



Improvement of Environmental life of City by Innovative Waste Management System (IWMS) based on ICT Design

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Abstract: By this study, we aim to elaborate ``Practical Process based on ICT`` (Innovation) for management of every waste produced in our environment in order to improve conditions of life. We have used some geolocalisation softwares, Internet connection and Microsoft Excell as technology to perform this work. Our interest was focused on hold housing wastes, pluvial and used liquid waste. Our mind was to manage waste produced in our environment in order to improve life in it. So, we did our study in a city called Soweto in Abidjan- Ivory Coast located in Africa. The general purpose of this study is Innovative.

Waste Management System (IWMS) consisting to collect, transport, dispose or/ recycle and control waste. According to these four subsystems developed, the focus of this study was on collection/production system of waste and control systems. For liquid waste, functional infrastructure network is ideal for collection/transportation of and have been done. For used waste, drainage or/with connection of toilet septic tank is the best according to simulation results. For solid waste, frequently collection of waste` has been chosen. Collection must be applied by installation of gabage in a relative architecture in the city, visdange of, transportation to discharge for treatment. We modeled the productions of waste according to our survey and shape a created system of production management for. The concept on control consisted to adapt frequency of collection in certain architecture of city with production of wastes. At the end, test of this system management of waste has been made and the results were good depending of three conditions elaborated. 13 criteria have been defined: Length (m), Number of potholes (NoP); Number of discharges point for collected cumbersome waste (NoDP); Length of Irrigation Network to clean (LoIN); Number of septic tank to drain (NoFV); Total areas (m²) of potholes (TAoP); Total volumes (L) to drain (TVV); Total Volume of Drainage Point (T) to clean (TVoDP); Volume of used waste/Pluvial (HL) to clean (VoUW); Volumes (L) of cleaning water needed (VoCWN); Number of Crossroads (NoC); Number of collection Point (NoCP), Number of empty areas (NoNA). Only 5 have been considered for simulation. With satisfaction obtained, we think that this system can be used in many fields.

Other studies will consist to perform 2 others systems (transportation, treatment recycle).

Keywords: Waste Management, Waste production, Architecture, Control Waste System.

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I. Introduction

In the world, many studies are done in field of waste in general. The particularities of each study will be the context of the studies. Our study is based on the context of an environment, mostly city. So, we aim to define problems met in our environment life. And we have chosen city of SOWETO in Abidjan- Ivory Coast located in Western Africa.

Indeed, this city is located in sub-region of Western Africa. It has 31 regions and 2 autonomy districts; ABIDJAN and YAMOUSSOUKRO. We have 13 subdivisions. Le Plateau,

Abobo, Adjamé, Attécoubé, Cocody, **Koumassi**, Marcory, Port-Bouët, Treichville, Yopougon, Anyama, Bingerville et Songon. According to site ``presse Côte d'ivoire``, in rain season, we have flood in subdivision of KOUMASSI so SOWETO. Particullary, we have difficulties to go to school. The state of road is not good. Koumassi subdivision is 5° 18' 12" north, 4° 00' 33" west, population density is de **47 172 Hab. /km²**. It is limited in the North with subdivision of Marcory, to the South by subdivision of Port-Bouet, on South West, South-Est., North-Est. by **Laguna d'Ebrie** (close to a water flow). It is constituted by 10 sub-subdivisions and 4 cities, so 14 cities. Houses are about 60%, with

Precarious housing (26%). Divo city close to SOWETO has closely **10 546 and 169 traditional houses**.; Housing outstanding represents 5%; social layers are made up of **57%** young people with age between **15 to 39 years old**. Demographic growth is high. **Immigrations constitutes to 38.64 of international people, that is 68511.**

On economic context, there is **industrial zone in "Lagune"** working in fields of housing, public working, industry, textile, wood, precious stone, and more. National Economy is based on 40% of Abidjan economic. We have 600 MW to 1200MW national production of electricity with 42% Costumers low voltage, 52% average voltage. River **Transport** by pinasse and bus-boards. We have Islamique Church installed on almost **7500 m2**. 3 police stations (6e, 20e, 36e) and 2 military stations with the one based in **Koumassi**. Deeply we can find **"SOWETO City"** surrounded by a water body. There are **2 raining seasons** and 2 drying seasons. Temperature is around **27°C**. There is a **big treatment center** in ATTENGUE **since 2010**. Living conditions are **very poor** with flood, climatic risks, diseases due to pollution, poor conditions of people mobility. **In 1986 we saw an increased rate of unhealthiness** in abidjan district. In 2012, we have development of small employments like FANICO which consist to wash dresses.

Problems can be poor state of fonctionnal water network, poor state/ non existence of used water network, all septic tanks of used water are full, poor state of road with potholes, dirt along the streets, full discharge points. Image of city is very poor.

To face theses problems, we met many obstacles:

- Initiative to invest in that fields can be taken only by the government;
- Geological and geographical conditions are poor to have raw materials for building, to allow mobility of water (rain and used) in network infrastructures and to avoid degradation of road;
- mobility of water (rain and used) with non fonctionnal network of infrastructures for liquid waste;
- location of city which is in a central position, allowing crossing of many peoples (for solid waste) in terms of production control;
- density of population allows big production of waste.
- Last criteria can be designing of city (Architecture).

Also, many restrictions are: Limitation of budget, Limitation of raw materials or high cost, no monitoring at the end of project about maintenance, variability of rate production of wastes due to density.

Our general purpose is to draft a Pratical process of waste Management system of broken down in 4 sub- systems:

- Collection sub-system of waste management;
- Transport sub-system of waste management;
- Treatment sub-system of waste management;
- Supervision sub-system of waste management.

So, this hypothesis solution tries to explain that **a good system of Innovative wastes management contributes to improve environmental life of the city**. By applying this solution, we are trying to reach a good situation of city with specifics purposes:

- Reduction/ no floods;

- Reduction of diseases rate due to poor environment conditions;
- Increase attractivity of city by increasing frequency visitation with impacts on economics situation of city;
- Reduction of obstacle rate on the road.

In this article we will be limited to designing of theses 2 sub-systems of collection and transport in the field of liquid (rain, used wastes) and solid wastes.

