St. Mary's College Thrissur

Green Audit Report 2018-19





Natures Green Guardians Foundation

St. MARY's COLLEGE THRISSUR



Green Audit Report 2018-19



Preface

The students who are at present in schools and colleges are to be the enlightened leaders of immediate tomorrow. India's educational authorities, as in most developed countries, therefore insist that every student in our country should learn why damages to the environment occur and also how such situations could be averted, emphasizing more on possible remedies. This green education, no doubt, should start from schools and colleges, and the insistence on annual Green Audit of higher education institutions is to make students and staff well informed of the magnitude of one's own ecological footprints, as well as on which areas one should concentrate to make his or her environs greener than before.

The 2018-19 Green Audit Report of St. Mary's College, Thrissur, is prepared in such a manner that it can educate every stakeholder of the institution, on the major contributors tending to destroy, and on every step helpful to restore, leading to further flourishing of its green status. A brief presentation of the contents of this report at the beginning of the next academic year by the teachers to the other stakeholders would help in getting every one of them to start taking further steps to achieve a 'brighter shade of green' for their beloved campus and the region.

Green Auditing Team (2018-'19) of St. Mary's College, Thrissur Rev. Sr. (Dr.) Magie Jose, Principal, St. Mary's College, Thrissur Rev. Sr. (Dr.) Meena K. Cheruvathur (Sr. Santra Therese), Vice Principal Prof. V. K. Damodaran, Chairman, NGGFn - Coordinator Dr. Julie P. Lasser, HOD (Economics) & IQAC Coordinator, St. Mary's College, Thrissur Er. Jayaraman C., Fulbright Fellow & Accredited Energy Auditor, NGGFn, Kochi Dr. (Mrs.) Girija S., Director, CHILD, Thripoonithura, Kochi, NGGFn Er. Madhu Krishnan K., CEO, Herbal Heritage Homes, Peermade/NGGFn Mr. Hari Prabhakaran, EMS Auditor ISO 14001 & Managing Director, NGGFn, Trivandrum Mrs. Ranjini Damodaran, Monitor (Gender issues), NGGFn, Trivandrum Dr. Rekha K., Assistant Professor, Dept. of Botany, St. Mary's College, Thrissur Dr. Dalie Dominic, Assistant Professor, Dept. of Zoology, St. Mary's College, Thrissur Dr. Regi Raphael, Assistant Professor, Dept. of Botany, St. Mary's College, Thrissur Sr. Jovit Maria, Assistant Professor, Dept. of Chemistry, St. Mary's College, Thrissur Sr. Anna Jorslin, Assistant Professor, Dept. of Social Work, St. Mary's College, Thrissur Ms. Aneega Jose, Assistant Professor, Dept. of Vocational Studies, St. Mary's College, Thrissur

St. Mary's College, Thrissur

(Established 1946)

College Crest and Motto



Motto:

Scientia Et Disciplina (Knowledge and Discipline)

1. The **Motto** stands for the twin aspects of personal growth and personality development of young Marians. It is not merely an intellectual, physical and cultural training, but the holistic development of the students.

Crest:

- 2. The **Carmelite Monogram** signifies the Religious Congregation by which the College is administered.
- 3. **AVM** (Ave Virgo Maria) i.e., **Hail Virgin Mary**, is to seek protection and patronage of the Blessed Virgin Mary.
- 4. The Book with the Greek Alphabets Alpha and Omega represents God the Almighty.
- 5. The Dove symbolises Holy Spirit without whom learning cannot bear lasting fruit.
- 6. The Royal Crown is in honour of the Blessed Virgin Mary.

St. Mary's College, Thrissur

[Established 1946]

Vision and Mission

Vision

Our Vision is the holistic development of young women through academic excellence, intellectual, moral and spir itual growth to equip them for service to society and mould them as responsible citizens.



Mission

We envisage to groom young women as agents of love, justice and peace through love of God, pursuit of knowledge, moral integrity and social responsibility.We dedicate ourselves to inculcate in young Marians deep-rooted commitment to society and build a society which promotes faith, religious harmony and national integration.

Layout of St. Mary's College, Thrissur



Floor Plans



Executive Summary

This Green Audit Report of the premises of St. Mary's College, Thrissur, presents the observations of expert multidisciplinary green audit team on the holistic green status of this esteemed higher education institution which has a history of over 72 years of excellence in training young women in the region to become responsible citizens. Established in 1946 and administered by the Congregation of the Mother of Carmel Sisters (CMC) of Nirmala Province in the Roman Catholic Church of Thrissur Archdiocese, with the paramount objective of empowering women through higher education, the college offers 14 three year undergraduate courses and 10 post graduate courses in Arts, Science and Commerce streams, as well as doctoral programme in Mathematics. Two Add-on Certificate courses and 27 Skill development certificate courses are also offered by the College. During the year under audit, 2007 women students received education from this college in their choice subjects.

The college is affiliated to the Calicut University, Kerala State; recognized by the University Grants Commission (UGC); accredited by National Assessment and Accreditation Council (NAAC) in 2004 at B+ level, and re-accredited in 2010 and 2015 with 'A' Grade. It has also achieved 55th rank among colleges in India based on performance (by NIRF, Govt. of India).

Green Auditing of a Higher Education Institution is mandatory as per Criterion VII (of the 7 criteria prescribed) under the 'Guidelines for Submission' of the mandatory annual Internal Quality Assurance Report (IQAR) by Accredited Institutions. While Financial Auditing, Environmental Auditing and Energy Auditing, as well as Performance Auditing are familiar to the general public, Green Auditing is a new practice to be followed by all stakeholders including students and the teaching staff. Green Auditing is not another name for ecological or environmental auditing - as many people think it is. One can speak of an educational campus as "green", only if the performance audit encompasses the following aspects: Use of Water, Energy, Renewables, etc. and the State of Health (of all), Environmental Quality, Transportation & Communication as well as assessment on Accessibility for differently-abled, Gender Justice and the Carbon Footprint it leaves through all activities over a period coming under these areas.

Green is a colour in Nature - a colour lying between blue and yellow in the visual spectrum. It is believed to symbolize freshness, fertility, growth and harmony. A world full of all living beings – human, animals, plants and insects as well as the myriads of microorganisms that are useful or harmful - that keeps life on this plant in balance. Peace is the picture one would love to visualize on hearing 'green'. Different countries and sections of people perceive different shades for the 'greenness' they want to achieve.

Students at all levels are part of the army of future citizens, who are required to nurture the world around them into the 'shade of green' that they need for themselves and their successors. The ills of the globe due to irresponsible actions by their parent generations are to adversely affect their lives and work, and therefore, they have the responsibility to undo what is undesirable and build on the green fortress the way they want to feel protected. Students have the ability to influence their family members, their neighbours, and the public at large - more effectively than anybody else in this world.

Kerala, endearingly called 'God's Own Country' by discerning tourists, has been having a troubled look after the 'century's great flood' shook its bones, muscles and nerves this academic year – in August 2018. Through the joint efforts of teachers and students, supported by studies of scientists and experts and also governmental policies, the way out has to be figured out, if our coming generations are to live without the fear on waking up the next morning – of facing a flash flood, abrupt landslide or furious coastal erosion. Such a dreaded situation is also new to the world. No text book or an acclaimed curriculum of studies can be expected to contain the nature of these problems or the potential solutions to them. That underlines the need for the present day students to learn new ways of analyzing these situations objectively. Green Audit is, luckily the way to grapple with such enacting, evolving and emerging scenarios and help the community around to go forward in their mission to better their wellbeing from what it was before.

Green Audit is also a useful tool for a college or a community to know how and where they are using the most of energy, water and other resources. The college can thus plan for the needed changes to ensure inevitable savings. It can also be used to improvise their waste minimization strategy. As environmental sustainability is becoming an increasingly important issue for the world, the role of higher educational institutions in helping to ensure environmental sustainability is more apparent. Over a period, the 'green culture' will have to become 'the norm' in the society.

The Green Audit process for the St. Mary's College, Thrissur during 2018- '19 involved the creation of a student volunteer corps, and an audit team with students, teachers, and a team of experts who have practiced greening for years (including certified and accredited energy and environmental auditors and ecological administrators)' through the Nature's Green Guardians Foundation (NGGFn).

The results showed that, through the deep commitment of students, teachers and management for maintaining a healthy environment in St. Mary's college, Thrissur, the carbon footprint in 2018-'19 is only at a very low level of less than 7% of the national average of 1.7 T CO2 eq of 2018 at 0.112 T CO2 eq. But, the main outcome of the audit is that it brought out the potential that exists for St. Mary's Thrissur to evolve into a 'carbon neutral campus', with affordable extension of its existing strategies. With this in view, a number of suggestions to achieve a higher level of green are suggested.

Prof. V K Damodaran Chairman, NGGFn Former (Founder) Director of S&T and Environment Department & Former (Founder) Director of Energy Management Centre-Kerala And Former Secretary to Govt. of Kerala (Ex-Officio) International Energy & Environment Expert/Ex-Consultant to UNIDO & UNEP Trivand rum, 695035 Dated: 30.06.2019

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St. Mary's Green Protocol

St. Mary's College is committed in its Waste Management Strategy to the 4R philosophy of: "REDUCE, REUSE, RECYCLE and REFUSE"

To make the campus GREEN, everyone in the College would follow a GREEN PROTOCOL (in line with the Kerala Government Green Protocol) in all their activities and on all festive occasions.

The Ten Commandments of St. Mary's Green Protocol are:

- Strive to maintain all departments and supporting facilities as 'Zero Waste Zones'
- **4** Students and Staff insist on the use of eco-friendly files and packaging
- 4 At events and functions, ensure that bouquets, gifts or mementos given are 'Green'
- **4** Reduce the use of paper and single use plastic to minimum
- Insist on the use of steel, glass, or porcelain cups & containers, in place of disposable paper or plastic ones

Encourage and facilitate Staff and Students to use eco-friendly, re-usable cloth carry bags in the campus and outside

Insist on immediate, 'at source' segregation of biodegradable and non-biodegradable wastes into a 4-bin routine for better management and safe disposal

Strive for optimal use of water, focused on harvesting, recycling and conservation of water resources

Insist on judicious and efficient use of all forms of energy and reducing the use of fossil fuels Insist on conducting Green Audit of every functional unit by students every year

Green Audit Certificate

Green Audit for the period July 2018 to June 2019 has been conducted for St. Mary's College, Thrissur, Kerala, in accordance with the International Standards for ISO 14000 family of standards set by ISO TC 207 and its Sub-committees, Bureau of Energy Efficiency Standards, and stipulations under the Energy Conservation Act 2003 of Government of India, and other relevant mandates for promotion of sustainable living and education in a healthy environment.

In our opinion, the Institution has presented true and up-to-date data on the various aspects of working of this education institution before the audit team, and appropriate audit procedures have been completed by the audit team for preparing this report. The assessments and recommendations are based on verified data presented before the team on the situation as they existed at the time of audit.

In order to meet the objectives of the audit, the methodology did combine physical inspection of the campus on several work days and holidays, with analytical reviews of relevant documents and activities, as well as interviews with the Principal, selected Staff and students of the College.

This audit is conducted to ensure that a Green Policy is followed and implemented in the campus across all academic and non-academic departments and the body of students undergoing studies in the College, so as to make all stakeholders aware of the need for individual efforts in perpetuating green living habits among the people of our country.

St. Mary's College, Thrissur Green Audit 2018-'19 has found that the institution's per capita carbon footprint for the year is only 0.112 ton of CO_2 equivalent, a level only one-fifteenth of the 2018 national per capita average (1.7 T), with potential to develop into a carbon neutral campus by adopting a dedicated Green Policy and having a commitment to continue its green practices with approved remediation practices in position.

NGEn

Prof. V K Damodaran, For NGGFn Audit Team, Dated 30 June 2019

I agree with the data presented in this report as true, and further express my willingness to implement the recommendations of this audit report after internal review, even if any or many of them are in excess of the relevant mandates.

