

# SYSTEM ANALYSIS AND DESIGN

FALL 2024\_CSE 3203 SECTION 02

## SUBMITTED BY

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## SUBMITTED TO

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# UNIVERSITY OF LIBERAL ARTS BANGLADESH

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

# Residential Waste Management System

## System Vision

### Problem Description

Proper waste management is the major concern in urban area of Bangladesh. Government agencies like City Corporation, Municipal Corporation, local government and others related for collecting and managing waste are regularly facing vague situation due to their out of accountability and not to involve directly. Most of the time, they tendered to third parties who have lack of knowledge, do neglecting on duty and deficiency to authorize this third parties due to the shortage of organization's manpower. They don't regularly collecting trash which lead residents an unclamorous situation. On the contrary, this collected waste haven't any proper plan to decompose, most of the time are landfilled in roadside conceiving another problem. There are some valuable waste namely electronic device, plastics, packaging materials that pollutes environment, but they have a very high demands in recycling market. But followed government agencies have no supporting policies as if people sell this product to related vendors. Residents also face problems in complaining about their problems, solutions, comments which make this management process more inefficient.

It is recommended that a new system be developed and deployed so the whole process can perform in one information system. A cloud based mobile application is built for home renter, home owner and contractor as if they interact with each other instantly to collect waste and sell their recyclable products. At the same time, they also communicate with their authority about problems with this apps. Another information system is also build to maintain the mainstream processes from receiving garbage to processing this garbage. Mobile application is also incorporated with this system. Another two systems are fabricated, one for accomplishing organization's internal operations such as accounts, sales & marketing, HR, inventory, research & development, reporting etc. and other for government agencies to look after this complete function.

## System Capabilities

The new system should be capable of

- Collecting and storing information about the home renters, home owners and contractors.
- Storing information about total amount of collected waste and also the amount along with segregation.

- Storing information about the amount of total saleable raw product, total processed product and unusable products.
- Storing information about sales, accounting, marketing, HR, inventory, reports and so on.
- Home owner and home renter can find nearest contractor who are available and send request to collect garbage.
- Contractor can receive request regarding his availability.
- Contractor can receive payment.
- Home renter can receive and send their payments.
- Home renter, home owner, contractor and regional office can communicate with each other.
- Government agency and organization store reports.
- Research and development team use and integrate customizable systems according to their needs.
- Connecting via Wi-Fi (Internet) and transmitting data. □ Connecting via telephone and transmitting data.

## Business Benefits

It is anticipated that the development of this new system will provide the following business benefits to RWMS:

- Real-time communication between homeowners, renters, and contractors ensures quicker and more organized garbage collection.
- Helps optimize the deployment of collection vehicles and manpower, minimizing resource wastage.
- Government agencies and management can track contractor performance, ensuring they meet collection timelines and standards.
- Real-time and automated reporting on collection, disposal, and recycling processes enhance operational transparency.
- Homeowners and renters can seamlessly track and process payments, reducing disputes.
- Storing detailed information about recyclable, saleable, and nonusable waste allows better planning for waste segregation and disposal.
- Better planning for waste decomposition and recycling minimizes roadside landfills and their associated health hazards.

- Seamless communication channels between regional offices, residents, and contractors reduce inefficiencies caused by delays or misunderstandings.
- Optimized collection routes, proper waste segregation, and automation in processes minimize unnecessary expenses.
- The system enables the tracking and sale of recyclable waste, creating a revenue stream for the organizations.
- Streamlined data collection helps generate reports for decisionmakers and government agencies.
- Residents can request services, track contractors, and make payments via the mobile app, reducing their effort.
- Residents can sell recyclable waste to vendors directly, contributing to sustainability and gaining economic benefits.
- Residents can submit complaints, suggestions, or feedback directly to authorities, ensuring their voices are heard.
- Government agencies can oversee the entire waste management process in real time.
- Data-driven insights enable better policymaking for waste management and sustainability goals
- Agencies can evaluate the efficiency of contractors and organizations to ensure accountability and compliance.

## Context Diagram:

Efficient waste management is a critical component of sustainable urban development and environmental preservation. The Regional Waste Management System (RWMS) framework detailed here outlines the roles and responsibilities of key stakeholders involved in waste collection, processing, monitoring, and reporting. Each stakeholder contributes to maintaining an organized and accountable system to ensure waste is managed effectively at every level, from households to government agencies.

This framework identifies and assigns clear tasks to the following entities:

### 1. House to Owner

- Request for collection.
- View report.
- Make payment.
- Communicate with the regional office

## 2. Contractor

- Receive collection request.
- View report.
- Collect owing
- Communicate with the regional office

## 3. Regional Office

- Manage and monitoring local waste collection
- Manage house owner. Manage local stackholder contractor.
- Communicate with the contractor and house owner for maintenance.
- View report.

## 4. Management

- Manage the regional office.
- Monitor and manage RWMS
- View report.

## 5. Dumping and production zone

- Receive waste and processing
- View report

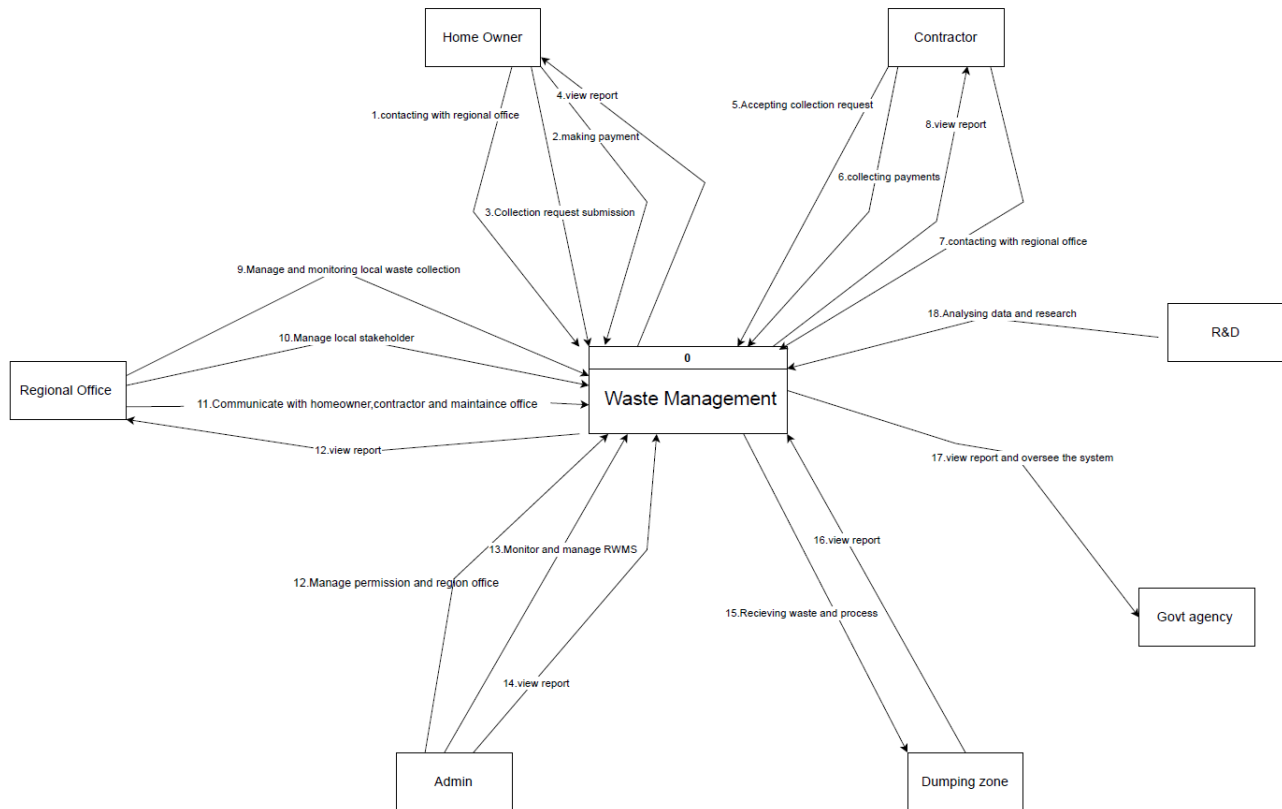
## 6. Govt Agency

- View report
- View Home Owner

## 7. Reacher and development

- Access waste report
- Write report

This systematic approach fosters collaboration among all stakeholders to ensure that waste is not only collected and processed efficiently but also used to contribute to sustainable resource utilization and environmental conservation

