

**Project Design Phase-II**  
**Solution Requirements (Functional & Non-functional)**

Date	26 October 2022
Team ID	PNT2022TMID04297
Project Name	Smart Waste Management System for Metropolitan Cities
Maximum Marks	4 Marks

**Functional Requirements:**

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Detailed bin inventory	<ul style="list-style-type: none"><li>• All monitored bins and stands can be seen on the map, and you can visit them at any time via the Street View feature from Google.</li><li>• Bins or stands are visible on the map as green, orange or red circles.</li><li>• You can see bin details in the Dashboard - capacity, waste type, last measurement, GPS location and collection schedule or pick recognition.</li></ul>
FR-2	Real time bin monitoring	<ul style="list-style-type: none"><li>• The Dashboard displays real-time data on fill-levels of bins monitored by smart sensors.</li><li>• In addition to the % of fill-level, based on the historical data, the tool predicts when the bin will become full, one of the functionalities that are not included even in the best waste management software.</li><li>• Sensors recognize picks as well; so you can check when the bin was last collected.</li><li>• With real-time data and predictions, you can eliminate overflowing bins and stop collecting half-empty ones.</li></ul>
FR-3	Expensive bins	<ul style="list-style-type: none"><li>• We help you identify bins that drive up your collection costs. The tool calculates a rating for each bin in terms of collection costs.</li><li>• The tool considers the average distance depo-bin discharge in the area. The tool assigns bin a rating (1-10) and calculates distance from</li><li>• depo-bin discharge.</li></ul>
FR-4	Adjust bin distribution	<ul style="list-style-type: none"><li>• Ensure the most optimal distribution of bins.</li><li>• Identify areas with either dense or sparse bin distribution.</li></ul>

		<ul style="list-style-type: none"> <li>• Make sure all trash types are represented within a stand.</li> <li>• Based on the historical data, you can adjust bin capacity or location where necessary.</li> </ul>
FR-5	Eliminate unefficient picks	<ul style="list-style-type: none"> <li>• Eliminate the collection of half-empty bins.</li> <li>• The sensors recognize picks.</li> <li>• By using real-time data on fill-levels and pick recognition, we can show you how full the bins you collect are.</li> </ul>

### **Non-functional Requirements:**

Following are the non-functional requirements of the proposed solution.

<b>FR No.</b>	<b>Non-Functional Requirement</b>	<b>Description</b>
NFR-1	<b>Usability</b>	<ul style="list-style-type: none"> <li>• IoT device verifies that usability is a special and important perspective to analyze user requirements, which can further improve the design quality.</li> <li>• In the design process with user experience as the core, the analysis of users' product usability can indeed help designers better understand users' potential needs in waste management, behavior and experience.</li> </ul>
NFR-2	<b>Security</b>	<ul style="list-style-type: none"> <li>• Use a reusable bottles.</li> <li>• Use reusable grocery bags Purchase wisely and recycle.</li> <li>• Avoid single use food and drink containers.</li> </ul>
NFR-3	<b>Reliability</b>	<ul style="list-style-type: none"> <li>• Smart waste management is also about creating better working conditions for waste collectors and drivers.</li> <li>• Instead of driving the same collection routes and servicing empty bins, waste collectors will spend their time more efficiently, taking care of bins that need servicing.</li> </ul>
NFR-4	<b>Performance</b>	<ul style="list-style-type: none"> <li>• The Smart Sensors use ultrasound technology to measure the fill levels (along with other data) in bins several times a day.</li> <li>• Using a variety of IoT networks ( (NB-IoT,GPRS), the sensors send the data to Sensoneo's Smart Waste Management Software System, a powerful cloud-</li> </ul>

		<p>based platform, for data driven daily operations, available also as a waste management app.</p> <ul style="list-style-type: none"> <li>• Customers are hence provided data-driven decision making, and optimization of waste collection routes, frequencies, and vehicle loads resulting in route reduction by at least 30%.</li> </ul>
NFR-5	<b>Availability</b>	<ul style="list-style-type: none"> <li>• By developing &amp; deploying resilient hardware and beautiful software we empower cities, businesses, and countries to manage waste smarter.</li> </ul>