Feasibility Study Report on the Claims & Solid Waste Management Integrated Information System in the Maputo City

December 2013

World e-Governments Organization of Cities and Local Governments

Contents

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ABBREVIATIONS

Abbreviation	Full name
AGOA	Africa Growth and Opportunity Act
ARS	Automatic Response System
CSWMIIS	Claim & Solid Waste Management Integrated Information System
CDMA	Code Division Multiple Assess
CTI	Computer Telephony Integration
DB	Data Base
DBMS	Data Base Management System
DMZ	Demilitarized Zone
DID	Direct Inward Dialing
DOD	Direct Out Dialing
DNS	Domain Name System
EASSy	East African Submarine Cable System
EIRR	Economic Internal Rate of Return
EBA	Everything But Arms
ECA	Export Credit Agency
F/S	Feasibility Study
FW	Firewall
FDI	Foreign Direct Investment
G/W	Gate Way
GSP	Generalized System Preference
GIS	Geographic Information System
GDP	Gross Domestic Product
HQ	Head Quarter
HIPC	Heavily Indebted Poor Countries
HRM	Human Resource Management
ICT	Information and Communication Technology

Abbreviation	Full name
ISDN	Integrated Services Digital Network
IVR	Interactive Voice Response
ITU	International Telecommunication Union
IDS	Intrusion Detection System
IPS	Intrusion Prevention System
LTE	Long Term Evolution
MoU	Memorandum of Understanding
MTC	Ministry of Transport and Communications
INCM	National Communication Institute of Mozambique
INTIC	National Institute of Information Technology and Communication
NPV	Net Present Value
N/W	Network
OECD	Organization for Economic Cooperation and Development
PSI	Policy Support Instrument
PM	Project Manager
RFID	Radio Frequency Identification
SNS	Social Network Service
SWM	Solid Waste Management
SADC	South Africa Development Community
SAN	Storage Area Network
TDM	TelecomunicaçõesdeMoçambique
UI	User Interface
UTICT	The Technical Unit for the Implementation of the ICT Policy
UPS	Uninterruptible Power Supply
VSAT	Very Small Aperture Terminal
WAS	Web Application Server
WeGO	World e Governments Organization

I. Overview

1. Background
2. Project Scope

Ⅰ. Overview

1. Background

1.1 Project Background

☐ Seoul City which is the president city of the world city e-government (WeGO) will provide consulting feasibility study expert for promotion of the application of e-government for the WeGO member cities, and will provide calculating the project cost for applying the e-government solution of Seoul city.

1.2 Purpose

☐ Seoul City will provide the reliability through the information-sharing of public sector and the cooperation of WeGO member cities, will serve as president city to pursue international cooperation through its overseas export of e-government system of Seoul.

☐ Focus on strengthening the global cooperation network and WeGO member city's ICT cooperation, and will strengthen the reputation of Seoul City through the result that deliver the advanced e-government implementation experience of Seoul city for the member cities.

2. Project Scope

1.1 Scope

☐ Conduct pre-feasibility study on cities that wish to apply for e-government among the 2013 WeGO member cities.

☐ Analyze environment and informatization status for the each project target city.

- Analyze Maputo City environment and informatization status selected by the consortium organization
- General status of Mozambique and Maputo City: project city/nation's humanities, geography, economy, population, information communication, etc
- Analyze current information communication infrastructure and information processing system
- Analyze Maputo City informatization requirements

☐ Feasibility analysis and information derived directional

- Reflect exterior environment of Maputo City as well as its current informatization stage, requirements, etc and deduct subject city informatization direction
- Informatization direction is deducted through analysis on each area's validity based on the status research; while validity analysis is categorized into political/technology/economic validity analysis

☐ Feasibility Analysis

- Whether it accords with the nation or city's mid-long term economic development plans
- Make a focused review on whether it accords with the city's mid-long term ICT development plans, etc
- Make an overall review on whether it accord with the masterplan on national information communication, information processing, e-government, and other ICT areas

☐ Technological Feasibility Analysis

- Research and analyze subject city requirements and technological status on the foreign city e-government feasibility study service

- Deduct the problems and improvement measures through analysis on current Maputo City informatization system structure and process
- Review comparison of alternative system improvements by analyzing e-government Seoul City case
- Deduct possibilities of realizing Maputo City informatization project application technology and optimum measures by comparing efficiency

☐ Economic Feasibility Analysis

- Analyze the consumed cost and budget, etc economic validity upon carrying out the Maputo City informatization project(Establish implementation plans, etc)
- Analyze the cost benefits of the informatization project, etc

☐ Establish Informatization To-Be Model

- Recognize the issues of the current informatization and establish the subject city's informatization future model through case analysis
- Deduct subject city's strengths and weaknesses of e-government launch by analyzing Seoul City e-government system's achievements and core capacity

☐ Establish Informatization Implementation plan

- Deduct Maputo City mid-long term informatization goal model and implementation road map
- Construct infrastructure, develop informatization deduction goals and deduct major project tasks
- Deduct detailed implementation tasks for major project tasks and implementation measures
- Estimate expected effect of constructing subject city informatization project

☐ Analyze current Seoul City information communication infrastructure, system environment and status

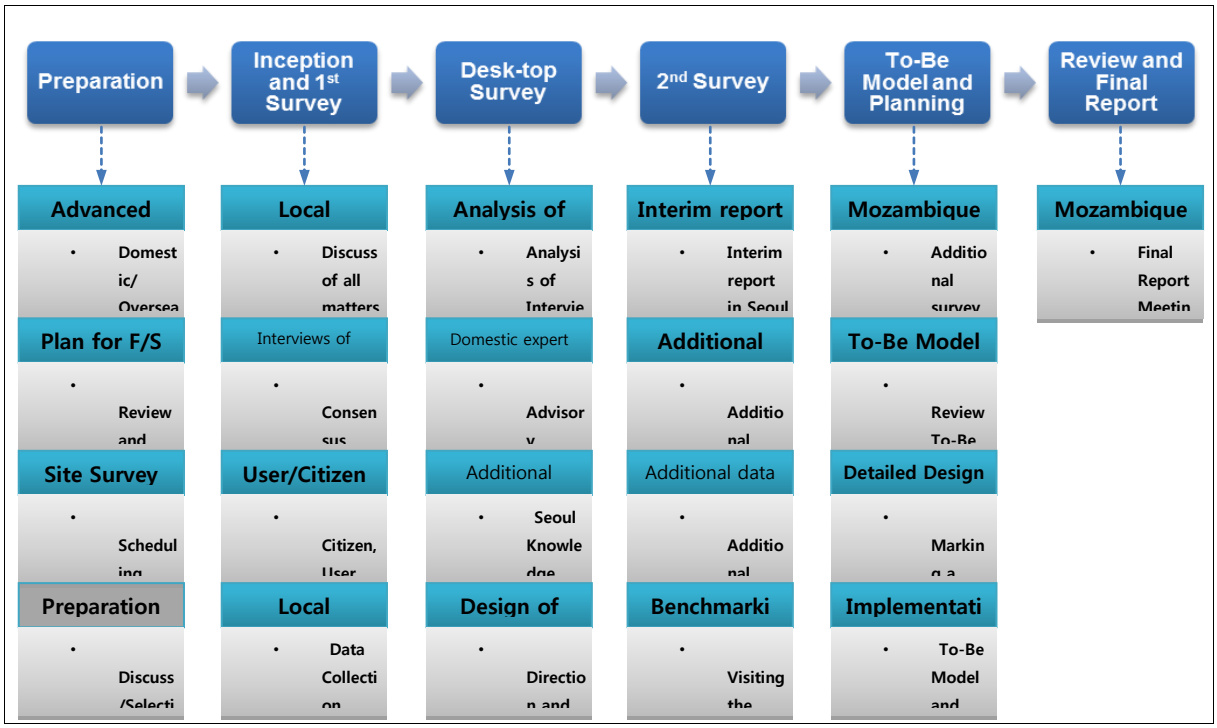
- communication network, hardware, network software, database, etc

☐ Establish foreign launch strategy for Seoul City information system

- Group individual Seoul City systems based on similarity and establish strategy for those that can be exported
- Review application possibilities for the parallel F/S Project to subject city
- Suggest phased(yearly) system export strategy

2.2 Project Implementation Schedule

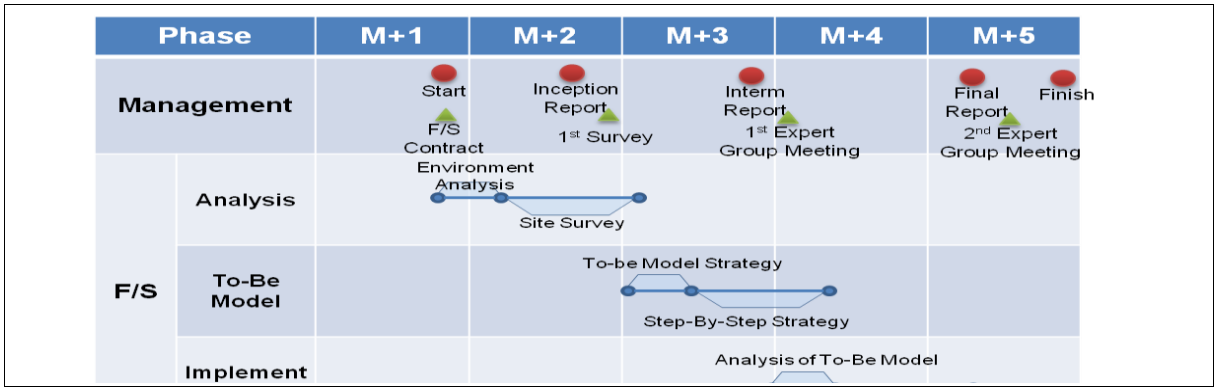
☐ Methodology



[Figure 1] F/S Project Methodology

☐ F/S Project Schedule

- Project Schedule: 2013.08.27 ~ 2013.12.31



[Figure 2] F/S Project Schedule

☐ Advanced Research

- Various analysis data on Mozambique was collected and used for a successful launch briefing and thus increase the level of understanding on this feasibility study.

- Based on the Maputo City's letter of intent, analyze the requirements and recognize will to pursue project as well as the direction

☐ Local Implementation Preparations

- Basic direction of the project was deducted with advanced research and collected data as basis; Project Implementation plans fit for Maputo was established to prepare the current research and Launch Briefing

☐ Local Inception Meeting and 1st Site Survey

- Consider local situations for smooth communication with subject city, determine Site Survey schedule and then conduct the 1st Site Survey (2013.09.23~2013.10.08)
- Local Inception Meeting Schedule

[Table 1] Inception Meeting Schedule

Time	Description	Presentation	Notes
10:00~10:10	Introduce Project	Countries that cooperate with Maputo City	
10:10~10:20	Project scope	Consulting PM	
10:20~10:30	Project output	Consulting PM	
10:30~10:40	Introduce participating manpower	Maputo ICT Director and Consulting PM	
10:40~10:50	Introduce 1st business trip schedule	Consulting PM	

- Inception Meeting Participants

[Table 2] Inception Meeting Participants

Category	Maputo City	F/S Team	Notes
Participants	Adelaide Lemos Souto	Ok Joong-kyung	
	Joao agostinho Mucavele	Lee Kyu-seop	
	Ivan Luciano De sousa Cangela	Yoon Sung-ho	
	Carlos Guambe		
	Ibraimo Caroga		
	Edson Cumbe		
	Americo Simbine		
	Justino Damane		

- Site Survey was conducted to check the results of the advanced research and attain additional questions and data, with the main focus on recognizing the status of related policy pursuits, future plans, the system, and the

requirements of the interested parties of the project through interview with project related institutions.

☐ Domestic Research Activities

- Possible tasks were analyzed based on obtained local information through the competed 1st site research to design Maputo City's future model.
- Conduct SWOT Analyze based on the drafted future model and increase the level of understanding on the project.
- Visit related domestic institution if necessary to adjust and share opinions regarding the project and analyze project validity
- Establish project implementation plans needed for the project construction based on the drafted future model

☐ Research and Analyze Model Cases

- Bench mark the basic plans of Seoul City informatization and analyze similar domestic/international cases to apply Maputo City's alternative service construction
- Apply the analyzed case results on this project to establish optimized project implementation plan and future model.

☐ Establish To-Be Model and Implementation plan

- Re-review validity of the Maputo City alternative service with comprehensive results obtained through domestic research and model case and discuss complementary items with the WeGO Secretariat
- After the discussion of security issues between Seoul City and WeGO Secretariat, re-establish alternative service future model for each subject city that reflect the local requirements
- Deduct priority tasks by making a general review on the re-organized future model and additional requirements

☐ Local Completion Report

- Discuss Maputo City's schedule based on the finalized report and determine the schedule for local report on completion (2013.12.11)
- Local Completion Report Schedule

[Table 3] Completion Report Schedule

Time	Description	Presentation	Notes
10:00~10:10	Introduce Project	Maputo Foreign Cooperation Office	
10:10~10:20	Project Scope	Consulting PM	
10:20~10:30	Project Output	Consulting PM	
10:30~10:40	Introduce Participants	Maputo ICT Director and Consulting PM	
10:40~10:50	Introduce 2nd Business Trip Schedule	Consulting PM	

- Completion Report Participants

[Table 4] Completion Report Participants

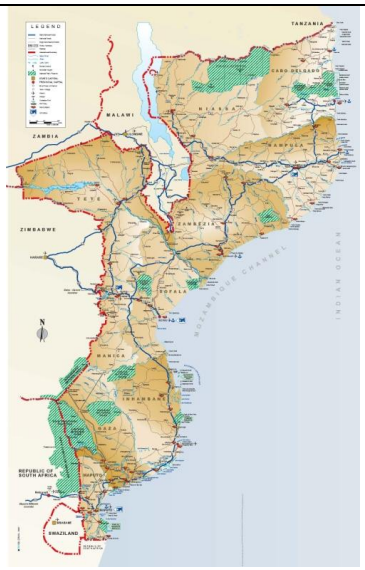
Category	Maputo City	F/S Team	Notes
Participants	Adelaide Lemos Souto	Ok Joong-kyung	
	Joao agostinho Mucavele	Yoon Sung-ho	
	Ivan Luciano De sousa Cangela		
	Carlos Guambe		
	Ibraimo Caroga		

Ⅱ. Mozambique General Status

1. General Status
2. Economy
3. Politics·Society
4. Industry Trend
5. Tax System
6. International Credit Rating

Ⅱ. Mozambique General Status

1. General Status



AREA	799 thousand km^2
Population	22.5 Million(2012\)
Political system	Republic(Presidential)
Diplomatic Policy	Practical interests
G D P	146 billion USD(2012)
Head GDP	652 USD(2012)
Currency Unit	Metical(MT)
Exchange(USD)	28.37(2012)
Climate	Tropical

[Figure 3] Mozambique General Status

- ☐ Mozambique, located on the southeastern shores of the African continent, is about 3.6 times bigger than the Korean peninsular in size and has the population of 225 million.
- ☐ Geographically it shares borders with Tanzania, Malawi, Zambia, Zimbabwe, Republic of South Africa, etc.
- ☐ It is rich in resources - such as aluminum, coal and other mineral resources as well as natural gas - recent influx of FDI(Foreign Direct Investment) is surging.
- ☐ However, it is one of the poorest countries in the world, with GDP per capita of $652 despite the satisfactory economic growth rate
- ☐ Stable political status continues with the ruling party's long-term prolonged governance but the gap between the rich and the poor is considered as its potential social risk.

2. Economy

2.1. Economic Outlook

□ Maintains solid economic growth rate around 7% thanks to the expansion of FDI influx

- In 2011, Mozambique economy archived the high growth rate of 7% thanks to the favorable condition of agriculture, mining, shipping industries, etc as well as the expansion of FDI influx led by large scale projects in resource industries.
- Mozambique shows continuously increasing FDI influx with their currently ongoing investment in Moatize Coal Development Project and discovery of gas field, marking a 7.4% economic growth rate in 2012.
- There were concerns of decreasing agricultural products after a flood, destruction of shipping infrastructure and other economic risks in January 2013, but continuous discovery of gas fields have led to positive anticipation on the large expansion of the scope of FDI.

□ Continued loss of financial earnings and expenses due to large scale government expenditure

- Financial earnings and expenses shows chronic deficit due to consistent increase in expenses for increasing public sector wages, obtaining social infrastructure, etc; the 2012 financial earnings and expenses deficit is about 4.4% of the nation's GDP.
- Mozambique's steady economic growth, increase in mineral industry taxes, etc, leads to expectations on swift increase in tax income as well as a simultaneous decrease of reliance on foreign aid.
- However it seems that the deficit will continue for a while with expenses spent on public health and education investment, social infrastructure investment, flood damage restoration, etc.

[Table 5] Mozambique Economic Indicator

Category	2008	2009	2010	2011	2012
Economy growth rate	6.8	6.3	6.8	7.1	7.4
Financial earnings and expenses/GDP	-2.5	-5.5	-3.7	-4.5	-4.4
Consumer inflation rate	10.3	3.3	12.7	10.4	3.0

2.2 Economy Structure

☐ Recently the aluminum, coal, and other mineral resources and natural gas export have been leading the nation's economic growth. However, such economic growth is sensitive to outside shocks; economic growth is expected to slowdown when demand for resources or foreign investment decreases.

☐ Government continues to make investment in agriculture and diversify other industrial foundation, etc, but a rapid growth of tasks is visible.

2.3 Economic Policy

☐ Since 2011 the government has carried out a currency control policy with the goal of stabilizing prices. In 2013 a stable consumer inflation rate around 3% was recorded

☐ In 2013 government will maintain the policy to stabilize inflation in relation to previous year's decrease in interest rate, etc, which led to increase in currency supply.

☐ Since 2008 Mozambique government have prepared to satisfy international standards to induce foreign investment in mining industry- and such accordance to standards was achieved in October 2012

☐ To reduce poverty, cultivate job creating industries, and enhance infrastructure, 5 year development strategy(2010 ~ 2014) was created; poverty reduction, job creating industries such as agriculture, fishing, tourism, shipping, etc are cultivated, and infrastructure improvement policy goals are currently carried out under this strategy.

- detailed goals include reducing poverty rate (54.7%→42%), achieving yearly economic growth rate of 8%, completing construction of south-north highway, constructing plant to increase electricity generation capacity, and increasing rural area's water access (52%→69%)
- In relation to agricultural development, government invests 6.45 million dollars during 2011~2019 for irrigation land expansion project

- Under IMF's PSI(Policy Support Instrument), balance of current account deficit management, establishment of foreign debt management strategy, and finance reformation are pursued

2.4 Foreign Trade

☐ Mozambique is one of the SADC(South Africa Development Community)'s 11 member countries with trade agreements signed with other member counties that have no customs for certain product groups.

☐ According to African Growth and Opportunity Act (AGOA) and Generalized System of Preference(GSP), Mozambique goods can enter U.S. market without taxation.

☐ Thanks to the Cotonou Agreement, Mozambique exports to EU member countries according to the EBA (Everything But Arms) principle.

3. Politics·Society

3.1 Political Trend

☐ Politics is stabilized with long-term prolonged governance of ruling party, Mozambique Liberation Front

- Mozambique Liberation Front, the ruling party, continues long-term prolonged governance with the party leader and the first president of Mozambique, Samora Machel and his successor President Armando Guebuza's consecutive term servings
- Based on strong organization and foundation it is thought that Mozambique Liberation Front will continue this prolonged governance in future presidential, general elections

☐ President Guebuza, who took office in 2004, pursued a strong economic reformation policy and achieved high economic growth above 10% during his term, which led to his second term in the 2009 presidential election.

☐ Stabilized democracy election led to relatively stable politics in Mozambique; it has become a model country of African democratization and market economy reformation.

- 2012 World Peace Index of Sub-saharan African countries ranked it 3rd after Mauritius and Botswana, with stable political·social conditions compared to other countries.

3.3 Social Trend

- Mozambique has a big gap between the rich and the poor, thanks to the high economic growth rate since the 1990s and disconnection to reduction of poverty
- Government is making investment expansion in human resources cultivation as poverty reduction policy and tries hard to resolve polarized income gap through job creation and eliminate corruption.
- UN's 2013 Human Development Index ranked Mozambique 185th out of 186 countries; rapid dispersion of AIDs marks average life expectancy of 48.4 years old (2010).
- Adult literacy rate is 44%; living and education infrastructure is very poor and regions in the center of the country suffer from risks of mass starvation due to continuing draught.
- In August 2010, sudden inflation made thousands to protest to the high living costs in the capital city, Maputo, and resulted in many injuries caused by armed repression.
- In 2001, government enacted Money Laundering Prevention Act to eliminate crimes such as increasing drug and armory trafficking, automobile theft, etc.

4. Industrial Trend

4.1 Agriculture

- 80% of Mozambique population resides in the rural areas. Agriculture is the foundation of Mozambique economy. In 1997 price control for agricultural products was discarded; national agricultural development program was executed with other reformatory policies

- Northern Mozambique is the central area for agriculture; recently sugar, cotton, cigarette, and other export grain industries are doing well under increase in foreign investment.
- Mozambique's major grain includes corn, sorghum, bean, rice, cassava, etc and exporting grain includes sugar, cashew nut, cotton, cigarette, tea, sunflower seed, etc.

4.2 Forestry

- Mozambique is rich in forestry resources; it makes 30 million dollars yearly with tropical lumber export

4.3 Fisheries

- With a 2600 km long Indian Ocean coastline, marine products used to be the biggest exporting product group before aluminum export took place actively.
- Fishes that take up around 30~40% of marine product export is prawn; other major types include mackerel, sea bream, bass, anchovy, sardine, tuna, lobster, oyster, mussel, etc.
- Recent depletion of marine resources has increased much interest in aquaculture industry; every year prawns are cultivated with aquaculture industry related investments made from France.

4.4 Transportation and Communication

- Constructing road network that connect Mozambique's major agricultural production site - the northern region - and the major consumers of these agricultural products - the southern region - is an urgent task. This is being worked on with aid from WB and other nations
- Ports and railways used as major trade routes include the 3 big ports of Maputo, Beira and Nacala and nearby country and railways that connect to the nearby countries such as Republic of South Africa, Zimbabwe, Malawi, etc. They are currently being modernized with foreign aid, foreign investment, etc.

- As for air transportation, Mozambique's national airway monopolizes the domestic airway. It began allowing private airways in 2004
- Telecommunication industry is monopolized by the national telecommunication corporate TDM for landline, but with recent passing of a bill many telecommunication companies are being founded. Mobile industry has M-Cell and Vodacom, etc.

4.5 Mining

- Mozambique is rich with numerous mineral resources such as aluminum, titanium, coal, bauxite, emerald, gold, limestone, etc, but mining related law and other production foundation are lacking due to shortage of geological information.
- Since the first mining resource expedition permitted in 1990, during the period between 1992 ~ 1998, around 150 expedition permits were issued. Companies from Republic of South Africa, Australia, Brazil, UK, Canada, etc are carrying out excavation works

4.6 Tourism

- Tourism industry has shown the greatest growth among all Mozambique industries since the Mozambique war and stabilization of political environment; with population working in the tourism industry increasing from 19,600 in 1990 to 32,000 in 2007.
- According to world tourism organization statistics, in 2005 Mozambique ranked no.1 in tourism industry growth rate with 37%; the FDI influx into the tourism industry totaling 84 million dollars.

5. Tax System

5.1 Income Tax

- Corporate income tax is charged for resident corporate on their whole income and for non-resident corporate with income created in Mozambique only.

- Personal income tax is charged on yearly income created all around the world; those who do not necessarily live in Mozambique but who makes income in Mozambique are subject to this tax

5.2 Personal Tax

- Income tax is deducted in withholding tax type with maximum tax rate of 32%. If monthly income is more than US$27,000 the maximum tax rate applies.
- Mozambique residents are deducted tax for all of their income; but any tax that has been paid abroad will not be charged. Non-residents are only charged for income made in Mozambique

5.3 Corporate Tax

- Standard tax rate for Mozambique's corporate is 32%. Additional tax rate for faulty report is 35%. 10% tax rate is applied to agricultural corporate whereas special tax rate is applied for certain investment project with incentives.
- Aside from share inclusion income deduction subjects, 20% tax rate is applied to share-out income

5.4 VAT and Special Consumption Tax

- Mozambique's standard VAT is 17%; exempted for banks health, educational and volunteer organizations. Welfare services and exporting goods are also exempt from VAT.

5.5 Tariff

- Raw material 2.5%, capital goods 5%, intermediary goods 7.5%, consumer goods 20% are respectively applied as tariff tax rate

6. International Credit Rating

6.1 Foreign Debt Repayment Method

☐ With Foreign Debt Relief and Rescheduling Experience

- According to HIPC (Heavily Indebted Poor Countries) initiative, 3.7 billion dollars and 3 billion dollars in 1999 and 2001 respectively were written off from the official foreign debt book. In 2006, 2.9 billion dollars were also written off with the concluding of Multilateral Debt Relief Initiative
- As of end of June, 2012, OECD member country ECA aid balance records 2.12 million dollars

☐ Foreign debt is increasing but manageable

- Despite the relief of foreign debt with huge foreign debt write-offs, high economic growth rate, and increasing foreign reserves, large-scaled development project expenses are causing foreign debt to increase.
- However, as big part of foreign debt comes from aiding countries as Concessional Loan, burden of repayment is not as great. Increase in mining export is contributing to the repayment capacity of the country.

6.2 International Market Evaluation

☐ Credit Evaluation Ranking of Major Institutions

[Table 6] Credit Evaluation

Evaluation Institution	Recent Evaluation Grade	Previous Evaluation Grade
Export, import bank	D1 (2012.10)	D1 (2012.7)
OECD	6 (2012.10)	6 (2012.10)
S&P	B+ (2013.2)	B+ (2012.2)
Fitch	B (2012.8)	B (2011.8)

6.3 Relations with Korea

☐ Mozambique established diplomatic relations with Korea on August 11th, 1993, and with North Korea on June 25th, 1975.

☐ Trade scale with Korea amounts to approximately (2012 standards) with exporting items such as synthetic resin and automobile and importing items such as copper, aluminum, etc.

☐

[Table 7] Mozambique-Korea Trade Scale

Category	2010	2011	2012	Major Products
Export	34,536	40,986	44,025	Synthetic resin, automobile, etc
Import	6,340	23,775	66,373	Copper, aluminum, etc

☐ Strengthen Korean government and Mozambique cooperation relations

- In July 2012, MOU for Industrial resources Cooperation with Mozambique's Mineral industry of Mozambique led the selection of Mozambique as our 'Priority Economic Cooperation Country' in November, 2012.
- In March 2013, the Ministry of Trade, Industry and Energy held the opening ceremony of Mozambique supply project pipe network in Maputo with Korea Gas Corporation.
- Ministry of Trade, Industry and Energy plans to make Mozambique the success model of industry·resource cooperation; a big joint dispatch group was sent to local site early in 2013.
- Also in 2013 KOTRA Trade Center was newly established in Maputo to enhance local marketing infrastructure and support launching of Korean corporations; Korean embassy is under preparations to be opened also

Ⅲ. ICT Status

1. ICT Status
2. Backbone Infrastructure
3. ICT Organization
4. Policy

Ⅲ. ICT Status

1. ICT status

1.1 Fixed Network

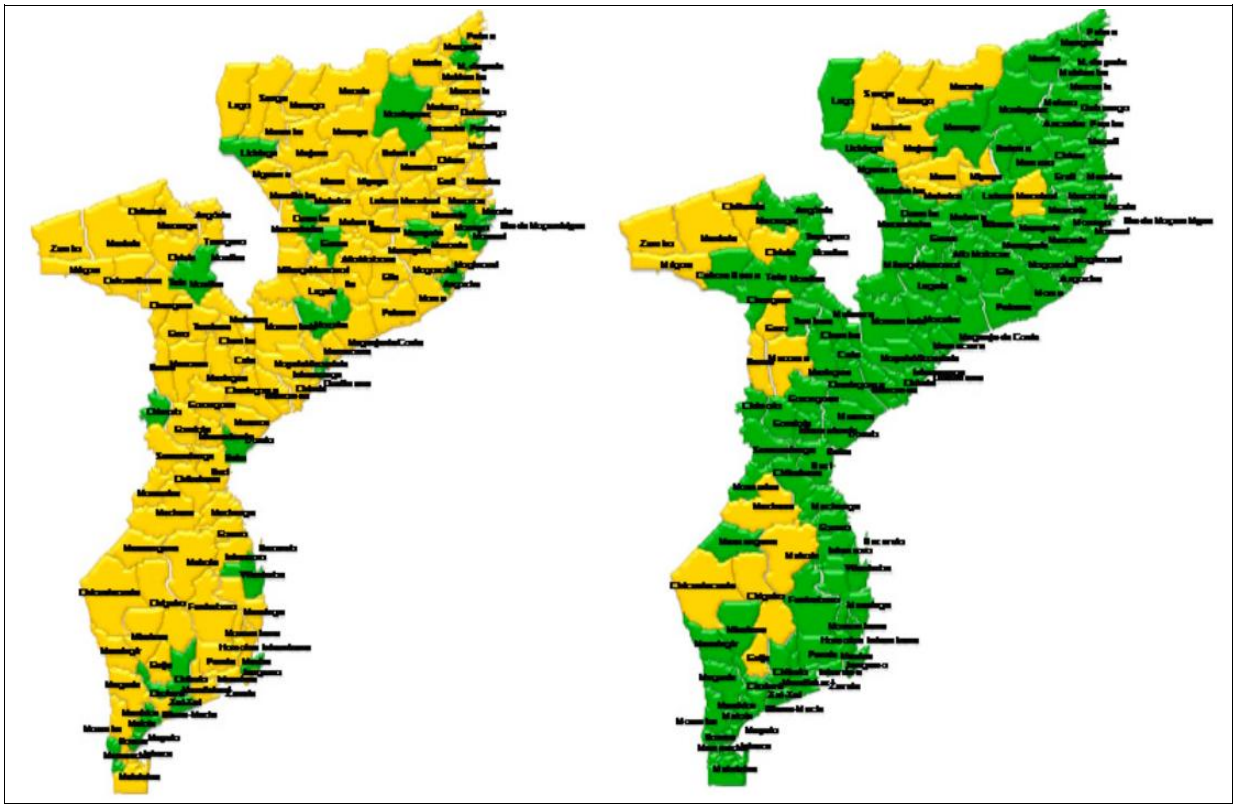
☐ Despite the opening of the Mozambique telecommunication market, government-operated TDM (Telecomunições de Moçambique) is the sole operator of Fixed Network.

☐ ITU data shows that in 2011 there are 88,000 landline telecommunication subscribers in Mozambique, distribution rate of 0.37%

- Wireless telecommunication preference shows steady reduction in subscriber numbers

☐ Currently areas that allow Fixed Network service is mainly around 10 major provincial cities, connected through over/underground fiber-optic cable.

☐ The green in the following figure shows changes in the TDM service region.



[Figure 4] Fixed Network Service Area(1998~2008)

1.2 Fixed-wireless Networks

- ☐ Fixed-wireless network service is provided through a TDM company. CDMA technology is used mainly in regions that do not allow landline services.
- ☐ Technology used in urban areas is CDMA 800MHz, while technology used in the rural area is CDMA 450MHz.
- ☐ CDMA TDM technology is usually used by broadband voice, data, government institution Internet, corporate, etc, especially for out of city region connections.
- ☐ CDMA TDM service provider includes TDM's subsidiary company. Based on WiMAX technology it currently provides services for Maputo, Matola, Beira, and Nampula regions.

1.3 Mobile Networks

- ☐ As of 2011 Mozambique's mobile telecommunication subscribers amounts to 7.86 million, with the distribution rate of 32.83%.
  - In 2010 660,000 more added to the existing 7.2 million mobile telecommunication subscribers - Mozambique's mobile telecommunication subscriber is continuously increasing.
- ☐ As of November 2013, mobile telecommunication businesses include Mcel, Vodacom Mozambique, Movitel, etc.
- ☐ Mcel is the biggest mobile telecommunication business in Mozambique , a TDM subsidiary founded in 1997. It recorded 4.5 million mobile telecommunication subscribers in early 2012, taking up 65% in market share.
  - Mcel not only provides CDMA, ISDN based telecommunication service and pre-paid and deferred paid system services, but also WiMAX technology based the Internet service.
- ☐ Vodacom Mozambique was founded in 2003 and provides Internet and mobile telecommunication services.
  - Vodacom Mozambique is a subsidiary of Vodacom Group. It began the GSM 900/1800 services in 2003.

