

Sustainable Urban Development: Role of Ambala Cantonment Board

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Abstract. This paper discusses the projects, government systems and people involvement measures, which have been embraced by the Ambala Cantonment Board (ACB) to enhance sustainable urban development in its operations. The study is a descriptive research design that utilized both primary and secondary information to examine the effectiveness of the activities of ACB in environmental management, waste disposal, green infrastructure, and conservation of resources. The results reveal that the Board has already enacted a number of sustainability strategies such as effective solid waste management systems, tree plantation exercises, lake development and preservation of sanitation units. But gaps in awareness of people, digital inclusion, and citizen participation also form part of the research and are considered to restrain complete achievement of sustainability objectives. The conclusion of the paper is that the Ambala Cantonment Board is a possible light leading the way in terms of urban sustainability and combining control with care towards the environment. It serves to increase the involvement of the communities, implement intelligent technologies, and promote inter-agency partnerships to improve the ecological sustainability and liveability in the cantonment territories in the long-term.

Keywords: Sustainable Urban Development, Ambala Cantonment Board, Environmental Management, Green Infrastructure, Urban Governance

1. Introduction

Urbanisation has become one of the hottest topics in the whole world and the 21 st century because of its urgent need of a paradigm shift in the way the city is planned and administered. Sustainable urban development stresses on economic growth, social inclusion and environmental protection interventions, thus avoiding the old infrastructure-focused model of urbanisation (Panwar & Thapliyal, 2024). In fact, poor imbalances of the Indian urban system Indian urban systems also often experience fast growth, accompanied by a decline in ecological state, inadequate service provision, and spatial inequalities (Shaban, Kourtit and Nijkamp, 2020). In this Indian setting, the importance of local governance institutions takes on an amplified importance especially in places where there is a mixed civil-military structure like cantonments.

ACB is a board of governance that represents a hybrid system of civilian municipality and military domain activities, with the Ambala Cantonment Board being the executive of the board. This is the two-fold position of the Board to act as an interface between state-

directed infrastructure necessities and community-directed urban remainability desires. The concept of urban governance sustainability demands inclusive decisions, institutional innovation and participation (Menon and Hartz-Karp, 2019). The cantonment model thus forms an interesting argument on the need to examine how hybrid governance arrangements may ease or discourage sustainable urban results. Over the last few years, governance agencies like the ACB started to embrace measures and initiatives that are consistent with the objectives of sustainable urban development: these include the rejuvenation of water bodies, waste separation, the development of greater green infrastructural networks and better amenities to the citizens. According to the literature, sustainable development requires urban local bodies to adhere to total approaches in their effort to enhance meaningful sustainability within a city, and this includes infrastructure renewal, participatory governance, ecological design and long-term resilience (Gahlot, Singh and Abidin, 2025; Raghubanshi, 2024). Besides, the analyses of Indian cities reveal that frameworks of measurement including multi-dimensional indicators (social, environmental, economic, institutional) is essential in the measurement of urban sustainability (Reddy & Tiwari, 2016). This research aims at analyzing how the Ambala Cantonment Board contributes towards the development of the city in a sustainable manner. Particularly, the research will address the following issues: (1) what sustainable initiatives have ACB performed; (2) how effective are these initiatives to improve service delivery, environmental resilience, and citizen participation; and (3) what processes and factors enabling and restraining their success are at play. The study illuminates the literature within the area of urban governance through its emphasis on the cantonment framework, since it is a less explored hybrid administrative framework that remains within the scope of the sustainability discussion, and its implication on practice. The importance of the current study is that it addresses the gap between the macro-level promise of sustainable urban development and the micro-realities of response governing systems in quasi-military situations. Although there is a body of literature on metropolitan municipal governments and smart-city initiative, very little is known about institutional actors like cantonment boards that function under both a defence and civilian statute. In clarifying the ACB strategies, stakeholder relations and performances, this research will produce workable implications among other urban entities in India and other jurisdictions with hybrid governance. By so doing, it is consistent with the overall scholarly goal of creating sustainable urbanism by using inclusive governance, building institutional capacity, and implementing plans contextually (Sarkar, 2018). Overall, this introduction creates a research ground of sustainable urban development, the empirical object of the research in this study is the Ambala Cantonment Board, and the research scope and objectives. The following parts will examine the literature that exists, methodology of research, explicitly give empirical results and implications to policy and practice.

