

Route optimization of solid waste transportation in part of Lucknow- Capital city of Uttar Pradesh, India

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Abstract – The solid waste management system is a tedious task facing developing and developing countries. Site validity analysis and improving a solid waste disposal route can make waste management cheaper and can be used for sustainable development. The result obtained shows the improvement of the route between the Shivari plant to the zone 4 place of Nagar Nigam Lucknow in two ways, each giving a very short effect and one of the fastest solid waste disposal routes. Time and distance are two factors that affect the outcome. In arc gis the distance to improve the route of the map and the time difference between the first collection point in the disposal of the time difference 0.2847 hour and the distance difference 0.2288 kilometer in large urban areas.

Key Words: Municipal solid wastes, Route optimization, Waste collection points, Disposal sites, GIS, Remote Sensing, and ArcGIS.

1. INTRODUCTION

The Municipal Solid Waste (MSW) Board from Urban Development has become a real concern for administrative offices, pollution control agencies, and administrative bodies and is open to most of the old urban areas. Lucknow is an important city and capital of Uttar Pradesh State 525 kilometers from Delhi and around 920 kilometers from Calcutta. Lucknow has long been known as a multicultural city and flourished as the social and artistic capital of North India for eighteen nineteen centuries and as a stronghold of the Nawabs. Lucknow is an important city and capital of Uttar Pradesh State. It is 525 kilometers from Delhi and about 920 kilometers from Calcutta. Lucknow has long been known as a multicultural city and flourished as the social and creative capital of North India in the eighteenth and nineteenth centuries and as the seat of the Nabsabs. Today it continues as an important center for teaching, commerce, aviation, accounting, drugs, innovation, programming, culture, the tourism industry, music and verse. Lucknow is still 123.45 meters above sea level and covers an area of 689.1 km. It is bordered on the east by the District Barabanki, on the west by the Unnao region, on the south by Raebareli and on the north by the districts of Sitapur and Hardoi. The town is located on the northwest shore of the Gomti waterway, which runs through it. Lucknow Municipal Corporation (LMC) is responsible for the management of the city-built MSW.

2. STUDY AREA

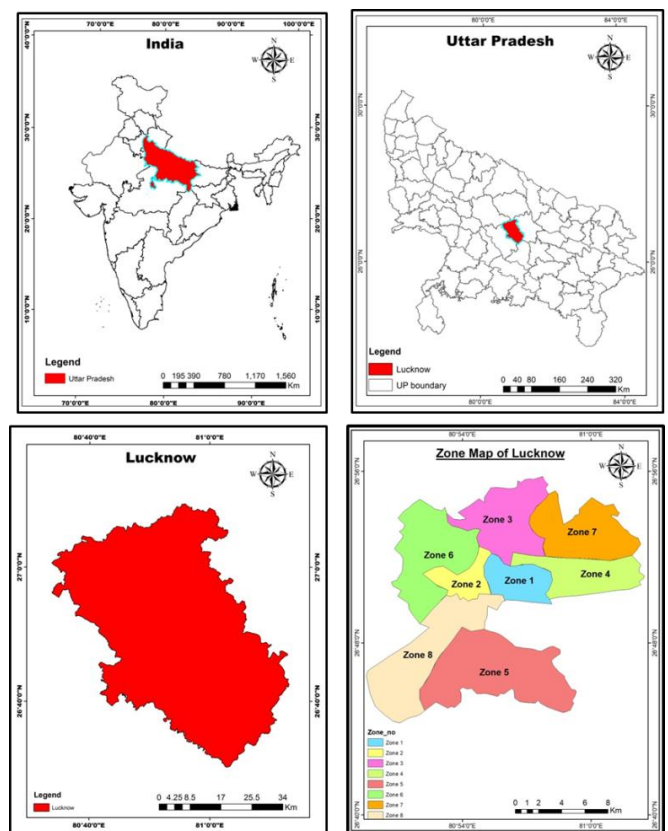


Figure 1: ArcGIS map of 8 Zones of Lucknow city

Lucknow, a large city in northern India, is the capital of the province of Uttar Pradesh. The Lucknow is located in the center of Uttar Pradesh between 26°55'11.12"N and 80°59'55.55"E. Uttar Pradesh is the most populous region in India, with Lucknow the capital. Municipal Lucknow city is divided into 8 zones.

