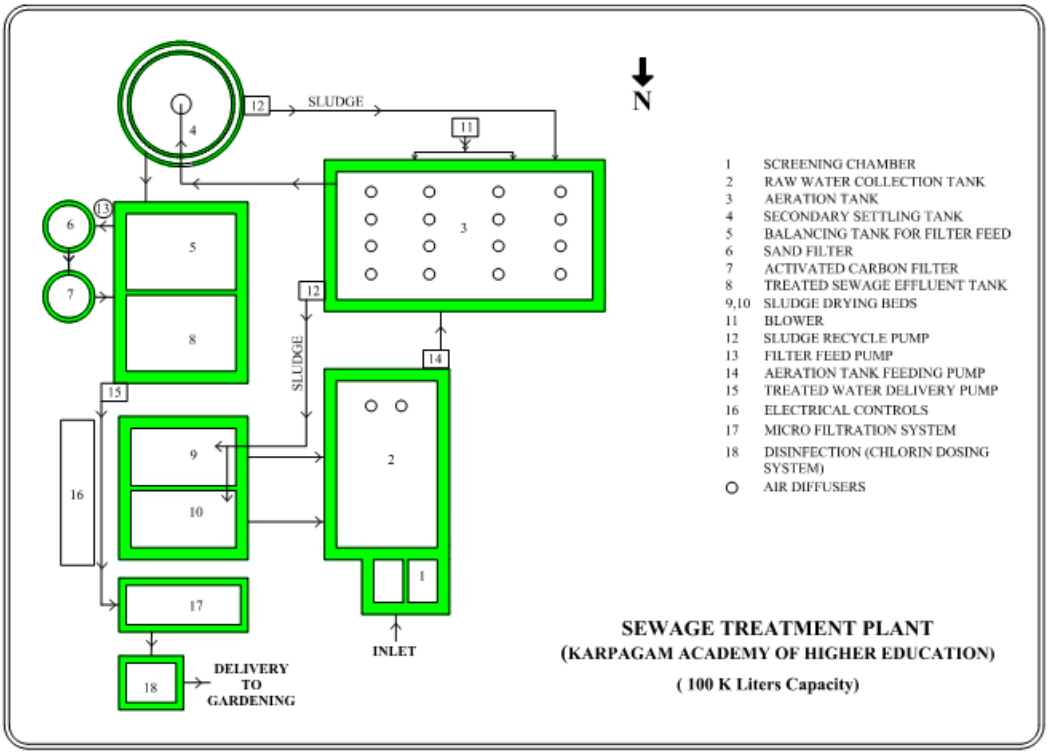
3 rain water collection sumps are there in the campus and no rain water is allowed to go outside the campus, charging the underground strata only. Thus, water resources are being Maintained.

WASTE WATER TREATMENT

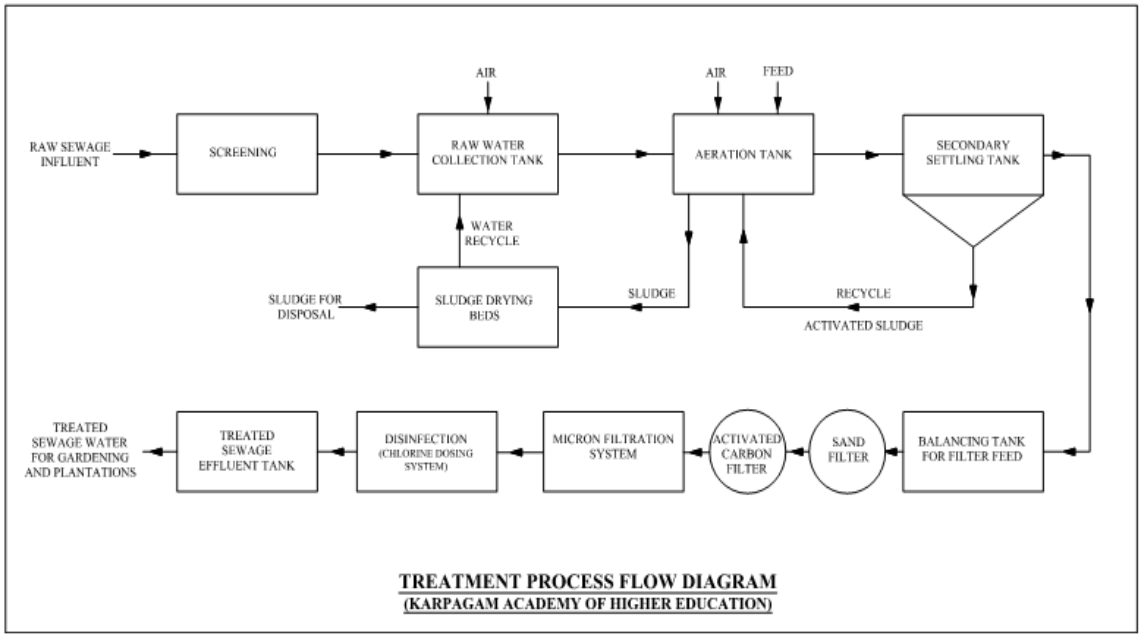
Water recycling is reusing treated wastewater for beneficial purposes such as agricultural and landscape irrigation, toilet flushing, and replenishing a ground water basin. Water recycling offers resource and financial savings. Wastewater treatment can be tailored to meet the water quality requirements of a planned reuse. Waste water treatment is a process of removing

contaminants from waste water or sewage and to convert it into an effluent resource. The treatment process takes place in a Sewage Treatment Plant (STP). The institution has installed Sewage Treatment Plant (STP) with a processing capacity of 1 lac litre per day. The treated water is disposed properly through various pipe lines for growing the trees, plants and grass. By using treated water, the campus is now Green Campus. The sludge settled in the STPs is removed 4 times a month and used as bio-manure for the garden. Excess treated water is discharged to the ground through Rain Water pit. Thus, the entire waste water generated in the campus is treated and used.

