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Country report on the Solid Waste Management in Occupied PALESTINIAN Territories

April 2014

SWEEPNET

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SWEEPNET

The Regional Solid Waste Exchange of Information and Expertise network in Mashreq and Maghreb countries

COUNTRY REPORT ON THE SOLID WASTE MANAGEMENT IN

OCCUPIED PALESTINIAN TERRITORIES

Published in
April 2014









Developed with the support of **Dr Reem Musleh**

This report is an expert opinion, published with no official clearance.

by D-Waste
Consultant for SWEEP-Net

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LIST OF ABBREVIATIONS

ARIJ	Applied Research Institute – Jerusalem
EIA	Environmental Impact Assessment
EQA	Environment Quality Authority
FAO	Food and Agricultural Organization of the United Nations
Gov.	Governorate
GS	Gaza Strip
H&B	Hebron and Bethlehem
HZW	Hazardous waste
IMG	International Management Group
JSC	Joint Service Council
Kg/c/d	Kilogram per capita per day
LGU	Local Government Units
m3	Cubic Meters
MDC	MA'AN Development Centre
MEnA	Ministry of Environmental Affairs currently EQA
MNE	Ministry of National Economy
MoA	Ministry of Agriculture
MoE	Ministry of Education
MoH	Ministry of Health
MoLG	Ministry of Local Government
MoPAD	Ministry of Planning and Administrative Development
MSW	Municipal solid waste
NDP	National Development Plan (2011-2013)
NGO	Non-Governmental Organization
PARC	Palestinian Agricultural Relief Committees
PCBS	Palestinian Bureau of Statistics
PENGON	The Palestinian Environmental NGOs Network
PHG	Palestinian Hydrology Group
PNA	Palestinian National Authority
PNGO	Palestinian NGOs Network
PS	Private Sector
PWA	Palestinian Water Authority
T	tons
t/d	Ton/day
t/y	Ton/year
TS	Transfer station

UNCSD	United Nations Conference on Sustainable Development
UNRWA	United Nations Relief and Works Agency for Palestine Refugees in the Near East
USD	United States Dollars
WB	West Bank
ZF	Zahrat al Finjan

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COUNTRY PROFILE on the solid waste management situation in Occupied PALESTINIAN Territories

April 2014

BACKGROUND INFORMATION

Population[i] :	4.421 million (mid, 2013)
Municipal Solid Waste (MSW) Generation:	1.387 million tons/year (2012)
Per Capita MSW Generation[ii] :	0.94 kg/day (2012)
- Urban areas[iii]	0.9-2.05 kg/day (2012)
- Rural areas[iv]	0.35-0.6 kg/day
MSW Generation Growth:	4 % per year; 1% per capita per year
Medical waste generation[v] :	3,226 tons/year (2011)
Industrial waste[vi] :	131,344 tons/year (2011)
Hazardous waste[vii] :	62,621 tons/year
Agricultural waste[viii] :	Gaza strip 440,000 ton/year West Bank (no estimate)
C&D Waste[ix] :	Unknown
Waste Tyres[x] :	5,550 tons/year (as rubber)
e-Waste:	Unknown
Packaging Waste:	Unknown

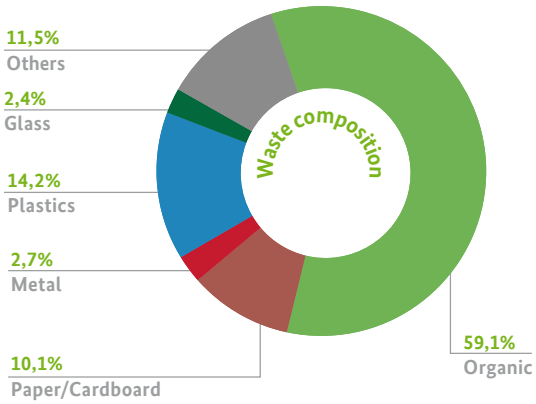
Hazardous and industrial waste

Number of hazardous landfills or plants (Chemical and physical treatment):	
- Planned	0
- Under construction	0
- Constructed	1 HAZ landfill cell constructed in 1998, but never went into operation due to lack of economic feasibility and lack of enforcement (in Gaza)
- Operational	0
Types of disposal and treatments for medical waste:	Uncontrolled Incineration & sterilization using autoclaves and microwave. Other than the limited above pre-treatment if available; disposal of most medical waste takes place at sanitary landfills, random sites, and by open burning.

