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List Of Abbreviations

CBO	Community Based Organizations
ECOWAS	Economic Community of West African States
EEE	Electrical and Electronic Equipment
EU	European Union
GDP	Gross Domestic Product
HDI	Human Development Index
IMF	International Monetary Fund
ISWM	Integrated Solid Waste Management
NGO	Non Governmental Organizations
OECD	Organization for Economic Co-operation and Development
SME	Small and Medium Enterprises
SWM	Solid Waste Management
TEIU	The Economist Intelligence Unit
UNDP	United Nations Development Programme
WEEE	Waste Electrical and Electronic Equipment

SECTION 1: CRITERIA FOR EVALUATION OF THE REGIONAL SOCIO-ECONOMIC SITUATION AND POLICY BACKGROUND

1 BACKGROUND

The African continent faces many challenges one of which is economic growth rates that are not able to deal with the numerous developmental challenges facing us such as reducing maternal health and infant mortality, access to clean and safe water and sanitation, development of infrastructure for dealing with solid waste, creation of employment opportunities for the youth, etc.

The African Côte d'Ivoire, Ghana, Nigeria and Senegal countries who are the immediate beneficiaries of this project are classified among the least developed countries in the world; economic conditions differ to some extent in these countries on the national scale. For instance according to the Human Development Index (HDI), Ghana is placed 152 while Nigeria is placed in 158 and Senegal and Côte d'Ivoire follow suite in positions 166 and 163 respectively (UNDP Human Development Report, 2008).

Even though they are all classified as least developed countries, their economic condition varies. For example, the Gross Domestic Product (GDP) growth rate in Cote D'Ivoire was 0.9 % in 2006 and 1.7 % in 2007 (World Bank, 2006; 2007). The IMF anticipates a positive GDP growth rate of 3.8 % in 2008 for the Cote D'Ivoire economy whilst Ghana's GDP growth rate in 2006 was 4.5% and 5.3% in 2007. In 2008 Ghana recorded an impressive GDP growth rate of 7.2% (Ghana Statistical Service, 2008).

Also variations exist in economic conditions in the countries. For instance in Ghana according to the Ghana Statistical Service's living standard survey, most regions in the south are more economically stronger than those in the Northern part of the country. The same situations exist in Nigeria where there are wide disparities in income levels and household incomes as you move from region to region. Côte d'Ivoire and Senegal are not different in this regard.

The lack of effective legislation for solid waste management, which is a norm in most developing countries like the four immediate beneficiary African countries, is partially responsible for the roles of the relevant national agencies not being clearly defined and the lack of coordination among them. Legislation related to solid waste management in developing countries is usually fragmented, and several laws (e.g. Public Health Act, Local Government Act, and Environmental Protection Act) include some clauses on regulations regarding solid waste management. The rules and regulations are enforced by the different agencies. However, there are often duplication of responsibilities of the agencies involved and gaps in the regulatory provisions for the development of effective solid waste management systems.

Within this context, there is the need to evaluate socio-economic and legal regimes in the four immediate beneficiary African countries. The evaluation of socio-economic status of residents in the four beneficiary African countries when completed will help to put into context the various kinds of investments made by their respective governments and the citizens on waste management issues. Evaluation of the legal regimes in the various countries is important as it shows how the countries are governed.

It should be also noted that legislation is only effective if it is enforced. Therefore, comprehensive legislation, which avoids the duplication of responsibilities, fills in the gaps of important regulatory functions, and is enforceable, is required for sustainable development of solid waste management systems.

1.1 Description of work package 1

The seventh EU framework programme for the project title “Integrated Waste Management in Western Africa” (IWWA) will be implemented in four West African countries namely, Ghana, Nigeria, Cote D’Ivoire, Senegal and Nigeria. The project seeks to help beneficiary countries to develop sustainable solid waste management programmes in order to achieve the UN Millennium Development Goal 7.

In conformity with the main objective of IWWA which seeks to enhance the enforcement of Integrated Solid Waste Management in Ghana, Côte d’Ivoire, Nigeria and Senegal, the main aim of Section 1 is to identify the indicators which need to be used for assessing the demographic, institutional and socio-economic aspects of these countries and how these affect the waste management and disposal trends in these countries. With this information, the group members anticipated specifying the required criteria for evaluating the socio-economic situation and policy background of the countries in question.

In order to arrive at the main objective of WP 1, the partners listed above conducted a literature review of the existing situation and also engaged in verbal discussions with various officers from different countries’ ministries in order to have an overview of the socio-economic situation in each country. After identifying common features which characterised these countries, as well as certain fundamental qualities which affect all these countries, information gathered was analysed with relevant conclusions drawn.

The first task to be implemented under project involved development of criteria for the evaluation of socio – economic conditions and legal regimes/background in the West Africa sub – region. Partners of this project were tasked to look at different aspects of the first task. KNUST and CEIA members of this team will propose a methodological framework for the assessment of the living conditions in these areas, including demographics and social aspects (human population growth, poverty, urban and rural population), economic aspects (production sectors, financial capacity, quality of life, distribution of income). The task team will also define general guidelines for the subsequent assessment under WP2. The outcome of this task will be a set of criteria and indicators, which will allow the socio – economical evaluation and classification of the regions in work package 2. A report will be prepared by KNUST to be included as section 1 in Deliverable 1.1.

1.2 Description of Section 1

The aim of section 1 is to come out with a methodological framework for assessing the socio-economic situation in the regions of the four targeted African countries. Under this task a set of indicators that affect the socio-economic situation in the selected countries will be identified and a methodology for assessing these indicators proposed which will serve as input for further work in task 2.4 to enable the classification of the regions in the targeted countries into socio-economic groups. This is necessary, as ISWM practice depend heavily on the socio-economic environment of a particular place. An ISWM practice proposed for one region may not necessarily work in another region even in the same country because of the vast difference in the socio-economic situation pertaining in the regions concerned. Under this task some factors have been identified that influence the socio-economic indicators of a region. The report therefore looks at the indicators for the following factors:

- Demographic;
- Economic; and
- Institutional.

The report will discuss the key indicators that affect the above-mentioned factors and by so doing justify the reason for selecting them. Also, a methodology is proposed for assessing each of the identified indicators.

1.3 Objectives of Section 1

The main objective of section 1 is to identify and define a set of criteria that would allow a comprehensive evaluation of SWM practices and living conditions in the targeted countries. The specific objectives are to:

- Identify all indicators – demographic, economic, and institutional – that define the socio-economic conditions and affect SWM practices in the targeted countries; and
- Define general guidelines for assessing living conditions with reference to the proposed indicators.

Indicators that would be identified would set the basis for evaluating living conditions and SWM practices in communities in the targeted countries, and would be designed to help all stakeholders in SWM in the targeted countries plan and implement large-scale ISWM systems in Western Africa.

Moreover, the development of a methodological framework based on identified criteria for SWM evaluation will be used to develop realistic action plans and systems, institutional structures, policy and technology requirements, as well as the development of effective stakeholder participation strategies for promoting ISWM practices in Western Africa. The results of section 1 as well as tasks 1.2 and 1.3 will be used to propose standardized evaluation criteria for assessing SWM practices in Western Africa.

2 SOCIO-ECONOMIC INDICATORS OF COUNTRIES

2.1 Introduction

In assessing the socio-economic situation of Ghana, Senegal, Nigeria and Côte d'Ivoire, the authors of this report discussed certain prevalent trends which are common to these countries. Based on these trends, identification was made of relevant factors and indicators for determining the socio-economic scenario in these countries.

Factors such as unemployment, high illiteracy levels, impoverishment amongst large sectors of the populace, lack of access of the populace to electricity, water, housing, water, clean sanitation facilities (such as toilets and insufficient dump sites) and transportation, as well as healthcare facilities are seen to be common to the four countries. Where these facilities are available, only a minority of the population in these countries reap the relevant benefits.

This scenario holds true in rural areas and many parts of urban areas, creating a massive exodus of rural-urban migration, which in turn results in overcrowding of many cities in these four countries. Coupled with these, the rising incidents of population growth in each of these countries and its attendant increases in waste generation (from rises in human activity which inevitably produce waste), all intensify poverty levels in these countries where most people live on less than a dollar per day.

Studies also confirmed that certain sectors such as agriculture-especially, farming and fishing have played an important role in generating financial income for many rural and urban poor communities.

While mining played an important role in Ghana's promotion of economic activity, oil and petroleum played a similar role in Nigeria. However, the main problems here were that the monetary gains from these industries had little or no effect on the communities within which these commodities were exploited. This meant that the most profitable sectors of the economy had no trickling down effect on these countries' populace.

Within the forestry sector which serves as a source of economic activity for the four countries, the effects of climate change are felt by rural communities in the four countries which then lack access to forestry products such as bush meat and charcoal for use in the home. In the face of insufficient governmental support for more renewable energy initiatives (such as waste to energy and solar energy facilities), these communities rely on charcoal for fuel/fuel wood. These practices ultimately contribute to forest decline within each of the four countries.

As far as the particular problems of waste management and climate change are concerned, socio-economic problems which confront these countries include insufficient levels of public enlightenment on the hazards of many forms of waste and the requisite methods for disposing/recycling such wastes in an environmentally sound manner which conform to international standards such as those specified by the Basel Convention on the Transboundary Movement of Hazardous Waste and Their Disposal (1989).

Other problems include the absence of adequate policy implementation for ensuring that waste is used for attaining sustainable development goals-so that in the promotion of economic activity, job creation to help resolve unemployment while paying attention to gender balances and considerations and environmental protection are attained. This could help countries attain sustainable development goals through sound managerial practices in waste, as well as other products such as forestry, as the latter for instance, could cause climate change if not managed sustainably.

Over the past few years, the gradual use of mobile phones in all four countries is also beginning to facilitate trade in agriculture, fabrics and other industries, as communication comes better. With the rising use of mobile phones and new ones, there is sometimes the issue of how to dispose of old ones and recycling these phones might also be a tool for

enhancing job creation, environmental protection and generating income, rather than disposing of these items haphazardly as is the case in these four countries.

Having discussed these trends as they generally relate to the four countries, the present report now highlights some specific details which affect each of these countries:

2.1.1 Ghana

Ghana is a country of 238,537 square kilometres located in West Africa. It is bordered to the west by Cote d'Ivoire, to the east by Togo, to the north by Burkina Faso and to the south by the Gulf of Guinea. A tropical rain forest belt, broken by heavily forested hills and many streams and rivers, extends northward from the shore, near the frontier with Côte d'Ivoire. This area, known as the "Ashanti," produces most of the country's cocoa, minerals, and timber. The northern parts of Ghana are mostly flat savannah, with the primary form of vegetation being bush and grasses. The climate is generally tropical. The eastern coastal belt is warm and comparatively dry; the southwest corner hot and humid; and the north hot and dry. There are two distinct rainy seasons in the south: May-June and August-September, while in the north, there is only one rainy season. Agriculture employs 55% of the people. The nation large depends on rain fed agriculture which is also affected by climate variability. Agriculture contributes 38% of Ghana's GDP.

According to the 2000 Population and Housing Census, Ghana's population was at about 18,412,247, of which about 49.5% are males and the remaining 50.5% females. The Ashanti Region is the most populous region in Ghana, accounting for about 3,187,607 (17.3%) followed by the Greater Accra Region with 2,909,643 (15.8%). The Upper East and Upper West Regions in Northern Ghana have the lowest, each with a population of less than a million. Current projections put Ghana's population at about 23,951,519. The population is very young for about 39.2% were children up to 14 years. The youth aged between 15 and 34 accounts for about 33.2% while adults (between 35 and 64) account for 11.3%. The aged (65+) constitute about 2.1%. This population structure translates into a dependency ratio of about 41.3%. The dependency ratio of about 41.3% means there are about 9 dependents for every 10 working people in Ghana.

Ghana like all developing countries seeks to attain a middle income status by 2015. Ghana's economy continues to revolve around subsistence agriculture, which accounts for 38% of GDP (2008) and employs about 55% (based on GLSS V) of the workforce, mainly small landholders. However, Ghana remains heavily dependent on international financial and technical assistance. The economy has seen improvements over the last decade, especially since 2001. Consequently GDP growth, which averaged about 4.7% over the period between 1995 and 2005, increased to about 6.2% in 2006, 6.3% in 2007 and further to 7.3% in 2008. Ghana's current GDP stands at about US$ 15,647 million (2008) (Government of Ghana Budget Statement, 2009).

2.1.2 Senegal

The Republic of Senegal is located south of the Senegal River in Western Africa. It shares borders with The Gambia, Guinea, Guinea-Bissau, Mali, and Mauritania. Senegal has a favourable geographic position, as its capital, Dakar is located at the furthest West point on the African continent. Senegal's close location to and ease of access from Europe and North America provide a platform for foreign investors to target the population of more than 70 million people living in the West African Economic and Monetary Union (WAEMU), and has fostered a young population that is in tune with global trends.

Senegal has an estimated population of 13,711,597 in 2009, of which approximately 58% live in rural areas. The 15-34 age groups made up approximately 35% of the total population in 2006. Population growth is an estimated 2.079 % in 2009 (Central Intelligence Agency 2011).

