First Annual Meeting of the African Clean Cities Platform (ACCP)

Report on Trial Activities of Data Collection For SDGs Indicator 11.6.1 in Abuja, Nigeria

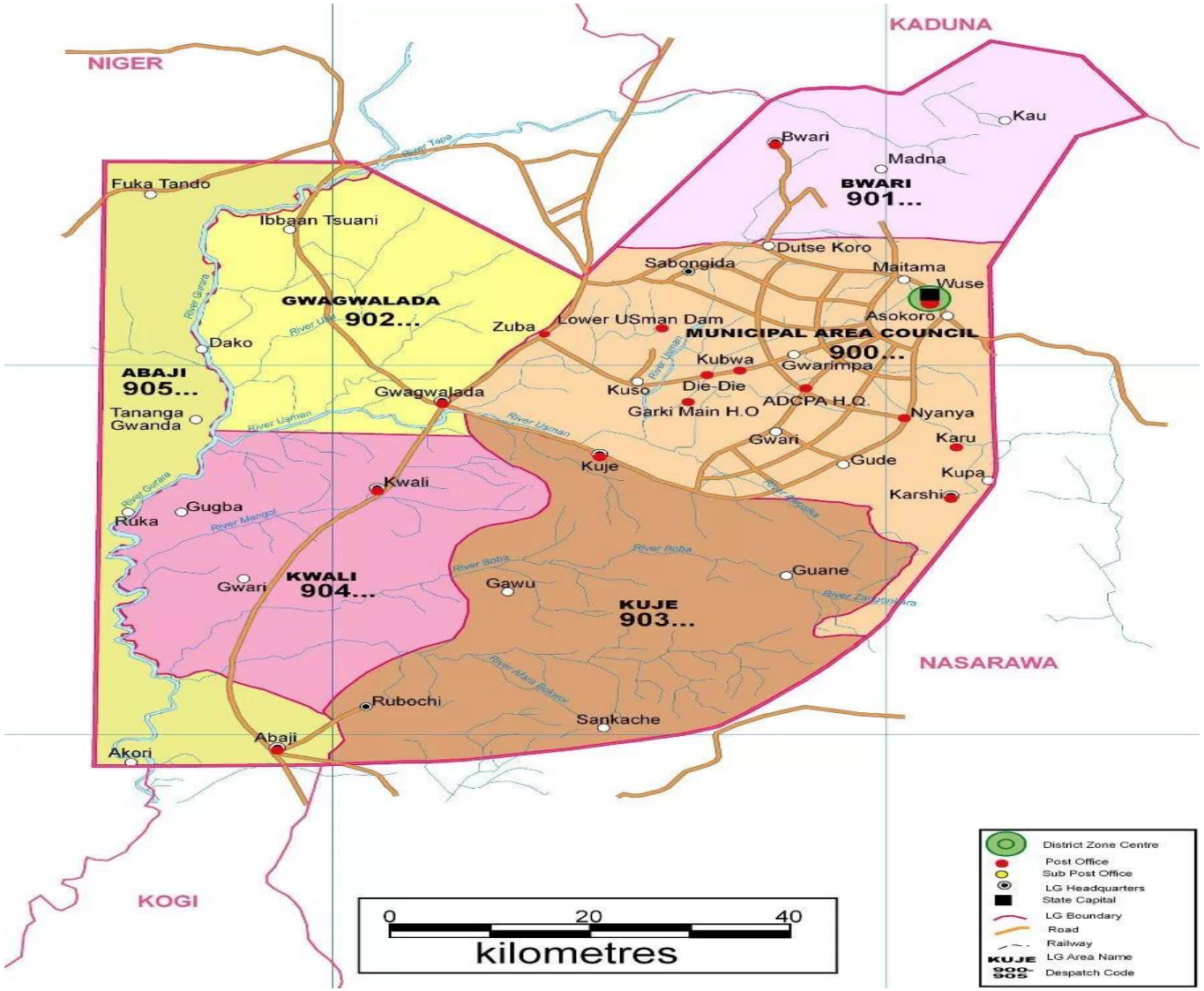
June 27, 2018

Abuja Environmental Protection Board (AEPB)
Abuja, Nigeria

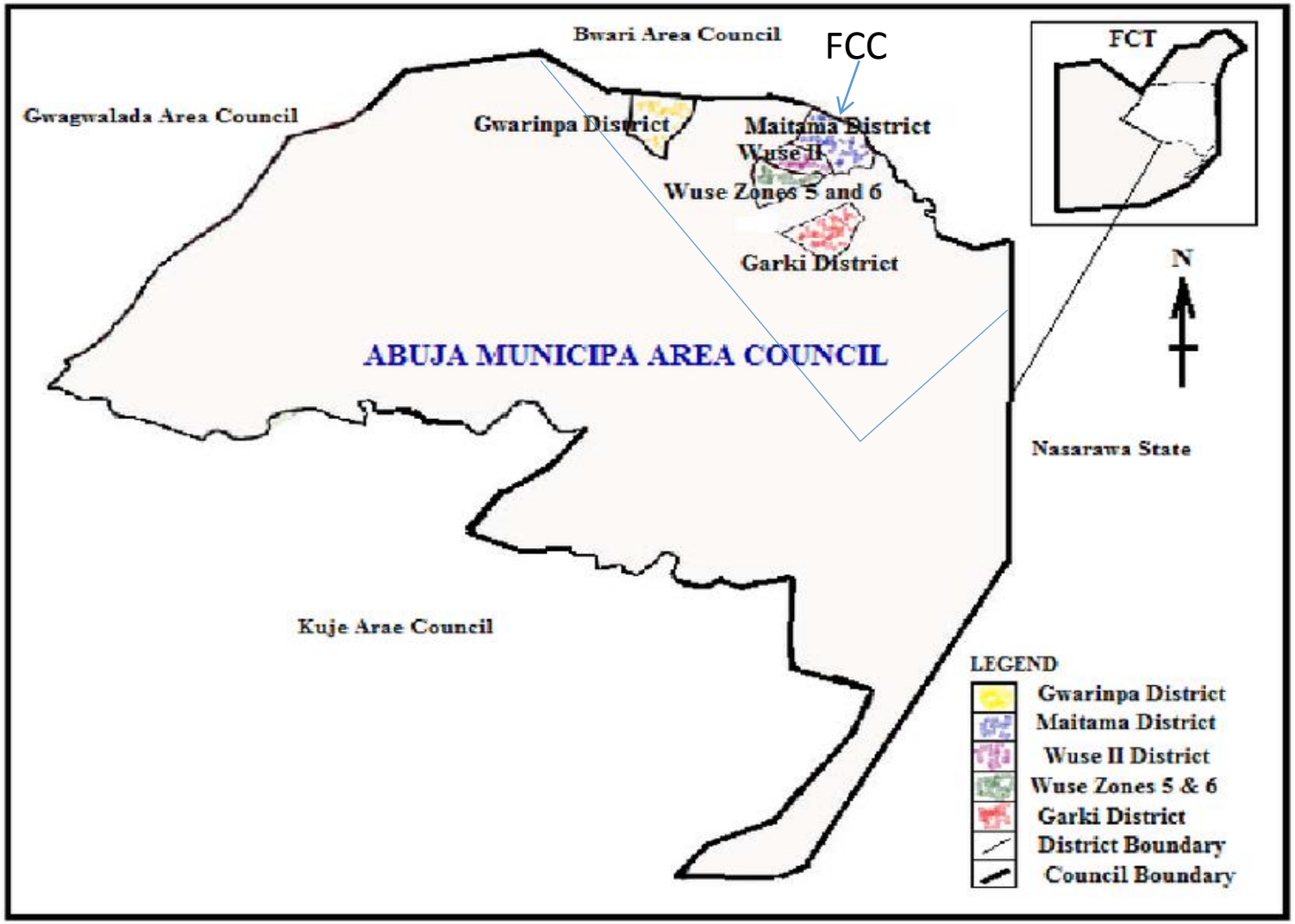
Contents

1. Introduction: NIGERIA and its Capital, Federal Capital Territory, Abuja.

The Federal Capital Territory (FCT), Abuja



The Federal Capital City (FCC), Abuja



- Nigeria is located in the Western part of Africa with a land mass of about 923,768 square kilometres and according to the World Bank report of 2011, it has a population of 162,470,737 with a GDP of US$ 235.9 billion.
- Nigeria has 36 States and a Federal Capital Territory (FCT) called Abuja.
- FCT is located in the Central part of Nigeria, and its territory covers about 8,000 Square kilometres.
- Federal Capital City (FCC) is a Metropolitan of FCT, and the area is about 250 square kilometres.

- According to the 2006 National Population Census, FCT has a population of 1,406,239 and FCC has 776, 298, which is amongst the most populous cities in Nigeria.
- With the population growth and rapid urbanization of Abuja, the challenges of solid waste management (SWM) of the City is increasing and becoming more complicated.
- The organisations which are responsible for waste management and sanitation in FCC is ‘Abuja Environmental Protection Board (AEPB)’ and the Area Councils are responsible for the zones outside the FCC as indicated in slide 4 & 5.