1.1 Review of Literature

Sustainable urban development (SUD) has become a paradigm on how to balance economic growth and ecological conservation as well as social welfare in urban areas. It demands a comprehensive approach whereby the governance organisations strategize urbanisation and save the natural resources as well as enhance the livelihoods of the citizens (Liu and Qin, 2020). The urbanisation process of India can be defined as very rapid and uneven in the form provision of services, which makes the process of sustainability especially complicated. The 74th amendment of the constitution created powers to local bodies in the urban areas; though there are few semi-autonomous areas such as cantonment boards with the Cantonments Act, 2006 we have a unique administrative environment that is combined of civil and military governance. A case study of the Ambala Cantonment Board (ACB); therefore, offers a fantastic chance to discover the meaning of sustainability and its application in hybrid systems of governance.

1.2 Governance and Institutional Framework of Cantonment Boards

Cantonment boards hold a distinct status of urban local government area that run at the administrative price of the Defence Estates Organisation and at the same time offer civil services to a civilian community. Research on the process of governance decentralisation in India emphasises, the institutional capacity, the role of the local leadership, and involvement of the citizens are determinants of results of sustainability (Kumar & Tiwari, 2021). Local administrative innovativeness usually defines the correspondence of environmental and development goals in these types of frameworks (Sarkar, 2018). Studies regarding the small-town governance indicate that the hybrid form can be effective when there is a high level of interdepartmental coordination and accountability mechanisms are transparent (Mohan & Kaul, 2019). Using these insights, the effectiveness of governance of ACB becomes essential in putting the plans on sustainability into the operational results.

1.3 Sustainability Dimensions within Cantonment Jurisdictions

Empirical research points to the fact that urban governance sustainability extends beyond the infrastructure to the environmental regulation, social inclusion and inclusive decisions (Elmqvist et al., 2019). In many cases, due to its spatial structure and limited development areas, cantonment boards do not have large areas of green cover and water planning compared to its neighboring municipalities (Tripathi, 2021). But due to the pressure of

population, the preservation of such ecological assets needs a systematic planning and allocation of resources. Indicatively, Kumar and Nair (2022) discovered that local institutions that had explicit mandates and investment in environmental preservation were able to support green infrastructure more efficiently than those reliant on the use of ad hoc grants. Such results suggest that institutional reactions to national sustainability agendas are expressed in the sustainability activities of Ambala Cantonment Board sustainability practices, including the rejuvenation of lakes, solid-waste segregation and protection of green spaces at the micro level.

1.4 Solid-Waste Management and Environmental Governance

Solid-waste management (SWM) is turning into a stern challenge of sustainability on the Indian cities. Joshi and Ahmed (2019) note that less than a quarter of the municipal waste in India is treated scientifically, and the decentralisation of the collection and citizen engagement is a challenge. It has been proved that small jurisdictions, with the manageable number of population and institutional control, can succeed in adopting effective SWM systems more than large cities (Gupta et al., 2021). Meena (2023) supplements this with sustainable governance of waste as it depends on the regulation implementation and the change of behaviour with the help of education. In the cantonment boards such as that of Ambala, which is organized based on military discipline and at the community level, the institutional governing structure would be appealing to pilot the integrated waste segregation and recycling programs. Practical experience of other towns gives evidence that this administrative enforcement combined with community incentives is more efficient in terms of higher compliance and sustainability (Dutta et al., 2022).

