BIN COLLECTION

MANAGEMENT INFORMATION SYSTEMS 3

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<u>LACK OF BIN COLLECTION</u>

1.Imagine walking down your street and being greeted by overflowing bins, litter strewn pavements and the pungent smell of rotting waste. This is the reality for many residents in our community, where inadequate bin collection services are causing frustrations, health concerns and environmental degradation. Bin collection is a major problem we are facing as the community of Southernwood. It is a critical issue that affects our environment and community. The improper handling of waste can lead to pollution, health hazards and ecological damage. It is essential to identify and address the biggest problems associated with bin collection in order to ensure a sustainable future. We have the following stakeholders:

<u>Stakeholders:</u>

1. Residents

2. Municipal Department

3. Waste Management Company

4. Drivers

5. Local Businesses

6. Environmental Groups

<u>Impact:</u>

Bin collection can present several challenges that may impact a community significantly. One of the predominant challenges is that, when bins overflow, they create unsightly rubbish that may be a breeding ground for vermin. Overflowing bins can also produce smells which are likely to lower the standards of living for the residents of that neighbourhood. There are other issues such as the discontinuity in bin collection timings. For example, if the residents do not know when their bins are going to be collected lifting their waste could be a wasteful act. There are also instances where people overstay their bins which may become earliest dumping sites and eventually create a mess on the roads.

<u>Need for solution</u>**:**

To have access to:

1. Reliable and efficient collection services

2. Real-time scheduling and updates

3. Optimized routing and logistics

4. Increased transparency and accountability

5. Improved waste management practices

6. Enhanced community engagement and education

2. Solutions:

1. Regular collection schedules

2. Increased collection frequency

3. Improved waste management infrastructure

4. Public education campaigns

5. Community involvement programs

Purpose:

The primary purpose of a Bin Collection Problem Database is to:

1. Centralize and manage bin collection data

2. Improve efficiency and effectiveness of waste collection operations

3. Enhance communication between residents, waste management providers, and local authorities

4. Reduce costs and environmental impact

5. Support data-driven decision-making for waste management improvements

How will it address the problem:

We propose Waste Management System as our Database solution that aims to address the lack of bin collection in our area by providing a centralized system for managing bin collection schedules, requests. And crew operations.

Operational Efficiency:

1. Route optimization: Identifies most efficient collection routes, reducing fuel consumption and lowering emissions.

2. Real-time scheduling: Ensures timely collections, reducing missed collections and complaints.

3. Automated reminders: Notifies residents of collection schedules, promoting participation.

Data-Driven Decision-Making:

1. Waste generation analysis: Identifies areas with high waste generation, informing waste reduction initiatives.

2. Collection frequency optimization: Adjusts collection frequencies based on waste generation rates.

3. Performance monitoring: Tracks key performance indicators (KPIs), such as collection rates and missed collections.

Resident Engagement:

1. Online portal: Allows residents to report issues, request special collections, and access collection schedules.

2. Mobile app: Provides real-time collection information, reminders, and feedback mechanisms.

3. Education and outreach: Supports targeted education campaigns to promote proper waste sorting and reduction.

Environmental Impact:

1. Waste reduction tracking: Monitors waste reduction efforts, identifying areas for improvement.

2. Recycling rate optimization: Analyses recycling rates, identifying opportunities to increase recycling.

3. Litter reduction: Identifies areas with high litter rates, informing targeted cleanup initiatives.

Cost Savings:

1. Route optimization: Reduces fuel consumption, lowering costs.

2. Reduced labour costs: Streamlines collection operations, minimizing labour requirements.

3. Improved asset management: Extends vehicle lifespan, reducing maintenance costs.

Here are the 5 main entities and their descriptions:

Entity 1: Resident

Description: An individual or entity responsible for generating waste.

Entity 2: Household

Description: A dwelling unit generating waste.

Entity 3: BinCollection

Description: is the process of gathering and transporting solid waste and recycles materials from homes

Entity 4: Bin

Description: A container for holding waste.

Entity 5: Vehicle (collection Truck)

Description: A vehicle used for waste collection.

3.
- o **Here is a list of key entities along with their definition and relevant attributes:**
- ➢ **Resident:** Definition: An individual living in a household that participates in the bin collection service.

 Attributes:

Resident ID: A unique identifier for each resident (PRIMARY KEY)

Name: The name of the resident.

Address: A particular place where someone lives

Contact Information: Phone number or email address for communication

- ➢ **Bin** Definition: A container designated for collecting waste or recyclables.

