ENVIRONMENT AUDIT

STUDY PERIOD (TWO YEARS) 2021 – 2022 & 2022 - 2023

Sustainability study

AUDIT REPORT

Studied for

Acharya Prafulla Chandra Roy Government College

Himachal Vihar, Matigara, Siliguri - 734 010, District Darjeeling (West Bengal), India

Studied in the capacity of

Accredited and Certified

Green Building Professional

Studied by

Website: https://thegreenviosolutions.co.in/

Email: greenviosolutions@gmail.com

Valid till 31 May 2024

Background reference image Nic Y C Gua on unsplash

Disclaimer

The Audit Team has prepared this report for the **Acharya Prafulla Chandra Roy Government College** located at *Himachal Vihar, Matigara, Siliguri - 734 010, District Darjeeling (West Bengal), India* based on input data submitted by the College analysed by the team to the best of their abilities.

The details have been consolidated and thoroughly studied as per the various guidelines for Green Buildings available in National and International Standards; the report has been generated based on comparative analysis of the existing facilities and the prerequisites formulated by various standards. The inputs derived are a result of the inspection and research. These will further enhance and develop a Healthy and Sustainable Institution.

These can be implemented phase wise or as a whole depending on the decision taken by the Hon'ble Management and College. The warranty or undertaking, expressed or implied is made and no responsibility is accepted by Audit Team in this report or for any direct or consequential loss arising from any use of the information, statements or forecasts in the report.

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The Report is prepared by the Team of Greenvio Solutions under their brand and department – Sustainable Academe as Consultancy firm with the Project Head - Ar. Nahida Shaikh who is as an Accredited and Certified Green Building Professional-Architect. Green Building consultancy is her forte and she is one of the most sought after names when it comes to providing excellent quality services within the stipulated time frame.

The Study is conducted in capacity of Accredited & Certified Green Building Professional with extensive experience.

Greenvio Solutions

Developing Healthy and Sustainable Environments

We are an Environmental and Architectural Design Consultancy firm

Sustainable Academe is our department for conducting Audits

Palghar District, Maharashtra- 401208

sustainableacademe@gmail.com

Acknowledgement

The Audit Assessment Team thanks the **Acharya Prafulla Chandra Roy Government College, West Bengal** for assigning this important work of Environment Audit. We appreciate the cooperation extended to our team during the entire process.

Our special thanks are extended are due to **everyone from the Governing body.**

Our heartfelt thanks are extended to the Chairperson of the entire process **Dr. Mayukh Sarker** (Officer-in-Charge) for the valuable inputs.

We are also thankful to College's Task force the faculty members who have played a major role in data collection – **Ms.Mandira Ghissing** (Assistant Professor) *(Special mention for the excellent coordination)*; **Smt. Smriti Singh** (Assistant Professor) and **Dr. Kartick Chandra Dey** (Associate Professor and Coordinator, IQAC).

We highly appreciate the assistance of the **entire Teaching, Non-teaching, and Admin staff** for their support while collecting the data.

Sustainable Academe
Brand of Greenvio Solutions, Palghar District, Maharashtra- 401208

Contents

1. Introduction

1.1 About the Institution

A.P.C. Roy Govt. College was established on 21st July 2010 to cater to the educational needs of this region. This is the second Govt. College of its kind in Darjeeling district and third in North Bengal.

The College is named after the legendary personality in the field of science Acharya Prafulla Chandra Roy who is hailed as the father of Indian Chemistry, a visionary and a great educationist.

It is hoped in all sincerity that this nascent institution will go a long way in carrying forward the noble vision of this great soul.