Senegal has experienced a steady economic growth in line with other countries in the West Africa region. Senegal made an important turnaround increasing GDP growth from 2.1% in 1993 to an average of 5% annually between 1995 and 2006. The annual inflation rate was estimated at 6.6% in 200827 and investment rose from 13.8% of GDP in 1993 to 16.5% in 1997, and 24.4% in 2008 (World Bank, 2008). GDP per capita (purchasing power parity) has been estimated at US$ 1,600 in 2006, 2007 and 2008 (World Bank, 2008). Between 2007 and 2008 however, Senegal recorded a decline in its GDP increase rate from 5.1% in 2007 to 4.5% in 2008 (World Bank, 2008). Senegal is above all an agricultural country. Approximately 77.5% of the population is employed in the agricultural sector, which however contributes only 16% to GDP (World Bank, 2008).

2.1.3 Nigeria

Nigeria is the most populous country in Africa, Nigeria accounts for over half of West Africa's population. Although less than 25% of Nigerians are urban dwellers, at least 24 cities have populations of more than 100,000. The variety of customs, languages, and traditions among Nigeria's 250 ethnic groups gives the country a rich diversity. The dominant ethnic group in the northern two-thirds of the country is the Hausa-Fulani, most of whom are Muslim. Other major ethnic groups of the north are the Nupe, Tiv, and Kanuri. About half of the Yorubas are Christian and half Muslim. The predominantly Catholic Igbo are the largest ethnic group in the southeast, with the Efik, Ibibio, and Ijaw comprising a substantial segment of the population in that area. The Yoruba people are predominant in the southwest.

The oil boom of the 1970s led Nigeria to neglect its strong agricultural and light manufacturing bases in favour of an unhealthy dependence on crude oil. In 2002 oil and gas exports accounted for more than 98% of export earnings and about 83% of federal government revenue. New oil wealth, the concurrent decline of other economic sectors, and a lurch toward a static economic model fueled massive migration to the cities and led to increasingly widespread poverty, especially in rural areas.

A collapse of basic infrastructure and social services since the early 1980s accompanied this trend. By 2002 Nigeria's per capita income had plunged to about one-quarter of its mid-1970s high, below the level at independence. Along with the endemic malaise of Nigeria's non-oil sectors, the economy continues to witness massive growth of "informal sector" economic activities, estimated by some to be as high as 75% of the total economy.

Agriculture has suffered from years of mismanagement, inconsistent and poorly conceived government policies, and the lack of basic infrastructure. Still, the sector accounts for about 42% of GDP and two-thirds of employment. Agriculture provides a significant fraction (approximately 10%) of non-oil growth. Poultry and cocoa are just two areas where production is not keeping pace with domestic or international demand. Fisheries also have great potential, but are poorly managed. Most critical for the country's future, Nigeria's land tenure system does not encourage long-term investment in technology or modern production methods and does not inspire the availability of rural credit.

Arguably Nigeria's biggest macroeconomic achievement has been the sharp reduction in its external debt, which declined from 36% of GDP in 2004 to less than 4% of GDP in 2007. In October 2005, the International Monetary Fund (IMF) approved its first ever Policy Support Instrument for Nigeria. In December 2005, the United States and seven other Paris Club nations signed debt reduction agreements with Nigeria for $18 billion in debt reduction, with the proviso that Nigeria pays back its remaining $12 billion in debt by March 2006.

Côte d'Ivoire has a land area of 322,462 km^2 and is located in West Africa. It is bordered by the Atlantic Ocean in the south and shares borders with Ghana in the East, Burkina Faso and Mali in the North and Guinea and Liberia in the West. The country is influenced by two

air masses: a moist equatorial air mass called Monsoon and a dry tropical air mass coming along with a drying wind named Harmattan, with a saturation of 65–90 %.

The Gross Domestic Product (GDP) growth rate was 0.9 % in 2006 and 1.7 % in 2007. The IMF anticipates a positive GDP growth rate of 3.8 % in 2008. The Ivorian economy is largely dependent on external factors such as weather conditions and international raw material prices. The standard of living of the population and the state of infrastructure has deteriorated since 2002. The inflation rate was approximately 2.5 % in 2007.
The economy of the country rests on agriculture providing jobs for two thirds of the national manpower and contributes to the GDP to the tune of 20 %. Côte d'Ivoire is the leading world cocoa exporter with a yearly production of several million tons. Some mining activities such as gold, diamond and manganese mining are also conducted in the country. In 2005, however, the UN Security Council banned diamond export because it served to fund arms procurement. Industrial and material development sectors account for approximately 22 % of the GDP while the tertiary sector contributes 57 % (Profil Environmental de la Cote d' Ivoire, 2006; Presidence de la Republique de Cote d'Ivoire, 2007).

2.2 Demographic indicators

2.2.1 Overview

Three key indicators are identified as shaping the demography of a region when it comes to SWM. The three indicators are:

1. Population growth;
2. Poverty; and
3. Urban and rural population

2.2.2 Population growth

The effect of population growth on waste generation has never been in doubt. Studies conducted by in the past revealed that there is a positive correlation between waste generation and population growth (Kperegbeyi, 2009). The effect of high population growth on underground water bodies as a result of improper handling of solid waste leading to leachate contaminating the water bodies has also been investigated. Okwunodulu reported higher contamination as a result of higher amount of waste generated in high population density areas (2008). Future planning of disposal system, effective mapping out of collection system and route, correct estimation of quantities of waste generation are all influenced by population growth. Effective collection, disposal and managing of solid waste therefore require the knowledge of the population and the population growth rate of the particular region.

The following indicators are proposed:

Migration (in percent)

Population growth in especially urban areas is due largely to migration of people from rural or less deprived areas to the perceived more economically empowered areas. The effect of migration on urban areas is the springing up of slums in the outskirt of the urban areas. These slums often lacking amenities are poorly planned and constructed buildings and have limited access to routes.

Education (in percent)

The educational level of the population is another important criterion of population growth. Highly educated people are noted to give birth to fewer children as opposed to people with no or little education. The highly educated class also tend to understand and appreciate waste management issues better than the illiterate ones. Type of waste generated is also known to differ significantly in homes of highly literate class than those of illiterate. The combined effect of literacy and higher income levels usually leads to lower per capital waste generation whiles in terms of organic fraction, lower numbers are generated (Afon, 2007).

A basic classification will be the number of people educated (%). A more elaborate classification will be the level of education attained:

- No education at all (%)
- Basic level (%)
- Secondary/technical level (%)
- University/tertiary level (%)
- Advanced university degree (Msc/MPhil/PhD) (%)

Life expectancy at birth (%)

Life expectancy at birth indicates the number of years a newborn would live if the general rules of mortality at the time of its birth were to stay the same throughout its life.

Mortality rate, crude (per 1,000 persons)

The crude mortality rate indicates the number of deaths during the year for 1,000 people and is estimated at midyear. Subtracting the crude death rate, crude birth rate, we obtain the rate of natural increase, which is equal to the population growth in the absence of migration.

Population density (person per square kilometre)

The population density is the population in the middle of the year divided by land area in square kilometers. Population is based on the definition of de facto population which counts all residents regardless of legal status or citizenship, except for refugees who have not elected a permanent home in the country of asylum and are still generally considered part of the population of their country of origin. The territory is the total area of a country excluding areas under inland water bodies, on continental shelves and exclusive economic zones. In most cases the definition of inland water bodies includes major rivers and lakes.

Age (years)

The average age of a population influences the quantity and type of waste generated. Apart from the quantity and type of waste generated different age groups respond differently to issues pertaining to waste when it comes to collection, sorting and payment of bills. In addressing ISWM, the controlling age group of a particular region is very important to ascertain. The following age groups are therefore being proposed:

- Children (< 15)
- Youth (15-34)
- Matured adult (35 – 64)
- Old age (>65)

The effect of the various adulthood groups on waste generation, perception about waste management and general willingness to pay for waste management services vary significantly from age group to age group.

The methodology for assessing the age of the population will be the percentage of population in a particular age group.

2.2.3 Poverty

Poverty is defined as pronounced deprivation of the well-being of the individual or group of people. Since the general well-being of people bothers on issues of ability to access quality health, education or food, poverty may be defined specific to these (Khandker, 2010). Internationally, the poverty line is set at $1.25 per day which is believed to guarantee the individual's well-being. This implies that all those who spend less than $1.25 per day are classified as poor. Effective application of ISWM depends to a large extent on the ability of the beneficiaries to pay for the services rendered. African countries have a history of failed waste management practices as a result of the inability of the beneficiaries to pay economic price of services or products offered. A classic example is the centralised composting plants set up in Ghana, Nigeria, Benin and Togo in the 80's to treat municipal organic waste where beneficiaries inability to pay the economic price of the compost led to the collapse of these plants (IWMI, 2004).

The poverty gap is the difference between average income and the poverty line (no offset is specified in relation to persons who are not poor), expressed as a percentage of the poverty line. This reflects both the extent of poverty and its frequency. Note: 0.5 indicates a poverty gap of less than 0.5%. Poor neighborhoods often suffer from high population density and the logistics of waste collection in these areas is difficult and often requires unconventional approaches to succeed. The streets are narrow, unpaved and cluttered thus imposing constraints on systems of waste collection.

Indicators to measure poverty level include:

- Household income level
- Employment status

Household income level

The household income level will be classified into;

- Low
- Moderate
- High

Employment status (in percent)
There is a positive correlation between employment status and household income. Households with heads in formal employment tend to have higher income levels than households with unemployed heads.

The following indicators are therefore proposed;

- Informal employment (%)
- Formal employment (%)
- Unemployed (%)

Level of support

Most African households are known to receive financial support from relatives and loved ones abroad or more economically empowered than them. The quantum of support received in terms of monetary value aside their basic household income from their own activities gives a better picture about the true level of poverty in the region.

2.2.4 Rural and urban population (%)

Many African towns and cities have seen rapid urbanisation in recent times largely due to migration as a result of high economic prospects. Urbanization does not come cheap as it results in higher resource consumption, higher waste generation and sometimes lower quality of life. Areas are classified into: Rural, Semi-urban, and Urban.

Rural

It is also observed that regions with low income levels in Western Africa are mostly rural and agrarian, with relatively low population densities, strong persistence of cultural values and attitudes, and generally poor infrastructural development – schools, roads, health centres, banks, markets, and recreational facilities. Rural communities in Western Africa are also characterized by strong traditional leadership, where local chiefs, queens and heads of extended families command authority.

Urban

Urban communities are formal sectors of a city that are recognized by local authorities and government, and are characterized by relatively good infrastructure, high productivity and economic opportunities, and high population density.

Semi-urban

Semi-urban communities are distinct from urban and rural, and are characterize by poor site conditions, high population density, rapid population growth, irregular water availability, heterogeneous nature of the population, lack of legal and land tenure, low productivity and low income levels, lack of recognition by local authorities and government, and poor infrastructure (Hogrewe*et al.*, 1993); in addition there is strong urban influence, shortage of land, competition for land for agricultural and non-agricultural activities, abundance of labour, and life-threatening environment due to increasing pollution and poor waste disposal systems (DFID, 1997; KNUST, 2006).

2.3 Economic indicators

2.3.1 Overview

The economic situation of a region as pointed earlier in this report does not only influences the type of waste generated within the region but also determines to a large extent the ability and willingness of the people to pay for waste management services. In as much as the economic conditions differ in the various countries and also within the same countries as pointed out earlier it is very important to identify indicators to measure or determine the economic situation of any chosen region within the four selected African countries.

2.3.2 Criteria for the evaluation of economic conditions

A multiplicity of factors is known to affect economic conditions of a place in question. Chief among these factors are:

1. Production sectors of the local economy;
2. Distribution of income;
3. Quality of life; and
4. Financial capacity

When the need to compare the economic situation of one place to the other arises, then the purchasing power parity of the local areas must be taken into consideration to provide a realistic basis for the comparison.

Production Sectors

The production sectors of the regional economy are classified into three main areas of economic activity: agriculture, commerce and industry. Agriculture represents the sector of an economy that includes crop production, animal husbandry, hunting, fishing, and forestry while Industry describes the sector of an economy that includes mining, construction, manufacturing, electricity, gas, and water (The World Bank, 2004). Commerce describes the exchange of goods and services from the point of production to the point of consumption. The service sector of a local economy includes hotels, restaurants, and wholesale and retail trade; transport, storage, and communications; financing, insurance, real estate, business services; community and social services such as education and health care and personal services (The World Bank, 2004).
The following indicators are proposed:

- Number and percentage of people working under each sector;
- Number and percentage of households that depend on each sector for their daily bread; and
- Production output from each sector and its contribution to income generation for the local economy;

The highest percentage shall be the dominating factor and the region shall be classified as such.

Quality of life

From the perspective of international development, quality of life describes the situation of physical, emotional, and social wellbeing of people in a community or region (Gregory *et al.,* 2009). It encapsulates the concept of standard of living – which is mainly based on income levels, wealth and property – in addition to, inter alia, the quality of environment, security, and the built environment.

According to The World Bank (2004), quality of life is difficult to measure (whether for an individual, group, or nation) because in addition to material well-being (standard of living) it includes such intangible components as the quality of the environment, national security, personal safety, and political and economic freedoms. Factors that are considered are both qualitative and quantitative, and to date, researchers have still not come to a consensus as to what factors should be included in the determination of the quality of life. Some have argued for quality of life indicators to be identified from United Nation's Universal Declaration of Human Life as a way of arriving at a globally-acceptable framework of assessment.

