

SMRITI Upvan Project: Transforming a Tertiary Care Centre into a Sustainable Green Campus in Central India

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Abstract: This scientific paper focuses on the establishment of the Smriti Upvan Green Campus at AIIMS Bhopal, highlighting the steps taken to transform the campus into an environmentally sustainable and eco-friendly institution. The paper discusses various initiatives undertaken, including rainwater harvesting, waste management, wastewater treatment, green infrastructure development, promotion of green cover, achieving zero-waste status, and the adoption of renewable energy sources. These measures address water scarcity concerns, manage organic waste, conserve water resources, enhance transportation systems, promote biodiversity, and reduce energy consumption. The successful implementation of these steps showcases the commitment of AIIMS Bhopal toward creating a sustainable and green campus.

Keywords: smriti upvan green campus, environmental sustainability, rainwater harvesting, green infrastructure, green cover, zero-waste campus, sustainable maintenance practices.

1. Introduction

The establishment of the Smriti Upvan Green Campus at AIIMS Bhopal marks a significant effort to create an environmentally sustainable and eco-friendly institution. AIIMS Bhopal's commitment to sustainability and environmental conservation is evident through the successful implementation of these initiatives. By addressing water scarcity concerns, managing organic waste, conserving water resources, enhancing transportation systems, promoting biodiversity, reducing energy consumption, and embracing renewable energy, AIIMS Bhopal has set a remarkable example for other institutions aiming to create sustainable campuses. Through the successful implementation of various initiatives undertaken to achieve this goal, including rainwater harvesting, waste management, wastewater treatment, green infrastructure development, promotion of green cover, achieving zero-waste status, and the adoption of renewable energy sources, AIIMS Bhopal has demonstrated its commitment to environmental sustainability and created a model for others to follow. This paper discusses the steps taken to achieve this goal.

2. Establishment of a Horticulture Committee

The committee is comprised of individuals passionate about

the environment. Their role is crucial in planning and implementing horticultural practices that contribute to the overall greening and beautification of the campus. The committee's responsibilities included selecting and maintaining appropriate plant species, designing green spaces, organizing tree plantation drives, promoting biodiversity conservation, monitoring Maintenance and Care of planted areas, and collaborating with the forest department, other campus departments, and student organizations to raise awareness. Their active involvement ensures the success and sustainability of the Smriti Upvan Green Campus initiative. They encourage the growth of native plant species, create habitats for birds and insects, and implement sustainable gardening practices to support local ecosystems. The committee ensures the ongoing maintenance and care of the planted areas. This includes regular watering, pruning, fertilizing, and disease control to ensure the health and longevity of the plants.

The establishment of a dedicated Horticulture Committee for the Smriti Upvan Green Campus initiative at AIIMS Bhopal signifies the institution's commitment to environmental sustainability and beautification. The committee's handpicked members, chosen by the Executive Director for their passion and expertise, actively contribute to the selection, design, and maintenance of horticultural practices on the campus to ensure the success and long-term sustainability of the Smriti Upvan Green Campus initiative, creating a green and welcoming environment for the AIIMS Bhopal community.

3. Rainwater Harvesting

To address water scarcity concerns, rainwater harvesting units have been set up on the campus. This stored water is effectively utilized for various purposes, such as irrigation, toilet flushing, and other non-potable water needs. The implementation of rainwater harvesting and recharge wells at AIIMS Bhopal through the SMRITI UPVAN Project demonstrates the institution's commitment to sustainable water management. The successful construction of 14 recharge wells, along with the installation of media filters, ensures efficient rainwater harvesting and augmentation of groundwater levels. The interconnected design of the recharge wells prevents water

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overflow within the campus during heavy rainfall. The recharge wells are equipped with multimedia filters that contain different types of media and gravel layers. This design ensures efficient filtration, as larger particles are trapped in the coarse, medium layer, while finer particles are captured in the deeper bed. An automatic backwash system removes contaminants in the filter bed, which are then flushed down the drain. This ensures the consistent performance of the media filters. The project's success serves as a model for other institutions seeking to implement effective rainwater harvesting practices and enhance groundwater sustainability [1]-[4].