1.2 About the statements of the Institute

1.2.1 Vision

The College proposes

- *To fulfil the educational aspirations of the region of North Bengal, this is in many ways cut off from the mainstreams of learning.*
- *A large segment of the population of North Bengal is economically backward and some of the people of the region are well below poverty line with the unfortunate result that quality education is denied to them.*
- *To recognise the innate potential of students and to enrich these abilities to enable them to meet any challenges in their chosen field.*
- *To make quality higher education affordable to the less privileged sections of the society with further hope that this college does not become merely a training centre to train students to answer a few selected questions but an institution with a vision committed to the all-round development of the students so that they emerge as good and successful human beings.*

1.2.2 Mission

The College adheres and focuses towards:

- *To promote capacity-building and all-inclusive development through a quality teaching-learning process.*
- *Holistic education is one that stresses the importance of knowledge of a specific subject with equal amount of emphasis upon the instilling of moral values.*
- *To promote equity by empowering and encouraging women students, students from disadvantaged groups and differently abled students.*
- *To bestow students with human values and social responsibilities this would allow them to become honest and responsible citizens of the country and would be able to meet all kinds of challenges in the future.*

1.2.3 Aim

The College has formulated the following aim to achieve its mission:

Holistic learning - The institution promotes capacity-building and all-inclusive development through a quality teaching-learning process.

1.2.4 Motto

The College channelizes its efforts towards the motto of:

"Culture of knowledge and acquisition of power."

1.2.5 Objectives

The objective of the College is:

- *To fulfil the educational aspirations of the economically backward students of this particular region, which is in many ways cut off from the mainstreams of learning and to acknowledge the innate potential of students*
- *To enrich these abilities to enable them to meet any challenges in their chosen field.*

1.3 About the Institute building

The magnificent college building is situated at Himachal Vihar, the foothills of the district offering an unobstructed view of the hills, away from the noise of the city and yet not too far, in an environment that is serene and highly conductive to teaching and learning.

The College building is constructed by **S.J.D.A. (Siliguri Jalpaiguri Development Authority)** funded by the Govt. of West Bengal.

The spacious class rooms are highly lighted and well-furnished and so are the sufficiently equipped laboratories.

Library is the heart of every educational institution. The College library though in its formative stage has adequate number of books to meet the academic needs of teachers as well as students.

1.4 Assessment of the Institute

1.4.1 Affiliations

The Institute is affiliated to **University of North Bengal,** a public state collegiate major research university in North Bengal region of West Bengal, which is located in Raja Rammohanpur, Siliguri, Darjeeling district, in the Indian state of West Bengal

1.4.2 Certification

The College has received AISHE – The All India Survey of Higher Education code is C - 45353.

1.4.3 Recognitions

The College has upgraded in the teaching level – Under graduate to Post graduate in the **section 2(f)** (Order No.8-454/2011 (CPP-I/C) dated 12/08/2011) **and section 12 (B)** (Order No. 8- 386/2015 (CPP-I/C) dated 05/07/2016) **of the University Grants Council Act, 1956** Govt. of India, New Delhi.

2. Overview

2.1 Summarised Populace analysis for 2022-2023

2.1.1 Students data

The data (shared by the Institute) shows there were a total of **339 male and 450 female students.**

2.1.2 Staff data

S. No.	Type	Male	Female	Total
1	Teaching staff	27	14	41
2	Non-Teaching staff	08	03	11
Total Staff Members		**35**	**17**	**52**

Table 1: Staff data of the Institution for 2022-2023

The staff data shows the College premises had a total of **52 Staff Members.**

2.2 Summarised Populace analysis for 2021-2022

2.2.1 Students data

The data (shared by the Institute) shows there were a total of **344 male and 434 female students.**

2.2.2 Staff data

S. No.	Type	Male	Female	Total
1	Teaching staff	25	16	41
2	Non-Teaching staff	08	03	11
Total Staff Members		**33**	**19**	**52**

Table 2: Staff data of the Institution for 2021-2022

The staff data shows the College premises had a total of **52 Staff Members.**

2.3 Total College Area & College Building Spread Area

The **site area is 2.1 acres** and the **Built-up area is 86,111.28 sq. ft.** for an approximately **841 footfalls.**

2.4 Institute Infrastructure

2.4.1 Establishment

The Institute was established in **2010**.

2.4.2 Spatial Organisation

There are provisions for staircase for accessibility on the premises, whereas there are amenities such as CCTV, a first aid room, etc.