- As of June 2012, 2.7 million people have subscribed to Vodacom Mozambique's mobile telecommunication service.

☐ Movitel, founded in May 2012, officially began its mobile telecommunication service on May 11th, 2012.

☐ As of November 2013, Mozambique currently does not provide LTE service in the country.

1.4 Broadcasting Service

☐ Mozambique's broadcasting service companies include the national broadcasting company Televisao de Mocambique, satellite TV company TIM, and Radio Mozambique cable TV company Cabo TV

- Televisao de Mocambique, founded in 1981, provides broadcasting services to the whole country. At the time of its establishment it only provided broadcasting service every Sunday; but since 2001 it began to provide national satellite service as well.
- Mozambique's satellite TV business involves TIM and Record Mozambique.
- Cable TV company TV Cabo provides broadcasting service to Angola and Mozambique. Mozambique has 60 international channels and subscribers from Maputo and Beira.

[Table 8] Broadcasting Service

Category	Major Businesses
Groundwave TV	Televisao de Mocambique
Satellite TV	Televisao de Mocambique, TIM, Record Mozambique
Cable TV	TV Cabo

2. Backbone Infrastructure

2.1 Domestic Infrastructure

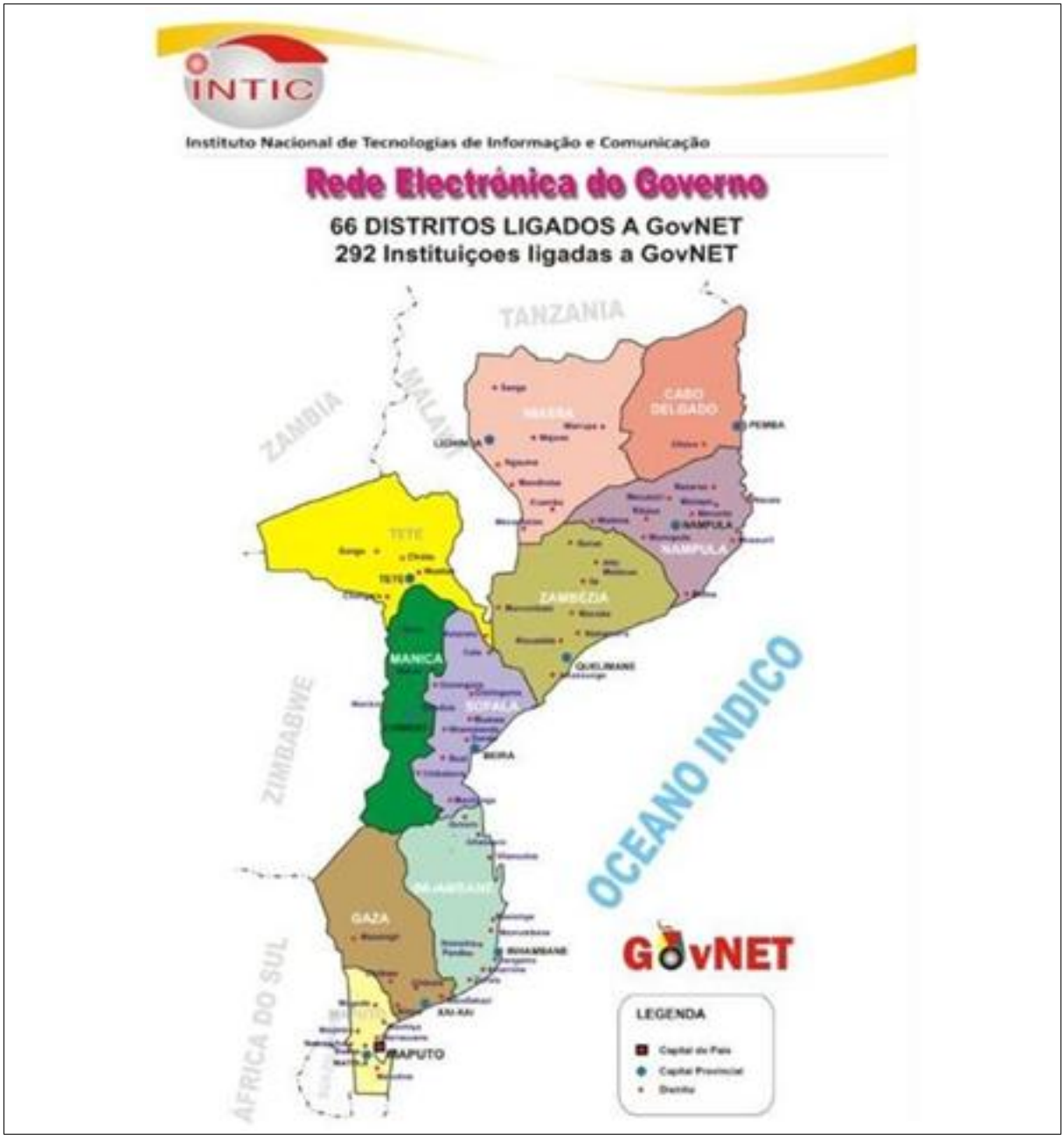
☐ TDM

- Mozambique's national backbone infrastructure belongs to TDM - with overground and submarine fiber-optic cable, wireless and VSAT system, it services all of Mozambique.
- Infrastructure construction for broadband telecommunication began its service in 2000, with the submarine fiber-optic cable that connected Maputo and Beira. Currently it connects 10 major cities of Mozambique.

[Figure 5] National Backbone Network

☐ GovNet

- INTIC's plan that took effect since 2004 to connect the capital city where government institutions reside, with other regional cities with the support of Italian government and World Bank.
- Until 2010 it connected the hardware, software, networks needed in 5 institutions located in provinces; as of 2013 it is expanding to 128 cities in Mozambique.



[Figure 6] The GovNet Network

2.2 International Infrastructure

□ SEACOM

- Mozambique is connected through SEACOM, the first fiber-optic cable network, and before SEACOM network it used VSAT telecommunication or Republic of South Africa's overground fiber-optic cable.
- In July 2009, it connected East-African region countries such as Djibouti, Republic of South Africa, Tanzania, Kenya, and Mozambique to Europe and Asia.

[Figure 7] SEACOM Submarine fiber-optic Cable

□ EASSy

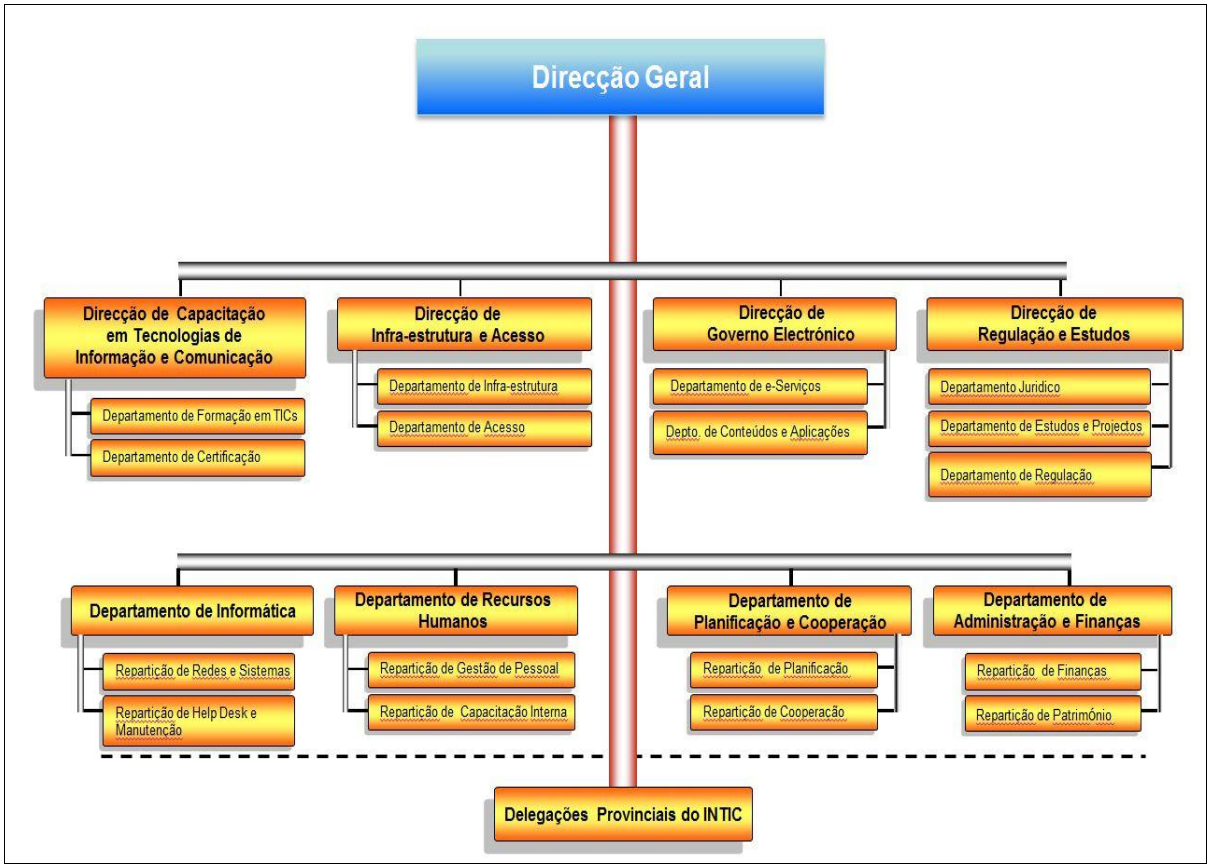
- In November 2009 EASSy(East African Submarine Cable System) officially began providing service in Maputo City.
- EASSy service provides 4.82TBbps in capacity; it has the goal of connecting the Republic of South Africa, Mozambique, Madagascar, Comoros, Tanzania, Somalia, Djibouti and Sudan, and other mainland countries
- EASSy Cable is a submarine fiber-optic cable that directly connects East-African region, Europe, and North America.

[Figure 8] EASSy Submarine fiber-optic Cable

3. ICT Organization

3.1 INTIC (National Institute of Information Technology and Communication)

- ☐ Overseeing institution for Mozambique ICT policy, founded in 2002.
- ☐ INTIC was founded on December 26th, 2002, to enhance Mozambique's ICT policies; it used to back up The Committee for the ICT Policy which was eliminated in March 2007.
- ☐ The former body of INTIC was The Technical Unit for the Implementation of the ICT Policy (UTICT).
- ☐ In 2006 UTICT completed certification from The Committee for the ICT Policy on their guidance and information document for e- government strategy for each government official.



[Figure 9] INTIC Organization

☐ Role of INTIC

- Information communication related technology support for all Mozambique institutions
- Constructs information communication related cooperation
- Regulation cooperation with National Communication Institute of Mozambique (INCM)
- Suggest legal regulation for safety assurance and activate monitoring
- Executes project and program to realize ICT policy

☐ Vision of INTIC

- National Information Communication Technology Agency regulates human resources, supports technology and finance, etc, and also regulates ICT policy

3.2 MTC(Ministry of Transport & Communications)

☐ Institution to establish Mozambique information communication industry policy and strategy.

☐ Founded after the July 26-29 Mozambique Cabinet Meeting of 1975 certified Transportation and Telecommunication Department as an independent institution.

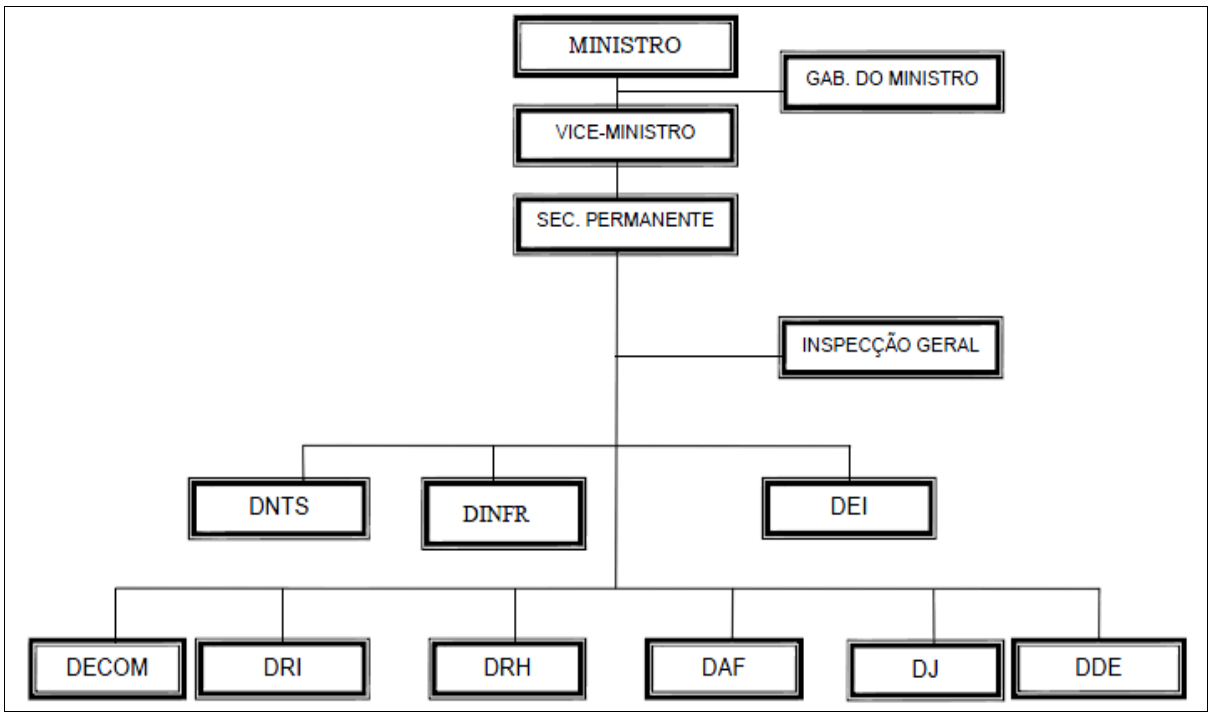
☐ Transportation and Telecommunication Department requires the following for the institution's development.

- Transportation development for the improvement of population and production
- Transportation plan for agricultural organization
- Transportation development plan to improve relations with the public
- Prevent accidents
- Safety securing in all transportation environment
- Expand postal and telecommunication service organization network

☐ Vision

- Information communication development is sought after to expand community and satisfy quality of life, with the goal of establishing information communication industry policies and executing related strategy for social-economic stability.

☐ Organization Status



[Figure 10] MTC Organization

3.3 INCM (National Communication Institute of Mozambique)

☐ Institution for Mozambique's information communication policy and regulation implementation.

☐ INCM, founded in November 2001, is a regulatory institution that monitors and regulates telecommunication and conducts frequency broadband management and other operations.

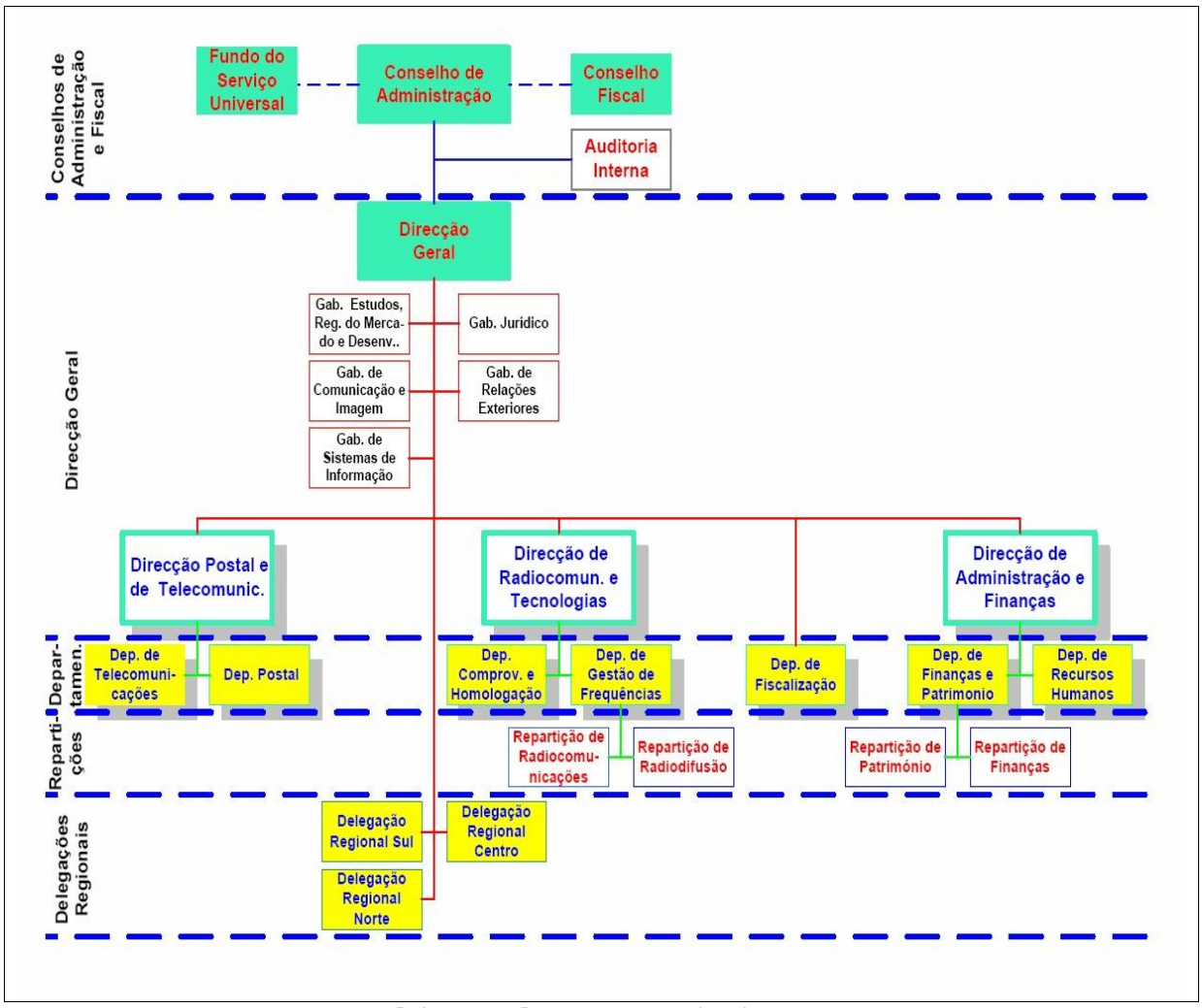
☐ INCM currently has 100 employees, with headquarters in Maputo and branches in Riverside and Nampula.

☐ Mainly handles Mozambique's frequency management and monitoring and regulates information communication and related industries.

☐ Vision

- The major characteristic of INCM is the fusion of information communication technology, with the goal of realizing various aspects of new development realities and law.

☐ Organization



[Figure 11] INCM Organization

4. Policy

4.1 Communication Regulation Policy

☐ Mozambique Communications Act 2004(revised) took effect on July 21st, 2004, and the revision focuses on the following areas

- Broadcasting and TV contents
- Network, communication service
- Communication and radio
- Postal service

- Tax policy

☐ Revision stipulates minimization of regulations in major fields, especially with the goal of cultivating and developing ICT distribution competition structure

☐ Government tries to create a competitive environment in the telecommunication business through license issuance, and in the past have issued licenses and developed market to enter the mobile telecommunication market, leading license issuance through 3rd party telecommunication corporation under government leadership

4.2 Frequency License Requirements and Expiration Period

☐ License Requirements

- Businesses that wish to acquire frequency license should be a valid legal business of Mozambique.

☐ □ Expiration Period and Renewal

- License is valid for 5 years and can be renewed for the same amount of time
- License renewal can be made according to relevant items and conditions after confirming of their implementation on mandatory required by telecommunication regulation institution
- Registration is valid for 3 years and can be renewed for the same amount of time
- renewal can be made after confirming of implementation on mandatory under the conditions of the telecommunication regulation institution.

☐ License Cancellation

- Frequency license, license, etc may be cancelled if the same business applies for the frequency license
- Request for frequency license cancellation is due every year, June 31st from a frequency broadband regulation institution; if this request is not made a frequency broadband charge will be made.

Ⅳ. Technology Analysis

1. Requirement Analysis
2. Current System Analysis
3. SWOT Analysis
4. Benchmarking

Ⅳ. Technology Analysis

1. Requirement Analysis

1.1 Requirements

1) Maputo City's Status and Problems

- ☐ Waste collecting is inadequate and as a result there are lots of related civil complaints
- ☐ Each district office has staff making in-person reports to the City Hall
- ☐ Claim and civil complaint reception requires citizens to make personal visits to country office, district office, and other related institutions. Some claims allow telephone reception but most of them are processed through personal visits
- ☐ Lack of waste processing facility and manpower. Most facilities were received through international aid (truck, tractor) and it is difficult to receive maintenance works upon any breakdowns
- ☐ Civil service processing takes quite a number of days and the citizen is not able to find out about the processing status but has to make visit around the estimated service completion time

2) Waste Processing System Related Requirements

- ☐ System that can integrate and manage the 3 independent systems used in waste processing department is needed (solid waste management system, waste department HR management system, waste emission measurement system)
- ☐ Waste collecting company's waste collecting status monitoring function requested
- ☐ Additional waste transport facility(truck) maintenance system requested
- ☐ System that automatically calculates amount of waste emitted to dump site for accurate calculation of cost for each contracted company is needed

3) Claim Related Requirements

- ☐ Request for a system that allows easy reception and processing of claims
- ☐ Automatic transfer to related department and processing to related department of claims upon reception is required as well as a system that provides processing status and results
- ☐ Request for a system for an integrated management of all waste related claim and claims in other areas as well as civil work
- ☐ Request system configuration that allows connection to city police station claim reception system developed as a pilot program to city police station
- ☐ Function that allows connection to work system for each department for land, building, tax, transportation, city police, etc, is needed

4) Other Requirements

- ☐ Request for systemization of cemetery management that is handled manually by the SWM department's Cemetery Department. Cemetery management system should be connected to the system that manages the deceased.
- ☐ Additional waste outlets on SIGEM GIS Map requested
- ☐ Request for system configuration that can be connected to SIDUC's claim and civil complaint reception

1.2 Project Scope Analysis

- ☐ As there are many requests from the Maputo City and there are many systems related to this project, project scope to be built in 1st stage needs to be determined.
- ☐ Inclusion status of this project for Maputo City's each requirement is shown below

[Table 9] Requirement Analysis of Maputo City

Category	Requirements	Inclusion Status	Description
Claim processing	Integrated claim reception window	O	call center and portal construct
	Realization of claim processing system	O	Staff web system development
	Reception of all claims	△	Limited to waste related claims
	Reception of all civil service claims	X	Delayed for future projects
Waste processing system	Integration of systems in existing departments	O	DB integration &Re-development in web base
	Solid waste management system	O	Re-development in web base
	Waste emission measurement	O	Re-development
	Waste collecting monitoring function	O	New development
	Waste vehicle maintenance	O	Package purchase
	Provision of Internet civil service	△	Some applicable service realization
SWM department	HR management system connection	O	Re-development in web base
	Cemetery management system development	O	New development
System connection	City police station's claim reception system	△	Claim reception detail transfer
	Land management system(SIGEM)	X	Delayed for future projects
	Building management system(SIDUC)	X	Delayed for future projects
	TAX System	X	Delayed for future projects
	Transportation department	X	Delayed for future projects
Others	Waste outlet added on the land management system(SIGEM) GIS Map	O	GIS map correction

1.3 Review Connection Possibilities with Existing Work System

- ☐ Maputo City Hall department uses its own small, stand-alone type application system.
- ☐ Most systems have the Access DB installed on personal PC, which makes connection impossible. In such a case DB should be integrated or be replaced with DB that allows connection, then the system needs to be re-developed.
- ☐ Land management system (SIGEM) and building management system (SIDUC) is relatively big in size compared to other systems, and uses DB that permits external connection.
- ☐ However, there is a problem of having to correct parts of the existing system for connection. This goes outside the project scope; sufficient analysis is required for connection and integration.

2. Current System Analysis

2.1 System Configuration

1) Waste Processing System

☐ Maputo City's waste processing department, SWM is in charge of establishment, management and monitoring plans for all waste processing of Maputo City.

☐ SWM operates solid waste management system as its management system.

☐ Major functions of the solid waste management system are as follows

- Cleaning company and waste production company registration
- Cleaning company license issuance and management
- SWM and waste production company's waste processing contract
- Issuance and approval of waste related bill
- Statistics and reporting function

☐ SWM's solid waste management system uses Access DB; 3 PC share data, with access control function realized for each type of work as the C/S environment application program.

☐ There is no connection to external system, no function for the citizen to make direct connection, only constructed and operated as the responsible public officer's work system.

☐ Solid waste management system was developed through consignment, by a local S/W company in Mozambique.

☐ Major SWM works that require system management is realized in the solid waste management system, used to assist manual work.

☐ There are plans to realize all future works into the system.

SWM Building

SWM Equipment

Register Office

Register Office

[Figure 12] SWM Office

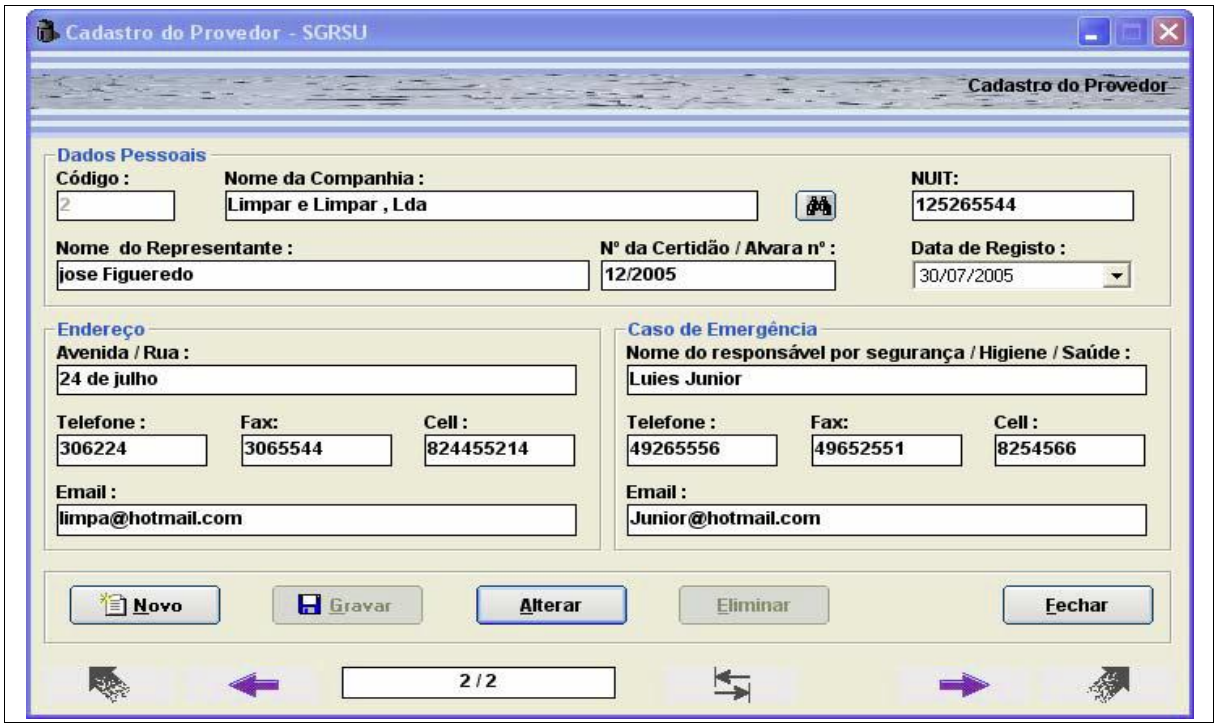
[Table 10] Requirement Analysis of Maputo City Hall

Menu	Sub-menu	Functions
File	Configuration	Parameter setting
	Table	Record provider parameters (minimum, maximum ton) Set container type Set waste type
	Password Change	Change to new password
	Log off	Log-off
	Finish	Finish program
Registration	Provider	Provider registration
	GPRSU	Big size waste producer registration
	Accounting	Tax registration

Process Management	Request	License request, complaint request, update request, cancellation request
	Test	Test request and license
	Dispatch	Dispatch management
	License	Designate/suspend provider license
	Contract	Sign contract with big size waste producer(emission quantity, removal date)
	Service Certificate	Certify service description
	Change status	Change contract status
	Update	Renew contract description
Fine	Provider	Manage provider fines
	Big size waste producer	Manage big size waste producer fines
Payment	License	Pay license fee
	Cleaning fee	Cleaning fee management(GPRSU,
	Contract	Manage payment upon contract
Report	License	Provider license information
	Big size waste producer	Big size waste producer information
	Approval	Report license, cleaning fee, contract related payment information
	Contract	Report contract information
	Debt	Report unpaid contract, license, cleaning fee information
	Invoice	Report contract, license, cleaning fee bill
	Invoice issuance	contract, license, cleaning fee invoice occurs
	Deposit / Advance	Contract deposit, cleaning fee deposit
Manager	Access level	List management, user authority management
	Back up and restoration	File back up and restoration

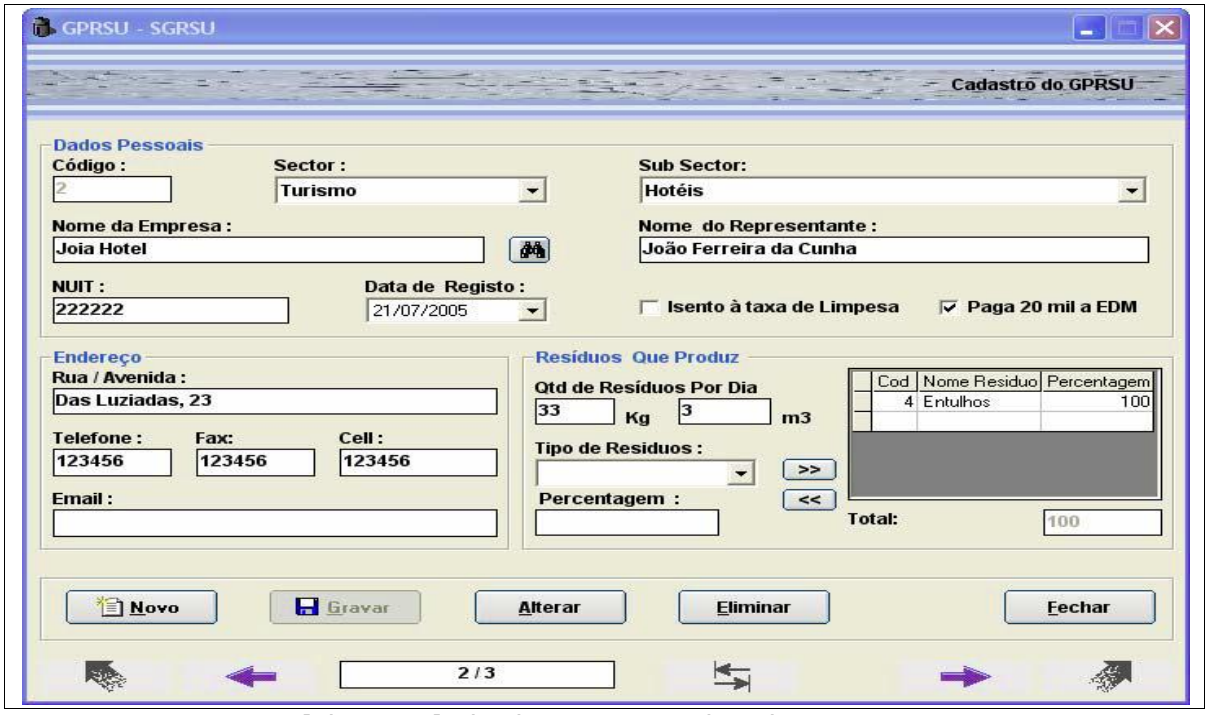
☐ Maputo City requires making a provider(cleaning company) registration request on SWM and then obtaining a cleaning license to work as a cleaning company.