3. METHODOLOGY AND DATA USED

Data Collect from Nagar Nigam Lucknow and ground truthing. **Software used**- ArcGIS.

- Study area boundary.
- Name of the roads and their width.

- c) Traffic volume details.
- d) No. of storage bins and their location.
- e) Capacities of the bins.
- f) Time taken for collection of solid waste per bin.
- g) Type of vehicles used and its capacity.

3.1 GIS – Geographic Information System

Geographic Information System (GIS) as a management tool can provide effective management, disclosure and use of location and location information. Solid waste collection and distribution frequently calculates the maximum percentage of the total amount set for waste management, Network analyst is used to estimate the correlation between the dynamic factors, like network traffic changes in the study area and to produce optimized route.

3.2 Digitization

Transport Network map of zone 4 of Nagar Nigam Lucknow is created and were examined.

3.3 Network analyst

Network Analyst tools can, find efficient travel routes from starting point to end point determine which facility or vehicle is closest, generate travel directions.

The ideal course for the assortment of strong waste is produced utilizing Network Analyst. It is created in view of two standards, route for distance criteria (Shortest) and route time criteria (Quickest).

Solid Waste collected from bins and transported to Shivari Plant.

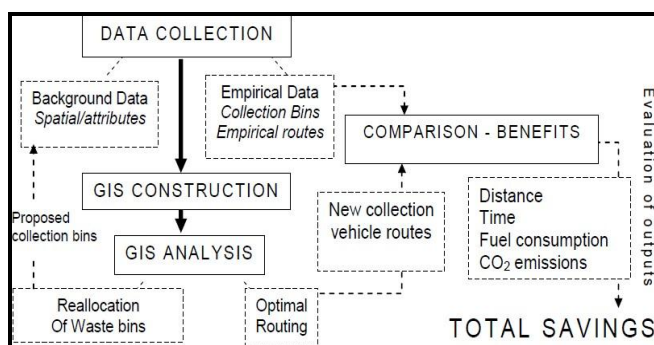


Fig. 2: Data flow of the proposed methodology

4. RESULT AND DISCUSSION

To achieve the objectives of this study, route optimization of solid waste disposal of zone 4 Nagar Nigam Lucknow by two ways, one is respect to time as say quickest route and other is respect to distance as say optimized route. The GIS gave the

definite data on street network availability among various examination focuses. The advanced courses created from this methodology were contrasted and the current courses that deliberate separation between singular ward to removal site at Shivari Mohan road. For each ward, the current course length was assessed in the Arc GIS-improved course length. The point by point data of every one of the connections produced from the current methodology is introduced in table.

Quickest Route Based on Time(in Hours)					
Name	First Stop	Last Stop	Total Stops	Total Time (in hours)	Total Distance(in Km)
Bin Location-1 to Shivari STP Plant	Bin Location-1	Shivari STP Plant	48	1.3879	34.6984

Shortest Route Based on Distance(in Km)					
Name	First Stop	Last Stop	Total Stops	Total Time (in hours)	Total Distance(in Km)
Bin Location-1 to Shivari STP Plant	Bin Location-1	Shivari STP Plant	48	1.6235	32.4696

Comparison Between Both Routes				
Route Type	Distance (Km)	Time (Hrs)	Difference in Distance (Km)	Difference in Time (Hrs)
Shortest	32.4696	1.4735	2.228	0.2847
Quickest Route	34.6984	1.1888	2.228	0.2847