TECHNICAL PERFORMANCE

Municipal Waste

MSW Collection Coverage[xi] :	
- Rural areas	88 %
- Urban areas	93 %
MSW Final Destination:	
- Composted	less than 0.5 %
- Recycled	less than 0.5%
- Landfilled	33%(42% WB, 22% GS)[1]
- Openly dumped	67%
Number of Dumpsites:	163
Number of Controlled Landfills:	
Number of Sanitary Landfills:	
- Planned	2
- Under construction	1 (GS)
- Constructed	1
- Operational	3 (2 WB, 1 GS)



1- Calculated based on data obtained in 2013.
i- PCBS. 1997-2016. http://www.pcbs.gov.ps/Portals/_Rainbow/Documents/gover_e.htm
ii- Calculated for this report, includes medical, institutional, commercial, and industrial
iii- Includes medical, institutional, commercial, and industrial
iv- Includes medical, institutional, commercial, and industrial
v- Calculated for this report.
vi- PCBS (2011) http://www.pcbs.gov.ps/Portals/_Rainbow/Documents/E_ENV_Tab1E.Solid%20Waste.htm
vii- PNA (2010). National master plan for Hazardous Waste Management for the PNA, 2010
viii- Zaghloul Samhan (2012) - National Report on Solid Waste Management – Sweep Net.
ix- PCBS has reported the number at 911 tons/year (2011), http://www.pcbs.gov.ps/Portals/_Rainbow/Documents/E_ENV_Tab1E.Solid%20Waste.htm
x- Calculated for this report.
xi- PCBS 2011

Policy and planning environment

1. The National Development Plan 2011-2013, the Palestinian National Authority, 2010 ;
2. The National Strategy for Solid Waste Management in the Palestinian territory 2010-2014, the Palestinian National Authority, May 2010 ;
3. The environment Sector Strategy, Environment Quality Authority, March 2010 ;
4. Master Plan for Healthcare Waste Management in West Bank and Gaza Strip, MTEAP, 2006 ;
5. The Palestinian Environment Strategy 2000-2010, Ministry of Environmental Affairs, 2000 ;
6. The development of a National Master Plan for hazardous waste management for the Palestinian National Authority, UNEP, February 2010. – Draft was never approved ;
7. Palestinian National Strategy to achieve MDGs by 2015. June 2012 ;
8. Cross-sectoral strategy for Palestinian local government and administration sectors (2011-2013).

Legal framework

- The Environmental Law no.7 for year, 1999 ;
- The Palestinian Environmental Assessment Policy, 2000 ;
- The Palestinian Local Authorities Law no.1/1997 ;
- The Public Health Law no.20 for year 2004 ;
- The Investment Promotion Law no.1/1998 ;
- The basic regulation on the Joint Service Councils of year 1996, and its updates, last in 2006 ;
- The Cabinet resolution no.53/2008, in relation to forming a national committee for following up the development of the national solid waste management strategy (NSWMS ;
- The Medical Waste Management Bylaw 2012.