2. Sub-Indicators for SDGs Indicator 11.6.1

Sub-Indicator 1: MSW collected rate

$$x = \frac{(\text{ regularly) collected municipal solid waste}}{\text{Total municipal solid waste generated by the city}} \times 100\ (\%)$$

Sub-Indicator 2: MSW collection coverage

$$x = \frac{\text{households who have access to a reliable waste collection service}}{\text{Total households in the city}} \times 100\ (\%)$$

Sub-Indicator 3: MSW collected with treatment and disposal

$$x = \frac{\text{municipal solid waste collected with treatment and disposal}}{\text{Total municipal solid waste generated by the city}} \times 100\ (\%)$$

3. Required data for Sub-Indicators

- ❑Population (incl. forecast)
- ❑Unit generation rate of solid waste (kg/capita/day)
- ❑Solid waste amount generated (ton/day)
- ❑Solid waste amount collected (ton/day)
- ❑Recycle amount (ton/day)
- ❑Total households numbers in the city (nos)
- ❑Household numbers who receive waste collection service (nos)

4. Fact finding surveys

4.1 Waste Amount and Composition Survey

Number of Samples of Waste Amount Survey

Category of Waste Generation Sources		Area (FCC)	Samples per Area	Number of Samples	Survey Days	Total Samples
				A×B		C×D
		A	B	C	D	E
Household	High-income	2	15	30	8	240
	Middle-income	2	15	30	8	240
	Low-income	2	15	30	8	240
	Sub Total	-	-	90	8	720
Commercial	Hotel	-	-	10	8	80
	Restaurant	-	-	10	8	80
	Market	-	-	5	8	40
	Shop	-	-	5	8	40
	Office	-	-	10	8	80
	School	-	-	10	8	80
	Sub Total	-	-	50	8	400
Road (Street Sweeping)		-	-	20	8	160
Total		-	-	160	-	1,280

Notes: Survey results are shown in article below.

Number of Samples of Waste Composition Survey

Category of Waste Generation Sources		Number of Waste Samples	Number of Waste Heaps Made Each Day Subject to Analysis	Survey Days	Total Number of Samples
					F×G
		C	F	G	H
Household	High-income	30	1	3	3
	Middle-income	30	1	3	3
	Low-income	30	1	3	3
	Sub Total	90	3	3	9
Commercial	Hotel	10	1	3	3
	Restaurant	10	1	3	3
	Market	5	1	3	3
	Shop	5	1	3	3
	Office	10	1	3	3
	School	10	1	3	3
	Sub Total	50	6	3	18
Road (Street Sweeping)		20	1	3	3
Total			10	3	30

