The City of Bangalore, India, with 11 million inhabitants is currently investigating the improvement of the municipal solid waste collection system due to low efficiency and significant environmental impacts of the prevalent collection system. The present door-to-door collection covers only 50 % of the generated MSW whereas the rest is discharged at Litter Spots (30 %) and complemented by street sweeping waste (20 %). This presentation describes the conceptual design of an appropriate and innovative MSW collection system for Bangalore on the basis of a MSW collection evaluation tool.

This collection tool is developed to project and simulate different scenarios and options for the collection system, considering temporary and spatial fluctuations of specific key parameters. The approach analyses three different scenarios – only door-to-door collection, only community bin collection, mixed systems – and three different options for waste segregation – separate collection of mixed, dry and wet waste, separate collection of wet waste as well as dry and mixed waste together, separate collection of dry waste as well as wet and mixed waste together. The evaluation tool calculates the capital and operational expenses per time unit to enable a scientific comparison of all systems. Additionally, CO\textsubscript{2} emissions, number of community bins and collection vehicles as well as the number of employees were simulated for temporal and spatial variations.

For the design of the evaluation tool, multiple key parameters are applied in order to investigate the variation of the entire system when one parameter is changed. The development of the investigated parameters is projected for three different strata in Bangalore. Key parameters are among others the ratio of door-to-door collection in the entire system, the rate of waste segregation at source and the collection frequency for community bins per week, as well as salary and number of employees per vehicle. The evaluation tool uses the results of the previous Municipal Solid Waste (MSW) characterization study and analysis of Bangalore (Weichgrebe et al., 2015), including waste densities, population and waste generation data as well as physical and chemical compositions.

While varying the input parameters, the optimal value can be identified with respect to capital and operational expenses, feasibility and CO\textsubscript{2} emissions. Moreover, the development of an increasing segregation at source rate can be investigated regarding impacts on the systems. The evaluation tool also calculates the specific waste volumes per community bin point in order to verify the space requirements and availability of land on ground.

As a result, the collection evaluation tool shows that a decrease in collection frequency for Community Bins is not seen as a feasible method to reduce costs. A frequency of 7 times a week is recommended considering all interdependencies. If a combination of both systems is desired, it is recommended to remain within a share of door-to-door collection coverage of 80 % to 25 % in order to avoid efficiency losses. However, a system with only community bin system shows significantly lower costs compared to a door-to-door collection system. In order to optimize community bin sizes and maximum walking distance, a radius of 200 m around each community bin is recommended for low density areas. For medium density areas, a radius of 135 m balances cost and bin volume in an optimal way, while for high density areas 100 m are recommended. Following the results, a community bin collection system with one separate wet waste bin and one dry & mixed waste bin can be recommended. Moreover, the results are used as part of a multi-criteria analysis to facilitate the decision process for the systems.

In conclusion, the evaluation tool for waste collection can be adapted and applied for urban areas in emerging countries. It offers great advantages to optimize the system parameters of existing and future waste management systems.