

# REPORT ON GREEN AUDIT OF HENRY BAKER COLLEGE, MELUKAVU



**Tropical Institute of Ecological Sciences (TIES)**  
Ecological Research Campus,  
Velloor P.O. Kottayam

# *PREFACE*

As part of NAAC accreditation programme, Green Audit is a mandatory component for fulfilling the requirements for the accreditation. Green audit includes energy audit, water audit and biodiversity audit. In June 2020, **Henry Baker College, Melukavu**, in collaboration with **Tropical Institute of Ecological Sciences (TIES)**, the affiliated research center of Mahatma Gandhi University, has initiated College NGO Partnership Initiative (CNPI) programme in the college campus involving students and faculty members.

In CNPI programme, Green Audit is the major component. It is basically a student capacity building programme, equipping them to meet the challenges and to evolve a socially and environmentally responsible society. It aims to inculcate research culture among the students and faculty of the college and to develop the right scientific temper and outlook. Besides, it provides valuable data regarding usage of various environmental components which help the college to implement conservation measures.





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T I E S - t i e s M i n d a n d N a t u r e

## CERTIFICATE

This is to certify that the report entitled “Green Audit of Henry Baker College, Melukavu” is a bonafide work carried out by the students and faculty of Henry Baker College with the collaboration of Tropical Institute of Ecological Sciences (TIES), Kottayam, during the period between June 2020 - November 2020.

Thanking you,  
Sincerely,

**Dr. Punnen Kurian**  
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20.01.2021



Supporting Agency for



Centre of Excellence



Service Provider



SUCHITHWA MISSION

Santhisthal



Course collaborator





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## 1. ABOUT COLLEGE

Henry Baker College, Melukavu has been formed to liberate people from the darkness of ignorance to the twilight of knowledge and wisdom. It is an arts and science college established in 1981 by Madhya Kerala Diocese of Church of South India (CSI) to impart adequate fundamental knowledge in all the basic sciences, arts, and commerce and to build interpersonal skills and bring out creativity in students that would promote innovation, research, and entrepreneurship. At present, it is an educational institution of higher learning under Henry Baker College Educational Society – a charitable society registered under the Travancore-Cochin Literary, Scientific and Charitable Societies Registration Act, 1955 and has been managed by East Kerala Diocese of CSI. The college is affiliated to **Mahatma Gandhi University, Kottayam** and it has been included under sections **2 (f) and 12 (b) of the UGC Act, 1956**. The college preserves and promotes the cultural heritage of India, the humanistic and spiritual values of our citizens, and thereby promotes peace and harmony in society. The college is located in Melukavumattom, the lower valley of the eastern hillside of Kerala. It faces the Melukavumattom – Kollappally – Pala Road and is 15 km away from Pala Municipal town and 12 km away from Erattupetta Municipal town. The HBC management gives much emphasis to the welfare of tribal communities. Moreover, we also give weightage to students coming from very poor tribal settlements at



the time of admission as per the university norms and also provide additional care and consideration to their academics, teachings, and career. The college located on the lower basin of Melukavu hill stations; it largely caters to the highest education aspirations of socially, educationally, and economically marginalized sections of a rural population belonging to different communities especially tribal and other marginalized communities. The college comprises 494 students, 40 teachers, and 10 non-teaching staff. The interventions of the college community in improving the welfare of the tribal community have always been praised by the society at large for years. This college has the highest proportion of SC, ST, OBC and OEC students with 71 percent. If minority students are added, the proportion of students is 91.1 per cent which is one of the largest in the State.

Henry Baker College, which began as a junior college with five Pre-degree batches in 1981, offers at present, 6 undergraduate courses with BA History, BA English, B.Com (Co-operation), B.Com (Computer Applications), B.Sc. in Physics and B.Voc Tourism and Hospitality Management and two postgraduate courses M.Com (Finance and Taxation) and MA (History). Department of Commerce is an approved Ph.D research centre of M G University, Kottayam. Besides, there are 2 diploma courses and 25 certificate courses run by various departments. The dedication of the management and the community combined with the excellent infrastructural and teaching facilities help maintain high standards in the curricular and co-curricular spheres of the college.

The college has entered into tie up with International Agencies such as **INCHE, and Albert-Schweitzer-SchuleAlsfeld (Germany)**. The college is in the process of **NAAC and NIRF grading**. Our college is an **ISO 9001 - 2015 and HLACT (UK)** certified institution. Besides, it has entered into MOU with a number of government/semi-government/private educational and other institutions in providing a better higher education services to the needy. The college is an approved centre for implementation of a number of governments' projects/approved programmes including **ASAP, SSP, WWS, CCEK, NPTEL-SWAYAM, YIP, YRC, NSS, SAP**, etc. College has been instrumental in implementing schemes of the government/local bodies which have social relevance to the society.

College has **fully automated Digital library** with adequate books, journals and e-resources. Ours **is a green, eco-friendly, tobacco free, plastic free campus** having implemented Green Protocol. **Cent percent of classrooms are smart classrooms** with modern ICT facilities and almost all teachers are actively using technology in teaching and learning process. **E governance** is implemented in the college with automated office operations including admission, attendance, TC, Finance and Accounts etc. College has state of the art computing facilities and ample opportunities for all curricular, extracurricular and co-curricular activities. Campus wide **high speed net connectivity** (+ 50 mbps) with **complete CCTV coverage** ensures safety and convenience.

In keeping with the lofty vision of its founders, Henry Baker College, Melukavu is a melting pot of students from all communities and creeds, thus preserving a secular character while promoting the Christian/Hindu/Muslim ideals of love and services.

## 2. VISION AND MISSION

### VISION

Henry Baker College visualizes a centre of higher education imparting qualitatively high, socially relevant and holistic education to all without discriminating anyone on the grounds of caste, religion or gender.

### MISSION

To liberate young men and women from the darkness of ignorance to the dawn of knowledge and wisdom through value based education.

### GOAL

To incorporate novel and pioneering branches of study and to lead the institution into a centre for excellence by providing quality Education and Training. Create and maintain a vibrant research environment to promote cutting-edge, interdisciplinary research and collaborative work with local, regional, and international communities.

### CORE VALUES

- Excellence
- Ethics
- Diversity
- Inclusiveness
- Growth
- Social Concern

### MOTTO

**“From Darkness into Marvellous Light”**

### 3. CNPI AT HENRY BAKER COLLEGE, MELUKAVU

College - NGO Partnership Initiative (CNPI) was initiated at Henry Baker College, Melukavu under the guidance of Tropical Institute of Ecological Sciences (TIES). The aim of the CNPI was to inculcate research culture among the students and faculty of the college and to develop the right scientific temper and outlook. Green Audit was the major component of CNPI programme; it consisted of Water Audit, Energy Audit and Biodiversity Audit.

CNPI is a mutually benefitting research-cum- extension project of TIES, involving students and faculty of Henry Baker College. The introduction of project work for college students is a significant step to promote research culture, but the prevailing system does not allow much progress in the area. Considering this fact, National Assessment and Accreditation Council (NAAC) has included this aspect in the NAAC accreditation process and set up criteria for assessing the performance of colleges in research and extension programmes based on College - NGO collaborative programmes. **Green Audit** is a compulsory exercise that NAAC demands too which is the most significant component of CNPI programme.

TIES-CNPI provides ample avenues for the college to improve their stakes in research and extension activities involving faculty and students of Henry Baker College, with the constant support of experts and scientists from TIES. Being an environmental research and action organisation, TIES will be benefitted through the rich human resource and localised infrastructure support from the Henry Baker College. In brief, the college can use their rich human resource and infrastructure facilities for conducting socially and environmentally important research and extension activities availing the vast expertise of Tropical Institute of Ecological Sciences, in the conduct of related projects and programmes.

#### 3.1. GENERAL OBJECTIVES

- ❖ To provide research support to the college to conduct research projects on social and ecological issues involving faculty and students

- ❖ To conduct community extension and development projects through Peoples Research Programmes (PRPs)
- ❖ To impart scientific methods and research techniques among students and faculty to deal with emerging social and environmental issues
- ❖ To study, suggest and implement solutions to environmental problems through timely interventions

## 3.2. BENEFITS

### BENEFITS OF HENRY BAKER COLLEGE

By conducting CNPI programme, the students and faculty of the college will have an opportunity to participate in research and extension projects in socially relevant and applied areas. The students will be trained in preparing scientific reports and can publish their reports based on their studies and activities. As a result of the programme, stake of the college in community development programmes (waste management, water and energy conservation, natural farming, livelihood issues, gender issues etc.) will be enhanced. Moreover, Green Audit is an essential criterion for NAAC accreditation.