Rev. Sr. (Dr.) Magie Jose, CMC Principal Date: [seal]

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Overall Objective	Main Objectives	Compliance Status
	1. Ensure that there is a competent Green Officer from an external agency, who will provide guidance on Environmental Impact Studies	Included
Ensure that a Green Policy is formulated, enforced and	2. Ensure that the Green Policy is reviewed annually, progress monitored and achievable and measurable targets set for the future course	Ensured
reviewed	3. Ensure that the Green Policy is enforced, regardless of whether it exceeds mandates of the law	Enforced
	4. Ensure that every member of staff and student community commits to the greening of the institution	Commitment ensured
	5. Ensure that Green Audit is conducted annually, and action taken on the basis of the report and recommendations given under them	Green Audit conducted and actions initiated on its recommendations

Green Audit Compliance Statement



Prof. V K Damodaran For NGGFn Audit Team 30 June 2019

Procedures and Priorities

St. Mary's College, recognized as the first 'First Grade College for Women' in Thrissur District, having established in 1946 underwent several transformations during its bid to expand its services for the holistic development of young women belonging to all communities through education, focusing from the beginning itself on core values such as Love of God, Academic Excellence, Moral Values, Women Empowerment, and Service to Society and Nation, with the latest added commitment on moulding young women as torch bearers of the emerging culture of 'Green Living'.

Administered by the Congregation of the Mother of Carmel Sisters (CMC) of Nirmala Province in the Roman Catholic Church of Thrissur Archdiocese, St. Mary's Thrissur was originally affiliated to Madras University and later, on States' Reorganization, got shifted as an affiliated college under the University of Calicut, while being situated in the heart of Thrissur city, the cultural capital of Kerala. In 1975, the Colleges under the CMC Management – St. Mary's College, Thrissur; Vimala College, Thrissur; Mercy College, Palakkad; and Carmel College, Mala were registered as a society, viz, "CMC Educational Society" under the Travancore Cochin Literary, Scientific and Charitable Societies' Registration Act (Act XII of 1955). Vimala College came into existence on extending the campus to Cheroor at the fringes of Thrissur city, and on bifurcation of St. Mary's college.

St. Mary's, as 1s true of all the four Colleges under CMC, is functioning quite successfully, and smoothly, maintaining a high level of academic and non-academic standards. National Assessment and Accreditation Council (NAAC), an autonomous body of the University Grants Commission (UGC), has in 2004 accredited St. Mary's College at the B+ level, and reaccredited in 2010 and 2015 with 'A' Grade. St. Mary's College, Thrissur has also achieved 55th rank among colleges in India based on performance (by NIRF, Govt. of India). Further, it has now 14 full-fledged vibrant departments offering 14 Under Graduate and 10 Post Graduate courses, along with Doctoral programme in Mathematics. In 2012, Dept. of Mathematics was recognized as a Research Centre by the University of Calicut.

Towards Detailed Green Auditing

With the above background and standing in the educational arena, for the Green Audit [for the year 2018-'19], the Faculty and the Management of St. Mary's College, Thrissur, decided to bring changes in the physical and educational environments of the institution - with the participation of students - in tune with the requirements of a reputed women's college, which is right in the middle of Thrissur municipal corporation area with its cultural heritage. Minimizing resources consumption and maximizing the performance efficiency in all sectors of activities of the campus were the ultimate broad objectives.

The Management believes that, through such an exercise, the enhancement of quality of education and the quality of life of students and their families can be sensed, if all stakeholders are able to ensure:

- Enhancement and coordination among various activities of the institution with careful ecological consideration and resources conservation in view;
- o Institutionalizing all such good practices, on being proven;
- o Driving a strong 'life cycle cost' basis for decision-making on institutional issues; and
- That all stakeholders including the students accept a dynamic system for such functional and lifestyle changes.

During the year under audit, the results of the 'needs identification' carried out during the previous year were discussed widely and arrived at the conclusion that improvements can be made through interventions in lighting and power, increased use of renewable energy, reduction in resources use, and in many other areas. Students, especially of Botany department, realized that there are areas in the campus, where they can collectively bring changes for raising the green status of the campus. The NGGFn (Nature's Green Guardians Foundation) and experts under its umbrella were contacted and requested to study these issues and conduct a Green Audit with a broader vision on building "Climate Change Impact Resiliency" in the wake of the devastating natural calamities and floods that gripped the State and the city in 2018.

The following Procedures and Priorities were decided in advance.

Procedures:

- 1) In the maintenance of biodiversity and green cover in the campus, though space constrained, St. Mary's will attempt to raise the diversity level. The greenery to be impactful in understanding Nature in a better way.
- 2) Apart from the efficient use of energy leading to substantial reduction in carbon footprint of the institution, renewable energy integration will be attempted to the extent possible.
- 3) The procedure for Green auditing adopted by the team is to collect basic data on the components of audit, compare them with appropriate benchmarks, and showcase improvements made as well as the way they have been achieved.
- 4) Feasible goals to be set for the year ahead, to go up in steps to the best possible level.
- 5) Collection of basic data would be done by the members of the 'Green Guardians Club' (trained student volunteers) and the staff who will act as propagators of Green Campus philosophy.
- 6) Students will be trained to populate Standard data sheets pertaining to component audits [By the members of the Green Guardians Club (GGC) under their own group leaders] by 'walking through' and observing activity patterns, studying log books, bills, procedures etc., and discussing in the presence of expert green leaders,

mentors, representatives of teachers from nearby schools, mothers from among the parents etc.

- 7) Opportunities given for students to interact with leaders in the field of arts, culture and technology, environment, health, career planning etc.
- 8) The message finally will be conveyed to the affiliated society for bringing desirable changes in life styles of the community through peer pressures.

Priorities:

- 1. While all the listed seven green audit components are equally important, priority for implementation will be for realizing what is immediately achievable, starting with no cost options first, to be followed immediately by low cost options, and then moving forward with larger initiatives that have longer 'Payback Periods' with financial preparation, technical advice and appropriate design support.
- 2. Finally, even with no reasonable payback period in sight, what is good from ecological point of view shall be done at any cost as sustainable lifestyles are to be learned by students and required to be promoted through their societal interaction opportunities.
- 3. With the realization that every affront on the ecological balance of a region has always earned much multiplied recoils from the nature, *'learning to live in harrrwny with nature'* is of utmost urgency for the society, and so for the students.

Courses Offered at St. Mary's College, Thrissur

No:	Degree	Subject	With Subsidiary Topics	Year Started
01	BA	History	Economics & Sociology	1979
02	BA	Economics	Sociology & History	1980
03	BA	English	Journalism & Social and Cultural history of Britain	2012
04	BSc	Mathematics	Statistics and Physics	1980
05	BSc	Botany	Zoology and Chemistry	1993
06	BSc	Chemistry	Mathematics & Computer Applications	1999
07	BSc	Biotechnology	Chemistry& Environmental Bio-technology	2000
08	BSc	Microbiology	Bio-Chemistry, Bio-Statistics & Computer Applications	2001
09	BCA	Computer Applications	No Subsidiaries	2001
10	BCom	Commerce	No Subsidiaries	2012
11	BBA	Business Administration	No Subsidiaries	2014
12	BSW	Social Work	No Subsidiaries	2014
13	BVoc	Software Development	No Subsidiaries	2014
14	BVoc	Multimedia	No Subsidiaries	2014

1. Graduate Programmes (With year of Starting)

2. Post-Graduate Programmes

No:	Degree	Subject	Year Started
01	MA	History	1998
02	MA	Applied Economics	2012
03	MSc	Mathematics	1995
04	MSc	Microbiology	2002
05	MSc	Bio-Technology	2004
06	MSc	Computer Science	2004
07	MSc	Psychology	2012
08	MCom	Commerce	2013
09	MSc	Botany	2014
10	MSc	Chemistry	2014

3. Doctoral Programme

No:	Degree	Subject	Guides	Year Started
1	Ph.D.	Mathematics	L .Sr. Dr. Magie Jose	2012
			2. Dr. Parvathy K. S.	

UGC Sponsored Add-on Courses

01	Yoga and Health Management Science
02	Plant Tissue Culture

Skill Enhancement [Certificate] Programmes

01	Museology
02	Data Interpretation & Statistical Computation
03	Adobe Page maker
04	Geomaths
05	Food and Nutrition
06	Laboratory Design & Safety
07	Graphic Designing -Photoshop
08	Graphic Designing - Advanced Concepts
09	Learning for Employment and Awareness Programme (LEAP)
10	Phyto-pharmacology
11	Indian Stock Market
12	Basic Counselling Skills
13	Mushroom Cultivation techniques
14	Graphic Designer & Camera Assistant
15	Junior Programmer
16	Self Defense
17	Hand Embroidery & Fabric Painting
18	Basics of Cosmetology
19	Basic Numerical Skills
20	Driving
21	Interior Designing
22	Clay craft and Surface ornamentation
23	Applied Psychology for Management
24	Legal Information
25	Communicative Skills in English
26	Applied Aquaculture
27	Butterfly Gardening

1. Energy Audit

Electricity, LPG (Gas) or Firewood and Fuel oil for transportation are the most popular forms of energy commonly used in substantial quantities in most colleges in Kerala. The efficiency of use in these cases are mostly depended on institution's policies, awareness and cooperation of students and the cooks in the hostel and canteen kitchens. Among these, electricity has wider ecological implications.

Electrical energy consumed is currently charged based on consumption that takes place during normal, peak and off-peak times (for Time of the Day – TOD - tariff), the monthly peak demand in terms of capacity provided (in kVA, measured by the Demand meter) and the contract demand. There is a demand charge and an energy charge. The power quality maintained internally (based on power factor (pf), maximum of which is 1) can earn either a penalty or incentive as the case may be, on a monthly basis. The College receives electricity from the Electricity Department of Thrissur Municipal Corporation [Bulk Licensee].

	TOD ->	Normal	Peak	Off-Peak	Total
May	2018	8,632	2,178	4,174	14,984
June	2018	6,986	1,850	3,592	12,428
July	2018	10,722	2,336	4,290	17,348
August	2018	11,290	2,514	4,586	18,390
September	2018	8,886	2,310	4,258	15,454
October	2018	12,240	2,812	5,198	20,250
November	2018	10,594	2,546	4,696	17,836
December	2019	8,028	2,762	5,200	15,990
January	2019	5,102	2,530	4,746	12,378
February	2019	5,586	2,392	4,520	12,498
March	2019	7,976	2,552	5,006	15,534
April	2019	9,834	2,670	5,150	17,654
Year Total		1,05,876	29,452	55,416	1,90,704
Maximum		(Oct) 12,240	(Oct) 2,812	Dec&Oct 5,120	(Oct) 20,250
Minimum		(Jan)5,102	(Jun) 1,850	(Jun) 3,592	(Apr) 12,378

Table 1: Monthly Consumption-Units (Energy in kWh) - TOD Tariff Zone-wise

Demand charges are generally the 'fixed charges' based on the agreement between the utility and the consumer, and is charged based on the monthly maximum demand (MD in kVA). Therefore, it is better to take stock of the potential variation in demand during future months and bring down the demand charges. Towards energy charges (EC), there is a 10% electricity duty and a surcharge of 2.5ps/kWh. Reducing consumption (unit or kWh) can bring in large reduction in carbon footprint as well as the amount to be paid to the supplier.

Charges -> Month		(Rs. 6.3/unit) kWh Energy Charges Rs.	(Rs. 400/kVA) kVA Demand Charges Rs.	Power Factor Penalty (+)/ Incentive (-)	Net Amount Paid (includes Duty & SC) Rs.
May	2018	94,685.85	28,036.00	-3,314.00	1,29,251
June	2018	78,466.50	24,000.00	-2,746.33	81,458
July	2018	1,09,894.05	30,004.00	-3,846.29	1,47,475
August	2018	1,16,553.15	31,100.00	-4,079.36	1,60,973
September	2018	97,930.35	29,804.00	-3,427.56	1,34,486
October	2018	1,28,245.95	30,960.00	-4,488.61	1,68,048
November	2018	1,12,990.50	24,000.00	-1,694.86	1,47,041
December	2018	1,01,247.30	28,736.00	-3,543.66	1,36,964
January	2019	78,475.95	25,440.00	-2,746.66	1,09,326
February	2019	79,153.20	26,304.00	-2,374.60	1,19,422
March	2019	98,018.55	30,920.00	-2,940.56	1,36,228
April	2019	1,11,519.45	30,776.00	-4,460.78	1,49,428
Yearly Total					16,20,100
Maximu	ım	(Oct) 1,28,246	(Sep) 30,960	(Oct) 4,489	(Oct) 1,68,048
Minimu	m	(Jun) 78,467	(Apr) 24,000	(Nov) 1,695	(May) 81,458

For the consumption as in Table 1, the monthly charges are paid.

