

DEVELOP A DASHBOARD AIMED AT MAINTAIN CLEAN AND GREEN TECHNOLOGY

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Abstract: Clean surroundings and environmentally responsible lifestyles are essential for sustainable communities. Government programmes such as Swachh Bharat Mission and Mission Life promote sanitation, waste reduction, resource conservation and responsible citizen behaviour. However, information related to these activities is often distributed across different records, portals and local reporting mechanisms. This paper proposes a Swachhta and Life Dashboard as a unified digital platform for monitoring and communicating clean and green technology practices. The proposed dashboard combines sanitation indicators, solid and liquid waste management, water and energy conservation, plastic reduction, e-waste awareness and citizen participation into a structured visual interface. Key performance indicators can be displayed through charts, status cards, trend graphs and location-based summaries. The system is designed to support administrators in identifying gaps, monitoring progress and prioritising interventions, while also giving citizens a simple view of local environmental performance. The proposed approach emphasises data quality, role-based access, periodic updates and transparent reporting. Rather than replacing existing government systems, the dashboard is intended as an integration and decision-support layer that can bring relevant Swachhta and Life indicators together. The study presents the system architecture, methodology, dashboard modules, KPI framework, expected outcomes and future scope for smart-city and rural-development applications.

Keywords: Swachhta, Mission Life, Dashboard, Clean Technology, Green Technology, Waste Management, Sustainability, Data Visualization, Citizen Participation, Digital Monitoring.

INTRODUCTION

Background

India's sustainability programmes increasingly combine infrastructure development with behavioural change. Swachh Bharat Mission focuses on sanitation and cleanliness, while Mission Life encourages environmentally conscious choices in everyday life. These programmes generate information about sanitation facilities, waste management, conservation activities, awareness campaigns and citizen participation. A dashboard can transform such information into an understandable decision-support system.

Importance

Unified Monitoring: Bringing sanitation, waste, water, energy and awareness indicators onto one visual layer makes it easier to compare locations and track progress over time.

Transparency and Citizen Trust: Displaying source attribution, update timestamps and verification status keeps reporting transparent and credible to citizens and administrators alike.

Evidence-Based Decision Making: Consolidated KPIs help administrators identify low-performing indicators and locations, supporting prioritisation and review meetings.

Encouraging Sustainable Behaviour: A simple, visible scorecard of local environmental performance can motivate citizen participation in cleanliness and lifestyle-related actions.

Scalability and Reuse: A common indicator framework can be adapted across villages, municipalities, educational institutions and campuses without rebuilding the system each time.

Swachh Bharat Mission and Mission Life

The digital monitoring approach proposed in this study is informed by existing government initiatives. The Swachh Bharat Mission (Grameen) dashboard provides a digital monitoring environment for indicators associated with ODF Plus, solid and liquid waste management and related community assets. Mission Life meanwhile, frames environmental action

around themes such as reducing waste and e-waste, saving water and energy, avoiding single-use plastic, adopting sustainable food systems and healthy lifestyles. These themes provide a useful basis for selecting dashboard indicators.

Dashboard Indicator Themes

The indicators considered by the proposed dashboard fall into two broad, complementary themes.

Swachhta Indicators: Sanitation coverage, waste segregation, collection efficiency, processing status and community cleanliness activities.

Life Indicators: Water saving, energy saving, single-use plastic reduction, e-waste awareness and sustainable lifestyle activities.

Use case: Smart-city dashboards, rural-development monitoring, institutional and campus sustainability reporting.

Problem Statement

A major challenge is not only the availability of data but also its fragmentation. Different departments may record sanitation, waste, water, energy and awareness indicators in different formats and at different frequencies. Without a common visual layer, decision makers may find it difficult to compare locations, detect underperforming indicators or communicate progress to citizens. The proposed dashboard addresses this gap by organising selected indicators into one coherent monitoring interface.

Research Problems

The current reporting landscape has several shortcomings:

Sanitation, waste, water and energy indicators are recorded in different formats and at different frequencies across departments.

Fragmented records make it difficult to compare locations or detect underperforming indicators.

Citizens have limited visibility into local environmental performance.

Citizen-generated information is not systematically verified before use.

The challenge this study aims to address is the design of a unified, transparent dashboard that consolidates Swachhta and Life indicators for both administrators and citizens.