☐ [Figure 13] provider registration screen requires information such as company name, name of person in charge, business number (NUIT), address, contacts, etc be inserted.



[Figure 13] Provider Registration Screen

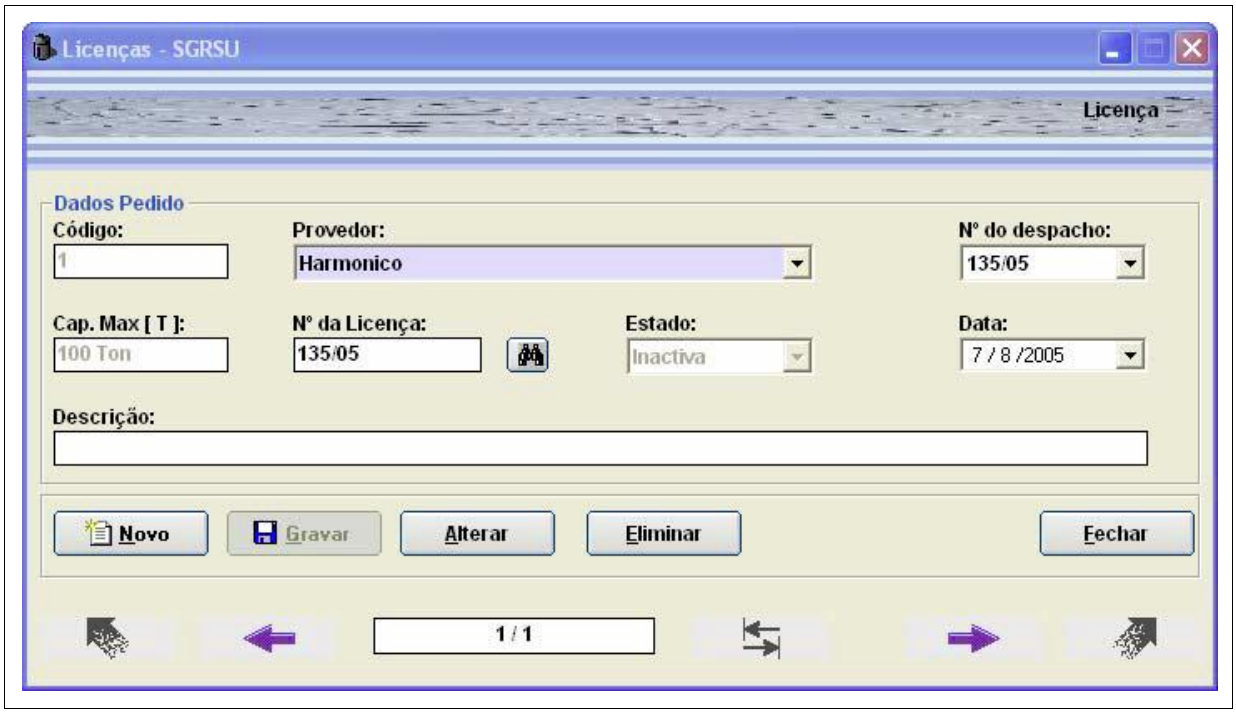
☐ The below figure is the insertion screen of a big size waste producer; which requires project field, company name, business number, name of person in charge, address, contact, waste type, and waste emission amount.



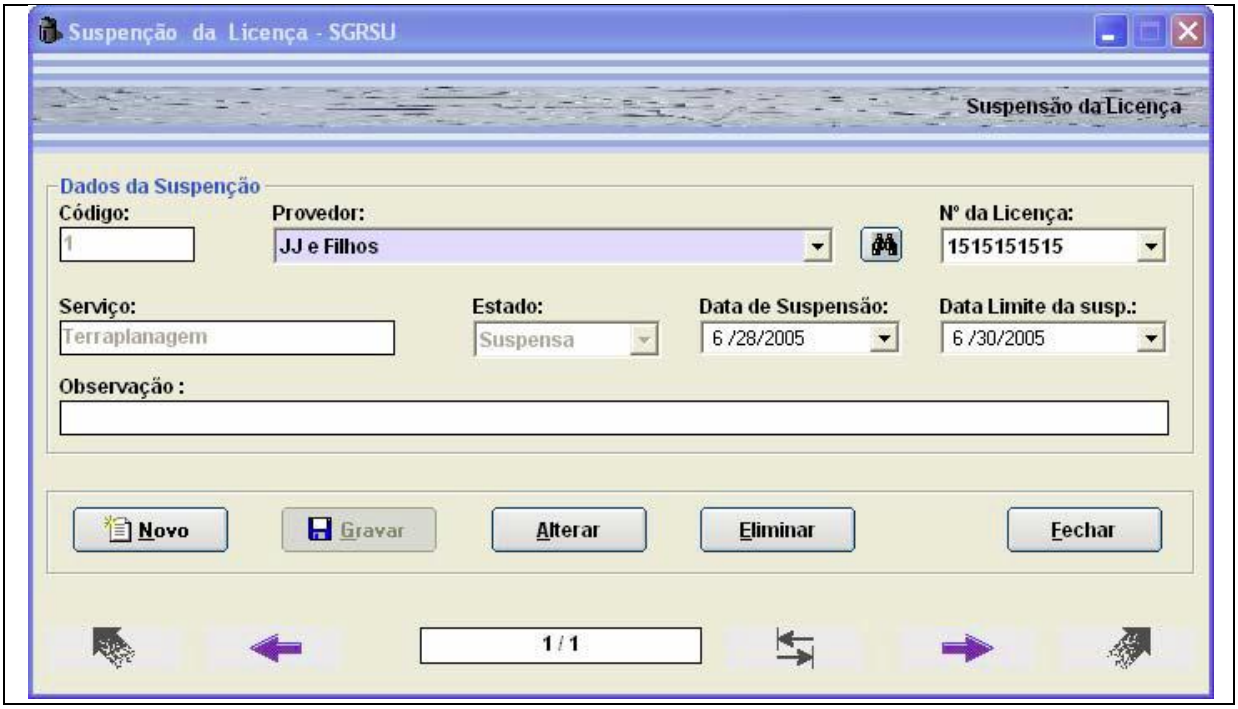
[Figure 14] Big size Waste Registration Screen

- [Figure 15] is the registration screen for cleaning company upon requesting license; provider, service field and maximum processing quantity is input after selecting provider (cleaning company) and area of service.
- Upon license request, SWM deliberates and determines whether license is issued or not.
- If the requested license is approved license issued to the provider. And as [Figure 16] shows, license designation screen requests information such as provider name (cleaning company), license number, issuance date, etc is input. Cleaning license is renewed in 1 year cycle after evaluation.
- If any reason to cancel license occurs, provider can be searched and selected as [Figure 17] shows and suspension date can be inserted to suspend license efficacy.

[Figure 15] License Screen

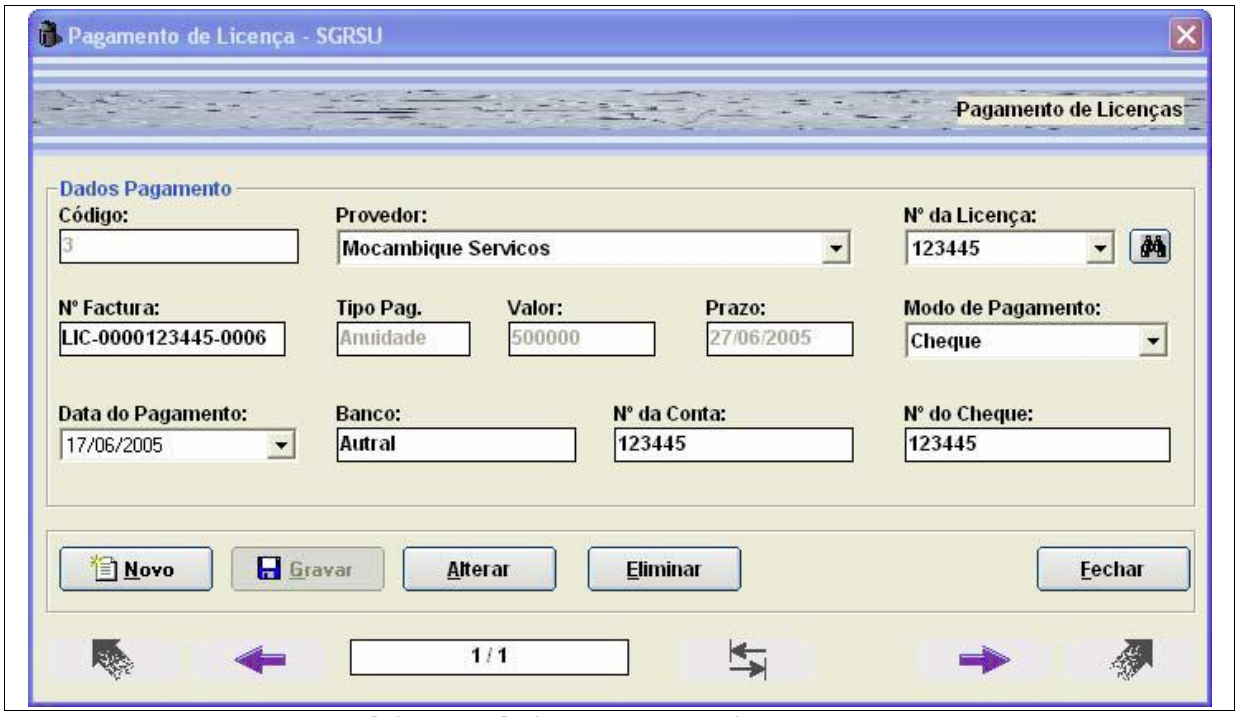


[Figure 16] License Designation Screen



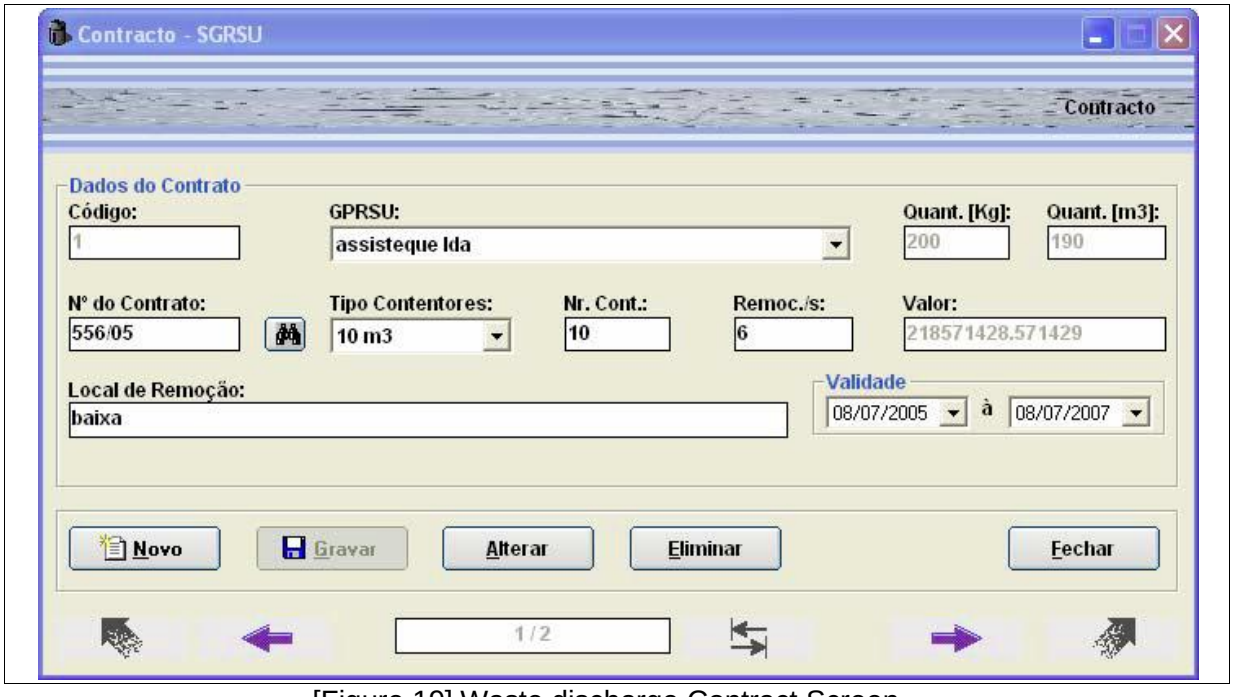
[Figure 17] License Suspension Screen

☐ The below figure is the license approval screen, for one to input provider name (cleaning company), license number, request number, payment method, payment date, bank, account number, and check number.



[Figure 18] License Approval Screen

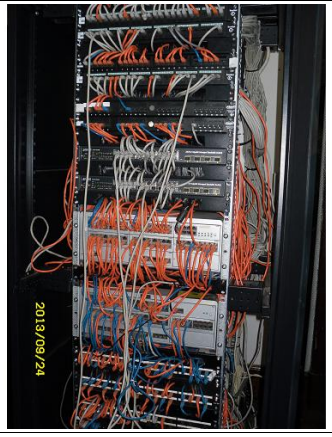
☐ The below [Figure 19] shows the registration screen for SWM and waste discharge contract, requesting information such as company name, contract number, emission quantity, contract period, collection spot, etc.



[Figure 19] Waste discharge Contract Screen

2) Claim and Civil Complaint Portal

- ☐ Maputo City Hall operates City Hall homepage to introduce administrative services to its citizens.
- ☐ City Hall homepage includes details on civil complaint service and request process for different types, with available format for download.
- ☐ However it is not yet available for direct claim/service reception online.
- ☐ There are plans to use the City Hall homepage as a civil service portal in the future.
- ☐ City Hall Computer Center is composed of main server, back-up server, and SAN storage facility. Virtual machine solution is attached on the main server for DNS, Mail, homepage, and DB services.

<table>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>Maputo City Home page</td><td>Complaints/Claim Page</td></tr>
<tr><td> 
</td><td> 
</td></tr>
<tr><td>Maputo City Server</td><td>Maputo City Network Equipment</td></tr>
</table>

[Figure 20] Maputo city Homepage and IT Equipment

3) Land Management System(SIGEM)

☐ Mozambique's Land Management Policy

- Mozambique government holds ownership to all the land in the nation; when leasing the land for living purposes the lease period is indefinite; for business purposes it is for 50 years
- Land lease is subject to designated tax according to lease purposes and area.
- Construction must begin on leased land within 2 years of land lease application; if not, leased land will be reclaimed. Depending on the case it may be extended twice (1 year, 6 months)

☐ Introducing Land Management System

- Land management system is a land ownership management system that uses the Maputo City GIS map as foundation
- Arc Map is used on ArcGIS 9 version (construction company ESLI)
- If the land is already in possession, registration is made on system after reviewing geographical and other legal matters on the land already in possession
- ◦ When land is newly requested the department in charge arbitrarily selects appropriate site on GIS map and then registration is conducted after going through legal process with the applicant (applicant cannot select desired site)

☐ Land Management System Operation Status

- System operation staff include 1 in IT System, 2 in GIS, and 2 in Cartography
- Currently around 100 PCs are in operation in the department, among which 10 of them are always connected to the SIGEM system
- There is a small Computer Center with 7 servers in operation (Web server, Storage server, DB server, DMZ server, Process, etc)

☐ Future Plans

- In relation to SIGEM development the current phase is at Phase 1(pilot project); within 2~3 months Phase 2 will commence
- Major works in Phase 1 include creating data on underground facilities such as land, infrastructure(road, water work, electricity, gas, etc) (World Bank, 1.5Million US$, 2 Years Project)

- Phase 2 will conduct project to mark and manage Maputo City billboard, solid waste container location, dump site, etc
- It is currently connected with the building management system SIDUC system with fiber-optic cable but data connection is yet to be made. SIGEM and SIDUC data connection is being planned.

<table>
<tr><td>  </td><td> 
</td></tr>
<tr><td>SIGEM Building</td><td>SIGEM Plate</td></tr>
<tr><td> 
</td><td>  </td></tr>
<tr><td>SIGEM Office</td><td>SIGEM Server</td></tr>
</table>

[Figure 21] SIGEM Office and Equipment

4) Building Management System (SIDUC)

☐ Introducing the Building Management System

- SIGEM sub-system that manages Maputo city buildings
- SIDUC Project was aided by USAID - with 27 computers (Desktop, Laptop) and 2 servers (Server specification: Window 7, 2TB, 8GB Memory)
- Currently operated as a pilot project; to be officially carried out from October 15th

☐ Building Management System Operation Status

- There are 4 internally operated servers - Antivirus, Firewall, SIDUC Main, and SIDUC Backup
- There are 38 internally operating PCs. In the future all PCs shall be allowed to connect to Internet with WiMAX technology

☐ Future Plans

- Future system construction shall be composed so that construction permit can be processed offline and online, with tasks being handled through office networking
- Construction permit work will allow simultaneous processing of civil services, and it will also allow future civil services to be reported online
- Project is being planned so that all Maputo City work are handled through Maputo City Hall homepage(www.cmmaputo.gov.mz)

	
SIDUC Building	**SIDUC Workstation**

[Figure 22] SIDUC Office

5) City Police Claim Reception System

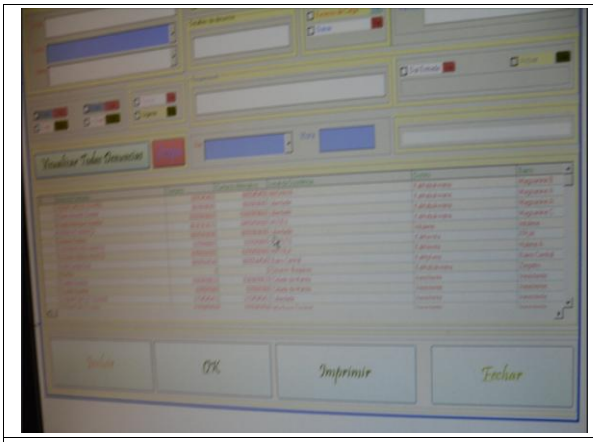
☐ Introducing the city police station

- Manages and processes all claims made on violation of law in Maputo City
- Unlike national police force they are employed by the city, trained in police forces, and designated to city police with the purpose of establishing city administration order.
- City police station has a Police Office per district with a separate HQ (Office: 6, HQ: 1)

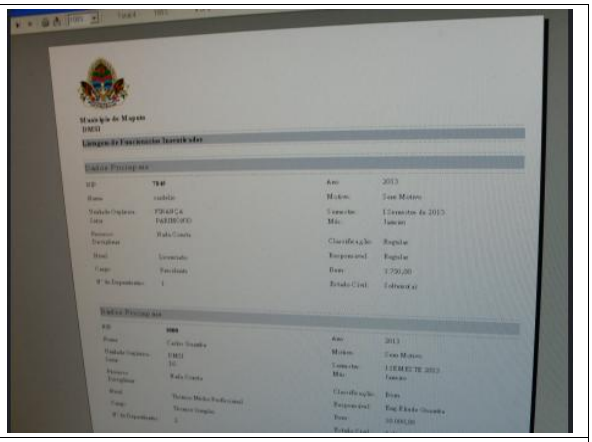
- Internet is not connected yet; nor is the N/W between HQ and Police Office composed.

□ Introducing City Police Station Claim Reception System

- Civil complaint reception can be done by visiting the police station, or via telephone call or text. All data are manually recorded while a computerization pilot project is underway.
- City Hall made a pilot program with the city police station's claim reception program, for a trial operation in the city police station HQ
- Upon receiving a civil complaint, it is first logged in the management log and then registered to the system
- Stand alone type program that can be developed by Maputo City Hall development team with Visual Studio 2008 C#, Mysql
- Reception and reporting function for different types of claims are provided
- Future expansion into Police Office is being planned



Claim List



Claim Report

[Figure 23] City Police Claim/Complaints Screen

□ Reviewing Connections to this Project

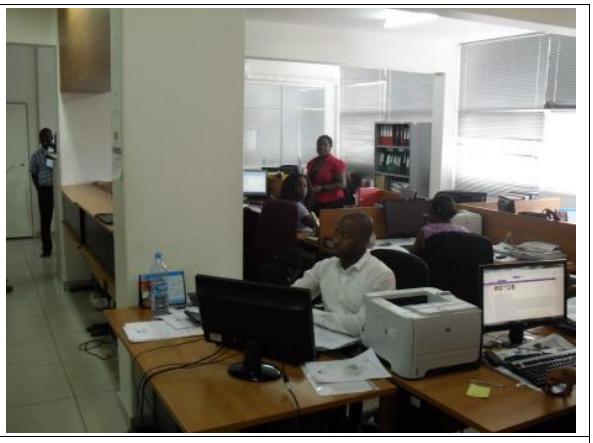
- System that can make integrated management for all claims and processing of City Hall(waste processing) and police station is requested
- If the reported claim is related to numerous departments, system that sends each institution notification of the claim description for cooperation and quick processing is requested.

- For example, if a waste related claim is made for something blocking the road, SWM quickly handles the waste while city police station charges fine and orders correction on any illegal matters
- As monthly claim processing performance is reported to City Hall in paperwork, automatic reporting function is required for the future system.

6) TAX System

- The most frequent claims are those made against real estate taxes.
- Upon TAX default the defaulter is notified of the payment; if the tax is still unpaid afterwards related information is transferred to the Ministry and tax is charged with additional fee.
- Maputo City Hall and Ministry does not share related information and work
- Tax payment reports are done daily/weekly/monthly to City Hall
- It is constructed in Stand-alone method, which allows individual system for different type of tax exists for taxation.

Tax Office Plate



Tax Office

[Figure 24] TAX Office

2.2 Work Process

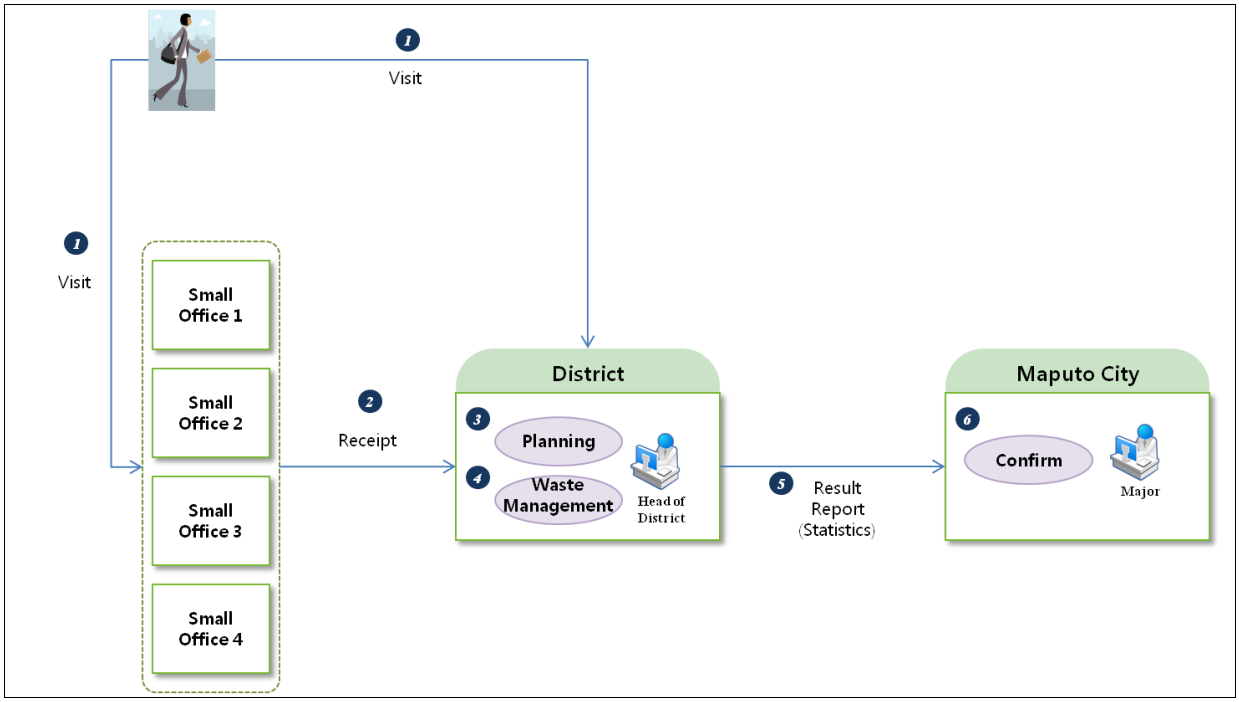
1) Waste Related Claim Processing

- ☐ Waste related claim processing is usually conducted by the district office. District office has the facility and manpower for claim processing.
- ☐ SWM takes care of big size waste claims that cannot be processed in district office.

☐ Among all 7 districts, aside from Inhaca and Catembe, 5 districts near the City Hall can make requests to SWM to process claims they cannot handle on their own

☐ District office waste claim processing process

- Citizen can make direct request by visiting the country office or the district office. Simple items can be done over the phone.
- As the country office does not have waste processing facilities, received claim is transferred to district office
- District Office considers priority claims and establish plan for resolving them; while processing the waste with facility at hand(truck, tractor)
- Received claims are regularly reported to City Hall
- Waste related major claims are shown in the below [Table 11]



[Figure 25] District Waste Claim Process

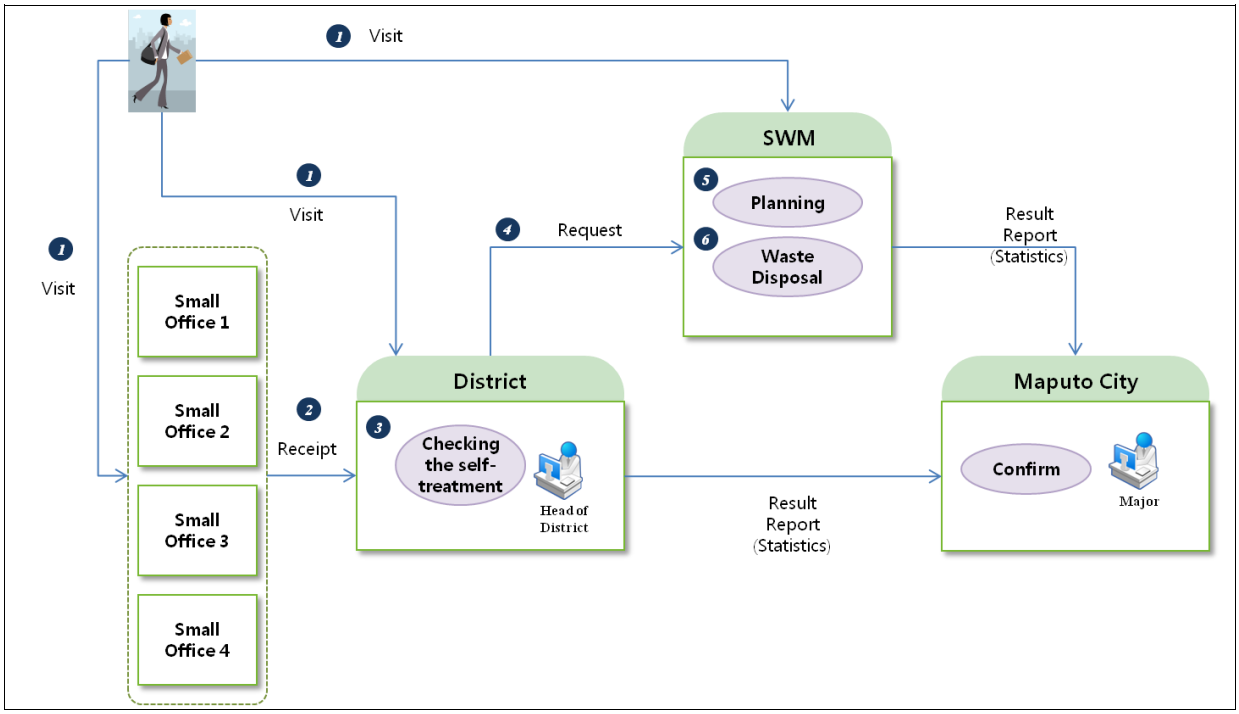
[Table 11] Type of Waste Claim

Claim Type	Description	Notes
Branch cutting	Request to cut branches on roadside trees	
Road clearing	Request when there is something blocking the road	

Uncollected waste report	Reported when cleaning company does not collect waste on designated date	
Waste collection request	If special type of waste is produced for personal reasons, request processing. This will be charged with tax	

☐ SWM Waste Claim Processing

- Citizen can request claim by visiting or calling the country office or District Office, or directly to SWM.
- If any claim received by District Office seems impossible to be handled on their own, processing is requested to SWM
- SWM establishes processing plan and processes waste accordingly
- Makes regular claim processing result reports to City Hall



[Figure 26] SWM Waste Claim Process

2) SWM Work Process

☐ Maputo City's waste department, SWM, is responsible for establishing, conducting, and monitoring waste related plans.

☐ Major SWM works include cleaning company license management, waste outlet business management, waste processing related contract and selecting district office cleaning company, etc.

☐ SWM charges and manages all waste related tax.

☐ Cleaning company license process

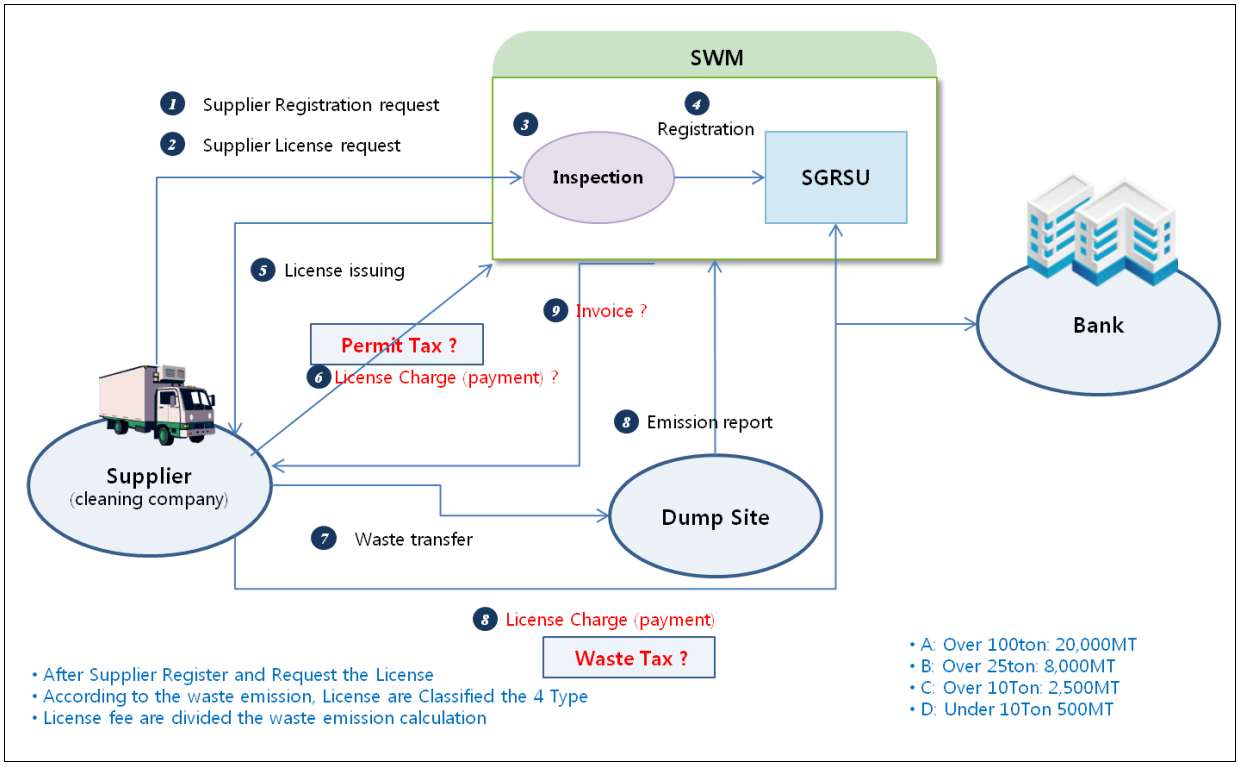
- Maputo City requires one to obtain license to collect waste and emit in dump sites. License is categorized in 4 levels depending on the emission quantity. As the following table shows yearly tax payment is required.