A reliable quality of life index has been developed by The Economist Intelligence Unit (TEIU) and is based on a methodology that amalgamates the results of individual-based life-satisfaction surveys to the objective determinants of quality of life (TEIU, 2005). TEIU uses nine quality of life factors, with each factor being represented by a set of indicators as listed below (TEIU, 2005):

i. Material wellbeing – GDP per person, at purchasing power parity in US$;
ii. Health – life expectancy at birth, years;
iii. Political stability and security – political stability and security ratings;
iv. Family life – divorce rate (per 1,000 population);

v. Community life - dummy variable taking value 1 if country has either high rate of church attendance or trade-union membership; zero otherwise;
vi. Climate and geography – latitude, to distinguish between warmer and colder climes;
vii. Job security – unemployment rate;
viii. Political freedom – average of indices of political and civil liberties; and
ix. Gender equality – ratio of average male and female earnings.

The TEIU's quality of life index was used to rank 111 countries in 2005 and the rankings for Ghana, with a score of 5.174, and Nigeria, with a score of 4.505, are 95 and 108 respectively. Many countries, including Côte d'Ivoire and Senegal and a host of countries in Western Africa, were omitted from TEIU's ranking as there was insufficient data to produce a viable rank

The methodology used by TEIU will be applied to regions within countries and the results will provide valuable information for proposing workable SWM systems for the region in question. A major drawback in the measurement of quality of life would be the absence of data for regions within the targeted countries.

2.3.3 Financial capacity

Financial capacity may be defined as the ability of a household to pay for goods and services including the cost of solid waste collection and disposal. It is directly linked to the income received by a household per year. In evaluating the financial capacity of regions within the targeted countries, there is the need to classify households under absolute poverty and relative poverty.

Absolute poverty measures the number of people living below the poverty line – the income level below which people are defined as poor – while relative poverty measures the income of households compared to the average income within the targeted countries, across the West African sub-region, or against a standard such as The World Bank's international poverty line of US$1.25 a day in 2005 (Khanna, 2010).

The following indicators could be used to assess the financial capacity of communities within the targeted countries:

- At the macro level, information needed is:
  (i) Output, employment, remittances and (ideally) labour earnings growth;
  (ii) Population growth; and
  (iii) Predicted price changes.

- At the micro level, the information needed is:
  (i) Labour and non-labour income and consumption, and
  (ii) Labour force status and basic job characteristics, including earnings.

2.3.4 Distribution of income

Economic growth may lead to better living standards, however if this is distributed unequally then relative poverty will increase. In the targeted countries, wide income disparities exist within and across regions.

The Gini coefficient, which measures the degree of inequality of household income distribution, could be used to assess income disparities across regions within the targeted counties. It ranges from zero (0) – state of complete equality to one (1) – state of total inequality. Between 0 and 1, the higher the coefficient, the more unequal household income

is distributed. UNDP's estimates of the Gini index for the targeted countries are: Ghana – 0.408, Senegal – 0.413, Nigeria – 0.437, and Côte d'Ivoire – 0.446 (UNDP, 2007).

Knowledge of the Gini coefficient of communities within the targeted countries can assist municipal authorities plan and implement ISWM systems that takes cognizance of variation of income levels. For example, households in areas with high Gini coefficients may be required to pay for cost of waste collection and disposal at different rates.

Even though the Gini coefficient is a powerful tool for assessing income distribution, its reliability depends directly on the quality of the statistical data used to determine it, and this could be a major challenge for its computation within different population sectors in the targeted countries.

2.4 Institutional indicators

2.4.1 Overview

Waste collection schemes of cities in the developing world generally serve only a limited part of the urban population. The people remaining without waste collection services are usually the low-income population living in peri-urban areas. One of the main reasons is the lack of financial resources to cope with the increasing amount of generated waste produced by the rapid growing cities. Often inadequate fees charged and insufficient funds from a central municipal budget cannot finance adequate levels of service. However, not only financial problems affect the availability or sustainability of a waste collection service. Operational inefficiencies of SW services operated by municipalities can be due to inefficient institutional structures, inefficient organizational procedures, or deficient management capacity of the institutions involved as well as the use of inappropriate technologies.

In the targeted countries, there is currently great interest in involving private companies in solid waste management. Sometimes this is driven by the failures of municipal systems to provide adequate services, and sometimes by pressure from national governments and international agencies. Arrangements with private companies have not all been successful, and as a result some opposition to private sector involvement is now in evidence. An important factor in the success of private sector participation is the ability of the client or grantor - usually a municipal administration - to write and enforce an effective contract. Many municipalities do not know what it has been costing them to provide a service, so they cannot judge if bids from the private sector are reasonable. The contract document must be well written to describe in quantitative terms what services are required and to specify penalties and other sanctions that will be applied in case of shortcomings. Monitoring and enforcement should be effective. It is also important that the rights of both parties are upheld by the courts. Three key components of successful arrangements are competition, transparency and accountability.

Four broad areas are considered under institutional indicators namely;

i. Authority
ii. Law enforcement
iii. Community organisation
iv. Education

2.4.2. Authority

Traditional authority (descriptive)

Traditional authorities in especially rural areas are very important institutions which cannot be neglected in any ISWM practise. It is very rich institution which is highly respected and revered. Apart from this it also serves as a strong bonding factor for the inhabitants since

embodies the soul, spirit and culture of the people. Traditional authorities are also permitted in some cases for instance in Ghana to adjudicate some cases under the chieftaincy act.

Central Government

Central Government is a major stakeholder in waste management. In most African countries it is the duty of government to clear refuse, ensure clean environment and cater for safe disposal and refuse treatment sites. Central government institutions like the local/district assemblies are responsible for enacting by-laws which govern the people in the locality and also are tasked with the responsibility of enforcing the laws. In larger cities and towns municipal and metropolitan assemblies run the show and make sure that laws are enacted and enforced in their localities. On the national scale, ministries, departments and agencies are also responsible for initiating national policies and are also tasked to work in tandem with the local district and municipal assemblies to ensure clean and safe environment.

2.4.3 Law enforcement

The law enforcement agencies include:

i. Police
ii. Courts
iii. Traditional authorities
iv. Local sanitary inspectors

Police

In most African countries the police are in charge of ensuring peace and security by enforcing law and order.

Courts

The presence of courts and local tribunals in local communities and regions serves to ensure that enacted laws are enforced.

Traditional authorities

Most traditional authorities in Africa have the power to adjudicate some cases except criminal ones which fall outside their jurisdiction. In Ghana for instance the chieftaincy act allows chiefs to adjudicate cases which can be taken to a law court for enforcement.
Furthermore, Article 270(2) of Ghana's 1992 constitution empowers chiefs to adjudicate on matters without any interference from government. However, within many regions of Ghana, there are inadequate resources that make it difficult for the work of the judicial committee of the regional house of chiefs to progress effectively.

Legal framework (description)

A well-elaborated legal framework can assist in effective implementation. The legal framework should also include an effective enforcement system. In most countries, environmental legislation has emerged in response to emerging environmental problems. There is often a lack of coordination between different pieces of legislation protecting different environmental interests. Legislation is often also incoherent since it has been issued at different times, is derived from different problems, protects different interests and encompasses different objectives.

National Policy (description)

The absence or otherwise of a national waste policy is very crucial to the successful implementation of an ISWM system. Efficient waste planning is necessary to ensure a well-functioning waste management system. First of all, it is important to have a national waste management plan that gives the total overview of the waste situation in the country as well as formulating targets and strategies. A national waste management plan should of course be complemented with local waste management plans. Local factors should be taken into consideration when developing a waste management plan. Experience and information can be transferred and collected from other regions and localities but each plan is specific to the local circumstances.

The national and/or regional waste policy together with the legal framework provides the foundation for the waste plan. The local waste plan is of more tangible character and will encompass waste quantities, waste composition and treatment capacity. Typically, it will also contain measures on waste minimization and prevention, recycling and reduction of waste going to landfill. A well-prepared waste plan at local level can be a very useful tool for local waste managers to improve local waste management. Furthermore, the long-term planning assists in making previsions and enables the possibility to be pro-active regarding deficiencies (lack of disposal capacity, major investments, etc).

2.4.4 Community organisation (Type(s))

Community organisation maybe classified into:

i. Non-governmental organisation
ii. Community based organisation

Non-governmental

Non-governmental organisations (NGOs) play an important role in knowledge dissemination, awareness creation and sensitization of people in community or region.

Community based organisation

Community based organisations just like NGOs play a very important role in knowledge dissemination, awareness creation and sensitization of people in a community or region.
Community-based solid waste services can also be managed by a cooperation of nongovernmental organizations (NGOs) and community based organizations (CBOs). The clearest difference with CBOs is that NGOs usually operate on a larger geographical scale, at city, regional, national or even international level. NGOs usually set up community-based solid waste management as a development project and only in operating and managing these services they work together with CBOs. The role of NGOs is confined to overall supervision, but very frequently it also includes financial assistance and control, training and recruitment of management committee members and of operators, and other technical support. CBOs play several roles in operation and management, such as in the cooperation with governmental institutions.

2.4.5 Education (number of years)

The presence and type of educational institutions in a community or region is an indication of the level of enlightenment of the people. Educational institutions also serve to educate the general populace in the region and depending on the type of educational institution in place,

may conduct research to address some of the key waste management issues facing the community or region. These educational institutions may be classified into the following groups:

i. Basic
ii. Secondary
iii. Tertiary

2.5 Conclusion

Achieving effective SWM practices in the targeted countries calls for identification and proper classification of the region in terms of demographics, socio-economic factors and institutional structures. This report provides a list of indicators – demographic, economic, and institutional – that would be used to classify and evaluate the socio-economic situation and policy background within the targeted countries.

It also spells out methodological frameworks for the assessment of proposed indicators. Even though the list of criteria is adequate for assessing the living conditions in the targeted countries, the inadequacy and unavailability of statistical data will be a major challenge.

3 SUMMARY OF INDICATORS AND METHODOLOGY FOR ASSESSING THE INDICATORS

Table 1 Summary and Assessing of Indicators

Criterion	Justification	Indicator for characterization	Guideline for evaluation and comparison
Demographic characteristics			
Population growth	This is important to be able to estimate future SWM options	Percentage	1: Very High 2: High 3: Moderate 4: Low
Population density	This helps to estimate the quantum of waste from a particular region	Number of persons per square kilometer	1: Very High 2: High 3: Moderate 4: Low
Age	The age variations influences the type of waste generated	years	0-14 (children) 15-34 (youth) 34-64 (adult) 64 and above (old age)
Life expectancy	This would enable us estimate future population	Percentage	1: Very High 2: High 3: Moderate 4: Low
Migration	This important in order to estimate future population of the region	Percentage	1. Very High 2. High 3. Moderate 4. Low
Mortality	This is important to estimate future population and waste generation	Percentage	1. Very High 2. High 3. Moderate 4. Low
Education	Level of education usually influences people's perception about SWM	Basic Secondary Tertiary No school	Descriptive
Household income	This is an indicator to help estimate the ability of the people to pay for SWM practices	$ (PPP)	1. High 2. Moderate 3. Low
Employment status	This will help us estimate the ability of the people	Percentage	1. Formal

	to pay for SWM practices		2. Informal 3. unemployed
Level of external support	Enables us to estimate the ability of inhabitants to pay for SWM practices	$	1. Very High 2. High 3. Moderate 4. Low
Settlement	This influences the type of waste management to be deployed and the type and quantity of waste expected	Rural Semi-urban urban	Descriptive

Economic characteristics			
Principal production sectors/ main economic activities	To make quick assessment of nature of waste generated, income levels, financial capacity etc.	Type of economic activity	1. Agriculture 2: Industry 3: Commerce 4: Mixed
Household income	Will influence the choice of SWM to be promoted in a community or sections within a community	Annual income in Euros per household	1: Very High 2: High 3: Moderate 4: Low
Income distribution	Will play a crucial role in proposing monetary payments to be made by inhabitants within different income brackets in a community	Gini Coefficient (GC)	1. Complete equality (GC = 0) 2. Variable levels of Equality (0<GC<1) 3. Complete Inequality (GC = 1)
Quality of life	Needed to propose type of SWM for a community or sections within a community	TEIU's quality of life index	1. Very High 2. High 3. Moderate 4. Low
Financial capacity	Will indicate ability of households to pay for services and facilities for waste collection and disposal	The World Bank's international poverty line (US$ 1.25 per day)	1. Above 2. Below
Cost of waste collection and disposal	To estimate cost of service provision	Annual cost in dollars per household	1. Very High 2. High 3. Moderate 4. Low
Expenditure on waste collection and disposal	Willingness to pay for waste collection and disposal	Percentage of household income	1. Very High 2. High 3. Moderate 4. Low

Institutional characteristics			
Authority	This enable us know the system(s) of governance in place in the region	Type(s)	1. Traditional 2. Local/district assembly 3. Ministries, 4. Departments 5. Agencies
Law enforcement	To know how laws regarding waste management will be enforced	Type(s)	1. Police 2. Courts 3. Sanitary inspectors 4. Traditional authorities
Legal framework	To determine whether legal framework exist	Description	1. Strong 2. Weak 3. Nonexistent
National policy	To know whether a comprehensive national policy on SWM exist in the targeted countries	Description	1. Exist 2. Weak 3. Nonexistent
Community organization(s)	To know how information will be passed on to people in the region	Type(s)	1. NGOs 2. CBOs
Education	This will help to estimate how enlightened the people in the region are and also how information will be disseminated	No of years spent in school	1. Tertiary 2. secondary 3. basic 4. no school

SECTION 2: CRITERIA FOR IDENTIFICATION OF RELEVANT KEY STAKEHOLDERS IN WASTE MANAGEMENT

1 BACKGROUND INFORMATION

1.1 Objectives of section 2

The main objective of work package 1 (WP 1) is to define the requested evaluation criteria in order to achieve a consensus for the standardisation of the evaluation exercises to be performed across the targeted countries. WP 1 will lay the basement for the following work packages of the IWWA project by elaborating structured and harmonized criteria to be used by all network partners in their specific task performances. These will include: evaluation of criteria of technological, social, legal and economic situation, the evaluation and classification of key stakeholders, relevant practices in the targeted countries, solid waste management technologies and best practices in Europe and non-OECD countries.