①Selection and collection of Sample

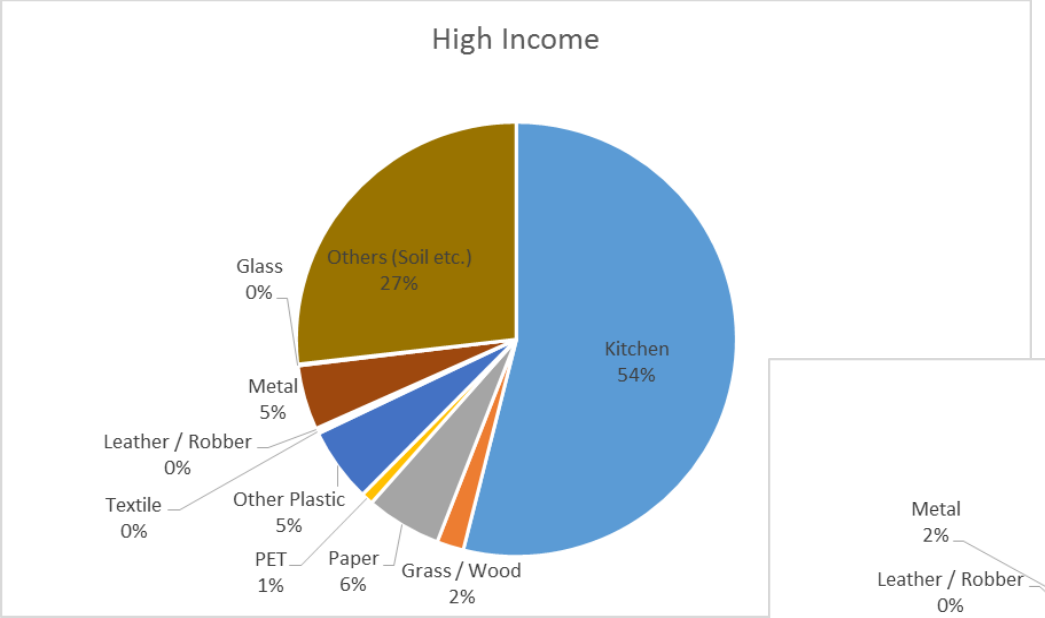
②Measurement for Weight of Sample

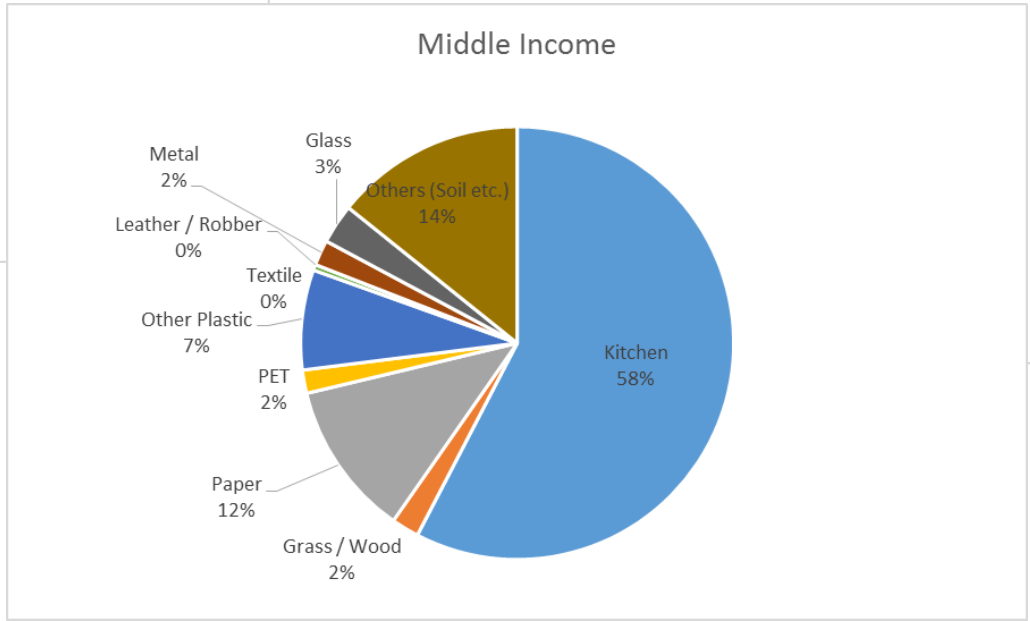
③Measurement for Volume of Sample

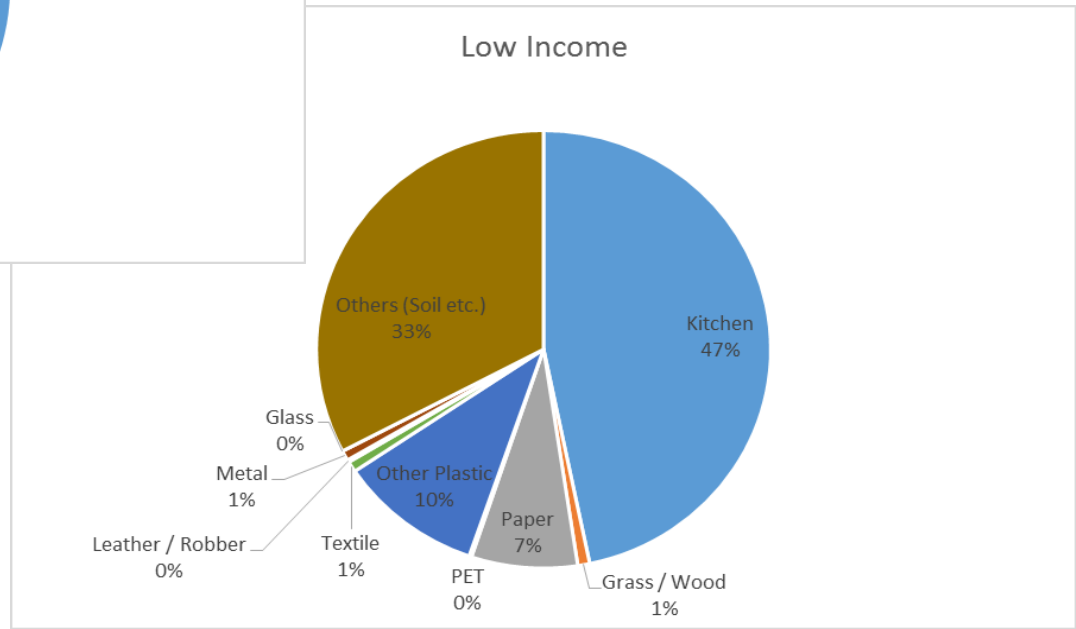
④Extraction of Sample of Each Source for Analysis of Waste Composition

