

# **AN ASSESSMENT OF GREEN PROTOCOL CERTIFICATION IN SELECTED SCHOOLS UNDER THE COCHIN MUNICIPAL CORPORATION**

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*In Partial Fulfilment of the Requirement for the Award of the Degree of*

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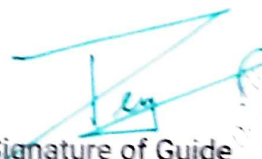
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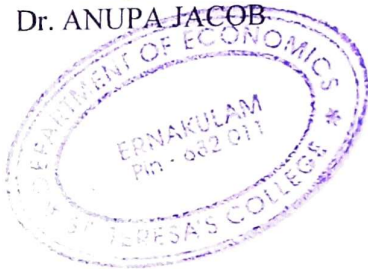
## CERTIFICATE

This is to certify that the project titled "**An Assessment of Green Protocol Certification in Selected Schools Under the Cochin Municipal Corporation**", submitted in partial fulfillment of the requirement for post-graduation of Integrated M.A Programme in Social Sciences - Economics to St. Teresa's college, Ernakulam (Autonomous) (Affiliated to Mahatma Gandhi University, Kottayam) is a bona fide record of the work carried out by JANE CELINE under my supervision and guidance.

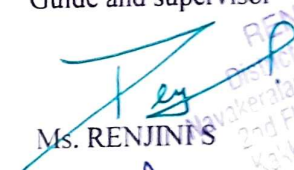
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## DECLARATION

I hereby declare that the project titled "**An Assessment of Green Protocol Certification in Selected Schools Under the Cochin Municipal Corporation**" submitted by me for partial fulfillment of the requirement for post-graduation of Integrated M.A Programme in Social Sciences- Economics in original work.

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# CHAPTER – I

## INTRODUCTION



## 1.1. Introduction

Environmental sustainability is growing as a major worldwide imperative in the face of rising problems such as climate change, rapid urbanization, depletion of natural resources and increasing volumes of solid waste. Among the various sectors contributing to sustainable development, educational institutions have a uniquely significant position, since they mold values, attitudes and behaviors at an early and formative stage of life. Schools in particular are not just centers of academia learning but also spaces where social responsibility, ethical conduct and environmental awareness can be developed. Governments and International agencies are emphasizing the role of schools in promoting sustainable development goals through education, infrastructure and daily habits as a result of realizing this potential.

From primarily theoretical instruction to more action oriented learning, environmental education in India has gradually changed. Students are now encouraged to participate in eco-clubs, work on practical sustainability projects and adopt environmentally conscious behaviors outside of the classroom. National programmes such as National Green Corps (now part of the Environment Education Programme) support the formation of Eco-clubs in thousands of schools, enabling students to participate in activities related to biodiversity, waste management, water and energy conservation and resource planning.<sup>1</sup>

This transition reflects a broader realization within Indian Educational Policy that sustainability is best learned via experience, with efforts aiming at transforming schools into living labs of environmental stewardship and empowering students as agents of change. Moreover, nationwide frameworks like as the Eco-Schools initiative provide formal pathways for schools to infuse environmental education and sustainability into their culture, curriculum and campus activities.<sup>2</sup>

Kerala is often seen as a pioneer in social development and decentralized governance. On November 1, 2025 (Kerala Piravi Day), a grand public meeting will be held at the Central Stadium, Thiruvananthapuram, where Hon. Chief Minister of Kerala, Shri Pinarayi Vijayan declared State

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<sup>1</sup> Environment Education Programme (EEP Kerala) – Kerala State Council for Science, Technology and Environment (KSCSTE), Government of Kerala.

<sup>2</sup> Centre for Environment Education. (n.d.). *Eco-Schools India*. <https://www.ecoschools.in/>

as free from extreme poverty, making it the first Indian State to make such a declaration.<sup>3</sup> The state has worked hard to make public institutions more state-level programs and by encouraging schools to adopt eco-friendly practices, cut down on waste and work on campus sustainability projects.

According to Kerala State Environmental policy, 2009 states the Government of Kerala's holistic vision and strategic plan for attaining environmentally sustainable development while protecting the State's delicate and varied ecosystems. Based on the constitutional responsibilities outlined in Article 48A and 51A(g), the policy acknowledges Kerala's distinct ecological features like its diverse biodiversity, high population density, vast wetlands, rivers, forests, coastal ecosystems, and the Western Ghats while emphasizing the growing environmental challenges stemming from unchecked development, urbanization, industrial pollution, mining activities, waste mishandling and overuse of resources. The policy highlights the values of sustainable development, conservation focused planning, and fairness across generations, seeking to harmonize economic advancement with environmental integrity. It recognizes key environmental issues such as deforestation and loss of paddy fields, diminishing and contaminating water supplies, buildup of solid and plastic waste, loss of biodiversity and health effects on the public resulting from environmental decline. To tackle these issues, the policy suggests targeted approaches and action plans. In general, the policy act as a guiding tool to integrate environmental conservation into Kerala's development framework and to guarantee clean air, water, soil and food for both current and future generations.<sup>4</sup>

In this context, applying the Green Protocol in schools signifies a tactical initiative to integrate sustainability into daily institutional operations. The Green Protocol aims to cultivate a culture of environmental responsibility among students, teachers and administrative staff by focusing on waste reduction, particularly the removal of single use plastics (SUP's) and encouraging ecofriendly alternatives. Moreover, it motivates schools to serve as exemplary institutions, showcasing sustainable living methods that can be duplicated in homes and communities. This program is a component of wider efforts by state and local governments, particularly under the

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The Hindu. (2025, January 18). *Kerala declared free from extreme poverty, first Indian state to do so*. The Hindu. <https://www.thehindu.com/news/national/kerala/kerala-declared-free-from-extreme-poverty-first-indian-state-to-do-so/article70228620.ece><sup>3</sup>

<sup>4</sup> Government of Kerala. (2009). Kerala State Environment Policy 2009. Department of Environment, Government of Kerala.

Haritha Keralam Mission, which seeks to establish a clean, green and resilient Kerala through collaborative action.

Haritha Keralam Mission (HKM), initiated by the Kerala Government on December 8, 2016, act as a comprehensive program for environmental sustainability within the state. The aim of promoting cleanliness, water abundance, water security and safe food production. The Mission's objectives are Water, Hygiene and Harvest. Haritha Keralam Mission consists of three sub-missions related to water conservation, sanitation and waste management and agriculture. Mission activities are carried out practically under the leadership of local self-government bodies.<sup>5</sup>

The Green Protocol in school aims to convert educational facilities into plastic-free, minimal waste and ecofriendly environments. Its execution encompasses various aspects, such as infrastructure, daily practices, celebrations and educational initiatives. A key element is source level waste segregation, involving the separation of biodegradable from non-biodegradable waste right at the generation site. Schools are urged to handle organic waste via composting or biogas systems, while recyclable items are provided to licensed organizations or Haritha Karma Sena groups. Another important factor is the removal of single use plastics on school grounds. Students are urged to carry water in reusable or steel bottles and food in lunch boxes that aren't plastic. If available, school canteens are encouraged to refrain from using disposable packaging and instead implement sustainable serving methods. Decorations for school functions, exhibitions and festivities should utilize paper, fabric or natural materials instead of plastic based products.

The protocol highlights the importance of visibility and awareness, suggesting that Green Protocol guidelines should be posted on notice boards and sustainability themes should be integrated into school assemblies, clubs and extracurricular activities. Educators and school leaders are crucial in promoting these practices, while students serve as agents of transformation by extending these behaviors beyond the school environment into their residences and communities.

The successful execution of the Green Protocol in educational institutions is backed by a network of organizations and agencies. Local Self- Government Institutions, such as Municipal Corporations, Municipalities and Panchayaths are tasked with ensuring compliance, offering

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<sup>5</sup> Department of Environment and Climate Change, Government of Kerala, "Mission Profile – Haritha Keralam Mission," Government of Kerala website, <https://haritham.kerala.gov.in/profile.php>

technical assistance, and coordinating systems for waste collection and processing. In Kochi, the Cochin Municipal Corporation is essential in managing the implementation of the Green Protocol in its area.

Agencies like Suchitwa Mission, it is more focused on liquid based waste management, offer technical advice, capacity enhancement and monitoring assistance. The Haritha Karma Sena, a local team focused on waste collection and management helps schools to effectively manage their segregated waste. By conducting inspections, running awareness campaigns and implementing certification processes, these organisations guarantee that the Green Protocol is not just a symbol but practically effective.

Under the guidance of the Cochin Municipal Corporation schools affiliated with CBSE and those aided by government within its area are progressively urged to implement Green Protocol practices as a component of the city's wider environmental management, assigning considerable responsibility to local self-governing bodies to encourage waste reduction, resource conservation and environment friendly behavior changes among the community. Cooperation among school administrations, local authorities and neighborhood organizations enables organized oversight, record keeping and communication of Green Protocol measures, guaranteeing that school oriented efforts like waste segregation at the source, minimizing single use plastics, encouraging reusable resources and conducting environmental awareness programs significantly support Kochi's overall solid waste management and sustainability goals.

Although supportive policy frameworks and institutional mechanisms exist, the level and efficacy of Green Protocol implementation differ significantly among schools. Variations in physical infrastructure, administrative management, financial and technical support, along with the degree of environmental consciousness among educators, students and parents greatly affect the extent to which sustainability practices are embraced. Often, schools that have superior facilities and proactive leadership can implement Green Protocol Guidelines more efficiently, whereas institutions with limited resources encounter practical challenges in converting policy directives into actual practices. In a city setting such as Kochi characterized by dense population and varied socio economic conditions these disparities are amplified, highlighting the necessity to explore how contextual elements influence the results of environmental efforts in educational settings.

In this context, the research emphasizes evaluating the application of the Green Protocol in CBSE Affiliated and Government Aided Schools under the jurisdiction of the Kochi Corporation. By examining both categories of schools, the study seeks to develop an understanding of institutional practices, challenges and outcomes associated with sustainable initiatives. The analysis extends beyond mere compliance with prescribed guidelines to explore the depth of integration of environmental principles into everyday school life, whether the green protocols are correctly followed by schools. The research helps in understanding the possible contribution of Green Protocols in encouraging long term environmental stewardship in future generations, in line with Kerala's broader environmental policy vision.

## 1.2. Background of the Study

Through policy frameworks like the Haritha Keralam Mission, which was introduced in 2016 to integrate waste management, sanitation, water conservation and sustainable resource use across institutions, environmental sustainability has emerged as a key governance concern in Kerala. The Kerala government implemented the Green Protocol guidelines as part of this mission, which aims to reduce waste production, single use plastics, promote source segregation, encourage composting and cultivate environmentally conscious behavior in public institutions, including schools. According to Haritha Keralam Mission, the Green Protocol moves the emphasis from awareness-based environmental campaigns to quantifiable and practice-oriented compliance inside institutional contexts.<sup>6</sup>

Since schools have an impact on families, communities, and children alike, they are seen as key locations for environmental change. In this regard, the application of the Green Protocol in schools involves the promotion of reusable materials, water conservation measures, energy saving techniques, on-site composting facilities and organized waste segregation systems. The Suchitwa Mission and Local Self Government Institutions (LSGs) support these efforts by offering monitoring assistance and technical advice.<sup>7</sup>

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<sup>6</sup> Haritha Keralam Mission. (2023). *Green protocol guidelines and waste-free Kerala initiatives*. Government of Kerala. <https://haritham.kerala.gov.in>

<sup>7</sup> Cochin Municipal Corporation. (2023). *Waste-free city initiatives and school-level environmental programmes*. Government of Kerala. <https://kochi.lsgkerala.gov.in>

Through school based programs, awareness campaigns and waste free initiatives that are in line with the state's larger sustainability goals, the Cochin Municipal Corporation has been actively involved in operationalizing these environmental policies within the framework of urban governance. The Waste- Free Kerala initiatives campaigns place a strong emphasis on school infrastructure development, behavioral modification, and institutional responsibility. However, despite continuous implementation efforts, there is still lack of rigorous academic evaluation of the degree of adherence, sufficiency of the infrastructure, flexibility in behavior and general efficacy of Green Protocol Practices in Cochin Corporation schools. Therefore, it is crucial to assess how well the Green Protocol is being implemented in these schools in order to determine the success of the policy, spot implementation gaps and make recommendations for ways to increase sustainable institutional governance at the municipal level.<sup>8</sup>

### 1.3. Research Gap

Even though Haritha Keralam Mission and the Suchitwa Mission have widely implemented the Green Protocol guidelines, the majority of the documentation that is currently available concentrates on policy announcements, certification statistics and campaign accomplishments rather than a thorough academic assessment of actual ground-level compliance in schools. Particularly within the Cochin Municipal Corporation's domain, there is an absence of systematic empirical research evaluating how well schools have integrated composting, waste segregation, plastic free practices and other green protocol measures into their everyday operations. Few studies look at long term sustainability results, monitoring systems, student and staff behavior change and infrastructure adequacy. Additionally, there is still a lack of research on evaluation, employing quantitative assessment techniques and comparative analysis across various school kinds.

### 1.4. Statement of Problem

Over the recent years, sustainability in the environment has become an important topic, especially in the backdrop of the increasing problems of waste generation, plastic pollution and environmental degradation. Education institutions are needed in order to sensitize students on issues surrounding the environment and enable them to act responsibly. Specifically, schools have

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<sup>8</sup> Suchitwa Mission. (2023). *School sanitation and green institutional practices under Haritha Keralam framework*. Government of Kerala. <https://suchitwamission.org>

a vital role to play in helping students to acquire environmental-friendly habits at an early age and to promote environmentally friendly attitudes by reducing waste, avoiding single-use plastic material and promoting the correct waste management systems.

The organizations such as the Suchitwa Mission and the Haritha Kerala Mission are the champions of the Green Protocol initiative with the support of regional organizations such as the Cochin Municipal Corporation. These practices are waste segregation, biodegradable waste composting, plastic-free campuses, eco-friendly school events and environmental awareness programs among others that schools are advised to indulge in this initiative. The schools which effectively implement those strategies are known to be committed to environmental sustainability as they obtain the Green Protocol Certification.

Even within the implementation of this certification system, there may not be a match between the policy guidelines and an actual practice applied in schools. Although there are school which may be keen to apply the guidelines of the Green Protocol, others may have hard time applying the same due to several factors such as lack of adequate infrastructure, low level of staff and student awareness poor monitoring or lack of institutional support. In some cases, schools can be certified, yet they might not be constantly maintaining the standards of sustainable environmental practices.

Consequently, the importance of assessing the actual level of the Green Protocol Certification implementation in educational institutions and whether the accredited ones are reaching the required standards in their everyday activities remains. In order to determine the effectiveness of the initiative, it is also vital to understand the degree of acceptance of Green Protocol practices by school administrators, instructors as well as students. Moreover, understanding of challenges and barriers that schools face in implementing such environmental practices may help understand the practical limitations of the program.

On this note, the present research paper is aimed at assessing the implementation of Green Protocol Certification in the specific schools in Cochin Municipal Corporation, the research will help to determine the policy-practice gaps, assess the level of awareness and involvement of the stakeholders, and assess the factors that enable successful implementation. By addressing these issues, the research will aim at providing information that can improve the effectiveness of Green Protocol programs in schools. Finally, it is possible to promote the successful implementation of

these strategies to transform ecologically conscious students and enhance the ecological sustainability of the community in the long term.

## 1.5. Objectives

- To examine compliance with government orders related to the Green Protocol, including the appointment of nodal officers and prohibition of disposable items.
- To analyze the environmental impact of Green Protocol implementation in terms of waste minimization and promotion of sustainable school environments.
- To identify implementation gaps and institutional constraints affecting the economic sustainability of Green Office initiatives.

## 1.6. Methodology

Both primary and secondary data sources served as the study's foundation. Using a structured questionnaire schedule created based on the Green Protocol evaluation methodology created under the Haritha Keralam Mission, primary data were gathered through field visits to schools. Major Green Protocol components, including the appointment of nodal officers, the implementation of programs that adhere to Green Protocol standards, the reduction of paper waste, the prohibition of disposable and plastic items, the use of reusable containers, waste segregation practices, the availability of color-coded bins, facilities for the composting or biogas, the management of inorganic and e-waste, liquid waste management systems, sanitation facilities, the creation of green clubs, the display of directive boards, public cleanliness standards and the creation of vegetable and flower gardens, were all covered by the questionnaire. A maximum score of 100 points was used for the evaluation and points were given based on how well the guidelines of the Green Protocol were followed. Photographs were gathered as supporting documentation, and direct observation was also done during school visits to confirm the answers.

Government reports, policy documents, official mission publications, research articles and scholarly journals were the sources of secondary data about the Green Protocol's implementation under the Haritha Keralam Mission and Suchitwa Mission. Studies by Parvez and Agarwal (2019) on the IGBC Green Campus Rating System, Paswan and Mehta (2025) on the role of green schools in sustainable development, Stephanie Kay Barr (2011) on whole school sustainability, Sugiarto,



Lee and Huruta (2022) on sustainable campus frameworks, Sharma and Jain (2019) on plastic waste management issues, Nirmala Padmanabhan and Tomy (2020) on waste management systems in Kerala, Kaza (2018) on global solid waste management, and Nazar (2018) on the Green Protocol's implementation in Kerala are important references. The current research's conceptual and analytical underpinnings came from these studies.

The 132 schools under Cochin Municipal Corporation that make up the study's population have all received green certification from the Corporation. Using basic random sampling, 60 schools were chosen as the sample from this population, guaranteeing that each school had an equal chance of being chosen.

To assess the degree of Green Protocol compliance and pinpoint implementation gaps among the chosen schools, the data was examined using percentage analysis, the scoring index method, comparative analysis and the Chi-square test. These statistical techniques were useful in identifying trends in institutional adoption of Green Protocol measures and evaluating the efficacy of sustainability policies.

## 1.7. Limitations of Study

- The study's restriction to 60 Cochin Municipal Corporation schools limited its applicability to other areas or educational systems with distinct administrative and environmental circumstances.
- For several categories (such school without compost facilities or nodal Officers), the sample size was tiny, which decreased statistical power and might have affected non-significant Chi-square test results.
- The study used self-reported questionnaire data, which could be skewed by social desirability bias or over reported levels of compliance.
- The instrument may not fully capture all aspects of Green Protocol implementation, as indicated by reliability values (Cronbach's alpha of 0.663 and 0.681) that show only moderate internal consistency.
- Examining changes in implementation over time or establishing causal linkages are limited by the cross-sectional research approach.