LIQUID WASTE MANAGEMENT Sewage Treatment Plant



Layout of Sewage Treatment Plant



MAIN WATER USES IN THE CAMPUS

- Drinking purpose.
- Toilets and Wash areas (including hostel and canteen).
- Labs.
- Gardening and agriculture.
- Construction purpose.
- Cooking purpose in hostels and canteen.

REASONS FOR WATER WASTAGE

- Leakages from taps
- Over use of water
- Overflow of water from overhead tanks

AUDITING FOR ENERGY MANAGEMENT

An energy audit is an inspection of energy flows for energy conservation in an institution or system to reduce the amount of energy input into the system without negatively affecting the output. Energy management (audit) approach is understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, and fuel and energy substitution.

OBJECTIVE

The objective of Energy Audit is primarily to assess the viability of implementing an energy efficiency mechanism prior to investing extensive resources in procuring an Energy Performance Contract (or Energy Performance Related Payment), including a subsequent Investment Grade Audit, for a project which is not commercially viable

DESCRIPTION OF SITE & SCOPE OF ASSESSMENT

Karpagam Academy of Higher Education is having a landscaped green campus extending to a total area of 25 acres with aesthetic ambience accommodating administrative and academic blocks. Academic blocks include separate blocks for Arts and Science, Engineering and Architecture and pharmacy programmes covering a total floor area of nearly 102401 square meters.

Building Area

S.No.	Block	Area in m^2	S.No.	Block	Area in m^2
1	A	6482.53	16	M	382.58
2	B	1757.72	17	N	5165.64
3	C	5005.55	18	O1	1407.47
4	E	5070.03	19	O2	1504.82
5	F	2627.00	20	O3	1452.44
6	H	5614.06	21	O4	1531.26
7	I	22402.06	22	O5	181.41
8	J	2857.68	23	P	8778.61
9	K1	2151.24	24	Q	235.78
10	K2	1279.84	25	R	810.38
11	K3	1749.72	26	S1	1610.28
12	K4	4708.50	27	S2	1153.84
13	K5	6739.68	28	S3	3829.06
14	K6	2167.35	29	T	1984.4
15	L	822.18	30	U	937.98
Total					**102401.1**

This assessment includes the following network utilities:

- [Electricity]

Karpagam Academy of Higher Education is having a maximum demand of 600 kVA Tamil Nadu Electricity Board 22kV HT Line is available and is backed up by four numbers of 125 kVA generators.

Data Analysis

- Data analysis was used to generate reports of block, application and location wise analysis.
- The database was prepared and the results have been graphically represented, which helped to identify the areas with maximum energy saving potential.

Recommendation

Energy as well as cost analysis of different appliances were performed and recommendations were made based on the capital cost recovery time.

Following were the steps involved in this process:

- The capital cost involved in replacing an appliance and/or process was estimated.
- The energy saving by the move was calculated in terms of price of energy per year.
- Some other recommendations were also made which are based on lighting intensity, AC insulation etc.

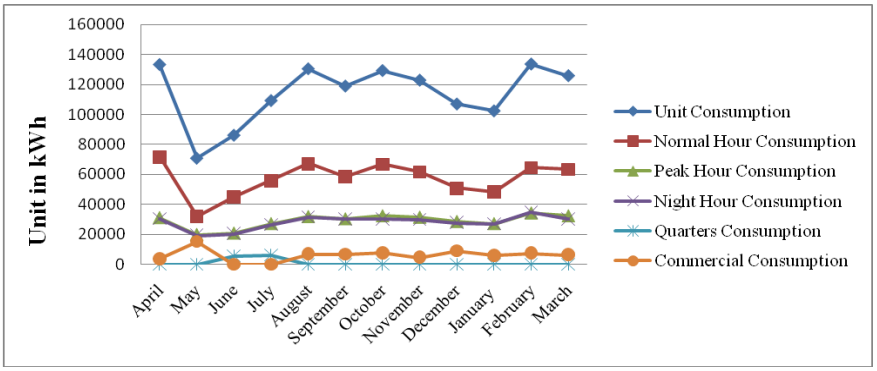
ANALYSIS OF POWER CONSUMPTION

Consumption

Overall annual energy consumption in campus during April 2017 - March 2018

Annual Energy

FIGURE: 1:- OVERALL ANNUAL ENERGY CONSUMPTION



The above load curve shows the overall annual energy consumption in the campus. From the above load curve monthly wise usage of energy consumption is noted. During month of February, March and April the unit consumption is reaching around maximum peak, approximately 1,40,000 kWh/month. Minimum energy is consumed during the month of May and June, approximately 75,000 kWh/month. **From the load curve 50% of energy is consumed for Non Academic purpose like street lighting, office room fans lights and Air Conditioner etc**