Total for the year: Rs. 16,20,100 [Avg./month Rs. 1,35,000] Table 2: Electricity Charges Paid

TOD ->		Normal	Peak hours	Off Peak hours	E. Duty	Surcharge
Contract Dema	nd: 80 kVA	kVA	kVA	kVA	Rs.	Rs.
May	2018	70.09	28.26	27.19	9,468.59	374.60
June	2018	52.21	25.15	26.06	7846.65	310.70
July	2018	75.01	29.30	44.24	10,989.40	433.70
August	2018	77.75	28.84	27.48	11,655.32	459.75
September	2018	74.51	29.05	27.78	9,793.04	386.35
October	2018	77.40	30.14	30.14	12,824.60	506.25
November	2018	57.18	30.98	27.16	11,299.05	445.90
December	2018	71.84	31.52	31.11	10,124.73	399.75
January	2019	63.60	33.23	31.56	7,847.60	309.45
February	2019	65.76	30.34	27.56	7915.32	312.45
March	2019	77.30	32.87	41.88	9801.86	388.35
April	2019	76.94	28.38	27.62	11,151.94	441.35
Maximu	ım	77.75	33.23	44.24	12,824.60	506.25

Table 2a: Demand Variation and Electricity Duty & Surcharge Paid

Replacing the existing ordinary tube lights and CFLs with LED lights in the Laboratories, Class rooms, Hostels and the Guest House without reducing illumination levels or human comfort will bring down the energy consumption. The following housekeeping measures required for achieving the cited gains were introduced during the Audit year:

- L Displayed stickers to switch off equipment like Computers, Printers, Photocopiers etc. when not required; also to isolate them from power supply, whenever possible to reduce what is called Phantom load (remaining switched-on will entail a consumption even without using it a small percentage of the energy during use).
- 11. Maintenance schedule for switchboards and distribution boards is prepared and followed.
- 111. Log Books for recording energy consumption, extent of power failures and running of standby generator etc. are introduced.
- 1v. Installing Meters for sub-units (like hostels) for monitoring the monthly energy consumption in every building to be completed in the immediate future.

In the case of other major equipment, physical isolation strategy of removing the plugs from the plug base (socket) when not in use will be advised to the authorized operators.

Energy Efficiency Improvement

In any energy application area, the most attractive opportunity in the path of greemng through energy management is the avoidance of incandescent bulbs and replacement of ordinary fluorescent tubes (1200 mm or 4 ft.) and/or compact fluorescent lamps (CFLs).

Hostels and Academic areas have the maximum number of 'ordinary four feet tubes'. Reduction in Carbon Footprint will arise due to electrical energy being saved by using LED tubes that require only less electricity for giving the same level of illumination. In this case, 16 or 20 W LED tubes can be used instead of 40 W ordinary tubes. 40 W tubes with magnetic choke and starter used to need 56 W (power) to light up. So, savings per tube will be 36 - 40 W.

As an action plan, it is proposed to study the use pattern over the TOD tariff zones. That is: as to how many hours of use happen during peak or off peak hours and normal rate zones. Once such a study is completed, hopefully during early next academic year, exact saving potential based on 'tariff plus duty' to be paid, can be worked out and profits that will accrue can be assessed.

Currently, the College policy is to replace all failed tubes and CFLs with energy saving LED bulbs and tubes. This will help in bringing down the carbon footprint. The carbon footprint due to electricity use in the campus is worked out in Chapter 10.

Cooking Energy

In the Hostels, cooking energy needs are met through the use of LPG (cooking gas) and partially with firewood. 19 kg type cylinders are used in hostels and, canteen and 14.2 kg type in the laboratories. In all, 30 cylinders in Canteen and 96 cylinders in hostels per year are used. In addition, 8000 kg of firewood is used for the whole tear with a steam cooking facility at the hostel kitchen. The college has introduced biogas produced from kitchen waste

as an additional cooking fuel. The Guest House does not operate its kitchen facility – instead takes food from canteen or hostels according to the choice of guests normally of short stay).

During the 2018-'19 Green Audit initial days, the team examined the energy requirements in the hostel kitchen and checked for any energy leakages. Very minor leakages only were noted and the management was notified. These leaks were immediately rectified.

It is recommended by the audit that during 2019-20, a project report may be attempted for advising the authorities to have a more efficient and reliable cooking energy supply system for reducing or even eliminating the purchase of firewood and LPG.

Other fuels that are used in the campus are shown in the tables that follow.

1. LPG								
No. and type of LPG Cylinders used during the year in different places								
(19 kg C	ylinder)		(19 kg C	Cylinder)	(14.2 kg	Cylinder)	(specify)
Cante	een		Hos	tel	Labo	ratory	Otł	ner places
Commercial	Domestic	Co	mmercial	Domestic	Domestic	Domestic	Domestic	c Domestic
30	0		96	0	10	0		
				2. V	Vood			
			Wood	l used/day i	n different	places		
Canteer	n		E	Iostel		(speci	fy)	
for cooking	ng	kg	For	cooking	kg	Place/ Purpose		kg
0			3	3,000	kg			
				3. Ke	rosene			
			Kerose	ne used/day	in differer	nt places		
(specify	·)		(s	pecify)		(specify)		
Place/ Purp	pose I	Litre	Place	/ Purpose	Litre	Place/ Pu	rpose	Litre
0								
	ł			4. B	iogas			
			Biaga	s used/day i	n different	places		
Canteer	n		E	Iostel		(specif	fy)	
for Cooki	ng C	Cum	For	Cooking	cum	Place/ Pu	rpose	Hours/ cum
0	1	5 m ³	3	Plants	45 m ³			

OTHER FUEL USE

Table 3: Energy sourced from sources other than electricity

2. Renewable Energy Use

India is now busy realizing its dream of treading a path of rapid energy transition, with Prime Minister Shri. Narendra Modi in 2014 calling upon the people of India to target 175,000 MW of renewables by 2022 - composed of 100,000 MW of Solar PV; 60,000 MW of Wind Power; 10,000 MW of Biomass based power and 5,000 MW of Small Hydro Power and other sources. A serious move towards renewable energy actually got started at a normal pace in 2008, when, as part of the Climate Change Action Plan for India announced by the then PM, Dr. Manmohan Singh, targeting an installed capacity of 20,000 MW through renewable energy sources by 2022, wherein Solar and Wind would be the major contributors. Further, India Government at the historic 21st UNFCCC (UN Framework Convention on Climate Change) held in Paris in December 2015, declared its INDC (Intended Nationally Determined Contributions) in which these enlarged targets were also explicitly stated. It is only natural that through a Green Audit, any Higher Education Institution in India should identify opportunities for developing locally feasible renewable energy (RE) sources and using them within its own premises, in view of the mounting climate change challenges. St. Mary's College, Thrissur, has been initiating and expanding the use of renewable energy in the college and hostel premises since 2015 as in Table 4 below.

No.	Actions Taken	Status	Cost	Audit Remarks
1	Solar Photovoltaic	120 kWh/ day	Rs. 20 lakh	The 50 kW SPV system is a
	power plant of	ofelectricity	to install.	grid-tie, supplying the power
	50 kW on the	produced	Saves Rs.	generated to KSEBL. Wrong
	College Roof top.		2.75 L/yr	stringing suspected. To be
	(Since 02.05.2017)			tested. Can have 200 kWh/d.
2	1 kW Solar PV in	4 kWh/day	Rs. 1 lakh	8 tube lights & 8 fans run in
	the Hostel			the study area.
	(Since 12/2015)			Okay.
3	Solar Street lights			4 street lights in College area -
	College: 18W x 4	1kWh/day		Okay.
	(Since 27.03.2015)		Rs. 3 lakh	
	Hostel: 25W x 4	1kWh/day		4 double tube street lights in
	(Since 12/2015)			hostel area - Okay.
4	Biagas Units of	45 m ³ of gas per	Rs. 7 lakh	Organic wastes converted to
	15 m3 volume, 3	day for cooking		manure for gardening by
	numbers in the	from kitchen		aerobic composting and
	hostel premises	wastes		vermin-composting. Excellent.
5	Solar Hot Water	2000 L of hot	Rs. 5 lakh	Saves electricity for hot water
	units of 500 LPD	water at SOOC		supply. From the RE use and
	4 Nos.	for bathing &		Health point of view, excellent
		utensil wash.		initiative.

Table 4: Renewable Energy Use in the college and Hostel



Solar Panels on the college building roof of capacity 50 kW



Control devices of the 50 kW Solar PV set up at the Ground Floor Switch room





Solar Street lights

Solar Water Heaters - In St. Mary's College, Thrissur campus



Solar Hot Water Units of Evacuated Tube Collector Type

Biogas Plants



Hostel kitchen has three Biagas Plants (15 cum each) as underground structures (Fixed Dome Type)



Feeding Point for one of the biogas plants using kitchen wastes as feedstock

The 2018-19 Renewable Energy Use plan included a house study on expanding the biogas generation, investigating the reduced generation from the 50 kW roof top solar, and also value addition for its utilization. This could be an activity for the 2019-20 greening efforts.

Out of 2007 girl students in St. Mary's College, Thrissur, only 230 are staying in the Hostel building with 90 rooms. Currently, the 1 kW solar electricity systems is serving the students in the hostel study hall with 8 tube lights and 8 fans. This ensures that even if the power fails after sunset, students can study without remaining in the dark.

Another observation is that, there are two standby fossil fuel generators installed with UGC support, of 82.5 kVA and 250 kVA connected to the college electric lines. With the increasing use of renewable power, the need to use carbon emitting oil engines should be minimized gradually and ultimately avoided.

The college has taken definitive steps for reducing the use of conventional energy forms for hot water supply in the campus for bathing, washing utensils etc. There are 4 numbers of Solar Hot Water units, each of 500 Litre per day, making a total of 2000 LPD. This saves electricity or firewood which could be the usual sources of heating in such situations.

3. Water Audit

St. Mary's College Campus in Thrissur Municipal Corporation area 1s very much in a central place close to the Paramekkavu temple, just adjacent to the famous 'Round'. The average annual rainfall in Thrissur is 3001 mm, and the mean temperature is 27.60C. The campus has three major wells which can supply potable water for the entire campus community numbering 2007 (250 students in the hostel), 109 teaching staff (4 male), 10 Lab Assistants & Technicians – all female, 12 Admin Staff (2 male), 14 Cooks and Kitchen Assistants – all female, 13 contract staff including Hostel Security Staff (3 male), occasional guests on an average not exceeding 5 per day, and day time visitors who are on an average only 50 per day.

The well water available in the campus 1s purified and distributed. The quality of supplied water is tested at frequent intervals by competent government authorities and certified. Purified drinking water is supplied in the hostel through six large 1000 LPD dispensers round the clock. Two rain water harvesting units of 54,000 litre capacity each are set up in the hostel area.

The total roof area of the buildings that can be conveniently ram harvested is to be worked out by the Student Green Guardians - under the guidance of teachers during the year 2019-20. The following assumptions will guide the assessment: For a 10-sq. ft. roof area getting 1 mm rainfall, the rain harvest will be 1 litre. Taking this as an empirical guide, the rainwater availability from the roof tops can be calculated. Green Guardians have taken it as an exercise to come up with figures for an expanded rain harvesting exercise.

The Audit finds that the College has not kept dependable data on water used exclusively for Flushing, Utensil washing, Face washing, Floor washing, Bathing, Cooking etc. However, the Student Green Guardians have collected some data on water use in the campus, which is given below. The students are requested to generate more accurate data from the next year onwards on these aspects, as a means of intensifying their efforts to conserve water.

Water use according	to Students' Assessment
Toilet flushing	15,000 LPD
Cooking	12,000 LPD
Utensils Wash	7,000 LPD
Floor Wash	2,000 LPD
Gardening	4,000 LPD
Loss thro' pipe break	Nil
Loss - tap leaks	100 LPD
Bathing/ Personal clea	aning 16,000 LPD
Other/ Occasional	23,900 LPD
Total	80,000 LPD

The Audit recommends that all the toilet flush tanks are to be checked for their 'per flush water use'. Older ones of 10 litre/flush should be replaced with newer 5 litre models in a phased manner. Kitchen floor wash can use hot water from either solar hot water system or biogas heating system with pressure nozzles, so that water use can be reduced and health benefits increased.



