



## C40 / CCAC WASTE WEBINAR

### FREETOWN

# *DESIGNING COMMUNITY- BASED SOLID WASTE SYSTEMS FOR SUB-URBAN AREAS*

APRIL 2021

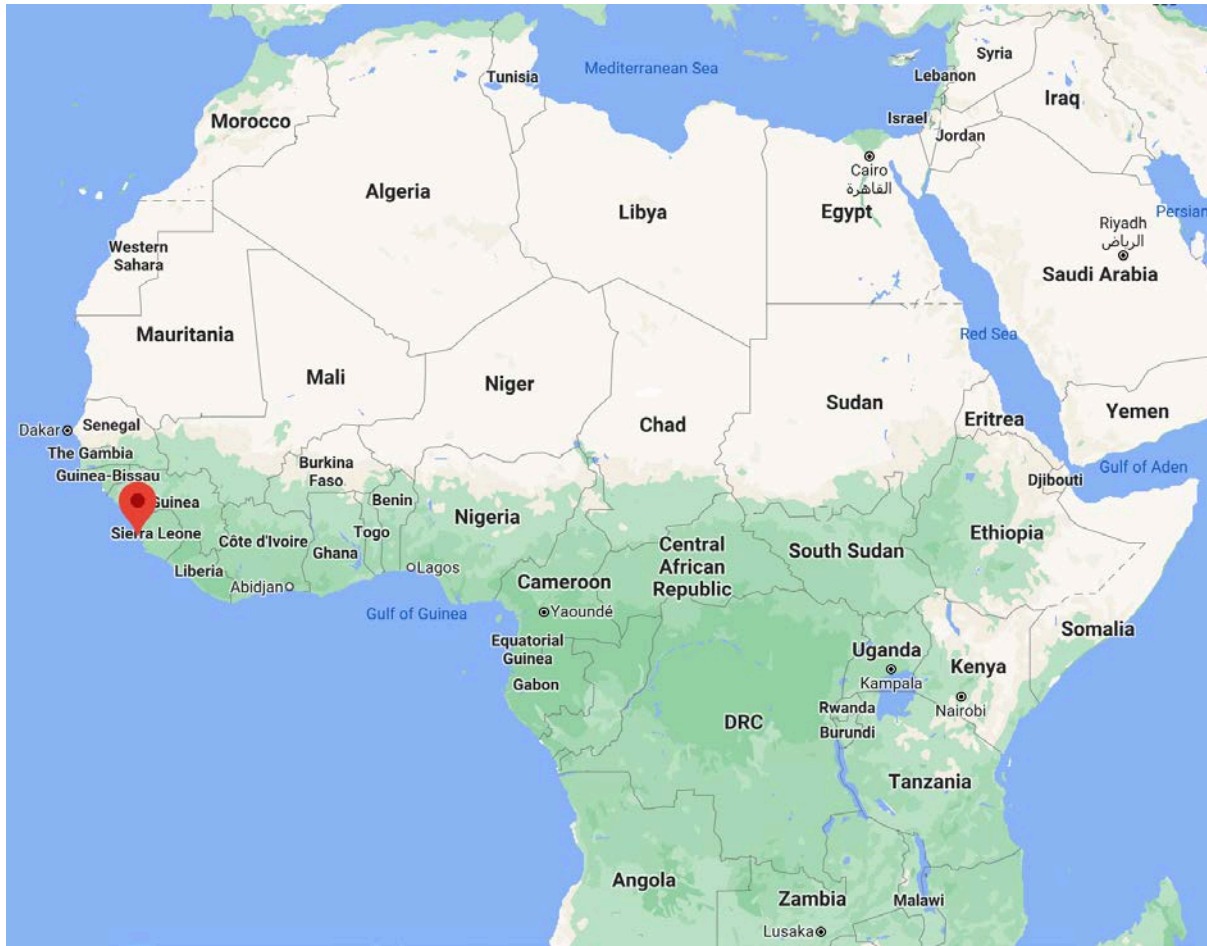


# 01.

## INTRODUCTION AND INITIAL ANALYSIS



# Freetown is the capital of Sierra Leone, in Western Africa

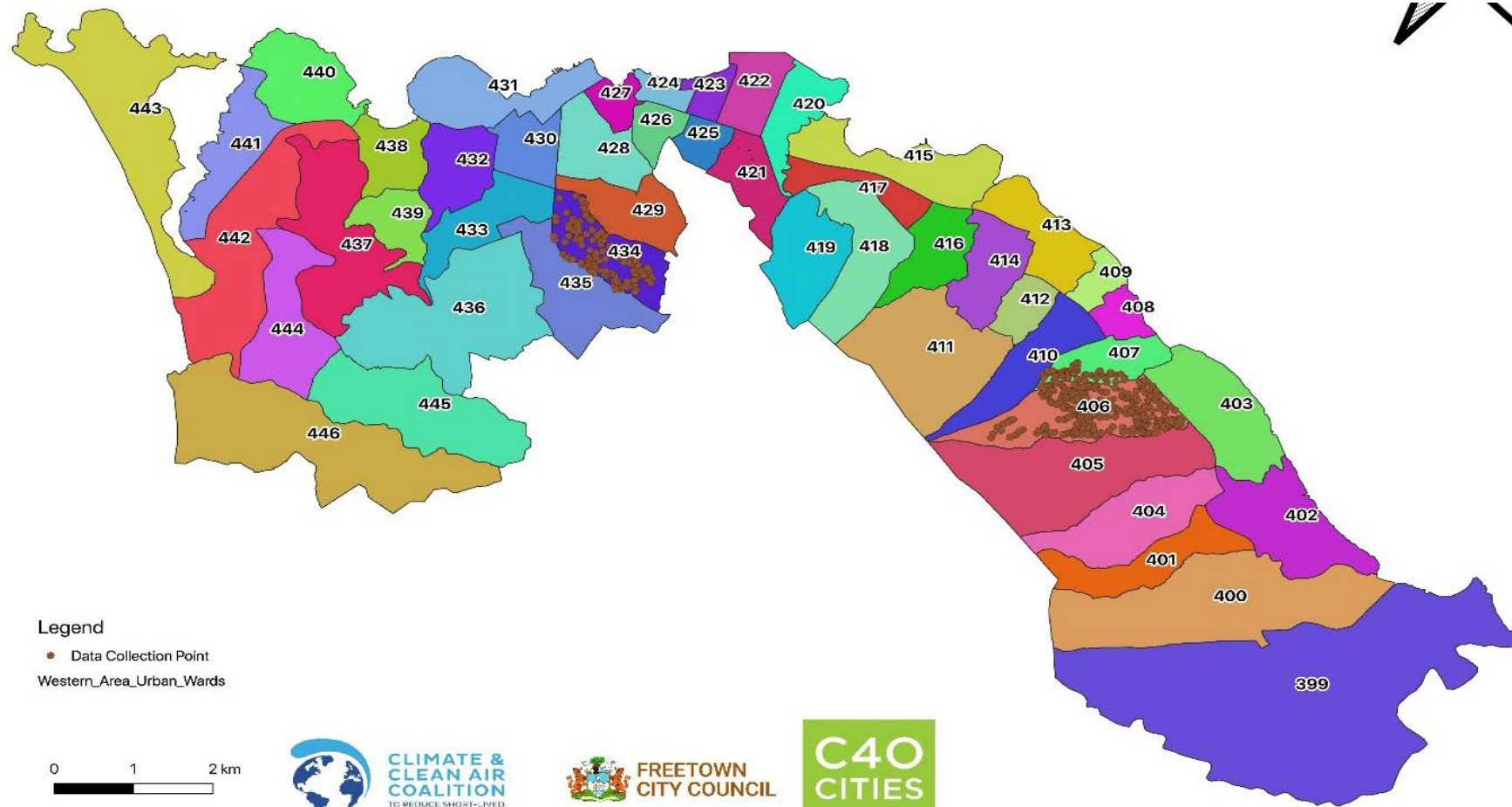


At a glance

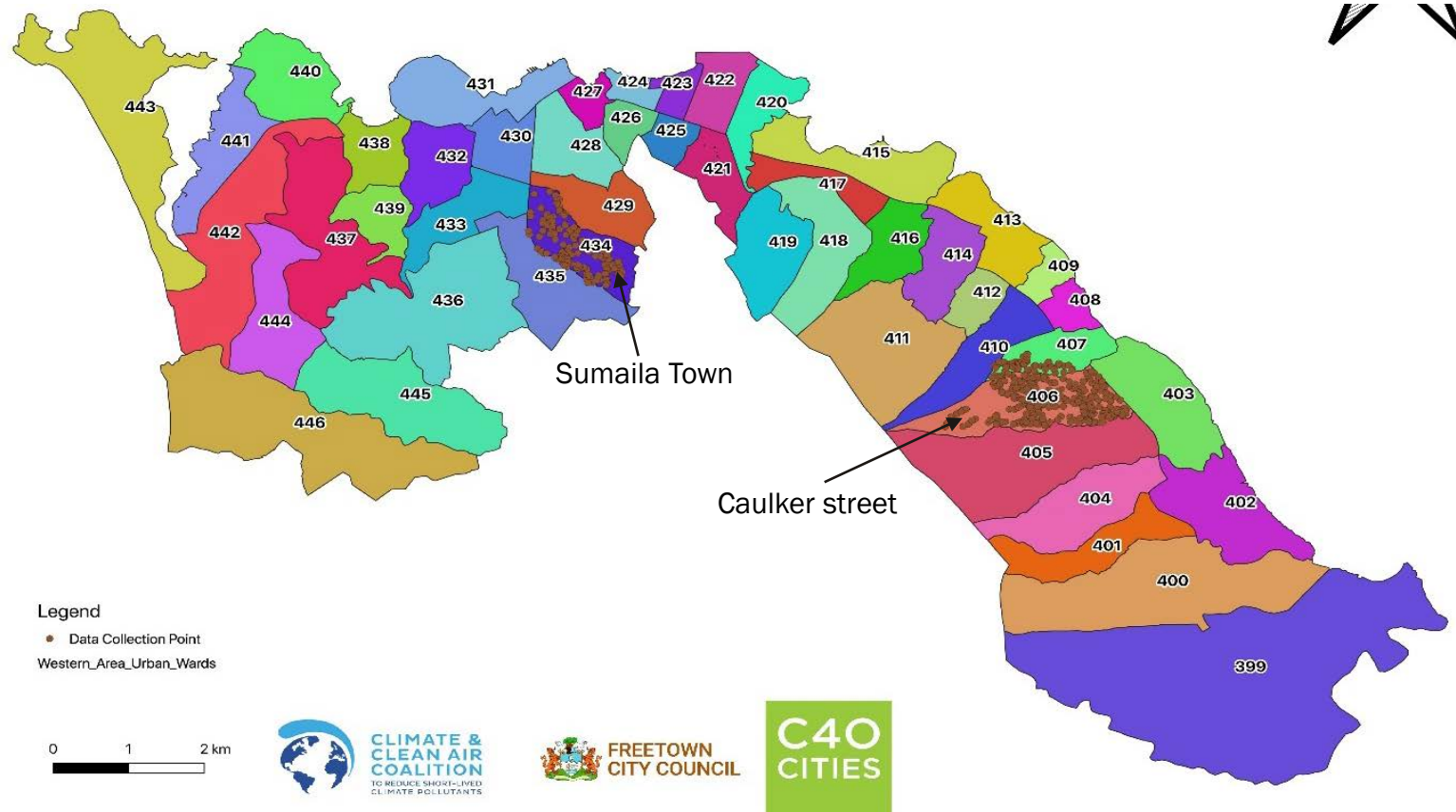
- Population:
- Area:
- Climate:
- Waste generation (est):



# Like many other cities in Africa, waste management in some parts of the city represents a challenge, especially in Hard to Reach Areas (HTRAs)



# Following site visits to 6 HTRAs, two wards were selected for developing the initial pilot



## Selection criteria

- Accessibility (roads)
- Analysis of current waste management services
- Drainage system / flooding (upper catchment)
- Level of community engagement / willingness in the project
- Land availability for sorting / composting

# Numerous surveys and interviews were carried out at the two wards and with external stakeholders, to gain key input and insight for the new waste management system

Survey / interview participants	Number of surveys / interviews
Households (Sumaila Town)	142
Households (Caulker Street)	371
Focus Group Discussions	10 (Sumaila + Caulker)
Key Informant Interviews	6



## Key findings

- Strong preference for door-to-door system, 2-3 times per week, ideally in the mornings
- Majority of households willing to pay about \$3 per month for a reliable system
- Good interest in community / household composting opportunities (due to local subsistence farming and need for reforestation)
- Good interest in recycling as revenue source, training on source segregation will be needed both for waste workers and citizens

# 02.

## NEW SYSTEM OPERATIONS AND FINANCIALS





# High level operating model to collect and recover waste in HRTAs



- (SOURCE SEPARATED) WASTE WILL BE COLLECTED TWICE A WEEK BY WASTE COLLECTORS, HIRED ON AN ANNUAL BASIS
- HOUSEHOLDS AND LARGE GENERATORS WILL PAY A MONTHLY FEE FOR COLLECTION AND FOR BINS