### BENEFITS OF TIES

By collaborating with the CNPI programme of Henry Baker College, TIES will have a richer human resource support for its further research programmes. Besides, the scientific reports of green audit in the college will be jointly published with college contributors. Moreover, TIES will have an improved database and stake in community developmental activities.

## 3.3. METHODOLOGY

On June, 2020 the inauguration of the CNPI programme at Henry Baker College, Melukavu was conducted online. Students and faculty members from the college

attended the orientation programme given by the supporting organization, Tropical Institute of Ecological Sciences (TIES). After getting orientation about Green audit, students were divided into three groups to conducted water audit, energy audit and biodiversity audit. The study was conducted during the period June 2020 June to November 2020. For the ease of the auditing programme the whole college was divided into different areas.

## 4. ENERGY AUDIT

### 4.1. INTRODUCTION

The purpose of an energy audit is to account for consumption and recommend where savings are possible. A 'walk through audit' or 'site survey' involves sighting every light and piece of equipment that consumes energy, recording power ratings and estimating hours of operation. Obvious energy waste and inefficiencies are noted, as are items in need of maintenance or replacement. An action plan for energy management strategy can be formulated as a result of the audit.

For planning of new and refurbished buildings, an audit can comprise an assessment of all proposed energy consuming equipment, which in turn enables the preparation of an energy budget. The energy audit of the Henry Baker College campus was done with these objectives and to develop an energy management plan for the college.

### 4.2. AIM

To conduct an energy audit of the Henry Baker College campus and suggest conservation measures

### 4.3. OBJECTIVES

- To assess the existing pattern of electrical energy use in the college campus
- To find out the routes of energy loss
- To suggest and implement an energy conservation programme

### 4.4. METHODOLOGY

The energy audit was done through a walk through survey to the nook and corners of the college campus in multiple recurring sessions. The college areas were assigned to different groups of 2-4 students each. Due to the Covid restrictions limited number of students only presents in the college, hence full usage pattern has not been taken. The assumptions were made on the basis of available data.

#### 4.4.1. SITE SURVEY

Student volunteers explored their assigned area on three working days, three Saturdays and three holidays (Sundays). Every day they toured the area in three sessions – one hour before the classes begin; before and after noon interval (lunch break); and one hour after the last class session ends. For each location, they recorded the number of lamps, the types of lamps (incandescent or fluorescent or CFL or LED), and the power rating of lamps (Watts) and estimated the daily hours of usage by visiting rooms throughout a typical day or asking staff. The same procedure repeated for equipment's, instruments and other electrical installations. The student representatives also collected data regarding the positions and count of windows, doors, ventilation, bulbs, tube lights, fans and other electrical equipment in the rooms.

## 4.5. RESULTS AND OBSERVATIONS

**Table1. Outdoor Lighting in the Henry Baker College campus**

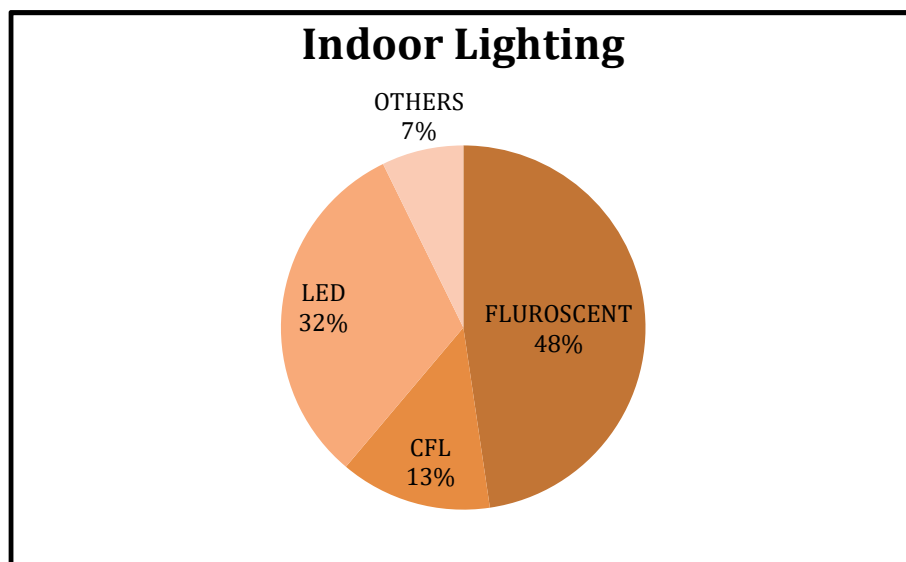
Sl. No.	Location	Use	Tree Cover	No. of light point	Type of Light	Power rating (W)	Hours of use/ Week	Units used/Day (kWh)	Units used/Week (kWh)	Units used/Year (kWh)
1	A Block	Major walk-way	Moderate	2	LED	100	40	8	56	2968
2	Auditorium	Major walk-way	Rich	1	LED	100	40	4	28	1484
3	Self-Financing Block	-	Moderate	1	LED	100	40	4	28	1484
4	Library	-	Moderate	1	LED Flood Light	50	40	2	14	742
				1	LED Bulb	9	40	0.36	2.52	133.56
5	Physics Block	-	Moderate	4	LED Flood Light	100	40	16	112	5939
<b>TOTAL</b>				<b>10</b>				<b>34.6</b>	<b>240.52</b>	<b>1247.56</b>

The energy audit conducted at the college comprised the auditing of different light sources in the campus including indoor and outdoor, different electrical gadgets in the campus, etc. The outdoor lighting is mainly powered LED Lights and the auditing was conducted in 5 areas in the campus viz: A Block; Auditorium; Self-financing block; Library and Physics block. On a daily basis, the highest amount of light energy is utilized in the Physics block followed by A Block and the least at Library. In case of tree cover, the Auditorium region has rich tree cover and the rest of the area with moderate tree cover. There are 10 light points in the outdoor area and among them Physics block has the higher number of lights (4 nos.) followed by A Block (2 nos.) and the rest with single light points. A Block and Auditorium are the major walk-ways in the campus and A Block utilizes highest amount of energy. A total of 1247.56 units per year is the annual usage of light in the outdoor.



**Table 2: Indoor Lighting (Fluorescent Lights (36W/40W)) in the Henry Baker College campus**

Location	Use	Construction type	Windows	No of Lights	No. of lights not in use	Units used/Day (kWh)	Units used/Week (kWh)	Units used/Year (kWh)	Hours of use per week
<b>PHYSICS DEPARTMENT</b>	Class Rooms, Staff Rooms Mechanical & Electronics lab, Verandha	Concrete	17	11	1	0.4511	3.16	167.48	36
<b>MIDDLE BUILDING</b>	Staffroom, Verandha, Heritage Museum	Clay Tile roof, Concrete walls	7	1	0	0.0571	0.4	21.2	10
<b>ADMINISTRATIVE BUILDING</b>	Office, Principal's Room, Leisure points, Classrooms	Concrete	19	7	0	0.156	1.096	58.088	15
<b>COMMERCE BUILDING</b>	IQAC, Classrooms, Staffrooms, Verandha,	Concrete	20	11	0	0.2954	2.068	109.604	28
<b>SELF- FINANCING</b>	Classroom, Staffroom, Corridor, Parlour, Lab	Concrete and Aluminium Roofing	1	17	0	1.36	9.52	504.56	71
<b>LIBRARY</b>	Classrooms, Library, Language Room, Seminar Hall	Concrete	63	34	0	0.96	6.72	356.16	35.5
<b>INDOOR STADIUM</b>	-	-	-	11	0	0.0314	0.22	11.66	0.5
<b>AUDITORIUM</b>	Meetings	-	-	0	0	0	0	0	0
<b>CANTEEN</b>	-	-	-	0	0	0	0	0	0
<b>TOTAL</b>				<b>92</b>	<b>1</b>	<b>3.311</b>	<b>23.184</b>	<b>1228.752</b>	<b>196</b>



**Graph 1. Major sources of indoor lighting at Henry Baker College**

The indoor auditing was conducted in all the blocks viz: Physics Department, Middle Building, Administrative Building, Commerce Building, Self-financing block, Library, Indoor Stadium, Auditorium and Canteen. The major form of light source in the indoor regions is by fluorescent lights, CFL, LED Lights, Incandescent lights, etc. Fluorescent lights are widely used in the case in comparison with other light sources. Fluorescent lights account for 48% of the total indoor lighting followed by LED lights (32%), CFL (13%) and other forms of light like incandescent lights, spot lights, sodium vapour lamps, etc. From the auditing data there are 92 fluorescent light in the campus used for indoor lighting and in that 1 is not used at the Physics Department. Fluorescent lights of 36 and 40 W are used. The lions' share of the fluorescent lights are used in the Library, ie., 34 fluorescent lights followed by Self-financing block with 17 and Physics Department, Commerce building and Indoor Stadium with 11. Fluorescent lights are not used in the Canteen and Auditorium and only 1 fluorescent light recorded in the Middle building. When we consider on a weekly basis, the highest usage of the light is noted in the Self-financing block, 71 hours the light is used and the lowest in the Indoor Stadium, weekly only 0.5 hours. Weekly the fluorescent lights are used for 196 hours. The yearly energy consumption of fluorescent light is 1228.752 kWh.