Vegetable garden in the hostel using gray water for irrigation

The 2018-19 Green Auditing team of St. Mary's College, Thrissur estimated that the Campus on the whole, consumes 85,000 Litre of water every day. The total water use works out to about 80 LPD for residents in the campus and 30 LPD for day scholars and others. These levels are found adequate. The water quality, as proved by testing at regular intervals is acceptable. There is no water problem in the campus either on quality or on quantity. There is no instance of lack of water in the pipes either in the hostel, academic area or in toilets, according to the random survey among hostellers, teachers and day scholars.

Audit suggests that a 'needs sheet' for the various utilization zones indicated above be prepared through a PG students' minor project (Social Work Department), and the current pumping efficiency be got tested and assessed to create a more authentic data base on water use and water conservation in the campus.

No:	Department	Date	Activity
1	Chemistry	Since 2010	Rain water from the roof of the college IS collected through pipes and led to rain water storage tanks of capacity 1000 L each. The water is filtered through a sand bed and fed in to another tank for use in the laboratory. The energy consumption for the distillation of water is saved in this way.
2	Vocational Studies	15.06.2017	Organised an invited talk on Well Recharge' by Mr. Ramdas K M, Team Member of District Rain Water Harvest Mission (DRHM) "MAZHA POLIMA", Collectorate, Ayyanthole. The talk was about the importance of rain water harvesting (Well Recharge) and the possibilities and various methods of well recharging.
3	Microbiology	07.07.2017	Bacteriological content of drinking water and tap water samples used in St Mary's college was analyzed and found safe.
4	Microbiology	13.12.2017	Bacteriological analysis for 41 samples from public wells conducted and public informed.
5	Botany	23.02.2018	Cleaned the Karthyayani temple pond at Chembukkavu, Thrissur.
6	Microbiology	08. 2018	100 water samples tested as a part of post flood well water analysis in association with Kerala State Pollution Control Board.
7	Social Work	03.09.2018	In association with NABARD and the District Administration, conducted a survey on quality of water in flood affected areas and conducted water Chlorination activities in Kaipamangalam Grama Panchayath.
8	Microbiology	29.12.2018	Supplied drinking water in cans to the village Panamukku, as the water in the local wells got polluted as a result of flooded fertilizer godown leaking harmful chemicals.
9	Social Work	09.03.2019	Dept of Social Work in collaboration with Mathrubhumi newspaper, conducted survey on post flood water quality in Chembukavu area in Thrissur.

Water Quality Assurance Related Activities at St. Mary's College (For College as well as for the Community around)

Conservation of water through effective rainwater harvesting and recycling of gray water are considered as essential activities, and the College has a scheme in operation to use gray water for vegetable garden irrigation, use of composted wastes as manure etc. It is desirable that the scheme is reviewed for optimizing.



Hostel vegetable garden with sumptuous green yields

The water conservation and water management policy as well as recycling strategy of the college is spelt out clearly in the College Green Protocol as 'Guidelines' for the students and teachers and as models for new entrants.

In the face of the predicted water shortage in the State due to climate change impacts in the near future, this initiative by the students and staff of St. Mary's in water conservation would serve as a model for replication at family level.

4. Natural Environment - Biodiversity Audit

The St. Mary's College campus in the centre of Thrissur Municipal Corporation area is shrunk within just around 5 acres of land. This includes separate areas for swimming and sports activities, developed into exemplary facilities that the students are putting to best use – as evidenced by their sports achievements. Being part of an urban setting, traditionally the campus can only be a jungle of concrete buildings. Enough open areas are also not to be expected. But, with the efforts of staff, students, and the management the campus is developing into a cool, green island where students can quietly undergo serious studies, pursue cultural activities and also physical education.

St. Mary's campus is just by the side of St. Thomas College, Thrissur. The busy Thrissur – Palakkad road keeps these two campuses on its left and right sides. Vadakkunnathan Temple, well known for the Thrissur Pooram festival, is only a few hundred metres from the college. The Thrissur Railway station is only 1 km from St. Mary's College. The City KSRTC Bus Station is just 0.9 km away.

Notwithstanding the lack of natural green bonus to the campus, the College with over 7 decades of standing as one of the best colleges for women in the State has built up islands of greenery within it, including a large herbal garden, a depository of hundreds of rare and endangered plants and a small butterfly garden. Students from several schools in Thrissur and Palakkad districts are visiting these gardens and the college finds time to entertain such young learners guided by accompanying teachers. As stated, the College has a butterfly garden and it assists the surrounding schools for setting up such greenery and small butterfly garden. A number of innovations towards greening have already begun in the campus and the authorities have seriously considered ways of making the campus a green haven in spite of the severe land limitations.

Many trees in the campus are labelled with their botanic name, common name and the local name in the vernacular - for all the students to know more about the plants in their learning environment. This activity is proposed to be expanded with the introduction of newer species of ornamental and fruiting plants under the leadership of the Botany department.

For the Biodiversity audit, the bigger trees are to be measured at breast height and tree data entered in a register. This activity, initiated during the year is expected to be intensified by the Green Guardians Club and the College NSS units during 2019-'20.

It is planned to complete the detailed audit of trees with qualified botanists leading the effort, by the end of next academic year. During 2018, as AGB (Above Ground Biomass), trees with girth above 10 cm were taken into record after survey by the Nature's Green Guardians Club members.
Herbal Garden

St. Mary's College, Thrissur, has a unique distinction of maintaining a rich herbal garden of 425 medicinal plants, which are fast depleting from their natural settings in the state as well as in the country. They are all labeled (Malayalam name, Binomial of the plant family, and important uses), arranged orderly and looked after well by the Botany department. Of these, 115 are under the RET (Rare, Endangered and Threatened) category. Important activities under this greening initiative during the auditing year are briefly recapitulated below:

- Seedlings of the medicinal plants are prepared for distribution. Some rare medicinal plant seedlings were purchased from central nursery of Kerala Agricultural University and from some commercial nurseries and added for distribution. Department organizes regular plant collection trips for plants and seeds of medicinal plants.
- A temporary medicinal plant nursery is maintained in the campus for the ready availability of plants to visitors and plant seekers.
- o Tissue culture work of some RET plants is ongoing as MSc project work and results obtained are presented in national seminars as well as published in the proceedings of national seminars.
- Contact is made with the various national level Ayurvedic Institutions within Kerala for exchange of information, plants and also for Students' interactions.
- A Medicinal plant exhibition was conducted during 1-2 August 2018 in connection with a seminar organized on monsoon diseases.
- Medicinal plant seedlings (especially of RET category) distributed to 25 schools from which a total of 572 students visited the College Herbal Garden.
- O College encourages dignitaries, college and school teachers, researchers, trainees of teacher training Institutions, medicinal plant lovers, industry persons and school children to visit this garden and collect plants as well as accept free mentoring for their protection.
- Several one day camps for school children are conducted in the medicinal garden at their convenience.
- o Assisted 50 educational institutions to establish "Biodiversity parks".
- Setting up of Medicinal Plants garden was funded by KSCSTE (Kerala State Council for Science, Technology and Environment).
- Environment related National and World Days are observed in the College with wider participation of scientists, students and the public.
- Continuing technical support of experts from Kerala Forest Research Institute (KFRI) and Forestry College of KAU (Kerala Agricultural University) are ensured for all.
- An illustrated booklet is prepared and published on Medicinal Plants with photographs and description on each plant.
- A Vermi-compost unit is run in the campus to provide safe fertilizer for planting the botanical/ herbal garden.
- A separate section of aquatic plants, ferns and wild orchids is established with plants of medicinal value in focus.

RET Garden

Red List Assessments highlight the extinction risk faced by plant species in the wild, raise awareness for the need to protect them and aid prioritization for plant conservation efforts. Currently, plant species are selected from the IUCN Red List of Threatened species. It is in this context that the Botany Department of St. Mary's, Thrissur, is concentrating its effort on RET plants conservation involving the students in all related activities. The effort is to provide chances for conservation of these fast vanishing plants within the campus and also for distributing the seedlings to neighboring educational institutions and the public to promote the pulse of conservation. Nearly 120 red listed plants are conserved in St. Mary's as of now. Rare Endangered and Threatened (RET) Garden of the college houses, among others the following important plants:

Nyctanthes arbortristis (Pavizhamulla), Citharoxylum subserratum (Parijatham), Bauhinia purpur ea (Chuvannamandh aram), Piper chaba (Katukurumulaku), Santa/um album (Chandhanam), Elaecarpus ganitrus (Rudraksham), Desmodium gangeticum (Orila), Pseudarthria viscida (Moovila), Strichnos nuxvomica (Kanjiram), Aegle marmelose (Koovalam), Anthoc eph alus cadamba (Kadambam), Pterocarpus marsupium (Venga), Diospyro s candolleana (Karimaram), Tinospora cordifolia (Amruth), Ty laphora asmatica (Vallippala), Pterocarpus santhalinum (Rakthachandanam), Annona muricata (Mullatha), Plumbago rosea (Koduveli), Cleodendruminermi (Cheruthekku), Mimusops elengi (Elangi), *Myxopyrum* serratulum (Chathuramulla), Trichopus zeylanicus (Arogyapp acha), Cardiosp ermumhalicacabum (Uzhinja), Curculigoorchioid es (Nilappana), Ipomea sepiaria (Thiruthali), Cympopogon citratus (Enjippullu), Evolvulus nimularis (Krishna kranthi), Piper longum (Thippali), Zingiber offzcinale (Kattinji), Rauwolfza serpentine (Sarppagandhi), Cinnamomum camphera (Karppooram), Wrightiatinctoria (Danthappala), Ensete superbum (Kalluvazha), Sapindus laurifolia (Urinji), Croton triglium (Neervalam), Mussaenda frondos, Kaempheria rotunda, Pongamia glabra, Justicia beddomi, Kaempheria galanga (Chittaratha), polystachia (Chemmaram), Cassia fistula (Kanikonna), Aphanamixis Albizialebbek (Nenmenivaka), Mesuaferrea (Naga), Asparagus recemosus (Sathavari), Alangium salvifolium (Ankolam), Acacia catechu (Karingali), Terminalia bellarica (Thanni), Cissus quadrifolia (Changalamparanda), Bixa orellana (Kurangumanjal), Terminalia chebula (Kadukka), Janakiya aryalptra (Janakeeya arrayal pathra), Thespesia populnea (Poopparuthy), Nelumbium speciosum (Thamara), Micheliachampaca (Chembakam), Abru sprecatorius (White Kunni), Abru spr ecatorius (Red/ Chuvanna kunni), Artabotrys hexapatalus (Manoranjini), Butea monosp erma (Plasu), Anamirta cocculus (Kattamruth), Tiliocora accuminata (Vallikkanjiram), Indigo f eratinctoria (Neelamari), Pseudarthria viscida (Moovila), Vateriaindica (Kunthirikkam), Holarrh enaantidysentrica (Kudakappala), Gymnemasylvestre (Chakkarakkolli), Hemedesmus indicus (Naruneendi), Holostemmaada-kodien (Adapathiyan), Sarcostemmaacidum (Somalatha), Alstonias cholarish (Yakshippala), *Rutagraveolens* (Arootha), Saracaasoca (Asokam), Alangium salvifolium (Ankolam), Pittosporum dasycaulon (Analivegam), Commiphoramugul (Gulggulu), Meliadubia (Mala veppu), Aristolochia indica (Karalakam), Thottea siliquosa (Alppam), Helicterusisora (Edampirivalampiri), Callophyllum tomentosum (Kattupunna), Antiari stoxicaria (Maravuri), Cratevareligiosa (Neermathalam), Stevia rebaundiana (Stevia) etc.

A glimpse of Herbal & RET Garden at St. Mary's College Thrissur



Nagadanthi Balicos ermum montanum



Miracle fruit Synsepalum dulcificum



Karpoora mararn Cinnamomum camphora



Karikurinji Strobilanthes ciliatus



All Students daily pass by the butterfly garden & medicinal plants garden



Mararnanjal Coscinium enestratum



Palkkaya maram Gardenia gummifera



Gulggulu Commiphoramugul



Green arch that beckons visitors to the medicinal plant world



Missionary's Green Mission



Greening by Community - Distributing seedlings & Sale of green vegetables



Take these Home - Green your Home

Suggestions for Future Work:

1. As a part of the greening through vegetation plan, it is suggested that an attempt be made to try out the Japanese technique called 'Miyawaki method of Urban Afforestation" (due to Dr. Akira Miyawaki, aged 95, Emeritus Professor of Yokohama University, Japan) for developing a natural forest (ideal for cities) with high biodiversity within a very short period. After three years, no maintenance is required. Within 10 years, the trees and vines will grow to give an appearance of 100 years old forest. It will absorb dust and noise common in the cities, as well as supply oxygen abundantly. It will also attract many varieties of insects, birds and small animals that are vanishing from our midst, in spite of being endemic (increase the biodiversity).