Institutional framework

- Environment Quality Authority (EQA): has the role of development of the national strategies and plans of the solid waste in cooperation with other related institutions ;
- Ministry of Local Government (MoLG) chairs the Steering Committee for the (NSWMS). MoLG is the co-chair for thematic sub-working group on solid waste management. Further, MoLG is responsible for monitoring the local authorities and joint service councils ;

Contact person

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Project Leader
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- Ministry of Health (MoH): monitoring the handling and managing the medical waste and licensing of operations of waste facilities ;
- Ministry of Planning and Administrative Development (MoPAD): has a responsibility of integrating solid waste in the national development plans ;
- The Steering committee for National solid waste management strategy is responsible for following up the implementation of the national strategy for SWM(2010-2014) ;
- The local authorities: responsible for solid waste management within their jurisdiction ;
- Private sector: partially collects and transport the waste. Recycling and reuse as well, it is expected that operation of sanitary landfill in the south of the west bank will be contracted out to an international private sector.

Private sector involvement

- Minimal participation in solid waste collection ;
- No participation yet in disposal facilities, a international company is expected to operate the disposal site in the south of the West Bank ;
- Private sector is mainly active in recycling of special streams such as construction and demolition waste in Gaza strip, recycling of e-waste illegally imported from Israel, few companies with small size active in recycling of plastic ;
- Participation of private sector in transfer and transport is practiced in some areas in the west Bank, such as Nablus and Ramallah.

Options for improvement

- Development of the legal framework; and enforcement of laws ;
- Environmental monitoring and waste information systems ;
- Environmental management of waste facilities ;
- Institutional building and improvement ;
- Financial management for waste management ;
- Increasing cost recovery; development and upgrade of tariff systems, billing systems, fees collection system, cost accounting centre.

EXECUTIVE SUMMARY

This report is prepared for the Sweep-net as an updated and restructured report that includes updated figures on municipal solid waste management, legislation, policies, institutional and financial aspects. Furthermore, the report has addressed several other streams including hazardous waste, medical waste, e-waste, agricultural and green waste, tyres, oil and lubricant waste, and packaging waste which was not addressed in depth in the previous report. The availability of information, on special streams varied from one stream to another, for example information on packaging waste is almost negligible, on the other hand information on hazardous and medical waste are more available.

The report concludes that the major obstacles in improving solid waste management are highly political. One of the important issues facing Palestinians in waste management is dealing with illegal import of waste. Illegally imported waste includes municipal waste, construction and demolition waste, E-waste and other hazardous waste. Quantification of illegal waste imports is not possible at the time. Another important problem facing Palestinian in waste management is obtaining approvals for disposal facilities. Most of environmental facilities such as waste treatment and disposal facilities can be located only in "Area C" as classified by OSLO Agreement. The process of approval requires the Israeli approval for constructing these facilities in "Area C", where Israelis have both civil and security control on that area. The approval of environmental facilities takes years (if approved), resulting in significant delays in improving waste management.

Chapter one of the report has reviewed municipal solid waste management, and it has concluded that municipal solid waste generation in Palestine is at 0.94kg/capita/day, with an increase of about 1% per capita per year. Waste collection rate has reached 91.5% of households in 2013. Sanitary disposal is increasing in the country were 33% of the waste generated is currently disposed in sanitary landfills.[1] This is expected to increase even further with the operation of the sanitary landfill in Al Menya by the beginning of 2014. Plans are undergoing for additional two sanitary landfills, one in the West Bank and the other in Gaza Strip. Recycling remains at minimal rate in Palestine at less than 1% of the waste. Waste management is mainly conducted by local authorities or by Joint Service Councils (an association of local authorities that is created to provide a service). UNRWA participates in waste collection from refugee camps, while private sector involvement is minimal. Private sector involvement is mainly focused on recovery of waste or recycling. Chapter one addresses the main facts and figures on municipal solid waste, while chapter two addresses, the institutional, legal and financial aspects of waste management. Chapter two describes the various policies, legislations and actions in municipal waste management, investments in the sector, monitoring arrangements for waste management, financial aspects of waste management, private sector participation, public awareness and community participation, capacity building initiatives and future requirements, in addition to multi-stakeholders exchange initiatives.

Industrial and hazardous waste management is not separated from municipal stream. Nevertheless new development in the sector includes estimation of quantities of hazardous waste generated, and the drafting of classification of hazardous waste list. Details on hazardous waste are presented in chapter 3.

