Study of Benchmarking (Resource Efficiency & Environmental) Performance of Mumbai Suburban Railway System

Sustainability Assessment of Existing Railway Infrastructure

1. Project Objective

One of our key achievements in FY20 was the successful completion of Consulting Assignment for Mumbai Railway Vikas Corporation Ltd. (MRVC Ltd) which is a PSU of Govt. of India under Ministry of Railways. The objective of the assignment was to measure the Sustainability performance of the existing Suburban Network of Mumbai & identify suitable measures to bring them on-par with Green Certified Stations. Indian Green Building Council's (IGBC) 'Green Existing Mass Rapid Transit System (MRTS)' rating system was used as the reference standard for carrying out the Sustainability Assessment.

For the purpose of this study, a representative set of 15 existing suburban at-grade stations across three railway lines was chosen; namely Western Line (Bandra to Andheri), Central Line (Sion to Ghatkopar) & Harbour Line (Vashi to Belapur).

One of the key pre-requirements for the study was establishment of a clear site boundary for identifying the facilities to be evaluated as per the rating system. The list of Railway facilities included in the scope of this assessment is as under:

1. Station building, ancillary facilities, parking, hardscape / Soft scape area around station, etc.
2. Property development areas within station (the property development areas outside and above stations are excluded from the scope).

The threshold criteria for Rating[1]certification levels are shown in Figure 1.

Figure 1: Threshold limits for IGBC Green Existing MRTS certification levels

[1] It may be noted that achieving the Rating for any station was not in the scope of the study. However, the requirements to achieve the Platinum level rating were considered as the bottom line to develop the sustainability roadmap for each station and the MRTS network.

With an intent to achieve Platinum Rating, the project team carried out gap analysis targeting 88 points out of 90 points as per IGBC MRTS. **Error! Reference source not found.**In Figure 2, the credits marked bold with '(M)' written besides it are mandatory and remaining are prescriptive credits.