1.5 Water-Body Restoration and Green Infrastructure

Another principle of sustainable urban development is restoration of urban lakes and green belts. As pointed out by Singh, Patel, and Mishra (2020), the rehabilitation of water bodies improves climate depends and social well-being through recreational and ecological services. Decentralised governance and community involvement in most Indian cities have determined desired transformations in restoration (Kumar and Prasad, 2021). Such integrated efforts are reflected in the efforts by Ambala Cantonment Board to make degraded land a perennial lake. Raghubanshi (2024) emphasises the fact that environmental restoration should be followed by long-term upkeep and sustained control in order to avoid the relapse into degradation. These sustainability prescriptions are compatible with the fact that the cantonment board has institutionalised the aspects of maintenance in its jurisdiction.

1.6 Citizen Participation and Local Sustainability

The engagement of citizens is the key to sustainability since it renders transparency, accountability and local ownership of environmental initiatives. Das (2020) determined that the participatory institutions in Indian urban bodies enhance service delivery outcomes in cases where they go beyond token consultation, as they now engage in shared decision-making. Security is a problem and there are hierarchies that restrict the participation in the cantonment areas. According to Nabatchi and Leighninger (2015), participatory governance can be changed via inclusive consultation procedures and feedback. In that connection, the outreach programs of Ambala Cantonment Board such as drives of public cleanliness, provision of grievance redressal systems, and awareness campaigns to citizens are the operational forms of participatory sustainability.

1.7 Hybrid Governance and Sustainable Outcomes

Increasingly hybrid form of governance, in which there is both administrative control and civic representation, is also recognised as a working although under-researched model of the sustainability discourse. Bulkeley and Betsill (2019) characterize hybrid systems as having the capacity of narrowing global sustainability standards and local realities, by means of flexible institutional orders. The ideal illustration of such hybridity is the cantonment boards in India that run a balance between the defence regulations and the development activity. The illustration of such hybrid organizations as port authorities and special administrative zones has shown how the achievement depends on the consistency of the policy, collaboration among the stakeholders, and the open feedback (Garcia and Fernandez, 2021). This study will help the literature on the potential of gaining environmental and social outcomes through hybrid governance in a restricted institutional environment by examining the sustainable efforts of Ambala Cantonment Board.

1.8 Identified Research Gaps

Researchers have conducted copious literature on sustainable urban governance in town, communities; however, there is little literature that studies sustainability in cantonment boards. Studies conducted are mainly concentrated on metropolitan corporations or Smart

City initiatives and small units of governance are underresearched. We also lack an assessment of the manner in which development of environmental norms by defence controlled city areas is reconfigured to fit local scenarios. The ongoing sustainability projects at the Ambala Cantonment Board makes it a special study case in analyzing institutional innovation, citizens participation and policy convergence in realizing urban sustainability.

2. Methodology

The current project takes a descriptive research design in order to investigate the role of the Ambala Cantonment Board (ACB) in ensuring sustainable urban development in its jurisdiction. Primary and secondary data was used in an effort to have an extensive data analysis and triangulation. In a bid to gain insights into the perception, participation and satisfaction of the key stakeholders in sustainability initiatives like solid waste management, restoration of the lakes, and green infrastructure maintenance, structured questionnaires and semi structured interviews were carried out among the key stakeholders including the ACB officials, the local residents, environmental officers and the community representatives. Stratified random sampling was used to pick a sample population of 120 respondents, making sure that the sample comprised of various wards and occupational groups. The secondary data were obtained in the form of authoritative reports by the Directorate General Defence Estates, annual reports by the ACB and government policies and published studies around the topic of urban governance and sustainability.