[Table 12] Cleaning Company License Level

Level	Emission Quantity	Tax
A	More than 100 ton	20,000MT
B	25 ~ 100 ton	8,000MT
C	10 ~ 25 ton	2500MT
D	Less than 10 ton	500MT

- License issuance process is as follows
  - Cleaning company should first be registered on SWM
  - Registered cleaning company may request license
  - SWM evaluates validity of requested license and makes final decision on issuance
  - When license is approved license information is registered on the waste processing system(SGRSU)
  - License is issued to cleaning company
  - Cleaning company pay license cost within designated period
- Cleaning company with license may sign contract with company that emits large size waste and conduct waste collecting and emission works.
- It is also given the chance to be selected as designated District Office cleaning company by SWM.
- After collecting the waste, cleaning company pays tax on the waste based on the monthly emission quantity measured at dump site.
- Waste tax payment process is as follows
  - Cleaning company emits collected waste to dump site
  - SWM dispatch staff manually records waste emission quantity at dump site (there is a weight calculation facility and tax calculation system but it does not work properly)
  - Dump Site reports cleaning company (by truck) emission quantity to SWM

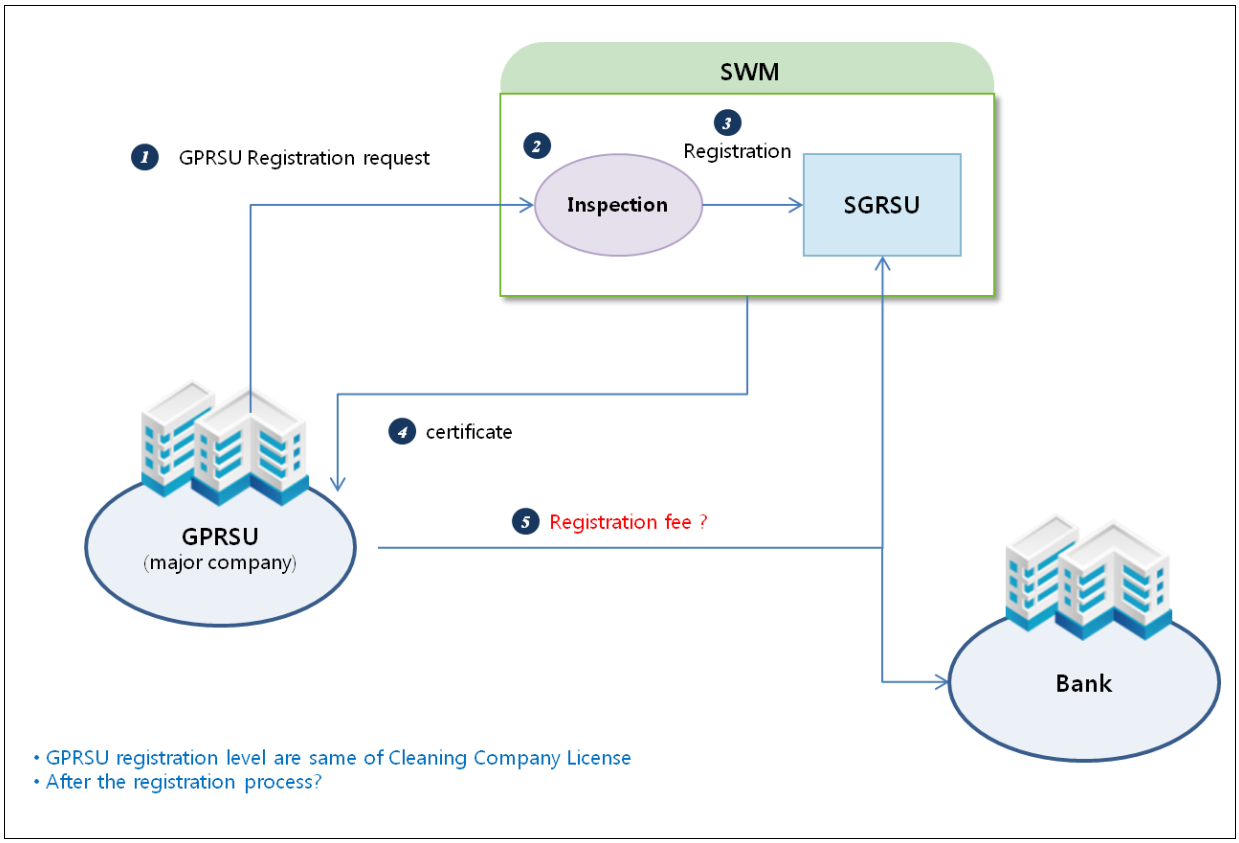
- SWM calculates waste quantity every month and charges the cleaning company with according tax
- Cleaning company pays directly to SWM or to the bank



[Figure 27] Cleaning Company License Process

☐ Big size waste emission company, registration process

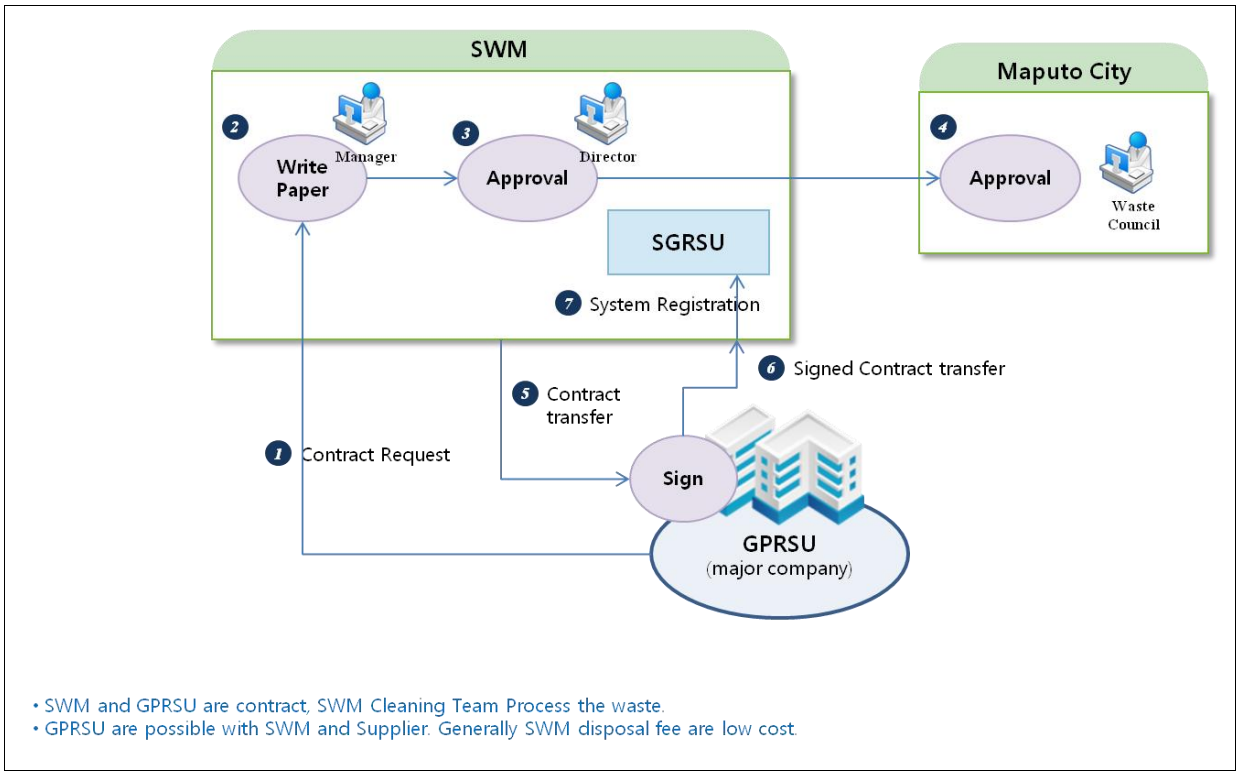
- Hotels, big restaurants, factories, etc, that emit bulk sized waste must register as GPRSU on SWM.
- GPRSU registration process is as follows
  - Request GPRSU registration on SWM
  - After evaluation SWM registers on its system(SGRSU)
  - Registration certificate is delivered to the company
  - Registration fee is paid to SWM or to the bank



[Figure 28] GPRSU Registration Process

☐ SWM and Waste Emission Company Contract Process

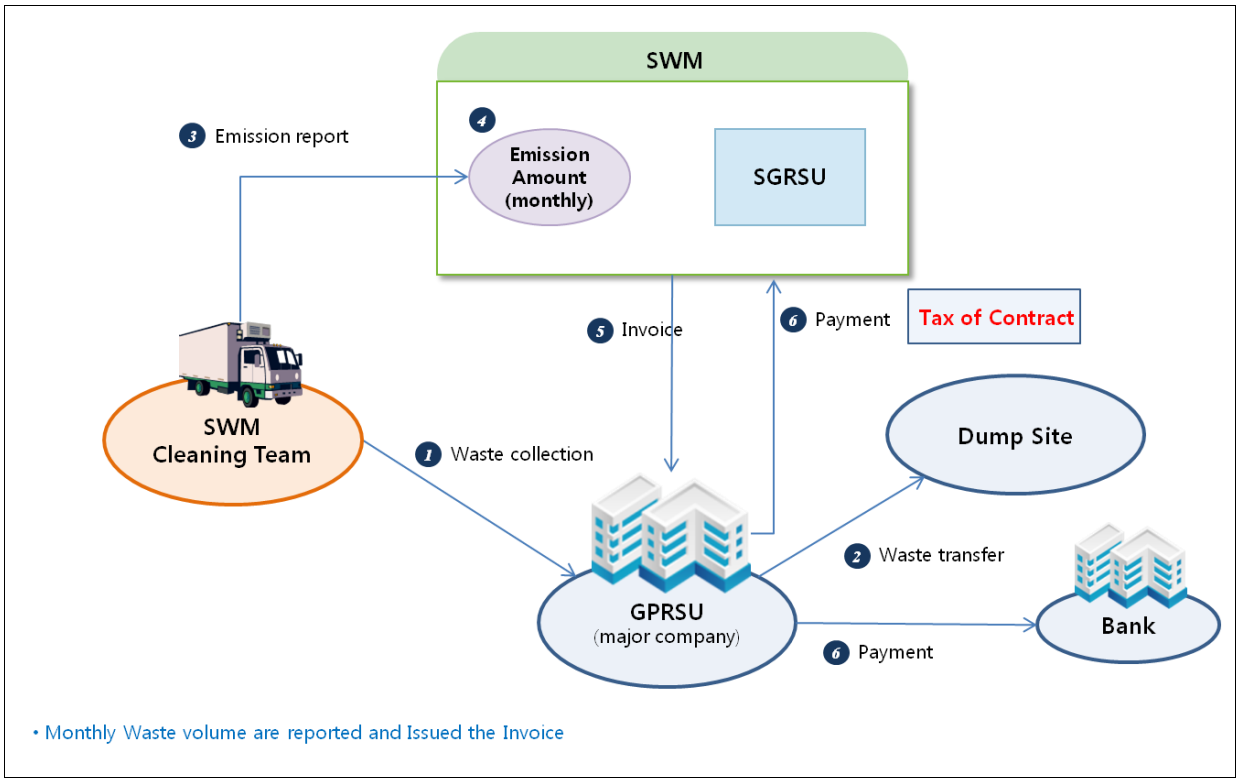
- Waste Emission Company can sign contracts for waste collection and emission with licensed cleaning company or SWM.
- After contract, SWM may use its own cleaning manpower and facility to handle waste. Generally more contracts are signed with SWM, which is cheaper than private cleaning companies.
- SWM and Waste Emission Company's contract process is as follows
  - Waste emission company suggests contract to SWM
  - Person in charge drafts contract document and receives approval from the SWM Director
  - Contract draft receives approval from the city congressman in charge of City Hall waste items, the uppermost person in charge related to the matter
  - Approved contract is sent to waste emission company and is signed
  - Contract signed by the waste emission company is managed by SWM, and registered on the system(SGRSU)



[Figure 29] SWM and GPRSU Contract Process

☐ Contract Approval Process

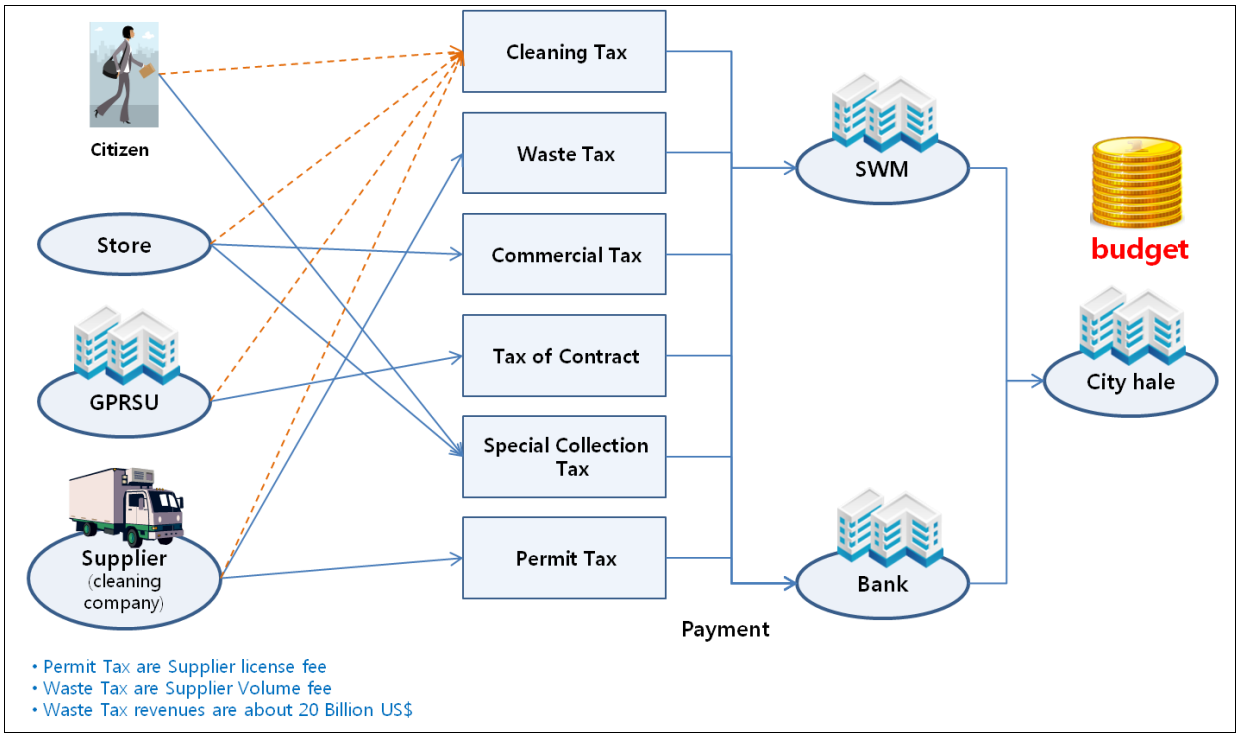
- If under contract SWM's cleaning team collects waste it bills the waste emission company every month for the cleaning costs (Tax of Contract).
- Contract approval process is as follows
  - SWM's cleaning team collects waste from contracted party and moves to the dump site
  - Waste processing is measured every month and company is billed accordingly
  - Company pays SWM or the bank



[Figure 30] Contract Approval Process

☐ Tax managed by SWM

- As the below figure shows, SWM manages 6 different types of tax.
- All tax can be paid directly to SWM or to the bank; total waste related tax income was about 20 billion won in 2012.
- SWM waste management system is realized so that it can manage Permit Tax, Tax of Contract, and Cleaning Tax only.



[Figure 31] SWM Tax

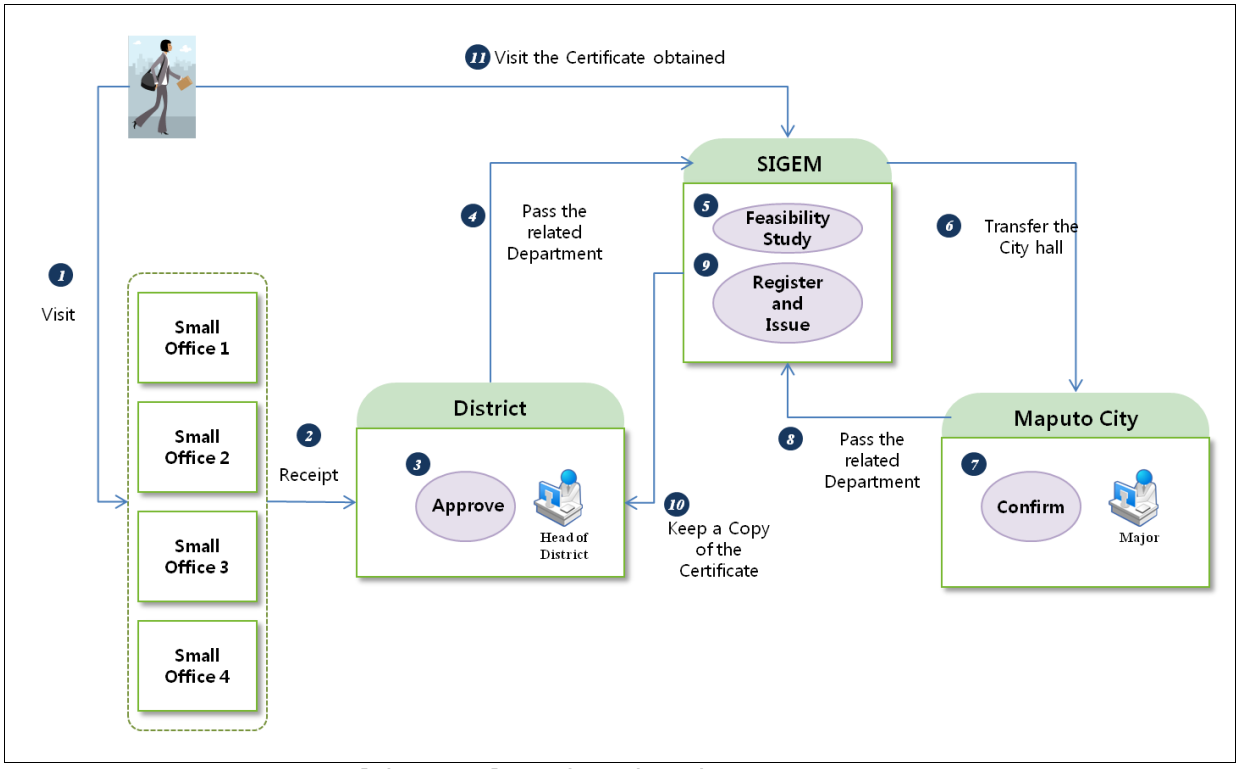
[Table 13] Maputo City Waste Tax

Tax	Description	Payment Cycle	Notes
Cleaning Tax	Mandatory tax for Maputo households and corporate, included in electricity bill	Every month	
Waste Tax	Tax paid by the cleaning company based on waste emission	Every month	
Commercial Tax	Waste processing tax in commercial places such as hotel, supermarket, restaurant, etc	1 year	
Tax of Contract	Tax paid in invoice form, for amount of collected waste	Every month	
Special Collection Tax	Special city waste processing cost Ex) branch cutting	Upon occurrence	
Permit Tax	Automobile issuance tax for dump site transportation Issued only to waste delivery companies - currently 32 companies have been issued	1 year	

3) District Office Work Process

☐ Land Registration Process

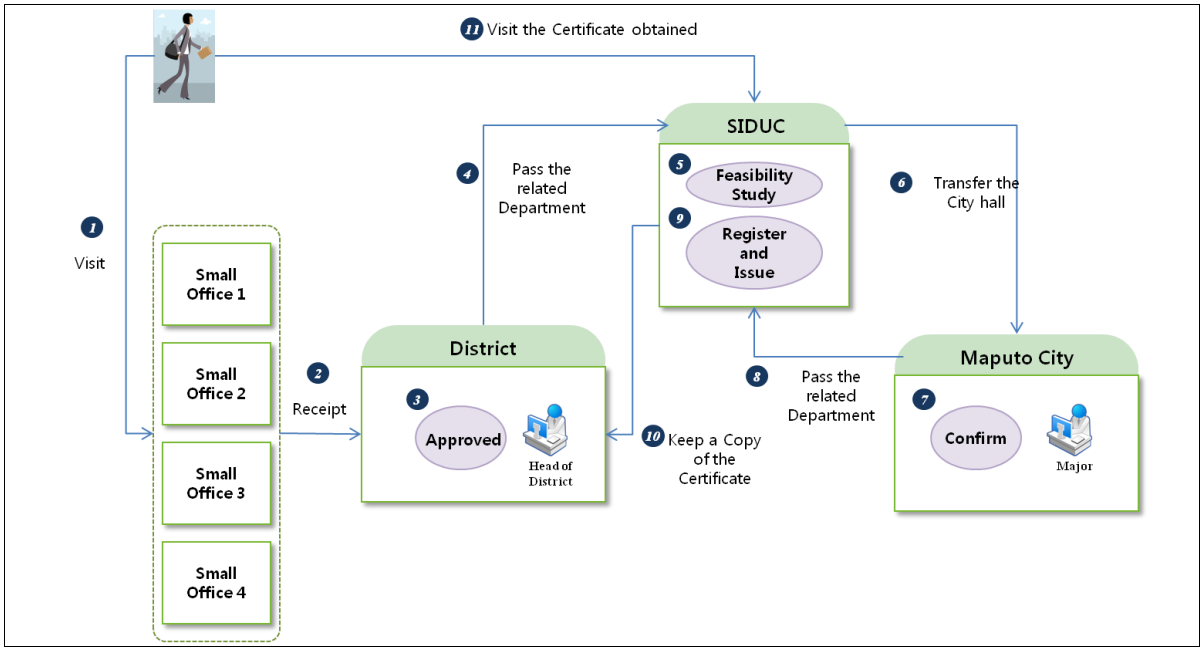
- Process to have and newly assigned is as follows
  - Citizen visits country office and requests land registration
  - Country office transfers received document to district office and it receives the district head's approval
  - District office transfers it to land department
  - Land institution reviews validity and transfers it to City Hall
  - Mayor signs on the final approval and it is transferred to institution in charge
  - Land institution registers the document on SIGEM and issues certificate
  - Copy of issued certificate is transferred to district office to be managed there
  - Citizen obtains land certificate by visiting the land institution
- Civil service processing is within 15 days in principle. Citizen may obtain the certificate 15 days after filing for the service.
- If it is not yet completed upon visit the citizen makes visit 2, 3 days later.
- It is difficult to make a phone call and find out about the processing status; no notification is made to the citizen after civil service is completed.



[Figure 32] Land Registration Process

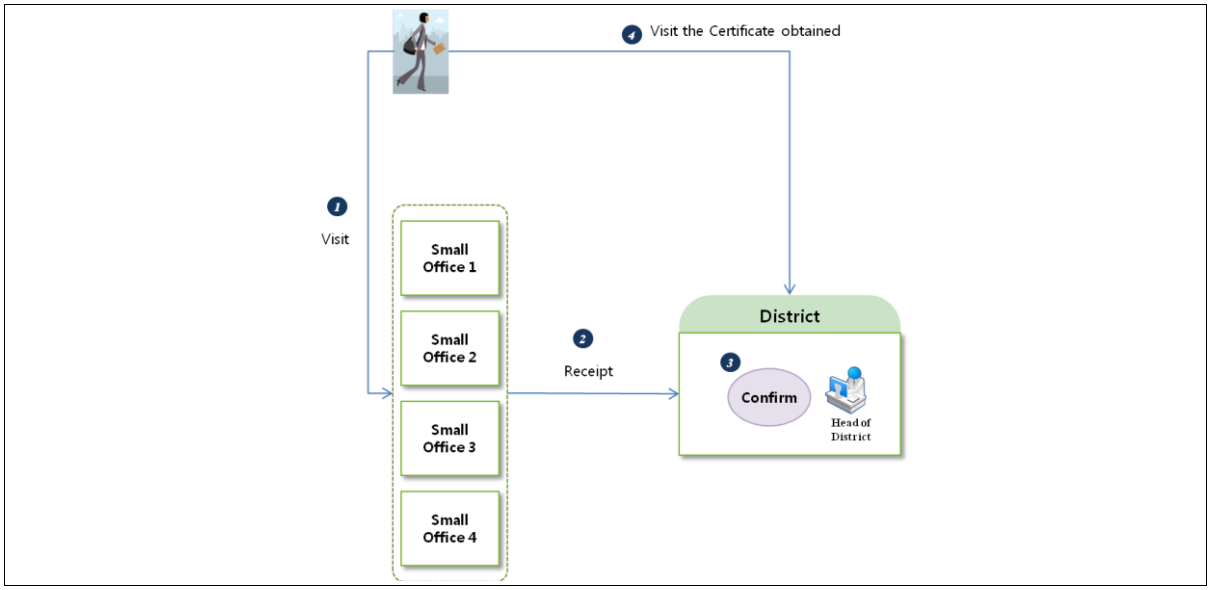
☐ Building Registration Process

- Big building registration is similar to that of the land registration in its process.
- Application received at District Office, registered on the responsible building institution's SIDUC system



[Figure 33] Building Registration Process

- Small stores do not need to be registered on SIDUC; it can be directly processed at the District Office. They are managed manually at the District Office



[Figure 34] Small Building Registration Process

2.3 H/W and N/W

1) City Hall Computer Center

- ☐ Maputo City Hall Computer Center is located on the 1st floor of Maputo City Hall.
- ☐ Currently the Maputo Computer Center is composed to store 4 servers and storage; with 3 main servers and 1 back-up server
- ☐ Server Specification
  - Dell R710
  - 3.0GHz - 4Core CPU
  - 96 GB RAM
  - 140GB HDD x 2
- ☐ Storage Specification
  - SAN 5TB
- ☐ Virtual Internal Cluster
  - Domain Controller
  - Mail - Exchanger
  - Application
- ☐ City Hall's Computer Center is spacious enough for internally used programs, sufficient for programs developed by Maputo City Hall in the future as well
- ☐ But various servers and workstations distributed in Maputo City Hall are to be transferred to the newly constructed building

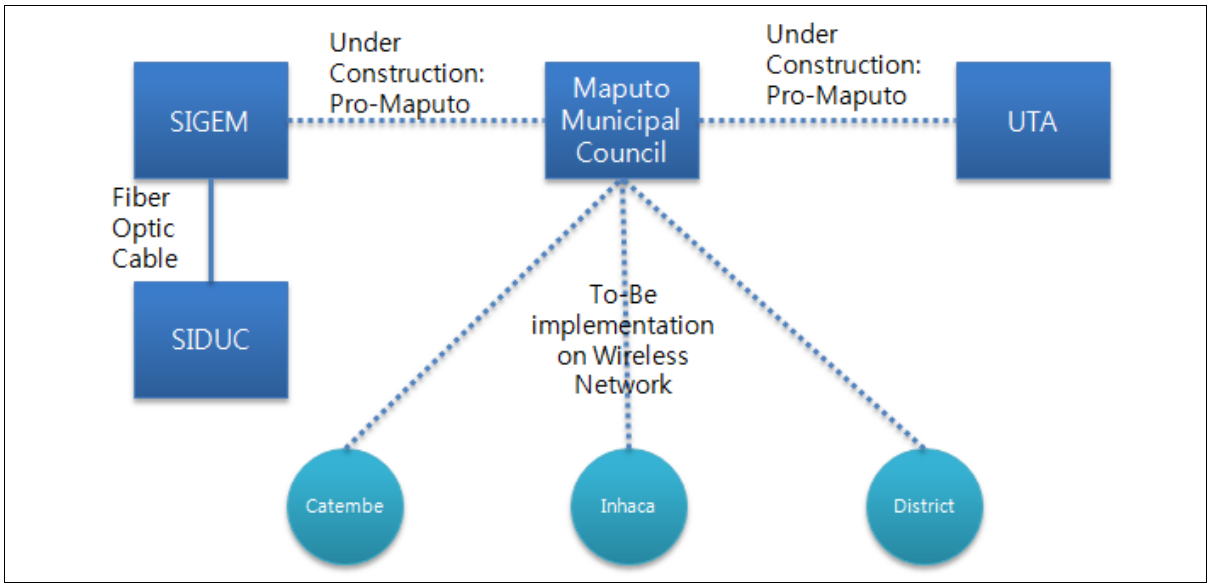
2) SWM

- ☐ Located about 1.3Km to the west of Maputo City Hall, with space for office work and automobile management inside
- ☐ Internal computerization system is categorized and operated in department operation system, waste processing company, and registration system, with no network connected externally.

- Waste registration space is located on the building's 1st floor, with 3 PCs operating on internal processing server.
- There is a computerization system for automobile management, but it is not in use due to lack of maintenance and automobile components.

3) Maputo City N/W Status and Plan

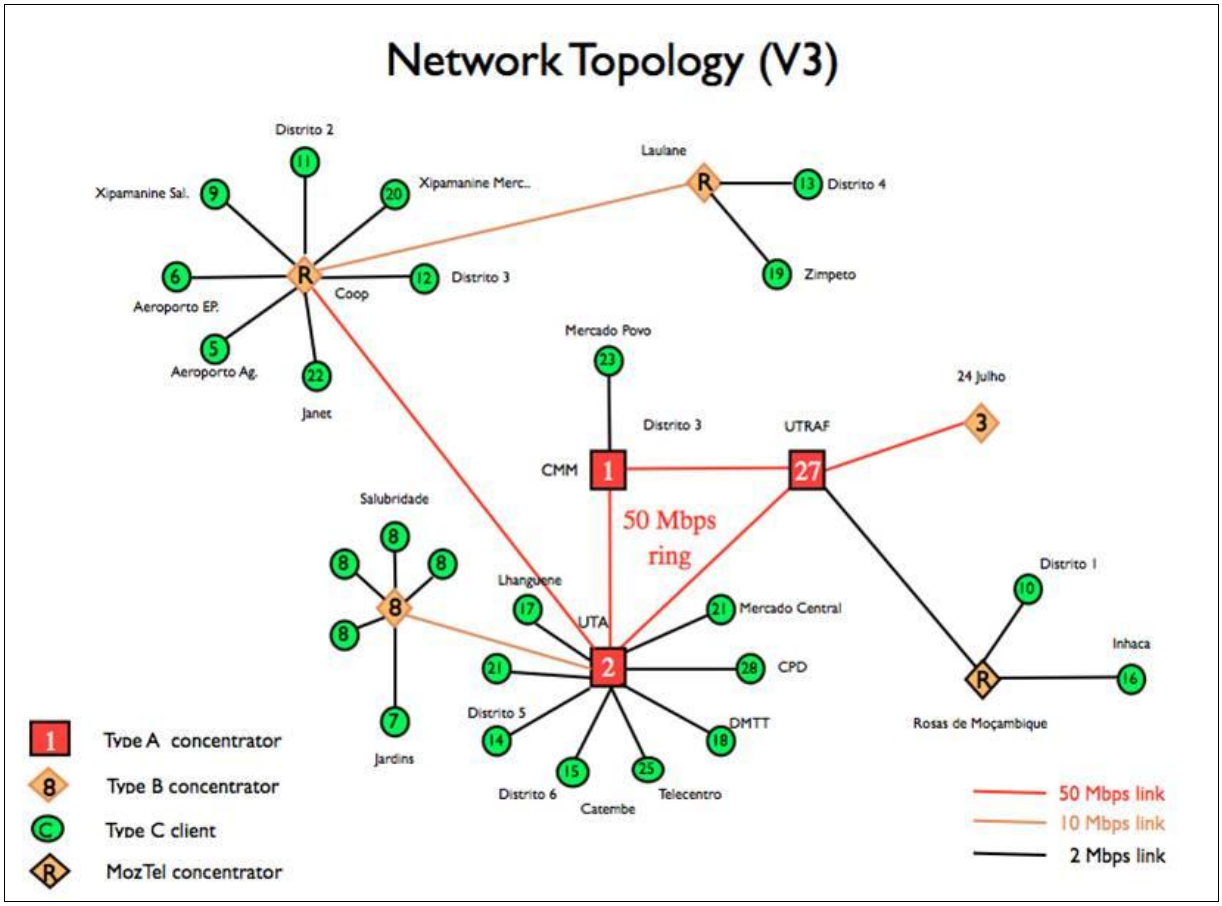
- Maputo City's network status allows each office in City Hall to be operated internally
- Exterior network is connected so that the land management system and construction management system is connected with fiber-optic cable.