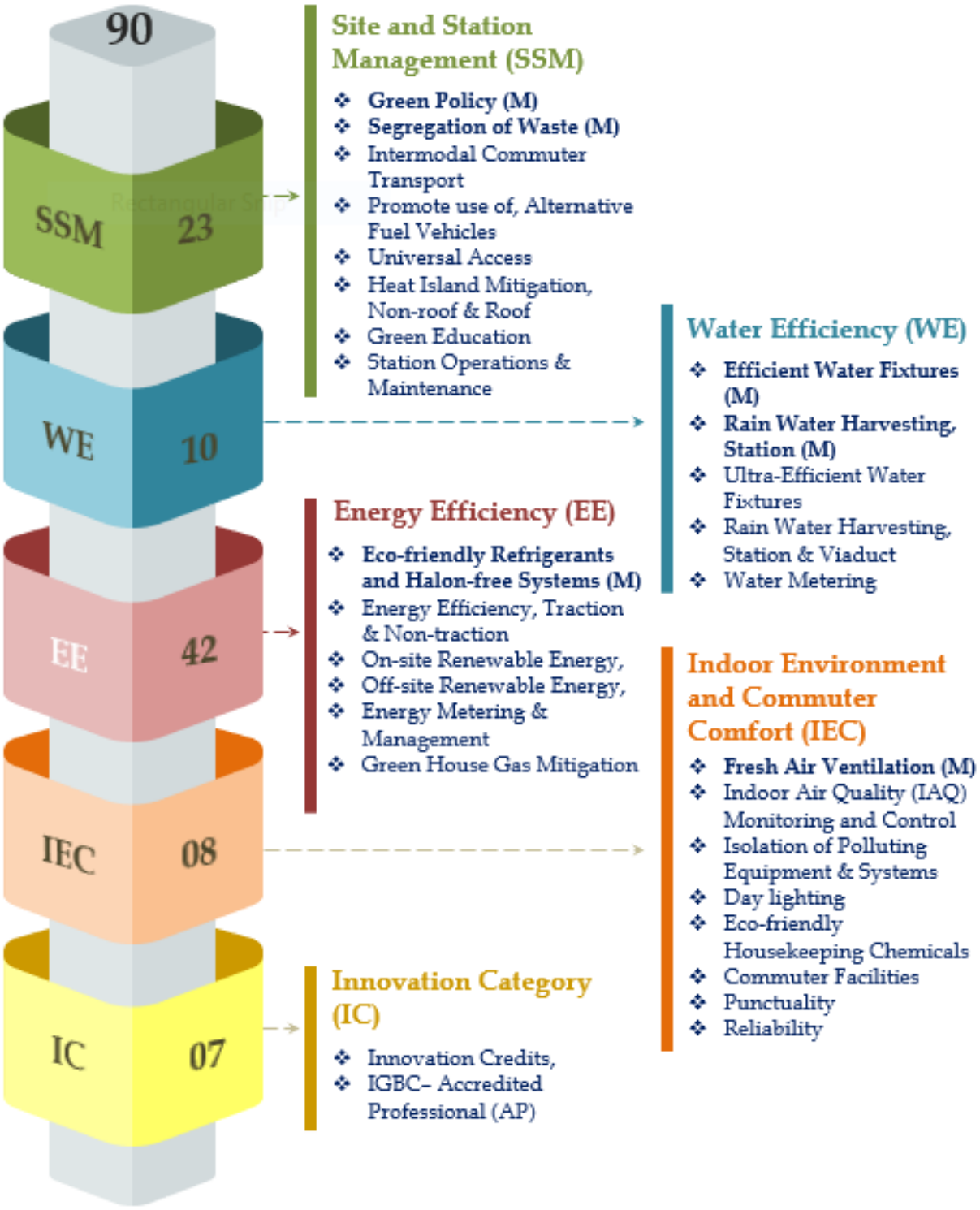

Figure 2: Mandatory and Prescriptive Credits in IGBC Green Existing MRTS Rating System

2. Project Team

An interdisciplinary team with expertise in Energy & Environment areas and a cumulative experience of executing more than 1,000 projects was set up. The team structure is shown in Figure 3.

Figure 3: Project Implementation Team

3. Project Outline

The execution stages at broader level have been defined as shown in Figure 4.

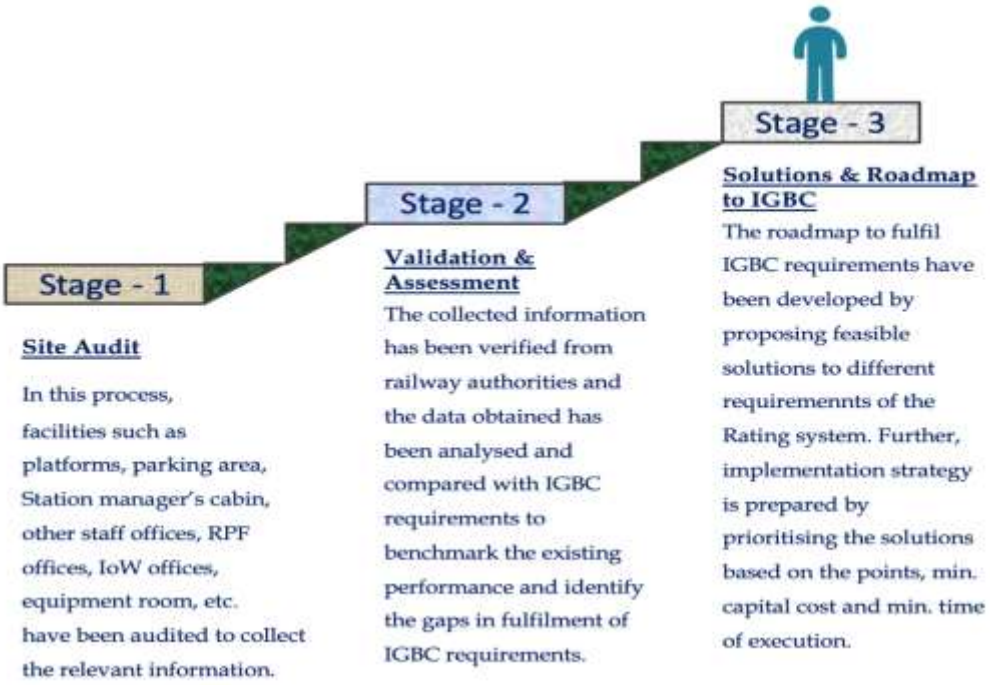

Figure 4: Execution Stages

4. Project Methodology

The Project was structured into six stages with a targeted completion time of 6 months. The activities carried out in these phases have been listed in Figure 5.

Figure 5: Project Methodology

In line with the above methodology, an in-depth research was carried out to assess the Sustainability index of the 15 stations. The existing performance was thoroughly calibrated to reflect the number of points achieved by each station as per the credits mentioned in the Rating system.

The typical block diagram of a suburban station of Mumbai is shown in Figure 6.