Specific objectives include the following:

- To define the criteria for the evaluation of regional socio-economic structure and policy background (section 1.)
- To define the criteria for identification of relevant key actors (section 2),
- To define the criteria for the evaluation of suitable ISWM practices (section 3).

Section 2 aims to define the criteria for the identification of key actors, in order to establish the level and the scope that the dissemination process will have. The members of this group, on account of their own experience implementing SWM projects, will decide which type of organisations and institutions should be contacted in order to deploy the dissemination strategy. These criteria will permit to identify under WP2 relevant stakeholders (task 2.3) such as Community Based Organizations, NGOs, micro and small enterprises, the informal sector, etc. as well as those actors with a high potential in the implementation of the results achieved during the project. In this sense, special attention will be paid to government agencies in the target countries.

1.2 Waste characteristics

The project focuses on municipal waste or “household” waste and e-waste or electronically and Electrical Waste (WEEE) and industrial waste excluding other types of hazardous waste. The term municipal waste is applied to all urban/municipal waste that is produced within the domain of local authorities. That covers first of all the following origins:

- private households;
- small-scale services and business like restaurants, snack bars, workshops, offices, shops;
- market places, slaughter houses
- Companies, industries, manufacturers

1.3 Type of territory

The whole project will characterize urban, peri-urban and rural regions with regards to their access to integrated SWMS.

1.4 Methodology for the development of section 2

The following methodology for the development of this section has been followed:

1.4.1 Conducting a literature review in each country

The starting point was a review of literature on stakeholder participation in SWM. The main aspect of municipal, electronic and industrial waste is that it involves all actors of society. It includes actors who play or have had to play a major role in the process of waste management and that after periods wedged from business models used by the country (government direct grant, other forms of contracting.). In Sub-Saharan Africa waste management has gone through different management models which determined the place and role of different stakeholders. This Literature review has the advantage of simultaneously tracking the factors of success and failures of different management models already adopted and evaluate the pros and cons of each organizational SWM structure. It will provide a historical perspective to better understand the context in which current SWM systems emerged. The activity circumscribed relevant research, information, analyses and interpretations of the research results on SWM and stakeholders' participation in the system.

1.4.2 Developing a dialogue with institutions and organizations involved in the most relevant waste management in different countries

The dialogues will allow a more detailed understanding of present situations and contexts and will help to draw lessons from past experiences in order to identify possible factors of success or failure. In order to involve the various actors in the management of solid waste, a strong emphasis will be made on the flow of information and communication between them. The optimal involvement of stakeholders requires an integrated process that focuses on communication between the actors themselves and the dissemination of information to identify the actors.

1.5 Criteria identifying key stakeholders in SWM

This chapter deals with the aspect of potential stakeholders' identification. This is one of the crucial aspects of IWWA because it will guide the dissemination of research results. The lists of stakeholders in Table 2 gives a more detailed description of their nature, their roles, their level of influence/power, the links between the different actors and the institutional ones, the scale and their impacts on waste management of their intervention. Depending on the objectives of the dissemination activities the list of stakeholders will be modified. The interactions between the different actors are closely linked to the notion of Integrated Solid Waste Management (ISWM), as analyzing the actors of SWM covers all the aspects of sustainable development (the environment, the economic and the human). The general approach of the latter aspect is to promote complementarity between public action, private sector and community-based actions for good local governance of the environment through consultation and coordination.

Furthermore, the implementation of SWM projects requires the participation of stakeholders at all levels because participation is a process through which stakeholders influence and share control over development initiatives and the decisions and resources which affect them. Ownership of a project by stakeholders involves ensuring the widest possible participation of those who are supposed to be the primary beneficiaries of the project. It is important that all stakeholders are involved in the development of projects and not just direct beneficiaries or policy-makers.

First of all, in order to identify the main and secondary stakeholders of the system, it is necessary to consider the following aspects:

1.5.1 Technical aspects of municipal waste

- The origin of waste (e.g. households, streets and markets, institutions and offices, hotels and restaurants, hospitals, public gardens ports and airports, industries, companies, manufacturers)
- The composition of waste (e.g. paper, glass plastics, metals, organic waste) in order to identify the different waste streams and the interests of each group.
- The chain of SWM. It is important to consider the entire solid waste chain in order to identify the involvement of each actor in this chain: production/pre-collection/ collection/ transportation/ treatment (reuse and/or recycling of materials (plastic, rubber, glass and ceramics, paper and cardboard), valorization of energy (methanation-biogas, incineration with energy recovery), composting/ disposal (storage, landfill, incineration without energy recovery)

1.5.2 Organizational aspects of SWM

- Analyzing the current organizational structure that manages the current SWM starting from the Government to the smallest waste collector or street sweeper and will enable to identify the links and relationship between the groups of actors.

1.5.3 Financial aspects of SWM

- Analyzing the financial aspect is interesting to identify the funding circuit of SWM, and see which actors are involved in financing the sector (taxes, fees, private donations, national grants, international grants, profitability of the different waste streams)

1.5.4 Social aspects of SWM

- Analysis of how the community participates into the SWM and to what extent they are integrated in the official system. And to what extent they are recognized or not by local and state authority. It is interesting to analyze their satisfaction or non satisfaction with the current service. This deals also with the current service frequency, service coverage and suitability to the service recipients.

1.5.5 Legal aspects of SWM

- This handles all the main and secondary laws which govern the integrated SWM system in any place from waste collection, transportation, processing, final disposal, fund raising, business approvals, labor rights and working conditions etc. It will help to analyze the place and role of the main institutional actors and policy-makers.

The aim is to prepare a large list of people/groups/institutions that are affected by SWM; that have influence or power; that have an interest in its successful or unsuccessful effects. A list of potential stakeholders in West Africa has been drawn up in D. 2.3. However this list needs readjustment to each particular country situations.

Thus, the identification criteria of stakeholders of SWM will have to answer the following questions:

1. Who are the people/groups/institutions that are involved in the management of SWM?
2. Which ones have an interest in establishing integrated waste management systems?
3. Who may impact or be impacted by SWM?
4. Who is concerned about SWM in a locality (village, town, region, district, and country, international)?

1.6 Identifying the actors according to their nature

Once the general criteria above have been considered, the actors can be approached according to their nature:

- Are the actors official or non –official? Organized or non-organized?
- Are they public or private? Do the actors of the public sector depend on central states or do intervene at local level (decentralized) as local authorities and their technical services? As for the private sector, it will be necessary to distinguish the private sector as opposed to the non-profit or community-based sector. One should also distinguish between the private enterprises having a public procurement contract with the municipality and those who have no link with the local authority or no contract.

1.7 Identifying the actors according to their level of influence/power in waste management

The point here is to approach the actors in terms of their role and their involvement in waste management at local, regional, national level. Actors will be ranked according to the level of intervention such as definition of policies, implementation of policies, financing, collection, treatment and see how the involvement of every actor is impacting waste management at country level. This exercise will allow classifying stakeholders by their power and their interest in the information dissemination of SWM investigations. The result will indicate the course of action to be taken towards different groups of stakeholders. The purpose is to assess prior or current relations of collaboration or conflict. This information will be taken into consideration in the communication strategy.

1.8 Identifying actors according to their role in the different steps of SWM

The aim here is to disaggregate the steps of the waste management cycle and see which actors are involved.

Table 2 Key actors of SWM

Step in the chain	Actors involved
Production	Residents and Households, Commercial and Markets, Institutions and Offices, camps and hotels, small workshops, Public Gardens, Industries, companies, manufacturers
Pre-collection	Informal sector, and waste pickers
Organization of collection	Public institutions such as local and regional governments
Transportation	Private companies, contractors, NGOs
Reuse	Waste pickers
Recycling	Waste processors, and waste recyclers and export
Energy recovery (incineration, methanation)	Private companies, Universities, International NGOs, Consulting firms
Disposal (management of landfill sites, incineration without energy recovery)	Private companies, Municipalities,
Training of community-based actors, collectors, municipality agents	NGOs, Private Sector, Universities, International municipalities, Consulting firms
Funding	National/International Donors, Government, International NGOs
Collecting local taxes and/or community fees	Water agencies, central governments, municipalities or Community-based Organizations
Policy and law making	Ministries, Parliaments
Law enforcement	Ministry of Environment, Police
Research	Universities, NGOs
Information/Communication on SW and new techniques and approaches	Universities, Researchers, NGOS, Consulting firms, National and International networks on SWM

1.9 Example of key actors

This identification may be supplemented by a kind of profile as described in the table below. However, the actual list can vary from country to country.

Table 3 Key actors in municipal waste management

Actors in municipal waste management	Scale of intervention (Neighborhood, local, regional, national)	Links with institutions	Role in the field	Impact on waste managements
Waste producers: Residents and House-holds Commercial and Markets Streets Institutions and Offices Camps and Hotels Small Workshops Public Gardens Industries Companies Manufacturers	Neighborhood Local Regional National		The waste producers are the service recipients. They can be divided into users and non-users. The users are participating through their direct contribution to the funding of pre-collection of waste. They are also mobilized through different awareness actions of urban cleanliness. Sometimes, They create a community program for collection or waste treatment, or they separate waste at the source in a simple manner. They are generally not consulted for the definition of the collection route, schedules, location of trays, the types of trays. They are not consulted in the definition of urban cleanliness. The non-users are the ones excluded from the official WM system (especially the collection)	Significant since these actors are involved in the generation and consumption of resources
Private Sector Contractors	Neighborhood (according to the contracts they have with the municipalities)	Contractors: subcontracted by local institutions (no formal partnerships with the states)	Implementation of Operations in the waste management chain (Service Providers): Big or medium enterprises having a public procurement contract on waste collection of management of treatment plants.	Significant, as they are responsible for providing waste management services by a way or another. Their participation in the management of waste is often limited

				by the government regulations
Recycling industries	Neighborhood	Usually none	Big or medium enterprises having a public procurement contract on waste collection of management of treatment plants.	Significant, as they are responsible for providing waste management services. Their participation in the management of waste is often limited by the government regulations
Organized Community based actors Micro-enterprises or small cooperatives	Neighborhood	paid by municipalities	Creating recycles associations Pre-collection	Significant employment
Individuals Waste pickers/or waste collectors (Street/Public Dumps)	Neighborhood	Usually none	They provide door-to-door pre-collection through simple transportation systems.	Significant, individuals gain additional money or its their option to be employed and at the same time they perform environmental protection while collecting garbage for further recycling or treatment
Waste pickers and recyclers (street/at the source in accordance with residents/inside factories/in shopping centers/community sorting centers/at the dump sites)	Neighborhood	Usually none	They may be independent or may belong to an association based in the neighborhoods or in another sector. They generally charge residents directly for their services and offer poor quality and frequency, dump the product of their collection in empty lots, in bodies of water or in more or less organized collection points.	Significant, individuals gain additional money or its their option to be employed and at the same time they perform environmental protection while collecting garbage for further recycling or treatment

Waste dealers (both organized and non-organized)	Neighborhood	Usually none	They sell and buy waste materials. Small buyers managing small volumes sold to industries generally popular manufacturing all kinds of metal objects, plastic, glass, and cardboards. Major buyers managing large volumes who sell to the steel industries until the large factories of glass and cardboard	Important as they generate income to waste collectors and facilitate jobs of waste processors and recyclers
Institutional actors Relevant Ministries: Ministry of Environment, Ministry of Local Affairs/Local Development/ in charge of Housing and Planning, in charge of Domestic Affairs and Decentralization, in charge of health care, in charge of finance in charge of urban development Directors of Environmental Affairs in General and SWM in Specific. Local government sanitation task forces	National		They are the policy makers: authors of the legislative, regulatory and general promoter of national research and experimentation, provider of technical assistance and financial incentives controller and communicator and progressive results of new strategies.	Significant, as they are responsible for forming the legal, organizational and financial frameworks of current SWM system
* **Local actors**: municipalities (cluster of urban cities, urban municipalities, rural municipalities; regions, districts) Depends on the decentralization Specifically: Governors, Chiefs of District and Regions	Local		Municipalities: operation and management of local facilities. They also provide technical assistance and pay Economic Interests Groups for their service.	Significant
Funds by EC, IMF,WB Technical agencies like GTZ and the Agence Française de Développement International NGOs	Local, national and international	Grant, Loans	Financial and technical assistance in the development of SWM systems	Significant, technical and financial assistance can have a strong impact to start or to improve SWM systems
Universities **Research Institutes**	Local National Regional	Information Communication Research	Conduct Field Researches and Waste characterization Investigate the Socio-Economic Impacts of the current and possible	Important as they keep track of the cons/pros of the current/potential services and their socio-economic

			services	impacts
International or National NGOs	Local Regional National International	Need the agreement of local or national authority to intervene. Some have contracts with municipalities	Conduct Training, Service Monitoring, Carry out public awareness campaigns They carry out training sessions, public awareness campaigns; monitor the service done by the Private/Public Agencies	Important as they are the link between the residents and the government