- (SOURCE SEPARATED) WASTE IS TAKEN TO THE MATERIAL RECOVERY FACILITY (MRF)
- MRF STAFF FURTHER SEPARATE, COMPACT AND BALE / COMPOST
- 400 SQUARE METER IN TOTAL (20MX20M)



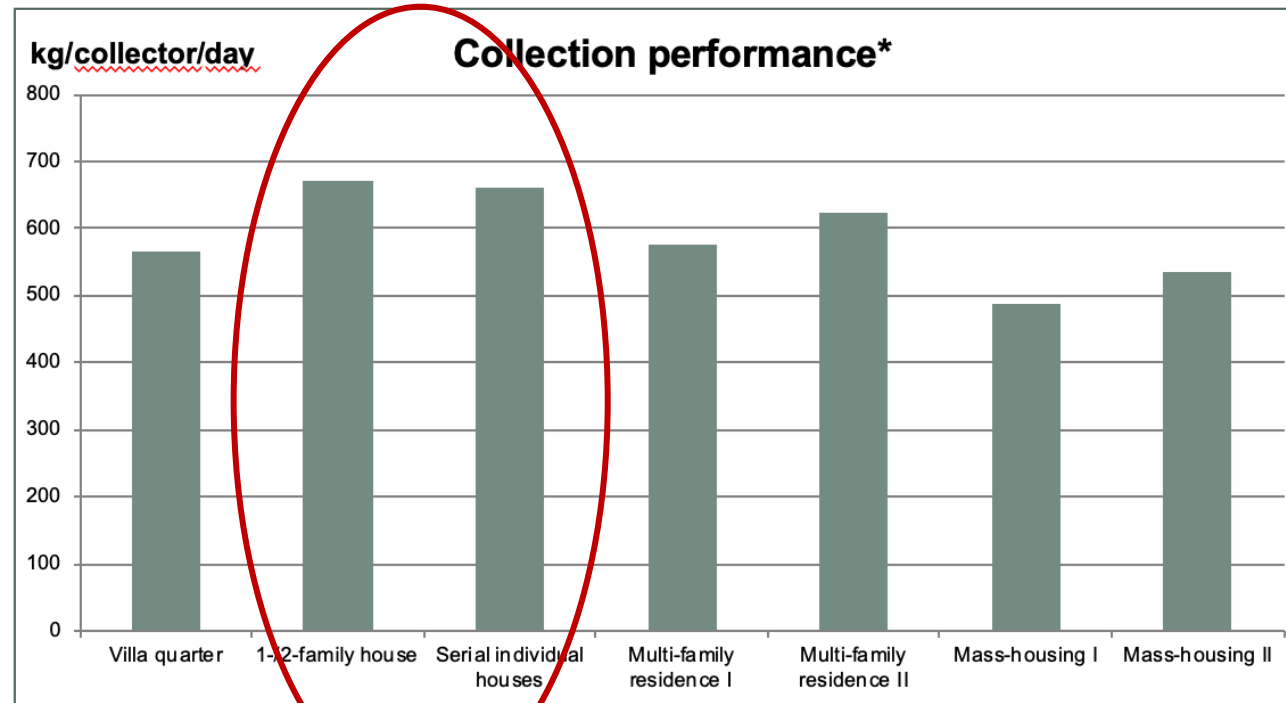
- RESIDUAL WASTE (EST. 30%) IS TAKEN FROM THE MRF TO THE LANDFILL
- AN 8 TON TRUCK WILL BE CONTRACTED TO HAUL WASTE TWICE PER WEEK





# Within the two communities, each waste collector should collect between 600-700 kg of waste per day (with hand pulled cart)

»» Labour-intensive separate collection system  
Collection performance in relation to settlement structure



\*Daily Collection GDP 4,000 EUR / person / year

# 03.

## OPERATING MODEL AND FINANCIALS



# CAPEX is estimated at approx. 850 million sll (under \$100k), with some costs recurring periodically, making coverage efficiency and profit retention fundamental aspects