- Deeper comprehension of institutional constraints was hampered by a lack of qualitative data and vague answers about operational difficulties.

## 1.8. Chapter Scheme

There are five chapters in this work. A brief description of content of each chapter is given below.

Chapter 1: The study's history, research gap, problem statement, objectives, methods, limits and general structure are all presented in this chapter. It highlights the significance of assessing how Green Protocol practices are being implemented in educational institutions.

Chapter 2: Important national and worldwide research on sustainability, green campuses, environmental education and plastic trash management is reviewed in this chapter.

Chapter 3: This chapter describes the institutional and legislative framework for environmental sustainability and solid waste management, including government programs like Kerala's Green Protocol guidelines, Suchitwa Mission, and Haritha Keralam Mission.

Chapter 4: This chapter outlines the research methodology utilized for the study, including data sources. The frequency of responses of each questions in questionnaire is analyzed by categorizing the schools based on their institution type that is State and CBSE.

Chapter 5: This chapter examines the degree of adherence to government directives concerning Green Protocol activities in schools, namely the designation of nodal officers and the prohibition of plastic and disposable products on school grounds.

Chapter 6: The environmental effects of Green Protocol practices in schools are assessed in this chapter. It looks at metrics including resource recovery, waste minimization, waste management infrastructure, behavioral change and overall environmental performance.

Chapter 7: The difficulties and constraints schools encounter while putting Green Protocol practices into practice are examined in this chapter. It examines things including the accessibility of composting facilities, administrative assistance, infrastructure constraints and operational challenges.

Chapter 8: The study's overview, key findings, conclusions and policy recommendations for enhancing the use of Green Protocol practices in Cochin Municipal Corporation schools are presented in this chapter.

# CHAPTER- II

# LITERATURE

# REVIEW

## 2.1. Introduction

The literature on sustainability, green campuses, environmental education and plastic waste management is reviewed in this chapter. It looks at research that emphasizes the value of green building certifications, the significance of sustainable practices in educational institutions, and the influence of environmental consciousness on waste reduction. Research on solid waste management systems, governmental measures and community involvement are also examined in the review, with a focus on Kerala. This chapter discusses important ideas, methods and research gaps related to plastic waste management and sustainability in educational institutions by examining earlier works.

## 2.2. Review of Literature

Nikhat Parvez and Avlokita (2019) reviews the Indian Green Campus Rating System, which was first implemented in 2017 by the Indian Green Building Council. By concentrating primarily on environmental factors including water conservation, energy efficiency, waste management, green cover, sustainable transportation and health and welfare, the approach encourages sustainability on Indian Campuses. It assesses campuses in eight areas, such as materials, energy, water, site layout and innovation. The authors find that IGBC is less concerned with intellectual, social, economic and community participation aspects and more focused on environmental operational criteria as compared to international frameworks such as STARS and CSAF. Although the system is a step in the right direction for sustainable growth on Indian campuses, the study contends that in order to become a more complete and all-encompassing sustainability grading framework, it must incorporate social, cultural, academic and economic factors more widely.<sup>9</sup>

Pradeep Kumar Paswan and Deepa Mehta (2025) examines the body of search on the value of green schools in advancing environmental conservation via instruction. It emphasizes the necessity of including sustainability at all educational levels and links the origins of environmental education to major world events like the Rio Earth Summit, the Tbilisi Declaration and the United Nations

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<sup>9</sup> Parvez, N., & Agrawal, A. (2019). IGBC Green Campus rating system: An initiative to sustainable campuses in India. *International Journal of Engineering Research & Technology*, 8(6), 112–118.

Conference on the Human Environment. Green Schools according to the authors are establishments that integrate environmentally friendly facilities with hands on environmental education. They make reference to frameworks that emphasize waste management, water conservation, energy efficiency and healthy learning environments such as LEED and Collaborative for High Performance Schools. Benefits like financial savings, enhanced student performance, environmental awareness and support for the UN sustainable Development Goals particularly SDG 4 (Quality Education) and SDG 13 (Climate Action) are highlighted in the review. The study indicates that by encouraging environmental value, skills and responsible citizenship, green schools play a critical role in achieving sustainable development, despite obstacles including funding limitations and policy gaps. It also urges greater institutional and governmental support.<sup>10</sup>

Stephanie Kay Barr (2011), explores how curriculum, school culture and facilities collaborate to advance sustainability in US LEED-certified schools. The study emphasizes the collaborative element of whole-school sustainability and is based on surveys of community members, building professionals and staff. According to the authors, shared value serve as the cornerstone of sustainable schools, impacting curriculum, school culture and facility design. Strong leadership, teamwork, high standards and student involvement are important qualities. With elements like exposed systems and indoor-outdoor connections that promote experiential learning, green buildings are viewed as educational resources. In order to match facilities with instructional objectives, the study highlights an integrated design process that involves principals, instructors, students, and architects from the outset. It also points out that project based, student- centered learning is frequently employed in sustainability- focused curricula to foster environmental stewardship and critical thinking. Overall, the study offers a comprehensive model in which values influence curriculum, infrastructure and culture resulting in a distinctive and dynamic system that improves educational and environmental results.<sup>11</sup>

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<sup>10</sup> Paswan, P. K., & Mehta, D. (2025). Role of green school in environmental conservation and sustainable development: A systematic review. *Environmental Research Review*, 14(1), 22–35.

<sup>11</sup> Barr, S. K. (2011). *Green schools that teach: Identifying attributes of whole-school sustainability* (Master's thesis, Colorado State University). <https://doi.org/10.25675/3.021229>

Agus Sugiarto, Cheng-Wen Lee, and Andrian Dolfriandra Huruta's (2022) paper examines international research on sustainable campuses in higher education. The report divides campus sustainability initiatives into three primary categories: physical facilities, learning and educational resources and behavioral. Active community involvement and leadership commitment are recognized as important sustainability drivers in the behavioral dimension. University administrators are essential in establishing regulations and promoting eco-friendly behavior on campus. In order to minimize resource consumption, the learning dimension emphasizes incorporating sustainability into curriculum and encouraging eco-friendly technology like e-learning and paperless systems. Water conservation, waste management, green transportation systems, energy efficiency and renewable energy adoption, and sustainable master planning are all included in the physical facilities dimension. Overall the report recommends for additional long term and varied research to improve sustainability outcomes in higher education and offers a structured framework of priority areas to help universities execute sustainable campus programs.<sup>12</sup>

George Kats (2006) examines 30 green schools constructed in the US between 2001 and 2006. According to the study, green schools are around 1.7% more expensive to build, but over the course of their existence, they save energy, consume less water, enhance health and improve learning outcomes, all of which result in financial benefits that are about 20 times greater. Green schools cut operating expenses and their impact on the environment by using roughly 33% less electricity and 32% less water. Additionally, they reduce emissions of pollutants like carbon dioxide and particulate matter, which improves public health. Significant health and educational advantages are highlighted in the paper, such as better indoor air quality, lower absenteeism, increased teacher retention, and 3-5 % gains in student test scores. It also highlights how renewable energy and green building projects have a good job impact. All things considered, the study shows that green schools are financially sensible and environmentally advantageous investments that improve community well-being, public health and student achievement.<sup>13</sup>

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<sup>12</sup> Sugiarto, A., Lee, C.-W., & Huruta, A. D. (2022). A systematic review of the sustainable campus concept. *Sustainability*, 14(10), Article 5890. <https://doi.org/10.3390/su14105890>

<sup>13</sup> Kats, G. (2006). *Greening America's schools: Costs and benefits*.

Mark Dino Vaccher and M. Ashiqur Rahman (2024) assesses green building certifications in Victoria and New South Wales. The study evaluates sustainability from an environmental, social and economic perspective using expert questionnaires and secondary data. Significant environmental benefits are demonstrated by the studies, which include up to 55% lower water costs and 80-87% lower energy costs in certified buildings. Nevertheless, there were only modest gains in material efficiency. Compared to Victoria, NSW showed more certification acceptance and advantages, most likely as a result of more benevolent laws and favorable market conditions. The study emphasizes the necessity of tightening certification requirements, particularly in the areas of ventilation, life cycle assessment, material consumption and end of life management. Long-term savings, enhanced environmental performance, and better indoor environments offer significant economic and social benefits, even though initial certification costs and complexity continue to be obstacles. All things considered, the case study offers insightful regional information about the efficacy and potential advancement of Australia's green building certification programs.<sup>14</sup>

Kartika Rahmasari, Ova Candra Dewi, Nandy Putra, and Nisrina Dewi Salsabila (2024), in their research the EDGE green building certification system is used in to assess the energy, water and material efficiency of a nine-story integrated laboratory building (i-cell) at Universitas Indonesia. In comparison to a baseline construction instance, the analysis shows notable savings of 70% energy, 42% water and 48% less embodied energy in materials which resulted in the buildings EDGE Advanced certification. This study illustrates how green construction concepts can be implemented in educational settings with tropical climates. Passive thermal insulation, an improved windows-to- wall ratio, LED lighting with occupancy sensors, an ASRAE 90.1 aligned variable refrigerant flow cooling system, and solar photovoltaic panels that supply 67.6% of the energy requirement are important tactics. Low-flow fixtures, rainwater and reusing shipping containers and low-embodied energy materials are ways to save resources. The results show that dual-flush fixtures are essential for reducing water use, and LED lighting and effective cooling systems are significant contributors to energy savings. Overall, the study supports more general

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<sup>14</sup> Vaccher, M. D., & Rahman, M. A. (2024). Determining the effectiveness of green building certifications in terms of impacts on sustainability: A case study from Australia. *7th International Conference of Contemporary Affairs in Architecture and Urbanism (ICCAUA 2024)*. <https://doi.org/10.38027/ICCAUA2024EN0218>

sustainable development goals by demonstrating the efficacy of green building certification in educational institutions, especially in tropical, developing nation environments.<sup>15</sup>

Moein Hemmati and Nastaran Abdoli's (2024) studies Middle Eastern certification programs like LEED and Green Building Index. With an emphasis on indoor environmental quality, water utilization, energy efficiency and long-term sustainability, the study looks at non-residential new construction projects (2014-2024). Results indicate that certified buildings save almost 20% on energy costs when compared to non-certified ones, while Platinum and Gold Projects outperform non-certified ones in terms of long-term sustainability standards. However, many buildings perform poorly in long-term impact areas like thermal comfort and advanced energy performance while primarily meeting short-term certification standards. High upfront expenses, a lack of climate-specific recommendations and low stakeholder knowledge are among the major issues identified in the study. Given that buildings have a 30-50 years' lifespan, it emphasizes the necessity of locally tailored standards, more robust policy support, and a better focus on long-term sustainability. Overall the study emphasizes how crucial it is to enhance certification programs in order to adapt to the severe climate of the Middle East and encourage more resilient and sustainable urban development.<sup>16</sup>

Dr. Nirmala Padmanabhan, S.M. Mohankumar and Karthika K. (2017) their study which was published by the Decentralization Analysis Cell under the Gulayti Institute of Finance and Taxation, the study looked at how Grama Panchayats handled solid and liquid waste in Kerala. The study examined the distribution and use of funds for environmental projects among Panchayats and discovered that, in comparison to total development spending, waste management and environmental protection expenditures were very low. The authors discovered substantial amounts of solid waste generation, with households accounting for the majority, using primary surveys, garbage audits and water quality analysis in a few Panchayats. The study also noted that

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<sup>15</sup> Rahmasari, K., Dewi, O. C., Putra, N., & Salsabila, N. D. (2024). Green building certification in educational facility. *IOP Conference Series: Earth and Environmental Science*, 1234, 012045. <https://doi.org/10.1088/1755-1315/1234/1/012045>

<sup>16</sup> Hemmati, M., & Abdoli, N. (2024). Assessing the influence of green building certification programs on energy efficiency and sustainable development in the Middle East. *International Journal of Engineering and Applied Sciences*. Retrieved from <https://www.isi.ac/article/assessing-the-influence-of-green-building-certification-programs-on-energy-efficiency-and-sustainable-development-in-the-middle-east>



while plan money utilization remained low, Panchayats relied significantly on programs like the Mahatma Gandhi National Rural Employment Guarantee Scheme to carry out environmental initiatives. To guarantee sustainable waste management at the local level, the authors suggested an integrated environmental management plan, improved institutional processes, encouragement of waste segregation at the source, composting of organic waste and behavioral change initiatives.<sup>17</sup>

“Plastic Waste Management: Issues, Solutions and Case Studies” (2019) by Sharma and Jain discussed the expanding environmental challenge brought on by rising plastic consumption and insufficient waste management systems was covered by authors, they looked at the origins and makeup of plastic debris, emphasizing how common single-use plastics are and how persistent they are in both terrestrial and marine environments. They underlined that inappropriate disposal methods, such open dumping and burning, pose major health concerns to the public and degrade land, water and air. The study also examined current waste management practices, such as energy recovery, recycling and policy interventions and found implementation gaps in poor nations. The authors illustrated the significance of expanded producer responsibility, community involvement, and source segregation in attaining sustainable results through a variety of case studies. The study, which was published by TERI Press, comes to the conclusion that efficient management of plastic trash requires an integrated strategy that incorporates technological innovation, legal frameworks and behavioral modification.<sup>18</sup>

Nirmala Padmanabhan and Tomy (2020) emphasize the transition of Kerala’s solid waste management system from a centralized disposal model to a decentralized, resource-based approach is examined, emphasizing the roles of Local Self Government’s, source level treatment and policy reforms. The paper emphasizes how land limits, population density and rising consumption habits have increased trash generation while also reducing disposal alternatives. It highlights Kerala’s

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<sup>17</sup> Padmanabhan, N., Mohankumar, S. M., & Karthika, K. (2017). *Role of Grama Panchayats in waste management and environment protection*. Thiruvananthapuram, Kerala: Decentralisation Analysis Cell, Gulati Institute of Finance and Taxation.

<sup>18</sup> Ministry of Housing and Urban Affairs. (2019). *Plastic waste management: Issues, solutions and case studies*. Government of India. Retrieved from <https://sbmurban.org/storage/app/media/pdf/SBM%20Plastic%20Waste%20Book.pdf>

policy change towards decentralized waste management, where Local Self Governments are crucial to source level treatment and segregation. Nonetheless, the authors point out enduring issues such as insufficient technical capability, inconsistent regional implementation, inadequate monitoring and restricted financial viability. In order to guarantee long-term environmental and financial sustainability, the study indicates that better institutional coordination, enhanced data systems and the incorporation of financial incentives are necessary for efficient waste management in Kerala.<sup>19</sup>

Kaza, Silpa, Yao, Lisa C. (2018), provide a thorough worldwide analysis of Municipal Solid Waste management, predicting a sharp rise in garbage creation due to population expansion, fast urbanization and rising income levels. According to the study, waste generation is predicted to increase at the quickest rate in low and middle-income nations, where institutional ability, financial resources and technical infrastructure are still insufficient to handle the growing load. The authors stress that there are major threats to the environment and human health associated with ineffective collection methods, open dumping and uncontrolled landfilling. The report's emphasis on the necessity of trustworthy, disaggregated data on waste quantity and composition to assist evidence based policy formation is one of its main contributions. In order to guarantee the financial sustainability of waste management systems, the study also emphasizes the significance of economic tools, cost recovery strategies and private sector involvement. Additionally, solid waste management is positioned as a crucial part of sustainable urban development by Kaza, Silpa, Yao, Lisa C, who support a change from a linear "collect-dispose" model to a circular economy framework that prioritizes waste reduction, recycling and resource recovery.<sup>20</sup>

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<sup>19</sup> Padmanabhan, N., & Tomy, A. T. (2019). *Waste management in the emerging economy of Kerala (in Kerala and the World Economy)*. Centre for Development Studies, Thiruvananthapuram. Retrieved from <https://cds.edu/wp-content/uploads/CDS-50-Years-Souvenir-Final.pdf> (contains the chapter *Waste Management in the Emerging Economy of Kerala* by Padmanabhan & Tomy)

<sup>20</sup> Kaza, S., Yao, L. C., Bhada-Tata, P., & Van Woerden, F. (2018). *What a waste 2.0: A global snapshot of solid waste management to 2050*. World Bank. <https://openknowledge.worldbank.org/handle/10986/30317>

Walshe, Perry, & Healy (2025) in their article used survey data from 2,429 students between the ages of 11 and 14, they investigated secondary school student's experiences and expectations of climate change and sustainability education (CCSE) in England. The results show that although the majority of students are exposed to climate change concepts through courses like science and geography, the coverage is frequently disjointed, shallow and inadequately related to practical applications. Students expressed a significant need for learning that goes beyond theoretical understanding to include real-world applications, conversations focused on the future and chances for active participation through projects, outdoor learning and community service. The study also identified disparities in CCSE experiences associated with socioeconomic status, indicating that different access to effective climate education. Additionally, the authors stress that interdisciplinary curriculum integration, better teacher preparation, and institutional support are effective CCSE in order to equip with the agency, knowledge and skills necessary to address climate and sustainability issues in a positive way.<sup>21</sup>

Shanu N. Nazar (2018), analyzed the Green Protocol's implementation and effects in Kerala, presenting it as a trailblazing waste-minimization program that gives the solid waste management hierarchy's "reduce" principle first priority. The report emphasizes that the Green Protocol's main goals are to discourage the use of single use packaging, plastic, paper, thermocol and other throwaway materials while encouraging reusable substitutes and ecologically friendly waste management techniques. The study shows that the protocol has been successfully applied in large-scale public events, religious festivals, educational institutions and social functions, greatly reducing the generation of non-biodegradable waste, using secondary data from government reports, mission documents and institutional records. The Green Protocol's successful implementation on significant occasions like the 2015 National Games is regarded as a turning point, demonstrating how public involvement, coordinated institutional support and volunteer mobilization through Haritha Karma Sena may result in nearly zero waste outcomes. The study also highlights the economic and environmental advantages of trash reduction, such as lower costs, less strain on disposal infrastructure and increased resource efficiency. According to Nazar (2018), the Green Protocol has developed into a people-driven movement in Kerala and is a scalable