1- It is estimated that this has reached about 44% in 2014; as additional 400 tons/day were diverted to SLF.

Medical waste is addressed in chapter four. It was estimated that about 2,000 tons of medical waste was generated in 2011. Medical waste is collected in a mixed manner with municipal waste. In some hospitals pretreatment for infectious medical waste exists in the form of autoclaving or by uncontrolled burning in incinerators that does not reach the temperatures required nor has air treatment units. A new microwave unit has been established in the southern West Bank, however the operation has not started yet. The most important development in the medical waste is the approval of the medical waste by law, which became effective in 2013.

Other waste streams such as green and agricultural waste, packaging waste, construction and demolition waste, tyres, oils and lubricants waste, and e-waste are also addressed in separate chapters.

The reports ends up with two chapters on international financial assistance programs and international technical assistance programs in Palestine, following by a section on capacity building needs until end of 2015.

1. INTRODUCTION

1.1. SOCIO-ECONOMIC AND POLITICAL SITUATION

The political situation in the West Bank (including Jerusalem) and Gaza Strip has been the main cause of poor waste management.

With the signing of OSLO agreements and the establishment of the PNA, the situation has started to change. Palestinian territory was divided under Oslo Agreement into "A", "B", and" C", in which jurisdiction for civil and security in "Area C" remains with the Israelis (over 60% of the West Bank);[2] "Area A" is built up area mainly in urban centers is completely under the Palestinian jurisdiction, and "Area B" has civil administration of PNA and Israeli control over security. It is important to note that significant stretches of agricultural land and different types of natural resources are located within "Area C", the only contiguous area of the WB.

The Palestinian economy is highly dependent on the political situation with 1/4 of the population to be categorized as food secure.[3] Furthermore, unemployment and poverty are the most important social problems that need to be solved, with the unemployment rate at 20.9%;[4] poverty rates at 25.8% (2011), and deep poverty at 12.9%.[5]

The PNA has invested in the social development; this has resulted in high enrolment rates in primary education (96.5% for males; and 98.7% for female); immunization coverage at 96.5%, and provision of cash assistance to some 85,000 poverty affected households.[6]

1.2. SOLID WASTE FACTS AND FIGURES

As the monitoring section identifies that there is no obligatory reporting on waste management, all indicators were estimated utilizing either raw data from service providers or utilizing information available in secondary sources.

Waste generation

No figure for the waste generation in Palestine was available. For the needs of this report the waste generation in Palestine in 2012 was estimated at 1.387 million tons (for details please refer to annex 3).

2- OHCA, United Nations Office of the Coordination of Humanitarian Affairs (2011) Displacement and Insecurity in Area C of the West Bank.
http://www.ochaopt.org/documents/ocha_opt_area_c_report_august_2011_english.pdf
3- WFP, FAO, PCBS, UNRWA (2012) Socio Economic and Food Security Survey West Bank and Gaza Strip, Palestine.
http://reliefweb.int/sites/reliefweb.int/files/resources/wfp259657.pdf
4- PCBS. Unemployment Rate Among labour Force Participants in the Palestinian Territory by Governorates and Sex, 1999-2011.
http://www.pcbs.gov.ps/Portals/_Rainbow/Documents/Unemployment%20Rate.htm
5- PCBS (2011). Poverty Rates Among Individuals According to Household Monthly Consumption in Palestine by Region, 2011
http://www.pcbs.gov.ps/Portals/_Rainbow/Documents/Poverty_2011_e.htm
6- PNA (2012) Sustainable Development Under Israeli Occupation: Achievements and Challenges. Palestine's Report to the United Nations Conference on Sustainable Development, Rio de Janeiro, 20 - 22 June 2012.
http://www.uncsd2012.org/content/documents/835palestine.pdf.