Attributes:

Bin ID: A unique identifier for each bin (PRIMARY KEY)

Type: Classification of waste (e.g., general waste, recycling, compost)

Size: The maximum volume or weight the bin can hold.

 Location: The specific address or coordinates of the bin.

Collection frequency: How often the household's bin is collected.

- ➢ **Household** Definition: A residential unit that generates waste and is served by the bin collection service.

Attributes:

Household ID: A unique identifier for each household (PRIMARY KEY)

Address: The physical location of the household.

Number of occupancy: The total number of people living in the household.

Collection Frequency: How often the household's bin is collected.

Waste generation rate:

> ➤ **Vehicle** <u>Definition:</u> The transportation unit used for collecting waste from bins.

Attributes:

Vehicle ID: A unique identifier for each collection vehicle (PRIMARY KEY)

Type: The type of vehicle (e.g., truck, compacting vehicle).

Capacity: The volume or weight the vehicle can carry.

Condition: Indicates whether the vehicle is operational, in maintenance, or out of service.

Maintenance schedule:

> ➤ **Bin Collection** <u>Definition:</u> is the process of gathering and transporting solid waste and recycles materials from homes

Attributes:

jobID (Primary Key): Represents a unique identifier for the job (PRIMARY KEY)

binID: A unique identifier for each bin

residentID: A unique identifier for each resident

householdID: A unique identifier for each household

vehicleID: A unique identifier for each collection vehicle

collection_schedule: A schedule that specifies the days and times when solid wastes will be collected from household

- o Entities with their attributes, including data type and constraints

Resident:

1. residentID (Primary Key)

2. First name

3. Last name

4. Address

5. Contact Information

Household:

1.householdID (Primary Key)

2. Address

3. Number of Occupants

4. Bin Collection Frequency

5. Waste Generation Rate

Bin:

1.binID (Primary Key)

2. Type (recyclable, non-recyclable)

3. Size

4. Location

5. Collection Frequency

BinCollection:

1.jobID (Primary Key)

2.binID

3.residentID

4.householdID

5.vehicleID

6.collection_schedule

Vehicle (Collection Truck):

1. vehicleID (Primary Key)

2. Type (rear-loader, side-loader)

3. Capacity

4. Condition

5. Maintenance Schedule

5.**SQL Statements for Data Management**

CREATE TABLE tblResidents

residentID INTEGER,

first_name VARCHAR(20),

last_name VARCHAR(20),

address VARCHAR(50),

contact_information VARCHAR(30),

PRIMARY KEY(residentID)

)

residentID	first_name	last_name	address	contact_information

CREATE TABLE tblHouseholds

(

householdID INTEGER,

address VARCHAR(50),

number_of_occupants INTEGER,

bin_collection_frequency VARCHAR(30),

waste_generation_rate VARCHAR(10),

PRIMARY KEY(householdID)

)

householdID	address	number_of_occupants	bin_collection_freque	waste_generation_rate

CREATE TABLE tblBins

(

binID INTEGER,

type VARCHAR(15),

size VARCHAR(10),

location VARCHAR(20),

```
collection_frequency VARCHAR(30),

PRIMARY KEY(binID)

)
```

binID	type	size	location	collection frequency

```
CREATE TABLE tblBinCollection

(

jobID INTEGER,

binID INTEGER,

residentID INTEGER,

householdID INTEGER,

vehicleID INTEGER,

collection_schedule VARCHAR(20)

PRIMARY KEY(jobID)

)
```

binID	type	size	location	collection frequency

```
CREATE TABLE tblVehicles

 (

 vehicleID INTEGER,

 type VARCHAR(15),

 capacity VARCHAR(10),

 condition VARCHAR(20),

 maintenance_schedule VARCHAR(30)

PRIMARY KEY (vehicleID)

)
```

binID	type	size	location	collection frequency

```
INSERT INTO tblResidents

VALUES

(378926, "John", "Smith", "6 Muir Street, East London Southernwood", "johnsmith@gmail.com", "trash")
```

(373546, "Jessica", "Willaim", "7 St Peters Street, East London Southernwood", "jessicawillian@gmail.com", "trash")

(377883, "Naida", "Doan", "2 St Gorge Street, East London Southernwood", "naidadoan@gmail.com", "trash")

(372213, "Zinhle", "Qhudeni", "15 St Patrics Street, East London Southernwood", "zinhleqhudeni@gmail.com", "trash")

(378765, "Nandi", "Smelani", "21 St Dominic Street, East London Southernwood", "nandismelani@gmail.com", "trash")