⑤ Measurement of Weight and Volume of Sample for Analysis of Waste Composition

⑥Measurement of Weight of Each Sample Classified into 10 Types for Analysis of Waste Composition


High Income
Kitchen 54%
Others (Soil etc.) 27%
Glass 0%
Metal 5%
Leather / Robber 0%
Textile 0%
Other Plastic 5%
PET 1%
Paper 6%
Grass / Wood 2%


Middle Income
Kitchen 58%
Others (Soil etc.) 14%
Glass 3%
Metal 2%
Leather / Robber 0%
Textile 0%
Other Plastic 7%
PET 2%
Paper 12%
Grass / Wood 2%


Low Income
Kitchen 47%
Others (Soil etc.) 33%
Glass 0%
Metal 1%
Other Plastic 10%
Paper 7%
Leather / Robber 0%
Textile 1%
PET 0%
Grass / Wood 1%

		
		
Sampling Waste of High Income	Sampling Waste of Middle Income	Sampling Waste of Low Income

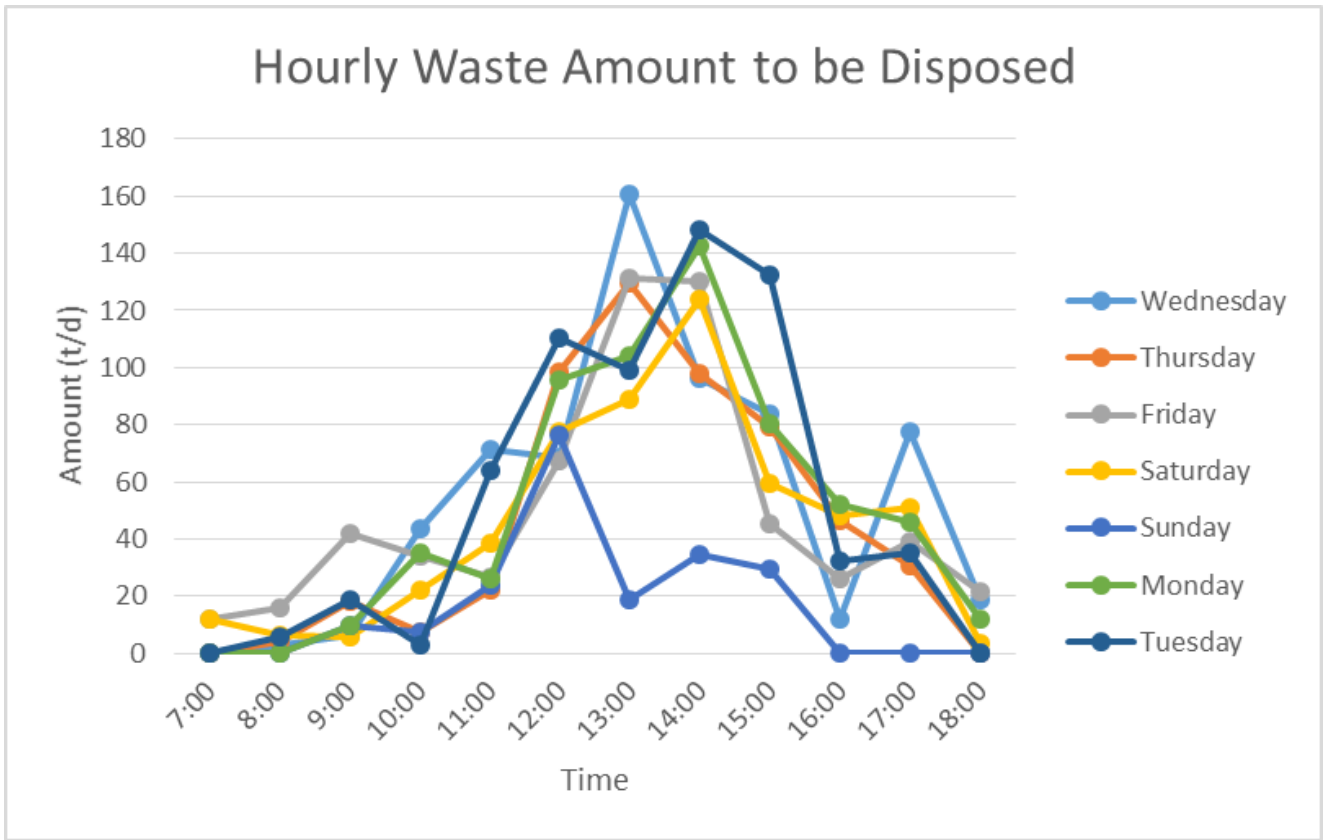
4. Fact finding surveys

4.2 Survey on Waste amount to be Disposed

Survey Result of Waste Amount to be Disposed (Tonnes/day)