Specific purposes are:

- Modelling the state of the city regarding wastes;
- Verify/ test two systems designed.

Criteria that can be taken in account are, state of dumping point, solid wastes on the street, state of water network (irrigation), level of river, state street (number of small concentrated point of water called potholes), state of mobility machines for transportation of solid wastes, state of resources, state of general dumping point, growth rate of density in city.

Our research question is what criteria is most important to insure success of these systems and then must be particularly monitored ?

The methodology developed employed is mixed method with qualitative criteria and also quantitative. We will follow this plan:

- Literature review
- Design
 - Concept and variables definitions ;
 - Populations;
 - Tools;
- Data collection method ;
- Procedure analysis;
- Data Results and analysis;
- Discussions;
- Conclusions;
- Projections.

II. Methodology

II-1 Developed practice:

Waste collection for decades creates world anxiety for Environment. Many ac-tions have been developed in this idea order I call: **" simples acts allow to act for improvement of lifestyle and to prevent lifestyle of each one: each citizen can throw and throw better"** Michel Augris, David Savy. 2001. According to him, Waste Management consists to:

- Renovate and reduce waste produc-tion and attacks by acting in Manufacture and Distribution of Waste networks of products;
- Waste Transport organisation and limit in volume and distance;
- Their value for recycle and later use.
- Sensitise people on impacts, preven-tion and possible compensations, from process production to destruction/recycling;
- Pollution/buying principe ;
- Implication of all in term of Access to information;

In the same line depending of classifi-cation, we have household waste, `ultimate`, `inertias`, `industrials`, `common`, radioac-tive

and industrialists specials, agricultural waste. This classification determines actions taken during process. In the Transport sector, we emphasize Product dangerousness. Concerning treatment, we are looking to selection of wastes.

In General order, this management production costs will be compensated by acting on Producer. We are talking about concept "pollution maker/ buyer". Also, contribution of all needs access to relative information.

Concerning sanitation, we are talking about atmospheric pollution, soil, water, security protocols, prescriptions signs, tracking sheets, method of treatment (re-recovery, recycling, incineration, regeneration, security protocol ANDA,)

According to 17 Sustainable Development Goals of United Nations, on its 3rd Goals we must Ensure healthy lives and promote well-being for all at all ages.

Systematisation, prevention, control, explanation.

II-2 Design

II-2-1- Main concepts and definitions

Basically, we will try to define some concepts and variables more important to accept this follow study and then, operational method to measure will be defined.

- **Waste Management:** It is a process applied to waste in order to control, to reach purposes defined for city. It consists of collection, transportation, treatment and control/supervision;
- **Waste:** It is considered as any element which is not on his place in a place (confere architecture) in society, made by an actor (producer) that we must define (liquid, solid, paste)
- **Liquid waste:** rain, surface, used, resources;
- **Solid wastes:** Housing, industrial, special.
- **Producers:** It can be human actions, natural producers (climate, vegetables), animals.
- **Period:** day, week, month;
- **Architecture:** Some places/location/ area in the city (centre) where we can analyse waste; (collection point, segment, Carrefour, area);
- **Transporta network:** Centre, elbows, frames, bridges.
- **Waste System Control:** It consists to know in which section of process management wastes are situated :

- Sub-system

- ✓ Collection: (Architecture, volume, quantity of furniture);
- ✓ Transport: (network, volume, Distance);
- ✓ Treatment: (selection, recycling, disposal, empty, washing,storages);

- Natural wastes (defrosting, civil engineering actions).

Environmental life:

- Diseases cases : Number of patients due to pollution diseases like malaria, cholera, cecity);
- Flood cases: Number of flood cases;
- Road statement, Number of: – potholes-fed up with water, - Mud-areas, - Encombrants-Furnitures; -Agricoles wastes areas.
- Quantity of furniture ;

- Volume of solid waste ;
- Volume of mud, sand ;
- Network maps (numbers of segment, elbows, ...).

II-2-2 Populations

Architecture and water network of Soweto.

II-2-3 Tools:

- General tools: Camera, questionnaires sheets, electronics recorded, google map software, computer, internet network, GPS, excel software;

- Special tools for simulation : Google map software, microsoft Excel, questionnaires sheets, lab software, computer.

II-3 Data Collection and Analysis

II-3-1 Data Collections Method

First of all, we have designed network and architecture of Soweto City by Google map and verified by a citizen on the ground. Based on this information, we have collected information on the state of all architecture and network at the same time. An array of informations designed will be filled for simulation. We will model this information on matlab/Excel and do simulation for tree cases conditions:

- Best conditions with much limited waste;
- Average conditions ;
- Worst conditions.

Then for each condition, solution of waste management system will be applied and results recorded.

II-3-2 Sub- System Of Collection And Transport Process

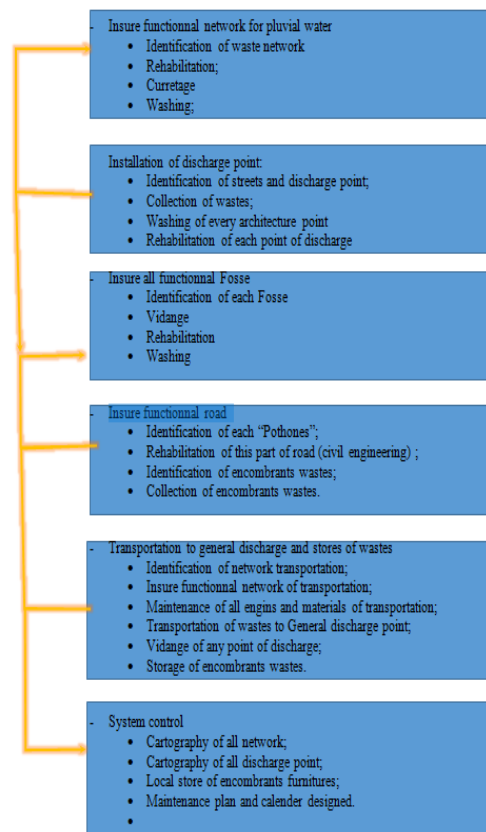


Figure 6: Sub-System of Collection And Transport

II-3-3 Simulation on Excel

a-1 Table of soweto Architecture

Architecture	Number	Location	Average total Length/superficy
Segments	8+8+29		17.58 km
area			8.5 ha
Collection point	18 main entrances + 41 entrance ways	5°16'59.50" N 3°56'50.75" W	
carrefour	12		