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<sup>21</sup> Walshe, N., Perry, C., & Healy, G. (2025). *Student perspectives on climate change and sustainability education in England: Experiences and expectations*. *Frontiers in Education*, 10, Article 12257304. <https://pmc.ncbi.nlm.nih.gov/articles/PMC12257304/>

sustainable waste governance paradigm that combines social responsibility with environmental preservation.<sup>22</sup>

Hareesha, Ruby, Bijina & Sajan (2023), examine using the IHRML-UNDP biodiversity conservation project as a case study, they investigate the role of the Haritha Keralam Mission (HKM) in fostering sustainable development among tribal communities in Kerala. The authors place the mission within Kerala's distinct ecological context, pointing out that declining agricultural land, environmental degradation, and underdevelopment in tribal areas justified a government led initiative to integrate environmental conservation with socio-economic development as part of a multi-tiered intervention framework. They describe the implementation mechanism of IHRML-UNDP project, which is backed by the Ministry of Environment, Forests and Climate Change and the Global Environment Facility. The project's goal is to protect the biodiversity of the High Range Landscape while improving community-based resource governance. This includes cluster-based interventions, capacity building, mainstreaming biodiversity into local planning and promoting sustainable livelihoods through ecological conservation techniques and value chain improvements. Strengthened community resource management, the implementation of multiple-use landscape management, improved governance frameworks and the creation of sustainable livelihood options like value chain linkages for non-timber forest products, ecotourism initiatives and local capacity enhancement are among the project outcomes reported by the authors. These findings demonstrate how environmental conservations can be combined with economic opportunities for tribal populations. They also highlight the significance of participatory governance in sustainable development projects by documenting the adoption of local climate change action plans, habitat monitoring procedures and ecosystem conservation strategies that support the protection of endemic species while incorporating tribal groups in decision-making processes. In order to attain long-term ecological and socioeconomic advantages, the report recommends that successful methods be extended into

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<sup>22</sup> Nazar, S. N. (2018). *Implementation and impact of Green Protocol in Kerala*. Journal of Emerging Technologies and Innovative Research, 5(12), 335–350. <https://www.jetir.org/papers/JETIR1812042.pdf>

larger government initiatives. It concludes that the HKM led IHRML-UNDP project shows a reproducible paradigm for sustained biodiversity protection and community empowerment.<sup>23</sup>

Sini (2019) examined the Green Protocol, emphasizing its role in tackling waste generation caused by consumerism and inefficient waste management techniques. According to the study, the Suchitwa Mission's Green Protocol places a high priority on waste reduction by prohibiting the use of plastic and encouraging the use of reusable, environmentally friendly substitutes. The study shows that policy enforcement in conjunction with public awareness, institutional involvement and community involvement has greatly decreased plastic waste across public events, schools, government offices and social functions using secondary data and fields insights from Kannur district. According to the results, the Green Protocol has improved waste governance at the local level, encouraged behavioral change and developed a participatory approach to environmental management. According to author, Kerala's Green Protocol is an affordable and reproducible policy framework for attaining environmental sustainability through cooperation and legal assistance.<sup>24</sup>

“UNEP Life Cycle Initiative report” (2021), In response to UN Environment Assembly Resolution UNEP/EA.4/R.9, the United Nations Environment Programme (UNEP) released the report Addressing Single-Use Plastic Products Pollution Using a Life Cycle Approach in 2021. Developed under the UNEP Life Cycle Initiative to inform global policy responses to single-use plastics pollution through robust life cycle assessment (LCA) evidence. The report summarizes LCA meta-studies that compare the full environmental impacts of single-use products with

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<sup>23</sup> Hareesha K., Ruby S., Bijina S., & Sarath Sajan. (2023). *Role of Haritha Kerala Mission for sustainable development of tribal resources & people in Kerala: A case study of IHRML-UNDP project*. In *Futuristic Trends in Management* (Vol. 3, Book 18, Part I, Chapter 2). IIP Series. <https://www.iipseries.org/assets/docupload/rs1202455A84C973F9228B.pdf>

<sup>24</sup> Sini, M. (2019). *Implementation of Green Protocol as a policy initiative for environmental sustainability: A Kerala experience*. In *Proceedings of the 5th International Conference on Economic Growth and Sustainable Development: Emerging Trends* (pp. 1–7). Mysuru, India. ISBN 978-93-83302-40-6.

reusable options in order to preserve resource value and promote the circular economy. The publication incorporates case studies from several nations, showcasing national level policy innovations and proving that life cycle thinking can highlight trade-offs and direct more sustainable production and consumption choices. It also suggests that policymakers take into account social and geographic contexts, encourage resource-efficient product design, and use a combination of market and regulatory tools to lessen the environmental impact of products throughout their life cycle, thereby aligning with broader sustainability goals. In order to reduce pollution and promote sustainable development, the paper emphasizes the significance of life cycle approaches in environmental decision-making and in forming policies targeted at systemic change.<sup>25</sup>

“The Wild Wisdom Global Challenge” (2024), through interactive quizzes, webinars and creative activities, aims to engage in biodiversity and wildlife conservation education. The 2024 edition, “Reptiles: The Ultimate Scaly Survivalists,” invited students from grades 6-9 to deepen their ecological knowledge, explore species diversity and adaptations and comprehend conservation challenges associated with reptile survival and habitat threats, thereby promoting early environmental stewardship and conservation values among future generations. According to the report, the 2024 challenge reached over 400,000 students from 2,600+ schools throughout India, including government, tribal, rural and private institutions. It also extended participation to students from 16 countries, highlighting both the scope and diversity of engagement and demonstrating WWF-India’s commitment to inclusive education that transcends geographic and socioeconomic barriers. Through expert-led sessions, remote and on-ground rounds, and a sense of agency and responsibility for protecting the natural world, which is in line with global goals for climate and biodiversity education for sustainable development.<sup>26</sup>

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<sup>25</sup> United Nations Environment Programme. (2021). *Addressing single-use plastic products pollution using a life cycle approach* (Summary for Decision-Makers).  
<https://wedocs.unep.org/20.500.11822/35110>

<sup>26</sup> World Wide Fund for Nature – India. (2024). *Wild Wisdom Global Challenge 2024 Report* (A. Dalal, A. Khan & K. Khulbe, Eds.). WWF-India.  
<https://academy.wwfindia.org/wildwisdom/pdf/Wild%20Wisdom%202024%20Report.pdf>



Dr. Nishad A (2024), used primary data from 48 respondents in Kerala, the study employs descriptive and statistical analyses to evaluate public attitudes, waste composition and factors influencing waste management practices. The article explores the role of Haritha Karma Sena as a grassroots initiative for improving solid waste management in Kerala, highlighting its emergence as a volunteer-led mechanism under the larger environmental governance framework of the Haritha Keralam Mission. Results show that Haritha Karma Sena's strategy which emphasizes waste segregation, collection, transportation, recycling, composting and community involvement has improved local waste management outcomes, however, issues like inadequate infrastructure, financial limitations, behavioral shifts, and participation gaps still exist. The study also shows that a significant amount of the waste stream is made up of plastic waste, highlighting the need for focused interventions. It also highlights the significance of awareness campaigns, cooperation with local authorities and incentive programs to improve sustainable waste management systems. The study presents Haritha Karma Sena as a model for decentralized waste governance that tackles both real-world environmental issues and socioeconomic aspects of sustainability in Kerala by emphasizing the interaction between community involvement, institutional support and environmental education.<sup>27</sup>

Hareesha K. and Dr. Ruby S. (2025), according to the study the Haritha Kerala Mission's adoption of the 3R's principle (Reduce, Reuse, Recycle) and the creation of decentralized waste systems like Material Collection Facilities (MCFs) and Resource Recovery Facilities (RRFs) represent a significant shift toward integrated, community-driven sustainability strategies that address both environmental degradation and socio economic inclusion. Kerala's approach may provide useful lessons for policymakers and practitioners looking to implement effective participatory models of sustainable waste management in similar socio-economic contexts. In particular, as a women-led group trained in waste collection and resource recovery, it has strengthened local waste governance, increased public participation and fostered waste to wealth initiatives that contribute to broader sustainable development goals. It also emphasizes that these practices have led to

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<sup>27</sup> Dr. Nishad A. (2024). *Haritha Karma Sena: Transforming waste management*. International Journal of Engineering, Business and Management (IJEEM), 8(3), 19–25. <https://dx.doi.org/10.22161/ijeem.8.3.3>

measurable improvements in municipal solid waste management, increased community engagement and decreased environmental impact.<sup>28</sup>

## 2.3. Conclusion

According to the examined literature, environmental education, efficient waste management systems and sustainable behaviors in educational institutions are all essential for encouraging environmental conservation. Prior research highlights the advantages of decentralized waste management, green architecture, community involvement and regulatory initiatives like the Haritha Keralam Mission and the Green Protocol. Long-term sustainability strategies, awareness and practical execution are still lacking, nevertheless. Therefore, in order to provide more efficient and situation-specific solutions, additional study is required to examine sustainability efforts and plastic waste management methods in educational institutions.

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<sup>28</sup> Hareesha, K., & Ruby, S. (2025). *Promoting sustainability: Best practices in waste management by Haritha Kerala Mission*. Management Researcher, 31(2), 143–150. IMDR.  
<https://imdrvm.com/article/imdr-article-1754820215.pdf>



# CHAPTER- III

## APPROACHES TO

## SOLID WASTE

## MANAGEMENT

### 3.1 Introduction

India's solid waste management system is underpinned by a robust regulatory framework that aims to safeguard the environment by controlling trash handling and preventing contamination. The Environment (Protection) Act, 1986, a comprehensive umbrella law that gives the Central Government the authority to create environmental standards and implement regulations for pollution control across sectors, including waste, is the cornerstone of this system. The foundations of India's environmental governance are this Act, which requires the development and implementation of subsidiary regulations on biomedical, hazardous, and construction waste, including the Solid Waste Management Rules, 2016, the Plastic Waste Management Rules, 2016, and the E-Waste Management Rules.<sup>29</sup>

Under these rules

- Waste must be separated at the source into specific types, such as biodegradable, dry (plastic, paper and metal) and domestic hazardous waste by solid waste generators like households, institutions and markets.
- The emphasis is on decentralized processing under the guidance of Local Self Governments (LSG's) and urban local organizations like Corporations and Municipalities serving as the main waste management system implementers.<sup>30</sup>

In India, Solid Waste Management (SWM) is based on a thorough legal and legislative framework intended to preserve the environment, maintain public health and advance sustainable development. The problems of garbage generation and disposal have become much more severe due to rapid urbanization, population growth, shifting consumption habits and the growing use of non- biodegradable materials. Solid Waste Management has become a crucial part of National Environment Policy as a result of India's gradual strengthening of its environmental governance systems in recognition of these difficulties.

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<sup>29</sup> Ministry of Environment, Forest and Climate Change, Government of India. (2016). *Solid Waste Management Rules, 2016* (notif. under the Environment (Protection) Act, 1986). Central Pollution Control Board.

<sup>30</sup> Local Self Government Department, Government of Kerala. (n.d.). *Policy & guidelines – Solid waste management*. Retrieved February 6, 2026, from <https://lsgd.kerala.gov.in/en/waste-management/solid-waste-management/policy-guidelines/>

The Environment (Protection) Act, 1986 (EPA), the main piece of comprehensive law for environmental protection in India, is at the heart of the nation's environmental regulatory structure. The Act, which was passed in the wake of the Bhopal Gas Disaster, 1984, gives the Central Government the authority to take all necessary steps to safeguard and enhance the environment, stop pollution, and set guidelines for waste management and emissions. The statutory foundation for the creation, publication and implementation of sector specific regulations, such as those controlling different types of solid and liquid waste, is provided by the EPA. As such, it serves as the main legislative tool for governing solid waste management in both urban and rural parts of India and the foundation of the country's environmental governance system.

In order to handle the many types of waste streams produced in the nation, the Indian government has issued a number of comprehensive waste management regulations in accordance with the authority granted by the Environment (Protection) Act. The Municipal Solid Waste (Management and Handling) Rules, 2016 (SWM Rules), which mark a substantial departure from previous regulatory strategies. The SWM Rules, 2016, broaden the oversight of control beyond local governments to encompass notified industrial townships, urban agglomerations, census towns, special economic zones, institutions and places of pilgrimage. The recognition that solid waste creation is now a national problem requiring coordinated governance across several administrative levels rather than being limited to metropolitan local authorities alone is reflected in this expanded dimension.<sup>31</sup>

To handle specialized waste streams, the EPA has formulated a number of additional waste-specific regulations in addition to the SWM Rules, 2016. These include the E-waste (Management) Rules, which aim to handle discarded electrical and electronic equipment in an environmentally responsible manner the Bio Medical Waste Management Rules, which regulate waste from healthcare facilities the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 and the Plastic Waste Management Rules, 2016, which aim to reduce plastic pollution through measures like Extended Producer Responsibility (EPR), restrictions on single use plastics, and strengthened recycling systems. These

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<sup>31</sup> Official Gazette (PDF) of the Solid Waste Management Rules, 2016  
<https://sanchitha.lsgkerala.gov.in/sites/default/files/books/Solid-Waste-Management-Rules-2016.pdf>

regulations work together to create a comprehensive regulatory framework that addresses the entire waste lifetime, from creation and segregation to processing and ultimate disposal.

The waste hierarchy gives priority to waste prevention, reduction, reuse, recycling, recovery and as a last resort, scientific disposal, is a fundamental tenet of India's Solid waste management framework. Source segregation is specifically emphasized in the SWM Rules, 2016 as the cornerstone of efficient waste management. Therefore, it is legally required that all waste generators, including homes, businesses, institutions, markets and event planners, separate waste at the source into different categories, such as dry waste (which includes plastic, paper, metal and glass) biodegradable (wet waste) and domestic hazardous waste. This strategy seeks to increase recycling system efficiency, reduce the amount of trash dumped in landfills and allow for the decentralized treatment of organic waste through bio-methanation and composting.

Additionally, the legal framework emphasizes the significance of scientific disposal and decentralized waste processing. The policy encourages localized alternatives including material recovery facilities (MCFs), small scale processing companies, community composting units, and home composting instead of depending only on centralized disposal sites. The goals of this decentralization are to improve community involvement in waste management procedures, cut greenhouse gas emissions, and lessen transportation costs. To decrease long term effects on the environment and human health, scientific landfill design, leachate management and legacy dumpsite closure are also required.<sup>32</sup>

Institutionally, Local Self Governments (LSGs), which include municipalities, municipal corporations and gram panchayats are principally responsible for carrying out solid waste management regulations. These organizations are in charge of setting up facilities for processing and disposal, making sure the trash is segregated at the source, planning door to door waste collection and carrying out awareness and capacity building initiatives. The regulations follow a shared responsibility paradigm, with clear duties for waste producers, local governments, and federal agencies. In order to monitor compliance, issue permits and

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<sup>32</sup> Solid Waste Management Rules, 2016 – Gazette PDF (official government source hosted via BBMP portal):  
[https://apps.bbmpgov.in/SWM/Home/Documents/Rules/MSW%20Rules%202016%20-%20Part%20III\\_Compendum.pdf](https://apps.bbmpgov.in/SWM/Home/Documents/Rules/MSW%20Rules%202016%20-%20Part%20III_Compendum.pdf)

enforce environmental regulations, State Pollution Control Boards (SPCBs) and the Central Pollution Control Boards (CPCB) are essential.<sup>33</sup>

States have developed policies and guidelines to contextualize solid waste management in accordance with local socioeconomic and geographic realities within this national framework. Kerala in particular has become a prominent illustration of community-focused and decentralized garbage management. The local Self Government Department (LSGD) oversees the state's policy framework, which places a strong emphasis on source segregation, waste treatment at the home level, the abolition of open dumping and public involvement. While incorporating state-specific initiatives like Haritha Keralam Mission and Green Protocol Guidelines aimed at minimizing waste generation and promoting environmentally responsible behavior in public institutions and events, Kerala's approach closely adheres to the principles enshrined in the SWM Rules, 2016.<sup>34</sup>

Overall end of pipe waste disposal is gradually giving way to a more comprehensive, sustainability focused strategy in India's solid waste management legislation and policy framework. The framework aims to meet the increasing complexity of waste management in a rapidly evolving economy by integrating legislative legislation, institutional responsibility, decentralized implementation and public participation. Solid waste management is both an environmental necessity and a continuous governance problem since the framework's efficacy ultimately rests on reliable enforcement, sufficient infrastructure, long-term financial viability and persistent behavioral change among waste generators.

### 3.2. Indian Laws Related to Green Protocols and Enactments

India has gradually embraced green protocols, which are sets of environmental norms incorporated into institutional and event management processes, in addition to statutory waste regulations. These guidelines support national environmental objectives including waste

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<sup>33</sup> Government of India, Ministry of Environment, Forest and Climate Change. (2016). Solid Waste Management Rules, 2016. Gazette of India, Extraordinary, Part II, Section 3, Sub-section (i), Notification No. G.S.R. 451(E), dated 8 April 2016. Available at: [https://cpcb.nic.in/uploads/MSW/SWM\\_2016.pdf](https://cpcb.nic.in/uploads/MSW/SWM_2016.pdf)

<sup>34</sup> Government of Kerala, Local Self Government Department. (2017). Haritha Keralam Mission – Official Framework. Available at: <https://haritham.kerala.gov.in/>

minimization, resource efficiency and sustainable event conduct even though aren't often enshrined in stand-alone laws. Extended Producer Responsibility (EPR), which holds producers accountable for the end of life management of their products, especially in categories like plastic and electronic waste, is a key idea in Indian Environmental Law. by giving producers more accountability, EPR aims to improve recycling and decrease waste production. Through state policies, notifications and infrastructure mandates most notably the Kerala State Policy on Solid Waste Management (2018) Kerala has reinforced its regulatory framework and brought it into compliance with federal guidelines. This policy explains how Kerala's municipalities and panchayats should interpret and implement the SWM Rules, 2016.<sup>35</sup>

In light of growing urbanization and environmental concerns, Kerala's experience with solid waste management illustrates both institutional experimentation and legislative growth. Due to inadequate infrastructure and an increase in the amount of household and commercial trash, municipalities, including the Cochin Municipal Corporation (CMC), have historically had difficulty collecting, sorting and disposing of waste.