Table 4 Actors in E-waste management

Actors (E-Waste)	Scale of intervention (neighborhood, local, national, international)	Links with institutions	Role in the field	Impacts on Waste Management (significant, relative, low)
Institutional actors: Ministries/ or Federal Ministry of environment, health, technology, communication, economy Specialized national agencies (related to ministries) like ADM, AGETIP, APROSEN in Senegal, ANASUR in Cote d'Ivoire or the EPA in Ghana or the Urban Development Board; and Environmental Sanitation Task Forces, the NESREA in Nigeria) Local government bodies (municipalities, cluster of urban cities, rural municipalities, regions, districts)	National Local		Policy makers In Nigeria, the federal agency NESREA is the only one empowered by law to formulate and ensure compliance with policies, guidelines, standards and regulations for waste management at the Federal level. Agencies can work with private collectors or the waste management agencies can directly engage in waste collection, disposal and management of landfills. Directly responsible for the cleanliness of their "territory"	
Manufacturers and importers	National/International	Municipalities, National, Customs	Any organizations manufacturing, assembling and/or importing EEE. This group is composed of the hardware brands but also of "unidentified" producers, when the equipments are non branded	Significant, since manufactures were producing and offering these items to be sold or exported in the countries

Actors (E-Waste)	Scale of intervention (neighborhood, local, national, international)	Links with institutions	Role in the field	Impacts on Waste Management (significant, relative, low)
Distributors Retailers Second hand market Organizations providing donated equipments	Local	Usually none	all bodies selling the equipments directly to the consumers	significant
Consumers Private (households) Corporate (mainly business and public administration) Business consumers have to be distinguished between small and medium enterprises (SMEs) and large enterprises	Neighborhood, local, National	usually none	The bodies that consume EEE and discard them as waste when they have reached the end of their useful life.	significant as they produce the WEEE, and feed the reuse and recycling sectors
Collectors Collection points (municipal points, drop-offs, retail shops) Pick-up services Organized (pick-up days organized by municipalities), Semi-organized / semi-informal (e.g. door-to-door collection) Informal sector	Neighborhood Local	The disorganized actors have no links with institutions	The actors that collect the E-waste	Significant
Refurbishes (formal/informal)	Neighborhood Local	usually none	All the repair units, service centers, etc, that extend the life time of equipments	Significant as they feed the second hand market
Recyclers Formal: formal e-waste recyclers (with any kind of recycling processes)	Neighborhood Local	Formal: sometimes partners of municipalities	Any organization doing dismantling, separation of fractions and/or recovering of material from e-waste	Significant as they develop the SW market

Actors (E-Waste)	Scale of intervention (neighborhood, local, national, international)	Links with institutions	Role in the field	Impacts on Waste Management (significant, relative, low)
Informal: informal e-waste recyclers doing basic dismantling and sorting and informal e-waste recyclers also doing material recovery through chemical-wet processes (e.g. gold leaching) recyclers with a potential to include e-waste as a new waste stream *Specific recyclers*: plastics recycling scrap metal dealers and smelters aluminum and copper smelters precious metals smelters (e.g. gold mining companies)		Informal: usually none		
Vendors/suppliers of recovered materials	National/international	Usually none	The industries buying the fractions (e.g. copper, plastics, metals and gold) produced by the recyclers or from jewelers to smelters.	Significant
Final Disposers	Local	Contracts with municipalities	Final disposers are organizations in charge of the final disposal of waste through incineration or landfill	Significant
Other stakeholders as for municipal waste Organizations involved in solid waste management NGOs working with informal sectors International funding / implementing organizations	Neighborhood Local Regional National international	Contracts Intervention agreement Technical assistance Funding	Intervention, state agreement, grants, loans, technical assistance	Significant in the success of any SWMS

Actors (E-Waste)	Scale of intervention (neighborhood, local, national, international)	Links with institutions	Role in the field	Impacts on Waste Management (significant, relative, low)
University institutes Consultancy offices				

Table 5 Key actors in Industrial waste

Actors (Industrial Waste)	Scale of intervention	Links with institutions	Role in the field	Impacts on Waste management
Waste producers Industries Companies Large Manufacturers	Local, National	-	Important, industries are embedded in the economical structure of the country and provide employment and goods to be used by the residents or destined for export	Significant, since these industries generate products for consumption and generate resources for further use such as fuel, fertilizer, products
Institutions	National International		Important, since inappropriate waste disposal may have effects to local, national and eventually international level. Institutions need to establish general laws and regulations to be followed.	Significant, since Institutions can decide conditions on the production and set up regulations on appropriate waste management
Research and Development	Local National International	Link with Universities	Important, academic and experts have an impact on the further development of industrial waste management systems.	Significant, since Research and development can emphasize on the longevity of products, reduction in use of resources and invention of environmentally friendly products
Local, National and International NGOs	Local National International			Significant , they can act and give guidance from “bottom up” to industries and institutions to change and adapt their production

2 COMMUNICATION AND DISSEMINATION PROCESS

The main aim of this chapter is to define the communication and dissemination process in order to address the key stakeholders identified. In a first contact, information about the results of the IWWA project itself will be disseminated, but the ultimate aim is to promote the establishment of ISWM in Western Africa by developing appropriate management policies and implementation strategies for ISWM at national and regional levels while gathering authorities, policy makers and other stakeholders in the process. To do so, the results of the project have to be disseminated through wide channel (local, national, regional, international). According to the classification already carried out, potential stakeholders have been organized in a series of groups, according to their nature, role, and influence in SWM. As each group of potential stakeholders have different background, needs, educational level and perceptions towards SWM, specific communication tools will be used in order to reach the different groups of stakeholders in an effective way.

Regarding the scope of dissemination, the project results could be disseminated at local or municipal, national and regional levels such as ECOWAS and the international level (international donors, NGOs, networks of capitalization, information). Also, one might mediate among the general public in the form of investigation TV report.

As for the space distribution and dissemination, they can be multiple and adopt many different places and existing exchange frameworks such as the trade associations and unions or associations of local elected officials, interdepartmental departments dedicated to sanitation issues, and the ECOWAS parliament.

Communication process to reach all stakeholders is described in Table 6.

Table 6 Communication process for stakeholders

Groups of actors	**Purpose of the communication, dissemination / other**	**Tools available (depends on the time and budget available)**
The users	Awareness of the environment, waste, sanitation, pre-collection, collection Avoidance of waste Reduce, Re-use, Recycle	Visits Dissemination of messages through local radios
Non users	The persons excluded from the official SWM system, especially the neighborhoods where there is no official waste collection	Visits Messages through Local Radios
Producers (Companies, manufacturers, industries)	Change in Production Innovations	Research and Development
Local private sector	Waste collectors, waste processors and recyclers	Messages through their chambers of Commerce. Direct mails, panels, and Local Radios
Municipalities	Regions, Districts, Cities, Main Villages	Local Radios, Workshops, Visits, Mails
Opinion Leaders	Thinkers, Writers, Journalists, Parties Leaders, Spiritual leaders	Local radios, Direct Mails. Reports on the Local and National / Local Journals and Magazines, Workshops and Seminars

Groups of actors	Purpose of the communication, dissemination / other	Tools available (depends on the time and budget available)
Civil Society Organizations	NGOs, Community-Based Organizations, Chambers of Commerce, Trade-Unions, Universities and other Research Institutions	Local radios, Direct Mails. Reports on the Local and National Journals and Magazines, Workshops and Seminars
Relevant ministries and national agencies	Ministers of Environment, Local Affairs/Development/ in charge of Housing and Planning, in charge of Domestic Affairs and Decentralization, in charge of health care, in charge of finance, in charge of urban development	Meetings, Workshops, Seminars Reports on the in national and regional Newspapers
Donors	National/International /Technical agencies/ International NGOs	Meetings, workshops, direct mails. Reports on the local and national newspapers, workshops and Seminars

3 CONCLUSION

Integrated Solid Waste Management is a holistic approach which emerges from the concept of sustainable development (economical, environmental, and human aspects). Thus, the implementation of SWM projects requires the participation of stakeholders at all levels of SWM and, above all, stakeholders of different nature (public-private partnership with the integration and recognition of the community-based actors). With regard to the administrative set-up, most West African countries have a very diverse structure often spreading responsibilities for sanitation over several ministries.

The dissemination of the IWWA results also needs to cover a wide range of stakeholders, and especially the key ones (authorities, policy makers, external stakeholders such as donors and international organizations but also the emerging civil society, the service providers) in order to develop appropriate management policies, i.e. establish a complementarity between public action, private sector and community-based actions for good local governance of the environment through consultation and coordination, a waste management system creating jobs and local wealth especially for the most disadvantaged social groups, without danger to the environment and health of both waste workers and populations, fairly funded and managed (polluter-pays principle, public or community control of operations); and implement strategies for ISWM at national and regional levels.

This report delivers criteria for identifying key actors in SWM, in order to establish the level and the scope that the dissemination process will have. These criteria establish a methodological framework to identify relevant stakeholders.

SECTION 3: CRITERIA FOR EVALUATIONOF SUIABLE ISWM PRACTICES

1 BACKGROUND INFORMATION

1.2 Objectives of section 3

The aim of section 3 is to develop criteria for the evaluation of suitable ISWM practices in the targeted West African countries, which will then be applied in task 2.4 on existing practices and technologies. As the concrete situation has an impact on the type of criteria selected and the level of detail for each criterion, the criteria list of section 3 shall be subject to adjustments during the ongoing project.

The selected criteria shall reflect and display the following aims of ISWM:

- Low environmental impact of the ISWM;
- High level of recovery of secondary resources;
- Preservation or creation of employment (incorporation of the informal waste management sector) and
- Provision of best available and affordable technology.

The criteria will regard technical, social and institutional matters, providing a significant guide to evaluate and classify the existing conventional low-cost technologies and innovative SWM options in terms of their feasibility in the West Africa targeted countries. These criteria will be used in order to evaluate SWM practices and technologies in targeted regions (task 2.4), as well as best practices for ISWM in EU and developing countries (task 3.1). Key indicators for comparison and evaluation will be elaborated. Indicators will cover general policy objectives of ISWM, e.g. the amount and type of waste collected, the rate of recovery and disposal, implementation costs, organisational and technical conditions (technical skills needed), compatibility with existing legal background, demands of the community, robustness, quality of SWM service obtained, efficiency, manpower and feasibility in developing countries.

1.3 Methodology for the development of section 3

The criteria are defined in the following manner for each country-specific case study/practice in the following work packages:

1. For each ISWM practice encountered in the region the waste characteristic shall be described.
2. The further criteria are defined for municipal solid waste and are modified and supplemented as far as necessary according for the following specific waste streams:
    - e-waste
    - plastic waste
    - industrial waste

2 CRITERIA LIST FOR THE EVALUATION OF ISWM

2.1 Criteria to evaluate practices for municipal solid waste management

The criteria for the evaluation of practices for municipal solid waste management are separated into the following main categories:

- Waste characteristics
- Collection and transportation practice and infrastructure
- Reuse practices
- Recycling practices and recycling infrastructure
- Secondary markets and downstream vendors
- Final disposal practices and infrastructure

2.1.1 Waste characteristics

The characteristics of municipal solid waste have basically two important consequences for planning and management.

First the high organic content accompanied by the hot climate results in the need for appropriate waste infrastructure, either through frequent waste collection, adequately distributed collection points and appropriate waste equipment and through the provision of separate collection and composting possibilities for organic waste. Especially the equipment such as trucks, truck trailers, pickups, storage containers and storage bins has to overcome unpleasant smell, insects and rodents which are attracted to the wastes.

In the second place the increasing inorganic constituents needs to be mentioned which on one hand provide an opportunity for reuse and recycling activities on the other potentially endanger the environment and the involved workers. Reuse and recycling activities offer possible benefits, such as creating micro and small-scale enterprises (e.g. home craft), creating employment in the formal and informal sector, reducing the dependency on foreign imports, reducing the amount of solid waste destinated for disposal, conserving resources and reducing pollution (Zuilen, 2006; Gatot Yudoku, 2000; Ojeda-Benitez and Beraud-Lozano, 2003).

Waste composition depends on a different number of factors such as cultural traditions, food habits, socio-economic and climatic conditions (Amponsah, 2004).

The criteria to describe the waste characteristics include the following:

Area covered

First it is essential to specify the area covered by a certain practice or technology as fundamental information for its assessment. This includes the surface of the targeted area and the number of residents living there. This information serves as reference in order to identify consistent requirements for the targeted regions. These requirements base on the assessment of effectiveness and efficiency of specific practices and technologies.

