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

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| Date | 16 October 2022 |
| Team ID | PNT2022TMID13627 |
| Project Name | Project – 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 | **Smart sensors** | Smart Sensors are designed for monitoring fill level in smart trash bins and containers using ultrasonic technology. Sensors transfer data very simple via all currently available IoT networks and/or GPRS. Sensors monitor all types of waste in bins and containers of different sizes. They are robust, water and shock-resistant. Fire alarm, tilt recognition and other features are included. |
| FR-2 | **Smart Waste Management Software System** | The powerful cloud-based waste management software system enables the customer to configure, monitor and manage daily operations of a waste management company. In addition, to live data from Waste monitoring, the tool can also hold complex bin database, plan the optimal collection routes, predict filling cycles, and manage reports from employees and citizens |
| FR-3 | **Citizen app** | Citizens app provides access to data from Smart Sensors to citizens. The mobile app informs about the location and fill level of monitored bins and enables you to find the nearest available bin for disposal of garbage or report an issue. Logged users can access even more information about the bins, request a pickup or maintenance. Available for free on Android and iOS. |
| FR-4 | **Adjust bin distribution** | Ensure the most optimal distribution of bins.<br>Identify areas with either dense or sparse bin distribution.<br>Make sure all trash types are represented within a stand.<br>Based on the historical data, you can adjust bin capacity<br>or location where necessary. |
| FR-5 | **Eliminate inefficient picks** | Eliminate the collection of half-empty bins.<br>The sensors recognize picks.<br>By using real-time data on fill-levels and pick recognition, we can show you how full the bins you collect are.<br>The report shows how full the bin was when picked.<br>You immediately see any inefficient picks below 80% full. |

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| FR-6 | **Plan waste collection routes** | The tool semi-automates waste collection route planning. Based on current bin fill-levels and predictions of reaching full capacity, you are ready to respond and schedule waste collection.<br>You can compare planned vs executed routes to identify any inconsistencies. |

**Non-functional Requirements:**

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

| FR No. | Non-Functional Requirement | Description |
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| NFR-1 | **Usability** | IoT device verifies that usability is a special and important perspective to analyse user requirements, which can further improve the design quality. 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, behaviour and experience. |
| NFR-2 | **Security** | Use a reusable bottles<br>Use reusable grocery bags Purchase wisely and recycle<br>Avoid single use food and drink containers. |
| NFR-3 | **Reliability** | Smart waste management is also about creating better working conditions for waste collectors and drivers. 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. |
| NFR-4 | **Performance** | The Smart Sensors use ultrasound technology to measure the fill levels (along with other data) in bins several times a day. Using a variety of IoT networks ( (NB-IoT,GPRS), the sensors send the data to Smart Waste Management Software System, a powerful cloud-based platform, for data- driven daily operations, available also as a waste management app.<br>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%. |
| NFR-5 | **Availability** | By developing & deploying resilient hardware and beautiful software we empower cities, businesses, and countries to manage waste smarter. |

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| NFR-6 | Scalability | Using smart waste bins reduce the number of bins<br>inside town , cities because we able to monitor the garbage 24/7 more cost effect and scalability when we moves to smarter. |