The Kerala government made a number of actions to change this landscape some of the actions are:

- State policies that are in line with the SWM Rules should be adopted, enabling LSGs to provide local solutions.
- To better coordinate waste, hygiene and environmental initiatives, the Local Self Government Department is being strengthened and sanitation missions are merging.
- The start of extensive initiatives that integrated policing, community involvement, infrastructure and behavior modification.

As a result of this historical change, the Haritha Keralam Mission was established in 2016-2017 as a component of the larger Navakeralam Karma Padhathi (New Kerala Action Plan)

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<sup>35</sup> Government of Kerala, Department of Environment and Climate Change. (2022). *Kerala State Environment Plan* (General Report, 29 September 2022). Kerala Government Document Portal. Available at: <https://document.kerala.gov.in/documents/generalreports/general2909202215%3A09%3A15.pdf>

which placed a strong emphasis on sustainable waste management and sanitation.<sup>36</sup> The primary objectives of the mission are:

- Using extensive waste management and sanitation initiatives to make Kerala Green and Clean.
- Encouraging people, volunteers, NGO's youth organizations and local self-government authorities to participate in garbage solutions.
- Promoting recycling, composting and useful reuse in order to transform waste management into a resource cycle.
- Operational strategies include a strong emphasis on integrated planning, decentralized implementation, green protocol enforcement and the development of technology-enabled systems such as digital performance evaluation and smart waste tracking.<sup>37</sup>

Haritha Keralam Mission coordinate many agencies to improve centralized waste governance throughout the state. The Clean Kerala Company, Kudumbashree Mission and other Local Self Government Institutions (LSGs) such as municipalities, municipal corporations and gram panchayats, work closely with it to carry out its operations. This multiagency coordination strategy guarantee that trash management is viewed as a community driven and participatory development process rather than as a separate administrative duty. HKM aims to institutionalize sustainable waste practices within local governance institutions by combining grassroots implementation with state level.

Creating and carrying out time-bound action plans to improve waste management infrastructure in both urban and rural regions is a key part of the Mission's approach. These plans prioritize reaching 100% doorstep collection of segregated garbage, encouraging decentralized systems and guaranteeing the progressive introduction of scientific waste treatment facilities. The core of Kerala's decentralized waste management concept, source segregation at the home level, is emphasized. The mission strives to end open dumping and guarantee environmentally responsible processing and disposal through concerted efforts and stringent monitoring procedures. In

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<sup>36</sup> Local Self Government Department, Government of Kerala (LSGD Kerala | തദ്ദേശ സ്വയംഭരണ വകുപ്പ്). (n.d.). *Official website*. Government of Kerala. Available at: <https://lsgkerala.gov.in/>

<sup>37</sup> Government of Kerala, Local Self Government Department. (n.d.). *Haritha Keralam Mission – Official Framework and Objectives*. Retrieved from <https://haritham.kerala.gov.in/>

accordance with unique requirements and capabilities of local entities, Haritha Keralam Mission also makes it easier to build small and larger waste management facilities, such as composting units, material recovery facilities and resource recovery centers. In order to reduce waste production and prevent single use plastics, the mission requires the application of Green Protocol Principles in public institutions and events in addition to developing of infrastructure. Another key principle of the mission is the promotion of environmental stewardship among residents through public education and behavioral change communication initiatives. Haritha Keralam Mission works to change waste management from a municipal duty into a shared civic duty in line with sustainable development principles through awareness campaigns, training programs and community mobilization efforts.

### 3.3. Kerala Government Initiatives: Haritha Keralam Mission

The Haritha Keralam Mission (HKM) a comprehensive state-level project of the Government of Kerala, was launched in 201-17 under the larger framework of the Nava Kerala Mission with the goals of sustainable development and environmental restoration. Through decentralized administration and public participation, the mission incorporates sanitation, scientific waste management and soil and water conservation. It signifies a change from traditional garbage disposal methods to a resource efficient, environmentally conscious strategy based on local self-government leadership and community involvement.

Core objectives are:

1. Establishing a Green and Clean Kerala

Through extensive cleanliness campaigns and organized waste management systems, HKM aims to make Kerala a clean, sanitary and environmentally sustainable state. In accordance with Green Protocol standards, the mission encourages source segregation, composting at the home level, material recovery facilities (MRFs) and the removal of single-use plastics from public gatherings.<sup>38</sup>

2. Participatory Governance and Community Mobilisation

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<sup>38</sup> Haritha Keralam Mission, *About the Mission*, Government of Kerala, available at: <https://haritham.kerala.gov.in>



The participative framework of HKM is one of its unique characteristics. To execute decentralized trash solutions, the mission mobilizes volunteers, Kudumbashree units, youth organizations, NGO'S, resident associations and Local Self-Government Institutions (LSGIs). HKM makes ensuring that waste management is no longer just a governmental duty but also a shared social responsibility by encouraging civic engagement and behavioural change.<sup>39</sup>

### 3. The Circular Economy Approach to Waste as a Resource

By promoting recycling, composting, biogas production and productive reuse, HKM advances the idea of turning waste into riches. Composting and biomethanation are used locally to process organic waste, while organized collection networks are used to channel recyclables. This strategy improves resource recovery efficiency and reduce reliance on landfills, which is consistent with the circular economy.

In order to implement waste management programs and campaigns, HKM collaborates with several organizations, such as the Clean Kerala Company, Kudumbashree Mission, Suchitwa Mission and local self- governments. To guarantee successful execution, the mission employs a number of strategic mechanisms.

- **Decentralized Implementation:**  
Local organizations are in charge of waste management, allowing for context specific solutions that are suited to both urban and rural environments.
- **Integrated planning:**  
To achieve comprehensive environmental results, waste management, sanitation, water resource management and soil conservative are linked.
- **Green Protocol Enforcement:**  
Public institutions, including government offices and shools, are urged to embrace eco-friendly policies that minimize disposable materials and encourage sustainable practices.
- **Technology- Enabled Governance:**

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<sup>39</sup> Haritha Keralam Mission, *Community Participation and Implementation Framework*, Government of Kerala, available at: <https://haritham.kerala.gov.in>

To guarantee accountability and transparency, HKM incorporates digital monitoring dashboards, smart waste tracking systems, geotagging of infrastructure and performance-based evaluation tools.<sup>40</sup>

### 3.4. Green Protocol

An institutionalized framework for environmental management, the Green Protocol was put into place in Kerala to guarantee that public gatherings, institutional operations are conducted in an environmentally responsible manner. The Suchitwa Mission, which is part of the Haritha Keralam Mission, is in charge of its operational coordination. It was conceived as a component of the state's larger sustainable development goal. The growing environmental burden brought on by single use plastics, throwaway items, and illogical garbage disposal methods during major events including festivals, political gatherings, weddings and official functions gave rise to the protocol.

The fundamental elements of Kerala's Green Protocol constitute an integrated framework for environmental management that aims to reduce waste production, encourage sustainable substitutes and guarantee scientific disposal methods. The protocol which is overseen by the Suchitwa Mission as part of the larger Haritha Keralam Mission, focuses mostly on waste prevention at the source. This implies that the planning phase of any event or institutional action is where environmental considerations start. In order to prevent excess, especially food waste, organizers are urged to use less materials, cut back on superfluous packaging, switch to digital initiatives and communications and carefully anticipate resource needs. The methodology diminishes the overall environmental effect and eases the strain on municipal waste management systems by preventing garbage before it generated.<sup>41</sup>

Eliminating single use and throwaway materials particularly plastics and thermocol products, which greatly increase pollution is another essential element. During both public and private events, the rule forbids the use of disposable plates, cups, PET bottles, plastic carry bags and PVC

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<sup>40</sup> Haritha Keralam Mission, *About the Mission*, Government of Kerala, available at: <https://haritham.kerala.gov.in>

<sup>41</sup> □ Haritha Keralam Mission, Government of Kerala, *Waste Management and Plastic-Free Campaign Initiatives*, available at: <https://haritham.kerala.gov.in>

flex banners. Rather, it encourages reusable and long lasting substitutes including glass tumblers, steel cutlery, cloth banners and reusable water dispensers. Biodegradable alternatives are advised when reused materials are not practical. This change helps the state's larger plastic reduction initiatives and drastically lowers the amount of non-biodegradable waste.

Strict source segregation of waste at the time of generation is another requirement of the Green Protocol. Waste is divided into three categories;

- Biodegradable
- Recyclable
- Reject waste streams

Event locations and institutional buildings have bins with visible labels. To avoid contaminating recyclable materials, volunteers or designated workers oversee appropriate segregation. This meticulous segmentation reduces reliance on landfills, increases the quality of recyclable items recovered and improves composting efficiency. The part of scientific waste processing and disposal that complements segregation is the channeling of recyclables through Material Recovery Facilities (MRFs) or authorized collection systems, while organic waste is sent to composting or biomethanation facilities. This scientific and decentralized method lessens environmental damage and improves resource recovery.<sup>42</sup>

The implementation of the protocol is further reinforced by administrative and institutional processes. Green Protocol is chosen by local self-government organizations. Nodal officers carry out monitoring and post event assessments and include compliance requirements in event permits. In public administration, this kind of regulatory oversight formalizes environmental duty and guarantees accountability. Additionally, the success of the strategy depends heavily on volunteer mobilization and community involvement. In keeping with Kerala's participatory government model, Kudumbashree units, youth organizations, NGOs, schools and resident associations actively assist rubbish collection, on-site monitoring and awareness campaigns.

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<sup>42</sup> Government of Kerala, *Solid Waste Management and Decentralised Waste Processing Guidelines*, available at: <https://lsgkerala.gov.in>



Source: Haritha Keralam Mission

Figure 3.1. Poster of Green Protocol for Green Office staff and visitors.

Additionally, the policy includes green procurement standards, which encourage government agencies and institutions to give eco-friendly goods and reusable materials top priority when making purchases. This incorporates sustainability into regular administrative tasks in addition to event management. Lastly, digital reporting tools, technology-enabled monitoring systems and performance evaluation systems improve enforcement's efficiency and transparency. In order to achieve sustainable waste management results in Kerala, these interconnected elements work together to develop the Green Protocol into an all-encompassing environmental governance plan that incorporates prevention, engagement, regulation and innovation.<sup>43</sup>

Under the larger context of the Haritha Keralam Mission, Suchitwa Mission and Local Self Government (LSG) initiatives, the Government of Kerala has implemented green certification for schools as an institutional mechanism to encourage sustainable environmental practices inside

<sup>43</sup> Haritha Keralam Mission, Government of Kerala, *Waste Management and Plastic-Free Campaign Initiatives*, available at: <https://haritham.kerala.gov.in>

educational institutions. Since schools have an impact on kids, families and the larger community, they are seen as crucial venues for forming environmental values and behaviours. The certification program encourages school to implement green protocol and systematic solid waste management practices by acting as an incentive system and an assessment tool. The fundamental idea behind green certification is to guarantee quantifiable, practice based environmental compliance on school campuses, going beyond raising awareness. The accreditation assesses the real use of sustainable practices rather than just symbolic involvement.

### 3.5. Green Protocol Certifications in School

As part of Haritha Keralam Mission, the Kerala government is leading the institutional mechanism of Green Certification for Schools, which is being carried out in collaboration with the Suchitwa Mission and Local Self Governance (LSG) organizations. The accreditation stems from the idea that schools that schools have a critical role in influencing young people's environmental values, behaviours and sustainable lives, which in turn affect families and the larger community. The green certification framework places a strong emphasis on the methodical application of quantifiable environmental policies on school campuses rather than just raising awareness or encouraging symbolic engagement.

It evaluates how well a school has implemented sustainable practices in day-day operations, including scientific solid waste management and segregation, water and energy conservation, biodiversity protection, green protocol adherence, the establishment of green islets (vegetation patches) and other sustainable measures. Green status certificates, frequently with graded distinctions reflecting the level of success, are given to schools that demonstrate effective implementation of these environmental policies through a systematic evaluation procedure. This accreditation serves as a tool for evaluation as well as an incentive system, identifying organizations that exhibit sustainable practices and inspiring others to increase their environmental commitments.<sup>44</sup>

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<sup>44</sup> Suchitwa Mission. (2023). *Environmental education and green school programmes under Haritha Keralam framework*. Government of Kerala. <https://suchitwamission.org>

The program has grown quickly under the ongoing Waste-Free New Kerala People's Campaign, which runs from Gandhi Jayanti (October 2) to International Zero Waste Day (March 30) every year. Approximately 14,536 schools statewide are targeted for certification, and 13,477 of these have been designated as “Waste-Free Green Schools” based on their use of environmental management techniques.

A school-based environmental program called “Changathikkoru Thai” was started by the Kerala Government's Haritha Keralam Mission. The program, which translates to “A Sapling for a Friend” aims to encourage kids to plant trees and take responsibility for the environment. Changathikkoru Thai's primary tenet is that every student should plant and raise a sapling at home or on the school grounds. By promoting active engagement rather than passive awareness, the program seeks to instill environmental ideals at a young age. Schools participate in this program to improve biodiversity, increase green cover, fortify climate resilience locally.

Kerala's policy strategy of combining environmental governance with educational institutions, acknowledging schools as catalysts for sustainable community transformation, is shown in Changathikkoru Thai.<sup>45</sup>

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<sup>45</sup> Suchitwa Mission. (2023). *Environmental education and green school programmes under Haritha Keralam framework*. Government of Kerala. <https://suchitwamission.org>

# CHAPTER- IV

# QUESTIONNAIRE

# ANALYSIS

## 4.1. Introduction

The analysis of the answers gathered from the study's structured questionnaire is presented in this part. At order to evaluate the degree of adherence to environmental regulations at schools run by the Cochin Municipal Corporation, the questions were created using the Green Protocol assessment methodology created under Haritha Keralam Mission. The questionnaire's questions all focus on different facets of implementing the Green Protocol, including the designation of Nodal officials, limitations on disposable items, waste segregation procedures, environmental infrastructure and green campus projects. To determine the degree of implementation and spot trends in adherence to Green Protocol requirements, the replies from the chosen schools are examined using percentage analysis and graphical illustration. The institutions are categorises into two institutions type which are CBSE and State.

## 4.2. Frequencies of Responses by Institution Type

A statistical technique called frequency analysis is used to illustrate and summarize data by displaying the frequency of each response or category in a dataset. By showing counts, percentages and cumulative percentages, it facilitates comprehension of the responses distribution. In survey research this approach is particularly helpful for determining patterns, trends and respondent's degree of agreement or compliance.

In this study, responses about the Implementation of the Green Protocol in schools were examined using frequency analysis. The findings display the percentage of schools is that choose each response option (e.g. Yes/No or levels like Always, Most Often, Often, etc.). It is simpler to understand the overall degree of implementation and pinpoint regions with high compliance or potential areas for improvement when the data is presented in terms of frequencies and percentages.



4.1. Table shows Frequencies of Question 1 and Question 2.

| Frequencies of Q1 Nodal Officer Appointed (5/0) |        |            |              |
|-------------------------------------------------|--------|------------|--------------|
| Q1 Nodal Officer Appointed (5/0)                | Counts | % of Total | Cumulative % |
| NO                                              | 8      | 13.3 %     | 13.3 %       |
| YES                                             | 52     | 86.7 %     | 100.0 %      |

| Frequencies of Q2 Programs Follow Green Protocol (8/6/4/2/0) |        |            |              |
|--------------------------------------------------------------|--------|------------|--------------|
| Q2 Programs Follow Green Protocol (8/6/4/2/0)                | Counts | % of Total | Cumulative % |
| ALWAYS                                                       | 29     | 48.3 %     | 48.3 %       |
| MOST OFTEN                                                   | 19     | 31.7 %     | 80.0 %       |
| OFTEN                                                        | 9      | 15.0 %     | 95.0 %       |
| SOMETIMES                                                    | 3      | 5.0 %      | 100.0 %      |

*Source:* Primary Data

From the table 5.1. we can see that in Question 1, of the 60 schools questioned, 52 (86.7%) have appointed a Nodal Office, while only 8 (13.3%) have not, according to the frequency analysis of Q 1. (Appointment of Nodal Officer). This demonstrates a high degree of institutional adherence to government guidelines about the official designation of a responsible entity for carrying out the Green Protocol.

The answers to Question 2 (Programs Following Green Protocol Standards) show a significant inclination toward consistent adherence. Programs are always carried out in accordance with Green Protocol criteria, according to nearly half of the schools (48.3%), while 31.7% said this most often. Furthermore, just 5% indicated occasionally, while 15% stated frequently. Interestingly, no school chose “never” indicating that all establishments at least partially follow the guideline.

4.2. Table shows Frequencies of Question 3 and Question 4.

| Frequencies of Q3 Measures to Reduce Paper Waste (5/0) |        |            |              |
|--------------------------------------------------------|--------|------------|--------------|
| Q3 Measures to Reduce Paper Waste (5/0)                | Counts | % of Total | Cumulative % |
| NO                                                     | 10     | 16.7 %     | 16.7 %       |
| YES                                                    | 50     | 83.3 %     | 100.0 %      |

| Frequencies of Q4 Ban on Disposable & Plastic Items (8/0) |        |            |              |
|-----------------------------------------------------------|--------|------------|--------------|
| Q4 Ban on Disposable & Plastic Items (8/0)                | Counts | % of Total | Cumulative % |
| NO                                                        | 4      | 6.7 %      | 6.7 %        |
| YES                                                       | 56     | 93.3 %     | 100.0 %      |

*Source:* Primary Data

From the table 5.2. we can understand that in Question 3, out of the 60 schools polled, 50 (83.3%) have taken steps to decrease paper waste, whereas 10 (16.7%) have not, according to the frequency analysis of Q3 (Measures to decrease Paper Waste). This shows that the vast majority of schools are implementing strategies to reduce the amount of paper they use, which is a step in the right direction toward sustainable practices and resource conservation.

An even greater degree of compliance is shown in the examination of Question 4 (Ban on Disposable and Plastic Items). Just 4 schools (6.7%) reported not enforcing a ban on disposable and plastic items, while 56 schools (93.3%) reported doing so. This indicates that among the schools questioned, the ban on single-use and plastic products is strongly enforced and broadly accepted.