**Table 3: Indoor Lighting (CFL Lights (9W/15W/18W/30W)) in the Henry Baker College campus**

Location	Use	Construction type	Windows	No of Lights	No. of lights not in use	Units used/Day (kWh)	Units used/Week (kWh)	Units used/Year (kWh)	Hours of use per week
<b>PHYSICS DEPARTMENT</b>	Class Rooms, Staff Rooms Mechanical & Electronics lab, Verandha	Concrete	17	1	1	0	0	0	0
<b>MIDDLE BUILDING</b>	Staffroom, Verandha, Heritage Museum	Clay Tile roof, Concrete walls	7	0	0	0	0	0	0
<b>ADMINISTRATIVE BUILDING</b>	Office, Principal's Room, Leisure points, Classrooms	Concrete	19	4	0	0.0205	0.144	7.632	6
<b>COMMERCE BUILDING</b>	IQAC, Classrooms, Staffrooms, Verandha,	Concrete	20	0	0	0	0	0	0
<b>SELF- FINANCING</b>	Classroom, Staffroom, Corridor, Parlour, Lab	Concrete and Aluminium Roofing	1	2	0	0.0514	0.36	19.08	10
<b>LIBRARY</b>	Classrooms, Library, Language Room, Seminar Hall	Concrete	63	12	0	0.1247	0.873	46.269	11
<b>INDOOR STADIUM</b>	-	-	-	0	0	0	0	0	0
<b>AUDITORIUM</b>	Meetings	-	-	10	0	0.1928	1.35	71.55	10
<b>CANTEEN</b>	-	-	-	0	0	0	0	0	0
<b>TOTAL</b>				<b>29</b>	<b>1</b>	<b>0.3894</b>	<b>2.727</b>	<b>144.53</b>	<b>37</b>

There are 29 CFL lights used in the campus for Indoor lighting and among that one in the Physics department is not in use. CFL lights of 9W, 15W, 18W and 30W respectively are used. The highest number of CFL lights is used in the Library, 12 CFL lights, followed by Auditorium, 10 CFL lights and the least number of CFL lights is used in the Physics Department, 1light. There are CFL lights in the Canteen, Indoor Stadium, Commerce and Middle Buildings. On a weekly basis CFL lights are used for a total of 37 hours. CFL lights are mainly used in the Library (weekly 11 hours) followed by Auditorium and Self-financing building (weekly 10 hours).The yearly energy consumption of CFL light is 144.53 kWh. CFLs fit most fixtures designed for incandescent bulbs and use about 75% less energy. CFLs are most cost-effective and efficient in areas where lights are on for long periods of time.

**Table 4: Indoor Lighting (LED Lights (9W/18W/20W)) in the Henry Baker College campus**

Location	Use	Construction type	Windows	No of Lights	No. of lights not in use	Units used/Day (kWh)	Units used/Week (kWh)	Units used/Year (kWh)	Hours of use per week
<b>PHYSICS DEPARTMENT</b>	Class Rooms, Staff Rooms Mechanical & Electronics lab, Verandha	Concrete	17	2	0	0.0514	0.198	10.494	11
<b>MIDDLE BUILDING</b>	Staffroom, Verandha, Heritage Museum	Clay Tile roof, Concrete walls	7	2	0	0.0377	0.27	14.31	20
<b>ADMINISTRATIVE BUILDING</b>	Office, Principal's Room, Leisure points, Classrooms	Concrete	19	13	0	0.3221	2.257	119.621	78
<b>COMMERCE BUILDING</b>	IQAC, Classrooms, Staffrooms, Verandha,	Concrete	20	5	0	0.0617	0.432	22.896	21
<b>SELF- FINANCING</b>	Classroom, Staffroom, Corridor, Parlour, Lab	Concrete and Aluminium Roofing	1	12	0	0.1648	1.154	61.162	34
<b>LIBRARY</b>	Classrooms, Library, Language Room, Seminar Hall	Concrete	63	11	0	0.0917	0.642	34.026	18
<b>INDOOR STADIUM</b>	-	-	-	2	0	0.0142	0.1	5.3	0.5
<b>AUDITORIUM</b>	Meetings	-	-	8	0	0.1028	0.72	38.16	5
<b>CANTEEN</b>	-	-	-	6	0	0	0	0	0
<b>TOTAL</b>				<b>61</b>	<b>6</b>	<b>0.8464</b>	<b>5.773</b>	<b>305.97</b>	<b>187.5</b>

Inside the campus 61 LED Lights are used for indoor lighting and among them 6 LED lights in the canteen are not in use. LED lights are used for 187.5 hours in a week. Administrative building has the highest number of LED Lights, 13 nos. The least number of LED lights in at the Physics Department, Middle Building and Indoor Stadium, all of the three sites has 2 light each. On a weekly basis LED lights are used for 78 hours in the Administrative building and which is the highest weekly usage and least at Indoor stadium (0.5 hours). The yearly energy consumption of LED light is 305.97 kWh.

**Table 5: Indoor Lighting (Other Lights (35W/60W/100W)) in the Henry Baker College campus**

Location	Use	Construction type	Windows	No of Lights	o. of lights not in use	Units used/Day (kWh)	Units used/Week (kWh)	Units used/Year (kWh)	Hours of use per week
<b>PHYSICS DEPARTMENT</b>	Class Rooms, Staff Rooms Mechanical & Electronics lab, Verandha	Concrete	17	4	0	0.1457	1.02	54.06	12.5
<b>MIDDLE BUILDING</b>	Staffroom, Verandha, Heritage Museum	Clay Tile roof, Concrete walls	7	5	5	0	0	0	0
<b>ADMINISTRATIVE BUILDING</b>	Office, Principal's Room, Leisure points, Classrooms	Concrete	19	4	0	0.48	3.36	178.08	30
<b>COMMERCE BUILDING</b>	IQAC, Classrooms, Staffrooms, Verandha,	Concrete	20	0	0	0	0	0	0
<b>SELF- FINANCING</b>	Classroom, Staffroom, Corridor, Parlour, Lab	Concrete and Aluminium Roofing	1	1	0	0.0085	0.06	3.18	60
<b>LIBRARY</b>	Classrooms, Library, Language Room, Seminar Hall	Concrete	63	0	0	0	0	0	0
<b>INDOOR STADIUM</b>	-	-	-	0	0	0	0	0	0
<b>AUDITORIUM</b>	Meetings	-	-	0	0	0	0	0	0
<b>CANTEEN</b>	-	-	-	0	0	0	0	0	0
<b>TOTAL</b>				<b>14</b>	<b>5</b>	<b>0.6342</b>	<b>4.44</b>	<b>235.32</b>	<b>102.5</b>

There are lights like Incandescent lights, sodium vapour lamps, mercury vapour lamps, spot lights, T-bulb used for indoor lighting rather than Fluorescent , CFL and LED lights. There are 14 numbers of lights were in the campus for indoor lighting. On a weekly basis they are used for 102.5 hours and yearly they consume a total of 235.32 kWh of energy. Among the 14 light 5 are not in uses at the Middle building. The highest number of other types of light is at Middle building, followed by Physics Department and Administrative Building. Among the 9 blocks of study only 4 blocks has other forms of light. On a yearly basis the energy consumption is 235.32 kWh.

Among the 4 forms of indoor lighting at Henry Baker College, the higher yearly energy consumption is by Fluorescent lights followed by LED Lights, Other lights and least by CFL lights. Lights like incandescent lights only uses 10% of their energy for lighting and the rest is lost in the form of heat. In the case of fluorescent lights about 80% of the energy is converted to light and LEDs use electricity more effectively than any other types of lights, they convert 90% of energy to light and they requires much less energy to produce the same amount of light as incandescent or fluorescent lights.