Characteristic of area

In addition to the surface and the number of residents the characteristics of the covered area have to be specified as well. This includes the categorization of the type of urbanization and prevailing structures such as residential areas, industrial areas and services.

Objective of the categorization into different types of urbanization is to relate the different waste streams to the prevailing activities in a certain region.

Origin of waste:

The project focuses on municipal solid waste (including plastic waste streams and e-waste). The term municipal solid waste is applied to all urban/municipal waste that is produced within the domain of local authorities. That covers first of all the following origins:

- private households;
- small-scale services and business like restaurants, snack bars, workshops, offices, shops;
- Market places, slaughter houses

The categorization into the different fields is provided for systematization of the generated waste. For the evaluation of solid waste practices and technologies a comprehensive description of the waste origin pattern is important.

Description of quality of waste:

There is a need for information regarding the quality of waste. Waste composition in general indicates the components of the waste stream given as a percentage of the total mass or volume. The component categories usually include: biodegradable waste such as food, yard, and wood wastes paper, and non biodegradables such as plastic, glass, metal, and other ceramics, textiles, leather, rubber, bulky wastes, household goods. The criterion has to take into account the different possibilities of waste composition. Therefore, the criterion should be variable and divided into different questions generating as much information as possible about the municipal waste stream.

- Is there to deal with a homogenous waste stream?
- Is the waste stream to understand as mix of the following waste types?
- Is the waste stream containing toxic substances?
- Is the waste stream containing valuable resources?
- Other possibilities for composition

Quantity of the waste stream (in t/d or t/year specified for total waste and several waste types):

In addition to the information about the quality of waste data regarding the quantity of waste has to be given.

This criterion is essential since the financial costs (for employers, collection equipment, disposal facilities) as well as the environmental impacts and the capacities for recycling and disposal depend on the quantity of generated waste.

2.1.2 Collection and transportation practice and infrastructure

Collection is by far the largest cost element of municipal solid waste systems. In developing countries up to 90% of expenditures are paid for solid waste collection (German Foundation for International Development, 2000). The expenditures for the collection in developing countries on average represent approximately 60-70% of the total solid waste management costs (UNEP/IETC, 1996b).

Most major cities in Africa have an established municipal solid waste collection system in place. Collection is carried out by human- and animal-drawn carts (wheelbarrows,

pushcarts), open-back trucks, compactor trucks and trailers. But a common feature of the services and infrastructure provided is that they are ineffective, underequipped and poorly maintained (Palczynski, 2002).

Where collection is performed by non-mechanical means, the volume of material to be collected often exceeds the capacity of the collection system. Because large areas of the cities are inaccessible to large vehicles, pre-collection is the first step in the waste management chain (Achankeng, 2003). Pre-collection is carried out by community groups in some areas not served directly by municipal vehicles. This is often carried out by small communal organizations or micro-enterprises of the informal sector that employ otherwise jobless youths, women, and sometimes even small children.

Waste collection involves all of the steps necessary for moving the solid waste from the storage point to the place of treatment or disposal.

Different collection criteria include the following:

Collection area (share of population):

In addition to the criteria “area covered” and “characteristics of area” (above mentioned) it is essential to specify the area covered by collection as fundamental information for further assessment. This includes first of all the share of population. These numbers serve as reference in order to identify consistent requirements for the targeted areas. Further general policy recommendation will be based among other conclusions upon these elaborated requirements.

The area can be categorized according to the number of residents in urban areas, semi-urban areas and rural areas (the following categories have to be understood as examples and should be adapted based on results drawn along the project):

- urban areas (>100.000 inhabitants);
- semi-urban areas (10.000 – 100.000 inhabitants);
- Rural areas (< 10.000 inhabitants).

Frequency of collection (e.g. not regular or weekly):

The decision as to how many times municipal solid waste should be collected is based on cost factors as well as market conditions for recyclables and climate conditions in each local government unit. In almost all cases, the more frequent the collection, the more expensive the system (UNEP/IETC, 1996a).

In determining the appropriate frequency of collection the following factors has to be taken into account:

- costs: consequences of less/more frequent collection (e.g. for infrastructure and employment);
- storage space: consequences of less/more frequent collection (e.g. for the storage capacities);
- Sanitation: consequences of less/more frequent collection for health and safety concerns associated with stored solid waste.

Waste collected related to total waste generated (in %):

Collection rates across the African continent range from 20 to 80% (Palczynski, 2002) of waste generated. Other sources indicate a range between 40 and 60% (UN-Habitat, 2010; Paris, 2000). In the major cities in West Africa between 150,000 to 300,000 tons of municipal

solid waste are generated per year, and waste management absorbs about 50% of the total municipal budget.

Specific data have to illustrate the collection situation for all the categorized areas. These data shall be used for the deficit analysis regarding waste collection with:

- Bins/barrels (%),
- Bags (%),
- Communal Container (%),
- Other (%).

Separate collection of waste fractions:

Separate collection is in some cases provided for special wastes, e.g. bulky items, defective appliances and electronics, furniture or garden waste include the following:

- Kerbside-Collection of waste fractions by waste pickers
- Collection of waste fractions in separate bins (e.g. paper, plastic, organic waste)
- Others

Average distance to the next local collection point (e.g. 500 m, 1 km, 5 km, >10 km):

The average distance from the waste generators to the next collection point in the covered areas provided information on the service level and the efficiency of collection.

Responsible entities for collection and transportation:

Waste collection is carried out by different stakeholders of the public and the private sector. The institutional organization of existing collection systems has to be assessed regarding the responsible authorities and the possible delegation of responsibilities to private companies. Informal organizations and stakeholder also form a part of the institutional organization.

- Public authorities

  Often the fiscal, operational, and administrative responsibilities for solid waste management in public authorities are fragmented between public health, public works and public cleansing departments with different budgetary and different responsibilities. That means that municipal collection and street cleaning services might be available only in certain residential or commercial areas; however some areas (e.g. informal areas) may not receive any service at all (German Foundation for International Development, 2000).

- Private companies

  In several regions the local authority uses private contractors for the collection of waste especially from households. In many cases the contractors are paid per bag/ per weight of waste collected during a certain period.

  Given the high rates of urban growth and development and the limited local resources the participation of other stakeholder will be necessary in waste service delivery (Zuilen, 2006). Thus many government leaders turned to the private sector to provide cost-effective and efficient municipal service.

  With the help of this criterion it has to be elaborated the importance of the private sector for the collection system.

- Other entities and persons

  First of all here is to mention the informal organizations of collectors, especially regarding the pre-collection in major African cities.

Number of workers engaged in collection and transportation:

A large number of employees and informal workers are involved in the waste collection system. Therefore the workers engaged in this sector have a high significance for the implementation of ISWM practices and the whole working system.

The criteria for the sectors shall be distinguished between official and informal sector.

- Official sector:

  Most of the major cities in Africa have an established municipal waste collection system. However there are often problems with available equipment and staff. In addition, not only the number and situation of workers in the major cities in Western Africa has to be assessed but also the circumstances in peri-urban and rural areas.

- Informal sector:

  The circumstances in urban, peri-urban and rural areas have to be assessed as well for the informal sector. Furthermore pre-collection in inaccessible areas of municipalities is an important activity of informal organizations.

Transportation technology used:

The aim of this criterion is to categorize the different collection and transportation technologies used in the targeted countries.

Generally three main methods of collection can be distinguished: (1) manual, (2) semi-automated, and (3) automated (UNEP/IETC, 1996a).

Manual collection and transportation of municipal solid waste continues to be the most common technique in developing countries. The manual collection and transport includes generally the “muscle-powered”-vehicles (as for example the two wheeled cart pulled by an individual or a donkey) and is based on a one-person collector or collection crew which moves through the service area using the vehicle for collecting the waste.

In spite of the above mentioned problems with regard to the maintenance of the equipments (such as trucks, trailers or compactors) general trends go towards means to reduce labour costs by semi-automated or fully-automated collection and transportation schemes.

Collection and transportation costs and financing

Knowing the full costs of collection and transportation can help authorities to make better decisions about and the design of the whole solid waste management system. The frequency of collection and transportation has a significant influence on the transportation costs.

2.1.3 Reuse practices

Reuse of waste understood as a part of the “3R”-concept of waste minimization (in addition to waste reduction and waste recycling) is one of the most effective instruments of managing solid waste and preventing negative environmental impacts of solid waste management. Reuse practices reduce waste collection and disposal costs. These practices focus on avoiding the generation of waste instead of trying to manage huge amounts after having been created. Methods for reuse include repairing broken items instead of buying new, designing products to be refillable or reusable (such as cotton instead of plastic shopping bags) or the reuse of second-hand products.

Reuse activities are widely practiced in low income societies which dominate in development countries. Therefore reuse activities should be taken into consideration while evaluation

actual and designing future waste management schemes. Nevertheless possible disadvantages of reuse practices and environmental costs have to be taken into account.

The following criteria have to be considered:

Waste types reused:

Based on the waste characteristics it is essential, to categorize the different waste types being reused. This criterion gives an indication on existing reuse practices.

Organization and practices of reuse

Research indicated that existing reuse practices have to be distinguished according to a low-income and a high-income background (Palczynski, 2002). Directly reuse (including as well a high rate of reuse) is first of all a common phenomenon for the low-income class of population especially in peri-urban and rural areas. In these areas the reuse is related to bottles, plastic bags, paper or cans for domestic use. In contrast in high-income areas rather than reusing the materials directly the bottles, plastics or paper will be sold to middlemen or commercial centre that pay for these materials.

Intended purpose of this criterion is in the first place to assess whether exist the organization of reuse and if so to describe in the second place the way of organization and the different practices.

Figure 1 Market for second hand electronics in Nigeria (Öko-Institute e.V)

Environmental impact of the reuse practices:

Reuse is an important step along the waste chain and helps to minimize waste generation. Reusing products and components of products finally also means less collection and disposal costs. The most commonly reported environmental health and injury issues in solid waste management are related to disposal problems (e.g. contaminated leak and surface runoff from land disposal facilities; methane and carbon dioxide air emissions; volatile organic compounds in air emissions) however also reuse activities can bring possible environmental impacts by producing for example new wastes (e.g. wastewater from washing petrol cans) or by improper disposal of not reusable components of a certain equipment (e.g. burning of plastics).

Number of workers engaged in reuse:

- Official sector:
  It has to be identified which and where reuse-industries and the majority of employment in the official sector are situated. There have to be named the primary cities in the first place, but the situation in secondary cities and rural areas has to be addressed as well by the criterion.
- Informal sector:
  Reuse and recycling of solid waste have positive ramifications in creating informal employment (Manhart and Prakash, 2010). It is quite common in African countries that waste pickers are living and working on dumpsites, sorting and collecting materials to reuse in order to generate a minimal income. On the other hand a high number of reused materials enter the waste stream only when they are no longer fit for domestic use. Thus they never reach the dumpsites.

  It is important to analyse the relevance of the informal sector within the solid waste management.

Revenue for reuse

This criterion is related to the employment in connection with reuse. If we want to learn more about the workers in the official and the informal sector and their relevance to establish ISWM practices we have to be informed about the opportunities for revenues in the reuse sector.

2.1.4 Recycling practices and recycling infrastructure

For the evaluation of suitable ISWM practices the existing recycling practices and recycling infrastructure are crucial. A set of different criteria are proposed in order to address this issue.

Waste types recycled

In a first step it is necessary to specify the waste types or waste fractions of the municipal waste (paper and cardboard, organic waste, metal scrap, plastic) which are at least partly recycled in the targeted country.

Organization and practices of recycling

The organisation and practices of recycling varies in the different countries and also within the countries in its urban, semi-urban and rural regions. A detailed specification of the “organisation and practices of recycling” is essential to understand the status quo of recycling. A comprehensive overview about the general organisation of recycling and about existing recycling plants (e.g. for production of cardboard from waste paper or for secondary aluminium) is a precondition to develop and propose further steps to improve the recycling situation. Information about export of waste fractions determined for recycling (e.g. metal scrap) to other countries are also necessary to understand the whole “recycling universe” of a country.

Environmental impacts of paper and cardboard recycling

The relevance of this criterion depends strictly on the concrete situation in the single country. Concerning waste paper mills comprehensive information about the standards of waste water treatment, treatment of process residues (impurities, fibres) energy demand and supply as well as information about airborne emissions are relevant. If there is no waste paper mill in the targeted country, the description of the “environmental impacts of paper and cardboard recycling” could focus on transportation issues (transport of waste paper and cardboards to the seaports) and for instance on pre-sorting procedures within the country

only (disposal on dumps or by open fires of separated fractions of very low qualities, which are not suitable for export and separated impurities like plastics).

Environmental impacts of organic waste recycling

Organic waste is a relevant fraction of municipal waste from households as well as from small enterprises like restaurants etc. The potential of organic waste recycling for an integrated solid waste management is well known and the potential contribution to climate protection is remarkable. The criterion is the basis for a detailed description of the technical standards and the environmental impacts of organic waste recycling. The following environmental impacts of organic waste recycling have to be taken into account: energy efficiency, odours, pathogenic germs, vermin and impacts on groundwater and on streaming water.

Environmental impacts of metal scrap recycling

Metal scrap recycling is widely practiced as in Figure 2 by applying low technical solutions. Most relevant environmental impacts are emissions of toxic substances to the air, water and its deposit on soils by open use of fire and chemicals and linked to it endangering of human health of the workers and of direct neighbours (Manhart and Prakash, 2010).