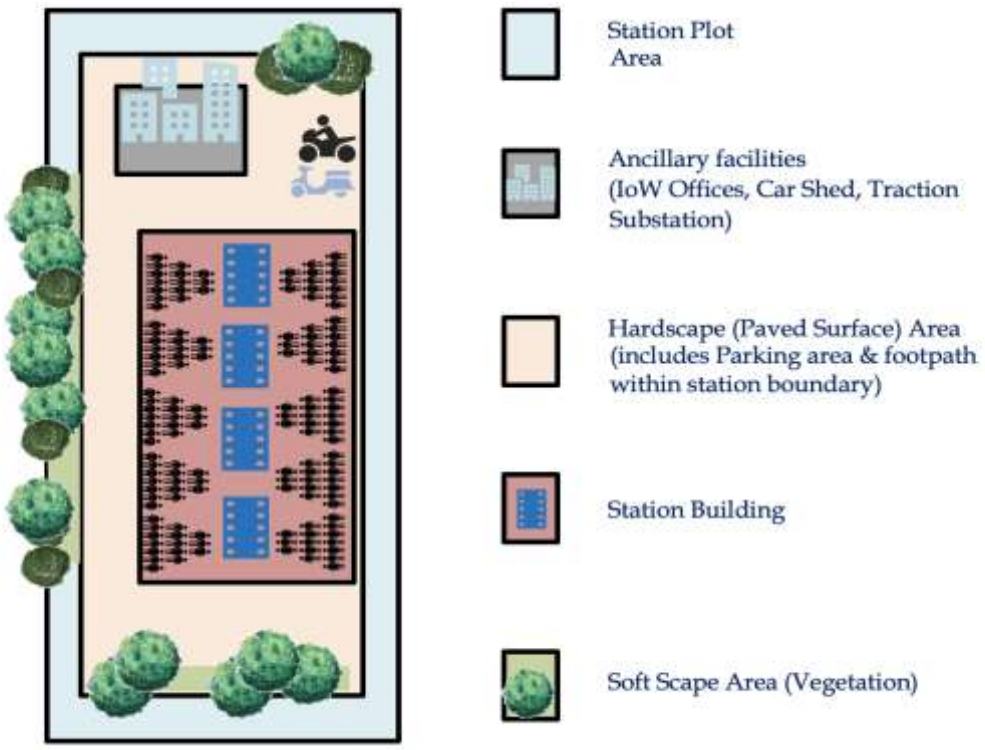

Figure 6: Typical block diagram of the Mumbai Suburban Station

5. Project Outcome

From the as-is assessment it was concluded that the 15 Mumbai suburban stations selected for the study qualify only for the 'Certified' Rating under IGBC MRTS. The Project Team prepared a detailed Gap Analysis Report to achieve the balance points for Platinum Rating. Necessary interventions were proposed to bridge the gap towards making these stations the best-in-class and achieve IGBC Green Existing MRTS Platinum Rating. Subsequently, for each of the proposed measure, an estimate of the cost & time was prepared so as to prioritize the measures in the implementation schedule . A summary representation is given below:

Note: The recurring cost (O&M) for these measures have been excluded for the purpose of prioritization of the measures.

The charts shown in Figure 7 and Figure 8 represent the breakup of cost (in %) and balance points respectively in implementing the measures for achieving rating. It can be seen here that most of the cost belongs to Site & Station Management (SSM) which is also in line with the balance number of achievable points for that station.

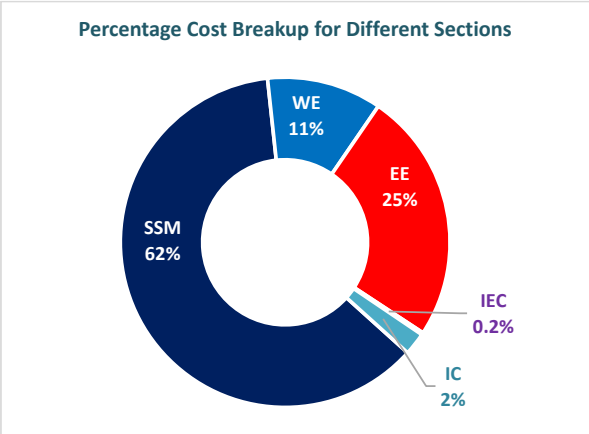

Figure 7: Percentage Cost Breakup for Five Sections of IGBC Green Existing MRTS Rating System

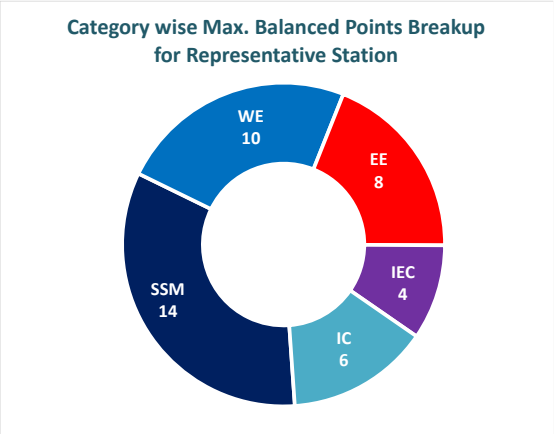

Figure 8: Balanced Points Breakup for Five Sections of IGBC Green Existing MRTS Rating System

6. Conclusion & Recommendations

The Project team prepared a consolidated list of actionable items after rounds of discussions & iterations with the end client & relevant Railway Authorities. The summary findings are illustrated by way of Graphical representation in Figure 9.