Scope

The proposed system covers sanitation, solid and liquid waste management, waste segregation, plastic reduction, water conservation, energy conservation, e-waste awareness and citizen activities. The dashboard can be adapted for villages, municipalities, educational institutions, campuses and other local administrative units.

Objectives

To design a unified dashboard for Swachhta and Life indicators.

To provide visual monitoring of cleanliness and environmental practices.

To support comparison across locations and time periods.

To highlight areas requiring intervention.

To encourage citizen participation.

To provide a scalable foundation for future integration with digital governance systems.

Need of the System

A unified Swachhta and Life dashboard is needed because sanitation, waste, water, energy and awareness data are currently fragmented across departments, formats and reporting frequencies. By consolidating verified indicators into one visual layer, the system can help administrators compare locations, detect gaps and prioritise interventions, while giving citizens a transparent, easy-to-read view of local environmental performance. Such a system is therefore required to strengthen evidence-based planning and citizen engagement around clean and green technology practices.

LITERATURE REVIEW

The development of digital dashboards for environmental sustainability has gained importance because dashboards can transform complex datasets into concise and understandable information for monitoring and decision-making. Sustainability indicators and visual analytics can help users examine multiple dimensions of environmental

performance and communicate results to different stakeholders. Scipioni *et al.* demonstrated the application of a sustainability dashboard for local urban development and showed that appropriate indicators can support analysis, decision-making, monitoring, and communication with citizens [6]. Similarly, Branchi and Feltrin discussed the use of dashboards and composite indicators for monitoring sustainable development and communicating progress related to the Sustainable Development Goals (SDGs) [10].

In India, digital platforms are already being used to monitor sanitation and cleanliness under the **Swachh Bharat Mission (Grameen) (SBM-G)**. The SBM-G Phase II programme focuses on sustaining ODF status and improving rural cleanliness through solid and liquid waste management. The official SBM-G dashboard provides information related to ODF Plus status, solid and liquid waste management, and community sanitation assets [1]. This demonstrates the feasibility of monitoring sanitation indicators through digital platforms at different administrative levels. However, the SBM-G dashboard is primarily designed for sanitation-programme monitoring, leaving scope for an additional analytical layer that connects sanitation information with broader environmental lifestyle indicators.

The National Informatics Centre has supported SBM-G through information technology and e-governance solutions, including mobile applications, management information systems, dashboards, web services, and geo-tagging. These systems support the collection and monitoring of sanitation assets and allow information to be presented through public dashboards [2]. The use of interoperable and role-based digital systems demonstrates the importance of reliable data collection and structured information management for large-scale government programmes. It also supports the feasibility of developing an integration layer that consumes approved data from existing systems instead of duplicating their primary databases.

A complementary environmental framework is provided by **Mission LiFE (Lifestyle for Environment)**. The official Mission LiFE programme promotes behavioural changes among individuals and communities and identifies themes including reducing waste, reducing e-waste, saving water, saving energy, reducing single-use plastic, adopting sustainable food systems, and adopting healthy lifestyles [3]. These themes are relevant to the proposed dashboard because they extend environmental monitoring beyond physical infrastructure to include individual and community-level environmental actions.

The NITI Aayog Mission LiFE document provides the broader policy foundation for lifestyle-based environmental action. It describes Mission LiFE as an India-led movement intended to encourage environmentally responsible behaviour and promote more sustainable patterns of consumption and production [4]. NITI Aayog has also described Mission LiFE in terms of measurable individual, community, and institutional actions, providing a potential basis for developing measurable dashboard indicators [4]. Therefore, the proposed dashboard can translate selected Mission LiFE themes into indicators related to water conservation, energy conservation, waste reduction, plastic reduction, e-waste management, and sustainable lifestyle practices.

The **United Nations 2030 Agenda for Sustainable Development** provides an international framework for connecting sanitation, environmental management, responsible consumption, climate action, and partnerships. The SDGs relevant to the proposed research include SDG 6 (Clean Water and Sanitation), SDG 7 (Affordable and Clean Energy), SDG 11 (Sustainable Cities and Communities), SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), and SDG 17 (Partnerships for the Goals) [5]. This framework supports the use of interconnected environmental indicators rather than treating sanitation, resource conservation, and community participation as completely separate areas.