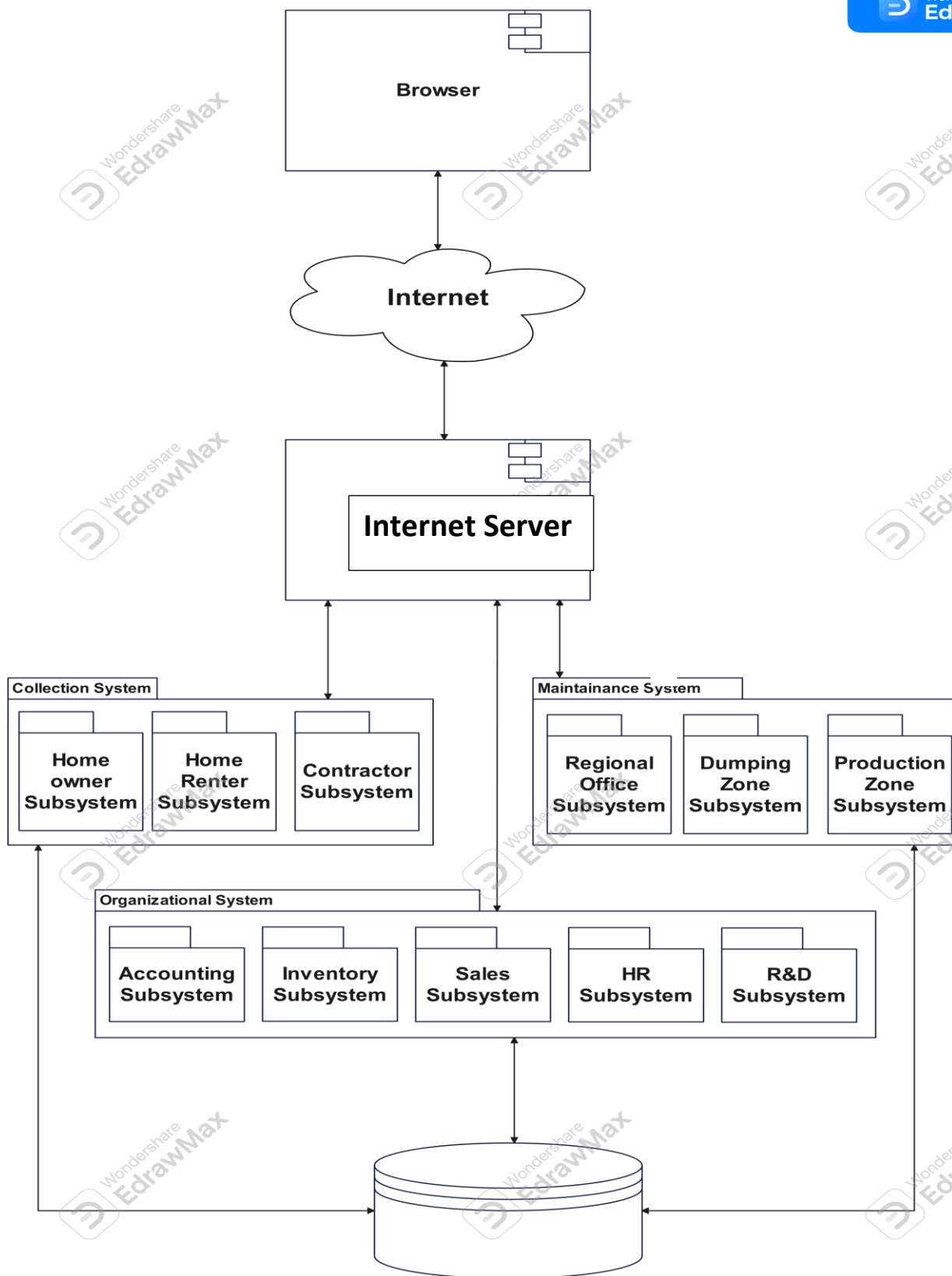


## System Overview

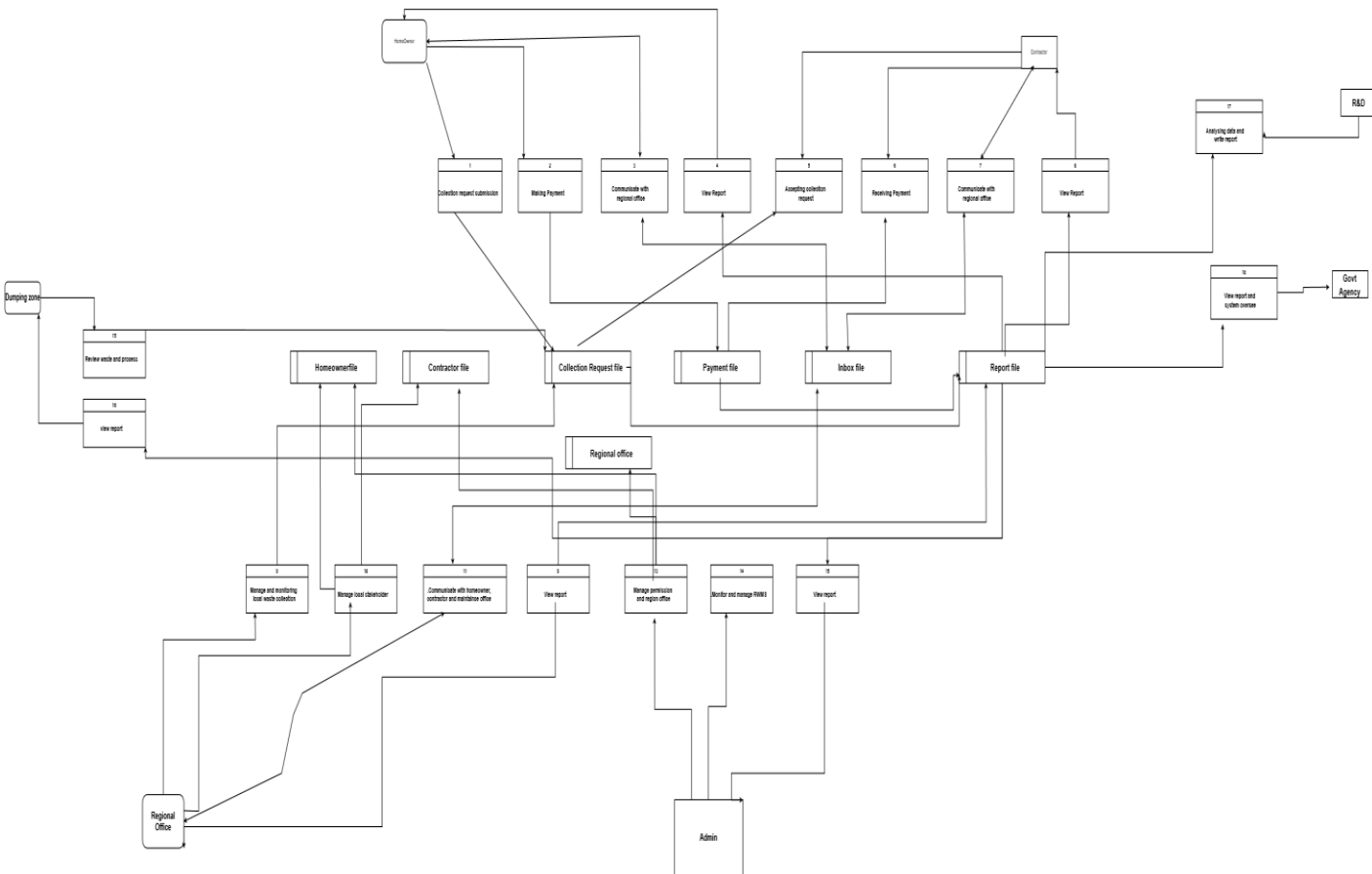
The system acts as the intermediary for communication and data exchange among all entities. Each interaction revolves around these core functions:

1. **Data Input:** Waste collection requests, payments, and reports.
2. **Data Processing:** Schedule validation, payment verification, and waste categorization.
3. **Reporting:** Area-based, financial, and performance summaries.
4. **Communication:** Message exchanges between stakeholders.

# System Architectural Diagram



## DFD-0



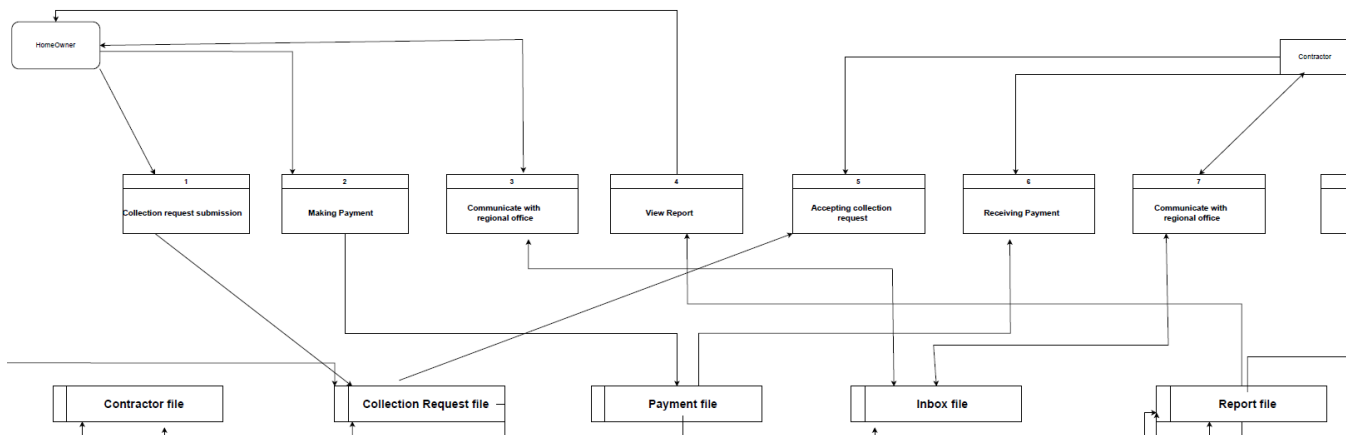
## 1. House to Owner

- Request for collection.
- View report.
- Make payment.
- Communicate with the regional office

## 2. Contractor

- Receive collection request.
- View report.
- Collect owing
- Communicate with the regional office



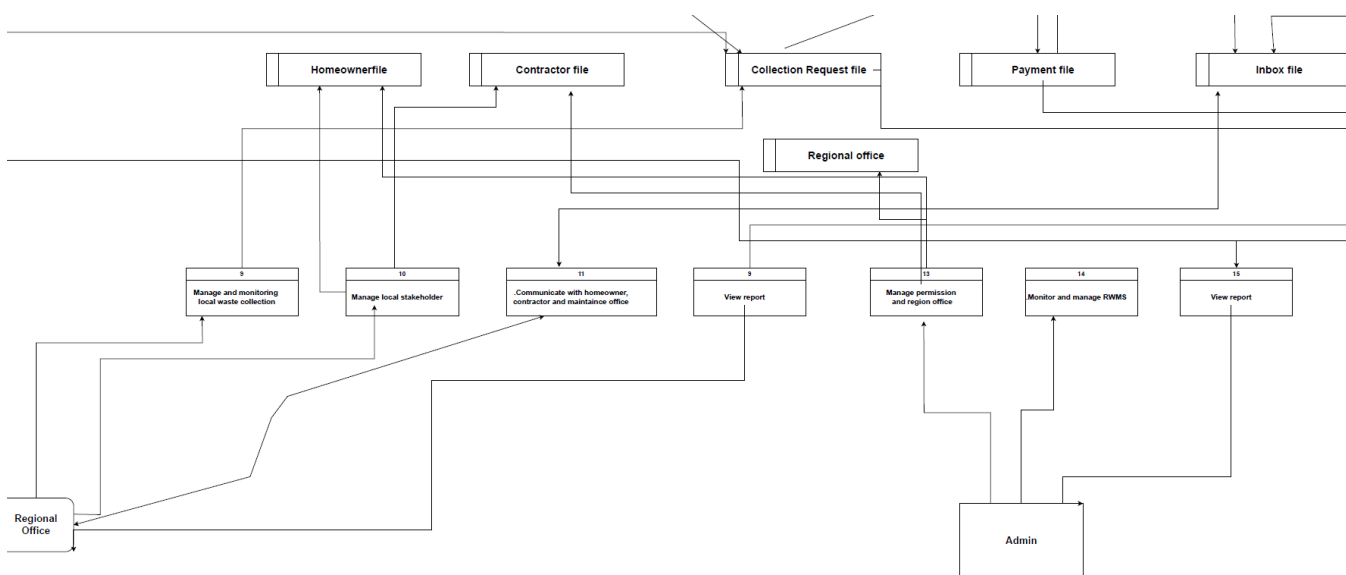


### 3. Regional Office

- Manage and monitoring local waste collection
- Manage house owner. Manage local stackholder contractor.
- Communicate with the contractor and house owner for maintenance.
- View report.

### 4. Management

- Manage the regional office.
- Monitor and manage RWMS
- View report.