II-3-4 Expected Results

- Empty functional Transport network of liquid;
- Empty fonctionnal septic tanks;
- Empty Dumping points;
- No solid waste on the road
- No Potholes on the road;
- No agricultural waste Areas;
- No cumbersome furnitures on the road;

Representation of Soweto with Installation of Innovative waste management system

- All Functional network;
- Fonctionnal septic tanks;
- Fonctionnal dumping Point;
- Calendar designed;
- Functional machines for transportation;

III. Data Results and Analysis

III-1 Results

III-1-1 Entrances Results



FIGURE 1 SOWETO NETWORK DESIGNED

Perimeter = 3.45 km and Area = 85,07 ha

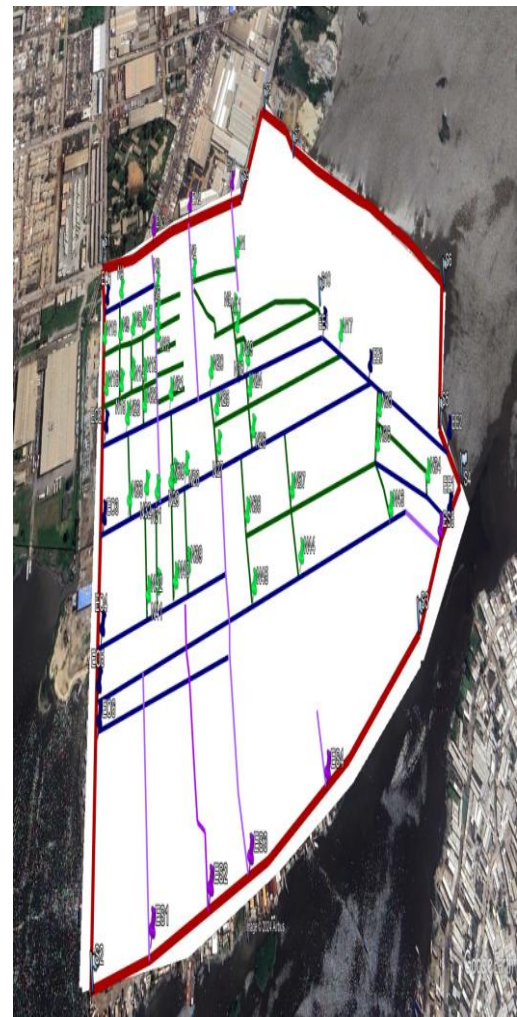


FIGURE 2 SOWETO ROAD ACHITECTURE

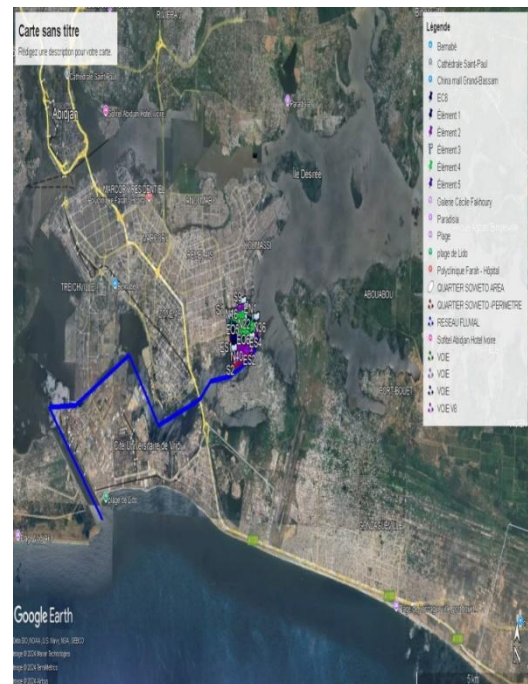


FIGURE 3 SOWETO RIVER NETWORK

Almost 14.1km of River Network in blue.

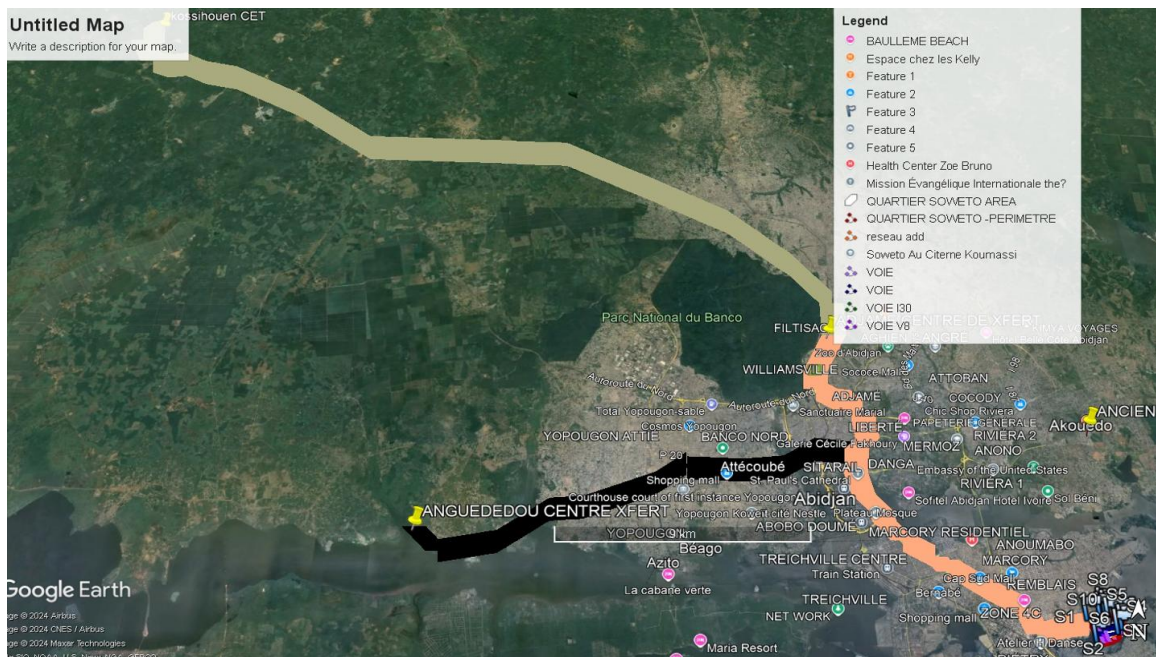


FIGURE 4: TRANSPORT NETWORK OF SOLID WASTE TO BE DUMPED

From the pattern collected, the Description of the neighbourhood is contained in the table below:

A-2 TABLE OF SOWETO SEGMENTS

Segments	Geolocalisation des points	Length (km)	Connected to
V1	EN3: ENN3:	0.391	EN3-ENN3
V2	EN2: EN20:	0.274	EN2-EN20
V3	EN1: EC1:	0.149	EN1-EC1
V4	S1: EC1:	0.235	S1-EC1
V5	S3: EN27:	0.391	S3-EN27
V6	S4: EC4:	0.667	S4-EC4
V7	S5: EC6:	0.936	S5-EC6
V8	S2: EN39:	0.285	S2-EN39
H1	EO1: EN3:	0.159	EO1-EN3
H2	EO2: EE4:	0.677	EO2-EE4
H3	EO3: EE3:	0.809	EO3-EE3
H4	EO4: EN40:	0.334	EO4-EN40

H5	EO5: EE5:	0.839	EO5-EE5
H6	EO6: EE6:	0.325	EO6-EE6
H7	EE2: EE4:	0.384	EE2-EE4
H8	EE1: E36:	0.204	EE1-E36
I1	EN36: EN43:	0.755	EN36-EN43
I2	EN36: ENN36:	0.995	EN36-ENN36
I3	EN34: EN35:	0.176	EN34-EN35
I4	EN36: EN38:	0.386	EN36-EN38
I5	EN44: ENN44:	0.168	EN44-ENN44
I6	EN45: ENN45:	0.167	EN45-ENN45
I7	EN40: EN28:	0.120	EN40-EN28
I8	EN30: EN40:	0.115	EN30-EN40
I9		0.116	
I10	EN32: EN42:	0.120	EN32-EN42
I11	EN17: EN25:	0.404	EN17-EN25
I12	EN5: ENN5:	0.365	EN5-ENN5
I13	ENN5: EN11:	0.275	ENN5-EN11
I14	EN111: EN2:	0.105	EN111-EN2
I15	EN111: EN19:	0.115	EN111-EN19
I16	EN21: EN30:	0.103	EN21-EN30
I17	EN18: EN26:	0.961	EN18-EN26
I18	EN20: EN27:	0.954	EN20-EN27

I19	EN23: EN33:	0.104	EN23-33
I21	EN10: ENN10:	0.238	EN10-ENN10
I22	EN16: ENN16:	0.161	EN16-ENN16
I23	EN4: EN15:	0.211	EN4-EN15
I24	EN8: EN14:	0.69	EN8-EN14
I25	EN7: EN22:	0.121	EN7-EN22
I26	EN6: ENN6:	0.809	EN6-ENN6
I27	EN12: ENN12:	0.619	EN12-ENN12
I28	EN13: ENN13:	0.823	EN13-ENN13
I29	EN0: ENN0:	0.826	EN0-ENN0
I30	EN1: EN2	0.146	EN1-EN2
TOTAL		18,207	

H1	EO1: EN3:	0.159	EO1-EN3
H2	EO2: EE4:	0.677	EO2-EE4
H3	EO3: EE3:	0.809	EO3-EE3
H5	EO5: EE5:	0.839	EO5-EE5
V1	EN3: ENN3:	0.391	EN3-ENN3
V2	EN2: EN20:	0.274	EN2-EN20
V3	EN1: EC1:	0.149	EN1-EC1
I4	EN36: EN38:	0.386	EN36-EN38
I11	EN17: EN25:	0.404	EN17-EN25

A-4 TABLE OF SOWETO INFRASTRUCTURE STATE

Architecture Soweto	LENGTH (km)	NoC	NoCP (3/km)	NoNA (5/km)	NoP (10/km)	NoDP (2/km)	LoIN (Km) (900/km)	NoFV (12/km)	TAoP (m2) (0.5/P)	TVV(HL) (100L/F)	TVoDP(T) (1.5T/km)	VoUW (T) (1/km/S)	VoCWN(T) (1.210/km)
Segment H1	0.159	0	0.477	0.795	1.59	0.318	0.1431	1.908	0.795	1.908	0.477	0.159	0.19239
Segment H2	0.677	1	2.031	3.385	6.77	1.354	0.6093	8.124	3.385	8.124	2.031	0.677	0.81917
Segment H3	0.809	0	2.427	4.045	8.09	1.618	0.7281	9.708	4.045	9.708	2.427	0.809	0.97889
Segment H5	0.839	2	2.517	4.195	8.39	1.678	0.7551	10.068	4.195	10.068	2.517	0.839	1.01519
Segment V1	0.391	0	1.173	1.955	3.91	0.782	0.3519	4.692	1.955	4.692	1.173	0.391	0.47311
Segment V2	0.274	1	0.822	1.37	2.74	0.548	0.2466	3.288	1.37	3.288	0.822	0.274	0.33154
Segment V3	0.149	4	0.447	0.745	1.49	0.298	0.1341	1.788	0.745	1.788	0.447	0.149	0.18029
Segment I4	0.386	1	1.158	1.93	3.86	0.772	0.3474	4.632	1.93	4.632	1.158	0.386	0.46706
Segment I11	0.404	1	1.212	2.02	4.04	0.808	0.3636	4.848	2.02	4.848	1.212	0.404	0.48884
Segment I18	0.954	2	2.862	4.77	9.54	1.908	0.8586	11.448	4.77	11.448	2.862	0.954	1.15434
Segment I21	0.238	2	0.714	1.19	2.38	0.476	0.2142	2.856	1.19	2.856	0.714	0.238	0.28798
Segment I30	0.146	1	0.438	0.73	1.46	0.292	0.1314	1.752	0.73	1.752	0.438	0.146	0.17666