Figure 2 Cable burning with open fire in Ghana (Öko-Institute e.V.)

Fractions produced

The different recycling processes (paper and cardboard recycling, organic waste recycling, metal scrap recycling, plastic recycling) deliver a bunch of distinguished output streams respectively. An overview is necessary which describes all the produced fractions from the recycling processes in detail for the single countries.

Figure 3 Lead refining from battery scrap with open fire in Ghana (Öko-Institute e.V.)

By-products of recycling processes

A description of the main by-products from the recycling processes is relevant to get information and first ideas about possible improvements of the recycling processes in the future.

Quantity of recycled fractions as specified above (in t/a)

The evaluation of the quantities (in t/a) of the different recycled fractions (see above) is very important for benchmark approaches concerning the targeted countries (e.g. recycled paper in kg per capita). By this way the strengths and weak points of the recycling practices and recycling infrastructures in the single countries could be worked out. Together with the evaluation of the other described criteria information about the quantity of the recycled fractions is a basis for improvement strategies.

Figure 4 Environmental impacts by recycling procedures in Ghana (Öko-Institute e.V)

Number of workers engaged in the recycling (official sector/informal sector)

The evaluation of the numbers of workers engaged in the recycling sector and the share of the official and the informal sector is also a very relevant criteria. In Western Africa the informal sector is very relevant and is often linked to inappropriate recycling practices as in Figure 4. Nevertheless, to transform the high numbers of people from the informal recycling sector to the official sector under appropriate and fair conditions has a large potential for the targeted countries.

Recycling technologies applied

The criterion demands a specification of the recycling technologies which are applied for the different waste recycling processes (paper and cardboard recycling, organic waste recycling, plastic waste recycling, metals scrap recycling) in the targeted countries. The results of this evaluation will give further impulses for improvements in the recycling sector.

Sale and disposal of different fractions

Concerning the different fractions which are produced by the several recycling processes detailed information about the quantities and the share between sale and disposal is very crucial in an evaluation process towards integrated solid waste management. The percentage of sale is an indicator about the quality of recycling processes and the standards of the recycling infrastructure.

Revenue of valuable fractions

Information about the revenue of the different valuable fractions of the recycling processes is also an important criterion to evaluate the status quo but also the further potentials of an integrated solid waste management in the targeted countries.

Disposal costs of non-valuable fractions

The evaluation of the disposal costs of non-valuable fractions is also relevant information to get an impression about the net revenues of the recycling practices in the targeted countries.

2.1.5 Secondary markets and downstream vendors

Availability of secondary markets for different fractions resulting from recycling

This criterion should address a distinguished assessment of the availability of secondary markets. In Western Africa the fast rising waste streams which includes remarkable shares of valuable fractions (metal scrap, paper and cardboard, plastics) means a growing potential for secondary markets, but the necessary infrastructure is often not yet mature enough. Therefore the assessment of the secondary markets pattern and their actors is a further important step towards an integrated solid waste management.

Informal or formal markets

To complete the information covered by the criterion above an evaluation about the character of the secondary markets, especially the scale of informal or formal markets are essential.

2.1.6 Final disposal practices and infrastructure

Agencies in charge of solid waste disposal

This criterion provides information about the decisive agencies in charge of solid waste disposal. Especially information about the relation between public or private agencies and the cooperation models applied is relevant to understand the disposal infrastructure of a single country.

Infrastructure for final disposal of municipal waste:

For the understanding of the final disposal infrastructure of a single country the evaluation has to cover detailed questions about the availability and the coverage of different final disposal installations for municipal waste. Questions regarding municipal waste incinerators seem to be not suitable for the situation in the Western Africa region.

The coverage of different installation levels as regards to the overall disposal shall be illustrated in Table 7.

Table 7 Differentiation of landfills

Landfill - level of installation	Coverage as regards to the overall disposal
Landfill without any further installation	*(percentage of total amount)*
Landfill with gas collection and thermal treatment and energy recovery	*(percentage of total amount)*
Landfill with gas collection and thermal treatment	*(percentage of total amount)*
Landfill with groundwater packing	*(percentage of total amount)*
Landfill with leakage water collection and – treatment	*(percentage of total amount)*
Dumping (not regular)	*(percentage of total amount)*

Number of workers engaged in the disposal

The evaluation of the final disposal has to include information about the numbers of workers engaged in the official and in the informal disposal. This information is a prerequisite in order to develop strategies for an improvement of integrated solid waste management in the single countries.

Average disposal costs

The average disposal costs of municipal waste (per ton) are an important benchmark indicator. It is a well-known fact in waste management that cheap landfills stand for the "negative benchmark" within the competition of different alternatives (recycling versus direct landfill).

Operational costs per year

Finally the operational costs per year of the landfills were split into the main cost positions (personal costs, energy costs) are needed to understand the final disposal practices and the infrastructure.

3.1 Criteria to evaluate practices for e-waste

Waste Electrical and Electronic Equipment, generally named as e-waste contains a high share of both valuable and toxic substances. In order to recover basic and precious metals such as copper, aluminium, gold and silver, e-waste is often collected and processed separately from municipal waste by informal and formal collection schemes. This treatment, however, in many cases leads to an uncontrolled release of toxic substances such as lead, cadmium, mercury and brominated flame retardants and therefore bears high risks to human health and the environment.

3.1.1 E-Waste characteristics

The indicators on the e-waste characteristics give an overview of the origin, the quality and the quantity of e-waste in a particular area. This provides important background information for further evaluation of the waste management system.

- Origin of e-waste (% private households, % small and medium enterprises, % large enterprises, % government, % others)
- Quantity of e-waste (in t/d or t/year specified for total and e-waste category: e.g. large household appliances, small household appliances, information and communication technology, consumer electronic)
- Estimated average age of discarded e-waste (per e-waste category)

3.1.2 Collection practice and infrastructure

The collection method of e-waste has a direct influence on how much of the generated e-waste reaches the e-waste refurbishment or recycling and how much is stored or dumped.

- Separate collection of e-waste;
- Formal separate e-waste collection through public or private entity
- Informal separate e-waste collection
- Collection period
- E-waste collected related to e-waste generated (%)
- Destiny of collected e-waste Number of workers engaged in collection within the collection area:
    - Official
    - Informal
- Remuneration for collected e-waste
- Collection technology used
- Collection costs and financing

3.1.3 Refurbishment / Repair practices

The refurbishment / repair practices extend the lifespan of certain equipment or components and therefore help to reduce waste. In addition, they generate jobs and income for low skilled workers.

- Organization and practices of refurbishment/repair
- Environmental impacts of refurbishment/repair practices
- Number of workers engaged in refurbishment/repair activities of e-waste
    - Official sector
    - Informal sector
- Average selling prices of refurbished/repaired equipment of a certain type (e.g. PC, TV, refrigerator).

3.1.4 Recycling practices and infrastructure

Recycling of e-waste contributes to closing material cycles by recovering e.g. metals. The e-waste recycling sector also provides jobs and income for many low skilled workers. However, if e-waste is not handled in an environmentally sound manner, it can also lead to negative impacts on human health and the environment.

- Organization and practices of recycling
- Specific e-waste recycling industry available
- E-waste recycled related to e-waste generated (%);
- Environmental impact of e-waste recycling practices
- Main fractions produced in the recycling processes
- By-products of recycling processes
- Quantity of recycled fractions as specified above (in t/a);
- Number of workers engaged in the recycling
  - Official sector
  - Informal sector
- Recycling technologies applied
- Costs of recycling technologies applied
- Secondary market/disposal of different fractions

3.1.5 Secondary markets and downstream processors

The e-waste recycling sector largely depends on the availability of secondary markets or downstream processors for different fractions resulting from recycling. Especially for hazardous substances, often no downstream processors are available and the fractions are therefore not taken care of.

- Local availability of secondary markets for different fractions resulting from recycling
- Export of fractions
- Revenue of valuable fractions for local market or export

3.1.6 Final disposal

If no adequate infrastructure is in place final disposal of e-waste can lead to long term contamination of the air, soil and water systems due to its toxic substances. Burning of e-waste also leads to highly toxic emissions to the air and the soil.

- E-Waste observed in disposed municipal solid waste
- Open burning of e-waste
- Infrastructure for disposal of non-valuable and hazardous e-waste fractions
- Disposal costs of non-valuable and hazardous e-waste fractions *(per ton).*

3.2 Criteria to evaluate practices for plastic waste

In this point, criteria for the evaluation of plastic waste management practices were defined, taking into account the specific characteristics of this waste stream. An important aspect for the evaluation of plastic waste management is the assessment of the collection system and the reverse logistics from plastic waste origin places to the plastic reuse or treatment plants.

This chapter indicates the criteria to be taken into account for the evaluation of plastic waste streams management systems. The criteria list was defined for each key point present in the life cycle of the plastic wastes coming from household waste and commercial waste similar to household waste.

3.2.1 Plastic waste origin

Post-use plastic can be described as plastic material arising from products that have undergone a first full-service life prior to being recovered. Households are the biggest source of plastic waste, but the evaluation of commercial waste similar to household waste is an interesting issue as well.

The criteria for the origin of plastic waste aims to quantify the demography of the studied areas related to the type of waste containing the plastic stream.

- Area covered (surface, number of inhabitants);
- Type of waste regarding the origin:
  - Household waste
  - Commercial waste similar to household waste (little markets, shops, offices and institutions, schools)

3.2.2 Plastic waste characteristics

The criteria for plastic waste characteristics should give an overview of the quality and the quantity of plastic waste. This provides important background information for further evaluation of the waste management system.

Figure 5 Plastic waste bales (GAIKER Technological Center)

- Description of quality of plastic waste:
  - Homogenous plastic waste stream
  - Composition (type of polymers) of mixed plastic waste streams
  - Plastic waste stream contains toxic substances
  - Other
- Quantity of the plastic waste stream (in t/d or t/year specified for total and plastic waste type: packaging, bottles, agricultural films).

Figure 6 Mixed Plastic Waste Stream (GAIKER Technological Center)

3.2.3 Collection practice and infrastructure

Reuse and recycling household and commercial plastic present a number of challenges. One of these relates to collection. Information about plastic waste collection systems implanted in the targeted countries will give a rough view about plastic reuse, recycling or dumping rates.

- Separate collection of plastic waste
- Plastic waste collection with:
  - Bins/barrels
  - Bags
  - Open
  - Other
- Quantity in %, of plastic waste collected in each collection area (share of population):
  - urban areas (>100.000 inhabitants),
  - semi-urban areas (10.000 – 100.000 inhabitants),
  - rural areas (< 10.000 inhabitants);
- Collection period
- Plastic waste collected related to total waste generation (in %);
- Average distance between local collection points (e.g. 500 m, 1 km, 5 km, >10 km);
- Responsible entity for collection and transportation:
  - Public authorities,
  - Private companies,
  - Other entities/persons
- Existence of plastic sorting plants
- Number of workers engaged in collection and transportation:
  - Official,
  - Informal;
- Transportation technology used

- Transportation costs and financing

3.2.4 Plastic waste reuse practices

Recycling is the most usual end-of-life practice for plastic waste, although reuse practices have to be considered as an important way for the recycling in countries that are not technologically developed. Therefore, information obtained by the indicated criteria for the evaluation of plastic waste reuse practices will be directly connected with results of the recycling practices evaluation.

- Plastic Waste product types reused
- Type of polymers of the reused products
- Organization and practices of reuse
- Number of workers engaged in reuse
  - Official sector
  - Informal sector
- Revenue for plastic waste reuse

3.2.5 Recycling practices and infrastructure

As already stated plastic waste recycling practices are highly influenced by the previous collection step, as they are dependant of the quality of plastics to be recycled or processed. Furthermore it is important to identify and quantify (as far as possible) the most present polymer families into plastic waste streams, as this aspect is related to the applied recycling technologies. The indicated criteria will also give financial and market information regarding plastic waste recycling practices.

The quality standards of the plastic recycling processes and plants need to be described. Issues of interest are the energy demand and supply situation, airborne emissions and treatments of residues from the plastic recycling processes.

- Plastic waste fractions recycled
- Infrastructure of plastic recycling field
- Description of obtained product
- By-products of recycling processes
- Quantity of recycled fractions as specified above
- Environmental impact of plastic recycling
- Number of workers engaged in the plastic waste recycling field:
  - Official sector
  - Informal sector
- Recycling technologies applied
- Sale of different fractions
- Disposal of different fractions
- Profit obtained from each valuable plastic fraction
- Disposal cost of non-valuable fractions

3.2.6 Secondary markets and downstream processors

In order to evaluate the situation of secondary markets and downstream processors for recycled plastics, it is essential to know the availability of the necessary processing industry infrastructure in the targeted countries. Description of the final products or applications coming from recycled plastics will enable the evaluation of the available plastic processing industries potential.

- Availability of recycled plastic processing industries
- Type of final products/applications obtained from recycled plastics
- Informal or formal markets

3.2.7 Final disposal

Final disposal like land filling could be presupposed as the most common practice for all solid waste (including plastics) in the targeted countries. Therefore, criteria for the evaluation of another final disposal of solid waste could be used for plastic wastes.