Waste Amount to be Disposed (t/d)		
Day 2	Wed	641.4
Day 3	Thu	534.6
Day 4	Fri	591.6
Day 5	Sat	536.8
Day 6	Sun	200.1
Day 7	Mon	604.1
Day 8	Tus	650.1
	Average	537.0


Waste Amount to be Disposed
700
600
500
400
300
200
100
0
Amount (t/d)
Wednesday
Thursday
Friday
Saturday
Sunday
Monday
Tuesday
Amount


Hourly Waste Amount to be Disposed
180
160
140
120
100
80
60
40
20
0
Amount (t/d)
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
Time
Wednesday
Thursday
Friday
Saturday
Sunday
Monday
Tuesday

5. Data collection and analysis of each required data

- Population (incl. forecast)

Population Projection in FCT

Year	Population	year	Population
2006	1,406,239	2015	3,247,608
2007	1,543,293	2016	3,564,122
2008	1,693,706	2017	3,911,491
2009	1,858,777	2018	4,292,711
2010	2,043,936	2019	4,711,085
2011	2,238,751	2020	5,170,239
2012	2,456,945	2021	5,674,140
2013	2,696,403	2022	6,227,149
2014	2,959,200		

Reference: AEPB/JP Experts projected the population by using National Census 2006 and National Population Commission, NPC 2006

Population Projection in FCT and FCC

Year	FCT	FCC
2015	3,247,608	1,798,045
2016	3,564,122	1,973,286
2017	3,911,491	2,165,606
2018	4,292,711	2,376,669
2019	4,711,085	2,608,304
2020	5,170,239	2,862,513
2021	5,674,140	3,141,499

5. Data collection and analysis of each required data

- Households numbers in FCC

Total Number of Household

Income Level	Projection Population (Person)	Average Number of Persons Per Household	Number of households
High Income	833,175	6.13	135,918
Middle Income	835,080	5.23	159,671
Low Income	708,414	7.00	101,202
Total			396,791

Number of Households subjected to waste collection fee

No.	Income Level	District	Number of Households
1	High Income	Asoko	2,445
2		CBD	0
3		Jabi	1,389
4		Life Camp	1,164
5		Mabushi	458
6		Maitama	2,895
7		Utako	2,196
8		Wuse II	5,304
		Sub Total	15,851
9	Middle Income	Durumi	836
10		Garki I	5,294
11		Garki II	2,358
12		Gudu/apo	1,911
13		Gwarimpe	4,153
14		Guzape	138
15		Kado	1,296
16		Wuse I	2,933
17		Wuye	1,088
		Sub Total	20,007
		Total	35,858

5. Data collection and analysis of each required data

- Unit generation rate of solid waste (kg/capita/day)

Waste Related Data of Existing Literature

No.	Target Area	Target Year	Waste Generation	Waste Generation Per Capita
1	Abuja	2013	1,918 ton/day	0.67kg/ capita/day
2	Abuja	2010	1,035 ton/day	0.59—0.74kg/capita/day
3	Abuja	2009	492 ton/day	0.66kg/ capita/day

"Characterization of Municipal Solid Waste in the Federal Capital Abuja, Nigeria" by Benjamin Ternenge Abur, published by Global Journal of Science Frontier Research in 2014

Estimation of Waste Generation Amount of Household Waste

Household	Waste generation per capita	Population	Estimation of waste generation
High Income	0.36kg/capita/day	831,834	299.5t/day
Middle Income	0.44kg/capita/day	879,368	386.9t/day
Low Income	0.69kg/capita/day	665,467	459.2t/day
Total		2,376,669	1,145.6t/day

5. Data collection and analysis of each required data

- Estimation of Waste Generation Amount of Commercial & Road Waste

Commercial	Waste generation per capita	Adjusted Value	Number	Estimation of waste generation
Restaurant	0.88kg/table/day	10 table/restaurant	395	3.5t/day
Hotel	0.27kg/room/day	50 room/hotel	406	5.5t/day
Market / Shop	2.01kg/shop/day	—	9,663	19.4t/day
Office	0.05kg/capita/day	80 persons/office	2,624	10.5t/day
School	0.01kg/capita/day	375 persons/school	217	0.8t/day
			Total	39.7t/day

	Population	Road Extension	Total Distance	Unit Generation Amount	Estimation of Waste Generation
	(1)	(2)	(1)×(2)	(3)	(1)×(3)
Road waste	2,376,669	0.4km/1,000 person	950.7km	6.94kg/km/day	6.60t/day