4. Waste Management

The campus focuses on managing organic waste through the implementation of waste converters or vermicomposting. Kitchen waste and dried leaves are converted into compost, reducing the overall waste footprint and promoting a circular economy. The campus-initiated recycling initiatives to manage plant and kitchen waste effectively by utilizing green and dry brown leaves resulting from tree cutting and pruning for composting and as a valuable source of plant manure. The 'Pusa Decomposer,' developed by the Indian Agriculture Research Institute, is employed to expedite biomass decomposition. This decomposer incorporates fungal strains that produce essential enzymes to accelerate the breakdown of biomass. Organic inputs such as jaggery and chickpea flour are also used to enhance the decomposition process. The 'Pusa Decomposer' solution significantly reduces the decomposition time for shredded and watered plant and kitchen waste from approximately three months to 25 days, facilitating faster compost production. The campus employs waste converters or vermicomposting pits for composting organic waste [5]-[8].

5. Wastewater Management

AIIMS Bhopal has established a wastewater treatment facility within the campus. This facility ensures that treated water is available for various purposes, reducing the strain on freshwater resources. The wastewater management at AIIMS Bhopal focuses on the utilization of treated wastewater from a Sewage Treatment Plant (STP) for the irrigation of lawns and flushing toilets and for non-potable applications. The STP plays a crucial role in removing contaminants and ensuring the safety of wastewater disposal. Effective wastewater management is vital for maintaining a sustainable environment in healthcare institutions. A Sewage Treatment Plant (STP) is a water treatment facility designed to remove contaminants and impurities from sewage water. It employs physical, chemical, and biological processes to treat sewage and produces treated wastewater suitable for discharge into the surrounding environment or for intended reuse applications. STP plays a critical role in preventing water pollution caused by untreated sewage discharges. The treated wastewater obtained from the STP at AIIMS Bhopal is utilized for irrigation purposes, specifically for maintaining the lush green lawns within the campus. This practice reduces the demand for freshwater resources and promotes sustainable water usage. By

implementing a Sewage Treatment Plant, AIIMS Bhopal ensures that sewage wastewater is effectively treated before being discharged into the environment. This practice prevents water pollution and safeguards the surrounding ecosystems [9]-[12].

6. Green Infrastructure

To encourage sustainable transportation options, the campus allows e-rickshaws to ply within the premises.

The thermal environment outdoors plays a crucial role in determining human comfort and health while also influencing sustainable transportation choices. The importance of walking as a sustainable mode of transportation within campus environments is vastly influenced by outdoor thermal environments. The potential benefits of reducing vehicle emissions and promoting physical activity through increased walking are encouraged at AIIMS Bhopal through urban design considerations, green infrastructure, shading techniques like the pathways connecting different buildings on campus, and the use of cool materials to create comfortable and inviting outdoor spaces that encourage walking [13], [14].

Bicycling is actively promoted at AIIMS Bhopal as Cycling not only helps reduce carbon emissions but also encourages physical activity and improves overall health and well-being. In collaboration with Bhopal Nagar Nigam, chartered bikes are installed within the campus, providing accessible and sustainable transportation options. E-rickshaws are electrically-powered vehicles that produce zero tailpipe emissions, reducing carbon emissions and air pollution. This initiative offers a convenient and eco-friendly mode of transportation for staff, patients, and visitors. The adoption of sustainable transportation options contributes to improved air quality within the campus premises. By reducing reliance on fossil fuel-powered vehicles, the campus environment becomes cleaner, benefiting the health and well-being of individuals within the institution. Promoting sustainable transportation is crucial for reducing carbon emissions and enhancing the overall environmental sustainability of healthcare institutions [15]-[18].