3. Result and Discussion

The data undertook were used to determine the perception held by the stakeholders on the role played by the Ambala Cantonment Board in implementing sustainable urban development by using both descriptive and inferential statistical parameters. The data were mainly centered around four dimensions of sustainability namely, environmental management, solid waste management, green infrastructure and citizen participation. A total of 120 participants who were residents, officials, and community members gave their responses. The analysis delivers the interpretation of the quantitative trends and adds to them the qualitative information provided through interviews.

Table 1 Perception of Environmental Management Initiatives

Environmental Initiative	Mean Score (1–5)	Interpretation
Maintenance of public parks and green belts	4.21	Highly effective
Tree plantation and afforestation drives	4.05	Highly effective
Drainage and sanitation management	3.82	Moderately effective
Air and noise pollution monitoring	3.67	Moderately effective
Lake and water-body restoration initiatives	4.10	Highly effective

Findings indicate that environmental management project like park-keeping, planting of trees and reviving of lakes are viewed by the respondents as very successful. The organized initiatives of the Swachh Cantonment Mission to work at Ambala Cantonment Board have made the area ecologically sound. Nevertheless, interviewees remarked that the process of pollution monitoring and sanitation needs to be technologically reinforced and coordinated on an interdepartmental level.

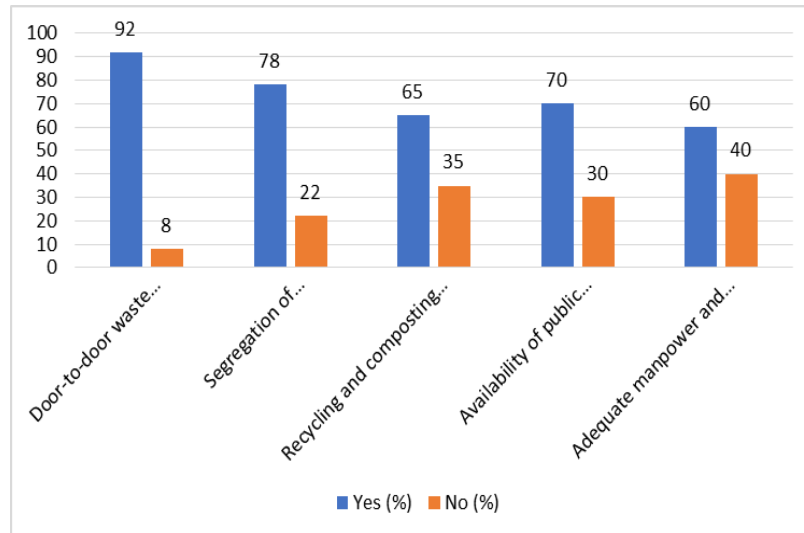


Fig. 1 Assessment of Solid Waste Management Practices (SWM)

As in Fig. 1, the majority of respondents also admitted to having well-run door-to-door waste picking systems, which is one of the features of the model of the sanitation of Ambala Cantonment. Nevertheless, the active recycling/composting rate was 65 percent and indicates that the efficiency of the collection is high, nonetheless, the waste sorting and treatment stages have to be expanded. Responses gotten during the interview on ACB officials revealed that they had intentions to have decentralized composting units and a digital tracking of the waste collection vehicles to enhance efficiency.