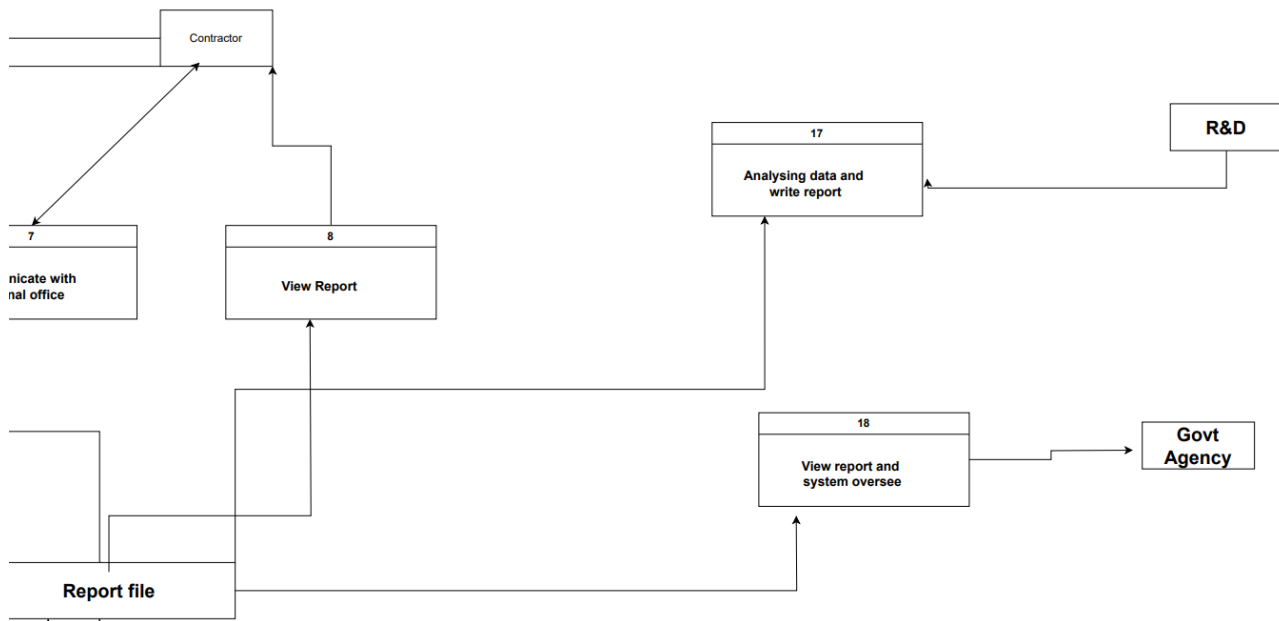


## 6.Govt Agency

- View report
- View HomeOwener

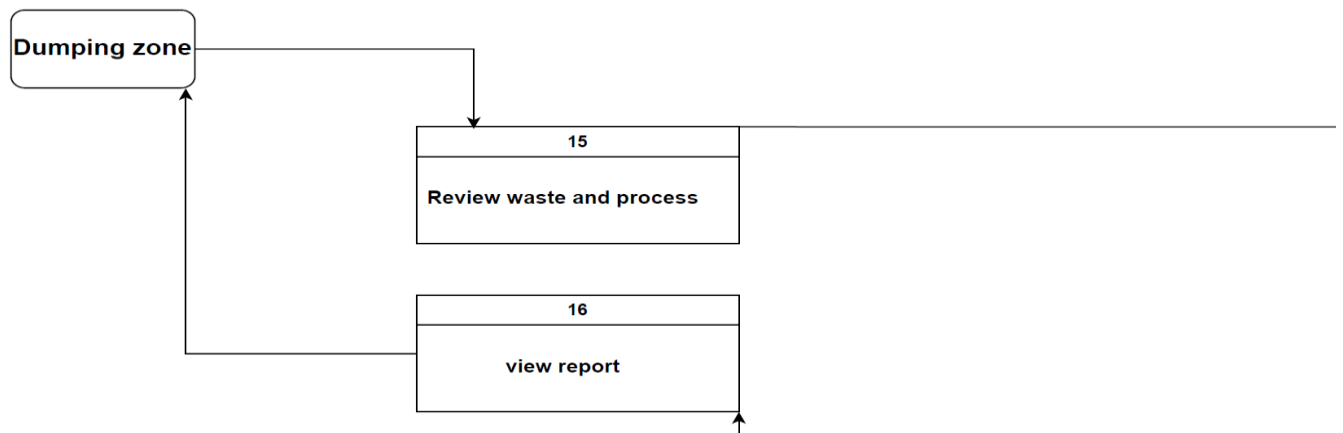
## 7.Reacher and development

- Access waste report
- Write report



## Dumping zone:

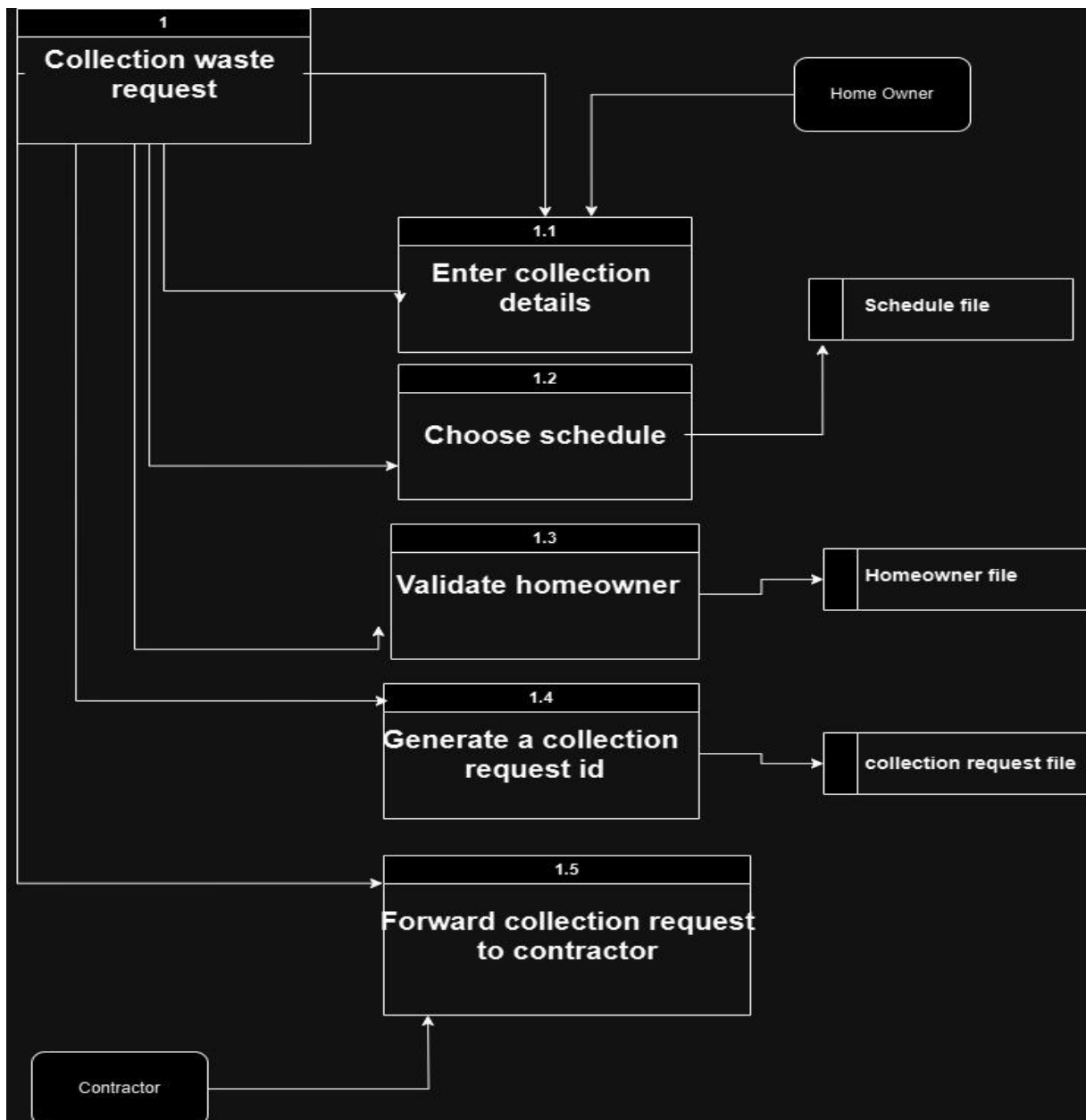
- Receive waste and process data
- View report



## DFD -01

### 1.Waste collection request

- 1.1. Enter collection details
- 1.2 choose schedule
- 1.3 Validate homeowner
- 1.4 Generate a request id
- 1.5 Forward to contractor