Under the Miyawaki model forest strip, species rich native plants of nearly 100 kinds will grow without any care into lush vegetation with allied other living organisms, after 3 to 5 years. Afforestation in our country so far has been by planting one or more of a very limited number of tree species in large number and the effort celebrated based on the number of saplings planted. Enhancing the bio-diversity will have to be given high attention in future greening exercises.

Kerala is a fast urbanizing State in India with a population density of 860, and 48% of Kerala citizen are living in urban areas. The urban community in Kerala is comprised of 6 Corporations and 87 Municipalities. It is expected that by 2030 – just 11 years away – 72% of global population will be living in urban spaces, contributing to a myriad of ecological problems. It is better to be well prepared before the ecological backlashes start hitting hard on our population. Awareness through greening of college campus to the students - and especially to the girls - in this respect will be most beneficial to the society.





5.Transportation and Environmental Quality

The biggest challenge for many educational institutions for shedding carbon footprints which is next only to electricity use, is in the transportation area viz., how to get students and employees to and from the campus efficiently and inexpensively when mass transit options don't offer convenient connections or when such service is absent or infrequent. The data related to St. Mary's College, Thrissur on the number of people using vehicles, type, average km travelled etc. are collected through field survey. College has no vehicle of its own.

Students/Staff coming in Own/Hired Vehicle

1.	Motor bike/scooter (single, shared) Per o	day
	a. No. of Motor bike/ scooter	12 (of staff) + 20 (of students)
	b. No. of Students	12 + 35
	c. Total km travelled/day (To and fro)	5 km/ pax
2.	Auto Rickshaw	
	a. No. of Auto Riksha used	: 25
	b. No. of Students	: 65
	c. Total km travelled/day (To and fro)	: 3 km/vehicle
3.	Own Car (single, shared)	
	a. No. of Own cars - staff	: 12 (5 single; 7 shared)
	b. No. of Students	
	c. Total km travelled/day (To and fro)	: 20 km to and fro/car
4.	Shared Taxi Car	
	a. No. of Taxi cars	: Nil
	b. No. of Students	
	c. Total km travelled/day (To and fro)	
5.	Private Van/Mini Bus/Bus	
	a. No. of Van/Mini bus used	: Nil
	b. No. of Students	
	c. Total km travelled/day (To and fro)	
6.	Public Transportation (Bus & Train)	
	a. No. of students	: 500 + 900 + 200
	b. Total km travelled/day (To and fro)	: lOkm + 20 km + 100 km (to and fro)
7.	Students Cycling to College	
	a. No. of students	: 7
	b. Average km travelled by person/day	: 5
8.	Students Walking to College	
	a. No. of Students (incl. hostellers)	: 300
	b. Average km travelled by person/day	: 2 km/pax to and fro

Educational Institution Vehicles Operated during the Academic Year 2018-19

Car/ Bus	Average No. of Students	Total distance travelled	Fuel Consumed	
Nos. per bus trip		during the Year (km)	(Litre)	
Car - Nil 0		0	0	
Bus - Nil 0		0	0	
The emission calculation is made based on available data from test running:				

2.3 kg C02/litre (petrol); 2.68 kg C02/litre (diesel) [DEFRA 2016].

Table 5: Transportation data for St. Mary's College, Thrissur

The mode of transportation for students in Kerala is mostly, bus or train. In some cases, they may travel by bicycle or even walk. The class time at St. Mary's starts from 8.30 am and close by 3.15 pm. During these times, bus rides are quite easy and comfortable and most of the girls depend on private buses plying short distances very efficiently. Other modes require fossil fuels to propel them – like Petrol, Diesel, or Gas. These fuels have heavy carbon foot prints, meaning the greenhouse gases (GHGs) generally referred to as carbon emissions (in the form of CO_2 , Sulphur compounds, Nitrogen oxides etc.) and the total impacts become heavy. This has a direct bearing on the Global Warming and the consequent Climate Change (CC). The purpose of Green Auditing is to make every stakeholder understand the depth of damage each one inflicts on earth and its atmosphere. Accurate assessment of such environmental damages is highly involved.

At the UN Framework Convention on Climate Change (UNFCCC-21) in December 2015, India too has committed to bring down our country's Carbon Foot Print on the global environment. In short, every citizen – be it a student, teacher or parent, or anybody else not connected with it directly, should know this burden on environment that each one inflicts, and try to bring their impacts to 'near nothing' through remedial actions wherever possible. 'Simple living' and 'greener travel' generally are capable of keeping a low carbon footprint profile.

Emission of climate changing gases through transport system – both public and private – is very high in India and India stands third in respect to GHG emitting resource utilization globally. India is also at the 6th place in the after industrialization accumulated emissions [160 years starting from 1850]. But, if we take per capita emissions, India is not a heavy polluter – it stands at 10th position only, and the quantum is less than one-third of the world average. The students and teachers of St. Mary's College, Thrissur, have through the observance of a Green Protocol, acted vigorously to lower the onslaught of increased carbon footprints and protect the natural environment.

For assessing the carbon footprint due to transportation related to the functioning of the College, the following specific details were gathered through the student led survey.

				Total km
SL	Details: Type	No. of	No. of	Daily run
No.		Vehicles	Students/ staff	to & fro
1.	Motor bike/ Scooter (Single/ Shared)	32	47	10 km/ bike
2.	Auto Riksha used	25	65	3 km to &fro
3.	Own Car (Single/Shared)	12	19	16 km/car
4.	Taxi Car (Shared)	Nil	Nil	Nil
5.	Private Van/Mini Bus	Nil	Nil	Nil
6.	Public Transportation/Bus		500+900+200	10, 20, 100 km
7.	Cycling to College	7	7	5
8.	Walking to College	NA	300	2 km/ pax

Table 6: Summary of the Mode of Transportation for Students and Staff of College

Further Assumptions are:

- 1) The hostellers travel to their homes once in a Semester normally. This is usually by bus (public) or train.
- 2) Parents, Staff and occasional visitors generally use public bus, rarely own car, and very seldom hired taxi.
- 3) Within the campus, students do walk regularly, and since all buildings are generally close to each other inside the campus, nobody uses vehicles inside.
- 4) A few students who stay in Girls' hostels near the College and the 230 girls in the college hostel (total 300 including sports trainees) walk daily from their hostels to college and back every day.
- 5) Among the public transport (bus/ train) users, 200 girls come from nearby districts covering 100 km one way; 900 girls come by bus from one way distance of 10 km; and 500 girls come from the neighborhood of St. Mary's of not more than 5 km one way by bus.

The management encourages the students to use public transport system for all travel to outside destinations and for returning to campus - as it is safer, economic and faster.

The Carbon footprint for each of the items is worked out separately in Chapter1O.

6. Waste Audit

The St. Mary's Thrissur campus, like other city college campuses, does produce solid wastes arising from its day-to-day functioning. There are differences between individuals, and between holidays and work days, as well as between seasons - in the quantum and quality of wastes generated. An average figure per person per day is however worked out by observing their activities for a week by student volunteers at the disposal area, through sample survey approach, quantifying the measured wastes, and then averaging [Table 7].

Research studies on waste generation in academic campuses in India, have approximated the rate at which waste is generated, and arrived at some empirical coefficients for assessing the GHG emissions from solid wastes. These are used in evaluating the green auditing data on wastes in this study. Summary of Data Sheets on Wastes with Auditor's Remarks is in Table 7.

SL		Qty.	Type of	
No.	Type of Waste Practice	kg/ day	Disposal	Remarks
1.	Food Waste by Students & Staff			
	Food Waste:			Used for organic
	Canteen	5.0+	Biagas plant +	farming, hostel
	+ Hostel	20.0	Vermi Compost	gardening - good results
2.	Paper Waste: Students & Staff	0.025	Burning	Stopped burning
3.	Paper Waste Bulk:			
	Canteen	5.0+	50% re-use	Welcome move
	+ Hostel	15.0	50% recycle	
4.	Plastic Waste - Individual	0	NA	Good
5.	Plastic Waste - Bulk:			
	Canteen	0.5	To recycling	
	+ Hostel	12.0	To recycling	Sent for proper
	+ Office	0.5	To recycling	processing
6.	Glass & other utensils:			
	Canteen	Nil		
	+ Hostel	0.5	Municipality	Okay
	+ Office	0.1	Municipality	
7.	Electronic Waste:			
	Canteen	Nil		
	+ Office	0.5	Municipality	Okay
	+ Laboratories	0.5	Municipality	

Notes: (i). Carbon footprint calculations are in Chapter 10. (ii) Being of small quantity, no alternative solution for recycling is possible. (iii) Burning or incinerating paper is not an advisable practice. (iv) Students try to minimize the generation of wastes. Many local bodies and almost all HEis are adopting this practice. Simple paper recycling and converting into ornamental pieces will have to be increased.

Table 7: Summary of Waste Audit

The wastes generated in the campus are systematically collected and disposed of, as scientifically as possible, partly with the help of Municipal Corporation. Being a women's college, adequate number of special disposal chambers for bio-sanitary pads are provided and they are scientifically disposed of. Other wet wastes are separated at sources itself. As shown in Table 7, most items are intended to be recycled, reused or processed to the extent possible in the case of this institution.



E-waste awareness creation and training on its handling and disposal, with an exhibition on e-wastes at the St. Mary's College, Thrissur.

Garbage bins are provided in every room (hostel has 90 rooms), and for common areas in every floor in the hostel, as well as in the academic area, and the students are using them very responsibly. Table 8 below shows the distribution of waste bins in hostels and other common areas in the college.

	Max. No: of	No. of
Location	students/	garbage bins
	persons	per building
Ladies' Hostel	250	200
Admin/Common	30-100	35
Academic area	2000	250
Total	2007+158	485

Table 8: Distribution of Garbage Bins in the Campus

The practice of burning/incinerating the paper waste, which is the usual practice, has been discontinued in St. Mary's and better options are tried. Using waste paper for creating decorative materials is one option, which the college is trying already, but only a part of the total volume is covered now. The other is to make them into paper pulp and obtain handmade cards with attractive designs and encourage the students to use them for making Greeting Cards, Signage or Direction Boards during events, etc.

The quantities are not huge, and as composting is resorted to for wet wastes, they are used in the Biagas/Compost units itself. The GG Club can discuss this issue with the teaching staff and adopt any or many of such options for future practice.

Recycling & Reuse of Water

The gray water from bathrooms and utensils wash area m the campus is now directly channeled to wet the soil in the garden area or for organic farming of vegetables for use in the kitchen. A part of rain water harvest is used for aquaculture (fish farming) and the drained water from there is used for watering the garden. The water used for drinking, cooking, bathing etc. is pumped from wells which offer good quality potable water during all seasons and purified through modern water outlets using electricity (6 units delivering running water 24x7). The water quality is tested at frequent intervals at college and government labs and the quality is re-assured. Purchase of water from the municipal water supply system is not resorted to.

Water re-processing is a good conservation strategy. A water re-processing plant can be installed in future and the processed water can be used for toilets flushing, gardening and for spraying needed for the lawns etc. This will be a positive move for carbon footprint reduction.

Audit recommends maintaining a Register of Water Test Results with sources and dates of sample collection as well as certified data recorded in Table form.

Ash from use of Firewood for Cooking

The firewood used per working day in the kitchen is an average of 30 kg (assuming that on vacations, the cooking needs will be far lesser). The ash available from the kitchen is currently used for gardening and landfill, being small in quantity. There is no smoke pollution, as major cooking is using LPG and biogas, and steam cooking is adopted.



Students learning from experts on how to handle and dispose of the Common 'Plastic' and 'Electronic' wastes in daily life



Students at the e-waste exhibition

7. Health Audit

The very purpose of greening of educational campuses is to ensure that the students study and grow up in a healthy environment, giving out the best of their physical and intellectual contributions to the society.

The method for assessing the physical well-being of the educational institution in Green Auditing has been decided by NGGFn as follow:

- 1. Examine the prevalence of major sickness leave, if there are any;
- 2. Examine the first aid and medical facilities available for resident students and staff as well as for others during working hours;
- 3. Evaluate the atmospheric quality for adequacy, drainage systems for fast evacuation and land pollution if any that are in the campus; and
- 4. Assess the achievements of students in sports and games, especially m inter-collegiate and inter-university contests
 - as these are indications of healthy mind and body of the youth.