Distributed annual energy consumption in campus during April 2017 - March 2018

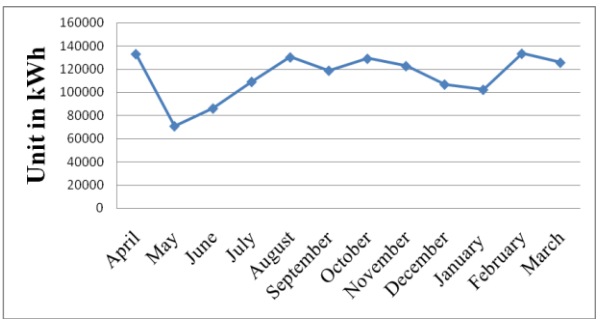


FIGURE: 2 :- DISTRIBUTED OVERALL ANNUAL ENERGY CONSUMPTION

The above load curve shows different distributed energy consumption, namely normal hour consumption, peak hour consumption, night hour consumption. Maximum consumption is around 35,000 kWh/month and Minimum consumption is approximately 20,000 kWh/month.

Main energy consumption is only is due to lightings, fans, computers and Air-Conditioners. Location wise and application wise analysis of the campus was carried out and the chart has been prepared.

Main Energy Consumers

The main energy consumers at the site that have been quantified for this assessment are summarized as follows:

APPLICATION WISE ANALYSIS OF CAMPUS:

Application wise analysis of overall campus has been carried out to find out the application areas with relatively higher power consumption. The results of the application wise analysis of power consumption in KU campus have been summarized in the following chart:

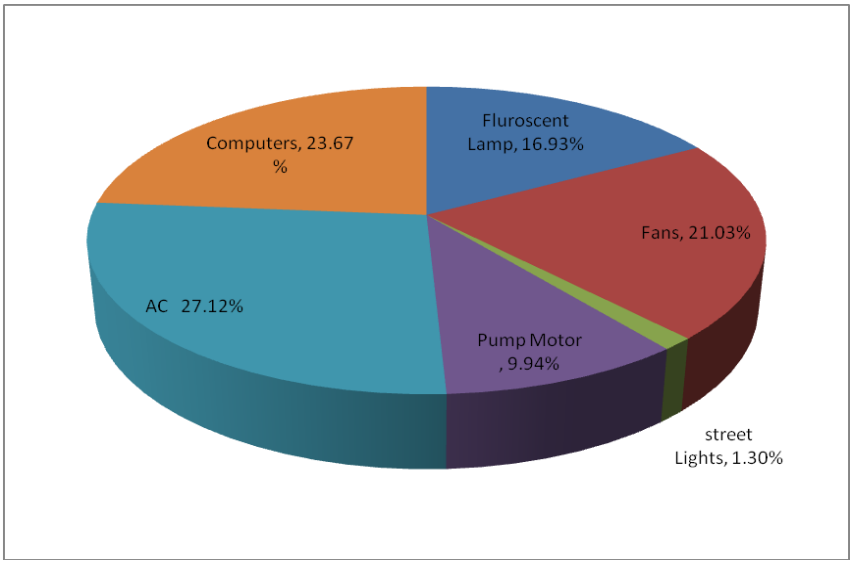


FIGURE: 3 :- APPLICATION WISE ANALYSIS OF OVERALL CAMPUS

As % of total consumption of 795.844 kWh.

It is important to state here that this equipment wise analysis has been carried out by ignoring a large number of appliances having consumption less than 1% to make the analysis work simpler. Air conditioners are found to be consuming as much as 27.12% of the total power consumption in KAHE Campus. Computers account for 23.67% of total power consumption in KAHE Campus. Fans have shares of 21.03% power consumption of KAHE Campus. Conventional tube lights have shares of 16.93% respectively in the total power consumption of

KAHE Campus. Pump motor have shares of 9.94% respectively in the total power consumption of KAHE Campus.

STREET LIGHT:

Following table summarizes the street lighting details:

CATEGORY	POWER(W)	NUMBER	HR/DAY	DAY/YEAR	TOTAL POWER (kWh)
CFL	40	10	10	365	1460
Metal Halide Lamp	400	25	9	365	32850
Total					34310

Water Pumping

There are 10 water pumping stations in our Campus, the details of which are as follows:

Sl. No.	Location	Rated Power (HP)	Measured Power(kW)
1	Animal house	10	7.47
2	Ladies Hostel Back Side	7.5	5.60
3	Ladies Hostel 1	7.5	5.60
4	Ladies Hostel 2	7.5	5.60
5	Ladies Hostel 2	3.5	2.61
6	Canteen	5	3.73
7	Main office	5	3.73
8	H1 Hostel	7.5	5.60
9	H3 Dining Hall	10	7.47
10	H3 Back Side	7.5	5.60
11	UM Block 1	5	3.73
12	UM Block 2	7.5	5.60
13	UM Block 3	7.5	5.60
14	UE Block 1	7.5	5.60
15	UE Block 2	7.5	5.60

The measured powers are, however, at certain instant when the measurement was performed and in no way reflect the average power consumed by that pump.

RECOMMENDATIONS FOR BETTER ENERGY EFFICIENCY

Based on the analysis of the power consumption data, certain steps have been recommended for improving energy efficiency of the campus.