## 2.Make Payment

2.1. Select Payment method

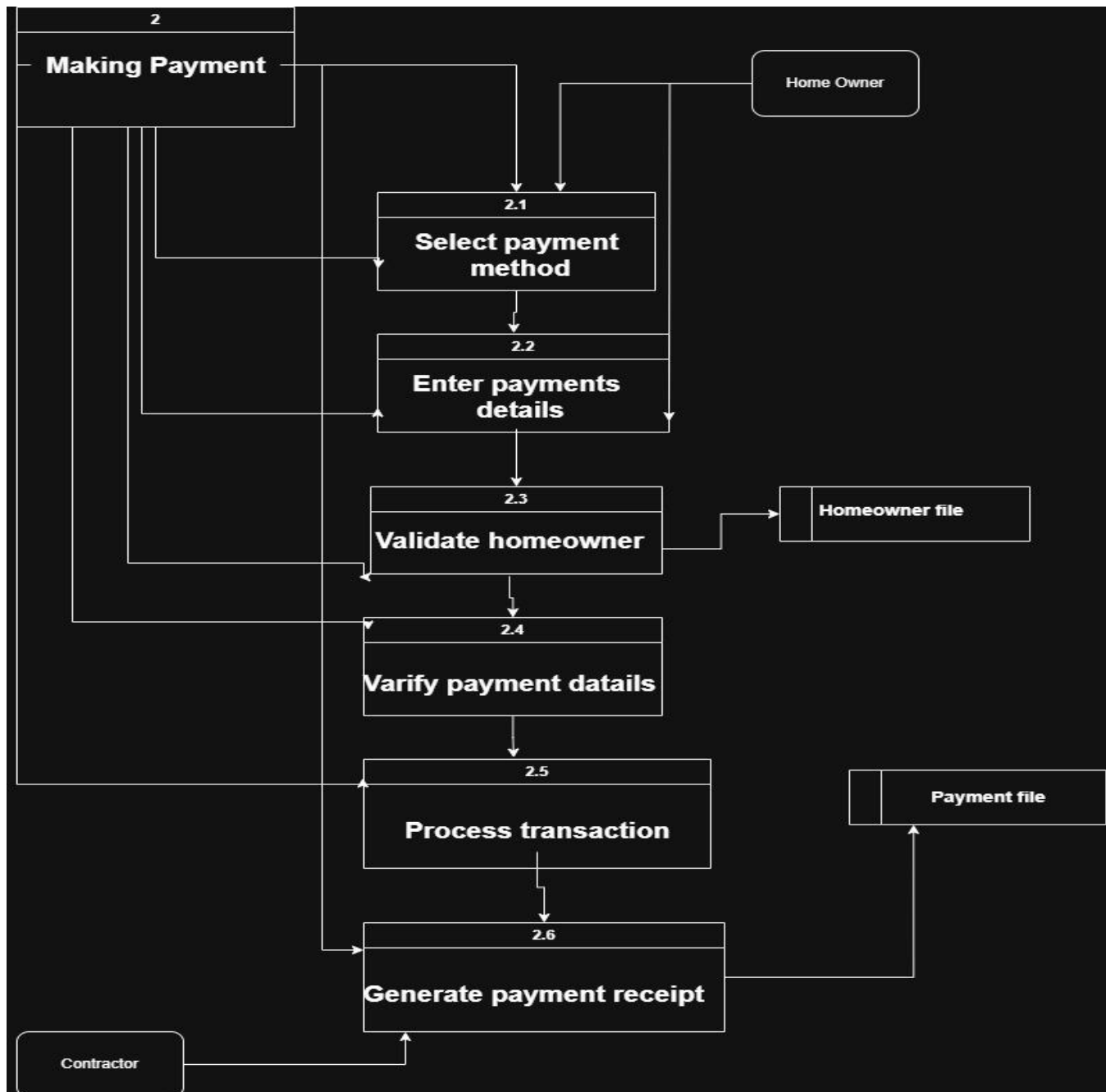
2.2 Enter payment Details

2.3 Validate Homeowner

2.4 Varify payment details

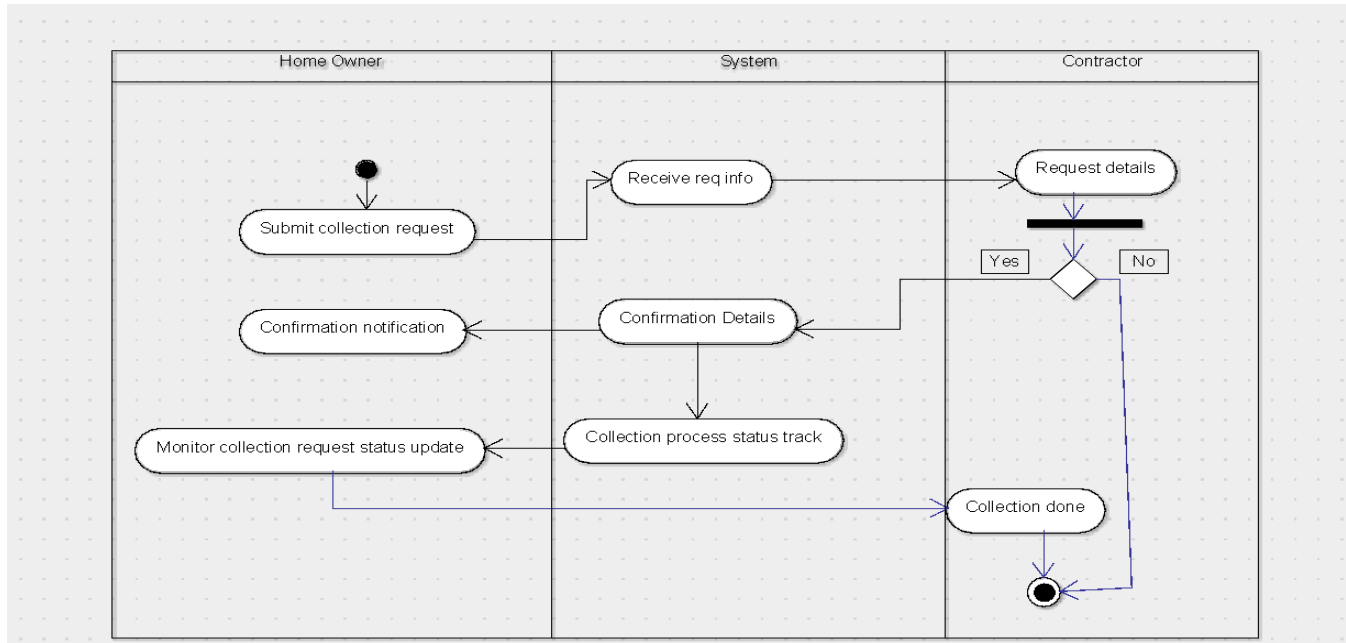
2.5 Generate report

2.6 Confirmation to homeowner

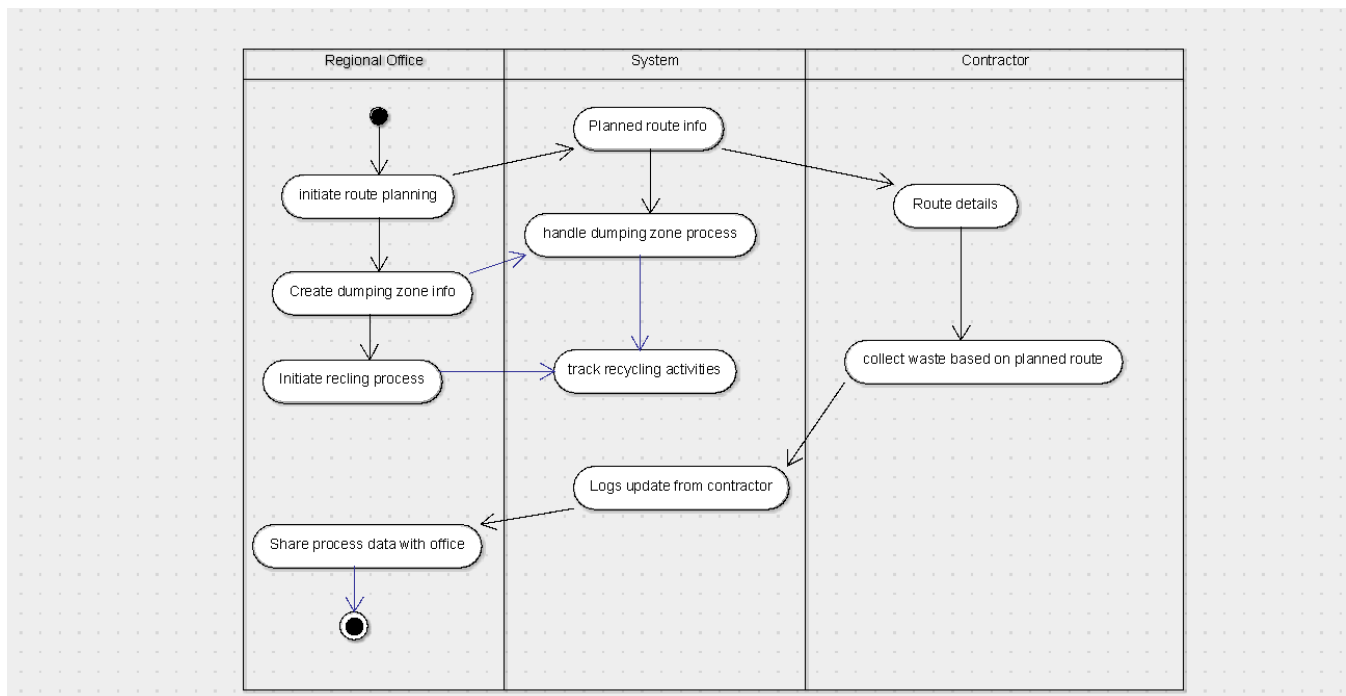


## Selected Activity Diagram

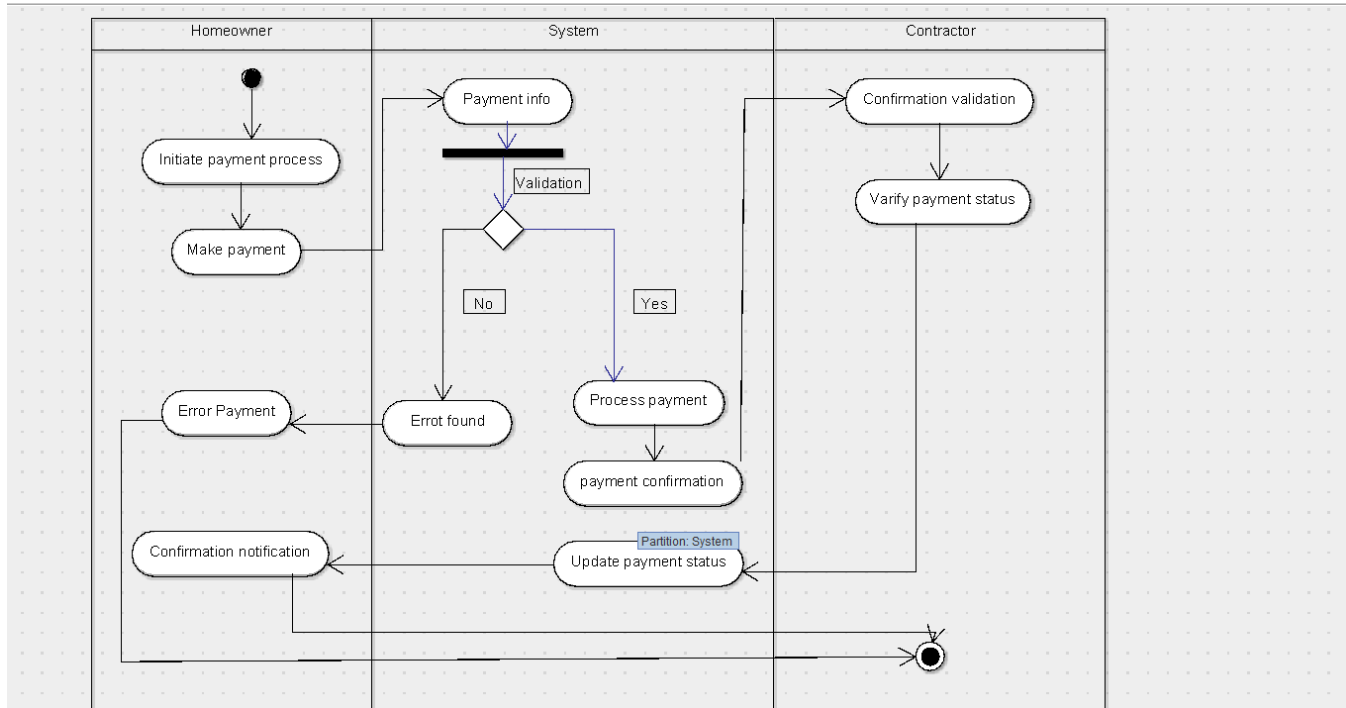
### 1.Waste collection request management



### 2.Maintaince system



### 3.Payment management



## Functional Requirements

Identifier	Requirement	PW
FR01	The system shall allow homeowners to request waste collection by providing collection details, choosing schedules, and validating their information.	5
FR02	The system shall enable homeowners to make payments by selecting payment methods, verifying details, and generating receipts.	5
FR03	The system shall allow homeowners to view reports such as waste collection and payment reports.	4
FR04	The system shall allow homeowners to communicate with the regional office via messages.	3
FR05	The system shall allow contractors to manage collection requests, either accepting or declining them.	5
FR06	The system shall enable contractors to view collection and payment reports.	4
FR07	The system shall allow contractors to track payment status, dues, and payment history.	3
FR08	The system shall allow contractors to communicate with regional offices and homeowners via messages.	3
FR09	The system shall enable regional offices to register, update, and remove contractors and homeowners.	5
FR10	The system shall allow regional offices to communicate with contractors and homeowners for maintenance purposes.	4
FR11	The system shall allow regional offices to view reports, including contractor, homeowner, area-based, and money collection reports.	4

Identifier	Requirement	PW
FR12	The system shall enable management to monitor and manage regional offices, contractors, and homeowners.	5
FR13	The system shall allow management to view reports, including contractor, homeowner, and area-based reports, as well as waste and money collection reports.	4
FR14	The system shall allow dumping zones to categorize waste into decomposable, recyclable, upcyclable, and toxic categories upon receipt.	5
FR15	The system shall enable dumping zones to view reports, including daily, monthly, and yearly summaries.	3
FR16	The system shall enable government agencies to view area-based, quarterly, monthly, and yearly reports.	4
FR17	The system shall allow research and development teams to access waste reports and generate detailed research documentation.	3

## Non-Functional Requirements

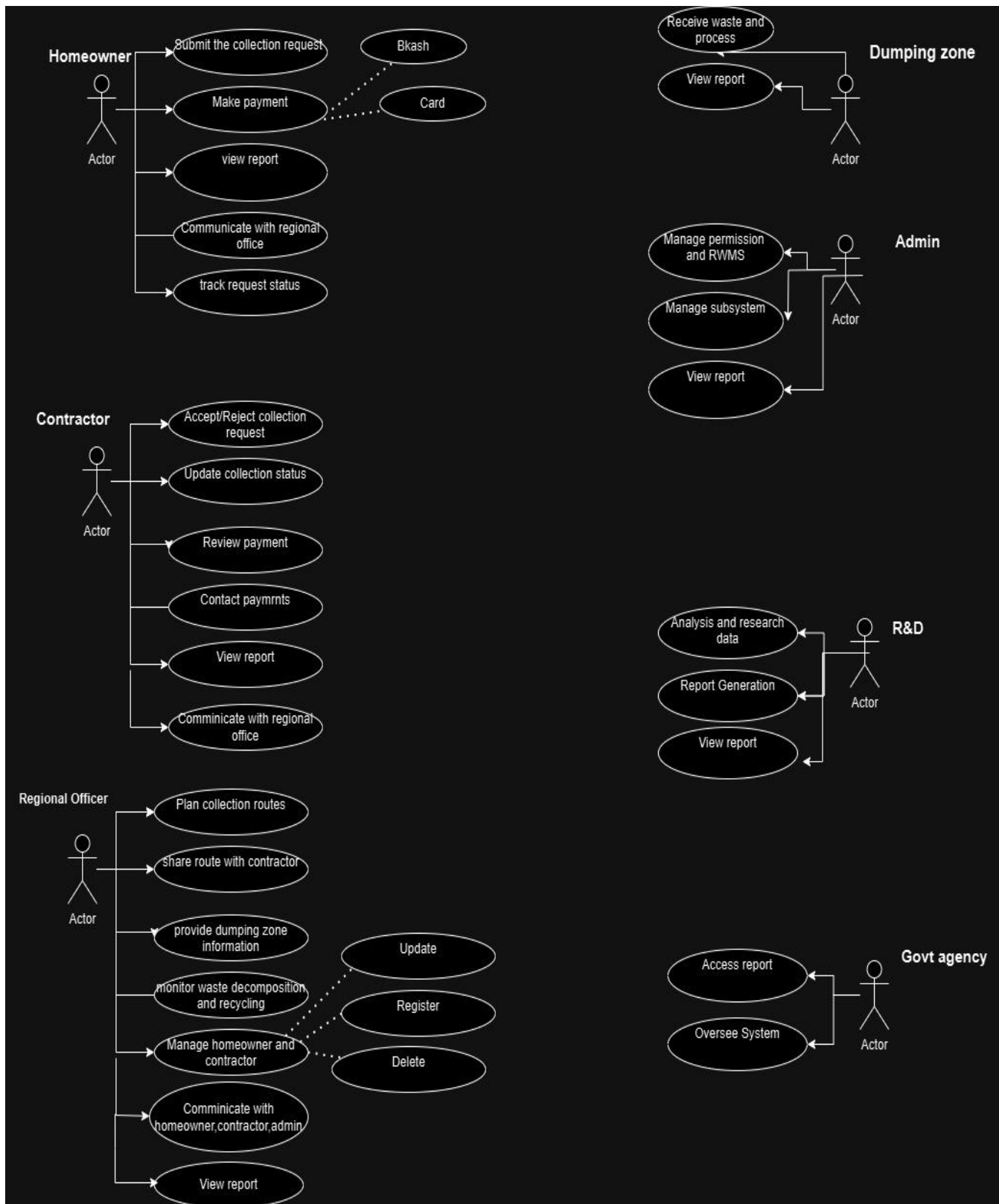
Identifier	Requirement	PW
NFR01	The system shall provide a response time of less than 3 seconds for all data retrieval operations.	5
NFR02	The system shall ensure data integrity and security by implementing role-based access control and encrypted connections.	5
NFR03	The system shall be scalable to support up to 10,000 concurrent users without performance degradation.	4
NFR04	The system shall be available 99.9% of the time annually to ensure uninterrupted operations.	5
NFR05	The system shall support multi-language functionality for all user interfaces.	3
NFR06	The system shall maintain audit logs for all transactions for at least five years.	4
NFR07	The system shall allow seamless integration with existing government and regional databases.	4