How to read the Graph:

1. In the figure, P1 represents the highest priority measure & P4 represents the lowest priority measures.

2. The Potential of execution represents the points that can be availed once the ECMs are incorporated. The points are represented on the y-axis in the Figure 9.

3. The time of execution represents the approximate duration for required modifications in the existing facility. Every criterion has been awarded a score on scale of 1-5 for comparative analysis where 1 represents minimal time and 5 represents maximum time. The score of each criterion has been shown by the size of bubble in the Figure 9.

4. The cost of execution represents the minimum capital cost[2] involved in implementation of ECMs. The cost data is represented on the x-axis of the Figure 9.

Note: The costs considered here are indicative in nature as per information available from secondary sources & have been taken only for purpose of our analysis.

[2] The minimum capital cost is considered which is indicative inn nature. The actual cost shall be considered at the execution stage based on the quote provided by the vendors.

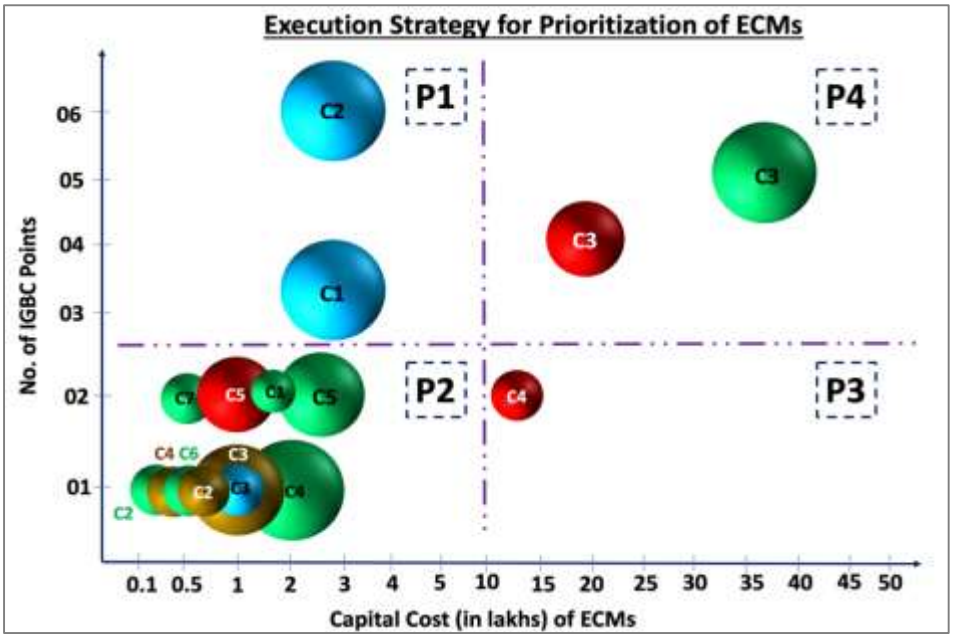

Figure 9: Execution Strategy

NOMENCLATURE	
	Green bubbles represent credits of Site & Station Management (SSM)
	Blue bubbles represent credits of Water Efficiency (WE)
	Red bubbles represent credits of Energy Efficiency (EE)
	Brown bubbles represent credits related to Indoor Environment and Commuter Comfort (IEC)
	Yellow bubbles represent credits of Innovation Category (IC)[3]
C1,C2,C3…	These alpha-numeric characters represent credit under respective section. For example, In Priority – 1 (P1) segment, blue colour bubble named as C1 represent 'Ultra-efficient fixture' credit under Water Efficiency section in IGBC Green Existing MRTS Rating system (guidebook).

The Criteria that falls under priority segment - P1 shall be considered first for implementation because implementing these measures will help the project team gain more points at lesser cost and lesser time in comparison to priority segments P2, P3 and P4. Hence, the criteria under P1 can be targeted first for implementation followed by criteria mentioned under P2, P3, and P4 segments respectively.

[3] The innovation credits are not shown in the Figure 9 as the credit requirements for innovation are linked to the credit requirements of few other credits where the exemplary performances requirements in respective credit shall be complied.