Supposed State Data for Simulation

A-5 CASE I: TABLE OF MINIMUM PRODUCED WASTE AND FUNCTIONAL INFRASTRUCUTURE NEEDED

Architecture Soweto	LENGTH (km)	NoC	NoCP	NoNA	NoP	NoDP	LoIN (Km)	NoFV	TAoP (m2)	TVV(HL)	TVoDP(T)	VoUW (T)	VoCWN(T)
Segment H1	0.159	0	0.318	0.53	1.06	0.212	0.0954	1.272	0.35333333	0.848	0.212	0.106	0.12826
Segment H2	0.677	1	1.354	2.25667	4.51333	0.90267	0.4062	5.416	1.50444444	3.61067	0.90267	0.45133	0.546113
Segment H3	0.809	0	1.618	2.69667	5.39333	1.07867	0.4854	6.472	1.79777778	4.31467	1.07867	0.53933	0.652593
Segment H5	0.839	2	1.678	2.79667	5.59333	1.11867	0.5034	6.712	1.86444444	4.47467	1.11867	0.55933	0.676793
Segment V1	0.391	0	0.782	1.30333	2.60667	0.52133	0.2346	3.128	0.86888889	2.08533	0.52133	0.26067	0.315407
Segment V2	0.274	1	0.548	0.91333	1.82667	0.36533	0.1644	2.192	0.60888889	1.46133	0.36533	0.18267	0.221027
Segment V3	0.149	4	0.298	0.49667	0.99333	0.19867	0.0894	1.192	0.33111111	0.79467	0.19867	0.09933	0.120193
Segment I4	0.386	1	0.772	1.28667	2.57333	0.51467	0.2316	3.088	0.85777778	2.05867	0.51467	0.25733	0.311373
Segment I11	0.404	1	0.808	1.34667	2.69333	0.53867	0.2424	3.232	0.89777778	2.15467	0.53867	0.26933	0.325893
Segment I18	0.954	2	1.908	3.18	6.36	1.272	0.5724	7.632	2.12	5.088	1.272	0.636	0.76956
Segment I21	0.238	2	0.476	0.79333	1.58667	0.31733	0.1428	1.904	0.52888889	1.26933	0.31733	0.15867	0.191987
Segment I30	0.146	1	0.292	0.48667	0.97333	0.19467	0.0876	1.168	0.32444444	0.77867	0.19467	0.09733	0.117773

A-6 CASE II: TABLE OF AVERAGE PRODUCED WASTES

Architecture Soweto	LENGTH (km)	NoC	NoCP	NoNA	NoP	NoDP	LoIN	NoFV	TAoP (m2)	TVV(HL)	TVoDP(T)	VoUW (T)	VoCWN(T)
Segment H1	0.159	0	0.7155	1.1925	2.385	0.477	0.21465	2.862	1.78875	4.293	1.07325	0.2385	0.288585
Segment H2	0.677	1	3.0465	5.0775	10.155	2.031	0.91395	12.186	7.61625	18.279	4.56975	1.0155	1.228755
Segment H3	0.809	0	3.6405	6.0675	12.135	2.427	1.09215	14.562	9.10125	21.843	5.46075	1.2135	1.468335
Segment H5	0.839	2	3.7755	6.2925	12.585	2.517	1.13265	15.102	9.43875	22.653	5.66325	1.2585	1.522785
Segment V1	0.391	0	1.7595	2.9325	5.865	1.173	0.52785	7.038	4.39875	10.557	2.63925	0.5865	0.709665
Segment V2	0.274	1	1.233	2.055	4.11	0.822	0.3699	4.932	3.0825	7.398	1.8495	0.411	0.49731
Segment V3	0.149	4	0.6705	1.1175	2.235	0.447	0.20115	2.682	1.67625	4.023	1.00575	0.2235	0.270435
Segment I4	0.386	1	1.737	2.895	5.79	1.158	0.5211	6.948	4.3425	10.422	2.6055	0.579	0.70059
Segment I11	0.404	1	1.818	3.03	6.06	1.212	0.5454	7.272	4.545	10.908	2.727	0.606	0.73326
Segment I18	0.954	2	4.293	7.155	14.31	2.862	1.2879	17.172	10.7325	25.758	6.4395	1.431	1.73151
Segment I21	0.238	2	1.071	1.785	3.57	0.714	0.3213	4.284	2.6775	6.426	1.6065	0.357	0.43197

Segment I30	0.146	1	0.657	1.095	2.19	0.438	0.1971	2.628	1.6425	3.942	0.9855	0.219	0.26499
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A-7 CASE III: TABLE OF MAXIMUM PRODUCED WASTE