[Figure 35] Maputo City Network

- Operated system is consisted of Internet and email networks, with very slow Internet speed
- Maputo City Hall Computer Center is to be transferred to the 1st floor of Mozambique Central Bank building, which is currently under construction. Servers distributed in various departments are to be transferred and integrated for operation
- To achieve the above, currently the Maputo City Hall is carrying out fiber-optic cable construction for each department network connection

☐ Wireless network is to be constructed to connect the 6 Maputo districts (excluding Inhaca)



[Figure 36] Maputo City Wireless Network Plan

☐ Also, fiber-optic cable construction is being planned to connect the biggest systems of City Hall - land management system and taxation system

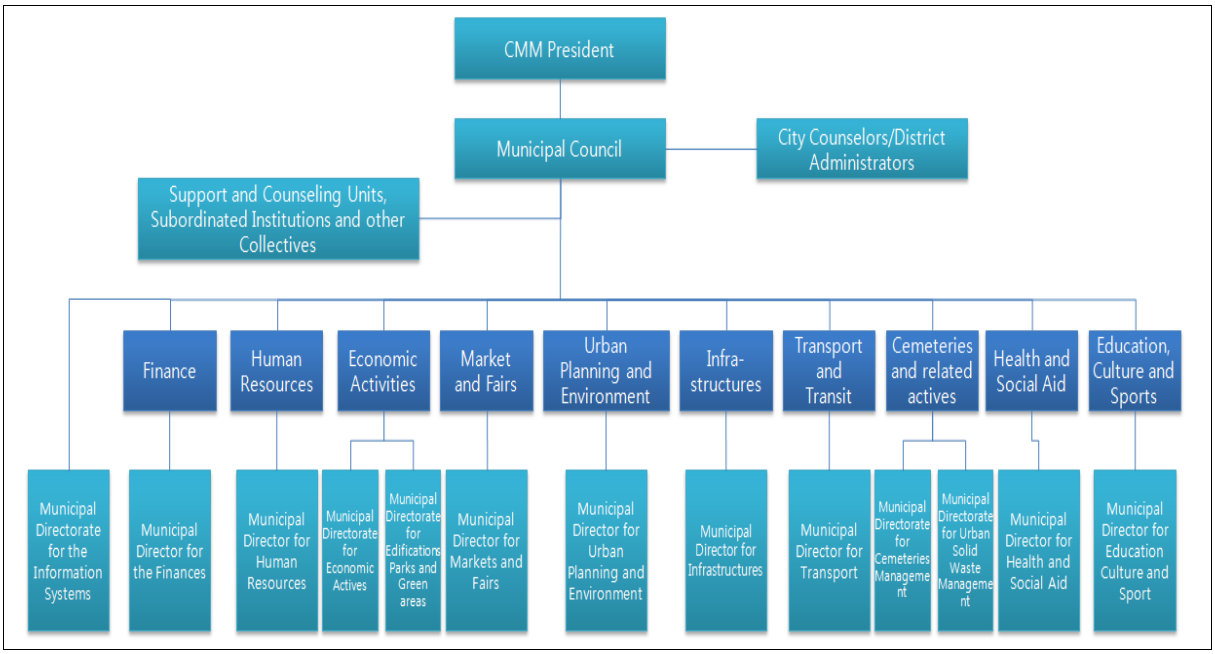
2.4 Organization

1) City Hall Organization Diagram

☐ Maputo City Hall has 10 departments as the below figure shows

☐ The technology department for this project shall conduct related works for this project with Maputo City Hall's information communication department and the SWM department, responsible for cemetery and related works

☐ Maputo City Hall Organization Diagram



[Figure 37] Maputo City Organization

2) Project Related Organization Description

☐ Project Related Organization

[Table 14] Project Implementation Organization

Organization	Description
Municipal Directorate for the Information Systems	• Oversees ICT related work of Maputo City Hall • Supports ICT manpower for each department • Maputo City Hall ICT Project works
Cemeteries and related actives	• Maputo City's solid waste processing related works • Maputo City's cemetery related works
Municipal Directorate for Finance	• Maputo City's TAX related work • Maputo City's Duty related work
Municipal Directorate for Transport	• Management and operation of Maputo's Transportation, Parking, Traffic related matters • Taxi, bus company, Parking, truck related license issuance management
Maputo City Police	• Maputo city transportation control • Maputo city security management with cooperation with the police • Processes police related civil complaints

3. SWOT Analysis

☐ Strategy for the project's success is deducted through SWOT Analysis; specifics are established for implementation

3.1 SWOT Analysis Results

[Table 15] SWOT Analysis

Strength	Weakness
• Korea IT's high reliability • Enthusiastic will of Mozambique Maputo City to pursue • Seoul City Dasan call center and environment department can be applied of system as model case	• Maputo City Hall's lack of budget requires international aid • N/W infrastructure construction is required
Opportunity	**Threatening**
• Increase in Maputo City administration work efficiency • Reduce social cost with reduced visitors • Enhance image with clean city making and improve citizen health • Expand local tax income with accurate waste tax imposition	• Establishing poor system due to insufficient project cost • Risk of spending too much time on local research for work analysis • Maintenance difficulties upon error • Lack of trained system operation employees in Maputo City Hall

3.2 Establish Strategy With SWOT Analysis

[Table 16] SWOT Strategy

Category	Opportunity	Threatening
Strength	**<SO Strategy>** • Implementation of certified success case of Korea	**<ST Strategy>** • Actively cooperate with Maputo City and develop funding source • Reduce work analysis time through preliminary cooperation with Maputo City • Preliminary system operation

		manpower preparation and training
Weakness	**<WO Strategy>** • Determine N/W infrastructure construction schedule and project scope	**<WT Strategy>** • Reflect appropriate local training course • Assume a third country corporate development and calculate construction cost

[Table 17] SWOT Strategy and Implementation plan

Category	Strategy	Implementation plan
SO[1] strategy	Implementation of certified success case of Korea	• Seoul City Dasan call center case application • Apply Seoul City electronic civil complaint case • Environment department applies the Allbaro system
ST[2] strategy	Actively cooperate with Maputo City and develop funding source	• Find out whether WB, AfDB, and KOICA can make financial aid beforehand • Focus on aids that have high possibility
	Work analysis time reduced through preliminary cooperation with Maputo City	• Descriptions needed for work analysis are delivered beforehand • Maputo City cooperation system is composed with designated person in charge
	Preliminary preparation and training of system operators	• Have the system operation and maintenance staff to attend the works from the early project development stage • Require preliminary expert knowledge for operation to be trained beforehand

[1] SO: Strategy that brings out opportunities with strengths
[2] ST: Strategy that minimizes risks through strengths

WO[3] strategy	Checks the N/W infrastructure construct schedule and determines project scope	• If the City Hall and city police stations do not have N/W connection, police station claim connection is to be excluded • District Offices will be excluded from project scope if the City Hall and N/W are not connected • If the City Hall and SMW do not have N/W connection project scope will be adjusted and system is installed in SWM
WT [4]strategy	Reflect appropriate local training course	• Server operation system management, training schedule and cost calculation • DBMS development and management, training schedule and cost calculation • Calculate server security training schedule and cost
	Assume a third country company development and calculate construction cost	• Calculate expenses in consideration of Mozambique local economy • Calculate development cost with enough consideration of expected business trip period

[3] WO: Strategy that brings out opportunities by complementing weaknesses
[4] WT: Strategy that complements weakness and minimizes risks

4. Benchmarking

4.1 120 Dasan Call Center

☐ Seoul City 120 Dasan call center was introduced as the call center system benchmarking subject.

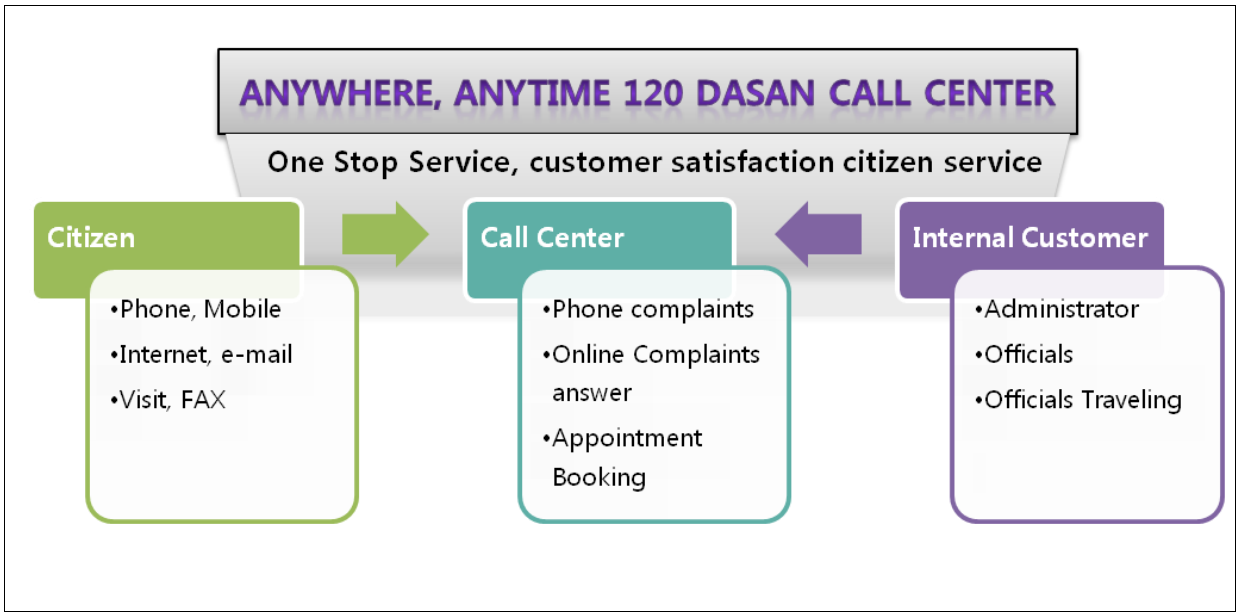
1) 120 Dasan Call Center History

☐ Seoul City 120 Dasan call center was constructed and is in operation to provide quick, accurate civil service with the number 120, which can be dialed from anywhere without any district number required.

☐ Dasan call center improved and integrate the Seoul City ARS telephone system that used to operate in complex manner in 23 different institutions

☐ Civil works requested and processed through various routes (telephone, fax, Internet, document, visitation, etc) are constructed in a single management system

☐ Citizen convenience and processing staff efficiency are enhanced simultaneously, while reacting to the various, more sophisticated citizens' expectation on administration services



[Figure 38] Dasan Call Center

[Table 18] Dasan Call Center History

Year	Description
2006. 10	• Standard consultation DB construction begins
2007. 1	• Seoul City civil service call center installed and operation ordinance enacted • Call center pilot operation (18 consultants)
2007. 3	• Seoul City civil complaint service title public contest - finalized: “Dasan”
2007. 7	• Civil complaint service integrated brand (BI) developed
2007. 9	• 120 Dasan call center officially opened
2008. 1	• Night consultation service begins (365 days, 24 hour consultation)
2008. 3	• Single Senior Ansim Call service launched
2008. 6	• Sign language (virtual) consultation service for those with hearing disability launched
2008. 9	• Location and road guidance service launched
2009. 3	• Mobile text consultation service launched
2010. 2	• Foreign language consultation service launched
2011. 5	• Health center integrated consultation service launched
2011. 11	• Smart phone application and widget service launched
2012. 2	• SNS consultation service launched

2) 120 Dasan call center service status

☐ 120 Dasan call center is operated 365 days, 24 hours in 3 shifts - day, evening, and night

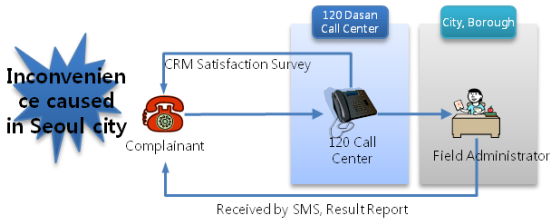
☐ Operation manpower is 542 in total, with 21 staff and 521 consultants

☐ 16 city hall institutions and 69 call numbers from 25 districts are operated in integration. ARS code system: ①Transportation, ②Water, ③General, ⑨Foreign Language.

☐ Consultation is done by consultant searching the standard consultation DB keyword and answering citizen questions. 3 expert operation organizations are consigned privately

[Table 19] Dasan Call Center Services

Service	Description	Operation status
Telephone consultation	• Responding to call inquiries • Main consultations - Traffic: location guidance, bus and other public transportation information, inconvenience report, etc - Water: price error calculation, change of names, leakage, outage, etc - General: welfare, culture, educational events, living information, etc - District affairs: passport, local tax, various reports, etc	• Consultation manpower: 470 - Staff: 21 - Consultant: 449 • Average case handled daily (weekday) - As of June '10, 43,716 cases (including foreign language consultations)
Mobile text consultation	• Provides mobile service to those with hearing disability and those in public places or any other places that prohibits phone calls	• Average case handled daily (weekday) - As of June '10, 5,262 cases
Text and sign language service for those with hearing disability	• Provides sign language consultation with special video telephone and text consultation with Internet messenger	• Consultation manpower: 6 • Average case handled daily weekday) - As of June '10, 92 cases
Foreign language consultation	• Provides Seoul life related consultation service for foreigners residing in Seoul, in 5 different languages - English, Chinese, Japanese, Vietnamese, Mongolian	• Consultation manpower: 20 - 4 for each language, 2 staff for every other day • Average case handled daily (weekday) - As of June '10, 192 cases
120 on-site civil complaint service	• Civil service subjects: 50 city/districts • Processing procedure	• Average case handled daily(weekday) - As of June '10, 787cases

		
CRM operation	• Out call expert consultation group operation to collect citizen opinions and evaluations on city/district office policies, etc • Gathers opinions on 120 Dasan call center service satisfaction level and other policies, etc	• 214,740 calls, 46 cases in 2010 - Total of 744,752 calls, 199 cases since 2007
Single senior citizen service Ansim Call	• 2~3/week calls to single senior citizens who need someone to talk to in general/about problems and issues - Recognize necessities of single senior citizens and guide welfare benefits - Visitation volunteer work • 120 Dasan call center consultants, 3 private call center consultants and organization, schools, etc provide the service	• Subject seniors: 3,289 • Service cases (accumulated) - As of June '10, 31,571 cases

3) 120 Dasan Call Center Consultation Information Provision Status

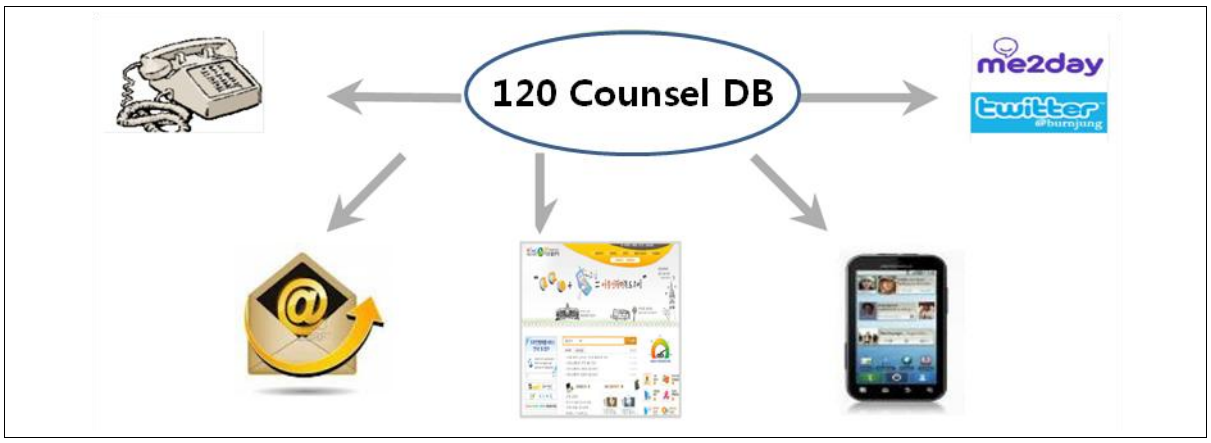
☐ Provides standard consultation DB through various consultation channel including consultant calls, texts, sign language, chats, email as well as Seoul City and 120 Dasan call center homepage

☐ City and District Office standard consultation DB has around 28,000 cases that are used to provide question& answer function

☐ Shares consultation DB integrated search function and information sharing via smart phone application

☐ Constructed mobile phone 3G virtual consultation system for people with hearing / speaking disability

☐ SNS(Social Network Service) consultation service expanded



[Figure 39] Dasan Call Center Information Provision System

4) 120 Dasan Call Center Consultant Operation Status

☐ Seoul City 120 Dasan call center operation is consigned to companies H, K, and M with total 542 consultants on the operation

☐ Company H with 7 staff, 156 consultants, total of 183

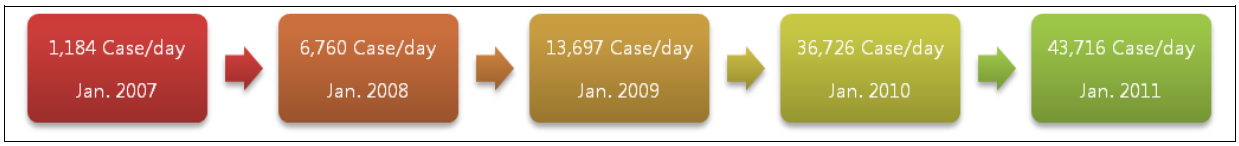
☐ Company K with 8 staff, 156 consultants, total of 170

☐ Company M with 6 staff, 163 consultants, total of 189

5) 120 Dasan Call Center Operation Performance

☐ As of December 2011, Seoul City Dasan 120 call center conducts average 38,257 telephone consultations per day, 2,506 text consultations, 153 text and sign language consultations for those with hearing disability, 276 foreign language consultations, 1,028 citizen inconvenience service Salpimi cases, and 302 cases through the Single senior citizen service Ansim Call

☐ 120 Dasan call center's accumulated consultation data shows a total of 17,960,781 calls (January '07 ~ June'10), averaging 4,716 call consultations per day as of 2010



[Figure 40] Dasan Call Center's Yearly Call Performance

- ☐ Virtual and text consultation for people with hearing difficulties amounted to ('08.6.23~) 30,801 cases (Daily average for June'10: 92 cases (weekday), 23 cases (holiday)
- ☐ There were 21,176 cases of virtual consultation (received 11,366, called 9,810) and 9,625 text consultations (received 4,867, called 4,758); and 945,526 cases of mobile phone SMS consultation ('08.3.10~) (June'10 daily average of 5,262 cases)
- ☐ Single senior citizen service Ansim Call ('08.3.10~) deals with 31,571 cases on average (Serviced: 289 people), 21,203 cases in foreign language ('10.2.9~) (received 14,263, called 6,940) (June '10 daily average 192 cases (weekday)
- ☐ 120 Dasan call center makes consultation through standard consultation DB, transportation information system, and private Internet portal, etc, and as a result 80% of its work is handled and completed by the consultant directly without handing over the call to the relevant department

[Table 20] Dasan Call Center's Major Performance Index

Base Date	Response Rate (Goal 95%)	Within 15 sec Starting Answer (Goal 80%)	1st Processing Ratio (Goal 80%)	Service Satisfaction (Goal 90%)
09" (Ave)	98.6%	86.4%	91.5%	93.5%
10" (Jan-Jun Ave)	99.3%	92.6%	88.9%	94.5%

- ☐ Dasan call center's successful operation received attention from not only public institutions but also major private corporation
- ☐ 556 institutions and organizations in Korea and abroad - Ministry of Public Administration and Security, Busan City, Samsung TESCO, Hyundai Capital, Moscow City, Guangxi Province in China, etc - visited 120 Dasan call center for benchmarking purposes
- ☐ From Korea, 2,339 from 489 institutions such as the Ministry of Public Administration and Security, Busan City, Samsung TESCO, etc visited the center
- ☐ From abroad, 791 from 41 countries, 67 institutions such as Moscow City, Guangxi Province in China, Singapore, etc visited the center

4.2 Korea's Waste Processing System

1) Waste Processing System Construction Background

- ☐ As the importance of waste management and appropriate processing increased with industrialization, ‘waste processing certification system’ took effect since 1999 for waste management
- ☐ Waste processing certification system involves the waste discharge, collector · transporter, processor, and overseeing district office sharing and storing paper transfer certificate every time the district office makes waste approval
- ☐ Using paper approval sheets does not allow real time analysis of waste status and wastes lots of time and cost for management, requiring improvement
- ☐ Therefore the online Allbaro system that allows drafting and confirming transfer certification began operation in 2001

2) Purpose of Construction

- ☐ Constructed to overcome the inefficiency of the ‘waste processing certification system’ to increase work efficiency of business · administration institution that use the system while also protecting the environment through transparent waste management.
- ☐ Waste approval, waste statistics analysis · provision and yearly waste performance report, and other waste related functions were acquired to oversee general waste related works
- ☐ On the other hand, based on years of system operation performance, it expands the scope to construction waste and project site waste reduction information to establish itself as the sole general waste information sharing field in the country

3) Allbaro System History

- ☐ Waste processing certification system operated; problem issued (1999~2000)

☐ System development construction and pilot operation(2001~2002)

☐ System normal operation(2002.9 ~)

☐ Waste approval application and processing function constructed (2003)

☐ Waste statistics analysis function constructed (2003)

☐ Disaster restoration center constructed to prevent system error (2004)

☐ ARS construction/operation for users with Internet difficulty (2006)

☐ Overall waste management system brand “Allbaro" launched (2007)

☐ Allbaro system operation made mandatory (2008.8)

☐ Construction waste electronic transfer made legally mandatory (2010.6)

☐ All project site made mandatory to use waste electronic transfer certificate (2011.7)

4) Allbaro System Application Subjects

[Table 21] Korea’s Allbaro System Application Subject

Category	Type	Standard
Designated Waste	Waste pesticides, sludge, residue, waste foundry, waste sand, waste refractory, ceramic pieces, incineration ash, solid processing material, waste stimulant, waste adsorbent, waste absorbent, waste organic solvent, waste oil	More than 50Kg per month or 130Kg in total
	Waste synthetic high molecular compound, waste acid, was alkali, waste paint, waste leaker, waste asbestos	More than 100Kg per month or 200Kg in total
	Sludge	More than 500Kg per month
	PCBs, waste toxin, medical waste	-
Project site waste	Project site waste from emission facility	More than average 100kg per day
	Project site waste from waste water processing facility	More than average 100kg per day
	Project site waste from public sewage processing facility	More than average 100kg per day

(Other than designated waste)	Project site waste from human waste processing facility	More than average 100kg per day
	Project site waste from public stock waste processing facility	More than average 100kg per day
	Project site waste from waste processing facility	More than average 100kg per day
	Other project site waste	More than average 300Kg per day
	Waste from construction (construction waste)	More than 5 tons
	Waste from a series of construction or works, etc	More than 5 tons

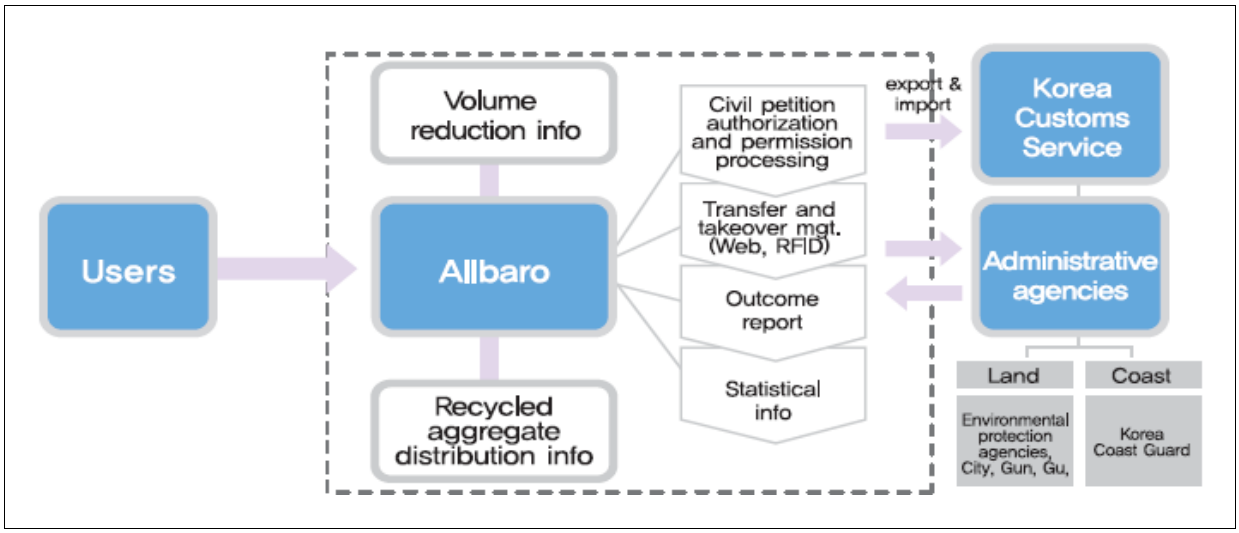
[Table 22] Processing method and Electronic transfer for Construction Waste

Types of building waste	Intermediary Management	Processing Method	Electronic Transfer Certification Drafting
1. Waste concrete	During construction	Recycle(Fragmentation · Pulverization)	-
2. Waste asphalt concrete	During construction	Recycle(Fragmentation · Pulverization)	-
	Recycling reporter	Recycle(Fragmentation · Pulverization)	Mandatory
3. Waste brick	During construction	Recycle(Fragmentation · Pulverization)	-
4. Waste block	During construction	Recycle(Fragmentation · Pulverization)	-
5. Waste roof tile	During construction	Recycle(Fragmentation · Pulverization)	-
6. Waste wood	Intermediary waste recycling reporter Incineration company Landfill company	Recycle · Incineration · Landfill	Mandatory
7. Waste synthetic resins			
8. Waste textile			
9. Waste wallpaper			
10. Construction sludge	During construction	Recycle(Dehydrate · Dry)	-
	Landfill company	Landfill	Mandatory

11. Waste metal	Intermediary waste recycling reporter	Recycle, Landfill	Mandatory
12. Waste glass	Landfill company		
13. Waste tile and Waste ceramic	During construction	Recycle	-
	Intermediary waste	Recycle	Mandatory
14. Waste board	recycling reporter	Recycle	Mandatory
	Incineration company	Incineration	Mandatory
15. Waste panel	Landfill company	Landfill	Mandatory
16. Waste building soil	During construction	Recycle(Fragmentation · Pulverization)	-
17. Complex building waste	During construction	Recycle	-
	Intermediary waste	Recycle	Mandatory
	Incineration company	Incineration	Mandatory
	Landfill company	Landfill	Mandatory
18. Other waste	During construction	Recycle	-
	Intermediary waste	Recycle	Mandatory
	Incineration Company	Incineration	Mandatory
	Landfill Company	Landfill	Mandatory

5) Introducing Allbaro System Functions

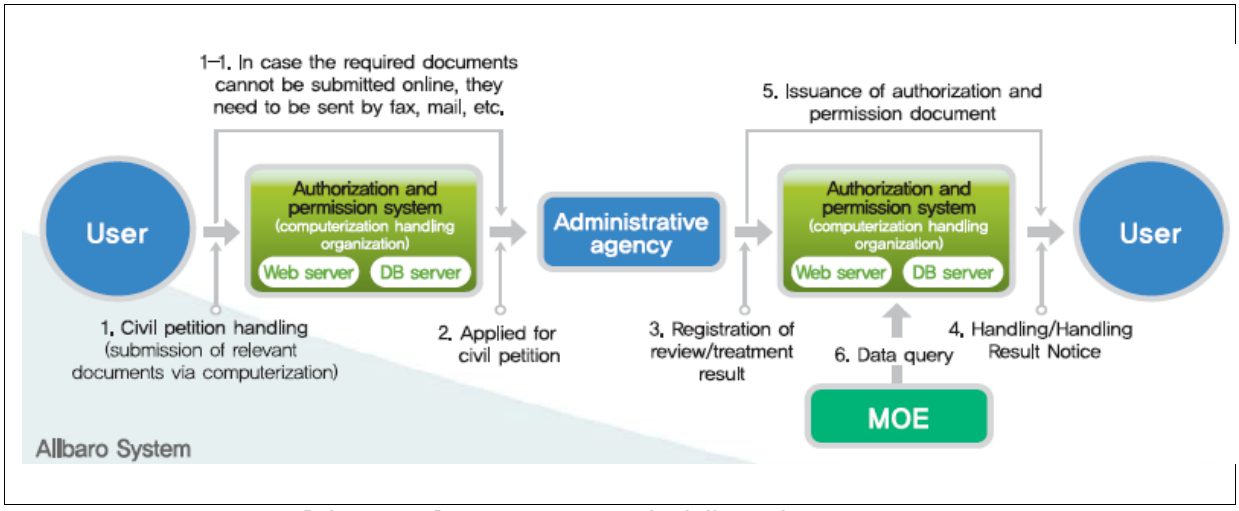
□ Allbaro system is composed of hand over management system that manages waste hand over, approval system that increases convenience of waste approval works, construction waste management system and waste reduction system, etc



[Figure 41] Allbaro System Concept Map

☐ Computerizes overseeing supervision institution's project site waste production · delivery · processing and export · registration · approval process and enhances user and administration institution's work efficiency while also improving competitiveness of business and administration institution's competitiveness through swift civil work processing

☐ Approval system construction eliminates visitation/postal work involved in submissions of necessary documents, thereby enhancing the convenience of administration institutions



[Figure 42] Waste Approval Civil Work Process

6) Allbaro System Operation Performance

[Table 23] Allbaro System Operation Performance

Category	Description
Effect of using waste transfer management system	• Work processing time and cost reduced - Project site: cost reduction of approximately 125 billion won per year, 9.8 million hours of work time reduced - Administration institution: cost reduction effect of approximately 14 billion won • Leads to astronomical benefits when considering the restored environment, human resources, and other economic · social loss caused by illegal waste processing and neglect • Waste route real-time monitoring makes illegal processing company regulation easy • Waste related e-information accumulation makes easy management of statistics • Maximizes the management effect of large, hazardous medical waste
Effect of using building waste information management system	• Computerization of building waste performance report work reduces cost and time used in postal services, etc • Increases accuracy of building waste statistics and the utilization rate of the statistics data • Induces recycling of and activates use of cyclic aggregate • Information sharing of building waste processing business allows searching processing businesses
Project waste reduction information system effect	• Waste / production ratio is decreasing • Waste / sales ratio is decreasing • Subject waste recycling rate of project site's regular waste is 67% on the average, with overall recycling rate increasing gradually