## Traceability matrix:

Requirement	Homeowners	Contractors	Regional Offices	Management	Dumping Zone	Govt Agencies	R&D Teams
FR01	✓						
FR02	✓						
FR03	✓						
FR04	✓						
FR05		✓					
FR06		✓					
FR07		✓					
FR08		✓					
FR09			✓				
FR10			✓				
FR11			✓				
FR12				✓			
FR13				✓			
FR14					✓		
FR15					✓		
FR16						✓	
FR17							✓

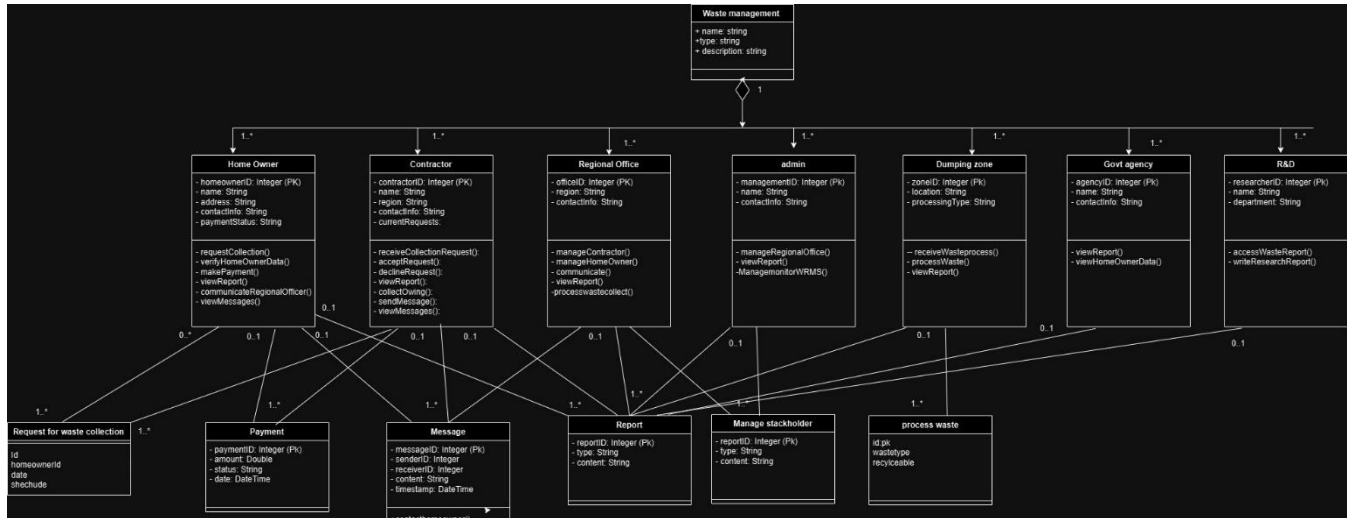