4.3. Table shows Frequencies of Question 5.

| Frequencies of Q5 % Staff Using Reusable Containers (Marks up to 10) |        |            |            |
|----------------------------------------------------------------------|--------|------------|------------|
| Q5 % Staff Using Reusable Containers (Marks up to 10)                | Counts | % of Total | Cumulative |
| 5                                                                    | 1      | 1.7 %      | 1.7 %      |
| 8                                                                    | 8      | 13.3 %     | 15.0 %     |
| 9                                                                    | 2      | 3.3 %      | 18.3 %     |
| 10                                                                   | 49     | 81.7 %     | 100.0 %    |

*Source:* Primary Data

From table 5.3. we can understand that the frequency analysis of Question 5 (% of staff using reusable containers) shows that school employees have adopted reusable containers at a very high rate. Of the 60 schools polled, 49 (81.7%) had the highest score of 10, indicating that nearly all employees utilize reusable containers. Just one school (1.7%) had a score of five, two schools (3.3%) received a score of nine, and eight schools (13.3%) reported significantly lower ratings. Very low scores were not recorded by any schools.

4.4. Table shows Frequencies of Question 6, 7 and 8..

| Frequencies of Q6 Reusable Containers Arranged (8/0) |        |            |              |
|------------------------------------------------------|--------|------------|--------------|
| Q6 Reusable Containers Arranged (8/0)                | Counts | % of Total | Cumulative % |
| NO                                                   | 2      | 3.3 %      | 3.3 %        |
| YES                                                  | 58     | 96.7 %     | 100.0 %      |

| Frequencies of Q7 Separate Waste Bins (5/0) |        |            |              |
|---------------------------------------------|--------|------------|--------------|
| Q7 Separate Waste Bins (5/0)                | Counts | % of Total | Cumulative % |
| NO                                          | 6      | 10.0 %     | 10.0 %       |
| YES                                         | 54     | 90.0 %     | 100.0 %      |

| Frequencies of Q8 Staff Practicing Waste Segregation (5/0) |        |            |              |
|------------------------------------------------------------|--------|------------|--------------|
| Q8 Staff Practicing Waste Segregation (5/0)                | Counts | % of Total | Cumulative % |
| NO                                                         | 3      | 5.0 %      | 5.0 %        |
| YES                                                        | 55     | 91.7 %     | 96.7 %       |
| YES                                                        | 2      | 3.3 %      | 100.0 %      |

*Source:* Primary Data

From the table we can see that according to the findings, respondents have a strong commitment to waste management methods. Reusable systems are widely used, as seen by the fact that 96.7% (58 out of 60) have set up reusable containers for Q6, while only 3.3% have not. The majority of participants use basic waste segregation infrastructure, as evidenced by the fact that 90% (54 respondents) reported having separate garbage containers in Q7, while 10% did not. In reference

to Q8, 91.7% (55 respondents) affirmed that employees segregate waste, 5% disagreed, and 3.3% provided an additional affirmative response, bringing the total number of affirmative responses to 95%.

4.5. Table shows Frequencies of Questions 9 and 10.

| Frequencies of Q9_compost |                  |        |            |              |
|---------------------------|------------------|--------|------------|--------------|
| Q9_compost                | Institution Type | Counts | % of Total | Cumulative % |
| NO                        | CBSE             | 6      | 10.0 %     | 10.0 %       |
|                           | STATE            | 30     | 50.0 %     | 60.0 %       |
| YES                       | CBSE             | 11     | 18.3 %     | 78.3 %       |
|                           | STATE            | 13     | 21.7 %     | 100.0 %      |

| Frequencies of Q10 Inorganic Waste Arrangement (5/0) |                  |        |            |              |
|------------------------------------------------------|------------------|--------|------------|--------------|
| Q10 Inorganic Waste Arrangement (5/0)                | Institution Type | Counts | % of Total | Cumulative % |
| NO                                                   | CBSE             | 1      | 1.7 %      | 1.7 %        |
|                                                      | STATE            | 6      | 10.0 %     | 11.7 %       |
| YES                                                  | CBSE             | 16     | 26.7 %     | 38.3 %       |
|                                                      | STATE            | 37     | 61.7 %     | 100.0 %      |

*Source:* Primary Data

From table we can see that in question no. 9 there are differences between CBSE and State schools in the frequency distribution of Q9 (Composting Facility). 60% of schools in the sample as a whole (N=60) said they lacked composting facilities, with state schools making up the biggest percentage (50%) and CBSE schools making up 10%. However, 40% of schools of which 21.7% are State Schools and 18.3% are CBSE schools confirmed that composting facilities are available. This shows that although some institutions have composting facilities, most especially State schools do not.

In question no 10, the results show considerably better implementation with regard to Q 10 (Inorganic waste Arrangement). State Schools made up majority (61.7%) and CBSE schools (26.7%) of the 88.4% of schools that reported having plans for handling inorganic waste. Just 11.7% of schools said they didn't have these arrangements. This implies that, in contrast to

composting programs, inorganic waste management techniques are more extensively used in schools.

4.6. Table shows Frequencies of Questions 11, 12, 13 and 14.

| Frequencies of Q11 E-waste Disposal System (5/0)       |        |            |              |
|--------------------------------------------------------|--------|------------|--------------|
| Q11 E-waste Disposal System (5/0)                      | Counts | % of Total | Cumulative % |
| NO                                                     | 13     | 21.7 %     | 21.7 %       |
| YES                                                    | 47     | 78.3 %     | 100.0 %      |
| Frequencies of Q12 Liquid Waste Management (5/0)       |        |            |              |
| Q12 Liquid Waste Management (5/0)                      | Counts | % of Total | Cumulative % |
| NO                                                     | 15     | 25.0 %     | 25.0 %       |
| O                                                      | 1      | 1.7 %      | 26.7 %       |
| YES                                                    | 44     | 73.3 %     | 100.0 %      |
| Frequencies of Q13 Sanitary Facilities Available (6/0) |        |            |              |
| Q13 Sanitary Facilities Available (6/0)                | Counts | % of Total | Cumulative % |
| NO                                                     | 4      | 6.7 %      | 6.7 %        |
| YES                                                    | 56     | 93.3 %     | 100.0 %      |
| Frequencies of Q14 Green Office Committee Formed (5/0) |        |            |              |
| Q14 Green Office Committee Formed (5/0)                | Counts | % of Total | Cumulative % |
| NO                                                     | 6      | 10.0 %     | 10.0 %       |
| YES                                                    | 54     | 90.0 %     | 100.0 %      |

Source: Primary Data

From the table we can see that environmental and sanitation measures are being implemented in a generally beneficial way. In Q 11, 21.7% of respondents did not have an e-waste disposal system, compared to 78.3% (47 respondents), indicating good but not widespread adoption. Proper liquid waste management was affirmed by 73.3% (44 respondents) in Q12, while 25% disagreed and 1.7% provided an alternative option, indicating some inadequacies in this area. Strong results are shown in Q13, with only 6.7% of respondents missing sanitary facilities and 93.3% (56 respondents) having them. Lastly, 54 respondents or 90% of the sample have established a Green Office Committee for Q14, whilst 10% have not. Although e-waste and liquid waste management systems require development, most institutions exhibit solid environmental management practices overall.

#### 4.7. Table shows Frequencies of Questions 15.

| Frequencies of Q15 Green Office Boards Installed (5/0) |                  |        |            |              |
|--------------------------------------------------------|------------------|--------|------------|--------------|
| Q15 Green Office Boards Installed (5/0)                | Institution Type | Counts | % of Total | Cumulative % |
| NO                                                     | CBSE             | 9      | 15.0 %     | 15.0 %       |
|                                                        | STATE            | 19     | 31.7 %     | 46.7 %       |
| YES                                                    | CBSE             | 8      | 13.3 %     | 60.0 %       |
|                                                        | STATE            | 24     | 40.0 %     | 100.0 %      |

*Source:* Primary Data

From the table we can see that the installation of Green Office Boards in CBSE and State institutions is displayed in the Q15 data. 8 (13.3%) of the CBSE institutions reported installing Green Office Boards, while 9(15%) did not. Twenty-four (40%) than CBSE institutions (13.3%) have installed Green Office Boards. Nonetheless, a sizable percentage of organizations still lack Green Office Boards, particularly State (31.7%). This implies even though there has been progress, especially in State Institutions, there is still room for improvement to guarantee broader adoption across both kinds of organizations.

4.8. Table shows Frequencies of Questions 16.

| Frequencies of Q16 Public Cleanliness Standard (0-5) |                  |        |            |              |
|------------------------------------------------------|------------------|--------|------------|--------------|
| Q16 Public Cleanliness Standard (0-5)                | Institution Type | Counts | % of Total | Cumulative % |
| 0                                                    | CBSE             | 0      | 0.0 %      | 0.0 %        |
|                                                      | STATE            | 3      | 5.0 %      | 5.0 %        |
| 1                                                    | CBSE             | 0      | 0.0 %      | 5.0 %        |
|                                                      | STATE            | 1      | 1.7 %      | 6.7 %        |
| 2.5                                                  | CBSE             | 0      | 0.0 %      | 6.7 %        |
|                                                      | STATE            | 1      | 1.7 %      | 8.3 %        |
| 3                                                    | CBSE             | 0      | 0.0 %      | 8.3 %        |
|                                                      | STATE            | 4      | 6.7 %      | 15.0 %       |
| 4                                                    | CBSE             | 2      | 3.3 %      | 18.3 %       |
|                                                      | STATE            | 7      | 11.7 %     | 30.0 %       |
| 5                                                    | CBSE             | 15     | 25.0 %     | 55.0 %       |
|                                                      | STATE            | 26     | 43.3 %     | 98.3 %       |
| YES                                                  | CBSE             | 0      | 0.0 %      | 98.3 %       |
|                                                      | STATE            | 1      | 1.7 %      | 100.0 %      |

*Source:* Primary Data

From the table we can see the majority of institutions achieved high cleanliness ratings, according to the data for Q 16. (Public Cleanliness Standard, 0-5 scale). Only a small number of institutions, mostly state institutions, received ratings between 0 and 3. No CBSE schools were rated lower than 4. Two CBSE (3.3%) and seven state (11.7%) institutions were noted at rating 4. 15 CBSE (25%) and 26 state (43.3%) schools received the highest grade of 5. Overall, most institutions received a score of 5, indicating high standards for public cleanliness, particularly State institutions. The findings indicate that there are few poor ratings and generally good levels of cleanliness in both state and CBSE institutions.



4.9. Table shows Frequencies of Question 17.

| Frequencies of Flower garden |                  |        |            |              |
|------------------------------|------------------|--------|------------|--------------|
| Flower garden                | Institution Type | Counts | % of Total | Cumulative % |
| NO                           | CBSE             | 0      | 0.0 %      | 0.0 %        |
|                              | STATE            | 6      | 10.0 %     | 10.0 %       |
| YES                          | CBSE             | 17     | 28.3 %     | 38.3 %       |
|                              | STATE            | 37     | 61.7 %     | 100.0 %      |

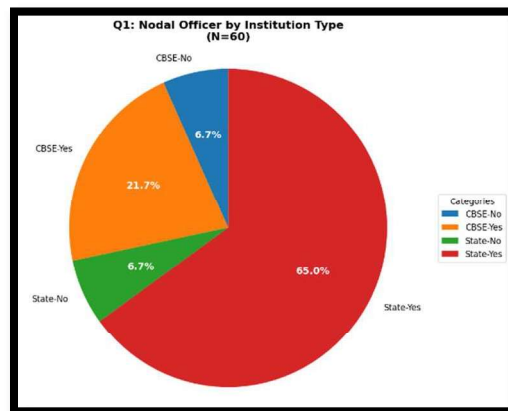
*Source:* Primary Data

From the table we can see that majority of schools maintain green area, according to data on the existence of flower gardens. Six state institutions (10%) said they did not have a flower garden, while none of the CBSE schools did. Positively, 37 state institutions (61.7%) and 17 CBSE institutions (28.3%) acknowledged the existence of a flower garden. An emphasis on greenery and environmental aesthetics is seen in the fact that 90% of the institutions have flower gardens. According to the findings, only a small percentage of state schools lack eco-friendly facilities, and both CBSE and state institutions actively promote such environments.

### 4.3. PLOTS OF RESPONSES

A comparison of the sustainability programs and environmental practices used in State and CBSE schools (N=60) is given in the analysis that follows. Pie charts and bar graphs are used to display the data in order to make the distribution, comparison and performance gaps across several factors easily understandable. Important topics covered in the study include the selection of nodal officers, the use of Green Protocol, waste segregation procedures, the availability of compost facilities and variations in overall institutional performance. The bar graphs clearly compare the State and CBSE schools, while the pie charts provide percentage wise distribution within categories. When combined, these visual aids assist in improved planning and improvement by highlighting strengths, pointing out gaps, and evaluating the general state of eco-friendly practices in schools.

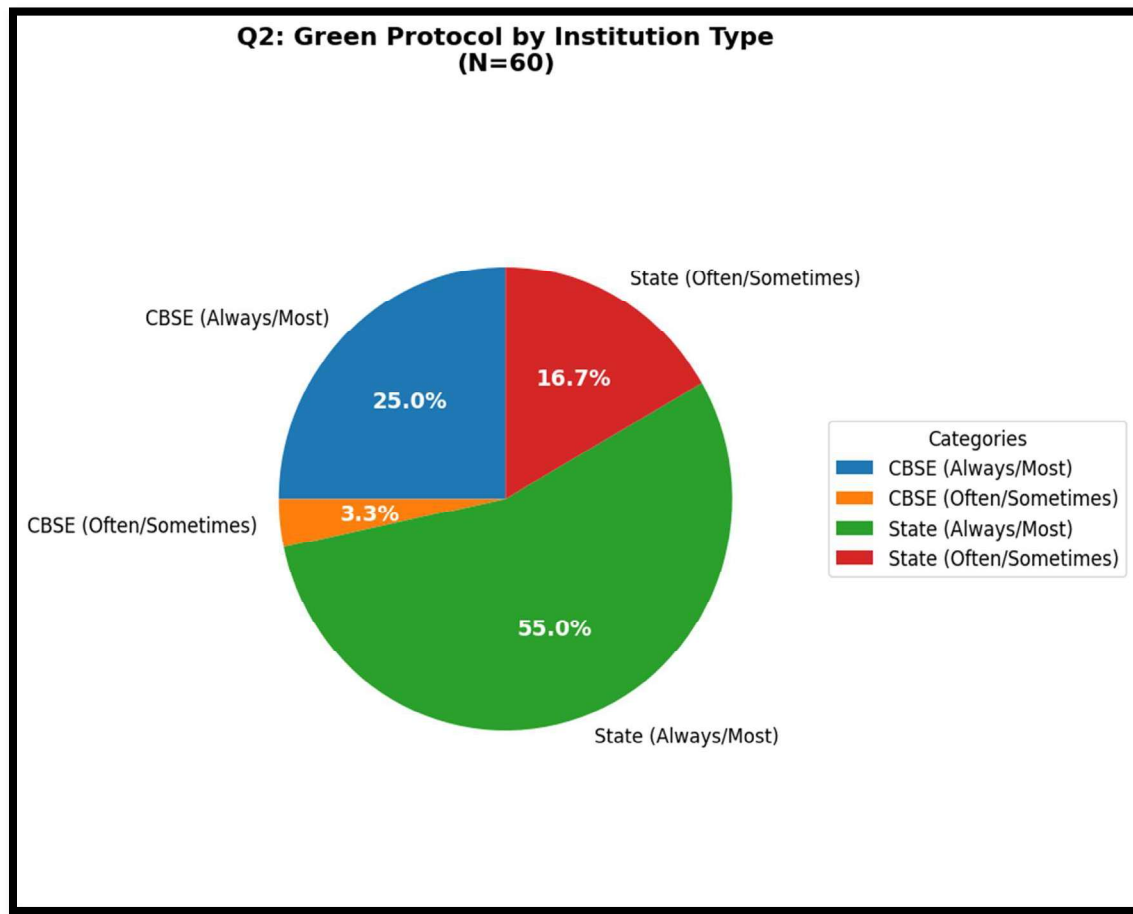
4.10. Figure shows pie chart of Nodal Officer implemented by Institution type.



*Source:* Primary Data

From the figure 4.10. the question 1 (Nodal Officer implemented by Institution type), State institutions fall under the Nodal System category and accounts for 65% of all nodal officers. With 21.7%, CBSE institutions in the Nodal System Category make up the second-largest group. On the other hand, just 6.7% of state and CBSE institutions fall into the “No” category, suggesting a very tiny percentage of institutions without nodal officers. Overall, the data makes it abundantly evident that the majority of institutions particularly State institutions have designated nodal officials, indicating high levels of engagement and compliance

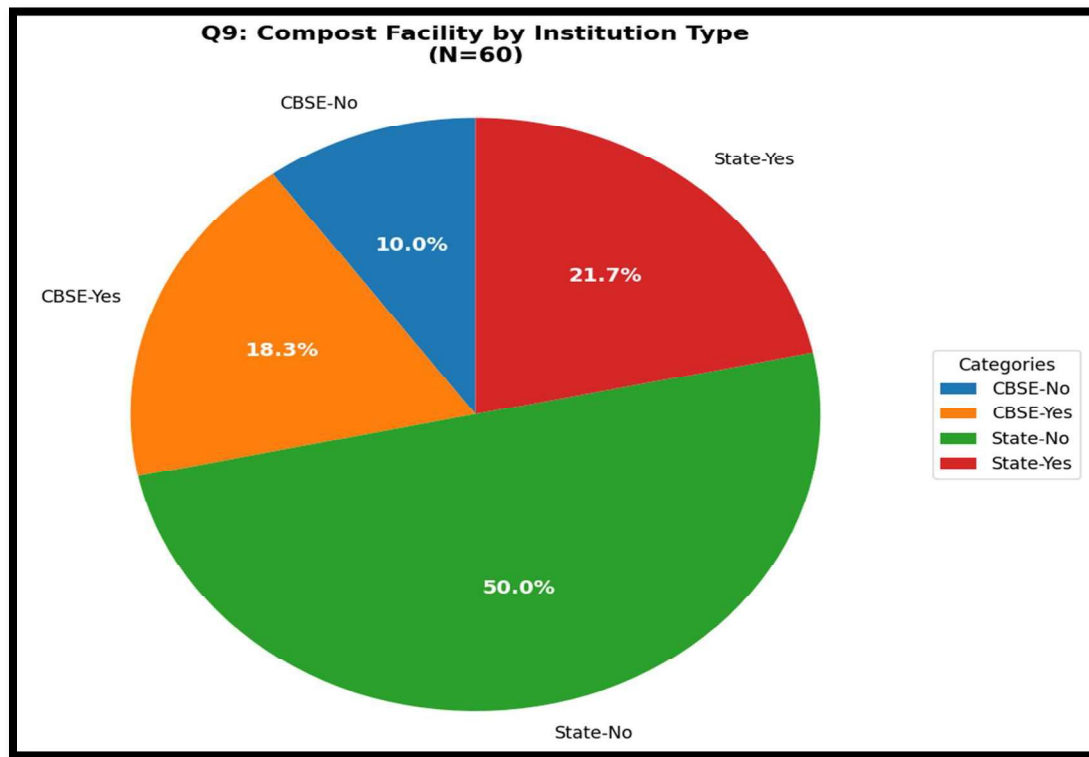
4.11. Figure shows the pie chart of Green Protocol followed by State and CBSE in their events.