The Institute is located prettyclose to nature and hence has a very fresh environment which is absolutely pollution free and healthy.

The Building is a Reinforced Cement Concrete (RCC) framework building.

3. Research

3.1 About the Green Building Study Audit

It is a systematic study of the aspects which make the Institution sustainable and healthy premises for its inhabitants.

3.2 Analysis of the Green Building Study Audit

The procedure included detailed verification as follows:

- Investigation
- Technical discussion with team
- Observations
- Inferences

3.3 Strategy adopted for Green Building Study Audit

The strategies included data collection from the admin department, actual inventory, investigation to check the operation and maintenance, analysis of the data collection, and preparation of the Report.

3.4 Activities undertaken for the Green Building Study Audit

- Discussion with the Institute
- Allotment and Initiation by the Institute
- Data collection
- Submission of the files

4. Observation

Survey Results

An online survey was conducted to analyse the student and staff views about the Energy management practices adopted in College, following is the result received.

4.1 Participation

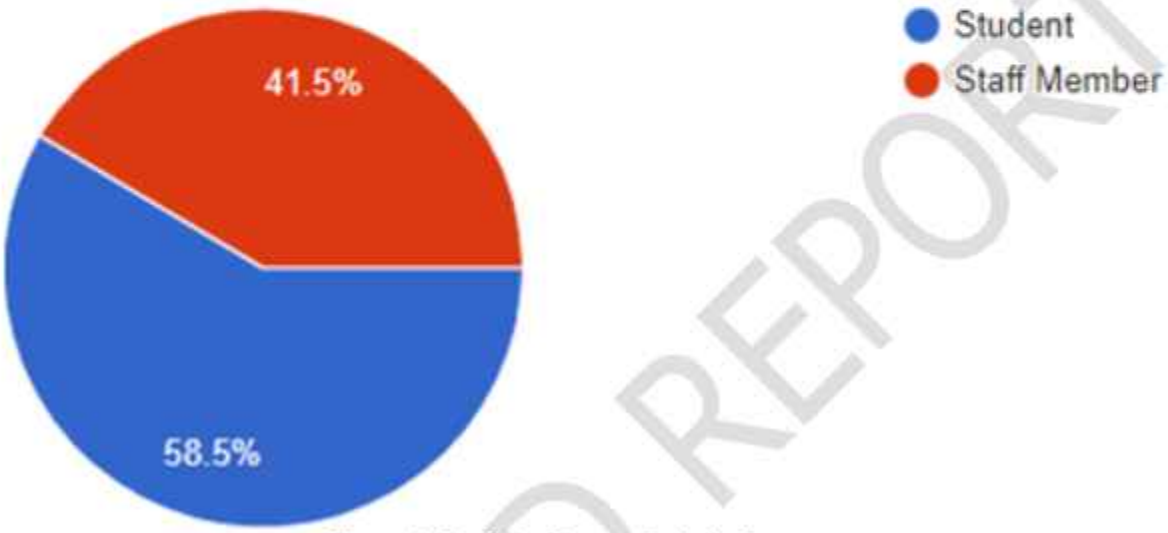


Figure 1: Participation analysis in the survey

A total of **94 responses** were received out of which 59% were students.