Item	Cost
Cost of 4 wheel cart	1,980,000
No of carts	20
tot cost of carts	39,600,000
Cost of motorised tricycle	30,000,000
no of tricycles	2
tot cost of tricycles	60,000,000
PPE (uniform, gloves, shoes)	880,000
No of PPE (collectors + MRF staff)	25
Total cost of PPE	22,000,000
20 litre household bin (3500 units)	123,200,000
composting equipment	39,600,000
manual waste compactor (small)	30,800,000
manual plastic + metal shredder (small)	35,200,000
MRF utilities setup	26,400,000
MRF construction	66,000,000
Land purchase	400,000,000
Document preparation (charter, etc.)	10,000,000
<b>TOTAL CAPEX</b>	<b>852,800,000</b>

← Likely recurring every 3 yrs

← Likely recurring annually

← Likely recurring every 2-3 yrs



**Once 100% coverage is reached, the system is expected to generate a profit, which can be reinvested in equipment replacement and upgrade.**

Item	Capital (one off)	Monthly
Total CAPEX	852,800,000	
Total OPEX (monthly)		47,672,000
Total revenue (monthly)		102,770,000
Total profit (monthly)		55,098,000

WITH 2 MOTORISED TRICYCLES

Item	Capital (one off)	Monthly
Total CAPEX	792,800,000	
Total OPEX (monthly)		35,672,000
Total revenue (monthly)		102,770,000
Total profit (monthly)		67,098,000

WITHOUT MOTORISED TRICYCLES

**However, it will take time to achieve 100% coverage, therefore additional operating funds will be required until approx. 40% coverage is reached (estimated breakeven)**

Item	Capital (one off)	Monthly
Total CAPEX	822,800,000	
Total OPEX (monthly)		21,252,000
Total revenue (monthly)		42,700,800
Total profit (monthly)		<b>21,448,800</b>

WITH 1 MOTORISED TRICYCLE

Item	Capital (one off)	Monthly
Total CAPEX	792,800,000	
Total OPEX (monthly)		15,252,000
Total revenue (monthly)		42,700,800
Total profit (monthly)		<b>27,448,800</b>

WITHOUT MOTORISED TRICYCLE

# All scenarios assume a 70% waste recovery rate and the sale of recyclables at international market prices. Compost will not be sold, at least in the initial phase

Assumption group	Assumption	Value	Unit
Users	Population serviced	14057	number of people
Users	Average household size	5	
Users	total number of residential users	2811	
Users	total number of large generators	25	
waste gen.	waste generation per capita	0.6	kilogram
waste gen.	total waste generation (daily)	8434.2	kilogram
waste gen.	percentage residual waste	30%	
waste gen.	residual waste (daily)	2530.26	kilogram
Waste (recovered daily, tons)	Organic	2	tons
Waste (recovered daily)	Plastic	0.2	tons
Waste (recovered daily)	Metal	0.1	tons
Waste (recovered daily)	Paper	0.2	tons
context	Population density	medium	
context	Housing type	single houses and multi-family	
context	terrain	hilly, dirt roads	
context	Distance from border to MRF	2 km average	
Waste sale (ton)	PET bale	1,056,000	sll estimated sale price
Waste sale (ton)	HDPE bale	1,320,000	sll estimated sale price
Waste sale (ton)	PVC bale	2,816,000	sll estimated sale price
Waste sale (ton)	Average plastic bale	1,730,667	sll estimated sale price
Waste sale (ton)	aluminium bale	616,000	sll estimated sale price
Waste sale (ton)	mixed paper bale	616,000	sll estimated sale price
Waste sale (ton)	high grade compost (non vermi)		NA sll estimated sale price

Assumption group	Assumption	Value	Unit
Users	Population serviced	5622.8	number of people
Users	Average household size	5	
Users	total number of residential users	1125	
Users	total number of large generators	25	
waste gen.	waste generation per capita	0.6	kilogram
waste gen.	total waste generation (daily)	3373.68	kilogram
waste gen.	percentage residual waste	30%	
waste gen.	residual waste (daily)	1012.104	kilogram
Waste (recovered daily, tons)	Organic	0.8	tons
Waste (recovered daily)	Plastic	0.1	tons
Waste (recovered daily)	Metal	0.05	tons
Waste (recovered daily)	Paper	0.1	tons
context	Population density	medium	
context	Housing type	single houses and multi-family	
context	terrain	hilly, dirt roads	
context	Distance from border to MRF	2 km average	
Waste sale (ton)	PET bale	1,056,000	sll estimated sale price
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Waste sale (ton)	high grade compost (non vermi)		NA sll estimated sale price