*Source:* Primary Data

From the figure 4.11. we can see that the majority of State institutions (55%) follow the Green Protocol always or most of the time, according to the pie chart (N=60), demonstrating robust adoption at the state level. Furthermore, 16.7% of state entities either frequently or occasionally adhere to it. Only 3.3% of CBSE institutions follow the Green Protocol Frequently or occasionally, compared to 25% that follow it usually or most of the time. Overall, data indicates that State institutions are more consistently implementing the Green Protocol than CBSE institutions, with the majority of schools indicating frequent adherence.

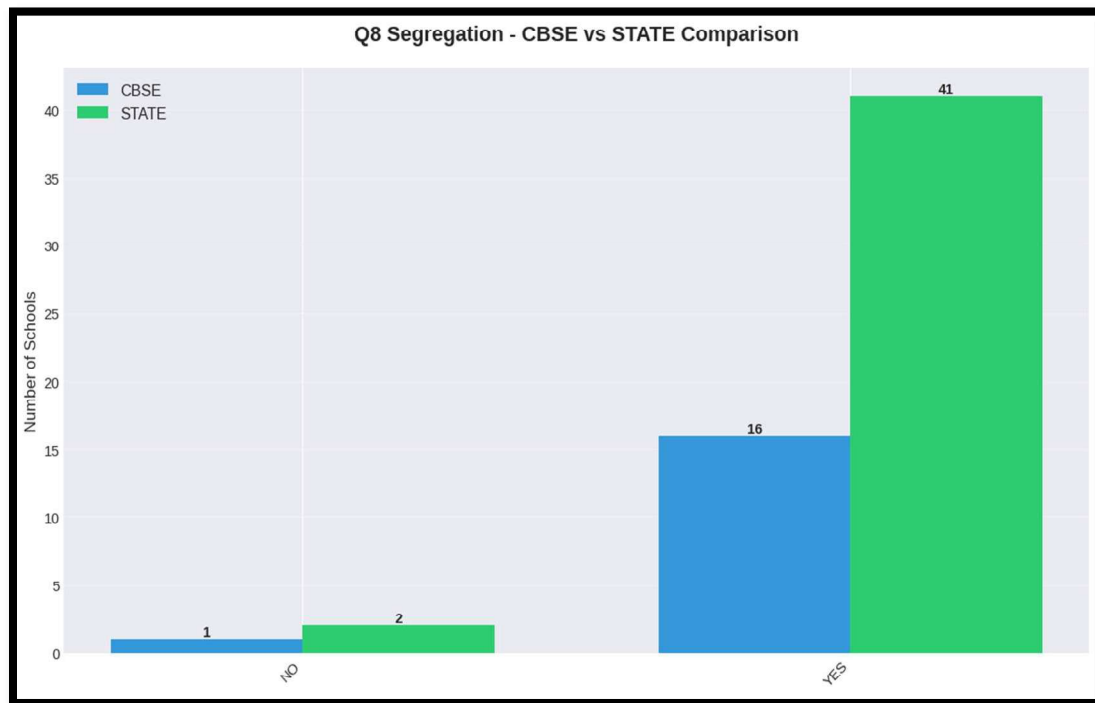
4.12. Figure shows the pie chart of availability of compost facility in CBSE and State institutions.



Source: Primary Data

From the figure 4.12, we can see that Q9: Compost facility by institution type (N=60), 21.7% of State institutions have a compost facility, whereas 50% of State schools do not. 10% of CBSE schools lack a compost facility, while 18.3% do. All things considered the data shows that a sizeable percentage of institutions especially State institutions do not have compost facilities. While some schools have embraced composting, most still require infrastructure improvements for sustainable practices and efficient waste management.

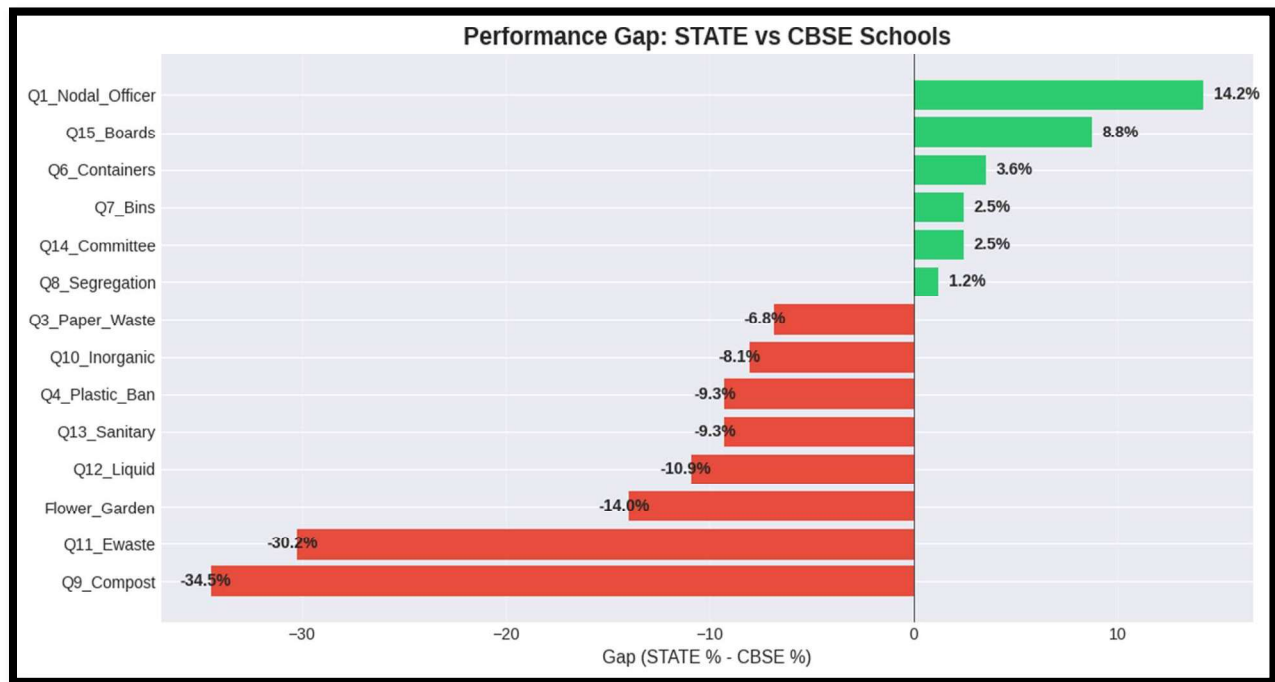
4.13. Figure shows the bar graph of segregation of waste by staff in State Vs CBSE.



*Source:* Primary Data

From figure 4.13. we can see that majority of schools use waste segregation, according to the bar chart, just one CBSE school said “no” to segregation by staff, compared to sixteen that said yes”. In a similar vein, 41 state schools said yes, while just 2 said no. all things considered, the data unequivocally shows that waste segregation procedures are extensively used in both CBSE and State schools exhibiting a greater number of participating institutions.

4.14. Bar graph showing performance gap between State and CBSE schools.



*Source:* Primary Data

According to the figure 4.14, figure analyzes the performance gap between State schools and CBSE schools across 14 key waste management indicators. A positive gap indicates State schools perform better; a negative gap indicates CBSE schools perform better. The places where state schools outperform CBSE schools are indicated by the positive values (Green Bars). Q1- Nodal Officer has the most positive gap (14.2%), followed by Q15- Boards (8.8%) and Q6- Containers (3.6%), Q7- Bins (2.5%), Q14- Committee (2.5%) and Q8- Segregation of waste by staff (1.2%). This implies that fundamental waste management infrastructure and administrative setup are implemented more effectively in state schools. The places where CBSE schools do better than State schools are indicated by the negative numbers (red bars). Q9- Compost (-34.5%) and Q11- E-waste (-30.2%) have the biggest gaps, followed by Flower Garden (-14.0%), Q12- Liquid waste management (-10.9%), Q13- Sanitary (-9.3%), Q4- plastic Ban (-9.3%), Q10- Inorganic (-8.1%) and Q3- Paper Waste (-6.8%). This suggests that composting e-waste management and specific waste handling techniques are more strongly implemented in CBSE schools.

## 4.4. Conclusion

A through grasp of the degree to which Green Protocol practices are applied in the chosen schools is provided by the examination of questionnaire replies and observations. The results show that the majority of schools have implemented a number of environmental measures, including waste segregation procedures, the recruitment of nodal officers, limitations on disposable items and green campus programmes. However, several areas exhibit relatively lower levels of implementation such as e-waste disposal, liquid waste management and composting facilities. Overall, the analysis shows that although schools show a positive attitude toward environmental sustainability, more infrastructure, monitoring and awareness initiatives are required to guarantee more efficient and uniform application of Green Protocol principles.

# CHAPTER- V

## Compliance with Green Protocol Regulations: Appointment of Nodal Officers and Ban on Disposable Items



### 5.1. Introduction

The answers to the questionnaire questions pertaining to Objective 1, which looks at adherence to government directives on the implementation of the Green Protocol, are analysed in this part. The selection of nodal officers and the Cochin Municipal Corporation's ban on plastic and disposable items in schools are the primary subjects of the analysis. Frequency distribution, percentage analysis and hypothesis testing are used to analyse the data gathered from the sampled schools in order to determine the degree of institutional compliance and spot differences in the application of Green Protocol rules.

**5.2. OBJECTIVE 1: To examine compliance with government orders related to the Green Protocol, including the appointment of nodal officers and the prohibition of disposable items.**

### **5.3. RELIABILITY CHECK**

Table 5.1. The Cronbach's alpha value yielded.

| Scale Reliability Statistics |       |
|------------------------------|-------|
| Cronbach's $\alpha$          |       |
| scale                        | 0.663 |

*Source:* Primary Data

To assess the internal consistency of the Green Protocol evaluation tool, Cronbach's alpha was calculated for the key implementation indicators. The analysis yielded  $\alpha = 0.663$ , indicating moderate internal consistency (Nunnally & Bernstein, 1994). This value is considered acceptable for exploratory research, though it suggests that the instrument captures multiple dimensions of Green Protocol implementation rather than a single unitary construct.

### **5.4. Analysis on appointment of nodal officers**

Figure 5.2. Table shows Frequencies of Question 1

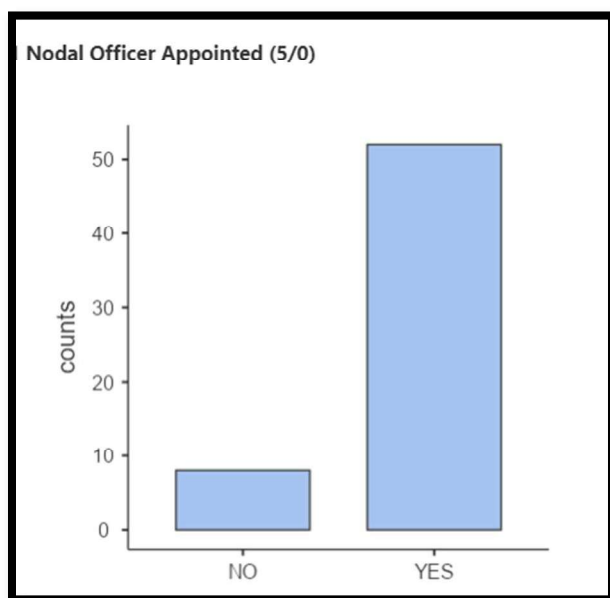
| Frequencies of Q1 Nodal Officer Appointed (5/0) |        |            |              |
|-------------------------------------------------|--------|------------|--------------|
| Q1 Nodal Officer Appointed (5/0)                | Counts | % of Total | Cumulative % |
| NO                                              | 8      | 13.3 %     | 13.3 %       |
| YES                                             | 52     | 86.7 %     | 100.0 %      |

*Source:* Primary Data

The table presents the frequency distribution of responses regarding whether a Nodal Officer was appointed. A total of 60 responses were recorded. 52 respondents (86.7% of the total) confirmed that a Nodal Officer was appointed. This indicates a strong compliance or implementation rate across the surveyed units. 8 respondents (13.3% of the total) reported that a Nodal Officer was not appointed. While relatively small, this group represents a notable minority that may require follow-up or support.

The cumulative percentage rises from 13.3% (for “NO”) to 100.0% (after including “YES”), confirming that all responses fall into one of the two categories, with no missing or invalid data.

5.3. Table shows Graph of Nodal Officers appointed in schools.



*Source:* Primary data

Analysis of nodal officer appointment revealed high overall compliance with Green Protocol requirements, with 86.7% of schools (n=52) having designated nodal officers. However, notable variation exists between institution types: State syllabus schools demonstrated 90.7% compliance (39/43), compared to 76.5% compliance among CBSE schools (13/17). The 14.2 percentage point gap suggests that CBSE schools may face unique challenges in implementing this aspect of the Green Protocol. These findings indicate that while the policy has been widely adopted, targeted interventions may be necessary to achieve universal compliance, particularly among CBSE-affiliated institutions

## 5.5. Hypothesis Test for Association Between Institution Type and Nodal Officer Compliance

H0: Institution type (CBSE vs. State) and nodal officer appointment are independent. Any observed difference in compliance rates is due to random chance.

H1: Institution type and nodal officer appointment are associated.

| $\chi^2$ Tests |       |    |      |
|----------------|-------|----|------|
|                | Value | df | p    |
| $\chi^2$       | 2.13  | 1  | .144 |
| N              | 60    |    |      |

Here p value > 0.05

Decision: Fail to reject the null hypothesis ( $H_0$ )

There is insufficient evidence to conclude that a significant association exists between institution type and nodal officer appointment ( $\chi^2 = 2.13$ ,  $df = 1$ ,  $p = .144$ ). Therefore, we cannot reject the null hypothesis that compliance rates are equal across CBSE and State schools. Although CBSE schools showed lower compliance (76.5%) compared to State schools (90.7%), this difference is not statistically significant and may be attributable to sampling variability.

## 5.6. Analysis on Prohibition of Disposable Items

5.4. Table shows Frequencies of Question 4.

| Frequencies of Q4 Ban on Disposable & Plastic Items (8/0) |        |            |              |
|-----------------------------------------------------------|--------|------------|--------------|
| Q4 Ban on Disposable & Plastic Items (8/0)                | Counts | % of Total | Cumulative % |
| NO                                                        | 4      | 6.7 %      | 6.7 %        |
| YES                                                       | 56     | 93.3 %     | 100.0 %      |

*Source:* Primary data

56 out of 60 schools have implemented a ban on disposable and plastic items. This represents excellent policy adoption across the Kochi Corporation area. Only 4 schools (6.7%) remain non-compliant.

#### 5.5. Frequencies of Institution type (CBSE, State)

| Frequencies of Institution Type |        |            |              |
|---------------------------------|--------|------------|--------------|
| Institution Type                | Counts | % of Total | Cumulative % |
| CBSE                            | 17     | 28.3 %     | 28.3 %       |
| STATE                           | 43     | 71.7 %     | 100.0 %      |

*Source:* Primary data

- STATE boards account for 43 institutions, representing 71.7% of the total sample. This indicates that state-board schools are the predominant category in this dataset.
- CBSE schools make up 17 institutions, or 28.3% of the total. While a significant minority, CBSE schools are less common than STATE schools in this sample.
- The cumulative percentage reaches 28.3% after CBSE and 100.0% after including STATE, confirming that all institutions fall into one of the two categories with no missing data.

### 5.7. Hypothesis Testing and Comparison of Compliance Scores Between Institution Types

Null Hypothesis ( $H_0$ ): There is no significant difference in the mean Compliance Score between different types of institutions.

Alternative Hypothesis ( $H_1$ ): There is a significant difference in the mean Compliance Score between different types of institutions.

In this analysis, a Compliance Score was calculated to measure how well institutions follow certain regulations. The score ranges from 0 to 1, where a higher value means better compliance.

To check whether different types of institutions follow the rules differently, an Independent Samples t-test was used. This test simply compares the average compliance score of two groups of institutions.

The results showed that the p-value was 0.702, which is greater than 0.05. This means that the difference between the two groups is not statistically significant.

Since the p-value is greater than 0.05, we fail to reject the null hypothesis. Therefore, we conclude that there is no significant difference in compliance scores between the two types of institutions. In simple terms, both types of institutions show similar levels of compliance.

## 5.8. Conclusion

According to the analysis, the majority of schools exhibit a high degree of adherence to the essential Green Protocol requirements. The vast majority of schools have imposed limitations on plastic and throwaway items and established nodal officers. Since there is not a noticeable distinction between the two type of institutions, the results also illustrate that State and CBSE schools exhibit comparable levels of compliance. Overall, the results indicate that schools have reacted well to the Haritha Keralam Mission's Green Protocol recommendations.