Shortest Route Based on Distance (Km) after bins allocation					
Name	First Stop	Last Stop	Total Stops	Total Time (in hours)	Total Distance(in Km)
Bin Location-1 to Shivari STP Plant	Bin Location-1	Shivari STP Plant	91	1.8371	36.7425

Quickest Route Based on Time (Hr) after Bins allocation					
Name	First Stop	Last Stop	Total Stops	Total Time (in hours)	Total Distance(in Km)
Bin Location-1 to Shivari STP Plant	Bin Location-1	Shivari STP Plant	91	1.5851	39.6265

Comparison Between both Routes after Bins allocation				
Route Type	Distance (Km)	Time (Hrs)	Difference in Distance (Km)	Difference in Time (Hrs)
Shortest	36.7425	1.8371	2.884	0.252
Quickest Route	39.6265	1.5851	2.884	0.252

Table 1: Optimization of route map of solid waste disposal of zone 4 Nagar Nigam Lucknow:

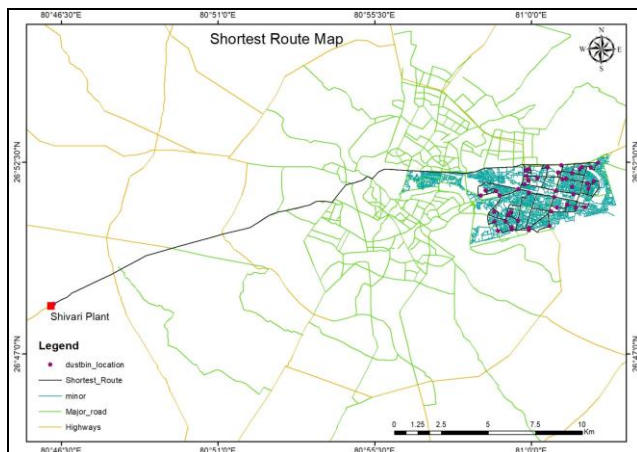


Fig. 3: Optimization route of shortest route for disposal of solid waste of zone 4

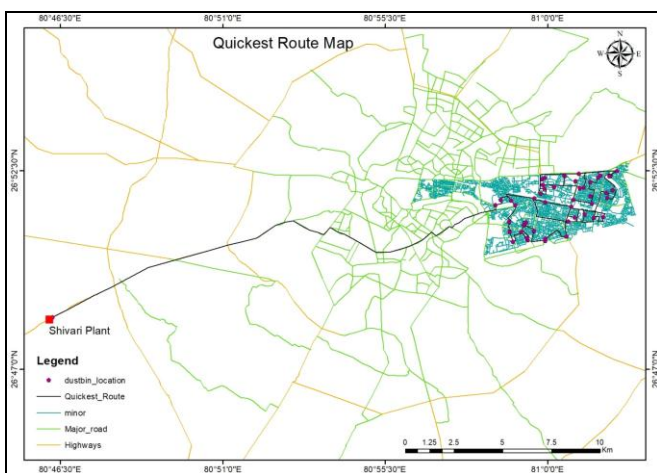


Fig. 4: Optimization route of quickest route for disposal of solid waste of in zone-4

5. CONCLUSION

Differential GPS should be used to track links to debris and to conduct detailed research into the physical and chemical properties of the soil. It is also recommended that the remote sensor and GIS be used to increase the efficiency of waste management in urban areas. The result obtained demonstrates the optimal performance of the Nagar Nigam Lucknow zone 4 in two ways, each giving the shortest result and one of the quickest solid waste disposal routes. Time and distance are two factors that affect the outcome. In ArcGIS the distance to improve the map route and the time difference between the first collection point to the time difference point .2847 hour and the distance difference 2.2288 (km). After the route improvement after the dustbin allocation the difference changes over time and the shortest and fastest distance is .252 hour and the distance is 2.884(Km). Redistribution of bins using GIS maps provides a comprehensive waste collection guide for effective waste collection points.

6. REFERENCES

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