Generation rate per capita[7] was estimated to be 0.94 kg/day, in GS at 1.045kg/day, and in the West Bank at 0.939kg/day. It is estimated that waste generation rate per year increases by 4%; where 3% is increase due to natural population growth, and 1% is due to increase in generation rate per capita. Per capita waste Generation in rural communities (very small villages) was observed to be between 0.35kg/day to 0.6 kg/day; in the big urban areas ranges from (0.9 to 2.05kg/day), while in middle size towns from 0.6kg/day to 0.9kg/day (according to PCBS, most of these middle size towns are classified as urban areas).

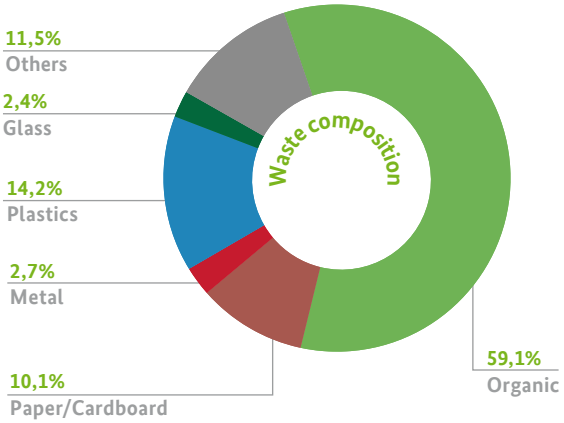

Figure 1: Waste composition in Palestine
(calculated for the report based on various studies, see annex iii for details)

Waste composition

Waste composition data in Palestine is very limited. Based on the data available it was found that organic waste forms 59% of the waste, recyclables (paper, cardboard, plastic, glass and metal) form 29.4%. For details on the calculations on waste composition please refer to annex 4 (Figure 1)

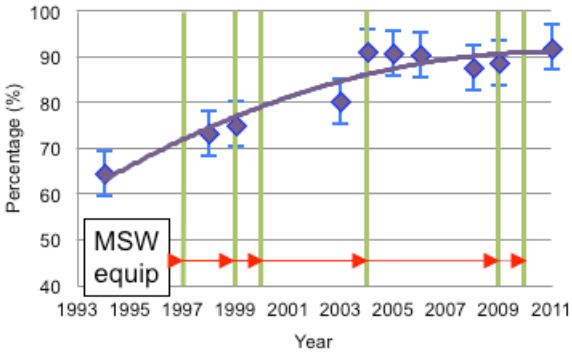

Figure 2: solid waste collection coverage for various years in Palestine
(Source of data: PCBS – Various years for household environmental survey).

Waste collection rates

PCBS collects regularly (every two years) data about percentage of households receiving services. According to the latest household environmental survey 2013, 8.5% of the households do not receive solid waste service. Since PNA taking over control over services in solid waste collection in Palestine, the waste collection rate has increased from about 64% in 1994 to 92% in 2011. This was associated with increase in equipment for solid waste collection at local authorities' level and joint service councils (Figure 2).

Waste Collection rates vary between GS and WB as well as between urban, rural and camps areas (PCBS, 2011, unpublished data about distribution by locality type). It can be seen that both GS has lower collection rates than the West Bank (Figure 3), and

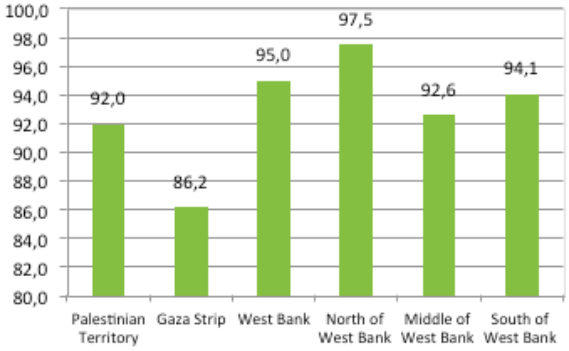

Figure 3: Percentage distribution of households receiving solid waste collection in the Palestinian territory by region (2011) – data from PCBS household environmental survey 2011.