5. Data collection and analysis of each required data

- Solid waste amount collected (ton/day)

Total Waste Amount Generated in FCC (2018)

Waste type	Waste Generation Amount (t/d)
1. Household waste	1,145.6 t/d
2. Commercial waste	39.7 t/d
3. Road waste	6.6 t/d
Total	1,191.9 t/d

Waste Collection Rate (2018)

Waste Amount Disposed	Waste Generation Amount	Waste Collection Rate
A	B	C=A/B × 100
537.0 t/d	1191.9 t/d	45.1%

5. Data collection and analysis of each required data

- Recycle amount (ton/day)

Results of Amount of Recycle in 2016 (t/d)

Agent	Amount	Agent	Recycle
Gwan-Gwan Cooperative Ltd	0.027	Aliyu Musa	0.007
Ibrahim Sleiman	0.028	Wahu Usman	0.818
Umar Sadiq	0.501	Monek Co.	0.020
God's Way Multipurpose Ltd	0.667	Fysal Ahmed	0.020
Bola Bola Cooperative Ltd	0.003	Saidu Abdullahi	0.022
Umaru Musa	0.001	Abusamad Masokano	0.817
Isa Mohammed	0.002	African Steel Company	1.427
Abba Usman	0.533	Jemilu Unwana Ini	17.701
Abubakar Ismail	0.000	Jemilu Hamisu Rabiu	2.567
Alhaji Bello Idris	0.007	Umar Hamza	1.567
Adamu Mohammed	0.002	Abdullahi Ibrahim Umar	0.233
Saidu Ibrahim	0.917	Abdullahi Hamisu	0.433
Adamu Yusuf	0.019	Rabiu Mohammed Sani	0.000
Kabiru Mustapha	0.002	Mohammed Inuwa Ismail	0.000
Hussieni Samila	1.000	Ahdalis Investm. Ltd	5.667
Ademu & Co	0.367	Total	35.38 t/d

Results of the Amount of Recycle (2018)

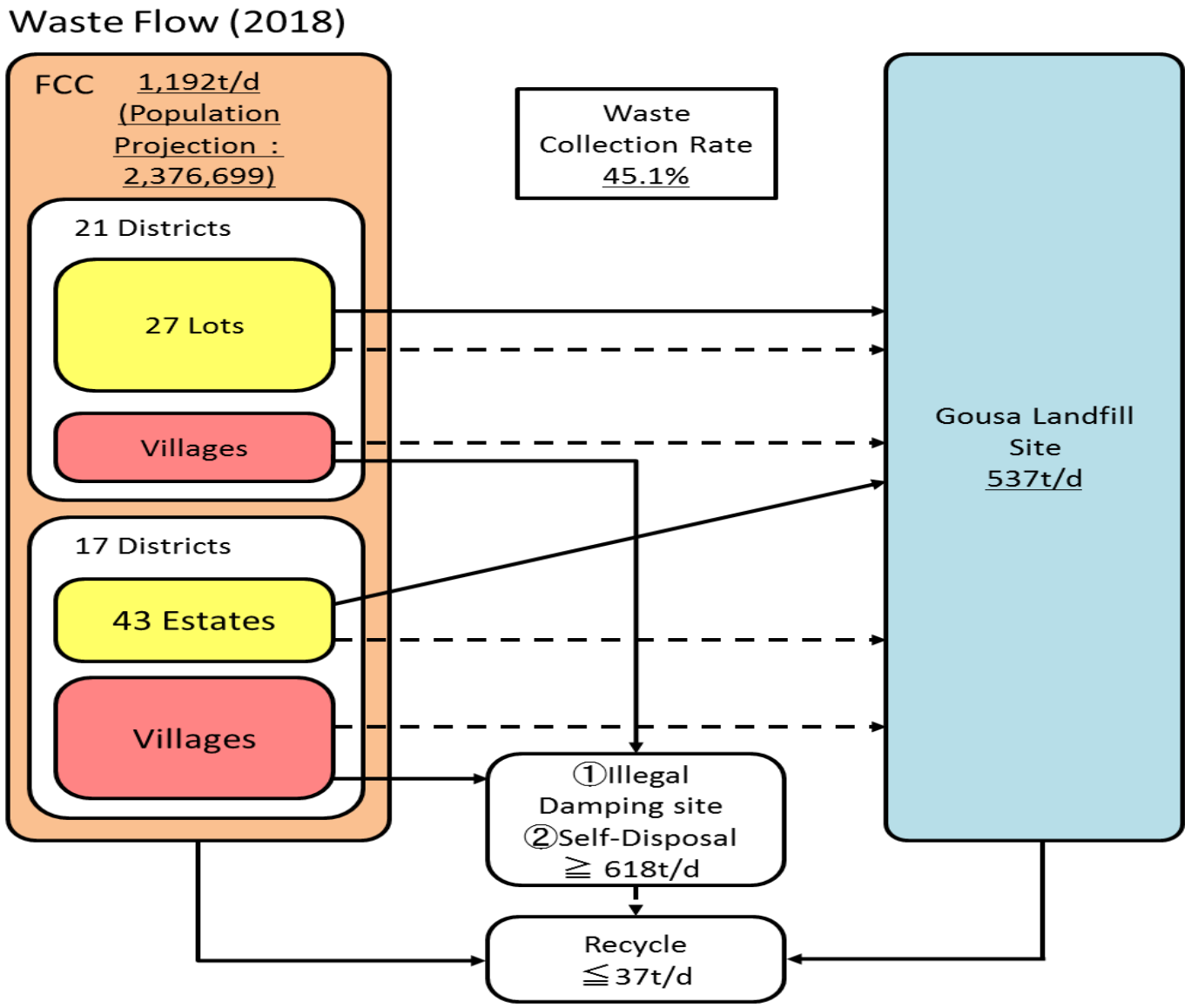
Agent	Amount of Recycle
Chanja Datti	0.184
Trans Abu	0.100
Gidan Rubber	1.000
Total	1.28