REPLACING TUBE LIGHTS WITH ELECTRONIC BALLAST:

- Total No. of Fluorescent Tube Lights = 3369
- Average Power of conventional Ballast[Choke] FTL = 56W

- Average Power of electronic Ballast[Choke] FTL = 44W
- Power saved per FTL = (56-44)W =12W
- Total Power saving = 3369 *12W = 40428W = 40.428kW
- Average Use of FTL per year = 270*7h=1890h
- Total Energy saved per year = (40.428*1890) kWh = 76408.92kWh
- Saving in Rs. Per year = 76408.92*6.35 = Rs. 485196.64
- Average Cost of Replacing each FTL = Rs. 150
- Total Cost of Replacing all Conventional Ballast[Choke]

  FTLs = 3369*150 = Rs.505350

  - **Capital Cost Recovery time = (505350)/(485196.64) = 1.04 years**

REPLACING TUBE LIGHTS WITH LEDs:

- Total No. of Fluorescent Tube Lights = 3369
- Average Power of Electronic Ballast [Choke] FTL = 44W
- Average Power of LEDs= 8W
- Power saved per LEDs = (44 - 08) W = 36W
- Total Power saving = 3369 *36W = 121284W = 121.284 kW
- Average Use of LEDs per year = 270*7h=1890h
- Total Energy saved per year = (121.284*1890) kWh = 229226.76 kWh
- Saving in Rs. Per year = 229226.76 *6.35 = Rs. 1455589.926
- Average Cost of Replacing each Electronic Ballast[Choke]FTL with LEDs = Rs. 150
- Total Cost of Replacing all Electronic Ballast[Choke]

  FTLs = 3369*500 = Rs.1684500

- **Capital Cost Recovery time = (1684500)/(1455589.93) = 1.16 years**

	LED	**CFL**	**INCANDESCENT**
Average Life (hrs)	50,000	10,000	1,200
Power (Watts)	6 – 8	13 - 15	60
Light Output (Lumens / Watt)	100	50	10
Heat Emitted (Btu/hr)	3.4	30	85
Electricity Use (kWh)1	350	700	3,000
Bulbs Need for 50,000 hrs of Use	1	5	42
Mercury Content	None	Contains 1 mg to 5 mg	None
Sensitivity to low	None	Yes - may not work	Some

temperatures		under negative 10oF or over 120oF	
Sensitive to humidity	None	Yes	Some
On/off Cycling	No Effect	can reduce lifespan	Some
Turns on instantly	Yes	Some delay	Yes
Durability	Very Durable	Fragile	Fragile

Suggested Opportunities for Energy Savings

The simplest measure to immediately improve lighting energy-efficiency is to ensure that lights are only switched ON when necessary, depending on the levels of natural daylight present. Ensure that students and staff know where light switches are, and encourage them to adopt energy-efficient practices.

AUDITING FOR WASTE MANAGEMENT

A waste audit is a methodically thought-out process which can be used to determine the amount and types of waste that are generated by an organization. Information from these audits can help the organization to determine how we can reduce the amount of waste that an institution generates. In most work places, cardboard, paper, plastics, metals and food constitute the majority of what goes in the garbage. Pollution from waste is aesthetically unpleasant and results in large amount of litter in our communities which can cause health problems. Plastic bags and discarded ropes and strings can be very dangerous to birds and other animals. Solid waste can be divided into two categories: general waste and hazardous waste. General wastes include what is usually thrown away in homes and schools such as garbage, paper, tins and glass bottles. Hazardous waste is waste that is likely to be a threat to health or the environment like cleaning chemicals and petrol.

WASTE MANAGEMENT

- Total Plastic ban on campus.
- Recycling and reuse of plastic at some departments.
- In all functions the plastic mineral water bottles, tea cups, straws, bouquets and gifts with plastic covering, decorations, etc. unnecessary plastic use is avoided.
- Use of one-sided papers in all departments.

SOLID WASTE MANAGEMENT

Improper disposal of solid waste can create unsanitary conditions, and these conditions in turn can lead to pollution of the environment and to outbreaks of vector-borne disease (i.e.) diseases spread by rodents and insects. They also pose a wide variety of administrative, economic, and social problems that must be managed and solved. Thus, Proper solid-waste collection is important for the protection of public health, safety, and environmental quality. Hence, for proper disposal of solid wastes dust bins are provided throughout the campus. Students and faculty are advised to dispose the food wastages, paper, metals, plastics, etc. in the degradable and non-degradable dustbins. Degradable wastages are disposed to local panchayat collection centres. Every day all the academic buildings and other surrounding area in the campus are cleaned by sweepers. The branches of trees are regularly trimmed and the dried leaves of plants are properly disposed as garden waste. In order to prevent environmental pollution, garden waste, food wastages, papers and metals collected are either (**converted into manure through the process of decomposition or converted into biogas via the biogas plant)**

AUDITING FOR GREEN CAMPUS MANAGEMENT

Green Campus is an environment which improves energy efficiency, conserving resources and enhancing environmental quality by educating for sustainability and creating healthy, living and learning environments. Green Campus rewards long term commitment to continuous environmental improvement from the campus community. Green institutions make a point to account for sustainable living when designing and operating their buildings. Many of their facilities incorporate natural lighting, improve air quality, and reduce energy and water use. Trees play an important ecological role within the urban environment, as well as support improved public health and provide aesthetic benefits to cities. Planting trees without consideration for their species, location, and maintenance will not result in all of their wished-for benefits. It is essential to plan where the trees are planted and to plan their ongoing maintenance in order to maximize future benefits and to ensure long-term tree survival and growth. Trees in a institution yard improve air quality and can reduce temperatures with their cool shade. They are a small environmental investment that will pay dividends for decades to come. So, while you are busy studying and working on earning those good grades, all the trees

on campus are also working hard to make the air cleaner for us. Trees on our campus impact our mental health as well; studies have shown that trees greatly reduce stress, which a huge deal is considering that many students are under some amount of stress.