# CHAPTER – VI

## WASTE MINIMIZATION AND SUSTAINABLE PRACTICES IN SCHOOLS

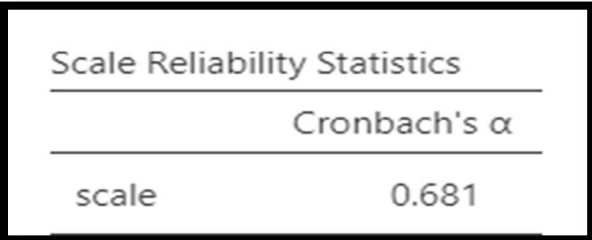
## 6.1. Introduction

The environmental effects of implementing the Green Protocols in schools are examined in this chapter, with an emphasis on waste reduction and the development of sustainable learning environments. It assesses how organizations use eco-friendly measures like cutting back on throwaway items, enhancing waste management systems and promoting worker and student environmental responsibility. Through an analysis of these practices, the chapter seeks to determine the degree to which Green Protocol measures improve environmental consciousness within the educational community and help create cleaner, greener and more sustainable school campuses.

6.2. OBJECTIVE 2 : To analyze the environmental impact of Green Protocol implementation in terms of waste minimization and promotion of sustainable school environments.

## 6.3. RELIABILITY ANALYSIS

Figure 6.1. Cronbach's alpha yielded.



| Scale Reliability Statistics |       |
|------------------------------|-------|
| Cronbach's $\alpha$          |       |
| scale                        | 0.681 |

*Source:* Primary data

The reliability analysis yielded a Cronbach's alpha of 0.681, indicating acceptable internal consistency for the waste management practices scale (Nunnally & Bernstein, 1994).

To evaluate the environmental practices followed by institutions, several composite indices were created using the Compute Variable option in jamovi. These indices were designed to summarize responses from multiple questionnaire items into meaningful indicators. All indices were standardized on a 0–1 scale, where higher values indicate better environmental performance.

## 6.4. Waste Minimization Index

The Waste Minimization Index was developed to measure the extent to which institutions reduce waste generation. This index was calculated using two questionnaire items: reduction in paper



usage (Q3\_Paper\_Reduce) and banning of disposable materials (Q4\_Ban\_Disposable). The index was computed using the formula:

$$\text{Waste\_Minimization} = \frac{\left( \frac{Q3\_Paper\_Reduce}{5} + \frac{Q4\_Ban\_Disposable}{8} \right)}{2}$$

This formula standardizes the responses and provides an overall measure of how effectively institutions minimize waste.

#### Waste Management Infrastructure Index

The Waste Management Infrastructure Index assesses the availability of infrastructure required for proper waste handling. It was constructed using four variables: availability of separate bins (Q7\_Separate\_Bins), management of inorganic waste (Q10\_Inorganic), e-waste management (Q11\_Ewaste), and liquid waste management (Q12\_Liquid). The index was calculated as:

$$\begin{aligned} &\text{Waste\_Management\_Infra} \\ &= \frac{\left( \frac{Q7\_Separate\_Bins}{5} + \frac{Q10\_Inorganic}{5} + \frac{Q11\_Ewaste}{5} + \frac{Q12\_Liquid}{5} \right)}{4} \end{aligned}$$

This index reflects the strength of institutional infrastructure for waste management.

### 6.5. Resource Recovery Index

The Resource Recovery Index measures how effectively institutions recover or reuse waste materials. It was calculated using responses related to composting (Q9\_Compost) and use of organic waste in gardens (Q17\_Garden). The formula used was:

$$\text{Resource\_Recovery} = \frac{\left( \frac{Q9\_Compost}{5} + \frac{Q17\_Garden}{5} \right)}{2}$$

Higher values indicate better recovery and reuse of waste resources.

#### Behavior Change Index

The Behavior Change Index represents the level of environmentally responsible behavior among staff and students. It was derived from the percentage of reusable materials used (Q5\_Reusable\_Percent) and staff participation in waste segregation (Q8\_Staff\_Segregation). The formula used was:

$$\text{Behavior\_Change} = \frac{\left( \frac{Q5\_Reusable\_Percent}{10} + \frac{Q8\_Staff\_Segregation}{5} \right)}{2}$$

This index measures behavioral adaptation toward sustainable practices.

#### Overall Environmental Impact Score

Finally, an Overall Environmental Impact Score was calculated to provide a comprehensive measure of environmental performance. This score was obtained by averaging the four indices:

$$\text{Environmental\_Impact\_Total} = \frac{(\text{Waste\_Minimization} + \text{Waste\_Management\_Infra} + \text{Resource\_Recovery} + \text{Behavior\_Change})}{4}$$

This overall score summarizes the combined impact of waste reduction, infrastructure availability, resource recovery, and behavioral practices within institutions.

## 6.6. ANALYSIS

6.2. Table showing the environmental performance of CBSE and State institutions across different indices, including the Waste Minimization Index, Waste Management Infrastructure Index, Resource Recovery Index, Behavior Change Index, and the Overall Environmental Impact Score.

| Group Descriptives                    |                  |    |       |       |        |
|---------------------------------------|------------------|----|-------|-------|--------|
|                                       | Institution Type | N  | Mean  | SD    | SE     |
| Waste Minimization Index              | CBSE             | 17 | 0.941 | 0.166 | 0.0403 |
|                                       | STATE            | 43 | 0.860 | 0.252 | 0.0384 |
| Waste Management Infrastructure Index | CBSE             | 17 | 0.941 | 0.141 | 0.0341 |
|                                       | STATE            | 43 | 0.814 | 0.245 | 0.0373 |
| Resource Recovery Index               | CBSE             | 17 | 0.971 | 0.121 | 0.0294 |
|                                       | STATE            | 43 | 0.860 | 0.315 | 0.0480 |
| Behavior Change Index                 | CBSE             | 17 | 0.700 | 0.294 | 0.0712 |
|                                       | STATE            | 43 | 0.542 | 0.226 | 0.0345 |
| Overall Environmental Impact Score    | CBSE             | 17 | 0.888 | 0.154 | 0.0374 |
|                                       | STATE            | 43 | 0.769 | 0.172 | 0.0262 |

*Source:* Primary Data

Descriptive statistics were calculated to compare the environmental performance of CBSE and State institutions across different indices, including the Waste Minimization Index, Waste Management Infrastructure Index, Resource Recovery Index, Behavior Change Index, and the Overall Environmental Impact Score. The results present the sample size (N), mean, standard deviation (SD), and standard error (SE) for each institution type.

For the Waste Minimization Index, CBSE institutions (N = 17) had a mean score of 0.941 (SD = 0.166), whereas State institutions (N = 43) had a mean score of 0.860 (SD = 0.252). This suggests that CBSE institutions demonstrate slightly better waste minimization practices compared to State institutions.

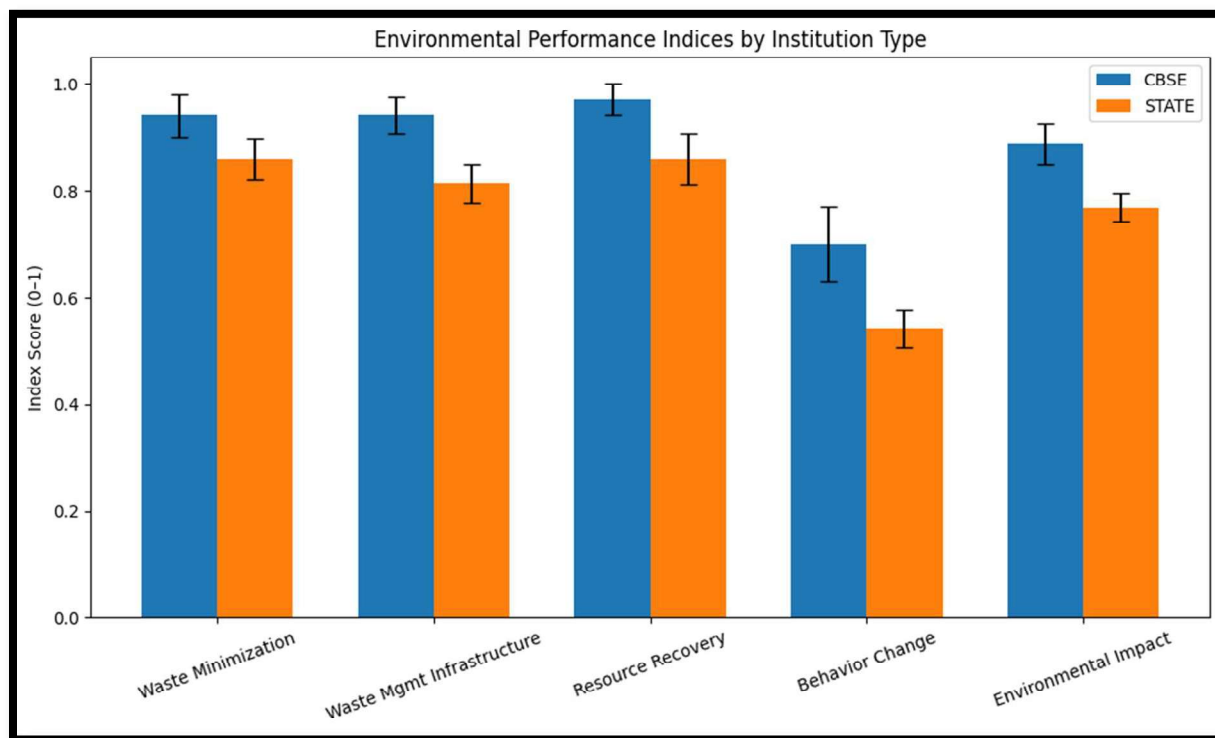
In terms of the Waste Management Infrastructure Index, CBSE institutions recorded a mean of 0.941 (SD = 0.141), while State institutions had a mean of 0.814 (SD = 0.245). This indicates that CBSE institutions tend to have relatively stronger waste management infrastructure.

For the Resource Recovery Index, CBSE institutions showed a higher mean value of 0.971 (SD = 0.121) compared to 0.860 (SD = 0.315) for State institutions. This implies that CBSE institutions may be more effective in recovering and reusing resources.

Regarding the Behavior Change Index, CBSE institutions reported a mean of 0.700 (SD = 0.294), while State institutions had a mean of 0.542 (SD = 0.226). This suggests that behavioral practices related to environmental awareness and sustainable actions appear to be somewhat stronger in CBSE institutions.

Finally, the Overall Environmental Impact Score also showed higher performance among CBSE institutions, with a mean score of 0.888 (SD = 0.154) compared to 0.769 (SD = 0.172) for State institutions. This overall score reflects better environmental practices and outcomes in CBSE institutions. Overall, the descriptive results indicate that CBSE institutions tend to perform better across most environmental indices compared to State institutions. However, further statistical tests are required to determine whether these observed differences are statistically significant.

6.3. Figure shows bar graph of environmental performance by State and CBSE.



*Source:* Primary data

The figure compares environmental performance indices between CBSE and State institutions across five areas: Waste Minimization, Waste Management Infrastructure, Resource Recovery, Behavior Change, and Overall Environmental Impact. The error bars represent the variability (standard error) in the data. Overall, the results suggest that CBSE institutions tend to perform slightly better in environmental management and sustainability practices than State institutions.

## 6.7. Conclusion

According to the report, the Green Protocol's implementation has improved school environmental practices. Numerous organizations have implemented sustainable efforts and waste reduction strategies to promote greener and cleaner campus settings. School communities are becoming more environmentally conscious, as seen by practices like waste segregation, cutting back on disposable items and encouraging the use of reusable resources. There are still certain implementation variances and infrastructure constraints, though. The overall environmental impact of Green Protocol actions in schools will be significantly improved by fortifying waste management facilities and guaranteeing constant adherence to sustainable practices.

# CHAPTER- VII

## IMPLEMENTATION

### GAPS AND

### INSTITUTIONAL

### CONSTRAINTS

### 7.1. Introduction

This section examines the institutional barriers and implementation gaps that hinder the Green Protocol's successful implementation in Cochin Municipal Corporation schools. It investigates whether environmental practices like trash segregation are impacted by administrative support mechanisms like appointment of nodal officers. The chapter also highlights the operational difficulties schools encounter and examines infrastructure elements, such as composting facilities. The analysis aids in comprehending the practical constraints that can impede the effective and consistent application of Green Protocol principles by integrating statistical tests and qualitative replies.

### 7.2. OBJECTIVE 3 : Identify implementation gaps and institutional constraints

## **7.3. The Relationship Between the Presence of a Nodal Officer and Waste Segregation Practices in Schools**

This analyzes whether the appointment of a Nodal Officer (Q1) is associated with better waste segregation practices among staff (Q8) in schools. A Chi-Square test of independence was conducted on a sample of 60 schools to determine if there is a statistically significant relationship between these two variables.

The data shows a positive descriptive trend. In schools without a Nodal Officer ("NO"), only 75.0% of staff reported practicing waste segregation. Conversely, in schools with a Nodal Officer ("YES"), the rate of staff practicing waste segregation was substantially higher at 94.2%. This suggests that the presence of a Nodal Officer is associated with better compliance in waste segregation.

Despite the large difference in percentages, the Chi-Square test indicates that this result is not statistically significant ( $\chi^2 = 3.65$ ,  $df = 2$ ,  $p = .162$ ). The p-value of .162 is greater than the conventional alpha level of 0.05. This means the association observed in the sample is not strong enough to conclude that it exists in the broader population of schools. The result could potentially be due to random chance.

While the data shows a clear trend that schools with a Nodal Officer have higher rates of staff practicing waste segregation, the relationship was not found to be statistically significant. This

lack of significance is likely influenced by the small sample size in key comparison groups, particularly the very low number of schools without a nodal officer (only 8 out of 60).

7.1. Table shows the contingency tables of Question 1 and 8.

| Contingency Tables               |              |                                             |        |        |         |
|----------------------------------|--------------|---------------------------------------------|--------|--------|---------|
| Q1 Nodal Officer Appointed (5/0) |              | Q8 Staff Practicing Waste Segregation (5/0) |        |        | Total   |
|                                  |              | NO                                          | YES    | YES    |         |
| NO                               | Observed     | 1                                           | 6      | 1      | 8       |
|                                  | % within row | 12.5 %                                      | 75.0 % | 12.5 % | 100.0 % |
| YES                              | Observed     | 2                                           | 49     | 1      | 52      |
|                                  | % within row | 3.8 %                                       | 94.2 % | 1.9 %  | 100.0 % |
| Total                            | Observed     | 3                                           | 55     | 2      | 60      |
|                                  | % within row | 5.0 %                                       | 91.7 % | 3.3 %  | 100.0 % |

| $\chi^2$ Tests |       |    |      |
|----------------|-------|----|------|
|                | Value | df | p    |
| $\chi^2$       | 3.65  | 2  | .162 |
| N              | 60    |    |      |

Source: Primary Data

#### 7.4. Do schools with compost facilities have better staff practices?

This analysis investigates whether the presence of a compost facility in a school (Q9\_compost) is associated with improved waste segregation practices among staff (Q8). A Chi-Square test of independence was conducted on a sample of 60 schools.

The analysis reveals two contrasting perspectives: a perfect trend in the observed data versus a lack of statistical significance.

- Observed Trend (Descriptive Statistics):

The data presents a compelling descriptive pattern. In schools without a compost facility, staff waste segregation sits at 86.1% (31 out of 36). However, in schools with a compost facility, segregation practices are reported at 100% (24 out of 24). This perfect correlation



in the sample suggests that the presence of a compost facility is strongly associated with staff consistently practicing waste segregation.

- Statistical Significance (Inferential Statistics):

Despite the perfect trend in the data, the Chi-Square test indicates that this result is not statistically significant ( $\chi^2 = 3.64$ ,  $df = 2$ ,  $p = .162$ ). The p-value of .162 is greater than the conventional alpha level of 0.05. This seemingly contradictory finding occurs because the test accounts for the distribution across all categories, including the cells with zero observations (schools with compost but staff not segregating).

While the sample data shows a perfect relationship—where every school with a compost facility also has staff practicing segregation—the finding is not statistically significant. This is likely due to the small sample size and the fact that 55 out of 60 schools fall into the "YES" category for segregation, leaving very few cases in the comparison groups. The result suggests a strong practical association, but it cannot be confidently generalized to all schools based on this limited data.

To determine if this relationship holds true in the wider population, further research with a larger sample is necessary. Ideally, the sample should include a more balanced number of schools with and without compost facilities, as well as more variation in segregation practices.

## 7.5. Analysis of Difficulties Faced with Waste Facilities

This report analyzes the qualitative responses to question Q9.2, which asked schools about difficulties they face in operating or maintaining their compost or biogas facilities. The data is cross-tabulated by Institution Type (CBSE vs. State) to identify patterns and specific constraints. A total of 34 responses were recorded in this breakdown.

1. Majority Report No Difficulties:

- The vast majority of schools ( 73.5% ,  $n=25$ ) reported "NO" difficulties.
- State schools constitute the largest share of this group (16 out of 25), while CBSE schools account for 9.

## 2. Reported Difficulties (Qualitative):

- 17.6% of responses (n=6) fell under a generic "YES" category, indicating unspecified difficulties. Notably, 6 out of these 7 "YES" responses came from State schools.
- Specific Qualitative Constraints:
  - Water Shortage: One State school explicitly mentioned "Water shortage now" as a constraint.
  - Waste Management Issue: One CBSE school reported a specific problem: "Too much waste when we cut the tree (old rain tree dangerous to children)."
- 3. Overall Positive Outlook: The data suggests that for the majority of schools (73.5%) that provided a response, no significant operational difficulties are being faced with their compost/biogas facilities.
- 4. State Schools and Unspecified Issues: State schools account for the majority of the generic "YES" responses. This may indicate a need for further probing to understand the specific nature of their difficulties, as they were not elaborated in the text.
- 5. Infrastructure & Environmental Constraints: The specific mentions of "water shortage" and challenges with "tree cutting waste" highlight real-world operational hurdles. Water scarcity, in particular, is a critical constraint for composting processes, which require moisture.

It is recommended to follow up with the 7 schools (especially the 6 State schools) that responded "YES" without specifying the difficulty. Understanding these unspecified challenges could reveal systemic issues not captured in the initial survey design. Additionally, the issue of water shortage, while only mentioned once, may be a growing concern that warrants attention in drought-prone or water-scarce regions.