Estimation of the Amount of Recycle

	Amount of Recycle
Survey result in 2016	35.38 t/d
Survey result in 2018	1.28 t/d
Total	36.7 t/d

Recycling rate in FCC is estimated to “3.1 %” (36.7/1,192 x 100 = 3.1)

6. Waste Flow of FCC in 2018



7. Five-Grade evaluation by Wasteaware

Landfill Site Name	Landfill Type	Operation Start Year	Degree of Control Score		Amount of MSW Received	Amount of Sewage Sludge Received
			JPT	C/P		
Gousa Landfill site	Controlled dumpsite	Phase (1) 1982 & Phase (2) 2005	(1) 7.1	(1) 8.6	537.6 t/d	N/A
			(2) 10	(2) 10		
			(3) 2.5	(3) 3.0		

8. Calculation Results

Sub-Indicator 1: MSW collected rate

$$x = \frac{\text{(regularly) collected municipal solid waste}}{\text{Total municipal solid waste generated by the city}} \times 100\ (\%)$$

$$x = \frac{①537.6\text{t/d}}{②1{,}191.9\text{t/d}} \times 100\ (\%)$$

$$x = 45.1\%$$

- In order to calculate MSW collection rate, the survey of waste amount to be disposed was conducted, in which the amount was considered as the collected municipal solid waste. In the central disposal site, Gousa landfill site, we do not have a weighbridge (weighting machine), so waste amount to be disposed is estimated based on the number of vehicles and their respective loading capacities etc.
- The total municipal solid waste generation amount was calculated by the population projection, unit generation rate of household waste & business entities and its forecast, inventory of business entities etc.

8. Calculation Results

Sub-Indicator 2: MSW collection coverage

$$x = \frac{\text{households who have access to a reliable waste collection service}}{\text{Total households in the city}} \times 100\ (\%)$$

$$x = \frac{①35{,}858\ \text{households}}{②396{,}791\ \text{households}} \times 100\ (\%)$$

$$x = 9.0\%$$

- The number of households that have access to solid waste collection services was estimated based on the households numbers that are subjected to waste collection charges/fees managed by AEPB. Most of them are high and medium income households.
- The total number of households was estimated by population projection and average persons per household which was clarified through the questionnaire survey of waste amount & composition as indicated in slide 18.

8. Calculation Results

Sub-Indicator 3: MSW collected with treatment and disposal

$$x = \frac{\text{municipal solid waste collected with treatment and disposal}}{\text{Total municipal solid waste generated by the city}} \times 100\ (\%)$$

$$x = \frac{①537.6\text{t/d} + 36.7\text{t/d}}{②1{,}191.9\text{t/d}} \times 100\ (\%)$$

$$x = 48.2\%$$

- Regarding the MSW collected with treatment and disposal, the waste amount to be disposed from household, business entities & road and the amount of waste recycled were adopted.
- Estimation of total municipal solid waste generated was from population projection, unit generation rate of household waste & business entities and its forecast, inventory of business entities etc.

9. Issues encountered and Measures taken to overcome

- Population forecast is based on the census in 2006***
- Population of low-income households***
- Unit Generation rate of Waste***
- Clarification of household numbers***
- Waste amount and composition survey***
- Estimation of recycling amount***
- Evaluation criteria of Wasteaware***
- Adopting Sub-Indicator 2***

Thanks for listening!