KARPAGAM ACADEMY OF HIGHER EDUCATION

Academic session 2018-19

GREEN AREA MANAGEMENT OBSERVATIONS

"Karpagam Academy of Higher Education (KAHE)' has raised beautiful greenery in the campus and there are 400 Various trees from 6750 Sq. Ft. landscape area.

AUDITING FOR CARBON FOOTPRINT

Microcosms of the world at large, institution campuses are great test beds for environmental change, and many students are working hard to get their administrations to take positive action. The initiatives that are emerging are models for the larger society, and the students pushing for them will be taking these lessons with them, too, as they enter the work force after graduation. Foremost on the minds of green-leaning students today is global warming, and many are joining hands to persuade their institutions to update policies and streamline operations so that their campuses can become part of the solution. Commutation of stakeholders has an impact on the environment through the emission of greenhouse gases into the atmosphere consequent to burning of fossil fuels (such as petrol).

The students and faculty of Karpagam Academy of Higher Education, who stay in far-away areas, are encouraged to use public transportation facility. It is economical and it benefits the environment too. Since the inception, the Institution provides transportation facilities for faculty and students. This has greatly reduced the usage of private transportation by the students which immensely helps in reducing the carbon imprints inside the campus. These kinds of practices help not only in cutting off the expenditures but in providing an environment which is clean and safe.

Water Management

- Remove damaged taps and install sensitive taps is possible.
- Improve Ground Water level, by constructing more number of rain water harvesting pit in the campus.
- Awareness campaigns can be held in the campus for the students to save water.
- Install display boards to control over use of water.
- Automated sensors can be installed in order to prevent the over flow of water from tanks.
- Periodical maintenance of water taps should be done in order to prevent the leakage of water through taps.
- To construct one more STP plant.

GREEN CAMPUS MANAGEMENT

- All trees in the campus should be named scientifically.
- Allot more space for planting.

- Grow potted plants in both veranda and class rooms.
- Create automatic drip irrigation system.
- Beautify the Institution building with indoor plants
- Provide funds to nature club for making campus more green

ENERGY MANAGEMENT

- Install more solar panels and other renewable energy sources.
- Conduct more “Save Energy” awareness programs for students and staff.
- More energy efficient fans should be installed.
- Observe a power saving or Energy Saving day every year.
- Automatic power switch off systems may be introduced.

WASTE MANAGEMENT

- Establish a functional bio gas plant.
- A model solid waste treatment system to be established.
- Practice of waste segregation to be initiated.
- A model vermicomposting plant to be set up in the Institution campus.
- Avoid paper plates and cups for all functions in the Institution.

Carbon footprint

- Encourage students and staff to use cycles.
- Establish a more efficient cooking system to save gas.
- More use of generators every day should be discouraged.
- New constructions are in compliance with green standards.

7.1.6 Reports on Environment and Energy Audits

(2016-2017)

ACKNOWLEDGEMENT

The green audit conducted by the Karpagam Academy of Higher Education is an External audit which aims to promote a clean and safe environment. The initiative is taken up to foster the concept of environmental sustainability. Sincere thanks to all for providing us necessary amenities and co-operation during the audit to make it a successful one.

Audit Key Steps

Planning completed	June 2016
Field work completed	December 2016
Draft report completed and sent for management response	February 2017
Management response received	February 2017
Final report completed	March 2017
Report presented to the Management	March 2017

ENVIRONMENTAL AND GREEN AUDIT REPORT

INTRODUCIION

Environmental Audit can be defined as systematic identification, quantification, recording, reporting and analysis of components of environmental diversity. The Environmental Audit aims to analyse environmental practices within and outside the university campus, which will have an impact on the eco-friendly ambience. The major component of Environment Audit is the Green Audit. It is the process of systematic identification, quantification, recording, analysing and reporting of flora and fauna diversity of the institution. Through Environmental Audit one gets a direction as how to improve the condition of environment and there are various factors that have determined the growth of carrying out Environmental Audit.

Moreover, it is a part of Institutional Social Responsibility (ISR) to ensure that it contributes towards the reduction of global warming through Carbon Footprint Reduction measures. Through Environmental Audit one gets a direction as how to improve the condition of environment. A clear and healthy environment helps effective learning and provides conducive learning environment.

Environmental Audit focuses on Green Campus, Waste Management, Water Management, Air monitoring, Energy Management being implemented by the Institution.

Having understood the significance of conducting the Environmental Audit, the Karpagam Academy of Higher Education vested the responsibility of conducting the audit to a Professional Agency,

About the Institution

Karpagam Academy of Higher Education (KAHE) s located in a sprawling, green, lush campus extending 26 acres. It has emerged from Karpagam Arts & Science College (Autonomous) a unit under the Karpagam Charity Trust established in 1989 philanthropist industrialist and educationist the great founded by Dr.R. VASANTHAKUMAR With the vision of instilling originality in the learning minds, search and imparting quality and value-based education and to engage Development with the noble objective of creating unique men and women to serve and lead the society.