**Table 6: Electrical gadgets and their energy use in the Henry Baker College**

Location no	Type	Equipment	No.& Power rating(W)	Average hourly use/week	Units used/day	Units used/week	Units used/year
L1	Physics Department	1. Ceiling Fan	11 x55	70	0.943	6.6	349.8
		2.Computer	7 x 100	1.5	0.0642	0.45	23.85
		3.Inverter	1x1600	8	1.8285	12.8	678.4
		4.PlugPoint & Power Plug	75 x-	-	-	-	-
		5.Projector	1x190	-	-	-	-
L2	Middle Building	1.Cooler	1 x 300	15	0.6428	4.5	238.5
		2.Computer	1 x 100	5	0.0714	0.5	26.5
		3.Fan	5 x 60 & 55	10	0.3428	2.4	127.2
		4.Plug Point	2 x -	-	-	-	-
		5.Printer	1 x 259	0.5	0.0185	0.1295	6.8635
L3	Administrative Building	1. A/C	1 x 1000	-	-	-	-
		2.Amplifier	1 x 250	1	0.0357	0.25	13.25
		3.Cooler	1X40	10	0.0571	0.4	21.2
		4.Computer	17 x 100	59.5	3.3928	23.75	1258.75
		5.DVR	1 x 30	40	0.1714	1.2	63.6

L4	Commerce Building	6.Fan	13 x 55, 5x 60, 5x50 1x80	69.5	1.7021	11.915	631.495
		7.Inverter	2x1600 1x2400	6	1.6	11.2	593.6
		8.LED TV	1X135	36	0.6942	4.86	257.58
		9.Modem	1x20	15	0.0428	0.3	15.9
		10.PlugPoint & Power Plug	43 x -	-	-	-	-
		11. Printer	1x12 1x58 1x230 2x250 1x1200 1x2400	120	11.3662	79.564	4216.892
		12. Stabilizer	1x50	40	0.2857	2	106
		1.Computer	3x100	3.5	0.0928	0.65	34.45
		2.Fan	11x55	58	0.7307	5.115	271.095
		3.Inverter	1x1200	5	0.8571	6	318
		4.Plug Point	8 x -	-	-	-	-
		5.Printer	1x50 1x250	2.5	0.0321	0.225	11.925
6.Projector	1x218	1	0.0311	0.218	11.554		
7.UPS	1X800	1	0.1142	0.8	42.4		
8.Cooler	1x300	10	0.4285	3	159		
L5	Self-financing Building	1.A/C	2X1000	0.5	0.1428	1	53
		2. Cooler	1x300	10	0.4285	3	159
		3. Computer	32x100	4	1.3428	9.4	498.2
		4.Fan	6x55 13x60	71	1.7728	12.41	657.73
		5.Exhaust Fan	2x70	35	0.35	2.45	129.85
		6.Inverter	2x4000	5	5.7142	40	2120
		7.LED TV	1X50	0.5	0.0035	0.025	1.325

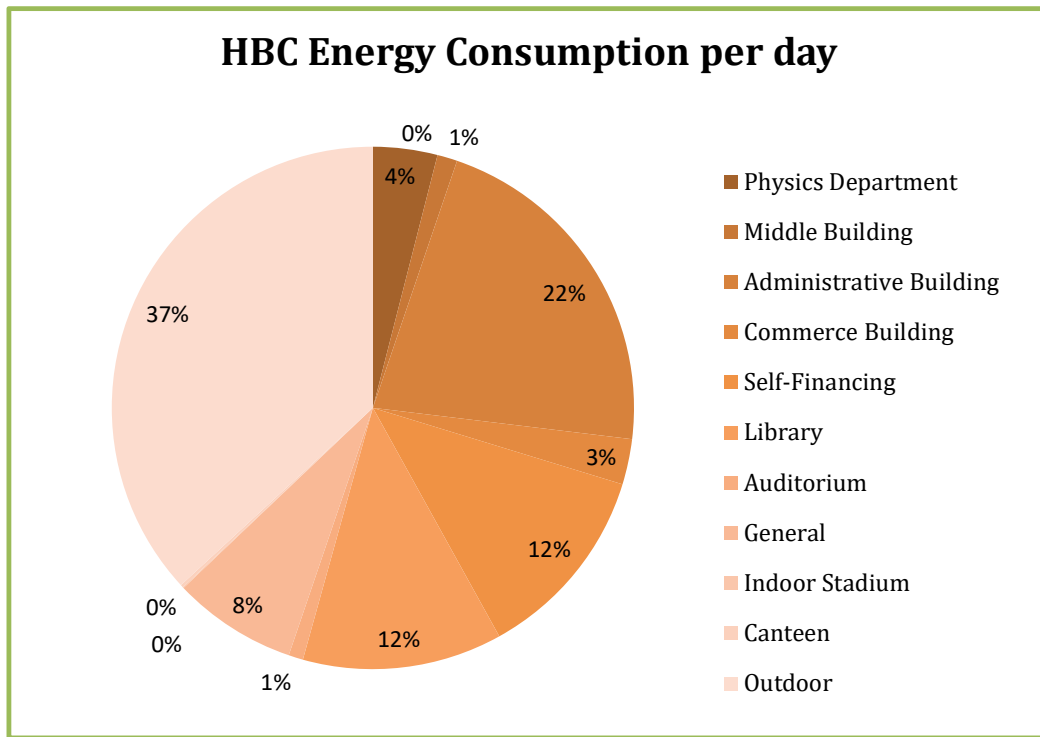
L6	Library	8. Mini CPU	1X18	0.5	0.0012	0.009	0.477
		9. PlugPoint & Power Plug	66 x -	-	-	-	-
		10. Printer	1x1200 1x16	0.10	0.0868	0.608	32.224
		11. Projector	1x218	1	0.0311	0.218	11.554
		12. Stabilizer	3x50	0.5	0.0107	0.075	3.975
		1. Amplifier	1x250	5	0.1785	1.25	66.25
		2. Cooler	1x300	10	0.4285	3	159
		3. Computer	5x100	40	1	7	371
		4. Fan	27x55 31x60	175.5	6.44	45.08	2389.24
		5. Inverter	1x1600	2	0.4571	3.2	169.6
		6. Mini CPU	2X18	-	-	-	-
		7. Modem	1x20	30	0.0857	0.6	31.8
		8. PlugPoint & Power Plug	63 x -	-	-	-	-
		9. Printer	1x-	10	-	-	-
		10. Projector	3x218	45	1.4014	9.81	519.93
		11. Speaker	2x150	5	0.2142	1.5	79.5
12. UPS	1X800	2	0.2285	1.6	84.8		
L7	Auditorium	1. Plug Point	11x-	-	-	-	
		2. Speaker	2x50	5	0.0714	0.5	26.5
		3. Printer	1x240v	1hr	0.17	1.22	68.4
		4. Ceiling fan	10x100w	7hr	5.09	35.63	1995
L8	General	1. Motor	1x1100	5	0.7857	5.5	291.5
		2. CCTV	25x15	120	6.4285	45	2385
		3. Speaker	6x10	1	0.0085	0.06	3.18
L9	Indoor Stadium	1. PlugPoint & Power Plug	6 x -	-	-	-	
L10	Canteen	1. PlugPoint & Power Plug	6 x -	-	-	-	
		2. Fridge	1x100	1	0.0142	0.1	5.3
		3. Fan	4x55	5	0.1571	1.1	58.3
				<b>Total Units Used</b>	<b>93.8508</b>	<b>655.278</b>	<b>23229.7351</b>



There are a total of 806 electrical gadgets listed in the auditing of Henry Baker College during the energy audit from the 9 study areas. Among the 806, the highest number is found at the Library (196 nos.) followed by self-financing (164 nos.). A total of 23229.7351 units are used annually in the Campus by various equipments.

**Table 7: Location wise Energy usage in the Henry Baker College Campus**

Location	No. Of equipment	Energy consumption per day (kWh)	Energy consumption per week(kWh)	Energy consumption per year (kWh)
Physics Department	133	3.7486	26.2405	1390.7476
Middle Building	18	1.1713	8.1995	434.5735
Administrative Building	130	20.328	142.296	7541.688
Commerce Building	45	2.644	18.508	980.924
Self-Financing	164	11.4698	80.289	4255.317
Library	196	11.6107	81.275	4307.575
Auditorium	42	0.8385	5.87	311.11
General	32	7.2228	50.56	2679.68
Indoor Stadium	19	0.0457	0.32	16.96
Canteen	17	0.1714	1.2	63.6
Outdoor	10	34.6	240.52	1247.56
<b>TOTAL</b>	<b>806</b>	<b>93.8508</b>	<b>655.278</b>	<b>23229.7351</b>



**Graph 2.Per Day Energy Consumption at Henry Baker College**

On a daily basis the highest amount of energy is utilised in the Outdoor area (Fig. 2). It is followed by Administrative building. The least amount of energy is used at Indoor Stadium and Canteen. A total of 1247.56 units per year is the usage of electricity in outdoor region. The daily use of electricity in the college accounts for 93.85 units and yearly it reaches up to 23229.73 units of electricity (Table 7). As a whole there are 92 fluorescent lights, 61 LED lights, 26 CFL lights and 14 other lights in the camps. Daily a total of 39.178 units of electricity are used in the Campus for lighting purpose alone.