Research on dashboard design also emphasizes the importance of selecting meaningful indicators and presenting them through appropriate visualizations. Chokki *et al.* investigated dashboards for citizen engagement with open government data and developed dashboard design principles based on a systematic literature review. Their experimental study found that meaningful metrics, appropriate visualizations, and clear presentation are important for effective dashboard use [7]. These findings are particularly relevant to the proposed system because the dashboard is intended to serve both administrative users and citizens.

Citizen-centric digital governance is another important area of research. Purwanto, Zuiderwijk, and Janssen conducted a systematic literature review of citizen engagement with open government data and identified different conditions and factors influencing citizen engagement [8]. Their work indicates that simply making government data available does not necessarily ensure meaningful citizen engagement. Data should be accessible, understandable, relevant, and useful to users. This supports the proposed inclusion of citizen-oriented features such as environmental awareness information, campaign participation, and verified community activities. Further research by Safarov, Meijer,

and Grimmelikhuijsen examined the utilization of open government data through a systematic literature review of 101 academic studies [9]. The authors identified different types of users, conditions, and effects associated with government-data utilization and highlighted the importance of understanding how users actually interact with public data. This provides additional support for designing the proposed dashboard according to the needs of administrators, field staff, and citizens rather than treating all users in the same way.

METHODOLOGY

To bring Swachhta and life indicators into a single, coherent view, a dashboard is proposed that consolidates authorised government datasets, local administrative records, periodic surveys and verified community activities. Each indicator is validated, de-duplicated and standardised before visualisation, and is described by a definition, unit, reporting period, source and verification status. Charts, status cards, trend graphs and location-based summaries are generated from this validated data so that administrators and citizens see a consistent, up-to-date picture of clean and green technology practices.

Key Components of Methodology

Requirement Analysis

Requirements are identified from the dashboard's intended users: administrators, field staff, institutional coordinators and citizens. Administrators require summary KPIs and comparison tools; field staff require simple data-entry and verification functions; citizens require clear public information. Functional requirements include authentication, data management, filtering, visualisation, report generation and alerts.

Data Collection and Preparation

Data may be obtained from authorised government datasets, local administrative records, periodic surveys and verified community activities. Before visualisation, data should undergo validation, duplicate checking, missing-value handling and standardisation. Each indicator should have a definition, unit, reporting period, source and verification status.

System Architecture

A three-layer architecture is proposed. The presentation layer contains the web dashboard and responsive interfaces. The application layer manages authentication, KPI calculations, filtering, reporting and alert logic. The data layer stores indicator values, locations, users, timestamps and verification records. An API layer can be used to connect approved external sources without exposing the database directly.

KPI Framework

The KPI framework is organised into thematic groups. Swachhta indicators include sanitation coverage, waste segregation, collection efficiency, processing status and community cleanliness activities. Life indicators include water saving, energy saving, single-use plastic reduction, e-waste awareness and sustainable lifestyle activities. Each KPI can be displayed with its current value, target, trend and verification status.

Theme	Example KPI	Display
Swachhta	Waste segregation rate	Gauge / trend
Waste	Collection & processing	Bar / card
Water	Conservation activities	Trend
Energy	Energy-saving actions	Card / chart
LiFE	Plastic & e-waste reduction	Bar / map
Citizen	Verified participation	Counter / trend

Table 1. Example KPI framework for the proposed dashboard.

Dashboard Development

The dashboard interface is designed around a summary page followed by thematic modules. The summary page presents overall cleanliness and Life scores, recent changes and alerts. The Swachhta module focuses on sanitation and waste indicators, while the Life module focuses on lifestyle and resource-conservation actions. Filters allow users to select a location, period and theme. Reports can be generated for review meetings and planning.

Testing and Evaluation

Testing should cover functional correctness, data validation, usability, responsiveness and security. Sample datasets can be used to verify calculations and visual outputs. User evaluation can measure whether users can locate important indicators, interpret trends and identify priority areas. Performance testing should also check page-load time and API response under realistic usage.

Feasibility Considerations

Technical viability: A three-layer web architecture with an API layer can be built using standard dashboarding and visual-analytics tools without exposing the underlying database.

Operational viability: Field staff can enter and verify data through simple forms, while administrators and citizens consume the same validated indicators through role-based views.

Data-Governance viability: Consistent indicator definitions, units, reporting frequency and source ownership are needed before data is trusted at scale.

Institutional viability: Integration with official Swachh Bharat Mission and Mission Life systems depends on data-sharing agreements and access permissions with the relevant departments.