(377453, "Kiara", "Moore", "32 King Street, East London Southernwood", "kiaramoore@gmail.com", "trash")

(379864, "Samantha", "Bronze", "17 St James Street, East London Southernwood", "samanthabronze@gmail.com", "trash")

(371234, "Aphiwe", "Ndebele", "21 Oxford Street, East London Southernwood", "aphiwendebele@gmail.com", "trash")

(378765, "Stephan", "King", "41 St James Street, East London Southernwood", "stephenking@gmail.com", "trash")

(374321, "Steven", "Austin", "21Oxford Street, East London Southernwood", "stevenaustin@gmail.com", "trash")

SELECT* FROM tblResidents

residentID	first_name	last_name	address	contact
350075	Stephan	King	41 St James Street, East London Southernwood	stephenking
371234	Aphiwe	Ndebele	21 Oxford Street, East London Southerwood	aphiwendeb
372213	Zinhle	Qhudeni	15 St Patrics Street, East London Southernwood	zinhleqhude
373546	Jessica	William	7 St Peters Street, East London Southernwood	jesiccawillia
374321	Steven	Austin	21 Oxford Street, East London Southernwood	stevenaustin
377453	Kaira	Moore	32 King Street, East London Southerwood	kairamoore@
377883	Naida	Doan	2 St Gorge Street, East London Southerwood	naidadoan@
378765	Nandi	Smelani	21 St Donomic Street, East London Southerwood	nandismelar
378926	John	Smith	21 Kings Street, East London Southerwood	johnsmith@
379864	Samantha	Bronze	17 St James Street, East London Southerwood	samanthabr

INSERT INTO tblHouseholds

VALUES

(459081, "6 Muir Street, East London Southernwood", 6, "Weekly", "Weekly")

(498711, "7 St Peters Street, East London Southernwood",10, "Weekly", "Weekly")

(454325, "2 St Gorge Street, East London Southernwood", 12, "Weekly", "Weekly")

(492345, "15 St Patrics Street, East London Southernwood", 2, "Weekly", "Weekly")

(450012, "21 St Dominic Street, East London Southernwood", 9, "Weekly", "Weekly")

(478102, "32 King Street, East London Southernwood", 4, "Weekly", "Weekly")

(497586, "17 St James Street, East London Southernwood", 3, "Weekly", "Weekly")

(456745, "21 Oxford Street, East London Southernwood", 5, "Weekly", "Weekly")

(494567, "41 St James Street, East London Southernwood", 8, "Weekly", "Weekly")

(494579, "21Oxford Street, East London Southernwood", 4, "Weekly", "Weekly")

SELECT* FROM tblHouseholds

householdID	address	number_of_occupants	bin_collect
450012	21 St Dominic Street, East London Southernwood	9	Weekly
454325	2 St Gorge Street, East LondonSouthernwood	12	Weekly
456745	21 oxford Street, East London Southernwood	5	Weekly
459081	6 Muir Street, East London Southernwood	6	Weekly
478102	32 Kings Street, East London Southerwood	4	Weekly
492345	15 St Patricks, East London Southernwood	2	Weekly
494567	41 St James Street, East London Southernwood	8	Weekly
494579	21 Oxford Street, East London Southerwood	4	Weekly
497586	17 St James Street, East London Southerwood	3	Weekly
498711	7 St Peters Street, East London Southernwood	10	Weekly

INSERT INTO tblBins

VALUES

(650098, "trash", "Large", "Residential", "Weekly")

(651234, "trash", "XLarge", "Residential", "Weekly")

(654321, "trash", "XLarge", "Residential", "Weekly")

(655678, "trash", "Small", "Residential", "Weekly")

(687656, "trash", "Large", "Residential", "Weekly")

(659876, "trash", "Meduim", "Residential", "Weekly")

(650634, "trash", "Small", "Residential", "Weekly")

(650980, "trash", "Large", "Residential", "Weekly")

(650101, "trash", "Large", "Residential", "Weekly")

(650102, "trash", "Medium", "Residential", "Weekly")

SELECT* FROM tblBins

binID	type	size	location	collection_frequency
650098	trash	Large	Residential	Weekly
650101	trash	Large	Residential	Weekly
650102	trash	Medium	Residential	Weekly
650634	trash	Small	Residential	Weekly
650980	trash	Large	Residential	Weekly
651234	trash	Xlarge	Residential	Weekly
654321	trash	Xlarge	Residential	Weekly
655678	trash	Small	Residential	Weekly
659876	trash	Medium	Residential	Weekly
687656	trash	Large	Residential	Weekly