## 4.6. CONCLUSION AND RECOMMENDATIONS

The energy audit of the Henry Baker College revealed that the highest energy use in the college is in the Outdoor area, followed by administrative buildings and least in indoor stadium and canteen. LED lights accounts for the energy usage in the outdoor region. These are essential lights that should be lighted throughout the night every day. The outdoor energy use can be significantly reduced by using solar lamps in all such areas.

The indoor lighting is dominated by fluorescent lights and LEDs. It is high time to replace all tube lights with LED lamps.

In the case of equipment and instruments the usage pattern should be checked. The energy ratings of the equipment also should be rechecked and ECM elements should be included in future purchases.

The data on unnecessary or careless usage of equipment or lights is not available. An energy conservation education campaign should be conducted in the college covering all staffs, students and teachers.

A second round of energy audit should be conducted after the implementation of suggested conservation measures. This will transform the Henry Baker College campus into a true Green campus.

- Replacing the tubelights, incandescent and CFLs with LED light fittings can cut short the level of energy consumption to a great extends.
- Use Solar Energy wherever possible to cut short the usage of electricity which is a non-renewable resource.
- Replace old machines with new ones
- Make a regular check on the gadgets to improve its efficiency
- Recycle the used CFLS and fluorescents and other lights to avoid hazardous environmental effects caused by Mercury.
- Make sure to turn off the appliances and other gadgets after their use
- Increase tree cover and avoid asbestos or other such roofing to reduce the heat, which in turn reduce the dependency over ceiling fans, Air conditioners, etc.

- Use smart power strips. “Phantom loads,” or the electricity used by electronics when they are turned off or in standby mode, are a major source of energy waste. Smart power strips/ advanced power strips, eliminate the problem of phantom loads by shutting off the power to electronics when they are not in use. Smart power strips can be set to turn off at an assigned time, during a period of inactivity, through remote switches, or based on the status of a “master” device.
- Purchase energy efficient appliances and that should be done on the basis of its Energy Star label.
- Shade the windows, which in Summer days help to keep the heat out
- Place awareness boards and instructions for energy conservation measures in every user point (eg., Switch off lights, fan etc. while you leave the room).

## 5. WATER AUDIT

### 5.1. INTRODUCTION

Water audits provide an enjoyable educational way for students to examine the ways that they use water every day, and to encourage classmates, teachers and college administrators to make their college more water-efficient and cost-effective. By completing the project, students and college staff learnt about the amount of water that is consumed in the college for activities including washing hands, drinking, in the laboratories, watering landscaped areas and flushing toilets and urinals. From the results obtained, students and staffs will consider better ways to improve water conservation throughout the building and on college campus.

However, the investigators were unable to collect all the required data, as the college has not been working normally due to Covid-19 restrictions.

### 5.2. AIM

To find out the usage pattern and conservation of water in the Henry Baker College campus

### 5.3. OBJECTIVES

- To find out the pattern of water use in the Henry Baker College campus
- To find out the quantity of water wastage in the Henry Baker College campus
- To suggest remedial measures and water conservation practices

### 5.4. METHODOLOGY

After getting orientation about Green audit, students were divided into groups and conducted mock audit. For the study, the students were further divided into several groups and assigned different areas of the campus for auditing. The data was tabulated and analyzed.

## 5.5. RESULTS AND OBSERVATIONS

The data on water usage pattern of the Henry Baker College campus was estimated through a systematic and time-bound survey. The total water usage data is given in Table 8. The highest quantity of per day water usage was observed in kitchen followed by utility taps (Graph. 3). Interestingly, the average time of water outlet use is more in the kitchens followed by irrigation taps. The total daily usage of water is found as 807 litres (Table. 8).

The total capacity of water tank in the college is 3500 litres. The loss of water through leakage in the campus is also estimated. A total of two taps were leaking and average loss of water due to the leakage is 4 litres per day (Table 10).

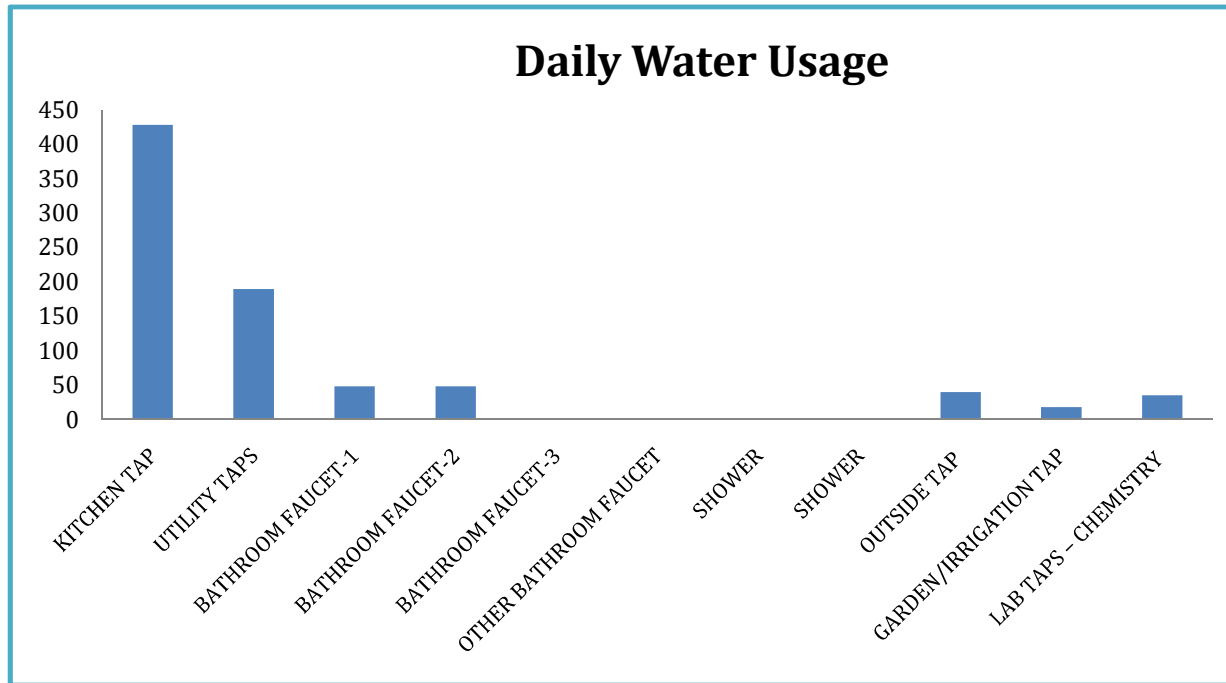
The amount spent for electricity that used for pumping motors and pumps were also estimated. It was found that on an average Rs. 4000 is the monthly expense.

**Table 8: Total water usage of Henry Baker College Campus**

<b>MEASUREMENT OF WATER USE (per day)</b>							
<b>SL. NO</b>	<b>FIXTURES</b>	<b>RATE OF DISCHARGE (litre/min)</b>	<b>DURATION OF USE (minutes)</b>	<b>AVERAGE QUANTITY PER USE (litre)</b>	<b>NO. OF USES</b>	<b>TOTAL DAILY USES (in litres)</b>	<b>PER CAPITA DAILY USE (in litres)</b>
1	Kitchen Tap	9.5	1	9.5	45	428	-
2	Utility Taps	9.5	1	9.5	20	190	-
3	Bathroom Faucet-1	8	2	16	3	48	-
4	Bathroom Faucet-2	8	2	16	3	48	-
5	Bathroom Faucet-3	0	0	0	0	0	0
6	Other Bathroom Faucet	8	2				-
7	SHOWER-1	0	0	0	0	0	0
8	SHOWER-2	0	0	0	0	0	0
9	Outside Tap (21 Nos.)	3.5	3	4	10	40	-
10	Garden / Irrigation Points	9	60	9	2	18	-
11	Chemistry Lab Taps	9.5	5	1	35	35	-
<b>TOTAL</b>			<b>76</b>	<b>65</b>	<b>118</b>	<b>807</b>	<b>-</b>

**Notes:**

- No. of uses - 550 persons 2 times a day.
- Total daily use - 807
- Utility tap - No. of uses - 20
- Capacity of water tank - 3500
- Frequency of filling tanks in a day - 2
- No. of leaking taps - 2
- Water loss from leaking taps/ day - 2L



**Graph 3: Comparison on total daily usage of water at various outlets in the college**



**Table 9: Consumption of Water in the college**

<b>Particulars</b>	<b>Quantity of water (in litres)</b>
Total daily use of water	807
Per capita daily use of water	-

**Table 10: Total loss of water per day due to leaking taps**

<b>Item</b>	<b>Quantity</b>
No. of leaking taps	2 taps
Quantity of water loss per day through leaking taps	2 litres/day
Total loss per day	4 litres/day

## 5.6. CONCLUSIONS & RECOMMENDATIONS

The water audit is an effective method to assess the water usage pattern and estimate the quantity the used in the college. Besides, it provides scientific measures to improve the water conservation preventing the water loss and lazy usage habits.