## Use case Diagram

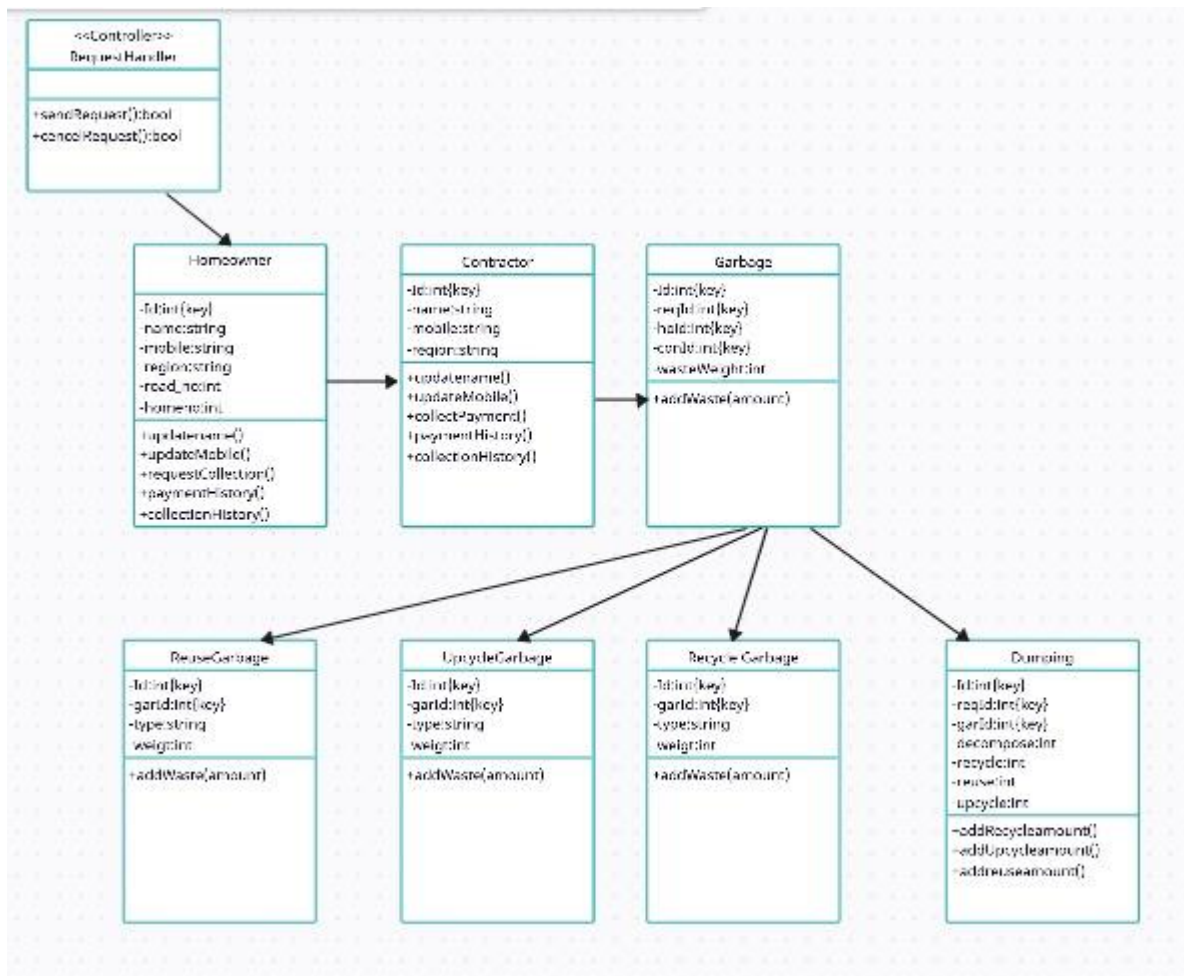


# Class Diagram

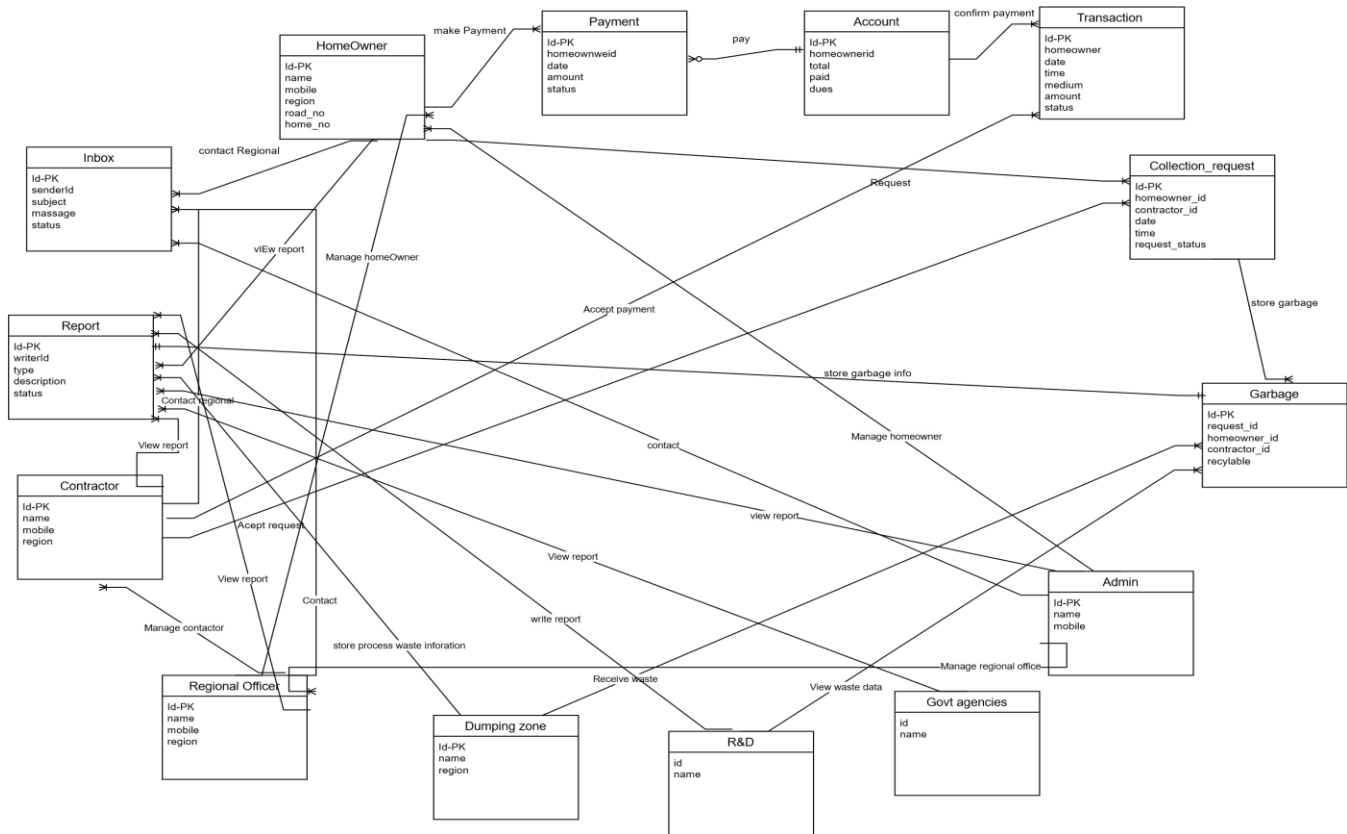
## 1.Domain class



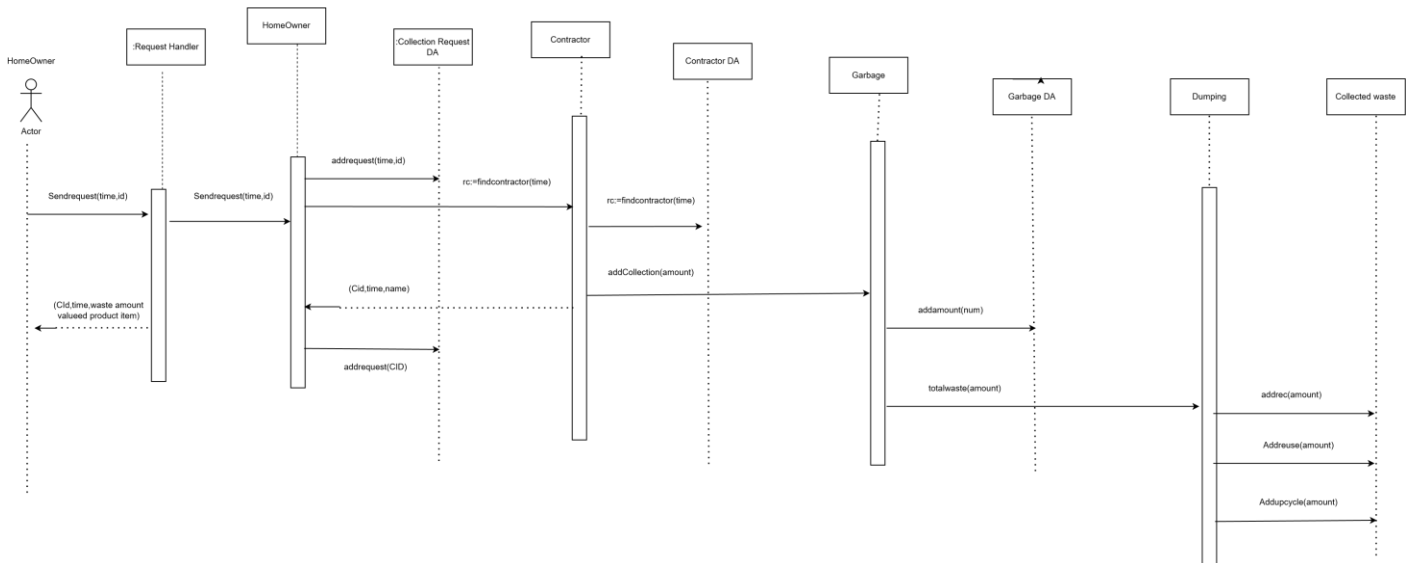
## 2.Details controller class

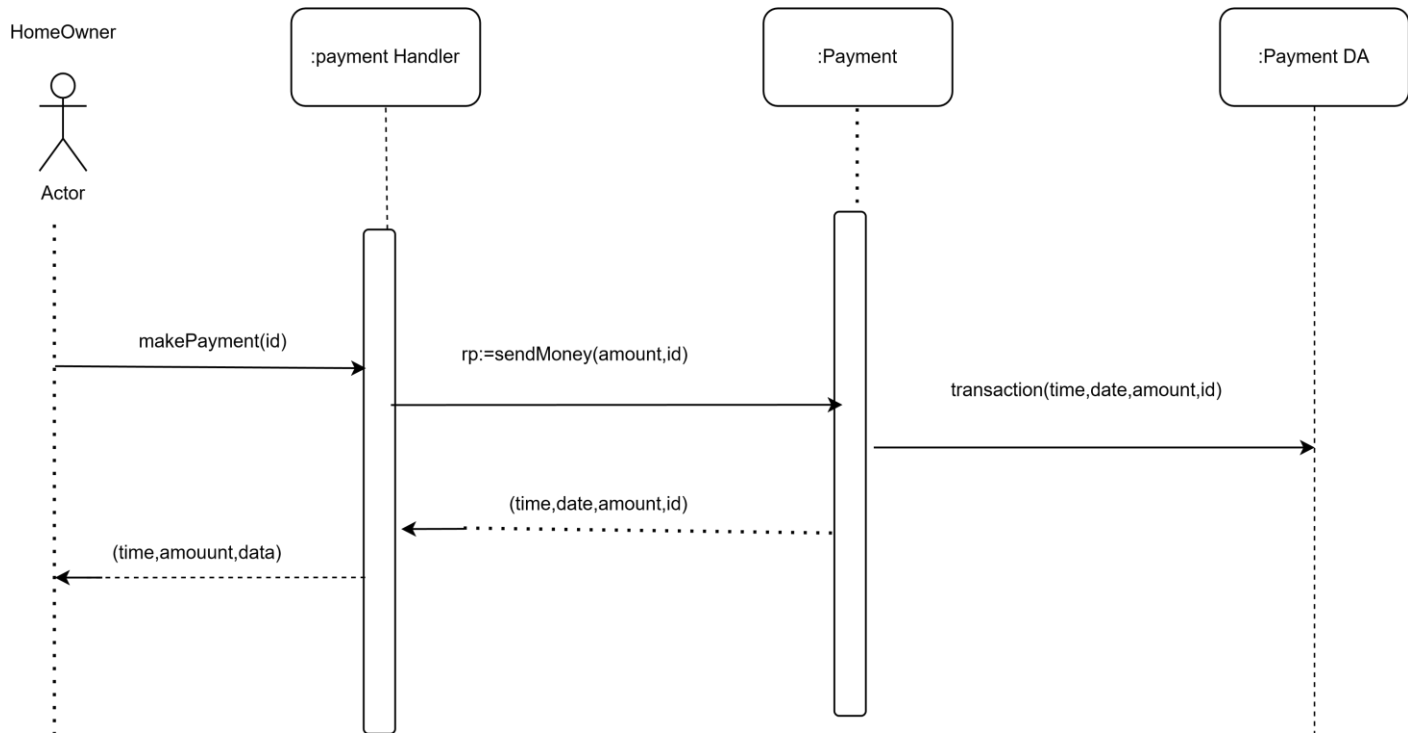


## ERD diagram



## Sequence Diagram

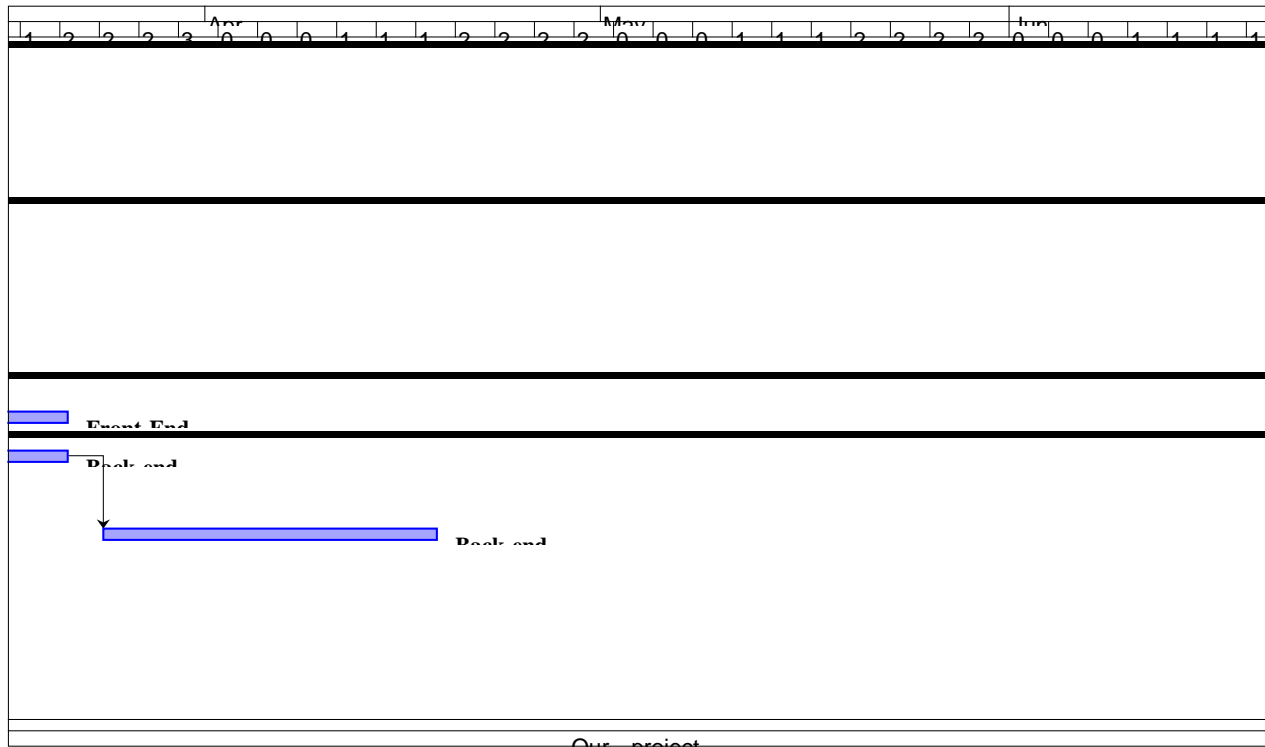
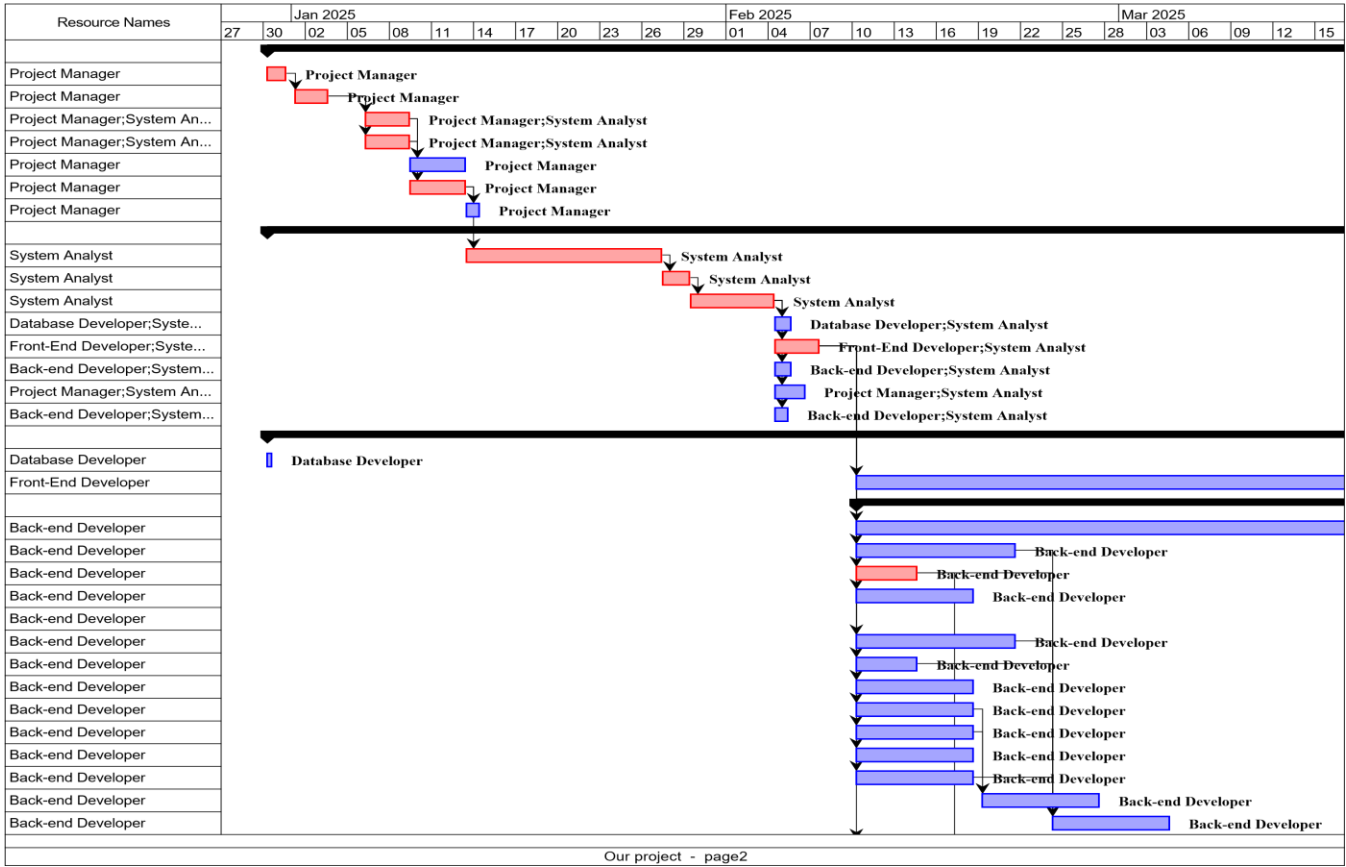