7. Green Cover

Creating a green campus environment is crucial for promoting biodiversity, enhancing aesthetics, and fostering a sustainable ecosystem. The establishment of herbal gardens and regular tree plantation campaigns promotes a green campus environment. AIIMS Bhopal actively engages in sampling and seed ball distribution to increase biodiversity and create a sustainable ecosystem within the campus. The establishment of herbal gardens, regular tree plantation campaigns, and sustainable maintenance practices at AIIMS Bhopal have contributed to a green campus environment. AIIMS Bhopal has actively established herbal gardens within the campus premises, serving as hubs of biodiversity and greenery. These gardens provide a conducive environment for research, education, and recreational activities. The institution has also conducted regular tree plantation campaigns to increase the green cover and enhance the campus environment. From 2012 to 2018, Nine

thousand and five hundred and ninety plants were planted at AIIMS Bhopal. Under the Smriti Upvan project, approximately 11,700 plants were planted and maintained within one year, with ongoing plantation efforts reflecting the institution's commitment to sustainability. The species diversity includes fruit-bearing trees like Mango, Mahua, and Amla, as well as flowering plants such as Bougainvillea, Petunia, Daisy, Button Rose, and Kashmiri Rose. Additionally, students and faculty have contributed by planting tree saplings like *Delonix Regia* (Gulmohar), *Ficus Benjamina*, Bottle Palm, Areca Palm, and *Phoenix sylvestris* Roxb. (Wild date palm/khajur), among others.

To maximize space utilization and enhance aesthetics, vertical gardens were installed at AIIMS Bhopal. These vertical gardens feature plant species like *Asparagus sprengeri*, *Portulacaria afra* (Jade), *Chlorophytum-variegated*, *Ipomea* (Golden leaves), *Setcreasea purpurea*, *Tradescantia zebrina*, Iresine herbs, among others. Hedges planted along the lawns include *Duranta Golden*, *Acalypha green*, and *Acalypha red*, adding to the overall beauty and biodiversity of the campus.

To ensure the health and vitality of the lawns and plants, AIIMS Bhopal has adopted sustainable maintenance practices. Soil quality improvement is achieved through the application of sludge, manure, and good earth and organic manure prepared by composting leaf and garden waste within the campus. Efficient watering and irrigation systems, including the provision of water through dedicated horticulture features like STP water treatment plants, are implemented to optimize water usage and maintain the lush greenery. The benefits of green cover at AIIMS Bhopal are increased biodiversity, improved aesthetics, enhanced air quality, and a soothing environment for patients, staff, and visitors. Additionally, the green campus environment promotes physical and mental well-being [19]-[22].

8. Zero-Waste Campus

To minimize waste generation and promote recycling, the university encourages waste segregation. Separate dustbins for biodegradable wet waste and inorganic dry waste are provided, and the use of single-use plastic and straws is strictly banned within the campus. Effective waste management in healthcare institutions is crucial to minimize waste generation, promote recycling, and mitigate environmental impacts.

The importance of appropriate containers for different types of medical waste is highlighted, ensuring safe handling and preventing leakage. Discharge in care units is facilitated through dedicated containers, and storage facilities are equipped with confined bags or containers. The institution enforces strict protocols to prohibit the reuse of dedicated waste bags, maintaining the highest standards of hygiene and infection control. Proper waste sorting at the first instance is paramount, as waste cannot be re-sorted once it is placed in a waste bin. The waste management strategies implemented in a healthcare institution should ensure efficient and responsible waste handling. Clearly labeled waste bins for different waste categories, such as recyclables, organic waste, and non-recyclables, have helped individuals to identify and sort waste

correctly and easily. The institution emphasizes waste segregation practices to separate biodegradable wet waste from inorganic dry waste. Separate dustbins are provided for each waste type, promoting recycling and minimizing the overall waste footprint.

The institution employs appropriate vehicles for the collection and transportation of medical waste outside the treatment facility. Traceability and adherence to disposal regulations are strictly adhered to for efficient medical waste management. Recyclable medical waste is processed through sterilization and crushing facilities, while non-recyclable waste undergoes environmentally sound treatment methods such as incineration.