The water audit conducted in the Henry Baker College campus revealed that the water usage pattern in the college is moderate and there is very little loss of water taking place in the college due to leaking or bad infrastructure.

The highest use of water is in kitchen. Hence, proper water conservation measures should be implemented in the kitchen. The per capita use of water was not estimated.

- The leakages need to be repaired.
- The students and other staff should get regular vigil on water usage and methods such as generating awareness of water conservation through banners and posters.
- Need for regular discussions among the group members for bringing new methods and ways for conserving water in and around the campus.
- Install flow restrictors to cut down the water flow
- Turn off the taps and other water sources after use
- Checks faucets and pipes for any leakages (should do a regular examination of the same)
- Plant native trees and plants in the campus, because it adapts to the climate and other water usage which reduce the usage of water in the gardens
- Put a layer of mulch around the plants and trees in order to maintain a cool atmosphere in the soil and which helps to store water and also mulch lowers evaporation
- Install dual flush tank to reduce the usage of water

## 6. BIODIVERSITY AUDIT

The biodiversity audit is conducted to analyze the present biodiversity status of the college and to propose plans to enhance the existing biodiversity. Following the audit, students have identified the floral and faunal diversity at the college surroundings through transect and quadrant methods. It provides students with hands on experience outside the classroom; their observational and identification skills will be improved identifying different flora and fauna. The random number of observation walks conducted during the last couple of months enabled the student community classify the rich biodiversity around them that provides the right ambience to pursue higher learning.

The results indicate presence of higher floral diversity against limited space availability. However, the faunal diversity is moderate. A planned greening programme will make the campus richer including more native organisms.

### 6.1. AIM

To conduct a biodiversity audit of the Henry Baker College campus and propose areas of improvement

### 6.2. OBJECTIVES

- To identify the floral and faunal diversity of the college campus
- To impart scientific temperament and culture among the students through participatory research methods
- To propose suggestions to enhance biodiversity of the college campus

### 6.3. METHODOLOGY

A baseline survey of flora and fauna at the college campus was conducted. The total area of the college campus was divided into 7 plots. Areas of survey are as follows:

1. Parking and the front yard of self-financing block.
2. Ground
3. Front yard of the indoor stadium and the surroundings of physics block.
4. Kirby garden and the centre courtyard
5. Area between the auditorium and the main block.
6. Backyard of the main block
7. Front yard of the main block and the butterfly garden

## 6.4. RESULTS & DISCUSSION

A group of students were assigned with the audit and specific areas were surveyed them and the flora, fauna, butterflies, odonates of the campus were identified. The data was recorded in tabular sheets :

**Table 11. Floral Diversity of Henry Baker College Campus**

Sl. No.	Scientific name	Malayalam Name	English Name	No.
<b>TREES</b>				
1.	<i>Artocarpus heterophyllus</i>	പ്ലാവ്	Jackfruit Tree	3
2.	<i>Mangifera indica</i>	മാവ്	Mango	4
3.	<i>Saraca asoca</i>	അശോകം	Ashoka Tree	2
4.	<i>Mimuspos elengi</i>	ഇലഞ്ഞി	Bullet Wood	3
5.	<i>Spathodeacam panulata</i>	തണ്ണീർക്കൈമരം	African Tulip	2
6.	<i>Tectona grandis</i>	തേക്ക്	Teak	7
7.	<i>Macaranga peltata</i>	വട്ട	Macaranga	5
8.	<i>Gmelina arborea</i>	കുമ്പിൾ	Beech wood	1
9.	<i>Cocos nucifera</i>	തെങ്ങ്	Coconut Tree	7
10.	<i>Artocarpus hirsutus</i>	ആഞ്ഞിലി	Wild Jack	7
11.	<i>Terminalia arjuna</i>	നീർമരുത്	Arjun Tree	5
12.	<i>Brasses flabelliform</i>	ചീണ്ടപ്പന	Toddy Palm	4
13.	<i>Delonixregia</i>	ഗുൽമോഹർ	Royal Princiana	3
14.	<i>Bauhinia variegata</i>	മന്ദാരം	Orchid Tree	4
15.	<i>Swietenia macrophylla</i>	മഹാഗണി	Mahagony	7
16.	<i>Morus alba</i>	മൾബെറി	White Mulberry	1
17.	<i>Annona muricata</i>	മുള്ളാത്ത	Soursop Tree	1
18.	<i>Cassia fistula</i>	കണിക്കൊന്ന	Golden Shower Tree	1
19.	<i>Psidium guajava</i>	പേര	Guava Tree	2
20.	<i>Terminalia bellirica</i>	താന്നി	Bellaric myrobalan	1
21.	<i>Syzygium cumini</i>	ഞാവൽ	Indian Blackberry	1
22.	<i>Simarouba glauca</i>	ലക്ഷ്മിതരു	Paradise Tree	1
23.	<i>Morinda citrifolia</i>	നോനി	Indian Mulberry	1
24.	<i>Nephelium lappaceum</i>	റംബൂട്ടാൻ	Rambutan	3
25.	<i>Terminalia catappa</i>	ബദാം	Almond Tree	1
26.	<i>Phyllanthus emblica</i>	നെല്ലി	Indian Goosberry	1
27.	<i>Peltophorum pterocarpum</i>	മഞ്ഞവാക	Copper Pod	2
28.	<i>Ficus benghalensis</i>	ആൽ	Banyan	1
29.	<i>Polyathia longifolia</i>	അരണമരം	False Ashoka	4
30.	<i>Casuarina equisetifolia</i>	ചൂള	Caturina	5
31.	<i>Albezia chinensis</i>	മൊട്ടുവാക	Sau Tree	1
32.	<i>Brideliaretusa</i>	മുള്ളുവേങ്ങ	Spinous Kino Tree	1

33.	<i>Chrysophyllum cainito</i>	സ്റ്റാർആപ്പിൾ	Star Apple	1
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MEDICINAL PLANTS				
34.	<i>Colocasia esculenta</i>	ശീമചേമ്പ്	Taro	
35.	<i>Curcuma angustifolia</i>	കുവ	Indian Arrow Root	
36.	<i>Sidar hombifolia</i>	കുറുനോട്ടി	Country Mallow	
37.	<i>Centella asiatica</i>	കുടങ്ങൽ	Indian Pennywort	
38.	<i>Hemidesmus indicus</i>	നറുനീണ്ടി	Indian Sarsaparilla	
39.	<i>Lantana camara</i>	കൊങ്ങിണി	Common Lantana	
40.	<i>Allamanda cathartica</i>	മഞ്ഞക്കോളാമ്പി	Golden Trumpet	
41.	<i>Hibiscus rosa-sinensis</i>	ചെമ്പരത്തി	Hibiscus	
42.	<i>Rosa spp.</i>	റോസ്	Garden Rose	
43.	<i>Musa paradisiaca</i>	വാഴ	Banana	
44.	<i>Carica papaya</i>	പപ്പായ	Papaya	
45.	<i>Tabernaemontana divaricate</i>	നന്യാർവട്ടം	Crepe Jasmine	
46.	<i>Syzygium myrtifolium</i>	ക്രിസ്റ്റിന	Christina Plant	

**Table 12. Faunal Diversity of Henry Baker College Campus**

Sl. No.	Scientific name	Malayalam name	English Name
1	<i>Corvus splendens</i>	പേനകാക്ക	House Crow
2	<i>Ixobrychus sinensis</i>	മഞ്ഞകൊച്ച	Yellow Bittern
3	<i>Dendrocitta vagabunda</i>	ഓലേഞ്ഞാലി	Rufous Treepie
4	<i>Pycnonotus cafer</i>	നാട്ടുബുൾബുൾ	Red Vented Bulbul
5	<i>Copsychus saularis</i>	മണ്ണാത്തിപ്പുള്ളി	Oriental Magpie Robin
6	<i>Dinopium benghalense</i>	നാട്ടുമരംകൊത്തി	Black Rumped Flameback
7	<i>Dicrurus paradiseus</i>	ഇരട്ടവാലൻ	Greater Racket Tailed Drongo
8	<i>Acridotheres tristis</i>	നാട്ടുമൈന	Common Myna
9	<i>Bubulcus ibis</i>	കരലാമി	Cattle Egret
10	<i>Halcyon smyrnensis</i>	മീൻകൊത്തിച്ചാത്തൻ	White Throated Kingfisher
11	<i>Turdoides striata</i>	കരിയിലക്കിളി	Jungle Babbler
12	<i>Centropus sinensis</i>	ഉപ്പൻ	Greater Coucal