Ⅴ. Implementation Plan

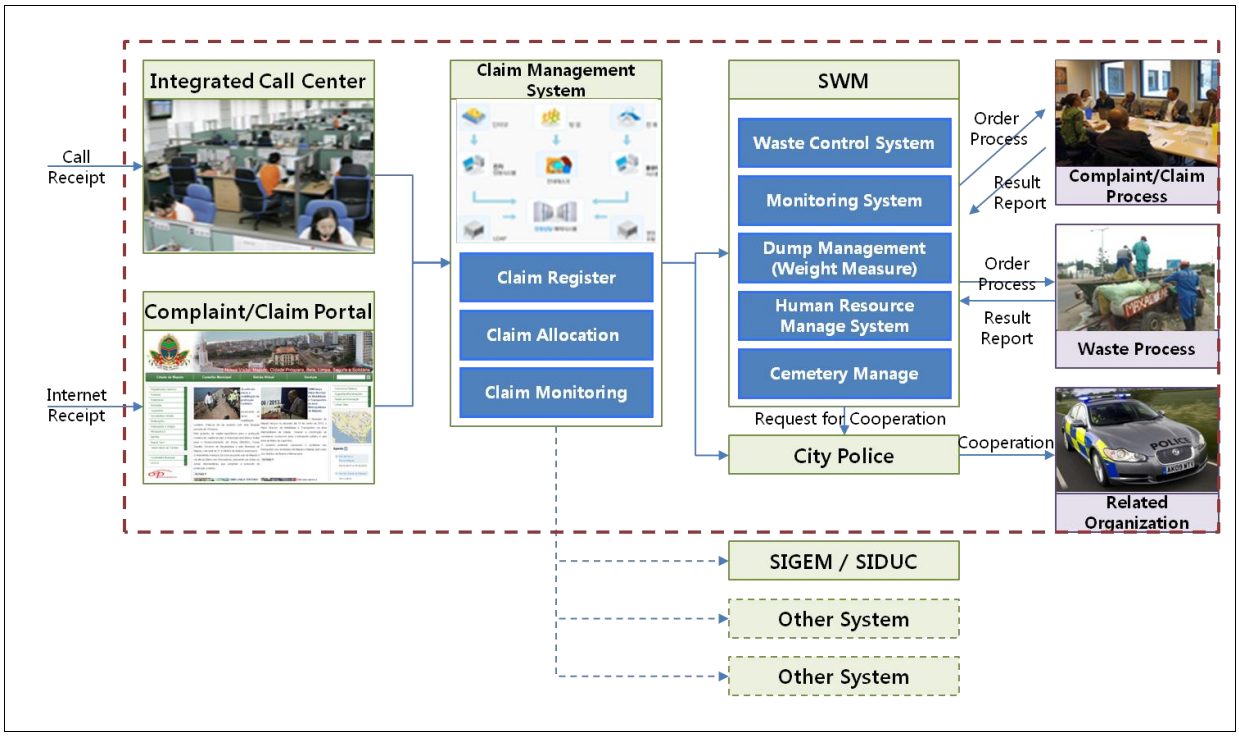
1. Implementation Direction
2. Vision and Implementation Strategy
3. System Development Scope
4. System Structure
5. Project Implementation Schedule
6. Project Implementation Organization
7. Training Plan
8. Operation and Maintenance Plan

Ⅴ. Implementation plan

1. Implementation Direction

1.1 System Concept Diagram

- ☐ Civil complaint reception is done through telephone (call center) and Internet (portal)
- ☐ Develop Claim Management System that receives all claims and makes automatic transfer to related department
- ☐ Compose the Claim Management System so that it allows connect and expansion to other department's legacy work system aside from that of SWM
- ☐ Develop an integrated waste management system based on the analysis result of SWM department's existing system and work



[Figure 43] System Concept Diagram

1.2 System Construction Directions

- ☐ Claim reception will be quickly and accurately notified to related department personnel, allowing swift, transparent processing of civil complaint
- ☐ Claim management system is designed to consider expansion in the future to allow connecting to related departments
- ☐ Waste processing system is computerized mainly with SWM work
- ☐ Electronic transfer is implemented as pilot to monitor waste outlet company and cleaning company

1.3 System Construction Considerations

1) Limitations Under Network Configuration

- ☐ Currently the City Hall does not have SWM, City Hall and District Office network connection
- ☐ This system is constructed in the City Hall Computer Center; for it to operate properly City Hall and all district offices, SWM department, and city police stations need to have connecting network constructed.
- ☐ Therefore it makes sense to construct the system upon the completion of network infrastructure construction.
- ☐ If this project was to take place before the infrastructure construction it won't be possible to construct the claim management system
- ☐ In such a case project scope will have to be adjusted to the computerization of SWM's own works, with server and DB constructed in the SWM Computer Center

2) Limitations Under Claim and Civil Complaint Service

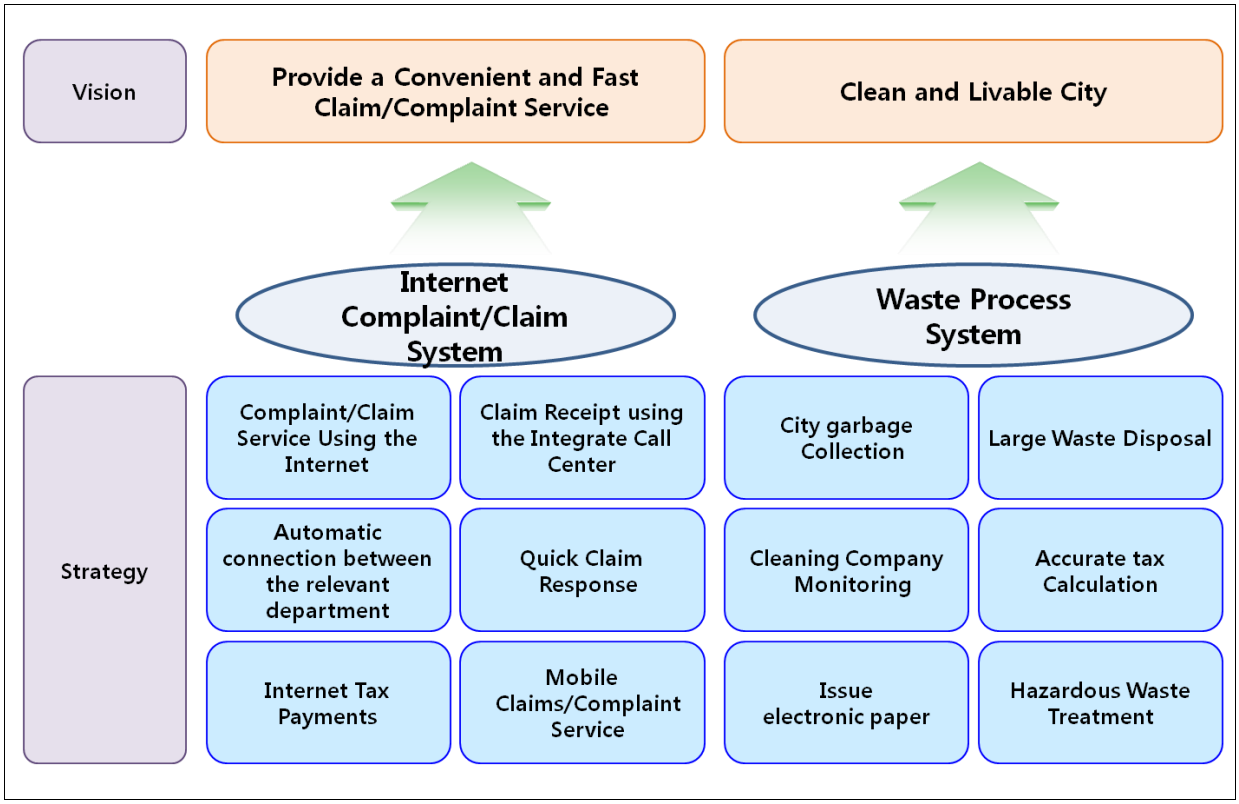
- ☐ Maputo City Hall has plans to provide all claim and civil complaint service on Internet
- ☐ To do this each department needs to computerize administration works

☐ Currently Mozambique has no means to identify oneself online. Therefore claim reception online should have to be in means that do not require ID authentication.

2. Vision and Implementation Strategy

2.1 System Vision

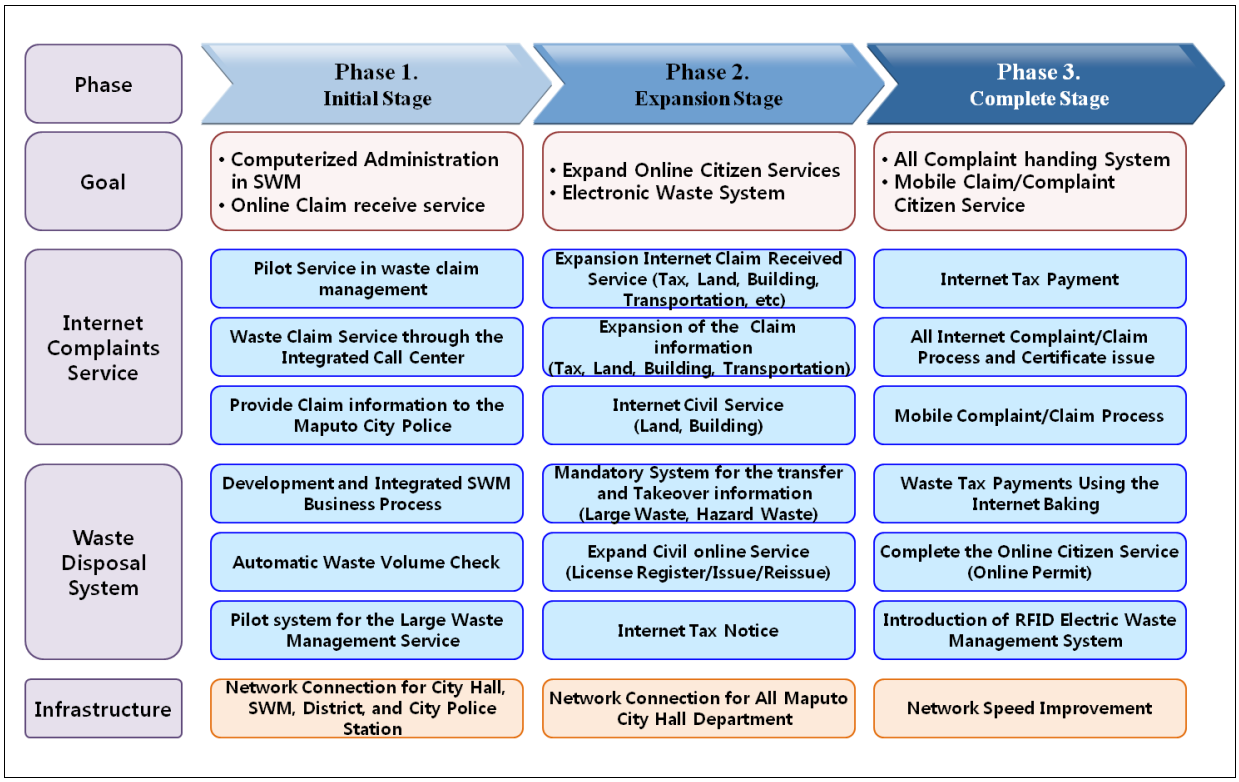
☐ The goal is to provide convenient and quick civil complaint service to the citizens through Internet and call centers and construct a waste processing system to create a clean, pleasant city



[Figure 44] Goal System Vision

2.2 Phased Implementation Strategy

☐ As [Figure 46] shows, Phased Implementation Strategy is suggested for goal system construction, in consideration of the situations in Maputo



[Figure 45] Phase Implementation Strategy

1) Phased Implementation Strategy For Internet Civil Complaint Service

☐ Phase 1

- Currently lack of Maputo City's computerization of N/W and each department work prohibits provision of all civil complaint services on the Internet
- Therefore Phase 1 should provide a claim reception pilot service on the Internet for waste related claims
- Also, Korea's Seoul City 120 Dasan call center model should be referenced to compose a single outlet for convenient civil complaint services for the citizens
- Phase 1 shall compose connection with city police station that has greatest relevance to claims

☐ Phase 2

- Phase 2 expands claim reception of City Hall portal and call center to all departments
- Also, major civil complaints that deal with land registration, building registration, etc, should be serviced without visitation on the Internet

- Phase 2 project requires citizen ID certification means; each department should have administration work system constructed in place

☐ Phase 3

- Phase 3 provides issuance service for various certifications on the Internet as well as online civil complaint application services
- Also, it should be constructed so that all the charges and taxes required for civil complaints is payable through Internet banking
- Mobile civil complaint service is provided to maximize citizen convenience
- Phase 3 project requires e-commerce foundation infrastructure constructed in place

2) Phased Implementation Strategy For Waste Processing System

☐ Phase 1

- Mainly deals with computerization of SWM department's own administration work
- Realize cleaning company monitoring and evaluating function
- Pilot implementation of electronic transfer to monitor large waste outlet company's outlet quantity
- Full-scale electronic transfer implementation requires making it a systematic compulsory; as early implementation stage is expected to be confusing a trial service period is required

☐ Phase 2

- Mandatorily apply electronic transfer to monitor waste outlet company, cleaning(delivery) company, processing company (Dump Site)'s waste outlet and processing status
- Compose system so that the hazardous waste can be carried and processed separately
- License registration/issuance/renewal, and other works are provided online
- Waste related taxes are notified on the Internet automatically

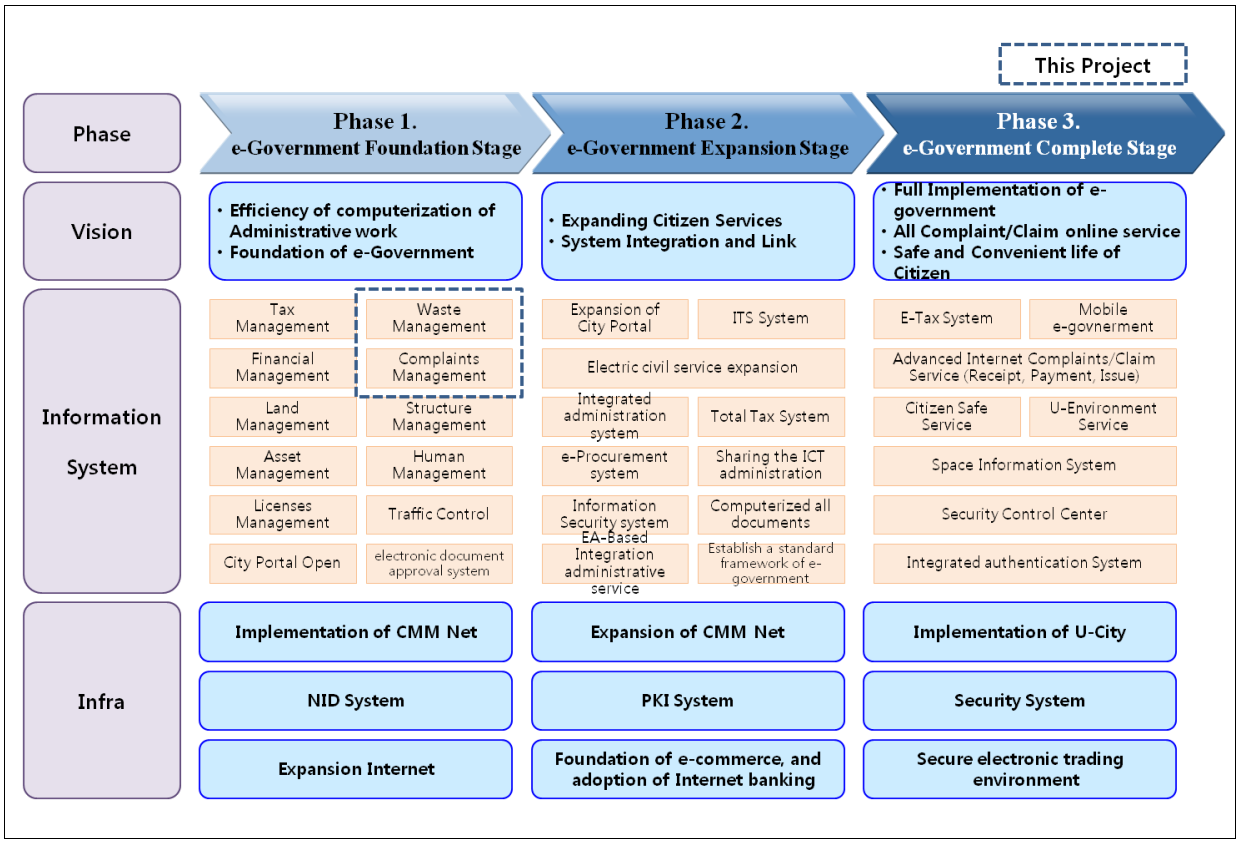
☐ Phase 3

- All civil services are provided online. (waste outlet and cleaning business permits)

- Internet banking and Internet billing system should allow easy payment of waste related tax
- Hazardous waste should be under thorough trace management with RFID electronic transfer system implemented

2.3 Maputo e-government Road Map

☐ Online civil service requires each department's administration work system constructed; each system should be connected and integrated. As the following figure shows Maputo City's e-government development road map is suggested



[Figure 46] Maputo e-Government Roadmap

3. System Development Scope

3.1 Claim Management System Development

☐ This project only deals with waste related claim reception and processing

☐ Citizen can directly input claim on the City Hall homepage or make a phone call to the call center

☐ When the call center consultant registers the received message on the claim management system it shall automatically deliver it to the related department

☐ City police station related claims shall have the claim delivered in connection to the city police station's claim reception system

☐ Civil services that require ID certification shall process it in person, like the current method

3.2 Integrated Waste Management System Development

☐ Required functions of the integrated waste management system is as follows

[Table 24] Function of Integrated Waste Management System

Sub-system	Function	Description
Waste Management	**Cleaning business management**	• Cleaning company management in groups
	Large waste outlet business management	• Large waste outlet business management (for different outlet amount / waste types)
	License Management	• Cleaning business license registration/evaluation/issuance/completion/extension
	Contract Management	• Selection and contract management of district office cleaning business
	Monitoring	• Cleaning business monitoring • Large waste outlet business monitoring • City living waste regulation app.
	Tax	• Tax(billing)charge/collection • Waste related tax default management

Waste Claim Management	**Claim reception**	• Automatic claim transfer to person in charge
	Claim viewing	• Viewing claim processing status
	Claim processing	• Description and registration of claim processing
Human Resource Management	**Staff management**	• Management of SWM department employee's joining and leaving
	On-Site dispatch management	• On-site dispatch management for resolving claims
Cemetery Management	**Cemetery management**	• Cemetery district management • Cemetery viewing and cemetery district designation
	HRM connect	• Connect with deceased management system
Dump Site Management	**Measure outlet**	• Measure waste weight
	Billing issuance	• Calculate charges and tax, bill issuance
	Output automobile management	• Registration and amendment of waste outlet automobile
Statistics	**Statistics viewing**	• Viewing of all sub-system statistics data
	Statistics report	• Reporting and output of summarized statistics information
Online service	**User certification**	• Certification on users connecting via Internet (Waste outlet and cleaning businesses)
	Electronic transfer issuance	• Register waste output and data • Electronic transfer issuance
	Information correction	• Changes in basic information of waste outlet business/cleaning business such as address/contact/email, etc
Electronic approval	**Claim processing approval**	• Claim processing related SWM department approval
	Approve electronic transfer	• Waste outlet business, cleaning business, dump site management staff approves after confirming waste transfer description

3.3 Etc

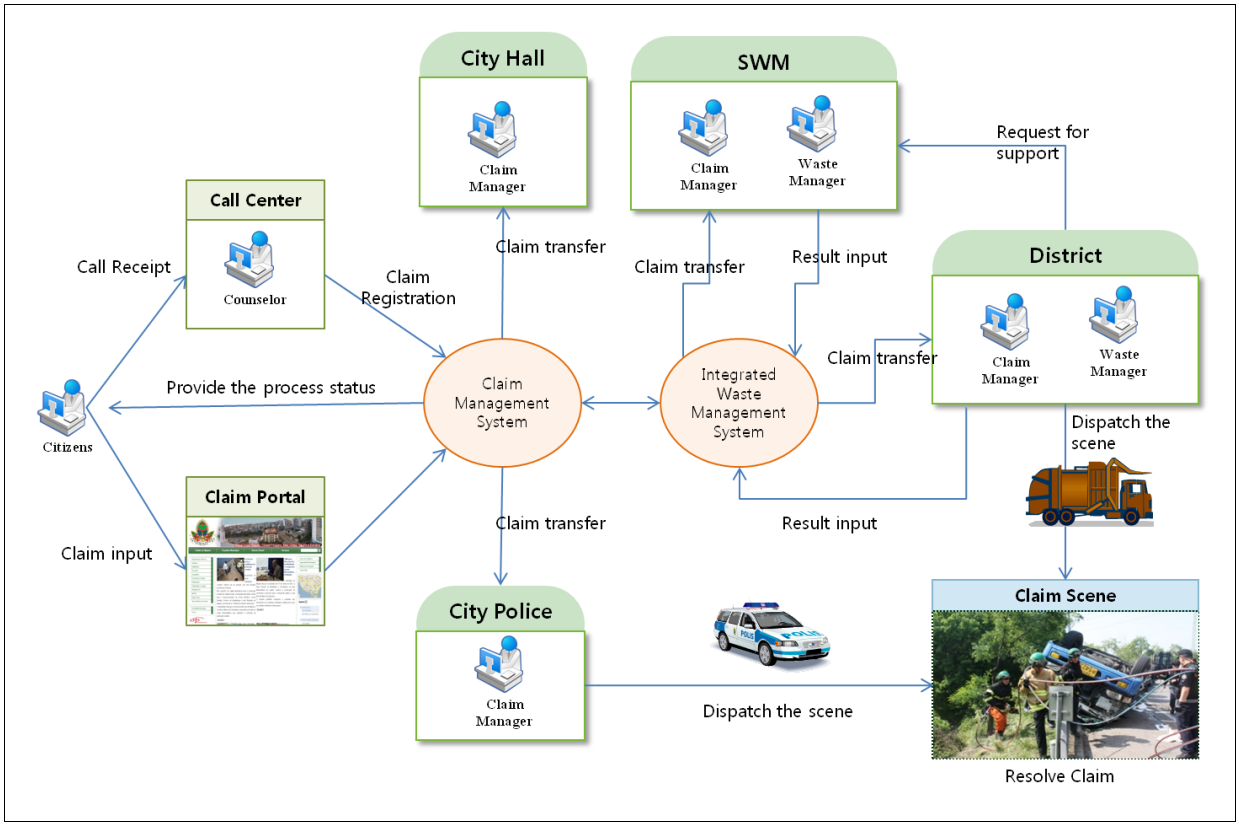
☐ Develop waste processing automobile maintenance system

4. System Structure

4.1 Work

1) Claim Processing

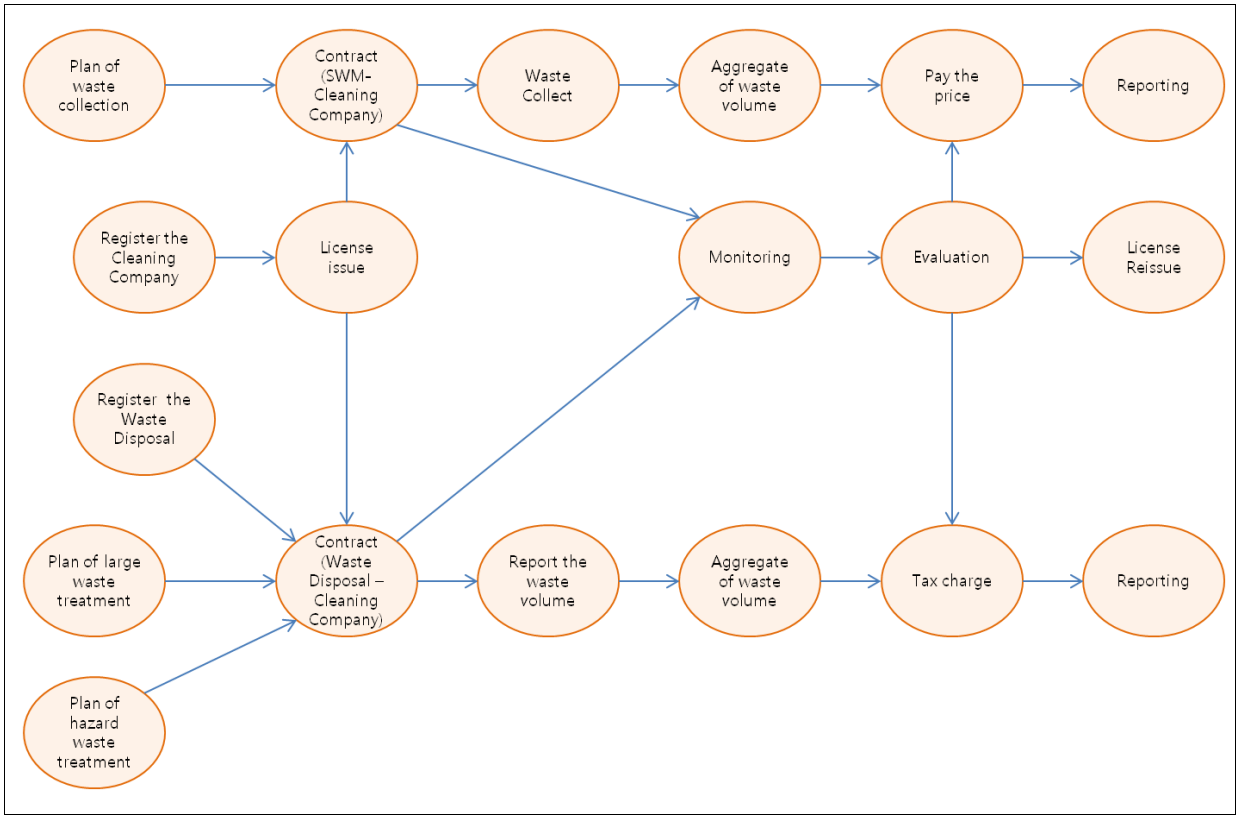
- ☐ Claims received through call center and portal are automatically delivered to related departments
- ☐ City Hall monitors all claim reception and processing status
- ☐ Waste related claims are processed under mutual cooperation between SWM and district office
- ☐ Claim processing status and processing results are notified to the person who made the claim
- ☐ Claim processing results are automatically notified to the City Hall



[Figure 47] Maputo City Claim Process

2) SWM Work Process

- ☐ SWM establishes city living waste collection plan, big size waste processing plan, and hazardous waste processing plan
- ☐ SWM manages cleaning and waste outlet business for Maputo City's waste processing
- ☐ SWM monitors and evaluates cleaning company's waste collection status and charges reasonable amount of tax
- ☐ Major work and process of SWM are shown below in [Figure 49]

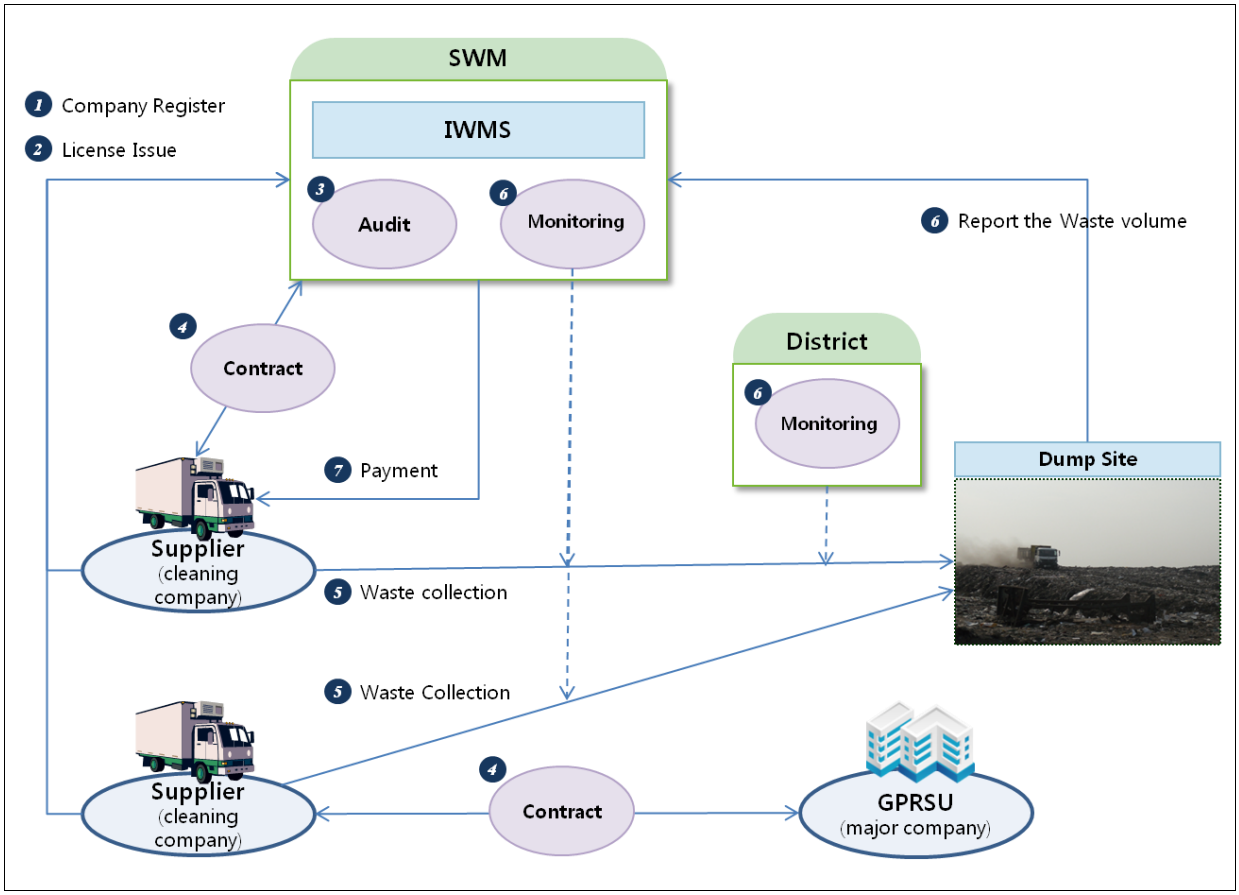


[Figure 48] SWM Work Process

3) Cleaning Company Management Process

- ☐ Cleaning companies shall be evaluated on their waste processing capacity, facility at hand, reliability, etc for issuance of license for different levels
- ☐ City living waste processing cleaning company shall be selected and its contract implementation status will be monitored to pay reasonable cleaning charges

☐ Dump Site's waste quantity measurement system is used to automatically send and collect the quantity of each cleaning company's waste output