4.2 Mode of commute to the Institute

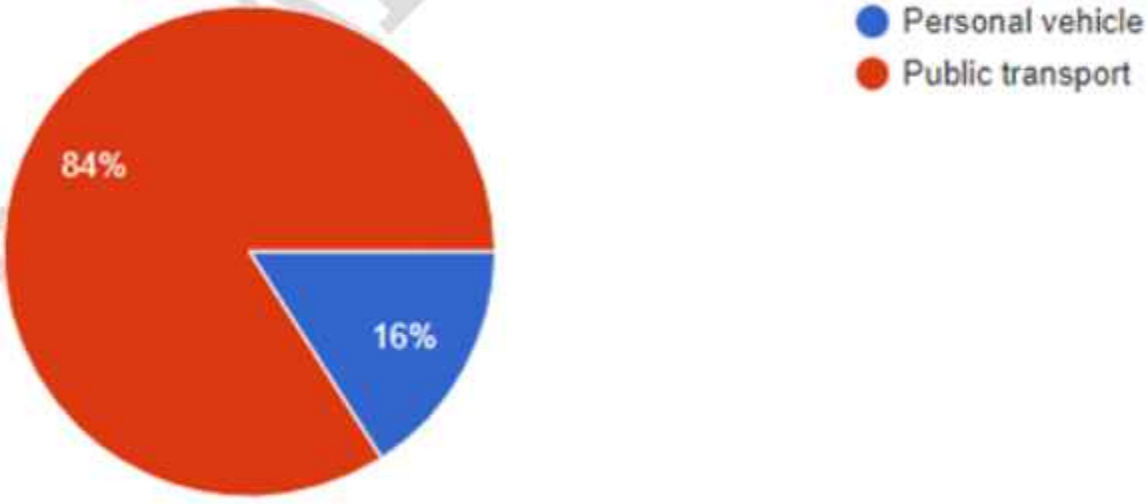


Figure 2: Mode of commute to the Institute

Around **84% of responses** *confirmed public transport as their mode of commute*, since this result is more than 75% this is a good practice.

4.3 Mode of travel to the Institute

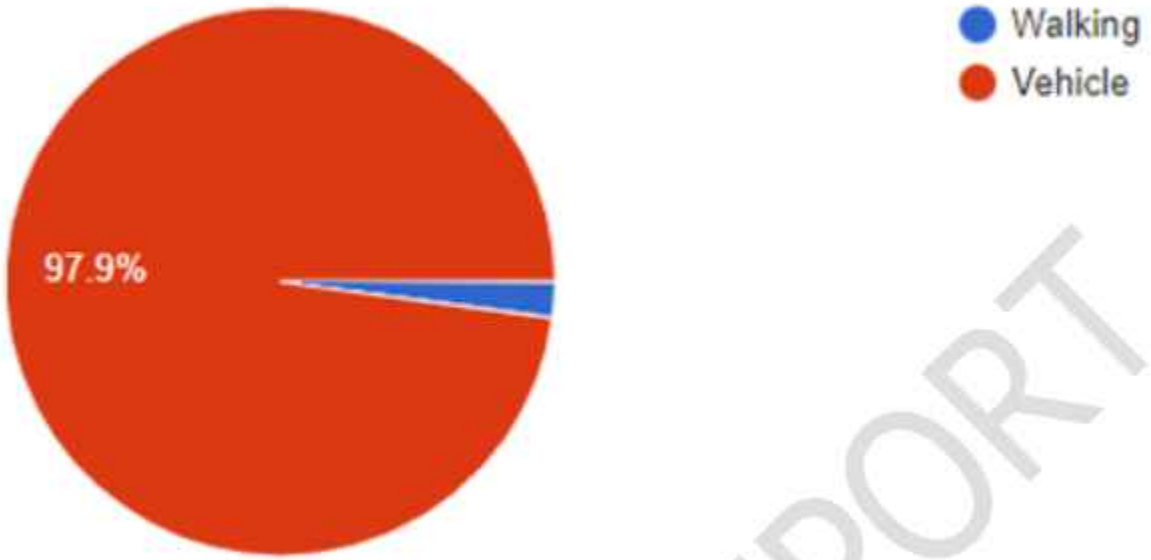


Figure 3: Mode of travel to the Institute

Around **98% of responses** *confirmed the use of vehicle as their mode of travel*, since this result is more than 75% this emphasis on carbon footprint contribution by the stakeholders.