Observations on these aspects in respect of St. Mary's College for 2018-19 are:

- 1. Sick leave: Kerala is known for its low mortality and high morbidity status when compared to national status in this regard. This is mainly because of high literacy especially among the mothers as even a minor headache is promptly reported to the nearest primary health centre or to a govt. or private clinic/hospital. The College is maintaining accurate data on sick leave (for several years) and data pertaining to the current year are as follow: Only 17 sick leaves of more than one week for the year 2018-19 for all the departments together. In addition, students are actively associating themselves in outreach programmes, NSS camps, NCC, and cultural programmes hosted by the college within the campus. A number of videos on such activities of St. Mary's, Thrissur, are live on You Tube. There were no incidents of pollen allergy in the campus successively for years.
- 2. *Sick Room:* There are sick rooms available in the hostel to keep sick students under care and isolated from other hostel mates, as well as in the college buildings with trained medical attendants, so as to transfer students who are feeling sick even for a short while, irrespective of the low sickness reporting by the students.
- **3.** *Medical facilities:* College has engaged an experienced Lady Medical Officer for regular visits and consultation for the benefit of students and staff of the College. The MO is also available anytime on call. In addition, annual medical check-up is done for all the students without fail every year. First Aid boxes and FA services are available in the hostel round the clock and in the academic area during class hours and physical fitness activities. The College authorities have made arrangements with the following hospitals in the vicinity for any sick student or staff member to report and get cashless treatment anytime of the day.

They are: (i) Government Medical College Hospital, Thrissur, (ii) Jubilee Medical Centre (distance within 1 km), (iii) Amala Institute of Medical Sciences (9.5 km), (iv) Oushadhi Ayurveda Hospital (3.7 km), and (v) Aswini Hospital (4.5 km). Those who prefer medical assistance according to other systems of medicine like Homeopathy are also linked to nearby doctors for support to the St. Mary's community. Transportation facilities are available just on call, being in the middle of the city. Counselling facilities are also available and in addition, frequent interactions by Mentors too are arranged.

Further, college arranges training for yoga practice, meditation etc. for all those who are willing to join. Invited talks and presentations are arranged on several key health issues like Women health through Naturopathy; Reproductive health; TB awareness; Life Style diseases; Alzheimer's and related disorders; Liver diseases in Women, delivered by well known experts in the respective areas.

- **4.** *Healthy Food:* A number of health ensuring measures are taken at the Hostel Kitchen as it is the main supplier of food and beverages to the entire community in the college resident and visiting. Notable among them are:
 - (a) All the kitchen staff are provided with Health Card
 - (b) Health checking and regular vaccinations are given to kitchen staff as per regulations of FSSAI (Food Safety and Standards Authority of India)
 - (c) The dishwashing system is manual and vessels are sterilized by using hot water for every eating episode
 - (d) Dining Hall, Pantry and Kitchen halls are hygienically maintained in all respects and regularly inspected by FSSAI and Institutional Health Authority officials
 - (e) Kitchen in the hostel has modern equipment like Steam cooking facility, Electric Grinders (Wet and Dry), Machines for cutting vegetables, Refrigerators, Cold Storage, Heaters and Warmers etc.
 - (f) Cooking energy sources are: LPG, Biagas and partly Firewood, to have smoke-free cooking.
 - (g) Energy Efficient Stoves with proper Chimneys are only used
 - (h) Cleaning areas and Wash Basins are supported with hygienic liquid hand wash and sanitizers
 - (i) The entire kitchen and dining areas are tiled, neatly washable and having electric chimneys for proper exhaust. Storage area is also well ventilated with exhaust fans
 - (j) The dining area and the kitchen are cleaned with sterilizers at least three times a day
 - (k) The entire staff in the kitchen and dining areas use Apron, Headgear and Gloves
- **5.** *Wastes and Pollution:* Regarding the land, water and air pollution status, the college campus is free of any waste heaps or leaching waste deposits anywhere. The ambient air quality in the college and hostel campus is surprisingly good and

conducive to healthy living. This aspect is a creation of the campus community and the management, especially as it is in the middle of the city.

6. Achievements in Sports & Games:

Even as a college for women, with a high percentage – 88% - of girls commuting daily from home to college and back, the regular sports and games participation by the students is high. The College has won the Best Women's College in Sports prize from Calicut University in 2017-18.



Best Women's College in Sports Trophy of Calicut University

A number of sports women and athletes from St. Mary's Thrissur have been getting crowned year after year, and the practice continued during the audit year 2018-19 also:

- The Department of Physical Education organized the All Kerala Hockey Tournament – MARIAN CUP – at St. Mary's Sports Land. Mr. Loneal Thomas inaugurated the closing functions.
- 2. The International Yoga Day was observed in the college on June 21 by a large number of students performing Yoga in the Marian Hall.
- 3. The Calicut University Judo Championship was conducted in the VKN Menon Indoor Stadium.
- 4. A photographic exhibition on World Cup 2018 was organized in the college during the year.
- 5. In addition, a 'Predict & Win' Competition and 'Shoot Out' Competition were organized in the college in connection with the World Cup 2018.



Torch Bearers Riya T. C. - Gold medal in Senior National Power Lifting Championship & All India Inter University Championship (*Left*) Nithina N. - Gold medal in Senior National Water Polo Championship (*Right*)



Friendly Hockey match with Men's team from the city - Checkmate!

7. National Cadet Corps (NCC) activities:

The NCC wing in the college has 56 girls under 7 Kerala Girls Battalion NCC. Ms. Gladwino Ousjes is the Under Officer and Ms. Arsha EP and Ms. Hasna K serve as Sergeants.

Multifarious activities were organized by the NCC during the year, such as:

- 1. World Environment Day celebrated with cadets planting Mahogany trees in the College Sports land, followed by awareness classes by Cpl. Vismaya and Cpl. Joyce Davis.
- 2. On International Yoga Day 21.6.18 all cadets joined the college celebration by bringing in the cadets from Sacred Heart School too.
- 3. On the International Drug Abuse Day, NCC Unit of St. Mary's conducted awareness classes after oath taking by the cadets. A pencil drawing competition for the entire college was also organized.
- 4. On the Commemoration Day celebrations, jointly with the City Police, the Cadets participated in the Blood Donation Camp.
- 5. Rashtriya Ekta Diwas (30 Oct) was fittingly celebrated, with Col. H Padmanabhan inaugurating the events which included dance, patriotic songs and mime.



Cadet Maneesha At AITSC Tal Sainik Camp, New Delhi

- 6. This year, the 70th anniversary of NCC was celebrated on NCC day Dec. 1
- 7. College NCC devoted 100 hrs for Swachh Bharath activities which included Awareness Campaign, Village and College level rallies, Screening of Movies, Waste collection from houses and segregation, cleaning of streets, drains and back alleys, helping people make compost pits in their premises, creating value added products from wastes, poster making competition and banner making competitions on 'support Swachh India', and Angan wadi visits and door to door campaigns.
- 8. The NCC cadets of St. Mary's did commendable Flood Relief Work for 15 days from the day of *Maha Pralay a* starting from 15 Aug 2018 in various affected locations in Thrissur district. Activities included safely rehabilitating the affected families in relief camps; collecting, sorting, packing and loading essential materials for people under deluge; as well as post flood cleaning work in areas such as Adaat, Mulakunnathukavu and Tholoor villages. Also, helped the collection centre organized at Government Engineering College, Thrissur.
- 9. For the election, on 28.3.2019, 12 cadets conducted 'Flashmob' at Thrissur.
- 10. NCC Unit completed 35 regular parade sessions besides the above listed activities.



Kargil Vijay Diwas-NCC

11. The vibrancy of the NCC cadets is reflected in their selection to various national level camps and activities: Cadet Maneesha at AITSC, Delhi; UO Gladwino at EBSB Camp, Nasik (23 Dec to 3 Jan); Sgt. Arsha EP at Army Attachment Camp, Bengaluru (14 Oct - 29 act); Cdt. Sushmitha Vasu at IGC and EBSB camp at Kozhikode and Kanhangad (22 Dec - 2 Jan) and 30 cadets at ATC held in Vimala College, Thrissur.

All these were under constant mentoring by Col. H Padmanabhan, Officer Commanding, and Major Durga P Suresh.



Health education for St. Mary's girls: Partake in large numbers



Learning to maintain form in Yoga style

These exercises are to be noted as above ordinary performance of young girl students of a women's college in Kerala. Such a performance in physical culture is indicative of the maintenance of good health and cheer in the campus. The College appears to be caring for the environment and nurturing the nature through every facet of its activities.

In general, Health Auditing of 2018-19 of St. Mary's College, Thrissur, revealed conducive health environment with active participation by the students, befitting a Green Campus.

8. Accessibility and Gender Justice

During the Audit Year (2018-'19), student strength of St. Mary's College, Thrissur is 2007 – all girls. Students who stay in hostels are 230. Teaching staff strength is 109 (4 Male). The non-teaching staff strength of 49 is divided into 44 Female and 5 Male. Total Staff strength is 158. Total campus strength is 2165.

Accessibility: There are 11 (Eleven) differently-abled students studying this year in the college. All the buildings and their passage ways are accessible, with ramps constructed in most of the elevated access points for entry. The normal mobility requirement of students of students and the staff does not require provision of a lift. Students coming under this category and their mobility requirements are fully met in the campus.



The College took interest in delivering assistive technology products and services to the visually challenged in the community around. One instance was providing the latest 'smart cane' developed by IIT, Delhi and marketed now with subsidy to the blind persons at a function organized by St. Mary's College in Thrissur. This device helps in mobility of the visually challenged by communicating the nature and distance of obstacles in their way through 4 different kinds of vibrations felt by the holding palm.

Gender Justice: As is seen above, being a women's college, with limited number of male mentors (teachers, supporting staff, security staff and sports coaches) working in harmony to achieve the goals of the institution, girl students are well secure in the entire campus and are fully empowered. The team had monitored the empowerment and the confident nature of the girl students on several occasions within the campus during the audit year; also, through the team's Female Monitor of Gender Issues.

In academic records, project activities, and in outreach programmes, the girl students are showing exemplary leadership with better abilities to interact with the community around and the rural people, as well as with disadvantaged social groups.

Further, freedom of girls after college hours is examined to find that they have no constraints for participation in combined study, co-curricular and extra-curricular activities etc. It was found that girl students can spend time at play ground or canteen and shopping centres of their own choice under intimation to the supervising staff. Those who want to spend time in Library beyond working hours are granted access according to requirements. Apart from these, it is also observed that the St. Mary's girls are smart enough for all kinds of group activities including cultural programs and for those requiring physical exertion. It was also observed that in interaction sessions with guest speakers of high standing, several students asked pertinent questions and joined the discussions to the satisfaction of the several male dignitaries who blessed the occasions.

Social Service: St. Mary's students organized free eye testing camps with Ophthalmic doctors in village school at Kanimangalam; free eye camp with Malabar Eye Hospital, Thrissur at Pattikkad GLP School; Hair Donation Camp for Cancer Patients; several Blood Donation camps, Flood Relief activities, Flood Rehabilitation programmes, NCC and NSS camps in very remote areas that required voluntary actions during the year.



Unnat Bharat Abhiyan – Leveraging knowledge institutions to help build an Inclusive India. St. Mary's girls in 2019 participated in this initiative for transformational change in rural areas.

9. Outreach and Societal Commitment

The rating of a Higher Education institution can be high, only if its products are socially committed youths with extensive experience in working with native communities.



Blood Donation Camp at St. Mary's. College NSS conducted 3 such camps and 217 units of blood donated by 173 donors from among the students

It appears that with over 70 years of excellence in education that the College can boast of, the students are very active in societal interactions. A record 67 events were organized during the audit year, involving students from 11 departments.

Two major societal interactions that were done this year relate to the flood relief measures and the super dynamic blood donation camps. The unprecedented flood that also affected the district in which the college is situated, was promptly noted by the campus and student volunteers from NCC, NSS and others dotted the scene of rescue, relief and rehabilitation with round the clock vigil, sheltering, feeding and with other essential services. Under its *Abhay am* project, one house was built for a deserving flood victim family at Karikkuzhy, Chuvannamannu, PIN 680653.