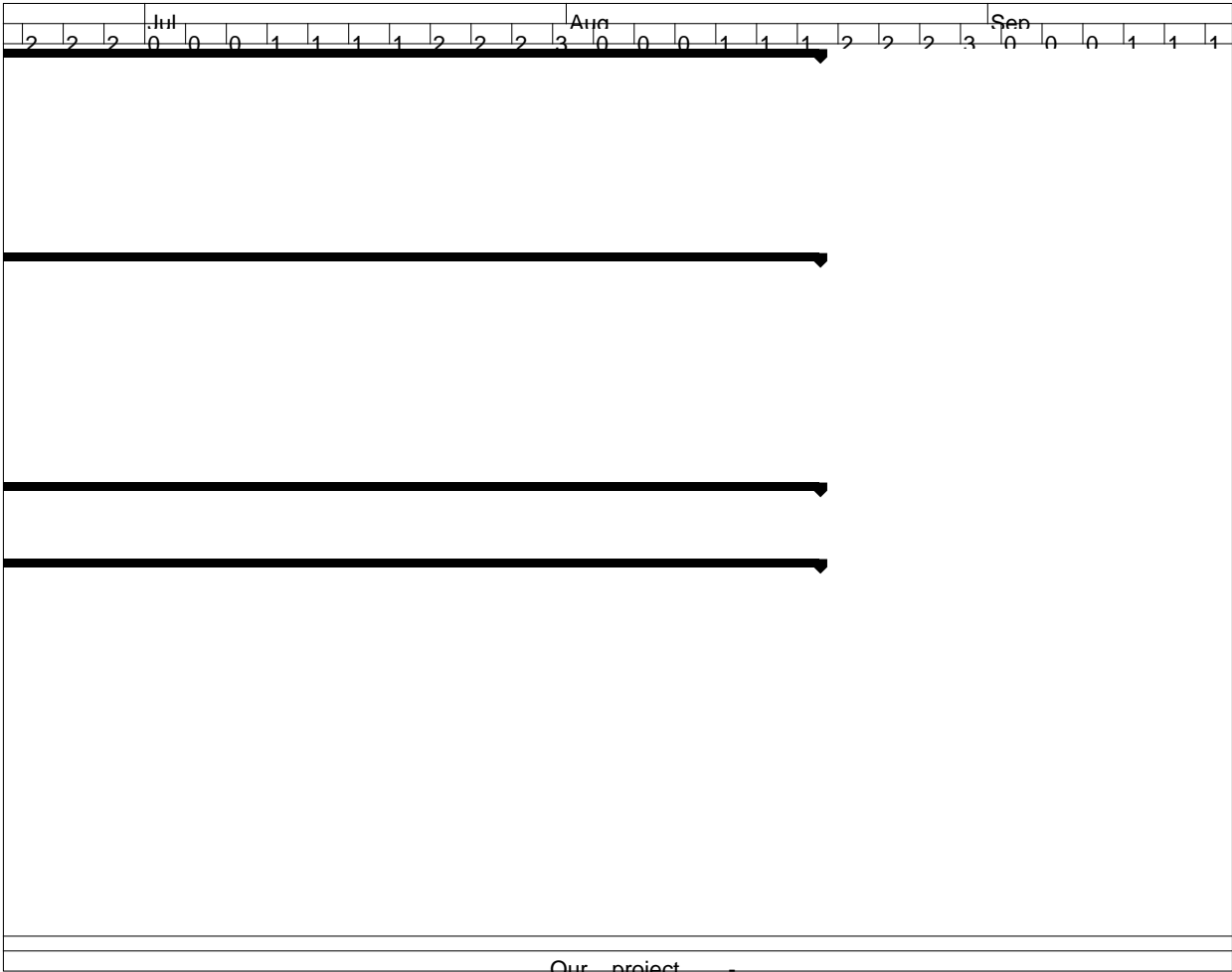


## Project plan:

		Name	Cost	Duration	Start	Finish	Predecessors
1		<b>Initialization and plann...</b>	<b>£17906.00</b>	<b>167 days?</b>	<b>30/12/24 08:00</b>	<b>19/08/25 17:00</b>	
2		Scope defination	£136.00	2 days	30/12/24 08:00	31/12/24 17:00	
3		bFeasibility study	£204.00	3 days	01/01/25 08:00	03/01/25 17:00	2
4		Stackholder meeting	£420.00	3.5 days	06/01/25 08:00	09/01/25 13:00	3
5		Requirment analysis	£420.00	3.5 days	06/01/25 08:00	09/01/25 13:00	3
6		Risk assesment	£136.00	2 days	09/01/25 13:00	13/01/25 13:00	4;5
7		Resourses planning	£136.00	2 days	09/01/25 13:00	13/01/25 13:00	4;5
8		Project approval	£68.00	1 day?	13/01/25 13:00	14/01/25 13:00	7
9		<b>System design</b>	<b>£16386.00</b>	<b>167 days</b>	<b>30/12/24 08:00</b>	<b>19/08/25 17:00</b>	
10		requirment drafting	£520.00	10 days	13/01/25 13:00	27/01/25 13:00	7
11		Moudle defining	£104.00	2 days	27/01/25 13:00	29/01/25 13:00	10
12		Architecture design	£208.00	4 days	29/01/25 13:00	04/02/25 13:00	11

13		Database modeling	£138.00	1.5 days	04/02/25 13:00	05/02/25 17:00	12
14		UI/UX prototype	£308.00	3.5 days	04/02/25 13:00	07/02/25 17:00	12
15		Security requirment	£156.00	1.5 days	04/02/25 13:00	05/02/25 17:00	12
16		Data flow	£300.00	2.5 days	04/02/25 13:00	06/02/25 17:00	12
17		Define Api endpoint	£104.00	1 day	04/02/25 13:00	05/02/25 13:00	12
18		<b>Development</b>	<b>£14548.00</b>	<b>167 days</b>	<b>30/12/24 08:00</b>	<b>19/08/25 17:00</b>	
19		Database	£40.00	1 day	30/12/24 08:00	30/12/24 17:00	
20		Front end	£1080.00	30 days	10/02/25 08:00	21/03/25 17:00	14
21		<b>Backend develop...</b>	<b>£13428.00</b>	<b>137 days</b>	<b>10/02/25 08:00</b>	<b>19/08/25 17:00</b>	
22		Request for collection	£1560.00	30 days	10/02/25 08:00	21/03/25 17:00	14
23		Make payment	£520.00	10 days	10/02/25 08:00	21/02/25 17:00	14
24		view report	£260.00	5 days	10/02/25 08:00	14/02/25 17:00	14
25		Contact region office	£364.00	7 days	10/02/25 08:00	18/02/25 17:00	14
26		Accept collection r...	£1040.00	20 days	24/03/25 08:00	18/04/25 17:00	22
27		Collect payment	£520.00	10 days	10/02/25 08:00	21/02/25 17:00	14
28		View report	£260.00	5 days	10/02/25 08:00	14/02/25 17:00	14
29		Communicate regio...	£364.00	7 days	10/02/25 08:00	18/02/25 17:00	14
30		Manage contractor	£364.00	7 days	10/02/25 08:00	18/02/25 17:00	14
31		Manage home owner	£364.00	7 days	10/02/25 08:00	18/02/25 17:00	14
32		Communicate	£364.00	7 days	10/02/25 08:00	18/02/25 17:00	14
33		View report	£364.00	7 days	10/02/25 08:00	18/02/25 17:00	14
34		Manage regional of...	£364.00	7 days	19/02/25 08:00	27/02/25 17:00	30;31
35		view report	£364.00	7 days	24/02/25 08:00	04/03/25 17:00	23;24;27;28;33
Our project - page1							





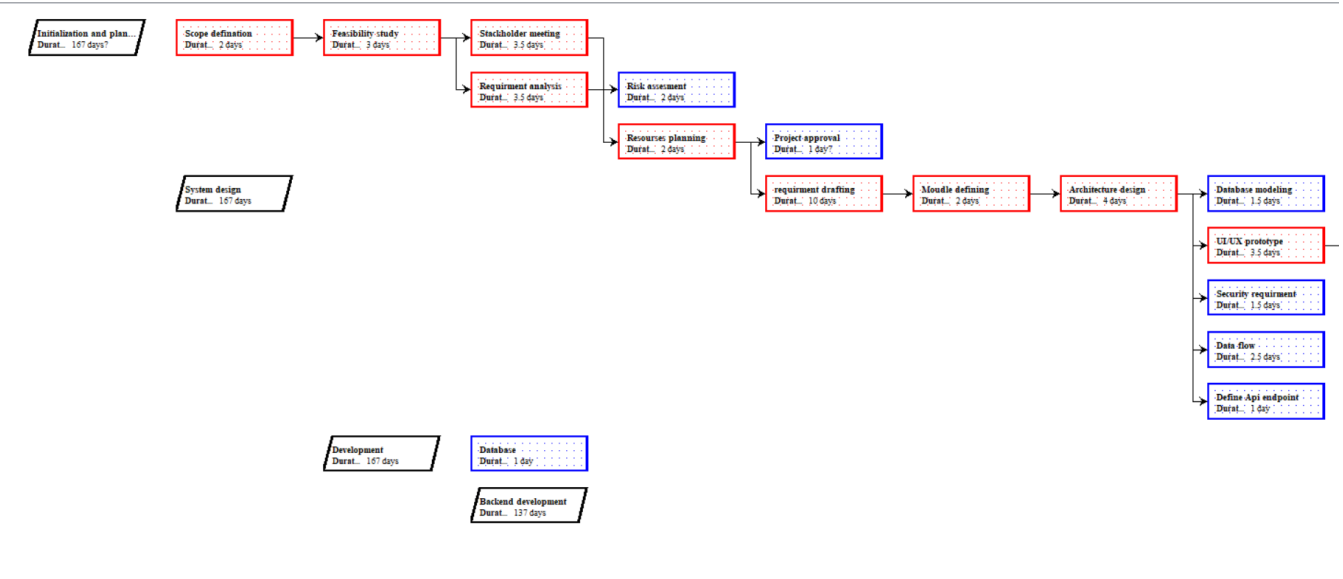
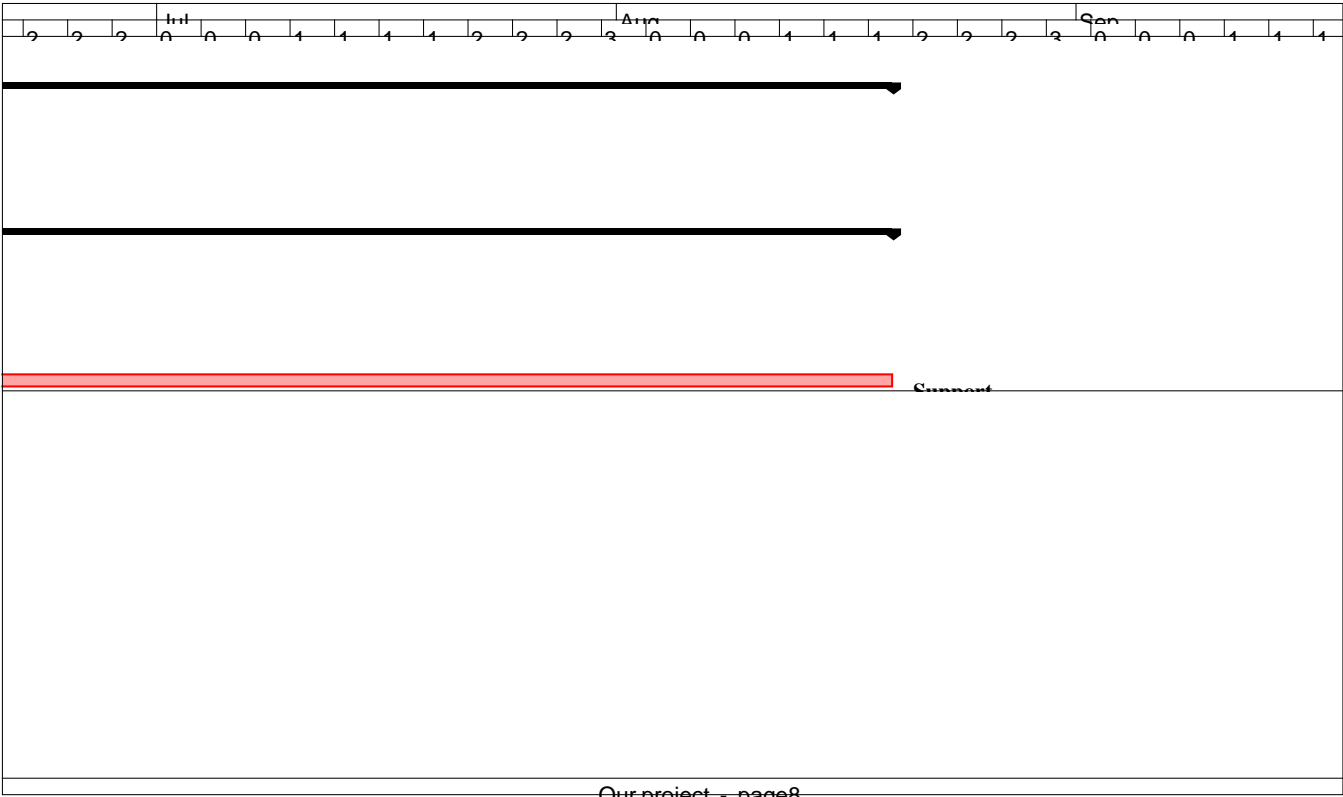
Our project