[Figure 49] Cleaning Company Management Process

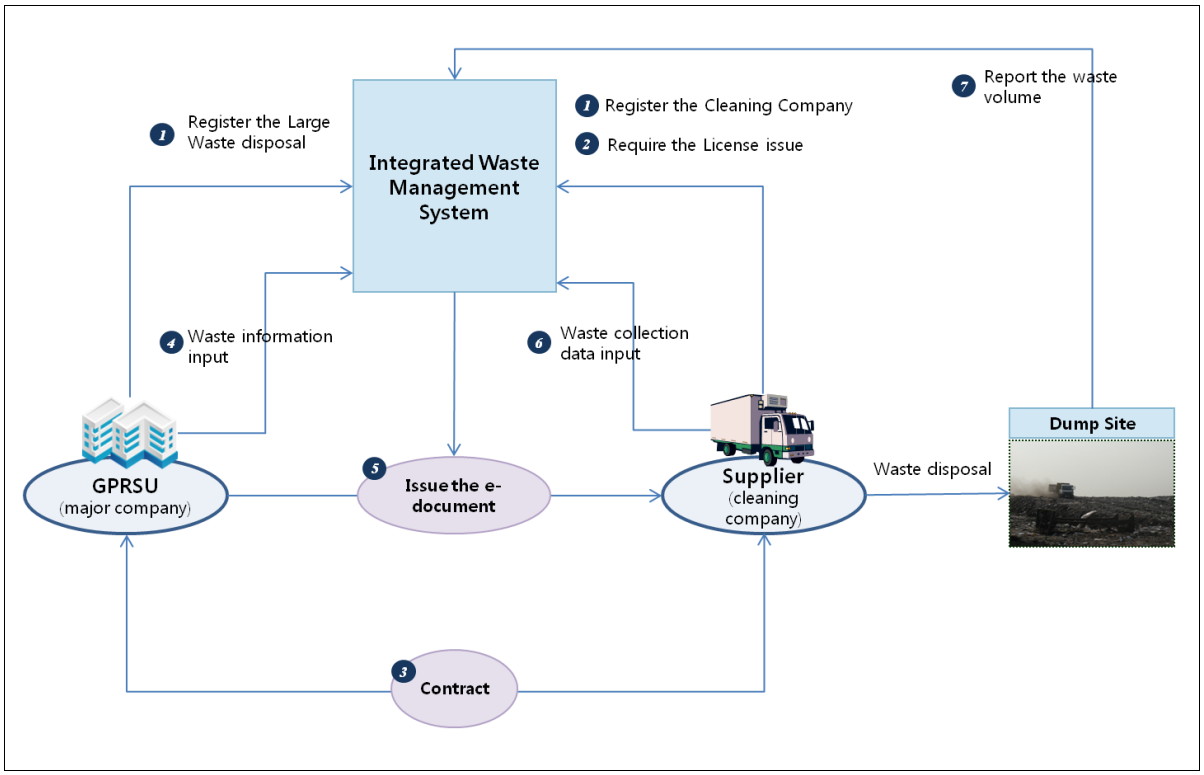
4) Large Waste Management Process

☐ SWM registers companies with large size waste and manages and oversees them

☐ Amount of waste emitted by large sized waste outlet businesses is accurately measured for taxation

☐ Waste change-over between waste and cleaning company shall issue and manage an electronic transfer certificate so that the emitted waste quantity is registered on system

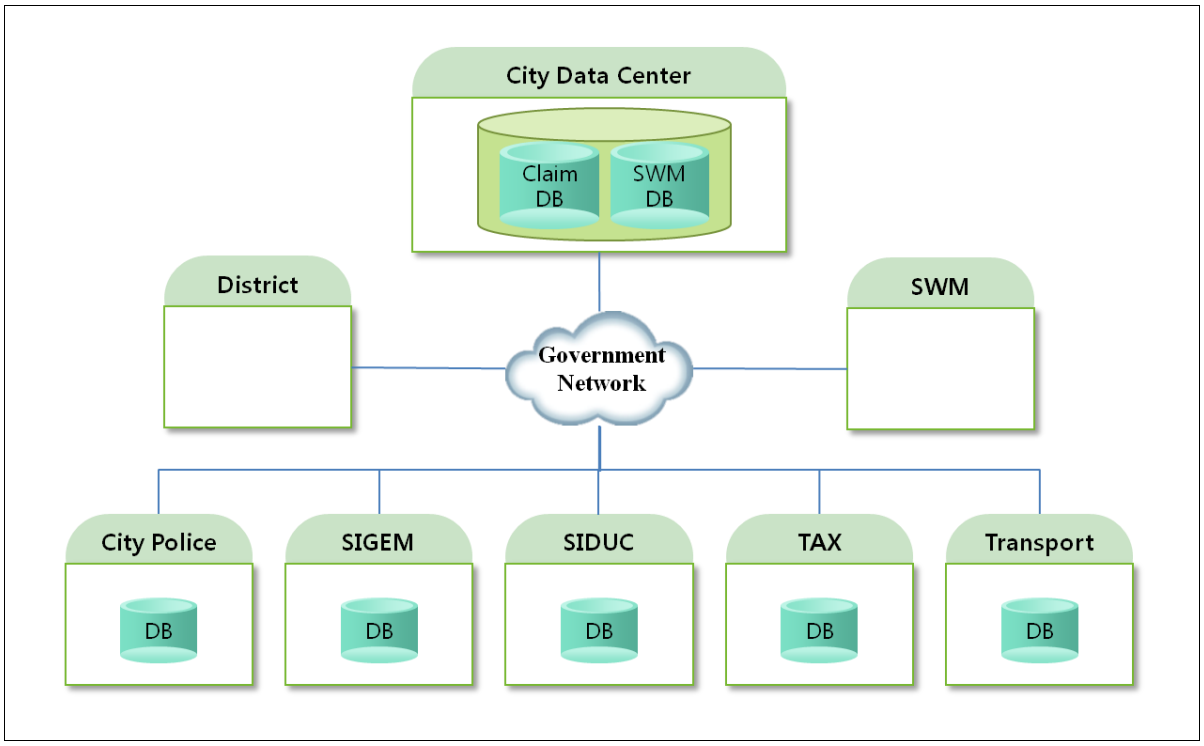
☐ Waste company views registered output and measures the actually delivered amount on Dump Site to regulate the cleaning company's illegal wasting



[Figure 50] Large Waste Management Process

4.2 Data

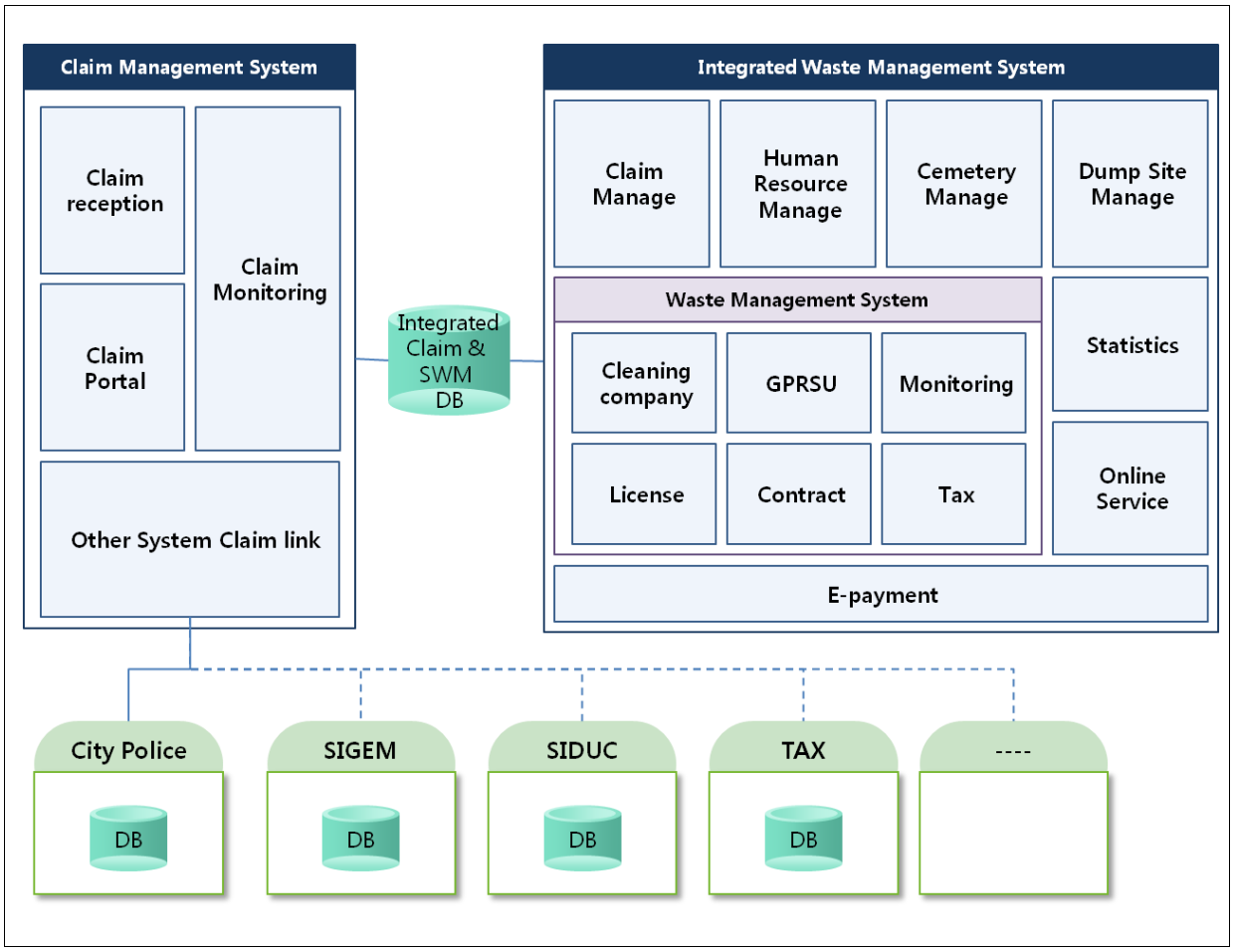
- ☐ Integrated DB is composed in City Hall Computer Center in consideration of server operation and maintenance
- ☐ Each district office and SWM do not construct their own DB but connects to the City Hall server for their works
- ☐ Work system for independent, large scaled systems like SIGEM, SIDUC, TAX, etc should manage their own construction and receive/transfer necessary information through data connection



[Figure 51] Maputo Database Architecture

4.3 Application

- ☐ Claim management system is composed of call center staff's claim registration module, citizen's direct portal claim inserting module, claim-department transfer module, and claim processing status monitoring module
- ☐ Integrated waste management system computerizes all SWM works like the [Figure 53] and provides online service for the waste outlet business and cleaning company to connect and register waste emission information

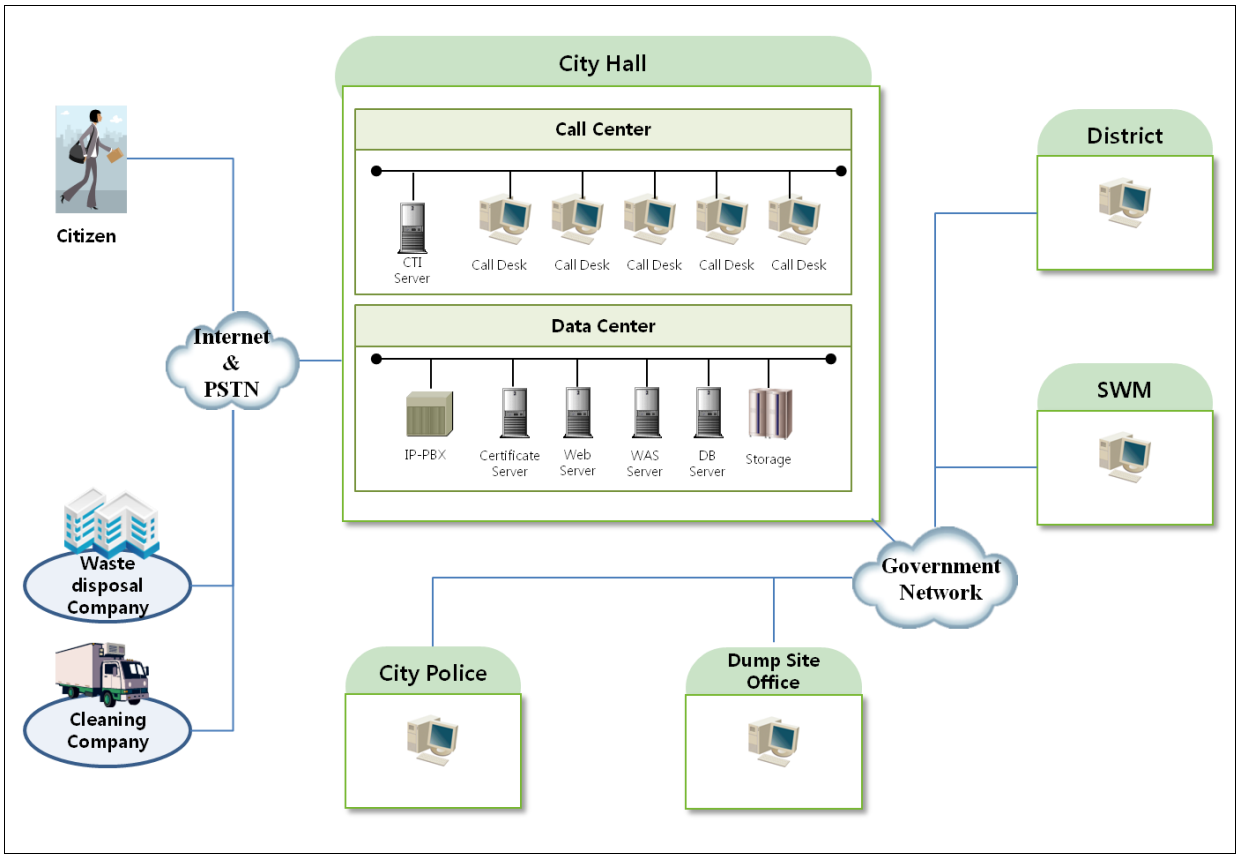


[Figure 52] Application System Diagram

4.4 H/W Configuration

1) H/W overview

- ☐ Call center is composed of facility and CTI Server required for the 5 call desks' operation
- ☐ City Hall Computer Center is composed of Certificate Server, Web Server, WAS Server, and DB Server
- ☐ Certificate Server conducts certification work for waste outlet business and cleaning company that access system via Internet



[Figure 53] Hardware Diagram

2) H/W Configuration

☐ IP-PBX

- Regardless of the caller's phone type, caller's telephone number information should be displayed on consultant PC or telephone.
- CTI connection should be done in international standard method.
- Media Gateway should have dual power and LAN connection parts for stable operation.
- IP-Phone and additional server (IVR, ARS) connection should allow direct connection without separate G/W.
- Switchboard call routing function should be provided upon CTI error for a stable operation.
- Maputo's periodic telecommunication business, special telecommunication business and telephone transfer system should allow mutual connection without limitations of digital/analogue use.
- Warning and error history recording function should be provided upon error.

- When the telephone is on hold various message functions should be in place.

□ CTI Server

- Standard API should be provided for consultant Application Interface.
- CTI international standard type and various protocols should be supported for connections to various switchboards.
- Call and Data synchronization should provide signal connection to consultant and connection to consultation work system should be provided.
- Should provide various statistics processing and recording function.
- Consultant should be able to log-in with his/her ID in all seats.
- Connected to Soft Phone, the consultant should be able to make and receive quick calls.
- All statistics provided should be fit for change and application in user-requested file format.
- Various DBMS should be provided.
- Manager should be able to make real-time monitoring on consultant status, the overall consultant work status and processing status.
- Should provide outbound dialing function.

□ WEB/WAS Server

- Consultation application program should be drafted in an web environment while PC based client consultation is supported and executed without problem.
- Maputo City's internal system and works are connecting for quick/accurate consultation work.
- Consultation program should be allowed for revision according to Maputo City Hall personnel and professional consultant requirements to accord to Maputo City's consultation work.
- Civil complaint information, search information, processing result registration, etc should all be composed so that all civil consultation can be processed in a single screen and user make expansion if necessary.
- Each consultant should be able to do own work with user account management. User designation and management, user information registration and correction function, user password and other personal formation management as well as user menu and management function should also be provided.

- Note sending/receiving function between consultation application program users should be enhanced.
- Should provide function that allows real-time monitoring of consultant activities and analyzes consultation as well as viewing of consultation description and result statistics.
- Unprocessed notification, missed call, consultation history, reservation call, call back, etc should be able to be made into icons and be available for confirmation.
- Upon receiving civil complaint it should be connected to DB and CTI so that the client information, consultation history, channel history, etc can appear on one screen automatically; as well as civil complaint information management function.
- Civil complaint statistics and analysis function should be provided, along with various analysis functions for different types, regions, days, times, keyword-oriented trend.

□ DB

- Should be composed after recognizing frequency for different civil complaint types, civil complaint processing, etc.
- Consulting DB should be specifically drafted for the consultant to make immediate use and realized to automatically manage Maputo organization department contacts, etc to allow quick/accurate information processing.

[Table 25] Hardware Specification and Quantity

Item	Specification	Quantity
IP-PBX	• DID/DOD:E1 • CTI Interface • IP User Licenses 20User • Power Supply (Rectifier, Battery 2Hours, Automatic Shutdown)	1Set
CTI Server	• Intel Xeon 6Core • 32GB RAM • 500GB HDD x 2 • In/Out Bounce License • Statistics, Routing, Interface, etc • Dual Power Supply	1Set

WAS/WEB Server	• Intel Xeon Quad Core • 32GB RAM • 300GB HDD x 2 • Dual Power Supply	Each 1Set (Total 2Set)
Certificate Server	• Intel Xeon Quad Core • 32GB RAM • 300GB HDD x 2 • 300 User License • Dual Power Supply	1Set
DB Server	• Intel Xeon Quad Core • 32GB RAM • 300GB HDD x 2 • SAN Switch • Storage 4TB • Dual Power Supply	1Set
Others	• UPS • Rack • PC(10EA) • Headset • IPS/IDS/FA	1Set

5. Project Implementation Schedule

5.1oject Implementation Schedule Outline

☐ SWM work systemization project; local work analysis will determine the success of the project

☐ Clear definition of requirements for works that are to be systemized among all SWM administration works is needed. After local work analysis basic design should be drafted and confirmed by SWM

5.2 Project Implementation Schedule Plan

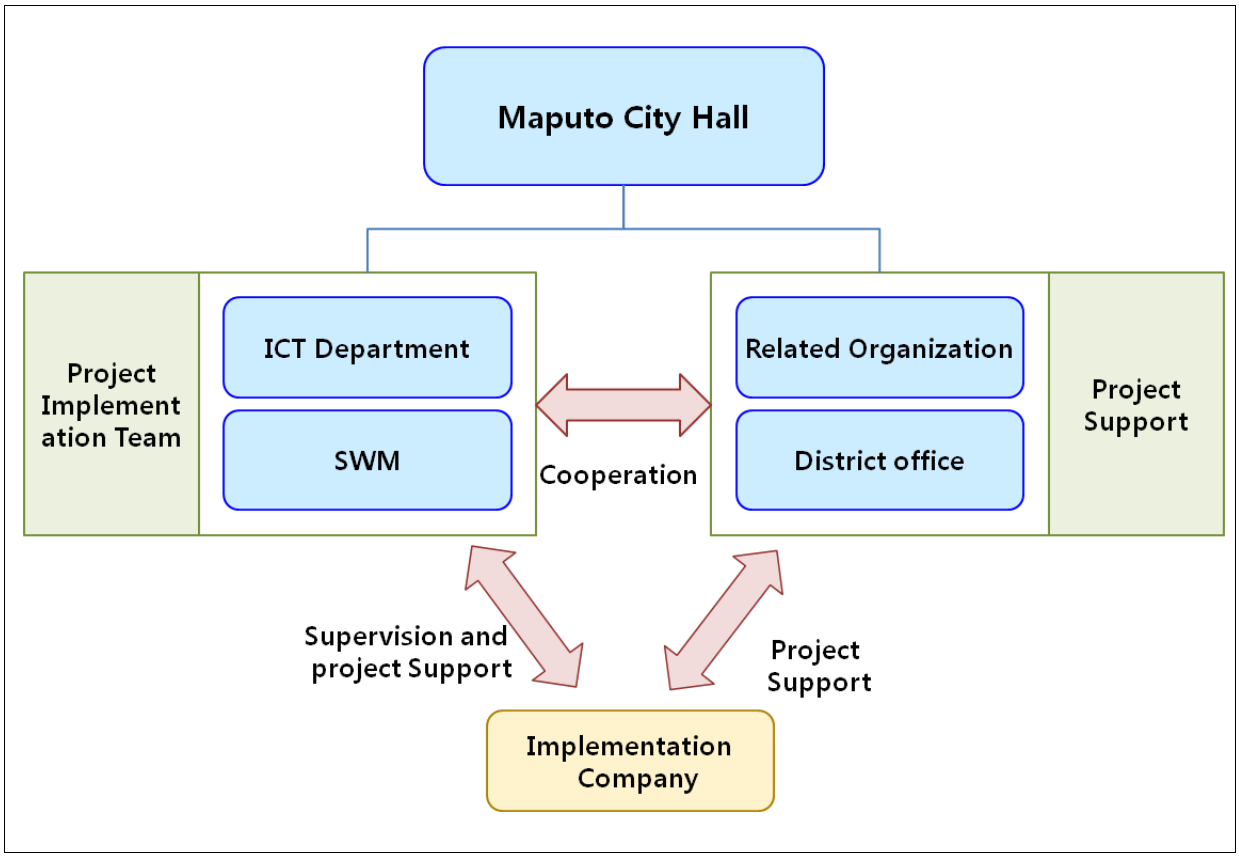
☐ Project implementation schedule is suggested as the below [Table 25] shows

[Table 26] Project Implementation plan

Category	Project Implementation Period											
	1M	2M	3M	4M	5M	6M	7M	8M	9M	10M	11M	12M
Project implementation plan												
On-site research and analysis												
Basic and detailed design												
Facility procurement												
Development												
Test												
Training and technology transfer												
Test operation												
Transfer & Takeover												

6. Project Implementation Organization

- ☐ Maputo City Hall ICT Department and SWM are the core responsible organizations for the implementation of this project
- ☐ Each district office and city police station require cooperative system with other related departments



[Figure 54] Project Implementation Organization

7. Training Plan

☐ Training plan is to be executed as the below [Table 26] shows

[Table 27] Training Plan

Title of Training		Description	Subject	Period
User Training	Claim System	• Claim system user training • System guideline and cautions	• City Hall claim staff • Call center staff • SWM claim staff • District office cleaning department staff • City police station civil complaint staff	1 week
	Waste Processing System	• Waste processing system user training • System guideline and cautions	• All SWM staff • District office cleaning department staff • Waste outlet business	2 weeks
Operator training	Claim System	• System configuration training • System manager function training	• Claim system operator	1 week
	Waste Processing System	• System configuration training • System manager function training	• Waste processing system operator	1 week
Manager training	Server management	• Server operator training • Server security management training • Error repair training	• Server manager	4 weeks
	DB management	• SQL basic training • DB installation training • DB back-up and restoration training	• DB manager	4 weeks

8. Operation and Maintenance Plan

8.1 Maintenance Plan

- ☐ The construction company conducts maintenance for 2 years; after that Maputo City must designate local corporate or maintenance personnel for maintenance beforehand.
- ☐ Maputo City has the development team for work system development. technology transfer for existing Maputo City development team to take care of S/W maintenance should be set in place
- ☐ However, the current Maputo City development team cannot conduct web-based system maintenance as body responsible for application program development right away. Therefore the newly implemented web-based system maintenance requires sufficient preliminary web development technology
- ☐ If City Hall development team is deemed incapable of system maintenance a local developer shall be selected

8.2 Operation Plan

- ☐ Maputo City's self-operation shall be assured with preliminary selection of system operator, server manager, and DB managers for sufficient technology transfer training

VI. Economic Feasibility Analysis

1. Estimated Project Cost
2. Detailed Project Cost
3. Yearly Expense Plan
4. Funding Plan
5. Economic Feasibility Analysis

Ⅵ. Economic Feasibility Analysis

1. Estimated Project Cost

☐ Total cost of this project amounts to US$ 1,788,516

1 US$ = 1,100 won

[Table 28] Project Cost

Classification	Korea Won	US$	Remark
	Sum	Sum	
1. Software	905,000,000	822,727	
- Oracle	40,000,000	36,364	
- WAS S/W	10,000,000	9,091	
- Certificate S/W	30,000,000	27,273	
2. Hardware	232,800,000	211,636	
- Certificate Server	15,000,000	13,636	
- Web Server	15,000,000	13,636	
- WAS Server	15,000,000	13,636	
- DB Server	15,000,000	13,636	
- SAN Storage	80,000,000	72,727	
- UPS	10,000,000	9,091	
- Rack	1,000,000	909	
- CTI Server	15,000,000	13,636	
- PC	25,000,000	22,727	
- Headset	1,800,000	1,636	
- IPS	40,000,000	36,364	
3. Development S/W	825,000,000	750,000	
4. Training Cost	161,678,895	146,981	
- Overseas Training in Korea	18,200,000	16,545	
- Local Training	143,478,895	130,435	
5. Operation & Maintenance	341,340,000	310,309	
- 1 Year	170,670,000	155,155	0.15%
- 2 Year	170,670,000	155,155	0.15%
Base Cost	1,640,818,895	1,491,654	
6. Tax and Duties	326,548,600	296,862	
Total Cost	**1,967,367,495**	**1,788,516**	

2. Detailed Project Cost

2.1 Software Cost

☐ Software cost needed for construction including industrial and development SW amounts to US$ 822,727 among which the development cost is US$ 750,000.

1 US$ = 1,100 won

[Table 29] Software Cost

Classification	Korea Won	US$
	Sum	Sum
1. Commercial Software	80,000,000	72,727
- Oracle	40,000,000	36,364
- WAS S/W	10,000,000	9,091
- Certificate S/W	30,000,000	27,273
2. Development Software	825,000,000	750,000
Total Cost	**905,000,000**	**822,727**

2.2 Hardware Cost

☐ Necessary hardware cost amounts to US$ 211,636.

1 US$ = 1,100 won

[Table 30] Hardware Cost

Classification	Korea Won	US$
	Sum	Sum
Hardware	**232,800,000**	**211,636**
- Certificate Server	15,000,000	13,636
- Web Server	15,000,000	13,636
- WAS Server	15,000,000	13,636
- DB Server	15,000,000	13,636
- SAN Storage	80,000,000	72,727
- UPS	10,000,000	9,091
- Rack	1,000,000	909
- CTI Server	15,000,000	13,636
- PC	25,000,000	22,727
- Headset	1,800,000	1,636
- IPS	40,000,000	36,364

2.3 Training Cost

☐ Necessary training cost amounts to US$ 146,981.

☐ Training cost is consisted of invitation training and local training

☐ Overseas Training in Korea

- 2 main personnel working for Maputo City Hall will be invited to Korea for training.
- Training will be for a week, consisted of visitation and training of Korea's advanced facility.

☐ Local Training

- Local training involves about 2 months of training for employees of Maputo City Hall Call Center and public officials.

1 US$ = 1,100 won

[Table 31] Training Cost

Classification	Korea Won	US$
	Sum	Sum
Training Cost	**161,678,895**	**146,981**
- Overseas Training in Korea	18,200,000	16,545
- Local Training	143,478,895	130,435

2.4 Operation & Maintenance Cost

☐ Maintenance cost is the warranty period - subsidy for technology required for stable operation and maintenance of the system for 2 years after the completion of construction.

☐ Maintenance cost was calculated to be 15% of the construction cost, remote or in-person visitation costs upon any errors of the system.

1 US$ = 1,100 won

[Table 32] Operation & Maintenance Cost

Classification	Korea Won	US$
	Sum	Sum
Operation & Maintenance	**341,340,000**	**310,309**
- 1 Year	170,670,000	155,155
- 2 Year	170,670,000	155,155

3. Yearly Expense Plan

☐ Yearly project expense plan was designated according to project implementation period and implementation schedule; detailed yearly budget distribution is shown below.

1 US$ = 1,100 won

[Table 33] Yearly Expense Plan

Classification	Y	Y+1	Y+2	Total
1. Commercial Software	72,727			72,727
2. Hardware	211,636			211,636
3. Development S/W	750,000			750,000
4. Training Cost	146,981			146,981
5. Operation & Maintenance		155,155	155,155	310,309
6. Tax and Duties	296,862			296,862
Total Cost	**1,478,207**	**155,155**	**155,155**	**1,788,516**

4. Funding Plan

☐ Maputo City is required to MoU with Seoul city for the technical support agreement and the funding of funding source.

☐ Thus, the funding plan will be established based on the result that find the funding source in a variety of ways and the occurrence of the task in progress.

5. Economic Feasibility Analysis

5.1 Methodology of Economic Feasibility Analysis

1) Overview

- ☐ In this chapter we perform an economic feasibility analysis for support to SWMMIIS Implementation Project through Benefit-Cost Model.
- ☐ For this analysis we analyzed social benefit and social cost and checked the economic feasibility of this Project through NPV(Net Present Value), EIRR (Economic Internal Rate of Return, or IRR) and Benefit-Cost Analysis. And we also executed sensitivity analysis how the changes in major variables such as discount rate, operation cost and benefit affect economic feasibility.

2) Net Present Value (NPV)

- ☐ Net Present Value is the most widely used method, and Net Present Value can be calculated by deducting present value of total future cash outflow from present value of total future cash inflow. The criteria of decision making at net present value method is: if net present value is higher than zero, then the project shall be an adoptable alternative.

  - $NPV=\sum_{t=0}^{n}\frac{B_T}{(1+r)^t}-\sum_{t=0}^{n}\frac{C_T}{(1+r)^t}$

Where B_T= present value of benefits

C_T= present value of costs

r = discount rate (interest rate)

n = durable years of analysis period

3) Internal Rate of Return

- ☐ Internal Rate of Return is used when there is a difficulty in deciding applicable discount rate at NPV method.

- ☐ Internal Rate of Return is a discount rate that makes the present value of future cash inflow and the present value of future cash outflow the same.
- ☐ The criteria of decision making at Internal Rate of Return method is: if Internal Rate of Return is higher than the discount rate (in this analysis, it is 12%), then the project shall be an acceptable alternative.

  EIRR: R that satisfies the equation: $\sum_{t=0}^{n} \frac{B_T}{(1+R)^t} = \sum_{t=0}^{n} \frac{C_T}{(1+R)^t}$

4) Benefit-Cost Ratio

- ☐ Benefit-Cost Ratio (BCR) represents the size (multiple) of value per a unit of investment. Since NPV does not directly show the size of investment, this Benefit-Cost Ratio shall be used as a supplementary one.
- ☐ The equation of Benefit-Cost Ratio calculation is as below. The decision making criteria of Benefit-Cost Ratio method is: if Benefit-Cost Ratio is higher than 1, then the project shall be an adoptable alternative.

  BCR $= \sum_{t=0}^{n} \frac{B_T}{(1+r)^t} / \sum_{t=0}^{n} \frac{C_T}{(1+r)^t}$

5.2 Assumptions of Economic Feasibility Analysis

1) Discount Rate

- ☐ In this economic feasibility analysis, the discount 12% has been assumed following "Economic feasibility analysis standard for EDCF projects."

2) Inflation Rate and Wage Increase Rate

- ☐ Inflation rate of 8.4% used which is an average of the past three year inflation rates reported by IMF as shown in [Table 34]. As the wage increase rate for employees and officials is not available, we will use inflation rate as the same as wage increase rate.

[Table 34] Mozambique Inflation Rate

Item	2010	2011	2012	Average
Inflation rate	12.7%	10.4%	2.1%	8.4%
GDP Inflation rate	7.1%	7.3%	7.4%	7.3%

3) Analysis Period

☐ For the estimation of durable years of information system and buildings to be built in the Project, 5 years and 40 years are used respectively as specified in the enforcement decree of the corporate tax act as shown in [Table 35].

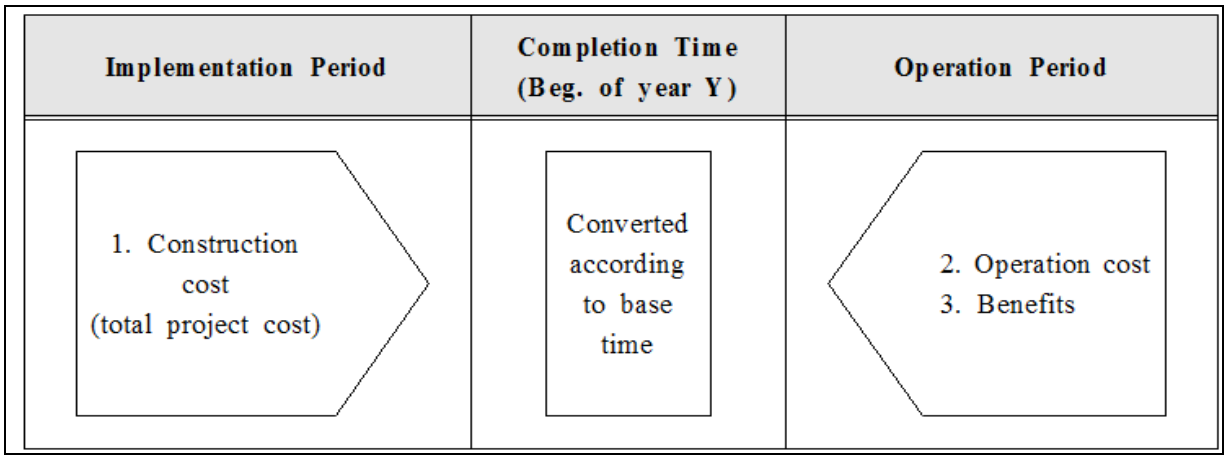
[Table 35] Estimation of durable years

Item		Asset Types	durable years (Min.~Max.)
Enforcement decree of the corporate tax act	Building	Building (including attached facility) and fixture built of steel frame/reinforced concrete, masonry, brick masonry, or steel frame	40 years (30 ~ 50 years)
	Equipment and facilities	Vehicles and transportation equipment, tools, appliances and fixtures (including S/W)	5 years (4 ~ 6 years)
	Industry asset	Public administration, defense and social welfare administration	5 years (4 ~ 6 years)
		Information processing and other industries related with computer operation	

☐ Therefore, the analysis period is set using 5 years which is the number of durable years for the information system.