The students were active in ecological improvements like tree planting drives, 5 in number, planting 112 saplings by 170 volunteers. Volunteers organized *Vriksha Mitra* programme, and several environmental enrichment programmes, in addition to creating butterfly gardens in schools etc. World AIDS day, World Stroke Day, Breast feeding Day,

World Environment Day, world Disability Day etc were observed with public celebrities also visiting the campus.

Kolazhy village is an adopted village of St. Mary's College, Thrissur and several activities that benefit the villagers are regularly organized there. During the audit year, Peringavu Village was also adopted as a Flood Affected Village and rebuilding programmes initiated there. There are two NSS Units in St. Mary's, Thrissur (Nos. 44 & 220) with 100 members. All the 100 members actively participated in all the programs organized during the year.



Outreach programme in which staff and students of St. Mary's reach out and interact with 'butterflies' in UP schools to arouse their 'wings of talents'.



Principal Sr. (Dr.) Magie Jose, CMC, receiving Trophy for outstanding Blood Donation activity



St. Mary's Outreach: Free Eye Clinic in Schools



Alumnae of St. Mary's join the current students in organizing free medical check-up in Primary schools around the city

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'Friday Routine' for the students and alumnae: Feeding bystanders in the district hospital. Food – free, prepared with love, compassion and care



Flood Relief Collection Centre at St. Mary's, Thrissur A backroom support team



2018 Flood Relief Centre at St. Mary's - Backroom ready to serve even at midnight

e-Literacy drive: 10 students and 2 teachers of the Department of Computer Science & Application of St. Mary's College, Thrissur, conducted a full day computer literacy workshop for the differently-abled students of St. Joseph's Special School, Cheroor on 28-01-2019. There were common, individual and entertainment sessions within the workshop to get the school children fall in love with the tools they are to use in everyday life and in their career in future. The e-literacy offers a quantum jump in the prospects of differently-abled becoming proficient in science and technology and later helps them better their career prospects.



St. Joseph's Special School, Cheroor



Getting to know their talents



Learning by leaps and bounds



Determined to master the skill



Cyclone Relief in Kodungalloor



Tribal women and children from Dahanu village of Maharashtra living with St. Mary's fraternity in Thrissur and interacting





Knitting together their broken lives - Sewing machines donated and training given





Students, Staff and also the Public can buy the in-house green produces

10. Carbon Footprint

Any environmental status examination of institutions or activities as well as of individuals, end up in knowing how heavy is the 'carbon foot print'. Carbon Footprint is a measure of the amount of carbon dioxide released into the atmosphere as a result of the activities of a particular individual, organization, or community. Among the varied descriptions given to explain carbon footprint, an acceptable definition is like this: *Carbon Footprint is the total amount of greenhouse gases produced directly and indirectly for supporting human activities, usually expressed in equivalent tons of* carbon *dioxide* (C02). The most common greenhouse gases (GHGs) in our environment are carbon dioxide, water vapour, methane, nitrous oxide and ozone.



How emissions (Carbon Footprints) arise (Source: University of Maryland Study Report)

Of all the greenhouse gases, carbon dioxide is the least harmful, but it is the most prominent greenhouse gas according to Intergovernmental Panel on Climate Change (IPCC), comprising 76% of all GHGs (globally) as seen in the illustration below:



[Source: IPCC 2014]

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In USA, during 2016, this percentage of C02 in GHGs was 81%. In the industry share of GHG, USA releases 30% of the global total. The release of C02 into the earth's environment through human activities is commonly known as carbon emissions and this total impact is called carbon footprint.

The name Carbon Footprint as a concept description, originated from the discussion on 'Ecological Footprint' advanced by William E. Rees and Mathis Wackernagel in the 1990s, while assessing the ability of earth to meet the excessive and increasingly enormous demands on resources of its population.

The Carbon Footprint (CF) is in fact, only a part of the ecological footprint. For creating awareness on the damages to environment on account of our own activities, the carbon footprint part was popularized by a campaign of BP (British Petroleum) in 2005.

Carbon footprint measures only the emissions of gases that cause climate change and therefore can be more accurately assessed than the ecological footprints. There are more than a dozen popular software tools known as 'CF calculator', freely available on the internet, and used by individuals and institutions to estimate the CF. These figures can then be used to remedy the damages. But, recently a comparative study by Christopher Weber of Carnegie Mellon University in USA came out with the finding that the calculation of carbon footprints for many products that we use often is a complex job.

This can be illustrated by looking at the smart mobile phones that a large percentage of the world population is currently, busy over-using. The data required for calculating its carbon footprint of such a phone will include CF on its production, shipment, technology used to make it, and the number of hours we use it, as well as on what all functions of the device are utilized. Our ability to accurately calculate the carbon footprint of a smart phone is therefore very limited. It will require too much time, energy and resources, and so it not worth the efforts.

Calculating the carbon footprint of an institution, industry, product, event, or service 1s to be understood as a complex task and the efforts at it should be commensurate with the purpose for which the knowledge so gained is to be applied. One tool currently popular is the LCA (Life Cycle Assessment) approach which looks at the product's impact for the whole life period of it. The ISO (The International Organization for Standardization) has for this, a standard called ISO 14040:2006 that has also the framework for conducting an LCA study. Another method is through the Greenhouse Gas (GHG) Protocol and the set of standards it has for tracking GHG emissions.

The Carbon Footprint calculation of a college like Mary's College, Thrissur for instance, is only to know whether or not the campus activities are making excess demands on the ecology of the campus and its surroundings, and to resort to remediation through possible 'reductions in consumption', and 'enlargement of carbon sinks' such as greenery. Here, the College can correctly remediate or attempt excess remediation, after roughly knowing the damages it is inflicting on the environment.

The important stakeholders like students, staff and the management can explore all means of reducing the 'consumption' that may result in higher emissions, increase the use of emission free energy forms, employ the 4R or 'reduce-reuse-recycle-refuse' strategy for wastes management, and expand the GHG absorbing/ sequestering technologies and greenery – to achieve a bit more than what is required as per the calculation. That will help the campus to continue to grow as a 'Greener Campus'.

Having noted that tedious procedures involving continuous monitoring throughout the year to obtain a precise measure of potential damages to the environment is not warranted, this audit will employ only empirical measures that will quantify the ecological footprint to reasonable accuracy and suggest simple remediation measures that will help neutralise the impacts completely. Also, take the positives even a shade higher than that is required. As the major contributors of damaging impacts are the increased population, their nature of consumption, and transportation requiring fossil fuels, the approach taken for this Green Audit is to use empirical constants on the quantities arrived at for the major contributors. Also, remediation will be based on expanding the potential positives present in the campus.

Creating awareness to the entire campus community on these and getting them to volunteer to contribute will be an effortless change in lifestyle, on which the institution as a whole can feel contended.

Data Obtained from Component Audits

Component Audits are in the foregoing chapters from 1 to 9. It was stated therein that the carbon footprints of each category of activity will be assessed in Chapter 10. These component audit findings give us the following data:

- 1. The area covering the higher education institution/college
- 2. The total number of persons (students, teachers, other members of staff, visitors including parents and guests) involved in normal functioning of the institution
- 3. The number of people resident in the campus
- 4. The type and number of vehicles normally used for transportation
- 5. The forms and quantity of energy used in the campus and their origin
- 6. The amount of water, food materials, stationeries etc. consumed and energy used for providing them
- 7. The amount of wastes including food waste
- 8. Amenities provided in the campus and their contribution to emissions

On the positive side:

- 1. The biodiversity in the campus and their potential to remediate GHG emissions
- 2. The 'carbon positive' (renewable) energy generation within the campus
- 3. The amount of recycling/ reuse of resources
- 4. The type of waste management resorted to
- 5. Water harvesting, water management and waste reduction approaches

Assumptions:

The following assumptions based on well researched and globally accepted empirical procedures, are used for assessing the carbon footprint as well as for determining the remediation measures:

- 1. The coefficients taken are as per IPCC, International Energy Agency, India's BEE or United Nations' FAO [in case of food related ones] as well as from India specific studies by Research Institutions
- 2. The carbon emitted by a car while consuming 1 litre of petrol to be taken as 2.3 kg C02 and if on 1 litre of diesel as 2.68 kg C02
- 3. Average distance covered by a car per litre of petrol in cities as 10 km
- 4. The km run by a bus as 4 km/L of diesel in towns and cities
- 5. For per capita carbon footprint calculation, a bus is assumed to have 50 passengers
- 6. An auto riksha running is assumed to get 16 km/litre of petrol
- 7. Two wheelers are expected to get 50 km/litre of Petrol
- 8. Carbon absorption capacity of one full-grown tree as 6.8 kg C02
- 9. Carbon absorption capacity of semi-grown trees as 50% of that of full grown
- 10. Carbon absorption of bush plants varies widely according to the species. Certain bushes absorb as high as 49,000 g C02 per plant, whereas some others absorb as low as 150 g C02 per plant. As a general guide, the per-plant carbon absorption is assumed as 200 g C02
- 11. The carbon absorption capacity of a 10-sq.ft. area of lawn is 1 g C02 per day
- 12.A person uses about 550 litre of pure oxygen each day (according to Arbor Day Foundation)
- 13. Paper is assumed to be of density 80 gsm (average)
- 14. Firewood is assumed to have not more than 10-20% moisture before burning
- 15. Contribution of Events & Festivals in the campus is based on the no. of events, persons (pax) participating and extent of festivities with high emission levels

Carbon Footprint Assessment Required:

The following activity related carbon footprints are to be assessed based on data available from component audits in the previous chapters. See Table – 9.

- 1. Carbon Footprint due to energy use
 - a) Electricity use including for water pumping, water purification and waste water treatment
 - b) Use of Fossil fuels like Diesel, Petrol, LPG etc.
 - c) Use of Firewood
- 2. Carbon Footprint due to production of Wastes
 - a) Food Waste
 - b) Paper use & Paper waste
 - c) Waste water
 - d) Other wastes (e-wastes, hazardous wastes etc., if any)

- 3. Carbon Footprint due to Transportation needs
 - a) Day scholars commuting between home and college
 - b) Staff & Students weekly/quarterly travel to and fro home
 - c) Use of Cars & Taxis by Staff, Parents, Management and others
 - d) Auto Rikshas (3-wheelers) hired
 - e) 2 wheelers Students and Staff
- 4. Carbon Foot print due to Events and Festivals within the campus

Remediation Available and/or Created [See Table – 10]

- 1. Due to increased use of renewable energy (RE)
 - a) Solar PV electricity
 - b) Solar Hot Water
 - c) Wind energy
 - d) Biagas
 - e) Micro Hydro Power & Other
- 2. Due to energy efficiency improvement
 - a) Replacement of old tube lights
 - b) Replacement of incandescent bulbs & CFLs
 - c) Replacement of Fans/Motors etc.
 - d) Up grading of UPS network
 - e) Phantom load reduction
 - f) Other means
- 3. Due to waste reduction, recycling and waste to energy projects
 - a) Waste Reduction
 - b) Recycling
 - c) Waste to Energy
- 4. Due to innovations in transportation
 - a) Sharing of Vehicles
 - b) Adopting Means of low CF travel options
 - c) Others like introduction of electric vehicles/ Solar autos, boats etc.
- 5. Due to biologic means
 - a) Conservation of existing greenery
 - b) Tree plantation & Biodiversity conservation (new)
 - c) Gardening, including lawns and hedges
- 6. Due to 'Outreach' for Promotion of Green Living

The CF calculated by the above consideration has to be brought into a Balance Sheet, where the remediation available is shown as compensation provided. The difference between these will indicate the amount of remediation to be planned and implemented in the coming years.

Having assessed the maximum carbon footprint in terms of Tons of C02 equivalent, the next step is to assess the remediation available and see how far it will compensate for the damages to the environment.