4.4 Use of E-vehicle for commute to the Institute

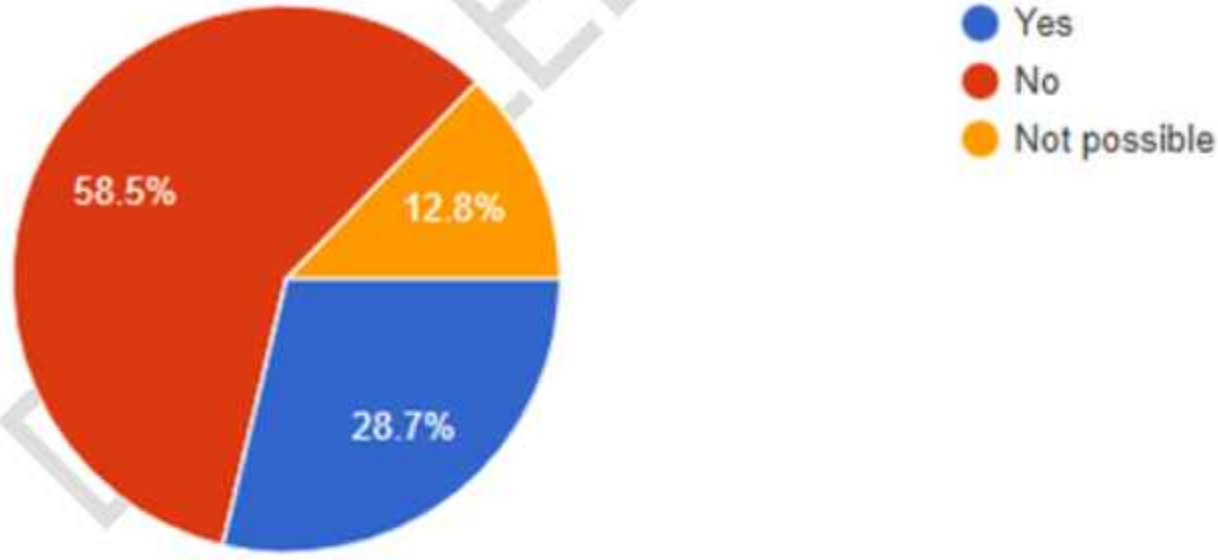


Figure 4: Use of E-vehicle for commute to the Institute

Around **29% of responses** *confirmed the use of E-vehicle as their mode of travel*, since this result is more than 25% this emphasis on good practices by the stakeholders.

5. Documentation

5.1 Open Spaces

There is an open space used by students at present for sports and cultural gatherings. **There are provisions for natural plantations enhancing the beauty of the space.**

5.2 Flora audit

A flora survey was carried out to identify the total numbers of plants and trees. The flora survey is common for the entire campus as documented below.

S. No.	Plant name	Type	Nos.	Planted by
1	*Anthocephalus kadamba*	Tree	1	Planted by staff
2	*Thuja occidentalis*	Tree	50	Planted by staff
3	*Delonix regia*	Tree	5	Planted by staff
4	*Lagerstroemia speciosa*	Tree	5	Planted by staff
5	*Azadirachta indica*	Tree	1	Planted by staff
6	*Mimusops elengi*	Tree	6	Planted by staff
7	*Araucaria columnaris*	Tree	2	Planted by staff
8	*Ziziphus mauritiana*	Tree	2	Planted by staff
9	*Polyalthia longifolia*	Tree	12	Planted by staff
10	*Acacia auriculiformis*	Tree	3	Planted by staff
11	*Bauhinia acuminata*	Shrub	1	Planted by staff
12	*Gmelina arborea*	Tree	1	Planted by staff
13	*Peltophorum pterocarpum*	Tree	2	Planted by staff
14	*Citrus aurantifolia*	Shrubby tree	2	Planted by staff
15	Ixora coccinea	Shrub	1	Planted by staff
16	*Nerium odoratum*	Shrub	2	Planted by staff
17	*Cascabela thevetia*	Shrub	1	Planted by staff
18	*Bombax ceiba*	Tree	2	Planted by staff
19	*Cassia ferruginea*	Tree	2	Planted by staff
20	*Caesalpinia pulcherrima*	Shrub	4	Planted by staff

Table 3: Details of the Flora in the premises

At present there are 105 numbers of plantations comprising of plants, trees, shrubs. Timely maintenance and care has resulted in positive benefits for the surroundings.