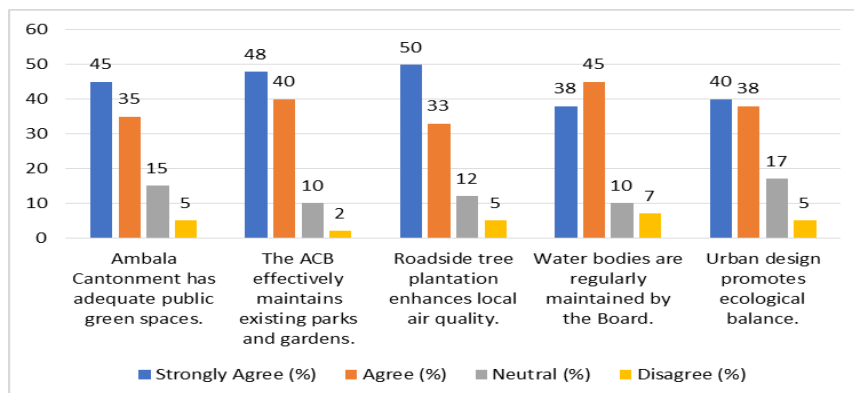


Fig. 2 Public Perception of Green Infrastructure Development

In the Fig. 2, it is visible that a huge majority of 85 percent of the respondents said that there was sufficient green infrastructure provided by Ambala Cantonment which demonstrate proper environmental stewardship by the Board. The use of tree plantations and parks maintenance have made the micro-climate and level of satisfaction with them visibly better. Nevertheless, 17% were still indifferent regarding the ecological design factors, which demonstrates that additional knowledge should be promoted on the aspect of sustainability of urban planning.

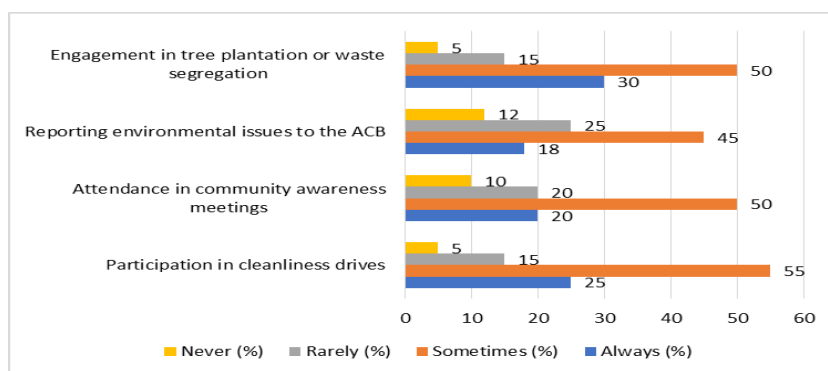


Fig. 3 Level of Citizen Participation in Sustainability Initiatives

Fig. 3 demonstrates results indicate moderation to high citizen involvement with almost 80% of the participants taking part occasionally or regularly in cleanliness or plantation practices. Nevertheless, the number of people attending awareness sessions and formal reporting systems is comparatively low, meaning that the interest of communities is present, but it is needed that institutions support their engagement in the long term. Digital communication channels were found to be preferred by the residents who would like to participate in the program, so the Board has intentions to organize mobile-based feedback. This data presents a collective picture indicating that the Ambala Cantonment Board has also been working well in terms of maintenance of the green spaces, environmental management, and collection efficiency of the wastes. According to respondents, the Board enjoyed administrative competence and accountability, which is a distinction between cantonment areas and the usual municipalities. Still, better work needs to be done regarding citizen outreach, waste separation, and combined environmental surveillance. It is affirmed by the analysis that it is possible to use hybrid governance forms, such as ACB, to create a successful approach on balancing sustainable urban development with defence-area management, although the involvement of the community and adoption of the technology must be improved.

4. Future Perspectives

There is a broader recognition in the debate on sustainable urban development in India that there is a need to combine environmental governance with community based planning. Considering the case of the Ambala Cantonment Board (ACB) sustainability practices can be developed with the help of institutional inventiveness, responsible administration, and place-based engagement. Nevertheless, the evolving path of the sustainable governance of the cantonments and semi-urban areas needs a deeper transformation in terms of change through technological modernization, data-driven policy formulation, and community co-creation models. The ensuing views identify the potential directions, applications of the same and the implications of this emerging paradigm to society at large.