- Agencies are in charge of plastic waste disposal
- Infrastructure for final disposal of plastic waste (see above mentioned table for the different landfill-levels of infrastructure):
    - regular landfill without any further requirements
    - regular landfill with gas collection and thermal treatment and energy recovery regular landfill with groundwater packing
    - regular landfill with leakage water collection and –treatment
    - dumping
- Number of workers engaged in the disposal:
    - Official sector
    - Informal sector
- Average disposal costs (*per ton*);
- Operational costs per year

3.3 Criteria to evaluate practices for industrial waste

Industrial waste includes waste in its solid and liquid form which is generated by the production of goods or resources through companies, large manufactures, industries and other organisations. The criteria for the evaluation of practices for Industrial waste are separated into the main categories.

3.3.1 Industrial solid waste characteristics

The characteristics of industrial waste depend on its conditions. The industrial waste can be solid or liquid. Furthermore differentiation between the parameters like containing toxic substances, its generation in large quantities, and its impact on the economy of the country or types of waste generated can be made. Additionally major location of industrial estates were of importance, which may influence the infrastructure of recycling establishments for industrial or other solid waste types.

3.3.2 Collection practice and transportation

The collection and transportation of industrial waste depend on its characteristics. The following parameters should be taken into account:

- Separate collection of industrial waste;
- Formal separate industrial waste collection through public or private entity or company itself
- Informal separate industrial waste collection
- Collection technology used
- Collection costs and financing

3.3.3 Recycling practices

Recycling of industrial waste depend mainly by waste type and depend on the industrial sector. Nevertheless, the following criteria can be used to evaluate the recycling practices of industrial waste:

- Industrial waste fractions recycled
- Infrastructure of industrial recycling field
- Description of obtained product
- By-products of recycling processes
- Quantity of recycled fractions as specified above
- Environmental impact of industrial waste recycling
- Recycling technologies applied
- Disposal of different fractions
- Disposal cost of non-valuable fractions

3.3.4 Final disposal

Final disposal like land filling may be the common practice for all solid waste in the targeted countries. Liquid industrial waste on the other hand needs to go through a sewage treatment plant.

Therefore, criteria for the evaluation of industrial waste could be the following:

- Infrastructure for final disposal of industrial waste (see above mentioned table for the different landfill-levels of infrastructure):
    - regular landfill without any further requirements
    - regular landfill with gas collection and thermal treatment and energy recovery regular landfill with groundwater packing
    - regular landfill with leakage water collection and treatment
    - dumping
- Number of workers engaged in the disposal:
    - Official sector
    - Informal sector
- Average disposal costs (*per ton*);
- Operational costs per year

4 CONCLUSIONS

The report delivers criteria for the evaluation of suitable ISWM practices. It represents a methodological framework for the assessment of suitable ISWM practices within the targeted countries, as well as good practices from EU and non OECD countries that can be adapted to their situation. In the case of the EU countries some of the criteria suitable for non OECD countries are unnecessary. Nevertheless most of the criteria are adequate for assessments and evaluations regarding ISWM issues all over the world. The report includes additional criteria taking into account the specifications of e-waste and plastic waste and industrial waste. The described criteria lists can be also obtained from the tables in the annexes.

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APPENDICES

APPENDIX I: CRITERIA LIST FOR MUNICIPAL WASTE

ISWM Practices	
1. Waste characteristics	
Area covered (surface, number of inhabitants)	
Characteristic of area	
Origin of waste (e.g. households, restaurants, offices, market place, slaughter houses)	
Description of quality of waste: 1) homogenous waste stream 2) mixed waste stream of the following waste types: 3) waste stream contains toxic substances 4) waste stream contains valuable resources 5) Other	
Quantity of the waste stream (in t/d or t/year specified for total and waste types)	
2. Collection and transportation practice and infrastructure	
Collection area (share of population): 1) urban areas (>100.000 inhabitants) 2) semi-urban areas (10.000 – 100.000 inhabitants) 3) rural areas (< 10.000 inhabitants)	
Collection period (e.g. not regular, weekly)	
Waste collected related to total waste generation (in %)	
Waste collection with: 1) Bins/barrels (to specify in %) 2) Bags (to specify in %) 3) Open (to specify in %) 4) Other (to specify in %)	
Separate collection of waste fractions: 1) Kerbside-Collection of waste fractions by scavengers 2) Collection of waste fractions in separate bins (e.g. paper, plastic, organic waste) 3) Other	
Average distance to the next local collection point (e.g. 500 m, 1 km, 5 km, >10 km)	
Responsible entity for collection and transport: 1) Public authorities 2) Private companies 3) Other entities/persons	
Number of workers engaged in collection and transportation: 1) Official 2) Informal	

Collection and Transportation technology used	
Collection and Transportation costs and financing	
3. Reuse practices	
Waste types reused	
Organization and practices of reuse	
Environmental impact of the reuse practices (describe)	
Number of workers engaged in reuse: 1) Official sector 2) Informal sector	
Revenue for reuse	
4. Recycling practices and recycling infrastructure	
Waste types recycled	
Organization and practices of recycling	
Environmental impacts of paper and cardboard recycling	
Environmental impact of organic waste recycling	
Environmental impact of metal scrap recycling	
Environmental impact of plastic recycling	
Fractions produced	
By-products of recycling processes	
Quantity of recycled fractions as specified above (in t/a)	
Number of workers engaged in the recycling: 1) Official sector 2) Informal sector	
Recycling technologies applied	
Sale/Disposal of different fractions	
Revenue of valuable fractions (per ton)	
Disposal cost of non-valuable fractions (per ton)	
5. Secondary markets and downstream vendors	
Availability of secondary markets for different fractions resulting from recycling	
Informal or formal markets	
6. Final disposal practices and infrastructure	
Agencies are in charge of solid waste disposal (Public vs. private)	
Infrastructure for final disposal of municipal waste: 1) regular landfill without any further requirements (percentage of total amount) 2) regular landfill with gas collection and thermal treatment and energy recovery (percentage of total amount) 3) regular landfill with gas collection and thermal treatment (percentage of total amount) 4) regular landfill with groundwater packing (percentage of total amount) 5) regular landfill with leakage water collection and –treatment (percentage of total amount) 6) dumping (not regular) (percentage of total	

amount)	
Number of workers engaged in the disposal: 1) Official sector 2) Informal sector	
Average disposal costs (per ton)	
Operational costs per year	

APPENDIX II: ADDITIONAL CRITERIA LIST FOR E-WASTE

ISWM Practices (Case study e-waste)	
1. E-waste characteristics	
Area covered (surface, number of inhabitants)	
Characteristic of area (% residential, % industrial, % services)	
Origin of e-waste (e.g. households, small and medium enterprises, large enterprises, govern-ment)	
Description of quality of e-waste: 1) homogenous waste stream, e-waste only 2) mixed waste stream of the following waste types: 3) Other	
Quantity of the e-waste stream (in t/d or t/year specified for total and e-waste category: e.g. household appliances, information and communication technology, consumer equipment)	
Average age of discarded e-waste (per e-waste category)	
2. Collection and transportation practice and infrastructure	
Collection area (share of population): 1) urban areas (>100.000 inhabitants) 2) semi-urban areas (10.000 – 100.000 inhabitants) 3) rural areas (< 10.000 inhabitants)	
Collection period (e.g. not regular, weekly)	
E-waste collected related to total e-waste generation (in %)	
e-waste collection with: 1) Bins/barrels 2) Bags 3) Open 4) Other	
Separate collection of e-waste: 1) Kerbside-Collection of e-waste by scavengers 2) Other	
Average distance to the next local collection point (e.g. 500 m, 1 km, 5 km, >10 km)	
Responsible entity for collection and transportation: 1) Public authorities 2) Private companies 3) Other entities/persons	
Number of workers engaged in collection and transportation: 1) Official 2) Informal	
Remuneration for collected e-waste	
Transportation technology used	
Transportation costs and financing	

APPENDIX III: ADDITIONAL CRITERIA LIST FOR PLASTIC WASTE

ISWM Practices (Case study PLASTICS)	
1. Origin of Plastic Wastes	
Area covered (surface, number of inhabitants)	
Household Waste (% or tons if possible) **Commercial waste similar to household waste** (little markets, shops, offices and institutions, schools...) (% or tons if possible)	
2. Plastic Waste characteristics	
Description of quality of plastic waste: 1) homogenous plastic waste stream 2) Composition (type of polymers) of mixed plastic waste streams 3) plastic waste stream contains toxic substances 4) Other	
Quantity of the plastic waste stream (in t/d or t/year specified for total and waste types)	
3. Collection and transportation practice and infrastructure	
Separate collection of plastic waste	
Quantity in %, of plastic waste collected in each collection area (share of population): 1) urban areas (>100.000 inhabitants) 2) semi-urban areas (10.000 – 100.000 inhabitants) 3) rural areas (< 10.000 inhabitants)	
Frequency of collection (e.g. not regular, weekly)	
Plastic-Waste collected related to total waste generation (in %)	
Plastic Waste collection with: 1) Bins/barrels (to specify in %) 2) Bags (to specify in %) 3) Open (to specify in %) 4) Other (to specify in %)	
Average distance between local collection points (e.g. 500 m, 1 km, 5 km, >10 km)	
Responsible entity for collection and trans-port: 1) Public authorities 2) Private companies 3) Other entities/persons	
Existence of plastic sorting plants	
Number of workers engaged in collection and transportation: 1) Official 2) Informal	
Transportation technology used	
Transportation costs and financing	
4. Plastic Waste Reuse practices	
Plastic Waste product types reused	
Type of polymers of the reused products (specify: PE, PP, PET, PS...)	
Organization and practices of reuse	
Number of workers engaged in reuse: 1) Official sector 2) Informal sector	

Revenue for plastic waste reuse	
5. Recycling practices and recycling infrastructure	
Plastic Waste fractions recycled (specify: PE, PP, PET, PS...)	
Infrastructure of plastic recycling field (describe)	
Description of obtained product (flakes, pellets, final products)	
By-products of recycling processes	
Quantity of recycled fractions as specified above (in t/a)	
Number of workers engaged in the plastic waste recycling field: 1) Official sector 2) Informal sector	
Recycling technologies applied	
Sale of different fractions	
Disposal of different fractions	
Profit obtained from each valuable plastic fraction (per ton)	
Disposal cost of non-valuable fractions (per ton)	
6. Secondary markets and downstream vendors	
Availability of recycled plastic processing industries	
Type of final products and applications obtained from recycled plastics	
Informal or formal markets	
7. Final disposal practices and infrastructure	
Agencies are in charge of plastic waste disposal (Public vs. private)	
Infrastructure for final disposal of municipal waste: 1) regular landfill without any further requirements (percentage of total amount) 2) regular landfill with gas collection and thermal treatment and energy recovery (percentage of total amount) 3) regular landfill with groundwater packing (percentage of total amount) 4) regular landfill with leakage water collection and treatment (percentage of total amount) 5) dumping (not regular) (percentage of total amount)	
Number of workers engaged in the disposal: 1) Official sector 2) Informal sector	
Average disposal costs (per ton)	
Operational costs per year	

APPENDIX IV: CRITERIA LIST FOR INDUSTRIAL WASTE

ISWM Practices	
1. Origin of Industrial Wastes	
Location and Agglomeration of industrial activities	
2. Industrial Waste characteristics	
Description of quality of industrial waste: 1) Industrial sector and type of waste 2) Quantities of waste 3) industrial waste stream contains toxic substances 4) Other	
Quantity of the plastic waste stream (in t/d or t/year specified for total and waste types)	
3. Collection and transportation practice and infrastructure	
Separate collection of industrial waste (yes/no)	
Frequency of collection	
Industrial Waste collection with: 5) Bins/barrels (to specify in %) 6) Bags (to specify in %) 7) Open (to specify in %) 8) Other (to specify in %)	
Responsible entity for collection and transportation: 4) Public authorities 5) Private companies 6) Other entities/persons	
Number of workers engaged in collection and transportation: 3) Official 4) Informal	
Transportation technology used	
Transportation costs and financing	
4. Industrial Waste Reuse practices	
Industrial Waste product types reused	
Organization and practices of reuse	
Number of workers engaged in reuse: 3) Official sector 4) Informal sector	
Revenue for plastic waste reuse	
5. Recycling practices and recycling infrastructure	
Industrial Waste recycled	
Infrastructure of industrial recycling field	
Description of obtained product	
By-products of recycling processes	
Quantity of recycled fractions as specified above (in t/a)	
Number of workers engaged in the plastic waste recycling field: 3) Official sector 4) Informal sector	
Recycling technologies applied	
Sale of different fractions	
Disposal of different fractions	
Profit obtained from each valuable fraction	
Disposal cost of non-valuable fractions	

7. Final disposal practices and infrastructure	
Agencies are in charge of industrial waste disposal (Public vs. private)	
Infrastructure for final disposal of municipal waste: 6) regular landfill without any further requirements (percentage of total amount) 7) regular landfill with gas collection and thermal treatment and energy recovery (percentage of total amount) 8) regular landfill with groundwater packing (percentage of total amount) 9) regular landfill with leakage water collection and –treatment (percentage of total amount) 10) dumping (not regular) (percentage of total amount)	
Number of workers engaged in the disposal: 3) Official sector 4) Informal sector	
Average disposal costs	
Operational costs per year	