7.2. Table shows the Frequencies of Difficulty faced by schools while using biogas.

| Frequencies of Q9.2 Difficulties Faced? (Yes/No)                           |                  |        |            |              |
|----------------------------------------------------------------------------|------------------|--------|------------|--------------|
| Q9.2 Difficulties Faced? (Yes/No)                                          | Institution Type | Counts | % of Total | Cumulative % |
| NO                                                                         | CBSE             | 9      | 26.5 %     | 26.5 %       |
|                                                                            | STATE            | 16     | 47.1 %     | 73.5 %       |
| Too much waste when we cut the tree ( old rain tree dangerous to children) | CBSE             | 1      | 2.9 %      | 76.5 %       |
|                                                                            | STATE            | 0      | 0.0 %      | 76.5 %       |
| Water shortage now.                                                        | CBSE             | 0      | 0.0 %      | 76.5 %       |
|                                                                            | STATE            | 1      | 2.9 %      | 79.4 %       |
| YES                                                                        | CBSE             | 1      | 2.9 %      | 82.4 %       |
|                                                                            | STATE            | 6      | 17.6 %     | 100.0 %      |

*Source: Primary Data*

Specific Constraint Examples from Data

Water-Related Constraints:

"Water shortage now." - *Govt LPS Padivattom*

Space-Related Constraints:

"Too much waste when we cut the tree (old rain tree dangerous to children)" - *The Delta Study*

Infrastructure Constraints:

"All bins are green." (indicating lack of color-coded system) - *CCPLM*

Waste Management Constraints:

"Cooperation team will take if less amount they will burn." - *Govt RFT HS& VHSS*

## 7.6. Correlation Results

7.3. Table shows the Correlation Matrix of Nodal Officers and total marks awarded to each school.

| Correlation Matrix |             |               |             |
|--------------------|-------------|---------------|-------------|
|                    |             | Nodal officer | Total Marks |
| Nodal officer      | Pearson's r | —             |             |
|                    | df          | —             |             |
|                    | p-value     | —             |             |
| Total Marks        | Pearson's r | 0.261         | —           |
|                    | df          | 58            | —           |
|                    | p-value     | .044          | —           |

Source: Primary Data

## 7.7. Relationship Between Nodal Officer Appointment and Implementation Success

Analysis Performed:

A Pearson product-moment correlation coefficient was computed to assess the relationship between compliance with Government Order requirement for Nodal Officer appointment (Q1) and overall Green Protocol implementation scores (Total Marks) across 60 schools in the Cochin Municipal Corporation.

Interpretation:

There was a positive correlation between the two variables,  $r = 0.261$ ,  $n = 60$ ,  $p = 0.044$ , with higher levels of Nodal Officer appointment associated with higher total implementation scores. The positive direction indicates that schools with appointed Nodal Officers tend to achieve higher implementation scores. However, with only 6.8% of the variance explained ( $r^2 = 0.068$ ),

the relationship is modest, suggesting that while Nodal Officer appointment is important, it is one of many factors influencing successful implementation.

## 7.8. Conclusion

Although the majority of schools exhibit good environmental practices, the research shows that there are still some implementation gaps and institutional limitations. Although there is no statistically significant correlation, schools with composting facilities and nodal officers typically exhibit superior waste management practices. Although the majority of schools reported no significant operating challenges, certain restrictions were noted, including a lack of water, problems with waste management and infrastructure constraints. These results imply that in order to guarantee more successful and uniform use of Green Protocol principles, greater institutional backing, better infrastructure and ongoing monitoring are required.

# CHAPTER – VIII

## SUMMARY AND

## CONCLUSIONS

## 8.1. Introduction

The study's summary, key findings, conclusions and recommendations derived from the data analysis are presented in this chapter. The study's main objective is to evaluate how the Cochin Municipal Corporation's chosen schools are using Green Protocol principles. By lowering trash production, promoting waste segregation and reducing the use of disposable and plastic items in institutions, the Green Protocol program seeks to encourage ecologically conscious behaviour. The promotion of sustainable behaviors and environmental awareness among students is a critical function of educational institutions. Therefore, evaluating the degree to which schools adhere to Green Protocol requirements is crucial to comprehending the efficacy of environmental programs. This chapter offers conclusions and recommendations for enhancing the use of Green Protocol practices in schools, as well as a summary of the study's key findings.

## 8.2. Background of Study

Through policy frameworks like the Haritha Keralam Mission, which was introduced in 2016 to integrate waste management, sanitation, water conservation and sustainable resource use across institutions, environmental sustainability has emerged as a key governance concern in Kerala. The Kerala government implemented the Green Protocol guidelines as part of this mission, which aims to reduce waste production, single use plastics, promote source segregation, encourage composting and cultivate environmentally conscious behavior in public institutions, including schools. According to Haritha Keralam Mission, the Green Protocol moves the emphasis from awareness-based environmental campaigns to quantifiable and practice-oriented compliance inside institutional contexts.<sup>46</sup>

Since schools have an impact on families, communities, and children alike, they are seen as key locations for environmental change. In this regard, the application of the Green Protocol in schools involves the promotion of reusable materials, water conservation measures, energy saving techniques, on-site composting facilities and organized waste segregation systems. The Suchitwa

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<sup>46</sup> Haritha Keralam Mission. (2023). *Green protocol guidelines and waste-free Kerala initiatives*. Government of Kerala. <https://haritham.kerala.gov.in>

Mission and Local Self Government Institutions (LSGs) support these efforts by offering monitoring assistance and technical advice.<sup>47</sup>

Through school based programs, awareness campaigns and waste free initiatives that are in line with the state's larger sustainability goals, the Cochin Municipal Corporation has been actively involved in operationalizing these environmental policies within the framework of urban governance. The Waste- Free Kerala initiatives campaigns place a strong emphasis on school infrastructure development, behavioral modification, and institutional responsibility. However, despite continuous implementation efforts, there is still lack of rigorous academic evaluation of the degree of adherence, sufficiency of the infrastructure, flexibility in behavior and general efficacy of Green Protocol Practices in Cochin Corporation schools. Therefore, it is crucial to assess how well the Green Protocol is being implemented in these schools in order to determine the success of the policy, spot implementation gaps and make recommendations for ways to increase sustainable institutional governance at the municipal level.<sup>48</sup>

### 8.3. Objectives of Study

The following are the objectives of the study.

- To examine compliance with government orders related to the Green Protocol, including the appointment of nodal officers and prohibition of disposable items.
- To analyze the environmental impact of Green Protocol implementation in terms of waste minimization and promotion of sustainable school environments.
- To identify implementation gaps and institutional constraints affecting the economic sustainability of Green Office initiatives.

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<sup>47</sup> Cochin Municipal Corporation. (2023). *Waste-free city initiatives and school-level environmental programmes*. Government of Kerala. <https://kochi.lsgkerala.gov.in>

<sup>48</sup> Suchitwa Mission. (2023). *School sanitation and green institutional practices under Haritha Keralam framework*. Government of Kerala. <https://suchitwamission.org>



## 8.4. Findings

The results demonstrate a strong institutional commitment to putting the Green Protocol into practice in Cochin Municipal schools. The majority of schools actively adhere to environmental regulations, which reflects good administrative response and an increasing understanding of the educational system's sustainability obligations.

- Nodal officers have been appointed by a substantial majority (86.7%), guaranteeing organized oversight of Green Protocol operations. Program implementation also demonstrates constant adherence; non-compliance with established environmental norms, while the majority state that requirements are followed regularly or always.
- Waste reduction strategies are used extensively. 93.3% of schools impose limits on plastic and throwaway items, and more than 83% of schools have taken action to reduce paper usage. Reusable container usage among staff members is remarkably high, suggesting a strong behavioural fit with sustainability goals.
- Systems for managing operational waste are mostly well-established. The majority of establishments use staff-level waste segregation, separate trash cans and reusable systems. Composting facilities are still scarce, especially in state schools, although inorganic waste management plans are being implemented more successfully.
- Overall, environmental infrastructure performs well. The majority of schools uphold strict public hygiene regulations, Green Office Committees and hygiene facilities. However, there are still gaps in the management of liquid waste and the disposal of e-waste, suggesting areas that need better monitoring systems and infrastructure.
- With 90% of schools maintaining flower gardens and encouraging environmental aesthetics, green campus activities are clearly visible. Wider acceptance is required, despite the fact that several institutions have set up Green Office Boards. Although schools have made great strides overall, certain changes can guarantee more consistent sustainability results.
- The Cochin Municipal Corporation's State and CBSE schools (N=60) are compared graphically in terms of sustainability practices. According to the Nodal Officer implementation pie chart, 21.7% of institutions are CBSE schools with officers, while 65% of institutions are State schools with appointed officers. Overall administrative compliance

is relatively high, with only 6.7% falling into the “No” category. State institutions are more consistent, according to the Green Protocol adherence chart. While CBSE institutions exhibit somewhat lower consistent adherence, about 55% of State schools always or most frequently follow the guideline. Due to widespread partial implementation, no institution reported total non- compliance.

- Infrastructure deficiencies are highlighted by the dispersion of compost facilities. 50% of State institutions do not have compost facilities, compared to 18.3% of CBSE and 21.7% of state schools. This implies that infrastructure for composting is still a significant issue in need of improvement, especially in state institutions.
- The Green Protocol implementation tool has moderate internal consistency, according to the reliability analysis for Objective 1, which yielded a Cronbach’s alpha of 0.663. this score indicated that instrument examines several aspects of institutional compliance rather than a single construct and is appropriate for exploratory study.
- With 86.7% of schools appointing nodal officers, an analysis of Nodal Officer appointments reveals good compliance. The Chi-square test ( $p=.144$ ) revealed no statistically significant correlation between institution type and appointment status, despite the fact that State schools (90.7%) outperformed CBSE schools (76.5%).
- 93.3% of schools enforced the restriction on throwaway items, indicating a high level of policy acceptance. Overall compliance scores across CBSE and State schools did not significantly differ, according to Independent Samples t-test results ( $p=.702$ ) suggesting generally comparable adherence levels.
- Reliability analysis for Objective 2 produced a Cronbach’s alpha of 0.681, indicating that environmental practice indices had adequate consistency. In comparison to State schools, CBSE schools score higher on composite indices for Waste Minimization (0.941), Infrastructure (0.941), resource recovery (0.971), Behavior Change (0.700) and Overall Environmental Impact (0.888).
- Positive but statistically insignificant correlations between staff practices and leadership were found in Objective 3 analysis. Although segregation rates were greater in schools with Nodal Officers (94.2%) than in those without (75%) a significant connection was not confirmed by Chi-square results ( $p=.162$ ).

- In a similar vein, compost facilities and staff segregation had a perfect descriptive correlation (100% vs 86.1%) however statistical significance was not reached ( $p=.162$ ). nodal Officer appointments and total implementation scores had a little but significant positive correlation ( $r=0.261$ ,  $p= 0.044$ ) according to correlation analysis, suggesting that leadership improves results.

## 8.5. Conclusions Drawn

According to the study's findings, the majority of Cochin Municipal Corporation school exhibits a strong dedication to ecologically responsible activities, and the implementation of Green Protocol standards is typically satisfactory.

- The majority of schools have designated Green Protocol nodal officers, indicating the existence of a structured administrative framework for overseeing and organizing environmental initiatives.
- Schools have demonstrated a strong institutional endorsement of environmental regulations and sustainability principles by minimizing the usage of plastic and disposable materials.
- The majority of schools adhere to waste reduction strategies like paper minimization, the use of reusable containers and waste segregation which suggests that staff and students are becoming more conscious of the environment.
- Although many institutions have well-established basic waste management systems, such as the usage of color-coded bins and segregation procedures, composting facilities are still scarce in many schools, especially state syllabus institutions.
- While most schools maintain environmental infrastructure, such as public cleanliness standards, sanitary facilities and Green Office Committees, there are certain gaps in areas like e-waste disposal and liquid waste management.
- A lot of schools actively participate in establishing eco-friendly environments through green campus initiatives including the creation of flower gardens and environmental beautification projects.

- While CBSE schools score marginally higher on some environmental performance measures, comparative analysis reveals that both State and CBSE schools exhibit comparatively similar levels of Green Protocol compliance.
- According to statistical research, having nodal officials enhances the general application of Green Protocol practices, highlighting the significance of leadership in environmental management.
- While the majority of schools show good adherence to Green Protocol criteria, variations in infrastructure availability and implementation consistency point to the need for greater environmental infrastructure, increased institutional support, and enhanced monitoring in some schools.

## 8.6. Suggestions

A few recommendations are made based on the study's findings to boost environmental sustainability in educational institutions and enhance the application of Green Protocol practices in Cochin Municipal Corporation schools.

- Since leadership has been proved to have a good impact on the implementation of environmental policies, all schools should make sure that Green Protocol Nodal Officers are appointed and reinforce their role through regular training and clearly defined responsibilities.
- To guarantee uniform adherence to Green Protocol requirements throughout all schools, the Cochin Municipal Corporation should work with the Haritha Keralam Mission to establish regular monitoring and assessment processes.
- In order to manage biodegradable waste, schools should be encouraged to increase their composting facilities, particularly those that do not currently have such equipment.
- Improving liquid waste management and appropriate e-waste disposal systems should receive more focus because these sectors demonstrated comparatively low levels of implementation.
- To ensure that sustainable practices become ingrained in the institutional culture, environmental education and awareness programs should be reinforced to encourage long-term behavioural change among staff and students.

- By guaranteeing the availability and appropriate usage of color -coded trash cans and by working with approved waste collection organizations, schools can further improve waste segregation and resource recovery procedures.
- To improve visibility, understanding and accountability for environmental activities on campus, more schools should set up Green Office Boards and environmental information displays.
- In order to raise their Green Protocol implementation standards, institutions with poorer environmental performance should be given more infrastructure support and direction.
- Through eco-clubs, environmental campaigns and green campus projects like caring for flower and vegetable gardens, schools should promote more student involvement.
- Lastly, ensuring the sustainability and long-term success of environmental practices in schools can be achieved by integrating Green Protocol compliance into normal institutional policies and evaluation procedures.

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## *Appendix*

### **Questionnaire**

1. Has a Nodal Officer been appointed according to Government Order to implement the Green Protocol? (Yes – 5, No – 0)
2. Are programs conducted strictly following Green Protocol standards? (Always – 8, Most often – 6, Often – 4, Sometimes – 2, Never – 0)
3. Are any measures taken to reduce paper waste? (Yes – 5, No – 0)
  - 3.1. If Yes, please explain:
4. Have all types of disposable items and banned plastic products (including items made of paper, plastic, and thermocol) been prohibited as per Government Order? (Yes – 8, No – 0)
5. Do staff members bring food and water in reusable containers? (Marks awarded proportionally based on the percentage of total staff out of 10)
6. Are reusable containers regularly available in the office for use? (Yes – 8, No – 0) 6.1. Are they sufficient to meet the institution's needs? (Yes, No)
7. Are separate bins arranged for sorting organic and inorganic waste? (Yes – 5, No – 0)
  - 7.1. If Yes, are there bins in different colors?
  - 7.2. What colors are used for the bins?
8. Are staff following waste sorting and disposal practices? (Yes – 5, No – 0)
9. Have composting or biogas facilities been installed for processing organic waste? (Yes – 5, No – 0)
  - 9.1. If Yes, are they currently in use?
  - 9.2. Are there any difficulties faced in their use? (Yes, No)
  - 9.3. Is there any measurement done on the organic waste generated? (Yes, No)

10. Are there arrangements for sorting, storing, and transferring inorganic waste? (Yes – 5, No – 0)
11. Is there a system for the timely removal of e-waste and discarded furniture? (Yes – 5, No – 0)
12. Is there a system for managing liquid waste? (Yes – 5, No – 0)
13. Are well-maintained basic sanitary facilities with water and waste disposal systems available? (Yes – 6, No – 0)
14. Have Green Office clubs or committees been formed, and has training been provided? (Yes – 5, No – 0)
15. Have Green Office directive boards been installed? (Yes – 5, No – 0)
16. Standard of public cleanliness maintenance (out of 5)
17. Have you set up a vegetable garden and a flower garden?

Maximum Marks: 100

Marks Obtained: \_\_\_\_\_

Percentage: \_\_\_\_\_

## **List of Samples**

1. St. Juliana's Public School, Pai Rd
2. GHS Edakochi
3. EMGHSS, Fort Kochi
4. GHSS Venala
5. GLPS Venala
6. The Delta Study
7. SRV GHSS Ekm
8. Ghss Panayapilly
9. GHSS Panampilly
10. OLG GHS Palluruthy
11. LMCCHSS Pachalam
12. GLPS Island
13. Santa Maria English Medium School
14. GHS Edapally
15. St. Alberts HSS
16. St. Mary AIGHS Fortkochi
17. Govt Higher Secondary School for Girls
18. GHSS Central Calvathy
19. St. Louis Mundamvelli
20. GUPS Edapally
21. Janonodayam Public School, Edakochi

22. Bhavans Adharasha Vidyalaya
23. HEHMMOHSS
24. Fe. Agostina Vellim
25. Rajagiri Christujayanthi Public School
26. Govt HS Willingdon Island
27. EMGLPS, Veli
28. EMCHS Veli Fort Kochi
29. Govt UPS Palluruthy
30. GOVT UPS Thamaraparambu
31. GLPS Central Calvathy
32. St. George's H S Edapally
33. GOVT Model Nursery School
34. Govt RFT HS& VHSS
35. St. Thomas CGHSS, Thevara
36. SDPY GHSS Palluruthy
37. ACS EMHSS, Kaloore
38. SDPY BHSS, Palluruthy
39. Britto School, Fort Kochi
40. St. Paul's Fort Kochi
41. St. Antony's
42. Teresa Spinelli
43. GVHSS Govt Kunnumpuram
44. Greets Public School

45. Kendriya Vidyalaya (Port Trust)
46. St. Rita's Public School
47. SRV LPS
48. Al Hudha Public School
49. Kendriya Vidyalaya (Kadavanthra)
50. St. Joseph H.S (FM), Chathiath
51. Pius GHS Edapally
52. Bhavans Vidya Mandir
53. GHSS Elamakkara
54. Nalanda Public school
55. GOVT Girls LPS
56. GHSLPS
57. Sacred Hearts
58. CCPLM
59. GOVT LPS Padivattom
60. St. Teresas Convent Girl's Higher Secondary School