Recognizing the importance of good healthcare waste management, the institution prioritizes raising awareness among healthcare professionals regarding waste reduction, segregation, and recycling. A dedicated waste management team, supported by a responsible committee, is responsible for developing waste management plans tailored to the institution's needs. These plans are integrated into daily operations to ensure sustainable waste management practices.

By implementing waste segregation practices, enforcing bans on single-use plastics, and utilizing appropriate containers and treatment methods, healthcare institutions can significantly contribute to a sustainable and environmentally friendly future. The integration of waste management plans into daily operations and the active involvement of healthcare professionals is crucial for achieving successful waste management outcomes [23]-[27].

9. Switching to Renewable Energy

AIIMS Bhopal recognizes the importance of renewable energy sources and has embraced solar energy to meet its electricity needs. Solar power is utilized to generate warm water in geysers, power laboratories, auditoriums and illuminate street lights across the campus. This transition reduces dependency on non-renewable energy sources and contributes to a greener future. The significance of renewable energy sources, particularly solar energy, in addressing the energy demands of institutions like AIIMS Bhopal and the integration of solar power for lighting purposes highlights its environmental benefits and potential for reducing costs.

The utilization of solar power in AIIMS Bhopal with a specific emphasis on generating warm water in geysers, powering laboratories and auditoriums, and illuminating street lights throughout the campus. The transition to solar energy helps reduce reliance on non-renewable energy sources and contributes to a greener future. The SMRITI Upvan Project at AIIMS Bhopal has incorporated solar lighting in various areas, including lawns, pathways, and green patches. The advantages of solar lighting, such as minimal construction requirements, like a non-invasive installation process that avoids destructive trenching or digging., independence from the grid, and cost savings, support the institute's sustainability goals, and minimize the carbon footprint.

Solar-powered lights contribute to a minimal carbon footprint and provide consistent power along busy intersections

and crosswalks, enhancing safety for drivers and pedestrians. The visual appeal of solar lighting systems is also aesthetically appealing, as they are designed to blend seamlessly with the surroundings. By embracing solar power, AIIMS Bhopal reduces its dependency on non-renewable energy sources, minimizes the carbon footprint, and paves the way for a more sustainable future [28].

10. Conclusion

In conclusion, the establishment of the Smriti Upvan Green Campus at AIIMS Bhopal exemplifies the institution's dedication to environmental sustainability and the creation of an eco-friendly campus. Through a range of initiatives, including rainwater harvesting, waste management, wastewater treatment, green infrastructure development, promotion of green cover, achieving zero-waste status, and the adoption of renewable energy sources, AIIMS Bhopal has made substantial progress in its sustainability journey.

The implementation of rainwater harvesting units and recharge wells has addressed water scarcity concerns, effectively utilizing stored water for various purposes and augmenting groundwater levels. Waste management practices, such as waste converters and vermicomposting, have minimized waste generation and promoted recycling, contributing to a circular economy. The establishment of a wastewater treatment facility has ensured the safe and efficient utilization of treated wastewater, reducing the strain on freshwater resources.

AIIMS Bhopal's commitment to sustainable transportation options, including e-rickshaws and chartered bikes, has reduced carbon emissions and improved air quality within the campus. The promotion of green cover through herbal gardens, tree plantation campaigns, and vertical gardens has enhanced biodiversity, aesthetics, and provided a soothing environment for the campus community. The implementation of sustainable maintenance practices and efficient watering systems has ensured the health and vitality of lawns and plants.

By actively enforcing waste segregation, banning single-use plastics, and utilizing appropriate containers and treatment methods, AIIMS Bhopal has demonstrated responsible waste management practices. The institution's transition to solar energy has reduced dependency on non-renewable energy sources, contributing to a greener future and minimizing the carbon footprint.

The success of these initiatives at AIIMS Bhopal serves as a model for other institutions seeking to promote environmental conservation and create sustainable campuses. The commitment shown by AIIMS Bhopal towards creating a green and sustainable campus sets an example for the healthcare sector and reinforces the importance of adopting eco-friendly practices. As AIIMS Bhopal continues its sustainability journey, it will inspire and influence others to follow suit, contributing to a more sustainable and environmentally conscious future.

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