5.3 Fauna audit

The details of the fauna available in the premises are documented below:

Fauna available	Names
Insects	Lepidopterans, Cabbage White, Peacock pansy, Grey pansy, Striped tiger and Small grass yellow bugs
Others	Fruit Fly, Earthworm, Garden Snail, Millipede and Indian ornamental tree spider
Amphibians	Common Indian Toad, Indian Pond Frog, Indian Bull Frog, Common Tree Frog, Tylototriton Himalayanus and Spotted Tree Frog
Mammals	Zebu (Cow), Common Cat, Goat and House mouse (rodent)
Hemipterans	Green stink bug, Stainer, Water scorpion, Water strider, Orthoptera, Grasshopper, Coleopteran and Asian Lady beetle

Table 4: Details of the fauna in the premises

The premise has a beautiful and rich fauna; it enhances the co-existence and provides a fresh environment for the premises.

5.4 Noise Audit

On a macro level the College is surrounded by public buildings and minimal residential blocks **thus there is a peaceful and noise free arena observed inside the premises.**

5.5 Carbon Footprint Audit

5.5.1 Eco-friendly Commuting Practices

- The site is located in a semi-rural locality.
- Overall, the carbon footprint is well under control.
- Students and staff members commute using public transport.
- There are no major fossil fuels used inside the premises.

5.5.2 Heat Island Reduction

In summer 2023 had been the reason to keep the educational institutes closed for a while in the entire district as directed by the State Government owing to severe heat wave situation in the country. The said Institute too fell under this decision owing to the natural condition.

Certain measures have to be taken to keep outdoor temperatures under control.

5.5.3 Outdoor Light Pollution Study

The College compound lights are not upward looking thus, these do not cause light pollution.

5.6 Universally accessible premises

As per World Report on Disability, 2011 there are 180 million approx. Persons with Disabilities that makes it 15% of total population of India.

The following facilities are available on the premises for the specially-abled as part of universally accessible premises initiatives.

- Low height risers in the staircases
- Non-slippery floor surfaces
- Handrails for support – This should be extended to all blocks
- Ramps at the entrance of only one block – This has to be extended to all blocks
- Universal toilet – The current toilet should be upgraded with appropriate amenities including grab bars, hand rails etc.

5.7 Fire Safety

Fire and life safety are an important consideration of the National Building Code 2016. This aspect is touched upon as part of this study in the capacity of an Architect registered with the Council of Architecture. As part of the research, fire safety audit was considered from the 'Building systems' perspective.

At present, the following provisions are available in the premises.

- Fire extinguisher.
- Open staircase without any barriers and free of storage or combustible material.

6. Suggestion

The following suggestions are section-wise recommendations and are supposed to be considered as a ***first priority*** for implementation. These **should be executed within the next 1.5 to 2.5 years from the date of the Report submission.** The Institute can execute a plan after discussion with Project Head.

6.1 Site beautification

- **Bird house/ Feeders** - At appropriate locations there can be provisions for drinking water and some grains for birds as they visit the site much frequently.
- **Child area** - There can be one provision where if student's or staff relative who are toddlers or senior citizens can rest and this area could have facilities accordingly.
- **Garden development** - The existing open space should be designed as an Architectural landscape. *Scientific name plates and QR codes* – The team should undertake a project to have name plates with QR codes on every plant of the premises.

6.2 Heat island reduction

- **Cool rooftops** - The Terrace rooftops should be painted with Cooltop – reflective materials to reflect the harsh sun rays and reduce the heat absorption in the top most floor and surrounding areas of the building.