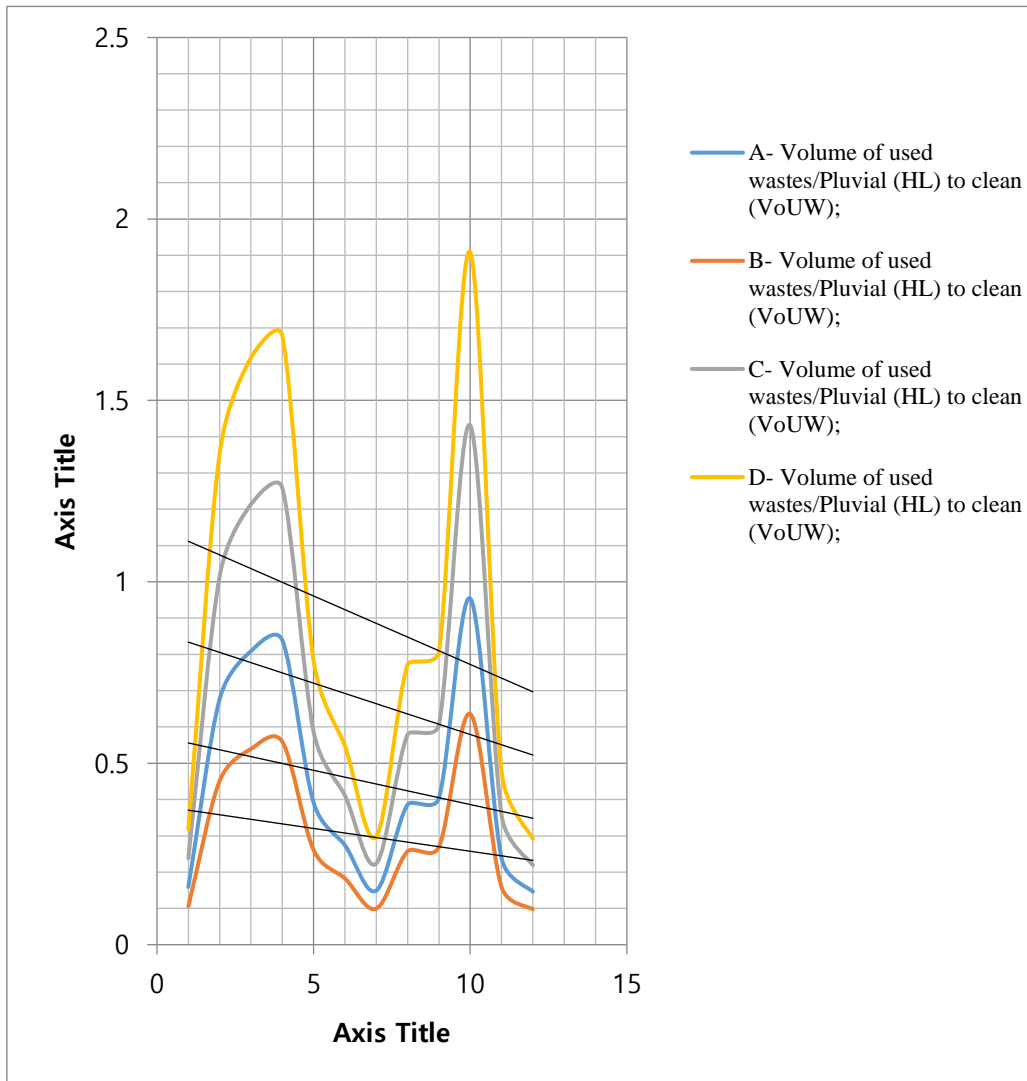
Architecture Soweto	LENGTH (km)	NoC	NoCP	NoNA	NoP	NoDP	LoIN (Km)	NoFV	TAoP (m2)	TVV(HL)	TVoDP(T)	VoUW	VoCWN(T)
Segment H1	0.159	0	0.954	1.59	3.18	0.636	0.2862	3.816	3.18	7.632	1.908	0.318	0.38478
Segment H2	0.677	1	4.062	6.77	13.54	2.708	1.2186	16.248	13.54	32.496	8.124	1.354	1.63834
Segment H3	0.809	0	4.854	8.09	16.18	3.236	1.4562	19.416	16.18	38.832	9.708	1.618	1.95778
Segment H5	0.839	2	5.034	8.39	16.78	3.356	1.5102	20.136	16.78	40.272	10.068	1.678	2.03038
Segment V1	0.391	0	2.346	3.91	7.82	1.564	0.7038	9.384	7.82	18.768	4.692	0.782	0.94622
Segment V2	0.274	1	1.644	2.74	5.48	1.096	0.4932	6.576	5.48	13.152	3.288	0.548	0.66308
Segment V3	0.149	4	0.894	1.49	2.98	0.596	0.2682	3.576	2.98	7.152	1.788	0.298	0.36058
Segment I4	0.386	1	2.316	3.86	7.72	1.544	0.6948	9.264	7.72	18.528	4.632	0.772	0.93412
Segment I11	0.404	1	2.424	4.04	8.08	1.616	0.7272	9.696	8.08	19.392	4.848	0.808	0.97768
Segment I18	0.954	2	5.724	9.54	19.08	3.816	1.7172	22.896	19.08	45.792	11.448	1.908	2.30868

Segment I21	0.238	2	1.428	2.38	4.76	0.952	0.4284	5.712	4.76	11.424	2.856	0.476	0.57596
Segment I30	0.146	1	0.876	1.46	2.92	0.584	0.2628	3.504	2.92	7.008	1.752	0.292	0.35332