# It is currently assumed households will be charged 30,000 sll and large generators 100,000 sll per month. The revenue from recyclable waste should represent 15 - 20% of overall revenue

Revenue item	Value
No residential users	2,811
No of large gen.	25
Monthly user fee (hh)	30,000
Monthly user fee (lg)	100,000
monthly rev (hh)	84,342,000
monthly rev (lg)	2,500,000
<b>tot monthly rev (fees)</b>	<b>86,842,000</b>
Plastic	10,384,000
Metal	1,848,000
paper	3,696,000
compost	
tot monthly rev (by-product sale)	15,928,000
<b>TOTAL REV</b>	<b>102,770,000</b>

REVENUES AT 100% COVERAGE

Revenue item	Value
No residential users	1,125
No of large gen.	10
Monthly user fee (hh)	30,000
Monthly user fee (lg)	100,000
monthly rev (hh)	33,736,800
monthly rev (lg)	1,000,000
tot monthly rev (fees)	34,736,800
Plastic	5,192,000
Metal	924,000
paper	1,848,000
compost	
tot monthly rev (by-product sale)	7,964,000
<b>TOTAL REV</b>	<b>42,700,800</b>

REVENUES AT 40% COVERAGE

# Operating expenses (mainly staff costs) and residual waste hauling will increase proportionally to service coverage

Item	Weekly	Monthly
Residual waste hauling	5,280,000	21,120,000
MRF utility bills	88,000	352,000
Motorised tricycle cost	1,500,000	6,000,000
Number tricycles	2	
Tricycle monthly cost		12,000,000
MRF staff salary	125,000	500,000
Number MRF staff	5	
MRF staff cost	625,000	2,500,000
waste collector salary	125,000	500,000
Number waste collectors	15	
waste collector staff cost	1,875,000	7,500,000
Admin staff salary	175,000	700,000
number admin staff	6	
admin staff cost	1,050,000	4,200,000
<b>total OPEX</b>	<b>10,418,000</b>	<b>47,672,000</b>

OPEX AT 100% COVERAGE

Item	Weekly	Monthly
Residual waste hauling	2,200,000	8,800,000
MRF utility bills	88,000	352,000
Motorised tricycle cost	1,500,000	6,000,000
Number tricycles	1	
Tricycle monthly cost		6,000,000
MRF staff salary	125,000	500,000
Number MRF staff	2	
MRF staff cost	250,000	1,000,000
waste collector salary	125,000	500,000
Number waste collectors	6	
waste collector staff cost	750,000	3,000,000
Admin staff salary	175,000	700,000
number admin staff	3	
admin staff cost	525,000	2,100,000
<b>total OPEX</b>	<b>5,313,000</b>	<b>21,252,000</b>

OPEX AT 40% COVERAGE

# 04.

## GOVERNANCE





# The governance model for community-based waste systems will vary depending on local context

**COMMUNITY BASED ORGANISATION (CBO)  
REGISTERED WITH THE CORPORATE AFFAIRS  
COMMISSION AS COMPANY LIMITED BY  
GUARANTEE UNDER THE 2009 COMPANY ACT  
OF SIERRA LEONE, WHICH DOES NOT INCLUDE  
DIVIDENDS TO BE SHARED AMONG  
SHAREHOLDERS AS IN THE CASE OF A PUBLIC  
OR PRIVATE LIMITED COMPANY.**



**PRIVATE COMPANY**

**REGISTERED WITH FCC AS A PRIVATE WASTE  
COLLECTOR**

**PROFIT AND DIVIDEND SHARING**

**FOR EACH QUARTERLY BOARD  
WOULD BE INCORPORATED INTO THE FUNCTIO  
ING OF THE PROGRAMME AS AN INCENTIVE  
MECHANISM**



**FOR EACH QUARTERLY BOARD MEETING  
WOULD BE INCORPORATED INTO THE FUNCTIO  
ING OF THE PROGRAMME AS AN INCENTIVE  
MECHANISM**

# Regardless of the governance system, additional support will be required, for an estimated 12 months

- Estimated one-year technical support needed for the smooth operation and sustainability of the new system, e.g. engagement with local community, training on composting and waste segregation, basic training on how to manage company finances
- Development of systems and necessary standards, operating procedures and manuals, stakeholder and risk mapping, safety and security, waste collection routes, etc.
- Will also provide necessary organisational and project management trainings for the staff of the two entities (Caulker Street and Sumaila Town)