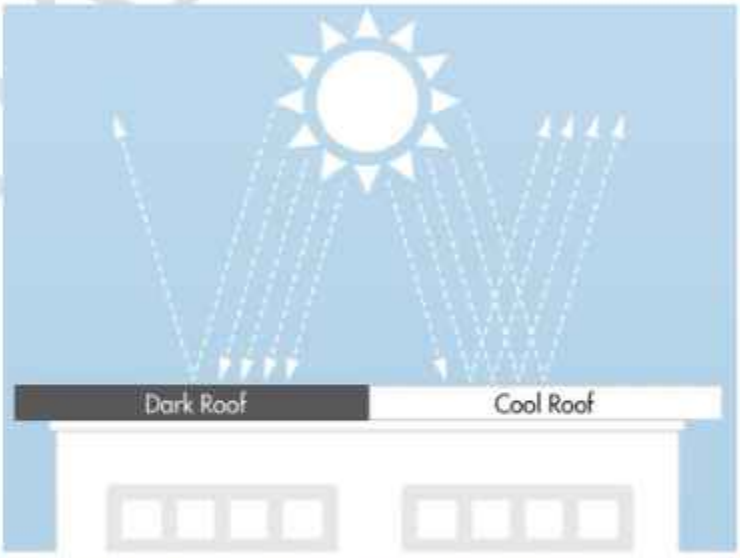
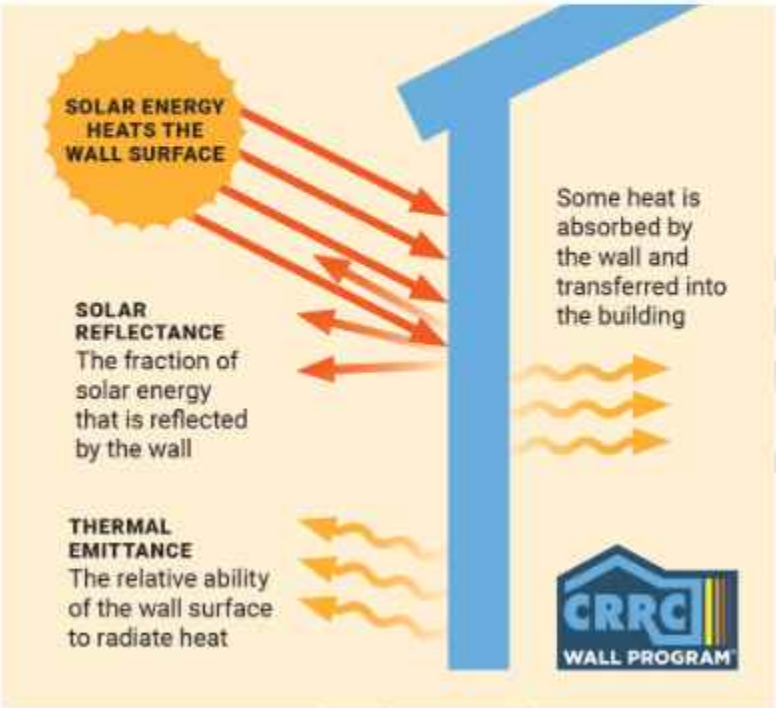


Plate 1: Cool roof comparative analysis (For reference purpose only)

Source: Image by https://www.gaf.com/en-us/blog/six-truths-about-cool-roofs-281474980105387

- **Cool walls/ Solar reflective exterior wall surface** – The exterior walls of the building can be painted in light colors as this will help in reflecting solar radiation. Thus, less heat will be absorbed in the interiors and cool temperature will be maintained.



This illustration describes the flow of radiant energy as heat between the sun, wall surface, building interior, and surroundings. The higher the solar reflectance, the more solar energy is reflected away from the wall surface. Some of the solar energy is absorbed by the wall as heat. The higher the thermal emittance, the more absorbed heat is radiated away from the wall surface. IMAGE CREDIT: COOL ROOF RATING COUNCIL

Plate 2: Cool wall physics analysis (For reference purpose only)

Source: Image by https://coolroofs.org/resources/what-is-a-solar-reflective-wall

- **Water bodies** – Lily gardens in small water ponds could be developed in the outdoor areas to reduce the heat, upgrade rain water harvesting and beautify exterior areas.

Plate 3: Lily pond (For reference purpose only)

Source: Image by Author and the team

- **Light colour flooring for cooler walkways** – The internal walkways in the outdoor areas should be painted in cool and reflective colours; if there is a need to use paver blocks they should be of light toned colour and less absorptive/ radiating materials.