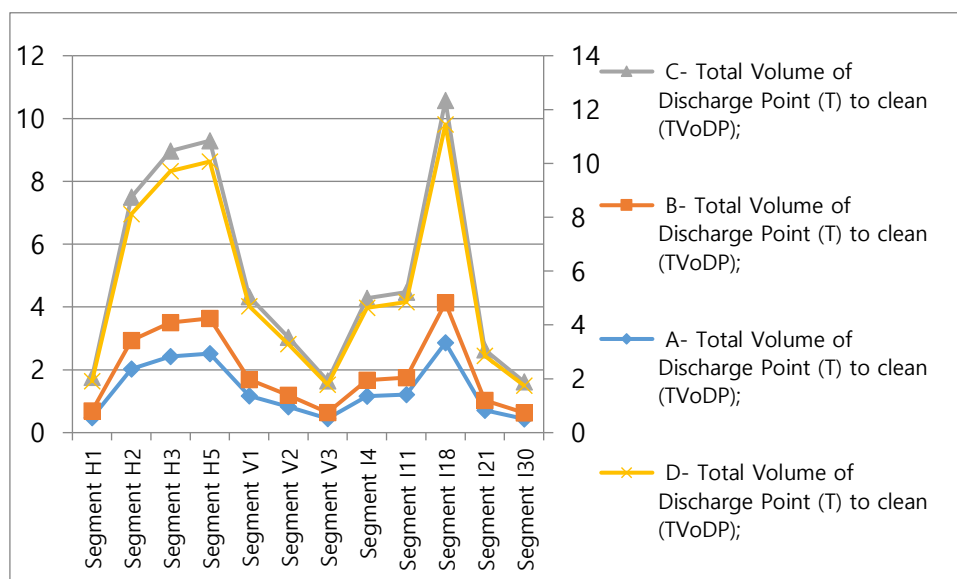
III-1-2-2 Results

GRAPH1

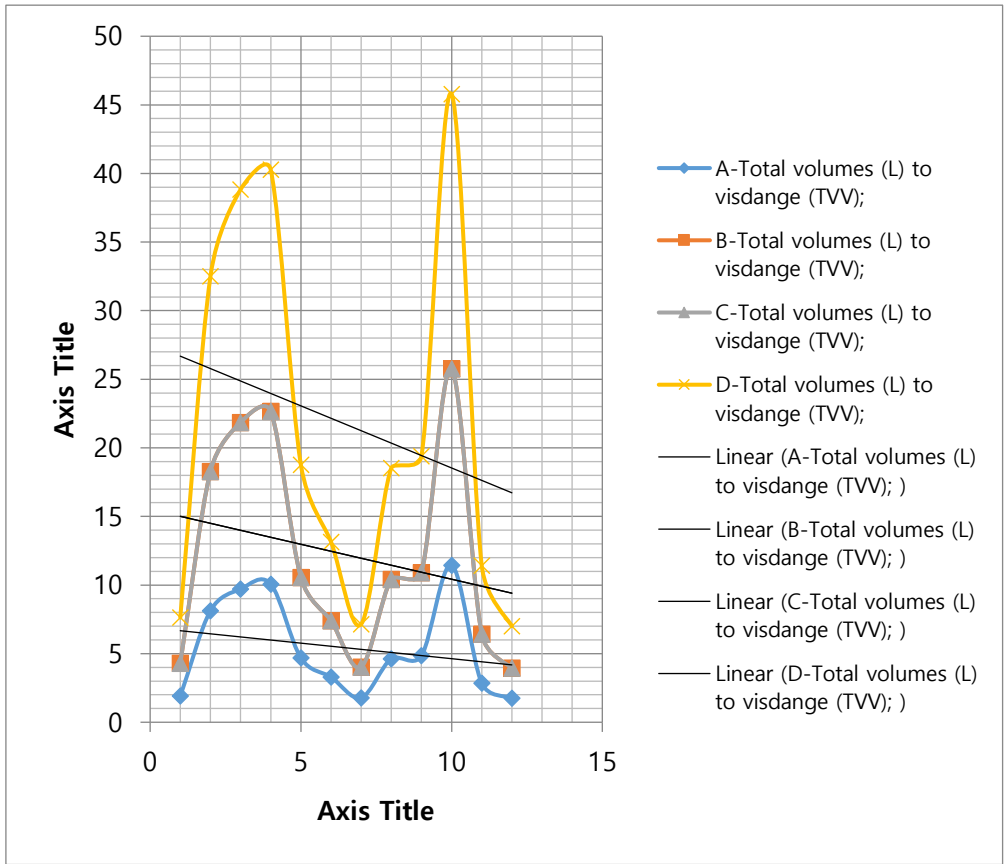
According to previous data results, we will present for each critieria on the same graph the 4 compared figures representing respectively: actual capacity of infrastructure built for this criteria; Minimum conditions of needs ; average conditions of need and maximum conditions of needs.