4.1 Digital Transformation and Smart Governance

Digital governance platforms can be very beneficial in future sustainability initiatives in the Ambala Cantonment Board. GIS-granted urban mapping, IoT-linked waste tracking, and mobile feedback systems may allow real-time information on resource usage and the efficiency of the services delivered. By using data analytics to monitor the environment

and specifics of air quality, water conservation, and waste, it would be possible to make evidence-based policy choices and respond proactively to the policies. Implementing smart infrastructure technologies will be able to put the development objectives of the Cantonment in conformity with the Smart City Mission in India, making the governing structures much more resilient, responsive, and transparent. Accountability can also be advanced by such digital ecosystems where citizens would ensure tracking progress and giving feedbacks via participatory mobile applications.

4.2 Integrated Resource and Waste Management

Circular economy where waste is perceived as a resource and not a liability is what a sustainable development needs. The Ambala Cantonment Board can be a first in the generation of facilities such as integrated waste management through the increase of the waste segregation, collection of decentralized composting facilities, and encouragement of upcycling businesses in the local communities. The main focus of the future policies should be the collaborations with start-ups and individual recyclers in order to develop a closed cycle that does not only handle the waste but also provides jobs and income. Also, the implementation of green procurement policies, i.e., the preference of environmentally friendly materials in the construction and state affairs, can also further instil the concept of sustainability in the institutional work of the Cantonment.

4.3 Green Infrastructure and Climate-Resilient Urban Design

The increasing climate change threat would require climate adaptive and restorative ecological planning of urban areas. The open-green spaces and the tree belts and water bodies in the landscape of Ambala Cantonment can be used as an example of low-carbon and climate-resilient design. Future developments ought to have focused on rainwater collection, green roofing, energy saving lights and sustainable stormwater systems. By integrating climatic vulnerability assessment on planning systems, it will make sure that the Cantonment is not affected by heat waves, water shortages, and flooding. Increased urban forestry and biodiversity zones can serve to sequester the carbon and serve to enhance the air quality as well which will make the city a better place to live.

4.4 Community-Centric Sustainability and Behavioral Change

Citizen involvement as well as changing behaviors will eventually result in the success of sustainable urban initiatives. The strategies in the future should be determined by

institutionalizing the community based sustainability activities, i.e. the community based composting drives, environmental education at the school and citizen monitoring of local projects. Enhancement of the environmental awareness campaigns will transform passive residents into the active stakeholders of the governance. Furthermore, establishing the partnership between the public, the private, and the community (PPCPs) may increase the involvement of other related means of participation into the traditional areas of administration, promoting collective responsibility in ensuring the environment is well-protected. The Cantonment has an opportunity to instill a culture of environmental living that cuts across administrative borders by internalizing the sustainability into the social organism.

4.5 Policy Innovation and Institutional Collaboration

Cantonment boards operate under a special system of governance that cuts across civil and defence systems of governance. In order to maintain and support sustainable practice, policy convergence across the Defence Estates Organisation, the Ministry of Housing and Urban Affairs and the local civic authorities should be encouraged in the future. By implementing inter-agency coordination structures in joint planning, joint budgeting and jointly reviewing performances, more efficiency and coherence in sustainability projects would be achieved. Also, pilot projects could be used as a way of policy innovation: carbon-neutral wards or green cantonment certification can be used to establish replicable models in other defense-administered urban areas in India.

4.6 Education, Research, and Knowledge Transfer

Constant learning and exchange of knowledge is the key to sustainable urban development. Partnerships with academic institutions, research centres, and non-governmental organisations can result in the creation of empirical data, creation of solutions relating to the context, and the establishment of local capacities by the Board. The gap between the research and practice may be bridged with the help of initiatives such as urban sustainability laboratories, internship programs, and citizen science projects. More so, the transfer of knowledge in the successful models that Ambala had to the other cantonments may enhance the process of innovation of sustainable ideas in the Indian urban world of governance. These efforts will also make Ambala a sustainability center in the region, which others will emulate in the entire country.