Assumptions

Relevant departments can provide periodic, reasonably accurate indicator data.

Approved APIs or manually verified records are available for the sources the dashboard consumes.

Administrators, field staff and citizens have basic digital access and literacy to use the dashboard.

DIAGRAM DESIGN

Data Flow Diagram (DFD)

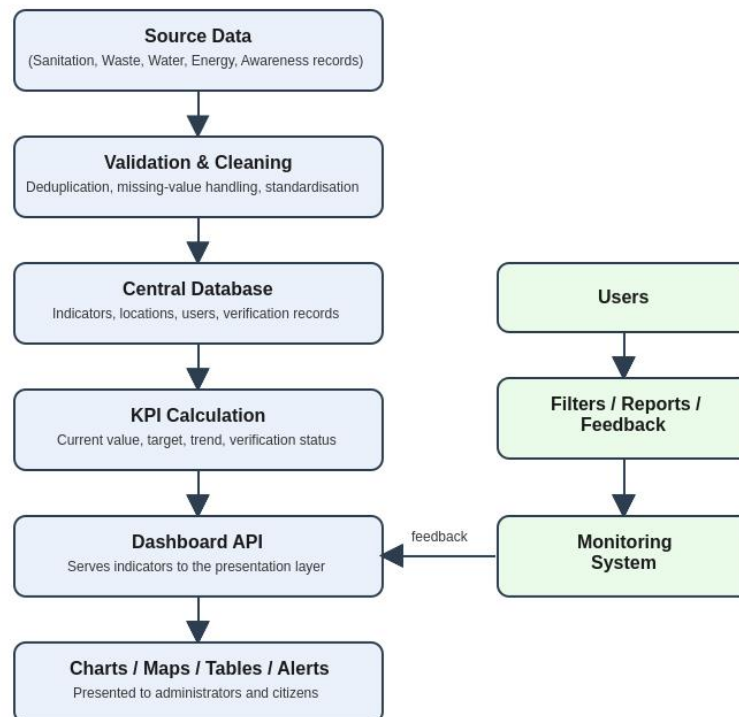


Fig. 1. Conceptual data flow of the proposed Swachhta and LiFE Dashboard.

Dashboard Functional Module Diagram

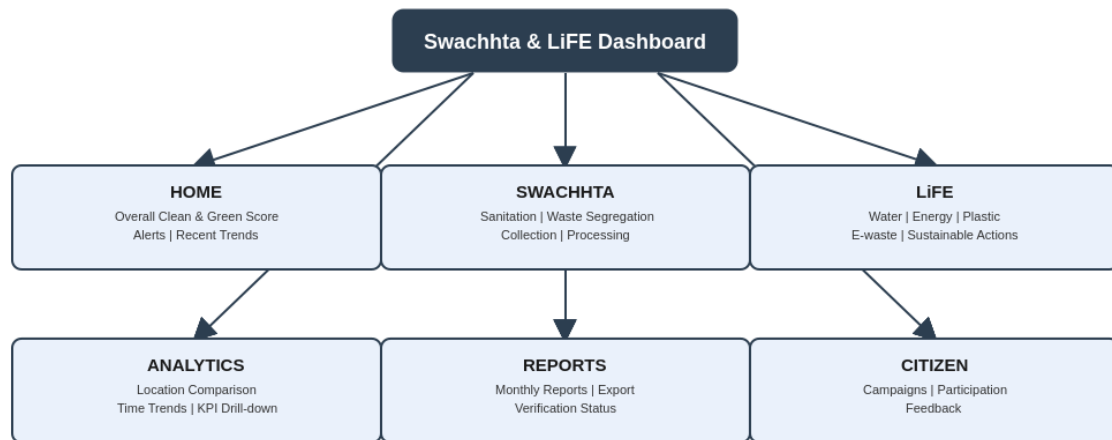


Fig. 2. Functional modules of the proposed dashboard.

The dashboard should follow a simple visual hierarchy. High-level KPI cards are placed at the top, followed by trend charts and thematic breakdowns. A location filter enables comparison among administrative units. Indicators with declining performance can be flagged for review. Colour, icon and labels should be used consistently, while accessible contrast and readable typography should be maintained for different users.