Karpagam Academy of Higher Education was conferred as Deemed to be University status by the Ministry of Human Resource Development in August 2008 under section 3 of the UGC Act 1956. It is a recognized Deemed to be University by the UGC It is a member of the Association of Indian Universities. The institution has been accredited by NAAC in 2015.

The institution has Faculty of Ats Science and Human Faculty of Engineering, Faculty of Architecture and Faculty of Pharmacy. It has 25 departments offering a wide range of 84 academic programmes from graduation to doctorate level. The Institution has more than 6000 students on campus, with a strong contingent or more than 350 teaching faculty, well supported by an almost equal number of administrative and supporting staff. Faculty have got good number of research projects with financial support from various funding agencies like DBT/ DST/ ICMR and have filed more than 60 patents. As many as 900 Research papers have been published by the faculty in SCOPUS. The institution has collaborated with Foreign Universities, Industries and Research Bodies for mutual benefit. The Institution ensures that education epitomizes excellence in every sphere and students are prepared to take on the challenges of the day and become the next generation leaders.

PRE-AUDIT STAGE

The green audit practically involves energy conservation, use of renewable resources, rain water harvesting, efforts of carbon sequestration methods, planting trees, waste management including hazardous and e-waste. This requires data collection and efforts for clarification of environmental policies. Green auditing includes systematic identification, recording and analysis of components related to sustainable development of an educational institution to preserve for future generations. The process has three important stages such as pre audit stage, audit stage and post audit stage.

MANAGEMENT'S COMMITMENT

The Management of the institution has shown the commitment towards the green auditing during the pre-audit meeting. They were ready to encourage all green activities. It was decided to promote all activities that are environment friendly such as awareness programs on environment, campus farming, planting more trees in the campus etc. after the green auditing.

SCOPE AND GOALS OF GREEN AUDITING

A clean and healthy environment aids effective learning and provides a conducive learning environment. There are various efforts around the world to address environmental education issues. Green Audit is the most efficient and ecological way to manage environmental problems. It is a kind of professional care which is the responsibility of each individual who are the part of economic, financial, social and environmental processes.

It is necessary to conduct green audit in institution campus because students become aware of the green audit, its advantages to save the planet and they become good citizen of our country. Thus, Green audit becomes necessary at the institution level. A very simple indigenized system has been devised to monitor the environmental performance of Karpagam Academy of Higher Education, Coimbatore. It comes with a series of questions to be answered on a regular basis. This innovative scheme is user friendly and totally voluntary. The aim of this is to help the institution to set environmental examples for the community, and to educate the young learners.

BENEFITS OF THE GREEN AUDITING

1. Empower the organizations to frame a better environmental performance
2. More efficient resource management
3. Benchmarking for environmental protection initiatives
4. To provide basis for improved sustainability
5. To create a green campus
6. To enable waste management through reduction of waste generation, solid- waste and water recycling
7. To create plastic free campus and evolve health consciousness among the stakeholders
8. Recognize the cost saving methods through waste minimizing and managing
9. Point out the prevailing and forthcoming complications
10. Authenticate conformity with the implemented laws
11. Enhance the alertness for environmental guidelines and duties

12. Impart environmental education through systematic environmental management approach and improving environmental standards Karpagam Academy of Higher Education, Coimbatore.

TARGET AREAS OF GREEN AUDITING

Green audit forms part of a resource management process. Although they are individual events, the real value of green audits is the fact that they are carried out, at defined intervals, and their results can illustrate improvement or change over time. Eco-campus concept mainly focuses on the efficient use of energy and water; minimize waste generation or pollution and also economic efficiency. All these indicators are assessed in process of "Green Auditing of educational institute". Eco-campus focuses on the reduction of contribution to emissions, procure a cost effective and secure supply of energy, encourage and enhance energy use conservation, promotes personal action, reduce the institute's energy and water consumption, reduce wastes to landfill, and integrate environmental considerations into all contracts and services considered to have significant environmental impacts. Target areas included in this green auditing are water, energy, waste, green campus and carbon footprint.

General Objective:

To study the upkeep of the precincts and ascertain the development of the nature into a greener place to create an ambience for teaching and learning.

Specific Objectives:

1. To study the status of the environment more specifically relating to Water Management, Air monitoring, Energy Conservation, Waste Management and Green Area Management in the KAHE Campus.
2. To identify the areas of strength and weakness,
3. To identify the areas which require further strengthening and
4. To offer suggestions for protection and sustainable development of Environment.

The study covered the following areas to summarise the present status of environment management in the campus

a. Water management
b. Air Monitoring
    i. Ambient Air Quality
    ii. Genset Smoke Emission
c. Energy Conservation

d. Waste Management.
e. Green Area management

AUDITING FOR WATER MANAGEMENT

Water auditing is a method of quantifying water flows and quality in simple or complex systems, with a view to reducing water usage and often saving money on otherwise unnecessary water use. Water is life; virtually everything we do or use each day involves water. Yet, we do not give it the importance that is due to it. India will soon be a water-stressed country and we all need to work towards our water security. Water Management:

Observations

There are 7 bore wells in the campus. 4 Nos. of Over Head tanks of each 190000 litres capacity and 3 Nos. of Sumps of 55000 litres capacity.

Athikadavu drinking water of 29500 litres used per day by KAHE.