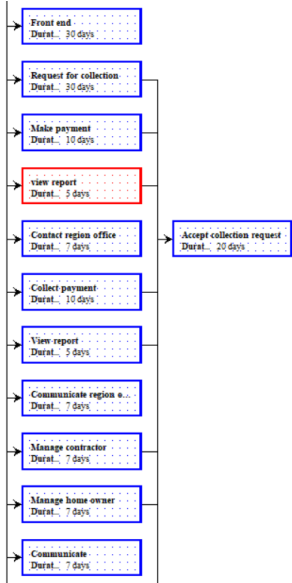
		Name	Cost	Duration	Start	Finish	Predecessors
36		Receive waste and	£780.00	15 days	10/02/25 08:00	28/02/25 17:00	14
37		Review report view	£364.00	7 days	03/03/25 08:00	11/03/25 17:00	36
38		Testing	£5212.00	132 days	17/02/25 08:00	19/08/25 17:00	
39		Functional testing	£1000.00	25 days	17/02/25 08:00	21/03/25 17:00	24
40		Integration test...	£400.00	10 days	24/03/25 08:00	04/04/25 17:00	39
41		Performance testing	£280.00	7 days	07/04/25 08:00	15/04/25 17:00	40
42		Security testing	£120.00	3 days	16/04/25 08:00	18/04/25 17:00	41
43		User acceptance ...	£120.00	3 days	21/04/25 08:00	23/04/25 17:00	42
44		Bug reporting an...	£200.00	5 days	24/04/25 08:00	30/04/25 17:00	43
45		Deployment	£3092.00	79 days	01/05/25 08:00	19/08/25 17:00	
46		Hardware setup	£440.00	5 days	01/05/25 08:00	07/05/25 17:00	44



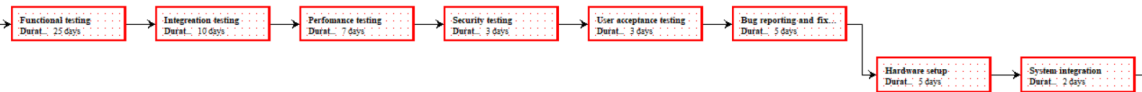
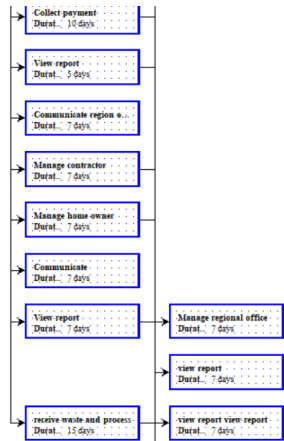


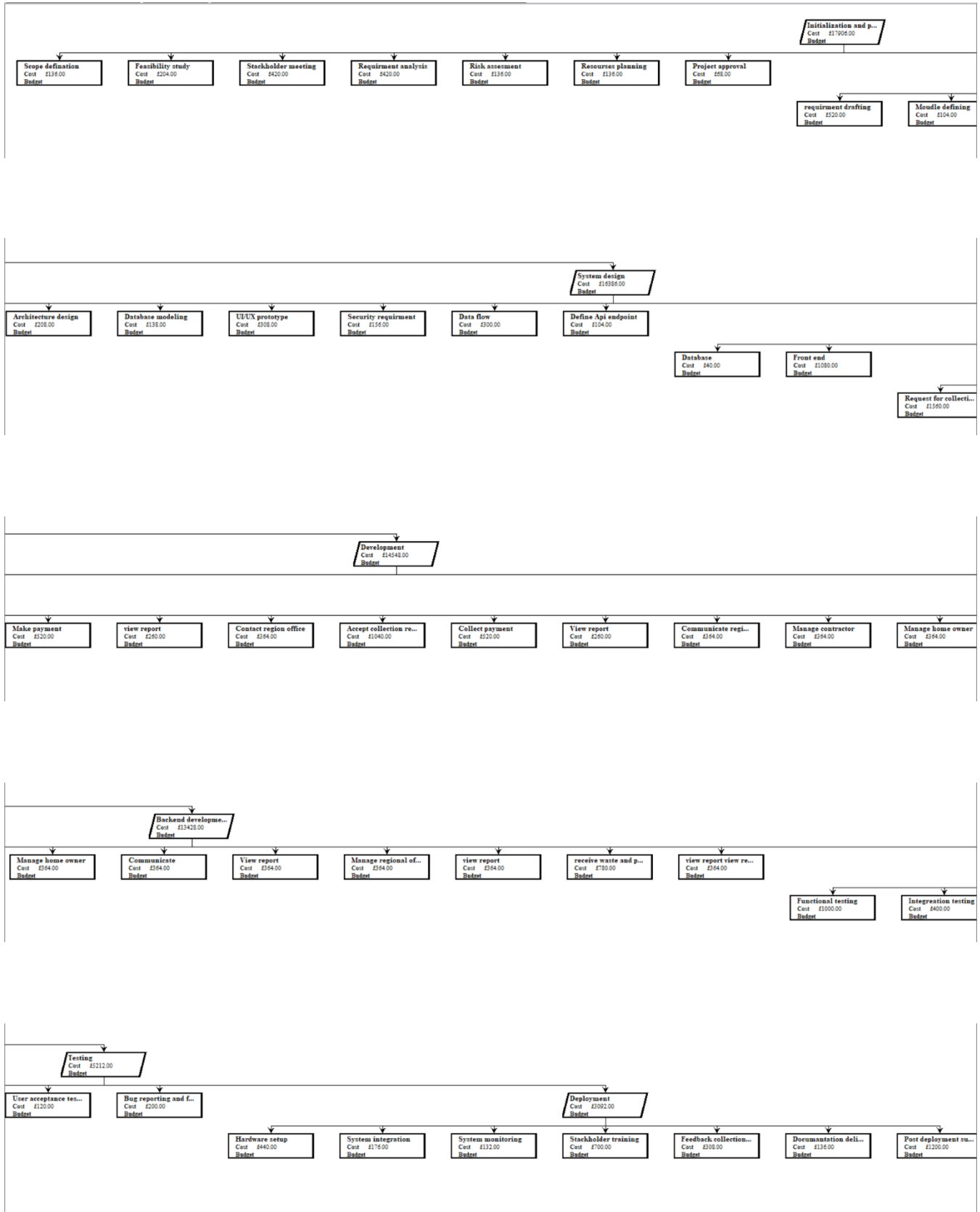






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# Cost Estimation for Waste Management and Recycling System

## 1. Hardware Costs

Item	Quantity	Unit Cost (USD)	Total Cost (USD)
Servers (Cloud or Physical)	2	\$2,000	\$4,000
Backup Storage Devices	2	\$500	\$1,000
Networking Equipment (e.g., routers, switches)	1	\$1,000	\$1,000
Workstations for Developers	4	\$800	\$3,200
Workstations for Regional Offices	5	\$800	\$4,000
Miscellaneous (Cables, UPS, etc.)	1	\$500	\$500

Total Hardware Cost: \$13,700

## 2. Software Costs

Item	License Type	Unit Cost (USD)	Total Cost (USD)
Operating Systems (Windows/Linux)	Per server	\$300	\$600
Database Management System (e.g., MySQL, Oracle)	Open-source/License	\$1,000	\$1,000
Development Tools (IDE, testing tools)	Per user	\$500	\$2,000
Cloud Services (if applicable)	Monthly	\$200	\$2,400 (1 year)
Project Management Software	Per user	\$100	\$500
Miscellaneous (e.g., APIs, Libraries)	N/A	\$1,000	\$1,000

Total Software Cost: \$7,500

## 3. Human Resource Costs

	Ⓜ	Name	RBS	Type	E-mail Address	Material Label	Initials	Group	Max. Units	Standard Rate	Overtime
1	👤	Project Manager		Work			R		100%	\$8.50/hour	
2	👤	System Analyst		Work			K		100%	\$6.50/hour	
3	👤	Front-End Developer		Work			M		100%	\$4.50/hour	
4	👤	Back-end Developer		Work			H		100%	\$6.50/hour	
5	👤	Database Developer		Work			K		100%	\$5.00/hour	
6	👤	QA Engineer		Work			Z		100%	\$5.00/hour	
7	👤	Support Engineer		Work			P		100%	\$2.50/hour	

<b>Project Manager</b>
Cost    £2618.00
Budget   £0.00

<b>System Analyst</b>
Cost    £1976.00
Budget   £0.00

<b>Front-End Developer</b>
Cost    £1206.00
Budget   £0.00

<b>Back-end Developer</b>
Cost    £8346.00
Budget   £0.00

<b>Database Developer</b>
Cost    £100.00
Budget   £0.00

<b>QA Engineer</b>
Cost    £2120.00
Budget   £0.00

<b>Support Engineer</b>
Cost    £1540.00
Budget   £0.00

4. Other Costs (Utilities, Miscellaneous)

Item	Unit Cost (USD)	Quantity	Total Cost (USD)
Electricity and Internet	\$300	6 months	\$1,800
Office Space (if applicable)	\$1,000/month	6 months	\$6,000
Training for Stakeholders	\$2,000	1	\$2,000
Miscellaneous (stationery, travel, etc.)	\$1,000	1	\$1,000

**Total Other Costs: \$10,800**