**Table 13. Butterfly Diversity of Henry Baker College Campus**

Sl. No.	Scientific name	Malayalam name	English Name
1	<i>Parantica aglea</i>	നീലകുടവ	Glassy blue tiger
2	<i>Euploea core</i>	അരളിശലഭം	Common indian crow
3	<i>Danaus genutia</i>	വരയൻ കുടവ	Common tiger
4	<i>Ypthima huebneri</i>	നാല്ക്കണ്ണി	Common four-ring
5	<i>Parthenos Sylvania</i>	ക്ലിപ്പർശലഭം	The clipper
6	<i>Tirumala limniace</i>	നീലകുടവ	Blue tiger

7	<i>Ypthima baldus</i>	പഞ്ചനേത്രി	Common five-ring
8	<i>Junonia iphita</i>	കരിയിലശലഭം	Chocolate Pansy
9	<i>Cirrochroa thais</i>	മരോട്ടിശലഭം	Tamil Yeoman
10	<i>Tanaecia lepidea</i>	പേഴാളൻ	Grey Count
11	<i>Athyma perius</i>	സർജന്റ്	Common Sergeant
12	<i>Hypolimnas bolina</i>	വൻചൊട്ടശലഭം	Great Eggfly
13	<i>Junonia atlites</i>	വയൽക്കോത	Grey Pansy
14	<i>Mycalesis perseus</i>	തവിടൻ	Common Bushbrown
15	<i>Junonia lemonias</i>	പുള്ളികുറുമ്പൻ	Lemon Pansy
16	<i>Troides helena</i>	ശരൂഡശലഭം	Common Birdwing
17	<i>Papilio clytia</i>	വഴനപൂമ്പാറ്റ	Common Mime
18	<i>Papilio dravidarum</i>	മലബാർരാവൺ	Malabar Raven
19	<i>Papilio polytes</i>	നരകക്കാളി	Common Mormon
20	<i>Eurema hecabe</i>	മഞ്ഞപാപ്പത്തി	Common Grass Yellow
21	<i>Delias eucharis</i>	വിലാസിനി	Common Jezebel
22	<i>Catopsilia pyranthe</i>	തകരമുത്തി	Mottled Emigrant
23	<i>Borbocinnara</i>	സരസശലഭം	Rice Swift
24	<i>Saustus gremius</i>	പങ്കുറുമ്പൻ	Indian Palm Bob
25	<i>Luthrodes pandava</i>	നാട്ടുമാരൻ	Plains Cupid
26	<i>Castalius rosimon</i>	നാട്ടുകോമാളി	Common Pierrot

**Table 14. Odonate Diversity of Henry Baker College Campus**

Sl. No.	Scientific name	Malayalam name	English Name
1	<i>Orthetrum sabina</i>	പച്ച വ്യാളി	Green Marsh Hawk
2	<i>Neurothemis tullia</i>	സാമിത്തുമ്പി	Pied Paddy Skimmer
3	<i>Brachythemis contaminata</i>	ചങ്ങാതിത്തുമ്പി	Ditch Jewel
4	<i>Rhyothemis variegata</i>	ശലഭത്തുമ്പി	Common picture wing
5	<i>Ceriagrion cerinorubellum</i>	കനൽ വാലൻ ചതുപ്പൻ	Orange-tailed marsh DART
6	<i>Vestalis apicalis</i>	ചുറ്റിച്ചിറക്കൻ തണൽ തുമ്പി	Black-tipped forest glory

The above data shows the different species identified in the campus during the auditing. The Floral diversity of the campus is moderately good and 46 species of trees and medicinal plants were identified. Among the 46, are 33 are tree species and rest are medicinal plants. Trees like Teak, Coconut Tree, Wild Jack, Mahogany are more in numbers. There are 15 and 8 exotic species of trees and medicinal plants in the campus. The faunal and odonate diversity in the campus is comparatively less with a number 12 and 6 species respectively in both categories. Butterfly shows a good number in the campus with 26

species identified. A planned effort to make green the nook and corners of the campus will definitely improve the diversity at all levels.

**Table 15. Simpson’s Index of Diversity of Henry Baker College**

Sl. No.	Community	Simpson’s Index (D)	Simpson’s Index of diversity(1-D)
1	Trees and Plants	0.3443	0.6557
2	Butterflies	0.0443	0.9557
3	Odonates	0.1563	0.8437
4	Birds	0.1698	0.8302

From the auditing data Simpson’s index was calculated and which is given in the above table. Simpson’s Index of Diversity (1-D) measures the diversity in a community. The value of the index ranges between 0 and 1, the greater the value, the greater the sample diversity. From the table it is clear the diversity of butterflies is high followed by odonates, birds and trees respectively.

**Table 16. Margalef Richness Index of Henry Baker College**

Sl. No.	Community	Margalef Richness Index(R)
1	Trees and Plants	0.4286
2	Butterflies	0.2336
3	Odonates	0.2333
4	Birds	0.193

Species richness expresses the number of different species. Here we calculated the richness using the Margalef’s Diversity Index, which is a species richness index. The auditing shows high evenness in the case of trees in the campus followed by butterflies, odonates and birds. The more the number of species present in the area, the ‘richer’ the area is.



## 6.5. CONCLUSIONS AND RECOMMENDATIONS

The biodiversity audit was completed partially and the data collection was not done systematically as it facilitates calculation of biodiversity indices. Being students, there are limitations to identify plants and animals during a short span of study period. Besides the estimation techniques are not employed scientifically. However, a basic understanding on the biodiversity of the Henry Baker College campus obtained through this survey. More systematic survey including few experts should be conducted in the next phase.

- By creating thematic gardens (like butterfly garden, star garden, medicinal garden, fruit tree garden, etc.) the green areas of the campus could be converted into an aesthetic as well as educational hub of the college.
- Plant more native trees in order to increase the floral as well as faunal diversity. Henry Baker College is located in high altitude area and part of Western Ghats ecosystem; hence restoration of typical high altitude plants should be of high priority. College campus can be transformed as a repository of local biodiversity (live museum).
- Planting nectarine plants will attract more butterflies and other bees which feed on these nectars and increase the biodiversity and improves pollination
- Presence of exotic species negatively affects the growth of native flora and fauna which in turn imbalances the ecosystem. So plant native trees and remove and destroy the native trees in order to decrease its spread and to improve the biodiversity.
- As a general rule, increasing biodiversity can be achieved by diversifying the range of habitat or vegetation structures available at the campus.
- Planting native trees helps them to naturally fight off pests and diseases and they require fewer resources and maintenance for growth
- Composting methods reduce the overall organic waste and thereby land filling space and it provides a natural nutrient rich fertilizer

- Place name boards to every tree and plants in the campus, showing common and scientific names, importance etc. Also place boards showing biodiversity of the campus at various localities

## 7. WASTE AUDIT

A waste audit is a process used to calculate the type and amount of waste generated by an organization. Any size organization can perform this type of audit. The data collected from the audit will identify the type of waste produced by the organization and how the organization manages this waste. The audit can also make the organization more effective at reducing waste management costs by educating staff about proper waste disposal and making better use of natural resources. When performing a waste audit, the organization should not inform staff about the audit prior to the completion of the audit. Informing staff in advance can alter waste disposal habits resulting in an inaccurate and counterproductive audit.

### 7.1. AIM

To conduct a biodiversity audit of the Henry Baker College campus and propose areas of improvement

### 7.2. OBJECTIVES

- To identify the waste category of the college campus
- To identify the various disposal methods adopted inside the campus
- To propose suggestions to enhance waste disposal of the college campus

### 7.3 METHODOLOGY

A baseline survey of the waste generated inside the campus was estimated by survey. Students were divided into separate groups for assessing the same using a questionnaire survey method. The amount of waste generated including paper waste, plastic waste, e-waste, biowaste and other waste (construction and demolition waste, clothes, sandals, etc) were estimated. The data was recorded in tabular sheets.