4.7 Societal and Long-Term Impact

Sustainable governance has effects that are not limited to environmental achievements in the society. With the current development of Ambala Cantonment, sustainability programs are directly associated with the promotion of the well-being of the population, economic sustainability, and social justice. Clean ecosystems reduce the effect of illnesses, green spaces enhance wellbeing, and inclusive administration enhances exclusivity. Besides, sustainability in conjunction with local livelihoods, i.e. increasingly use of eco-tourism, green jobs, and environmental entrepreneurship will mean that there will be economic self-reliance and social empowerment. The long term vision of the society should be to develop a just, robust, and non-discriminative city ecosystem where sustainability is an inherent part of the governance rather than an objective.

4.8 Broader Replicability and National Relevance

The sustainability model by the Ambala Cantonment Board has a high potential of replication in other cantonment areas and small city administrations in India. The experience of Ambala can serve as an example of hybrid urban governance in the future research and policy-making, as disciplined management and citizens participation can be its two sides of the coin. These models might successful inform national plans on sustainable defence-town models in line with the national national missions on sustainable habitation and the UN sustainable development goals (SDGs 11, 13 and 15). Therefore, the sustainability projects of the future that will be implemented by Ambala will not just improve the living standards of people in the area, but will become an important part of the sustainable urbanization of India. To sum up, sustainable urban development in Ambala Cantonment has a way forward that is institutional reformation, digitalization, environmental renewal, and participatory governance. With more and more ecological and social challenges in urban systems, the further development of the Cantonment Board into a smart, green, and inclusive form of governance will have a broad range of positive impacts in the society. Integrated sustainability planning can help evolve Ambala into a country model of the ways military-civic collaboration, technological development, and community empowerment can be a force helping to create a more sustainable and equitable urban future.

5. Conclusion

The paper on sustainable urban development: role of ambala cantonment board shows the imperative role of institutional governance in ensuring an environmental and social sustainability in semi-urban and defence-governed territories. The result shows that the results characterize the Ambala Cantonment Board (ACB) to be highly efficient in

information relating to solid waste management, green infrastructure development, restoration of lakes and development of sanitation facilities among people creating a clean living and ecological balanced urban environment. The well-organized administrative system of the Board supported by discipline and accountability makes it stand out among the traditional municipal structures and enables a successful Implementation of sustainability programs. However, the analysis also highlights some of the challenges, including the lack of citizen activity, the unreliable nature of waste segregation habits, and technological connections that should be increased in monitoring and resource management. On the whole, the research finds that the Ambala Cantonment Board can be regarded as an effective example of hybrid governance, balancing between the regulatory tasks and developmental ones and having the key elements of a sustainable urban planning in the form of ecological conservation, participative governance, and institutional innovation.

5.1 Recommendations

The multidimensional approach is suggested to intensify and increase the sustainability activities of the Ambala Cantonment Board. To begin with, the Board needs to invest in digitisation, such as GIS-based mapping of infrastructure, IoT-driven waste management, and citizen-friendly and mobile feedback and reporting. These data-driven tools will improve transparency and disclosure. Second, the ACB will have to enhance targeting integrated waste management through facilitating household-level segregation, community composting, and collaborating with recycling industries according to the principles of a circular economy. Third, climate-responsive urban design (with green roofing, rainwater collection and low-emission public space) must become characterized in the planning. Fourth, the engagement of the citizens must be enriched with the help of intensive awareness campaigns, school-based environmental education, and two-way communication platforms based on digital interactions. Fifth, improved harmonious inter-agency cooperation between the Defence Estates Organisation, state urban departments and civil society organizations will have a better pooling of resources as well as harmonisation of policies. Lastly, by establishing academic relationships and community-based research activities, encouraged by the Board, is possible to devise evidence-based sustainability plans and measure the environmental performance and best practices can be communicated to other cantonment and municipal boards throughout India. The efforts mentioned above allow the Ambala Cantonment Board to become a national model of sustainable governance that would show how local institutions can properly support the greater Indian vision of a resilient city and sustainable development.

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