Three rain water collection sumps are there in the campus and no rain water is allowed to go outside the campus, charging the underground strata only. Thus, water resources are being Maintained.

WASTE WATER TREATMENT

Water recycling is reusing treated wastewater for beneficial purposes such as agricultural and landscape irrigation, toilet flushing, and replenishing a ground water basin. Water recycling offers resource and financial savings. Wastewater treatment can be tailored to meet the water quality requirements of a planned reuse. Waste water treatment is a process of removing contaminants from waste water or sewage and to convert it into an effluent resource. The treatment process takes place in a Sewage Treatment Plant (STP). The institution has installed Sewage Treatment Plant (STP) with a processing capacity of 1 lac litre per day. The treated water is disposed properly through various pipe lines for growing the trees, plants and grass. By using treated water, the campus is now Green Campus. The sludge settled in the STPs is removed 4 times a month and used as bio-manure for the garden. Excess treated water is discharged to the ground through Rain Water pit. Thus, the entire waste water generated in the campus is treated and used.

MAIN WATER USES IN THE CAMPUS

- Drinking purpose.
- Toilets and Wash areas (including hostel and canteen).
- Labs.
- Construction purpose.
- Cooking purpose in hostels and canteen.

REASONS FOR WATER WASTAGE

- Leakages from taps
- Over use of water
- Overflow of water from overhead tanks.

AUDITING FOR ENERGY MANAGEMENT

An energy audit is an inspection of energy flows for energy conservation in an institution or system to reduce the amount of energy input into the system without negatively affecting the output. Energy management (audit) approach is understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, and fuel and energy substitution.

AUDITING FOR WASTE MANAGEMENT

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AUDITING FOR CARBON FOOTPRINT

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Suggestions

1. Installation biogas plant and compost units
2. Solar panels should be installed to generate renewable energy
3. Planting minimum of 25 trees /year in the campus
4. Replace CFL lamps with LED lights
5. Replace Old computer monitors with LED monitors
6. Install sufficient number of rain water collecting pit
7. Install automatic drip or sprinkler system for gardening
8. Number may be allotted for each and every trees and scientific names may be displayed
9. Solar operated street lights may installed
10. Separate baskets may be offered for segregating degradable and non-degradable wastages
11. Fire safety instruments should be installed in all the buildings.

KARPAGAM ACADEMY OF HIGHER EDUCATION

(Deemed to be University)
(Established Under Section 3 of UGC Act, 1956)
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7.1.16 Reports on Environment and Energy Audits

S.No.	Year	Particulars	Page No.
1	2019-2020	Report on Environment and Energy Audits	2
2	2018-2019	Report on Environment and Energy Audits	47
3	2017-2018	Report on Environment and Energy Audits	73
4	2016-2017	Report on Environment and Energy Audits	95
5	2015-2016	Report on Environment and Energy Audits	105

REGISTRAR
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Coimbatore - 641 021.

KARPAGAM ACADEMY OF HIGHER EDUCATION
CBE-21

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7.1.6 Reports on Environment and Energy Audits

(2015-2016)

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Having understood the significance of conducting the Environmental Audit, the Karpagam Academy of Higher Education vested the responsibility of conducting the audit to a Professional Agency,

About the Institution

Karpagam Academy of Higher Education (KAHE) s located in a sprawling, green, lush campus extending 26 acres. It has emerged from Karpagam Arts & Science College (Autonomous) a unit under the Karpagam Charity Trust established in 1989 philanthropist industrialist and educationist the great founded by Dr.RVASANTHAKUMAR With the vision of instilling originality in the learning minds, search and imparting quality and value-based education and to engage Development with the noble objective of creating unique men and women to serve and lead the society.

Karpagam Academy of Higher Education was conferred as Deemed to be University status by the Ministry of Human Resource Development in August 2008 under section 3 of the UGC Act 1956. It is a recognized Deemed to be University by the UGC It is a member of the Association of Indian Universities. The institution has been accredited by NAAC in 2015.

The institution has Faculty of Ats Science and Human Faculty of Engineering, Faculty of Architecture and Faculty of Pharmacy. It has 25 departments offering a wide range of 84 academic programmes from graduation to doctorate level. The Institution has more than 6000 students on campus, with a strong contingent or more than 350 teaching faculty, well supported by an almost equal number of administrative and supporting staff. Faculty have got good number of research projects with financial support from various funding agencies like DBT/ DST/ ICMR and have filed more than 60 patents. As many as 500 Research papers have been published by the faculty in SCOPUS. The institution has collaborated with Foreign Universities, Industries and Research Bodies for mutual benefit. The Institution ensures that education epitomizes excellence in every sphere and students are prepared to take on the challenges of the day and become the next generation leaders.

PRE-AUDIT STAGE

The green audit practically involves energy conservation, use of renewable resources, rain water harvesting, efforts of carbon sequestration methods, planting trees, waste management including hazardous and e-waste. This requires data collection and efforts for clarification of environmental policies. Green auditing includes systematic identification, recording and analysis of components related to sustainable development of an educational institution to preserve for future generations. The process has three important stages such as pre audit stage, audit stage and post audit stage.

MANAGEMENT'S COMMITMENT

The Management of the institution has shown the commitment towards the green auditing during the pre-audit meeting. They were ready to encourage all green activities. It was decided to promote all activities that are environment friendly such as awareness programs on environment, campus farming, planting more trees in the campus etc. after the green auditing.