4) Method of Analysis

☐ The method of analysis is, as shown in [Figure 55], to compare the total costs with the total benefits calculated at the completion time (at the beginning of year Y).



[Figure 55] Method of Analysis

☐ The total costs at the completion time consist of construction cost(total project cost) in which the inflation rate is considered, and a present value of operation costs, while total benefits consist of present value of benefits calculate by discounting them to the value at the completion time, Then, we analyze the economic feasibility by comparing the total costs and the total benefits at the completion time.

5.3 Cost Analysis

1) Calculation of Construction Cost

☐ The cash flow for economic feasibility analysis is set as USD 1,788,515 the mount of total project costs.

(Unit: USD)

[Table 36] Construction Cost

Item	Total project cost	Cash flow for analysis
1. System Development	822,727	822,727
2. H/W	211,636	211,636
3. Training	146,981	
4. O & M 2Years	310,309	
Contingency	0	0
Tax & Duty	296,862	296,862
Total Cost	1,788,515	1,788,515

2) Calculation of Operation Cost

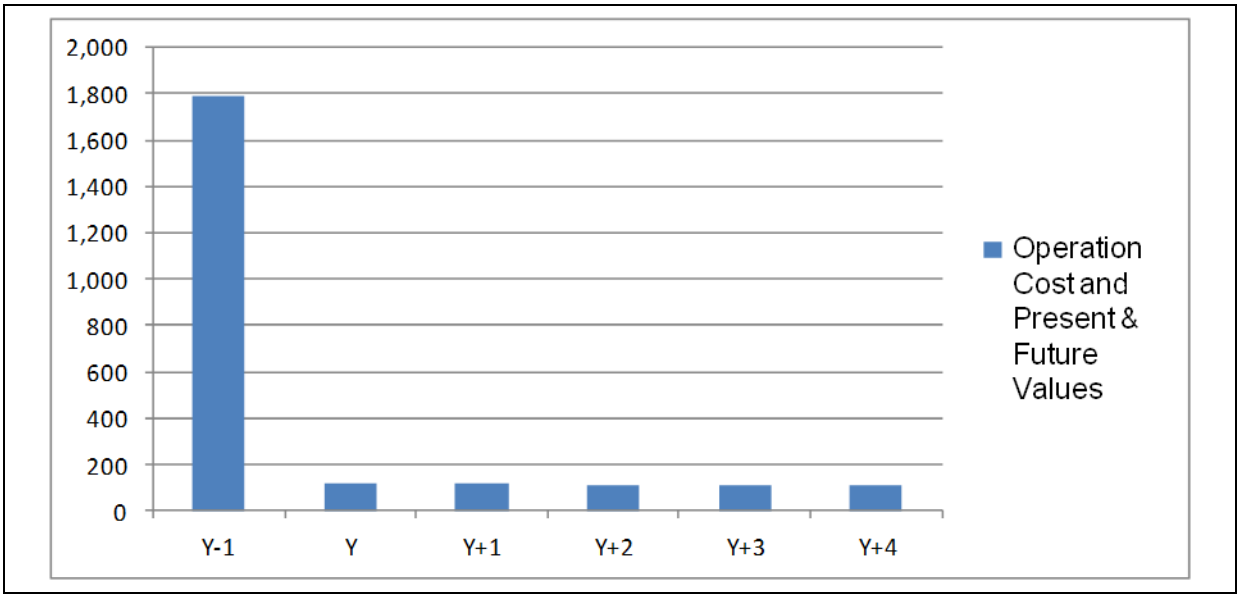
- ☐ Operation & Maintenance cost after project completion is set as 12% of total project cost per Year.
- ☐ Operation cost per year is USD 124,124

3) Cash Flow of Costs

- ☐ The cash flow of the project cost at the beginning of year Y is calculated as USD 1,788,515
- ☐ We assume that the operation & maintenance cost per year is 124,124, and after calculating future value by applying inflation rate of 8.4% to this amount, we can calculate its present value by applying discount rate of 12%.

  Example) PV of operation cost in Y+2 = $\frac{124{,}124\times(1.084)^3}{(1.12)^3}$

- ☐ The yearly operation costs and their present & future values can be shown in graphs of [Figure 56].



[Figure 56] Operation Cost and Present & Future Values

5.4 Benefit Analysis

1) Calculation of Benefits

☐ Three kinds of benefits are considered to calculate benefits: productivity enhancement of civil servant benefits, Time Cost saving, and Transportation Expenses.

- Improvement of civil servant is calculated as benefits arising from reducing manual operation, preventing from calculation errors and duplicated works and automating production of statistics.
- Improvement of time cost saving is calculated as benefits arising from reducing claim and complaint process time
- Improvement of time cost saving is calculated as benefits arising from number of visiting the city hall

2) Calculation of Civil Servant Benefits

☐ Benefits of civil servant are derived to measure PV at year Y assuming total Maputo city hall official's average salary productivity growth of 5%.

- Base on the Questionnaire, Total number of Maputo city hall official is 3,050 person
- Maputo city hall average salary is USD8,000(University grade, First year)
- Growth in the annual salary apply the 7.3% in GDP inflation rate
- Growth in the number of civil servants apply the 7.3% in GDP inflation rate

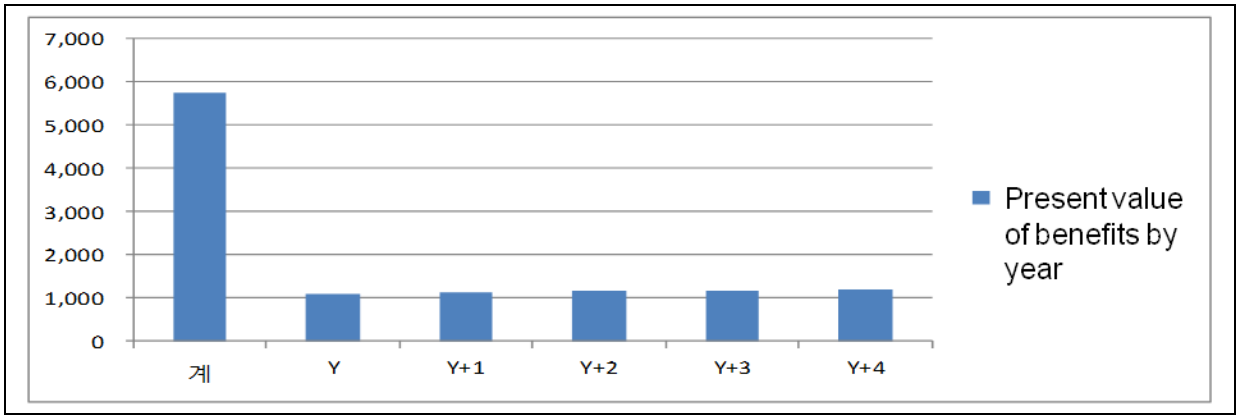
Equation) PV of benefits Y+n = $\frac{(\text{No.Officials}\times\text{gOx5\%})\times(\text{Annual Salary})\text{n}}{(1+\text{Discount Rate})\text{n}}$

Example) PV of benefits Y+2 = $\frac{(3{,}512\times 8{,}000\text{x}0.05)\times(1.073)^3}{(1.12)^3}$

[Table 37] Present Value of Civil Official

Item	Total	Y	Y+1	Y+2	Y+3	Y+4
City Official		3,050	3,273	3,512	3,768	4,043
Salary (Thousand USD)		8.0	8.6	9.2	9.9	10.6
Future Value (thousand USD)		1,220	1,405	1,617	1,862	2,144
Present Value (thousand USD)	5,760	1,089	1,120	1,151	1,183	1,216

☐ Yearly benefits of civil official and their PV can be graphically illustrated in [Figure 57].



[Figure 57] Present Value of civil officials

3) Calculation of Time Cost Benefits

☐ PV of the benefit at year Y is measured for time cost employee in charge of 1,500 complaints for each year, labor savings 1.7 USD per citizen to apply to the measure.

- Total number of complaints are 5,000, which 30% of the 1,5000 complaints handled online savings and 2houres saving are assumed
- Base on the Questionnaire, average wage is 6.8USD, 2hours saving is calculated 1.7USD
- Growth in the annual salary apply the 7.3% in GDP inflation rate
- The number of complaints per year assumed a 10% of growth rate.

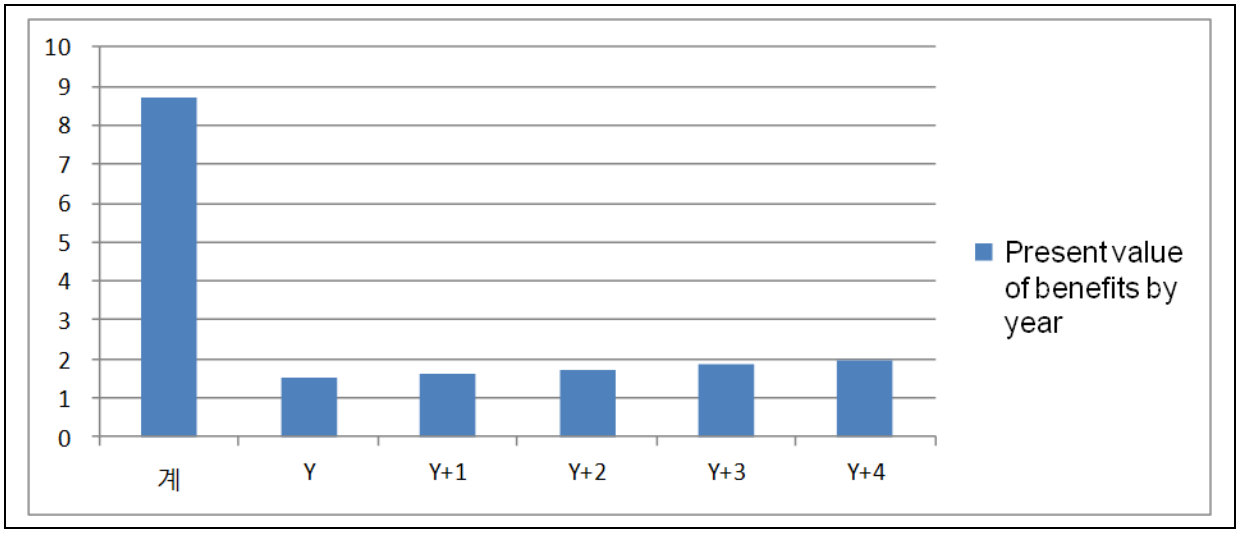
Equation) $PVY+n = \frac{(\text{Number of complaints per year x } 1.7)\times(\text{Annual salary growth})^{n}}{(1+\text{Discount rate})^{n}}$

Example) $PVY+2 = \frac{(1{,}815 \text{ x } 1.7)\times(1.073)^{3}}{(1.12)^{3}}$

[Table 38] Present Value of Civil Official

Item	Total	Y	Y+1	Y+2	Y+3	Y+4
City Official		1,500	1,650	1,815	1,997	2,196
Salary (Thousand USD)		1.7	1.8	2.0	2.1	2.3
Future Value (thousand USD)		3	3	4	4	5
Present Value (thousand USD)	13	2	2	3	3	3

☐ Yearly benefits of time saving and their PV can be graphically illustrated in [Figure 58].



[Figure 58] Present Value of Time Saving

4) Calculation of Benefits from Transportation Expenses

☐ 1,500 complaints processed in every year, the average savings per complaints 1.14USD is applied to the measured value of the current year.

- Base on the Questionnaire, average transportation fee is 1.14USD.
- The number of complaints per year assumed a 10% of growth rate.
- Growth in the annual transportation fee is the 8.4%.

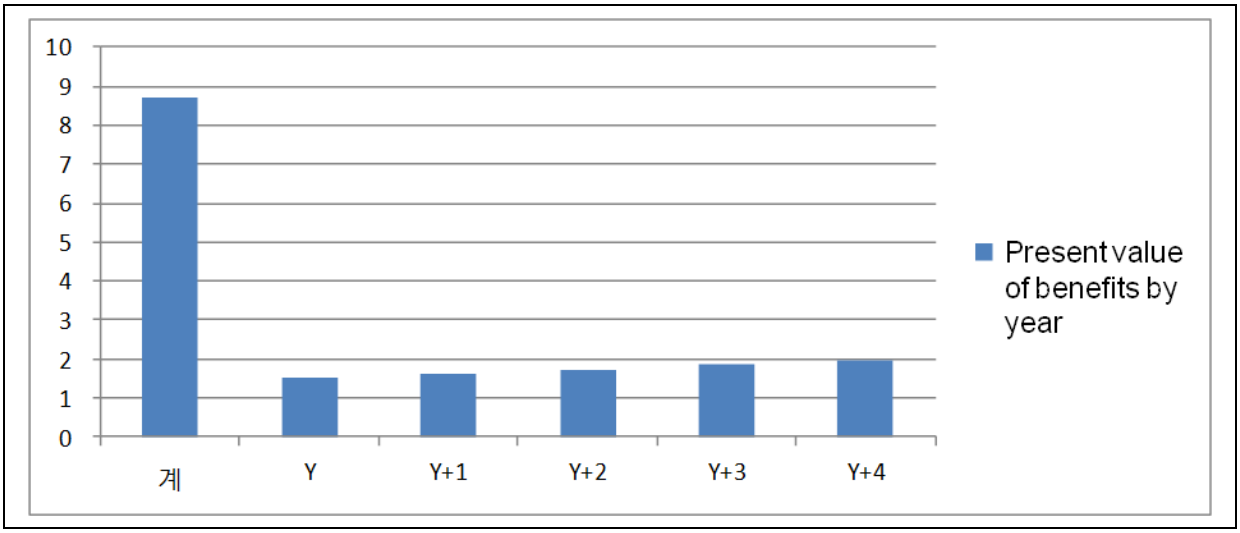
Equation) PVY+n = $\frac{(\text{Number of complaints per year x } 1.14)\times(\text{Annual inflation rate})^{n}}{(1+\text{Discount rate})^{n}}$

Example) PVY+2 = $\frac{(1{,}815 \text{ x } 1.14)\times(1.084)^{3}}{(1.12)^{3}}$

[Table 39] Present Value of Civil Official

Item	Total	Y	Y+1	Y+2	Y+3	Y+4
City Official		1,500	1,650	1,815	1,997	2,196
Salary (Thousand USD)		1.1	1.2	1.3	1.5	1.6
Future Value (thousand USD)		2	2	2	3	3
Present Value (thousand USD)	9	2	2	2	2	2

☐ Yearly benefits of transportation expenses and their PV can be graphically illustrated in [Figure 59].



[Figure 59] Yearly Benefit from Revenue Improvement

5) Cash Flow of Benefits

☐ Total benefits are calculated as the sum of present values of civil servant benefit, Time Cost Saving benefit, and transportation expenses benefit.

- Total Benefits = PV of civil servant benefit + PV of Time Cost Saving benefit + PV of transportation expenses benefit

5.5 Economic Feasibility Analysis

1) Cash Flows of Total Costs and Benefits

☐ Cash flows of total costs and benefits can be summarized as in [Table 40].

(Unit: USD)

[Table 40] Cash Flows of Total Costs and Benefits

Item	Sum of PV at Year Y	Y	Y+1	Y+2	Y+3	Y+4
Construction costs						
Construction Cost	1,789					
PV of operation cost		120	116	113	109	105
PV of operation cost	1,789	120	116	113	109	105

Total costs	2,352					
Benefits						
PV of official's benefits	5,760	1,089	1,120	1,151	1,183	1,216
PV of time savings	13	2	2	3	3	3
PV of transportation expenses	9	2	2	2	2	2
Total benefits	5,781					

☐ PVs of total benefits and costs are calculated in Table 39, resulting in:

- PV of total benefits at the beginning of year Y

  = official's benefit + time savings benefit + transportation expenses benefit

  = USD 5,781,134
- PV of total costs at the beginning of year Y
- = construction costs + operation costs
- = USD 2,351,791

2) Results of Economic Feasibility Analysis

☐ The results of economic feasibility analysis on this Project by NPV method show that the value is higher than "0" (zero) as below.

NPV = $\sum_{t=0}^{n} \frac{B_T}{(1+r)^t} - \sum_{t=0}^{n} \frac{C_T}{(1+r)^t}$ = USD 3,429,343 > 0

☐ The results of economic feasibility analysis on this Project by IRR method show that the discount rate is higher than "12%" as below.

IRR = 49.2% > 12%

☐ The results of economic feasibility analysis on this Project by Benefit-Cost Ratio method show that the value is higher than "1" as below.

Benefit-Cost Ratio = $\sum_{t=0}^{11} \frac{B_T}{(1+r)^t} / \sum_{t=0}^{11} \frac{C_T}{(1+r)^t}$ = 2.46 > 1

☐ Three evaluation methods have been used to analyze economic feasibility, and the results are summarized in [Table 41].

[Table 41] Analysis Result for Economic Feasibility

Analysis Method	Calculated Value	Decision Criteria	Analysis Result
NPV	USD 3,429,343	> 0	Economically feasible
IRR	49.2%	> 12%	Economically feasible
Benefit-Cost Ratio	2.46	> 1	Economically feasible

☐ To become economically feasible, NPV should be higher than "0," IRR should be higher than discount rate 12%, and Benefit-Cost Ratio should be higher than 1.

☐ As the result of economic feasibility on this Project satisfies all three criteria, the economic feasibility of this Project is evaluated as excellent.

☐ As this Project of improving civil servant has a big social benefit, and Citizen has, directly or indirectly social cost saving and economic benefits, reducing the visit the city hall.

5.6 Sensitivity Analysis

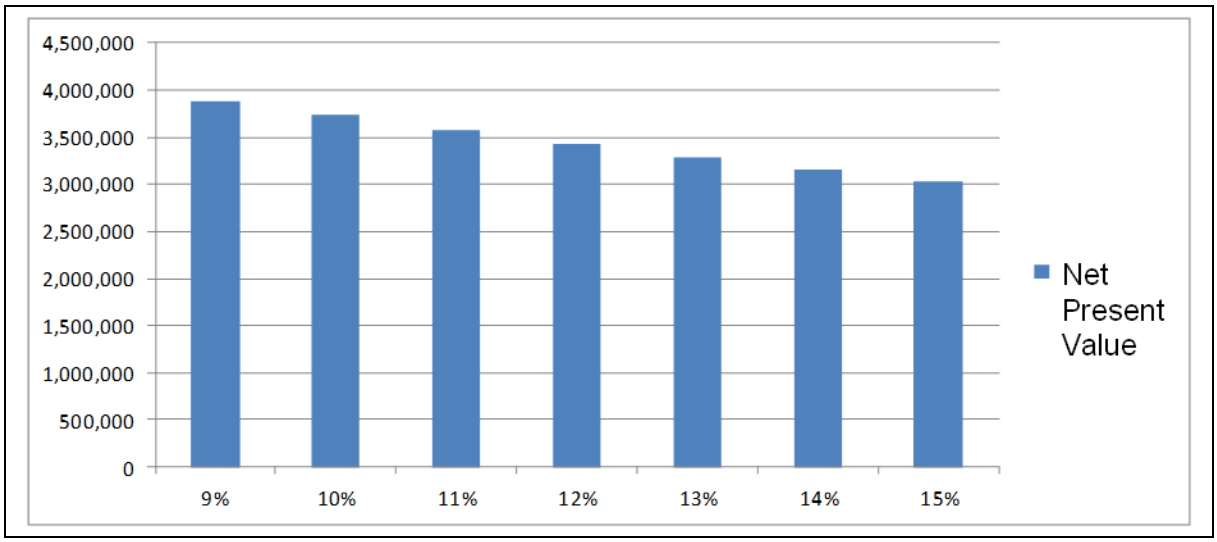
1) Sensitivity Analysis to Discount Rate Fluctuation

☐ The result of sensitivity analysis over increase or decrease of discount rate is as in [Table 42] and both NPV and Benefit-Cost Ratio are robust to the fluctuation.

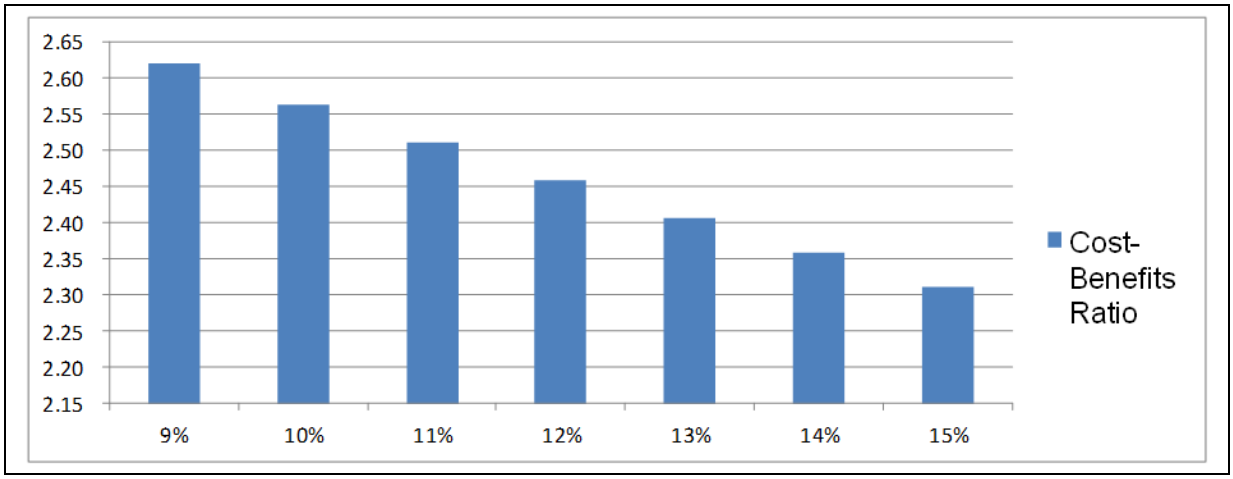
[Table 42] Sensitivity Analysis for Discount Rate Fluctuation

Discount Rate	NPV (USD)	Benefit-Cost Ratio
9%	3,886,835	2.62
10%	3,727,738	2.56
11%	3,575,360	2.51
12%	3,429,343	2.46
13%	3,289,351	2.41
14%	3,155,068	2.36
15%	3,026,201	2.31

☐ The result of sensitivity analysis of NPV and Benefit-Cost Ratio over discount rate changes is visualized in graphs [Figure 60] and [Figure 61].



[Figure 60] Sensitivity Analysis of NPV over Discount Rate Changes



[Figure 61] Sensitivity Analysis of B/C Ratio over Discount Rate Changes

2) Sensitivity Analysis to Benefit and Cost Fluctuation

☐ The result of sensitivity analysis according to cost and benefit fluctuation is as in [Table 43] and NPV, IRR and Benefit-Cost Ratio appear excellent.

[Table 43] Sensitivity Analysis to Benefit and Cost Fluctuation

Variables of Change		NPV (USD)	IRR	Benefit-Cost Ratio
Cost stable	Benefit stable	3,429,343	49.16%	2.458183
Cost increase (10%)	Benefit stable	3,194,164	42.53%	2.234712
Cost increase (20%)	Benefit stable	2,958,985	36.86%	2.048486
Cost decrease (10%)	Benefit stable	3,664,522	57.04%	2.731315
Cost decrease (20%)	Benefit stable	3,899,701	66.64%	3.072729
Cost stable	Benefit increase (10%)	4,007,457	56.26%	2.704002
Cost stable	Benefit increase (20%)	4,585,570	63.22%	2.94982
Cost stable	Benefit decrease (10%)	2,851,230	41.86%	2.212365
Cost stable	Benefit decrease (20%)	2,273,116	34.31%	1.966547
Cost increase (10%)	Benefit decrease (10%)	2,616,051	35.70%	2.011241
Cost increase (20%)	Benefit decrease (20%)	1,802,758	23.72%	1.638789
Cost decrease (10%)	Benefit increase (10%)	4,242,636	64.74%	3.004446
Cost decrease (20%)	Benefit increase (20%)	5,055,928	83.42%	3.687275

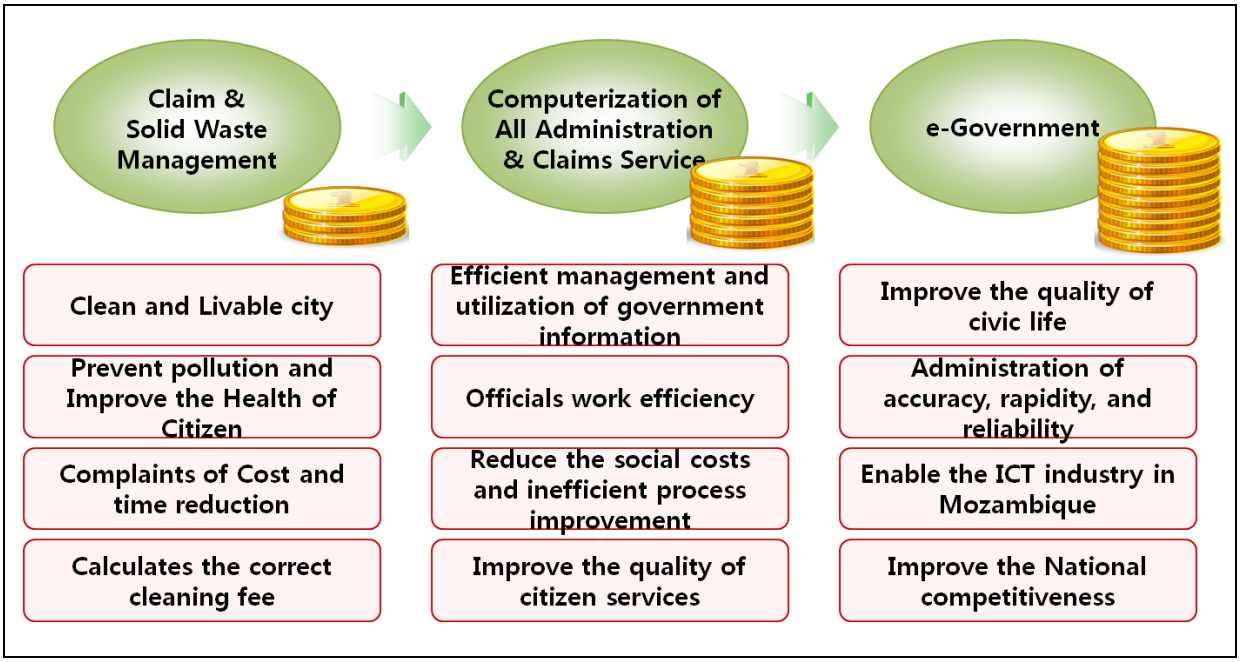
Ⅶ. Plan to Maintain Effects in the Future

1. Expected Effect
2. Risks and Response
3. Long-term Maintenance

Ⅶ Plans to Maintain Effects in the Future

1. Expected Effect

- ☐ Social cost rising from visitations required to handle Maputo citizen complaints can be reduced
- ☐ Accurate waste related tax can be collected
- ☐ Clean Maputo City can contribute to improvement of the city's image as well as the residents' health
- ☐ With CSWMIIS, all administration work and civil service can be computerized to increase public officials' work efficiency and the quality of service for the citizens
- ☐ Ultimately the country's competitiveness can be enhanced through the activation of Mozambique's ICT industry



[Figure 62] Expected Effect

2. Risks and Response

2.1 Project Failure due to Lack of Analysis on the Works

1) Risks

- ☐ As it is a foreign project it is expected that much time will be needed to recognize the current works given the communication issues with the client
- ☐ Person in charge of the construction project cannot be responsible for all the work research; active cooperation is required from each head of department
- ☐ There is high risk of failing to apply the constructed system if the current Maputo City work is not recognized and analyzed

2) Response

- ☐ It is important to compose preliminary cooperation structure with Maputo City for local research before the business trip; preparation is required for active cooperation during the business trip
- ☐ Basic design after local research through work analysis should be conducted;
- ☐ and receiving Maputo City's certification is required before returning home after conducting local research and developing detailed design for development
- ☐ UI-oriented prototype production for certification can also be applied
- ☐ It is required that a clear development scope be determined during the 1st local business trip with sufficient communication with the client

2.2 Project Cost Related to the Project Environment

1) Risks

- ☐ This project is deemed impossible to be constructed on its own due to lack of local businesses' technology manpower in Mozambique

- ☐ Therefore it makes sense to construct the system in Korea or other advanced foreign countries with enough civil complaint and waste processing construction and operation experiences
- ☐ In this case, work analysis through local research, test after construction, technology transfer, long-term dispatch to Mozambique of an engineer for maintenance is required
- ☐ Excessive cost is expected for foreign projects compared to a domestic project; there is high cost of project failing due to insufficient project cost which leads to the reduced system quality

2) Response

- ☐ Sufficient business schedule is considered upon establishing project budget to calculate the construction cost
- ☐ Local price level is considered (lodging, traveling fees, etc) considered upon establishing project budget to calculate the business budget

2.3 Failure of Self-operation

1) Risks

- ☐ Maputo City have no experience of constructing and operating electronic civil service system so far
- ☐ There is possibility of Maputo City officials not adjusting to work changed with the implementation of electronic civil service system
- ☐ Lack of technological manpower required for server management and DB management, and other works required for system operation
- ☐ Possibilities of self-operation failing due to lack of technological workforce necessary for system operation

2) Response

- ☐ Sufficient technology transfer is needed to allow Maputo City's self operation

- ☐ Easy, detailed user manual should be drafted along with thorough user training for Maputo City employees to comprehend and adapt to work process changes caused by system implementation
- ☐ Also, active participation of related City Hall departments is required for proper system operation. Therefore an ordinance for work changes with the implementation of a new system should be established and announced through the City Hall

3. Long-term Maintenance

3.1 Claim Management System

- ☐ Claim management system in this project is Maputo City's pilot system construction for all civil systems to develop into electronic civil service systems; gradual connection and expansion with City Hall departments in the future is required
- ☐ Therefore the claim management system should be designed in consideration of connection and expansion with other departments; technological standard and standard framework for connections with the department work system is required
- ☐ Korea came to become the no. 1 e-government after numerous trial and errors
- ☐ Korea especially conducts efficient administration works through data sharing and connection with central administration system with city/state system constructed for city, district, borough, and local government's e-governing
- ☐ e-government standard framework consisted of all the know-hows of Korean e-government data transfer and sharing needs to be customized according to Mozambique's status before establishing system construction strategy in consideration of future expansion

3.2 Waste Processing System

- ☐ Waste processing system is the computerized system for SWM department's administration work. It implements pilot electronic transfer system to monitor waste corporate, cleaning corporate, and processing corporate
- ☐ Currently Maputo cannot make active application of electronic transfer. It requires specific systemization for processing or different types of waste; with legal obligation set it place for electronic transfer
- ☐ Therefore systematic preparations need to be sufficiently reviewed after the 1st stage system construction before expanding the system; as well as realistic possibilities of electronic transfer succeeding in the Mozambique environment

☐ Implementation of electronic transfer pilot system in the 1st project will sufficiently deliver the efficacy and superiority of Korea's electronic transfer system and the actual implementation of electronic transfer in the future will lead to the export of Korea's Environment Department System