INSERT INTO tblBinCollection

VALUES

(453020, 650102, 378926, 459081, 645978, "Weekly")

(453021, 650101, 373546, 498711, 648765, "Weekly")

(453022, 650980, 377883, 454325, 649876, "Weekly")

(453023, 650634, 372213, 492345, 642345, "Weekly")

(453024, 659876, 378765, 450012, 641112, "Weekly")

(453025, 687656, 377453, 478102, 642346, "Weekly")

(453026, 655678, 379864, 497586, 648639, "Weekly")

(453027, 654321, 371234, 456745, 649876, "Weekly")

(453028, 651234, 378765, 494567, 647657, "Weekly")

(453029, 650098, 374321, 494579, 640097, "Weekly")

SELECT* FROM tblBinCollection

| jobID	binID	residentID	householdII	vehicleID	collection_s
453020	650102	374321	494579	640097	Weekly
453021	650101	378765	494567	647657	Weekly
453022	650980	371234	456745	649876	Weekly
453023	650634	379864	497586	648639	Weekly
453024	659876	377453	478102	642346	Weekly
453025	687656	378765	450012	641112	Weekly
453026	655678	372213	492345	642345	Weekly
453027	654321	377883	454325	649876	Weekly
453028	651234	373546	498711	648765	Weekly
453029	650098	378926	459081	645978	Weekly

INSERT INTO tblVehicle

VALUES

(645978, "Truck", "4500kg-9070kg", "maintenance", "Weekly")

(648765, "Truck", "4700kg-9070kg", "maintenance", "Weekly")

(649876, "Truck", "3200kg-9070kg", "maintenance", "Weekly")

(642345, "Truck", "3300kg-9070kg", "maintenance", "Weekly")

(641112, "Truck", "6500kg-9070kg", "maintenance", "Weekly")

(642346, "Truck", "5500kg-9070kg", "maintenance", "Weekly")

(648639, "Truck", "3500kg-9070kg", "maintenance", "Weekly")

(649875, "Truck", "3700kg-9070kg", "maintenance", "Weekly")

(647657, "Truck", "2500kg-9070kg", "maintenance", "Weekly")

(640097, "Truck", "3600kg-9070kg", "maintenance", "Weekly")

SELECT* FROM tblVehicle

vehicleID	ype	capacity	condition	maintenanc
640097	Truck	3600kg-9070kg	Maintenance	Weekly
641112	Truck	6500kg-9070kg	Maintenance	Weekly
642345	Tuck	3300kg-9070kg	Maintenance	Wekly
642346	Truck	5500kg-9070kg	Maintenance	Weekly
645978	Truck	4500kg-9070kg	Maintenance	Weekly
647657	Truck	2500kg-9070kg	Maintenance	Weekly
648639	Truck	3500kg-9070kg	Maintenance	Weekly
648765	Truck	4700kg-9070kb	Maintenance	Weekly
649875	Truck	3700kg-9070kg	Maintenance	Weekly
649876	Truck	3200kg-9070kg	Maintenance	Weekly