Sl. No:	Source	Rate	Quantity x Days/year	Total Quantity	Annual Eqvt. C02
1.a	Electricityuse	0.82 kgC02/kWh		100 7 100	150 65 600
		(India in 2018)		190.7 MWh	152.6 I C02
1.b	Fossil fuel use	2.68 kgC02eq/kg	LPG (126x19+142 kg)	2.536 T	6.8 T C02
1.c	Firewood	1.65-1.8kgC02eq/kg		8.0 T	14.4 T C02
2.a	Food waste	1.9 kgC02eq/kg	25.0x200	5.0 T	9.5 T C02
2.b	Paper waste	1.725kgC02eq / kg	20.0x250*	5.0 T	8.6 T C02
2.c	Water waste	0.298kgC02eq/ kL	29.0x250	7,250 kL	2.2 T C02
2.d	Plastic/Other	6.0kgC02eq/kg	2.0x250	500 kg	3.0 T C02
3.a	Bus-students	2.68 kgC02eq/ L		43,000 L	115.2 T C02
3.b	Staff, Students travel home	2.68 kgC02eq/ L	200x3x250 /4x50	750 L	2.1 T C02
3.c	Cars, Taxis	2.30 kgC02eq/ L	{12x16}x200/ 20	1,920 L	4.4 T C02
3.d	Auto rickshaws	2.68 kgC02eq/ L	25x3x250/ 16	1,172 L	3.1 T C02
3.e	Two wheelers	2.30 kgC02eq/L	32x10x250/50	1600 L	3.7 T C02
4	Events, Festivals	Annrox.	1000x3x1.2	3,600 kg	9.7 T C02
5	Construction	Lump sum		Nil	0.0
	Total				335.3 T C02

Calculation of Carbon Footprint

*No. of activity days in a year assumed at 250.

Table 9: Calculation of Carbon Footprint Source-wise

S1. No:	Source	Rate	Quantity x Days/year	Total Quantity	Annual Eqvt. Saved C02
1	1.a. Solar PV electricity	0.82	51.2 kW SPV	46.0 MWh	37.7 T C02
	1.b. Solar Hot Water	kgC02/kWh	2000 LPD	29.2 MWh	23.9 T C02
	1.c. Wind energy		None	Nil	-
	1.d. Biogas	1.34/kg	365x 15x 3m3	10.7 kg	14.4 T C02
	l.e. Micro Hydro Power, other		None	Nil	
2	2.a. Replacing old tube lights		Limited		1.0 T C02
	2.b. Replacing bulbs & CFLs		Limited		0.5 T C02
	2.c. Replacing Fans, Motors		None		
	2.d. UPS Upgradation		None		
	2.e. Reduce Phantom load		None		
3	3.a. Waste Reduction	0.26	29 kL/day	10,585 kL	2.8 T C02
	3.b. Recycling	kgC02/ kL	None		
	3.c. Waste to Energy	-	None		
4	4.a. Sharing of vehicles		None		
	4.b. Low footprint options		Yes, small		
	4.c. Electric/Solar vehicles		None		
5	5.a. Greenery forest retained	Nil	Per acre/yr.		
	5.b. Tree planting, Biodiversity	22kg/yr	Total 400	8.8 T	8.8 T C02
	5.c. Gardens, Lawns etc.	2200 kg		0.5 acre	1.1 T C02
6	6.Walking & bicycle use (300)	2.68 kg/ L	300x250/ 50x4	375 kg	1.0 T C02
		avoided			
7	7. Outreach activities	22 kg/yr	240 trees	50%	2.6 T C02
	Total				93.8 T C02

Remediation for Carbon Footprint

Table 10: Remediation for Carbon Footprints: available/ created

The International Organization for Standardization (ISO) also provides some general standards for

- Greenhouse gas emissions at organisation level (ISO 14064 1) and
- Greenhouse gas emissions at project level (ISO 14064 2).
- Specifications to validate and verify relevant accountings are documented in (ISO 14064 3).

Carbon Footprint Analysis and Evaluation

The per capita carbon footprint for the St. Mary's College, Thrissur, Kerala, is 155 kg (0.155 Ton) of C02 equivalent [335.3 Ton/2165 persons] (*See Table 9*), and a part of it (28%) is compensated by remedial routes adopted by the college. The net carbon footprint during 2018-'19 is thus [335.3-93.8 = 241.5 T C02]. Therefore effective CF for the year is 241.5/2165 or 0.112 T or 112 kg of C02.

According to the Economic Survey of Govt. of India 2009 -10, the per capita emission for an Indian was 1.2 ton C02 _{eq.} per annum. In the same report, it was projected that this will go up to 2.0 – 2.5 T of C02 by 2020 and to 3.0 – 3.5 T of C02 by 2030. In the year 2018-19, for St. Mary's College, Thrissur, the Carbon Footprint per capita at 0.112 T C02equivalent, is almost less than 5% of the benchmark (national average for 2018). According to OECD's study, India remained the 3rd largest contributor of C02 (2076.83 MT out of global total of 32,314.20 MT). The Hindu Business Line magazine estimated India's C02 contribution in 2018 as 2239 MT, positioning India as the fourth largest emitter globally. The comparison of college CF above, is based on the latest 2018 data from The Hindu study.

The campus can therefore be treated as of 'low carbon footprint' and thus a 'Green Campus'

CF Balance

The remediation gap between the assessed footprint and available remediation is 335.3 minus 93.8, equal to 241.5 Ton CO2 eq for 2018-19.

- On closer look, the major contributors are:
- 1. Use of Purchased Electricity (152.6 T);
- 2. Daily Bus journey by 1600 day scholars (115.2 T);
- 3. The use of Firewood and LPG for cooking (21.4 T).

A total of – 240 Ton C02 eq is seen left uncompensated in spite of having a 50 kW Solar PV plant installed as roof top system. However, there are several opportunities for bringing it down. The remediation routes can be up scaled to arrive at a net zero or net positive campus. For example, if the existing 50 kW SPV system is improved by proper stringing to get the full output and an additional 50 kW is added, the entire CF due to use of electricity will be wiped off and energy wise, the campus will become net positive – generating more than it consumes! Also, through energy efficient lighting devices, the electricity consumption can be substantially reduced.

SWOT Analysis and Future Directions

SWOT is an acronym very common in management studies, used to identify strengths, weaknesses, opportunities, and threats related to project planning or running an initiative like a business, industry or campaign. Strengths and Weaknesses are actually internal traits of the institution, and Opportunities and Threats arise from the external environment. But, all these are capable of influencing the greening activities of the College.

- o *Strengths* are aspects of the initiative that will give it some positive advantages
- 0 Weaknesses are factors that will adversely affect progress of the project
- o Opportunities are the exploitable windows helpful for the success of the initiative
- o Threats are elements in the environment that could cause trouble for the project

SWOT approach was introduced originally at the Stanford Research Institute, USA, during the 1960s. For community work and educational activities, it can be useful as a tool to identify positive and negative factors within the organization that will promote or limit effective implementation of social services. The SWOT analysis for any activity, however, is only an initial part of the planning process and is not a tool that will directly drive us to action. Through this analysis, it is intended to discover the shortest route to reduction of carbon footprint of the education institution, and for making it possible for the College to be a "net positive" green campus.

After the SWOT analysis is completed, the College should turn the SWOT list into a series of suggestions to consider critically all the elements of its strategic plan to achieve a higher shade of green for the campus.

Strengths and Weaknesses (Factors within the organization- internal)

•	Human resources	: Staff, students, volunteers, PTA, nearby NGOs, public
•	Physical resources	: Location, land, building, equipment
•	Financial	: Grants, funding agencies, other sources of income
•	Activities and processes	: Green Protocol, programs, services rendered
•	Past experiences	: Learning tools, reputation of the College in the community

Opportunities and Threats (Factors related to group/community/society - external)

•	Future trends	: What is in the horizon or what is expected shortly
•	The economy	: Own, local, national, or other
•	Funding sources	: Own, donors, governments, subsidies and incentives
•	Demographics	: Change of players - students & staff joining and leaving
•	Physical environment	: Sensitivities related to locality, political and public support
•	Legislation	: Change in government policies, regulatory controls, rule

While conducting this SWOT analysis, the team has tried to understand the group of people involved in the regular working of this educational institution through listening campaigns, interviews with staff and students, as well as through brainstorming exercises with the student volunteers – the Green Guardians Club members.

Careful data collection was also carried out using specially prepared questionnaires. Results of such a 'needs and assets' assessment is used to arrange the SWOT matrix presented.
St. Mary's College, Thrissur - Green Audit Report 2018-19

SWOT Matrix for a "Greener St. Mary's College"

S	W
Strengths	Weaknesses
 P> The college community practices a Green Protocol and the newcomers are fastidiously following it P> The college is using renewable energy technologies - Solar electricity and biogas - for over 3 years P> Students and Staff are helping in having a litter free campus P> Rain Water Harvesting, Waste reduction and conversion to useful products etc. are initiated P> Medicinal Garden established P> The College Green Guardians Club is established and active P> Proper community links for outreach activities are in position and expanded 	 Due to location inside a small busy municipal corporation, with only limited land area, expansion of greening activity has space Constraints Only 12% of the students are staying in the campus Lion share of students are in the campus only during college working hours, limiting their inputs for greening during their free time Due to the wide variety of courses having different patterns of training during working hours, sensitization and awareness creation have to be mainly thro' the departments
0	Т
Opportunities	Threats
 There is ample opportunity for expanding the use of renewable energy and for wiping off the carbon footprint gap completely There is large scope for improving energy efficiency in the academic and hostel areas Improvements to the existing old buildings when attempted can follow the Green route to achieve resources conservation Tree plantation with Biodiversity expansion is in the minds of St. Mary's community and the teachers have long experience in developing havens of greenery 	The majority of students remain in the campus only for 2 or 3 years and so, repeating the campaigns and training tend to cost more Having a large number of day scholars tend to increase the carbon footprint due to daily use of public transport The increase in the types and quantum of e-wastes, for which set up for safe disposal is lacking in the country, is a threat to be tackled at Management level Climate change impacts in urban spaces tend towards reduction in potable water availability and since the college has to house afflicted families during times of calamities, uncertainty in carbon footprint reduction will remain

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Objectives: The following are the objectives that were set in mind as obtainable from the SWOT analysis for helping the college management to prepare a strategic plan for making the campus greener than before and simultaneously for creating awareness among the students on the need for a national effort to bring down the calamitous consumption habit:

- Decide on the directions that will be most effective to proceed with
- Reveal possibilities and limitations for the intended change
- Identify barriers that will limit the objectives
- Explore new solutions to problems
- Re-look at plans to navigate the students and staff to get the best results

The management should take the SWOT analysis observations just as a snapshot of all the four parameters as of now, and only for discussion with staff members, students and parents. As both the internal and external environments are liable to change from time to time, it is necessary to review the scenario again - just before the implementation starts.

Future Directions and Search for New Opportunities

The assessment of carbon footprint of the campus and the SWOT analysis give us three areas, where more attention is to be bestowed. They are: 1. Reduction in the use of purchased electricity; 2. Reduction in fossil fuel based transportation, cooking and standby power; and 3. Expansion of greenery through community interaction and persuading them to join the climate resiliency efforts.

Towards this,

- a. Energy efficiency improvement measures such as accelerated introduction of LED bulbs and tubes, replacement of older fans with five star or BLDC (brush less direct current) fans, replacement of refrigerators with inverter fridges, changing of older pumps and redoing of piping plan to bring down pumping losses etc., shall be embraced in a phased manner. A registry of all lights, fans and pumps may be prepared and a phased replacement strategy worked out with cost-benefits estimated.
- b. On expanding renewable energy system such as Solar PV, the campus has 50 plus kW of solar power already. If an additional 50 kW of SPV is added in at least two stages, the entire carbon footprint due to electricity use can be compensated. Energy efficiency improvement as above also will bring down the present energy demand, and support this initiative.
- c. Biagas for water heating and cooking can be a good supplement to cooking energy supply. The number of cylinders of LPG currently used can be brought down significantly through higher biogas production. An in-depth study to integrate all inputs in the hostel area to run a single high performance biogas plant (which will give unfailing methane stream) which can also give 30% increase in gas volume may be considered and cost-benefit worked out; and if found profitable, may switch over to such a set up.
- d. It is not possible to cut down on the use of buses for day scholars to commute daily for bringing down carbon footprint on account of transportation fossil fuel. Instead, adequate compensatory afforestation / tree planting may be ensured. Miyawaki forest patch/ es will be an attractive initiative - being a city college.

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- e. Through the outreach activities, planting of trees can continue unabatedly within the campus and extended to offshore sites in villages and towns within the reach of the college (like, in the homesteads and community around the homes of day scholars and teachers).
- f. Biodiversity development as indicated in the Biodiversity chapter (Chapter 4) will add extra benefit of attracting symbiotic living forms with the planted trees, ensuring sustainability of the ecosystem in the campus.
- g. It is also appropriate to have an up-to-date Green Policy formulated in place of the Green Protocol adopted for the campus and vigorously pursued, including for all events in the campus.



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