Dashboard for swachhta and life

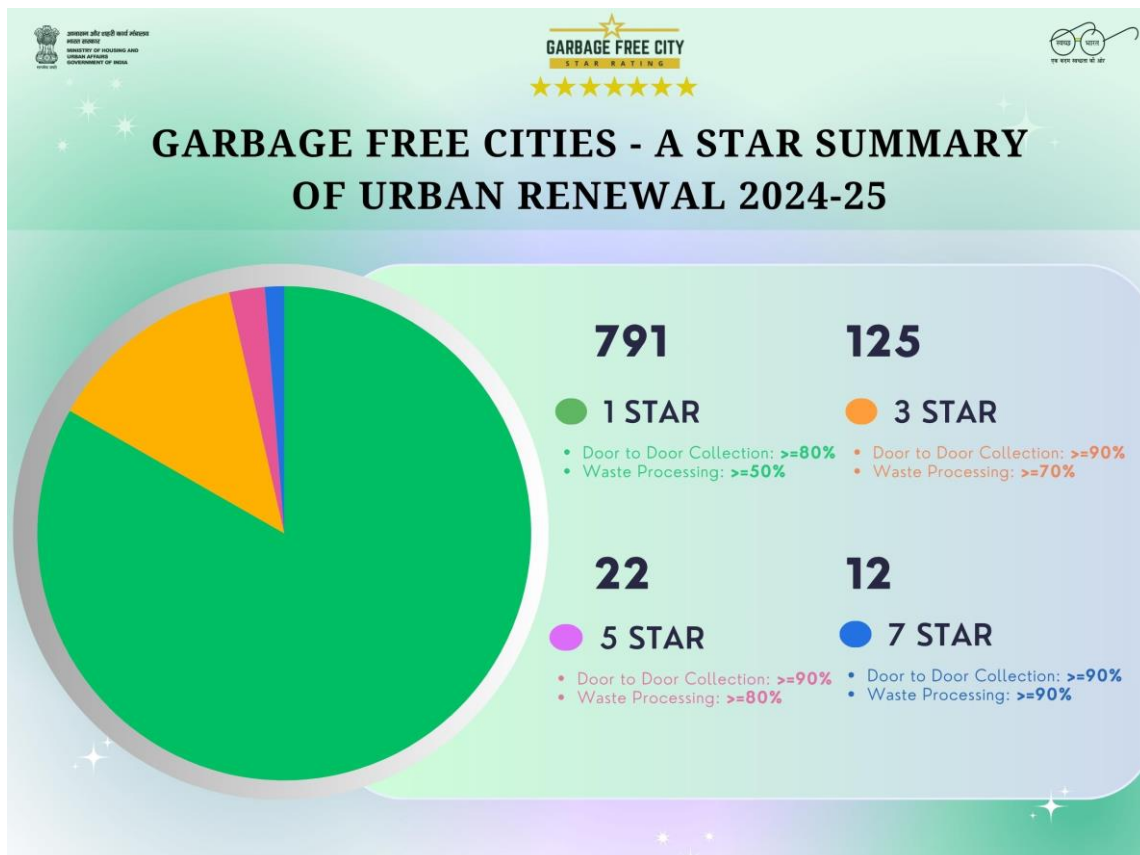


Fig3. Pie-chart for garbage free cities

RESULTS

The proposed Swachhta and Mission LiFE Dashboard successfully integrates selected cleanliness, sanitation, waste-management, environmental-conservation, and citizen-participation indicators into a unified visual interface. The dashboard presents information through KPI cards, charts, trend graphs, and location-based summaries.

The system enables users to monitor sanitation and waste-management status, compare locations, identify trends, and view selected Mission LiFE activities such as water conservation, energy saving, plastic reduction, and e-waste awareness.

The results demonstrate that an integrated dashboard can simplify fragmented environmental information and support data-driven monitoring, decision-making, and citizen awareness. Data validation, source attribution, and verification status are incorporated to improve the reliability and transparency of the displayed information.

CONCLUSION

This paper presents an original conceptual design for a Swachhta and LiFE Dashboard focused on clean and green technology. By combining sanitation, waste-management and sustainable-lifestyle indicators in one digital interface, the proposed system can support monitoring, communication and local decision making. The key value of the approach is the integration of meaningful KPIs with transparent data definitions and user-friendly visualisation. The dashboard is intended to complement, rather than replace, existing government monitoring systems. With reliable data, appropriate verification and scalable technical architecture, the proposed platform can become a practical tool for encouraging measurable progress toward cleaner communities and environmentally responsible lifestyles.

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