RELATIONSHIPS
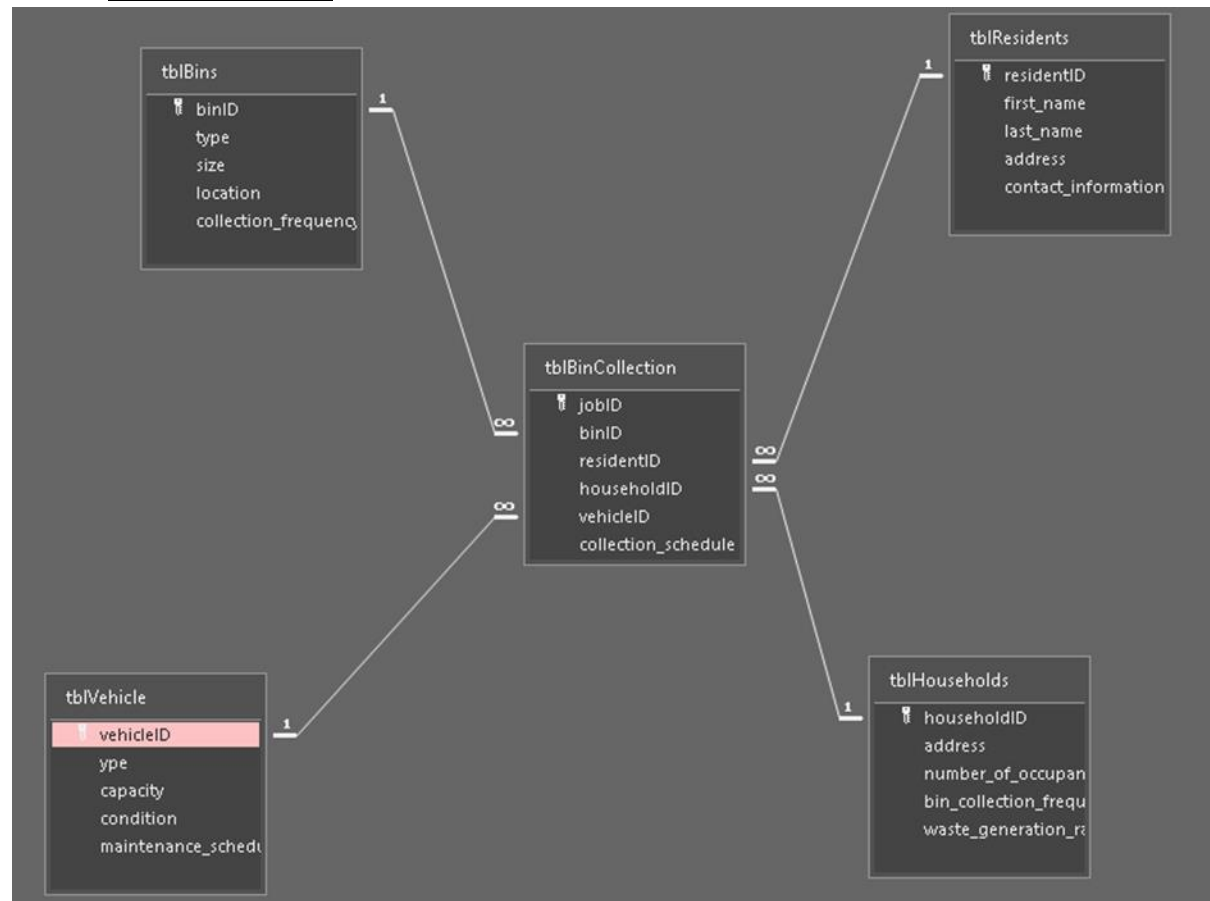
BUSINESS RULES

Resident Management

1. Each resident must have a unique Resident ID.

2. Resident information (name, address, contact details) must be up-to-date.

3. Residents can only be assigned to one household.

Household Management

1. Each household must have a unique Household ID.

2. Households can have multiple residents.

3. Households must be assigned to a specific bin collection route.

Bin Collection Route Management

1. Each bin collection route must have a unique Route ID.

2. Routes can have multiple households assigned.

3. Routes must be serviced by a designated vehicle.

Vehicle Management

1. Each vehicle must have a unique Vehicle ID.

2. Vehicles must be assigned to a specific route.

3. Vehicles must have a valid maintenance schedule.

Incident Report Management

1. Incident reports must be logged for missed collections, overflows, or other issues.

2. Incident reports must include date, time, location, and description.

3. Incident reports must be resolved within a specified timeframe.

Bin Management

1. Bins must be assigned to a specific household.

2. Bins must be emptied on the designated collection day.

3. Bins must be replaced or repaired if damaged.

Collection Schedule Management

1. Collection schedules must be created for each route.

2. Schedules must include collection day, time, and frequency.

3. Schedules must be updated if route or household changes.

Data Integrity

1. Data must be accurate, complete, and up to date.

2. Duplicate records are not allowed.

3. Data must conform to defined formats and standards.

Security

1. Access to the database must be restricted to authorized personnel.

2. Passwords must be secure and regularly updated.

3. Data must be backed up regularly.

Notification

1. Residents must be notified of changes to collection schedules.

2. Residents must be notified of missed collections or other issues.

3. Notifications must be sent via preferred communication method.

Reporting

1. Reports must be generated for collection efficiency, incident rates, and resident satisfaction.

2. Reports must be available for municipal department and waste management company.

3. Reports must be updated regularly.

Implementation of these business rules:

1. Automated checks and constraints

2. User access controls

3. Regular audits and reviews

4. Training for personnel

5. Continuous monitoring and improvement

<u>CONCLUSION</u>

In conclusion, a lack of bin collection signifies critical issues that extend beyond mere inconvenience. It poses public health risks, environmental challenges, community dissatisfaction, financial burdens, and aesthetic concerns, highlighting the need for effective waste management strategies to ensure a clean and healthy environment. Addressing these issues requires coordinated efforts from local authorities, community engagement, and potential policy changes aimed at improving waste collection services.