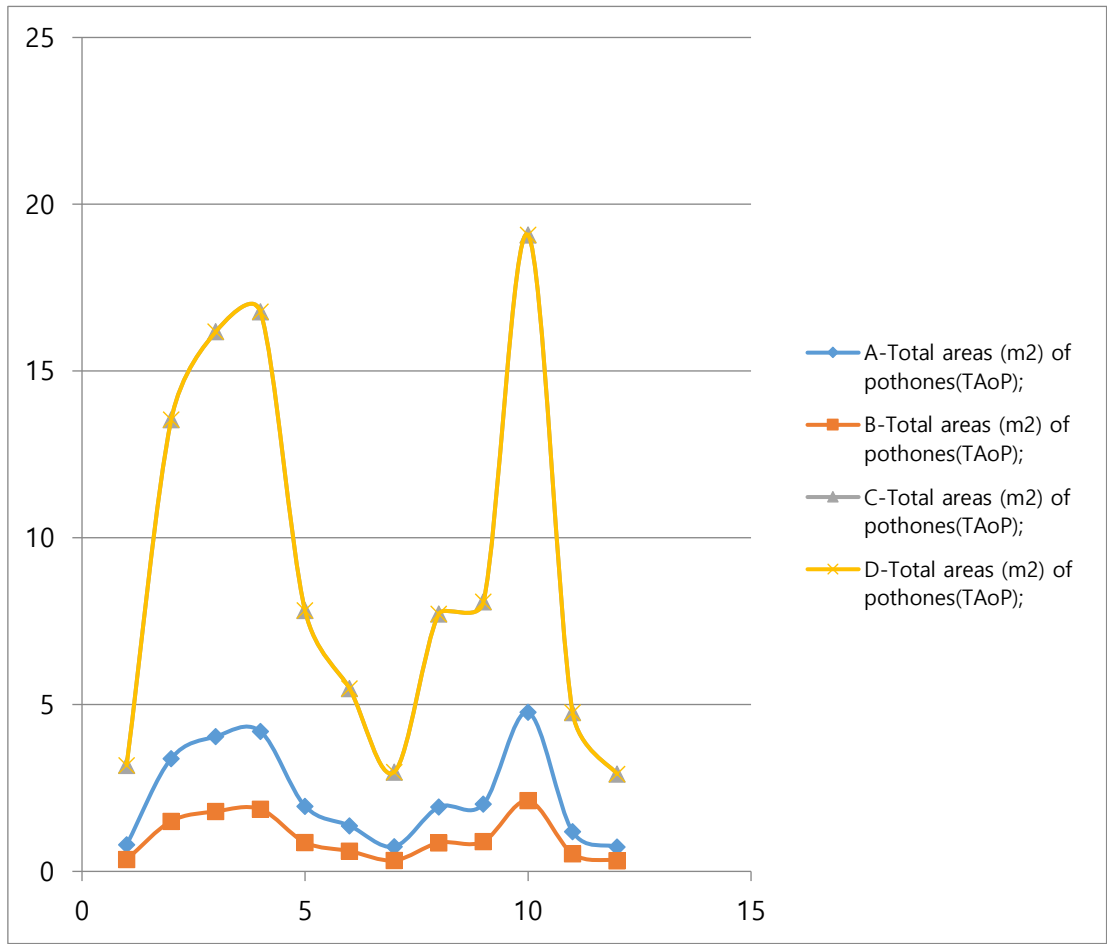
GRAPH 2



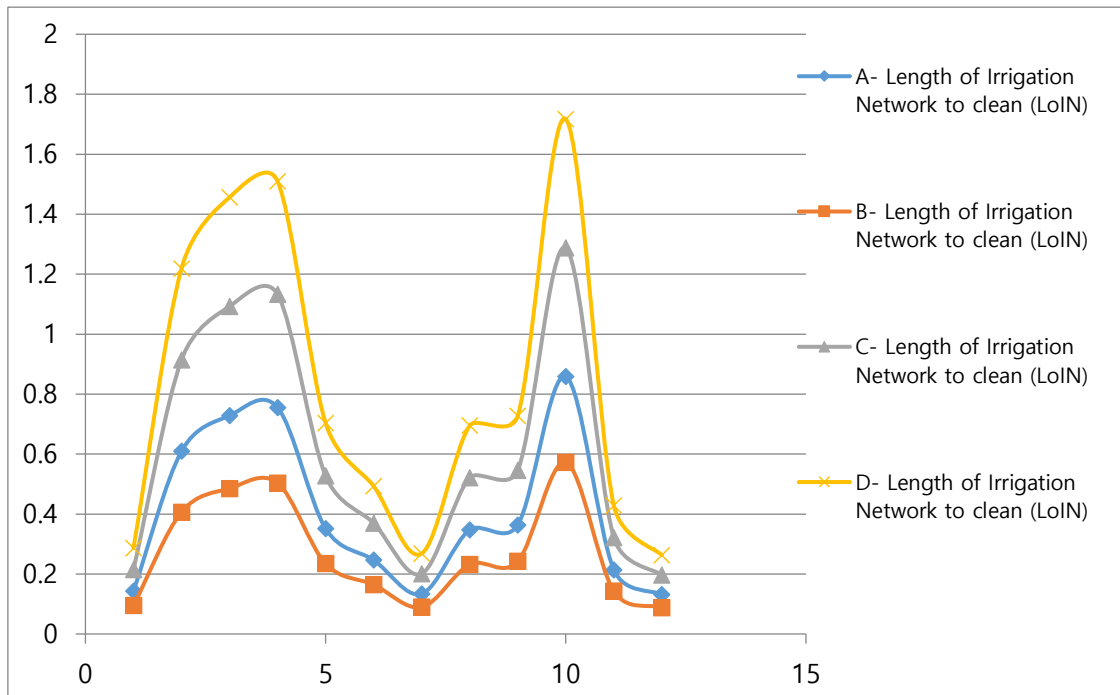
GRAPH 3



GRAPH 4



Graph 5:



III-2- General Analysis

Here we are trying to analyse each figure in order to provide some similarities and divergent points:

- For each criteria, we noticed that the blue graph representing capacity of infrastructure can perform minimum criteria needs for River waste, potholes area, length of irrigation network;

- installed infrastructure capacity is almost the same with the needs for waste to be discharged (collect) so, can almost perform the needs;

-for last criteria, (wastes to be drained), the installed infrastructure cannot satisfy the needs;

- for waste to be discharged and potholes area criteria, average and maximum needs are same;

- for volume of waste to be drained, min and average conditions needs are same;

IV. Discussions

After analysis provided in the previous section, these recommendations are formulated.

-as our infrastructure can satisfy only three criteria, it is very important to notice that it is the capacity of installed infrastructures identified in Soweto. by continuing to apply our designed system, we have to make sure this infrastructure is in good state in order to be functional, else we have to make it functional by maintenance and treatment, discharge, drainage and test.

- for the one which can almost satisfy the minimum criteria of drainage, we have to make it functional too.

- for the one who can not satisfy minimum criteria of drainage, the less we can make functional, we have to do it;

- for the all, as possible as it can be with financial resources, we have to carry out the project extension capacity of installed infrastructure to max needs values as specified in this simulation.

- for waste to discharge and potholes areas criteria which are same, only maximum can be taken into account; same resolution with same results for average and minimum conditions, we have to consider average conditions.

- as described in our designed system, all actions have been made in this exercise of simulation and all maps have been presented. Only map of discharge point of cumbersome wastes have not been presented, but it can be built.

- also, planned calendar has to be design depending on national calendar and available resources.

- when the capacity of installed infrastructures are same or more than the need we can say that making it functional is to reach expected results presented.

V. Conclusions

At the end of this study, we can say that "Innovative Waste Management System (IWMS) based on ICT Design" has been designed and presented in this study. Simulation allows us to have map of all network, and projected map of irrigation infrastructure ossature have been also designed and presented these maps precise point of fluvial dumping next to 14,1km from SOWETO. We also have 4 transfer points, burying center in Adjame, kossihouen, Anguedou 1 and 2 and Namoue. Also, we have an area of almost 8.5 ha in SOWETO. Main networks is for about 7.1 km.

The rest of simulation allows us to have hypothesis data for three levels of simulation shaping respectively minimum, average and maximum conditions of functional system for existed Infrastructure. Based on these conditions, these recommendations have been taken;

- we have to make existed infrastructure functional and by maintenance.

- for the all, as possible as it can be with financial resources, we have to perform project of extension of capacity of installed Infrastructure to max needs values as precised in this simulation.

- for wastes to be discharged and potholes aeras criteria which are same, only maximum can be take into account; same resolution with same results for average and min conditions, we have to consider average conditions.

-for the rest of simulation of system, we have to design a calender taking into account availables resources ;

-also, map of dumping point of cumbersome waste must be designed.

- all infrastructure must be functional and reach expected results as presented in this study.

Also, we shaped 12 criteria and only 5 have been focused on for simulation. We have to follow most criteria of total dumping waste. We can take into account criteria of total dumping point.

For resolution of our conflict of flood, criteria of total length of irrigation or total volume of used/river waste if satisfied helps us to answer to this problem.

We can say based on results at the end that yes, we can improvement environmental life of citizen with that system.

VI. Projections

According to informations on Ivory Coast Ministry site of Environnemnt, we have projection of actual volume of waste mutiplied by 7 for the next 2 years. And all quantity is multiply by 7 every two.

So, based on this coefficient, our actual data collected can be multiplied by seven to shape our infrastructure for the next two years or more. This can be the next study developed. Only available resources can help us to realize theses results.

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