## 7.4 RESULTS AND OBSERVATION

**Table 17. Waste Auditing of Henry Baker College**

**WASTE AUDITING OF HENRY BAKER COLLEGE**

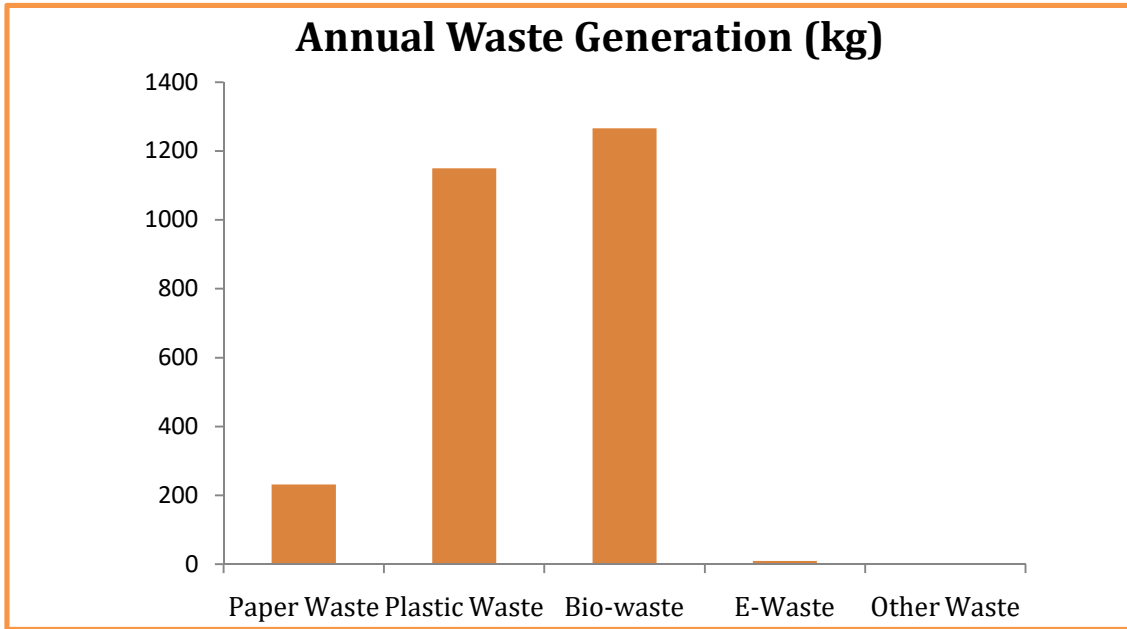
Sl.No.	Location	Waste Type					
		Paper Waste (Carton ,Paper coverlet) in grams per week	Plastic (cover, packing, others)in grams (per day)	Biowaste (sweeping, food waste, crop waste) in grams per day)	Amount of weekly waste generated (in kg) (Plastic, Paper, Bio- waste)	E-Waste (CD, Printer, Computer, etc) in grams per year	Other waste(Construction and demolition waste,sandals,clothes etc.) in grams/number(per year)
1	<b>College Campus</b>	148.7	394.89	209.43	8.4759	2097.06	890.56
2	<b>Office</b>	2600	680.9	109	148.2	4500	870.5
3	<b>Canteen</b>	219.4	987.6	1610	12.5058	213.65	435.87
4	<b>Hostel</b>	1000	908.12	809.4	57	1500	615.39
5	<b>Others</b>	397.4	127.98	675.65	22.6518	567.6	349.5
	<b>Total</b>	<b>4365.5</b>	<b>3099.49</b>	<b>3413.48</b>	<b>248.335</b>	<b>8878.31</b>	<b>3161.82</b>

The major portion of weekly waste comes from office followed by hostel. When we consider on a weekly basis, the major area where paper waste is generated is at the office followed by hostel. But in the case of plastic waste the more is generated at the canteen followed by hostel and in the case of bio-waste the major source is hostel. The major portion of waste like paper, plastic and bio-waste comes from office (148kg) followed by hostel (57kg).

**Table 18: Amount of different waste generated (Annual) at Henry Baker College campus**

<b>Waste Types</b>	<b>Quantity in kg</b>	<b>Percentage</b>
<b>Bio-waste</b>	1266.401	47.61400055
<b>Plastic Waste</b>	1149.911	43.2342228
<b>Paper Waste</b>	231.372	8.699098102
<b>E-Waste</b>	8.878	0.333794033
<b>Other Waste</b>	3.162	0.118884516
<b>TOTAL</b>	<b>2659.724</b>	

E-waste and other waste were audited on an annual basis and in that e-waste accounts the lions' share, which means 8kg/year and other waste like Construction and demolition waste, sandals, clothes etc, account 3kg/year.



**Graph 4: Amount of different waste generated (Annual) at Henry Baker College campus**

The major form of waste generated inside the campus is the bio-waste, which accounts for 47% of the waste generated in the campus and that is followed by Plastic waste, which accounts for 43% of the waste generated in the campus annually. From the study it is found that the amount of plastic waste generated inside the campus is comparatively higher than paper waste, which shows an increased need for changing the usage pattern in different areas. As per the auditing data bio-waste generated in the campus is collected by outside agents/ persons and e-waste and paper, carton, plastic waste are also selling.

## 7.5 CONCLUSION & RECOMMENDATIONS

The greatest source of waste generated in the campus is the bio-waste, so proper management measures should be taken to dispose or compost to the waste into useful other products, like biogas, fertilizer, etc. Recycled paper should be used in the campus. Plastic waste comes after bio-waste and it should be minimised in greater amount in order to follow an eco-friendly green campus.

- Use of recycled paper will reduce the dependency over the normal paper
- Instead of giving the bio-waste for outside agents composting can be done inside the campus. Composting is a simple as well as effortless way of recycling organic waste. The biodegradable waste will be degraded by microorganisms and that can be used as good manure for trees as well as vegetable garden.
- Follow the principle of 3R's viz: Reduce, Recycle and Reuse
- Hazardous waste should be treated properly to avoid environmental and health issues
- Encourage students in recycling waste into usable products.
- Avoid the use of single-use plastics, and other items.
- Replace disposable with reusable items; ban all disposables in the campus.
- Installing a biogas plant will help to reduce the biowaste (including food waste, toilet waste, etc) and the gas generated can be used in labs, kitchens, etc.
- Thumboormuzhi composting model, Deenabandhu bio-gas unit, etc are good examples to convert waste-to-energy
- Encourage parents to make a green lifestyle at their homes through students

## 8. CONCLUSION

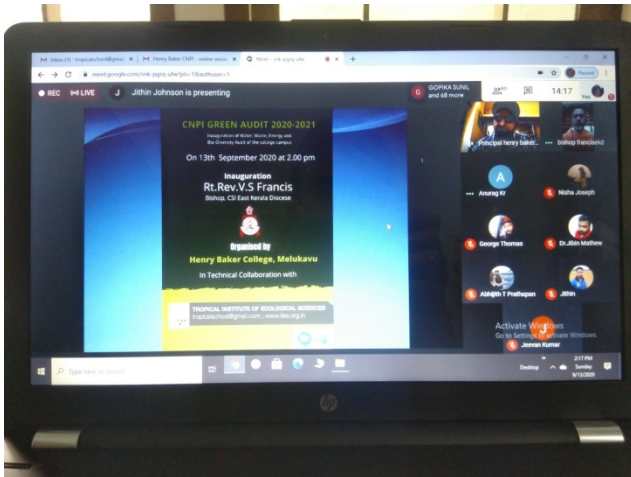
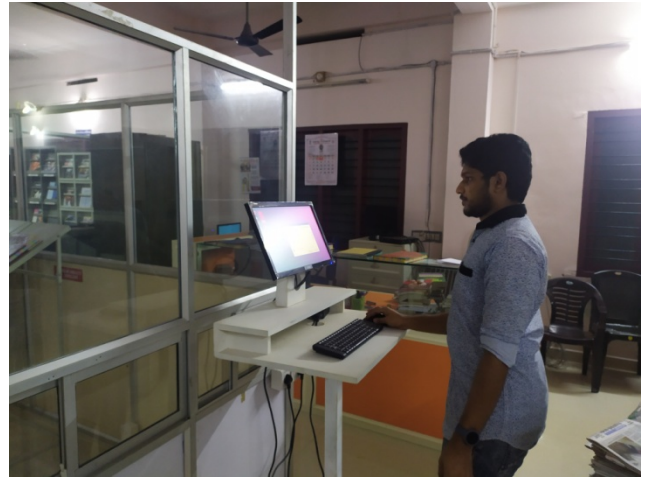
Green audit in the Henry Baker College was conducted as a tool to enhance its sustainable development by adopting necessary management and conservation strategies. By analyzing the results of present state of the energy, water and biodiversity audit, suggestions and recommendations are provided to reduce their anti-environmental activities, to adopt energy and water conservation measures, and strategies to improve the biodiversity of the campus.

The green auditing conducted from June 2020 to November 2020 was the first auditing performed in the Henry Baker College. The pioneering green audit in the college is successfully completed. The inputs collected during the study can be used in further research activities. The auditing was done by a total of 45 students from the college, who were divided in to 3 groups.

After the initial study, TIES suggests that similar green auditing programmes should be conducted every year for the improvement of overall environmental performance of the college. Gradually, sustainable resource utilization can be achieved within a period of 4 years.



## Annexure-1 Green Auditing at Henry Baker College, Melukavu







***HENRY BAKER COLLEGE, MELUKAVU***

*In Collaboration with:*



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