SCOPE AND GOALS OF GREEN AUDITING

A clean and healthy environment aids effective learning and provides a conducive learning environment. There are various efforts around the world to address environmental education issues. Green Audit is the most efficient and ecological way to manage environmental problems. It is a kind of professional care which is the responsibility of each individual who are the part of economic, financial, social and environmental processes.

It is necessary to conduct green audit in institution campus because students become aware of the green audit, its advantages to save the planet and they become good citizen of our country. Thus, Green audit becomes necessary at the institution level. A very simple indigenized system has been devised to monitor the environmental performance of Karpagam Academy of Higher Education, Coimbatore. It comes with a series of questions to be answered on a regular basis. This innovative scheme is user friendly and totally voluntary. The aim of this is to help the institution to set environmental examples for the community, and to educate the young learners.

BENEFITS OF THE GREEN AUDITING

- Empower the organizations to frame a better environmental performance
- More efficient resource management
- Benchmarking for environmental protection initiatives
- To provide basis for improved sustainability
- To create a green campus
- To enable waste management through reduction of waste generation, solid- waste and water recycling
- To create plastic free campus and evolve health consciousness among the stakeholders
- Recognize the cost saving methods through waste minimizing and managing
- Point out the prevailing and forthcoming complications

Objective:

The institution, with the advice of the Internal Quality Assessment Cell (IQAC) has set up an environmental quality assessment body (Green Campus) to assess the green practices followed in the institution. The main objectives of green audit are:

- To ensure efficient resource management
- To provide basis for improved sustainability and an eco – friendly campus
- To enable effective waste management by reducing waste generation and proper recycling of water.
- To identify cost saving methods by waste minimizing
- To Impart environmental education systematically to promote environmental protection
- To bring out a status report on environmental compliance and point out existing and forth coming difficulties

The study covered the following areas to summarise the present status of environment management in the campus

a. Water management
b. Energy Conservation
c. Waste Management.
d. Green Area management

AUDITING FOR WATER MANAGEMENT

Water Management: There are 7 bore wells in the campus. 4 Nos. of Over Head tanks of each 190000 litres capacity and 3 Nos. of Sumps of 55000 litres capacity. Athikadavu drinking water of 27500 litres used per day by KAHE. Rain water collection sumps are there in the campus and no rain water is allowed to go outside the campus, charging the underground strata only. Thus, water resources are being Maintained.

WASTE WATER TREATMENT

Water recycling is reusing treated wastewater for beneficial purposes such as agricultural and landscape irrigation, toilet flushing, and replenishing a ground water basin. Water recycling offers resource and financial savings. Wastewater treatment can be tailored to meet the water quality requirements of a planned reuse. Waste water treatment is a process of removing contaminants from waste water or sewage and to convert it into an effluent resource. The treatment process takes place in a Sewage Treatment Plant (STP). The institution has installed Sewage Treatment Plant (STP) with a processing capacity of 1 lac litre per day. The

treated water is disposed properly through various pipe lines for growing the trees, plants and grass. By using treated water, the campus is now Green Campus. The sludge settled in the STPs is removed 4 times a month and used as bio-manure for the garden. Excess treated water is discharged to the ground through Rain Water pit. Thus, the entire waste water generated in the campus is treated and used.

MAIN WATER USES IN THE CAMPUS

1. Drinking purpose.
2. Toilets and Wash areas (including hostel and canteen).
3. Labs.
4. Construction purpose.
5. Cooking purpose in hostels and canteen.

WATER WASTAGE

1. Leakages from taps
2. Over use of water
3. Overflow of water from overhead tanks.

AUDITING FOR ENERGY MANAGEMENT

Energy consumption could be reduced. Unnecessary lights and fans could be switched off. During daylight, lights can be switched off. Energy saving through the replacement of incandescent bulbs, CFL lamps and tube lights to LED light could be a good option. Energy efficient electrical equipment's especially fans and pump sets can be replaced against old ones. Awareness programs for the stakeholders to save energy may also increase sustainability in the utilization of various energy source.

AUDITING FOR WASTE MANAGEMENT

Wastes cannot be avoided in any environment. Wastes can be classified as Biodegradable and Non- biodegradable wastes. Biodegradable wastes include food wastes; which can be easily decomposed by the bacteria in soil. But nonbiodegradable wastes are those which cannot be degraded by any organism and remain as such for many years. Much amount of waste is generated from the institution campus.

1. The food waste generated from the canteen is collected and given to pigs.
2. Total Plastic ban on campus.
3. In all functions the plastic mineral water bottles, tea cups, straws, bouquets and gifts with plastic covering, decorations, etc. unnecessary plastic use is avoided.

AUDITING FOR GREEN CAMPUS MANAGEMENT

Suggestions

1. Installation biogas plant and compost units
2. Solar panels should be installed to generate renewable energy
3. Replace CFL lamps with LED lights
4. Replace Old computer monitors with LED monitors
5. Install automatic drip or sprinkler system for gardening
6. Number may be allotted for each and every trees and scientific names may be displayed
7. Solar operated street lights may installed
8. Separate baskets may be offered for segregating degradable and non-degradable wastages
9. Implement a mechanism to recycle plastic waste in a scientific manner.
10. Maximum reduction of burning waste materials is required by adopting recycling methods.
11. Awareness programs on water conservation to be conducted.
12. Automated sensors can be installed in order to prevent the over flow of water from tanks.