Plate 4: Cool walkways (For reference purpose only)

Source: Image by https://www.dutchiesstoneworks.com/outdoor-living-spaces/stone-walkways-and-stairs/

6.3 Universally accessible premises

- **Universal Toilet** - There should be a minimum of 1 toilet in every block for the specially-abled people as per guidelines prescribed by the National Building Code 2016.

- **Resting places** - There should be increased provision for resting places on-premises outdoor and indoors.

- **Provisions for visually impaired - Audio Visual Section** – There should be dedicated section for ther visually impaired students to listen to the audio books; Abrar the audio book reader should be available.

64 Life safety

- **Mandate fire extinguisher in spaces** - One fire extinguisher should mandatorily be there in every space which has an air conditioner/ gas cylinder.

- **Combustible equipment** - Every space which has a gas cylinder or combustible equipment should have a provision for the barricade around the gas cylinders, appropriate safety board's mentioning 'danger sign' and 'Do not touch' with an additional small fire extinguisher close by.

6.5 Pollution Control

- **Promote the use of Eco-friendly vehicles** - There can be student and staff sensitization program on eco-friendly and battery-operated vehicles/ low emission vehicles for daily use.

- **Avoid burning waste** - The waste produced on the premises should not be burned as it is dangerous to the health of students and staff

- **Bicycles as a gift** - As an appreciation gesture maybe the student's toppers/ staff best performers can be awarded a bicycle occasionally.

- **Avoid using plastic in premise** - There should be a provision for a ban on the use of plastic bags or products on the Premise.

- **Paperless technologies for offices** - The Institute can go technology-friendly and go paperless in the functioning of the Premise to a certain extent maybe not fully.


Investigative parameters – Energy Management – Solar street light and sources of energy consumption



Investigative parameters – Ecological Management – Plantations, covered parking and ramp


Investigative parameters – Water Management – Water sources and proposed rain water harvesting system



Investigative parameters – Waste Management – Sanitary vending machine, dustbins and cleanliness in premises

7. Compilation

The study is based on the data collected, analysed, rechecked, and confirmed through multiple modes. For the quality study, some standards/ notes have been referred to. These are listed and noted below. However, no direct references have been used anywhere. These are used as a base to analyse and study the data collected.

7.1 National references

- Uniform Plumbing Code – India, 2008
- IGBC Green Existing Buildings – Operation & Maintenance (O&M) Rating system, Pilot version, Abridged Reference Guide, April 2013
- IGBC Green Landscape Rating system, March 2013

7.2 International references

- Form, Space and Order by Francis D. K. Ching
- BOMA Canada Waste Auditing Guide, Best Environmental Standards, BOMA BEST – Canada
- Used only for understanding Universal design - Universal Accessibility Guidelines for Pedestrian, Non-motorized vehicle and Public Transport Infrastructure – Report guidelines by Samarthyam (National center for Accessible Environments) – an initiative supported by Shakti Sustainable Energy Foundation and www.umassd.edu
- The city of Cheyenne, Streetscape/ Urban Design elements - Wyoming Planning Association, Gillette, Wyoming, United States
- Streetscape elements – Chapter 6 on San Francisco
- American lung association https://www.lung.org/
- Study related to air pollution https://www.airgle.com/
- Exploring the light pollution https://education.nationalgeographic.org/
- Accessibility study https://www.washington.edu/
- Urban heat island effect https://www.epa.gov/heatislands/what-you-can-do-reduce-heat-islands

7.3 Reference images for suggestions:

- https://www.gaf.com/en-us/blog/six-truths-about-cool-roofs-281474980105387
- https://coolroofs.org/resources/what-is-a-solar-reflective-wall
- https://earthbound.report/2021/07/14/5-ways-to-reduce-the-urban-heat-island-effect/
- https://www.dutchiesstoneworks.com/outdoor-living-spaces/stone-walkways-and-stairs/