7- if we calculate the generation rate utilizing data of waste collected, we can conclude that an increase of 6% per year is taking place, however, there is an overestimated increase due to the improvement in waste collection, Waste collection has improved in the past two years. On the other hand, in several studies an estimation of waste generation per capita increase is 1%, while population increase is in the range of 3%, and studies indicate that total MSW increase at 4%.

that rural areas have lower collection rates than both camps and urban areas (Figure 4).

There are no estimates of percentage of waste not collected in urban, rural, and camps areas. However, it is important to note that the main urban centers (main cities) have close to 100% collection. While the middle size towns classified as urban areas, have lower rates of solid waste collection than those in the urban centers. On Average, we can say that the generation rate in urban areas is double that in rural and camps areas. Hence, this means that about 92.2% of the waste is collected in Palestine.

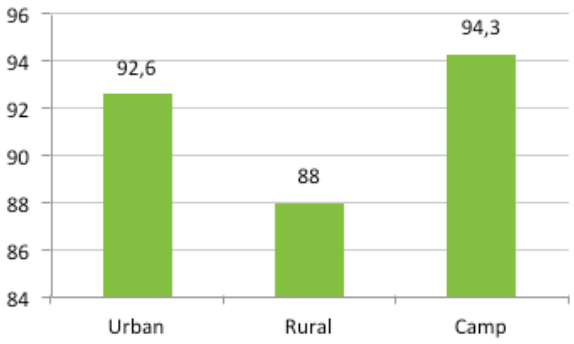

Figure 4: percentage distribution of households receiving solid waste in the Palestinian territory by type of locality (2011)

Source household environmental survey database, 2011. Unpublished data

Solid Waste collection is conducted mainly by municipalities or Joint Service Councils (an association of several municipalities to provide one or more service for all member municipalities). About 8.5 of households receive service from UNRWA, and 2.3% receives the service from private sector (2013)[8] mainly in smaller rural areas that utilizes agricultural tractors and trailers to collect waste. Informal sector is not active in solid waste collection.

Solid waste transfer

There are eight transfer stations in the West Bank; two in the south of the West Bank (currently under operation by JSC and will be operated by private sector by end of 2013); two under the operation of JSC Jenin (one in tubas the other in Jenin); one in Tulkarem, one in Qalqyilya, one in Nablus, and one in Ramallah. The TS in Nablus and Ramallah were constructed and built by private sector, while the rest were built by JSCs. Transport of waste is conducted by either JSCs equipment or by private sector. Furthermore, it is expected to have additional two transfer stations in Ramallah and Al Brieh governorate with expansion of the current one, or to build three new TS and abandon the current TS of Ramallah city. One additional TS is still needed in Nablus governorate (applied for EIA), and maybe one in Salfeet (this has not been proved yet).

In Gaza Strip, there are seven temporary storage areas, which evolved as a result of utilizing donkey carts with restrictions on fuel import to Gaza strip. In addition, there is one official transfer station, in which temporary storage of waste takes place. The feasibility study for Gaza Strip suggests that three temporarily sites will be cleaned and abandoned, four of the temporary sites will be converted into TS, official TS will remain active, and one new TS will be required.[9] As a result it is expected that in the future GS will have six operational official transfer stations.

Solid waste disposal

According to a study conducted by ARIJ, the projected costs of diseases associated with improper waste management in the West Bank was forecasted in 2005 for 20 years to be 909 million USD.[10] Solid waste

8- PCBS (2013), Household Environmental Survey 2013.
9- UNDP – PAPP; DHV ENFRA TECC (2012) Feasibility Study and Detailed Design for Solid Waste Management in the Gaza Strip January 2012.
10- Arij (2011)- Status of the Environment in the occupied Palestinian territory , A Human Rights – Based Approach.

disposal in sanitary landfills makes only 33% of the waste (Figure 5).[11] The rest is disposed of in random dumpsites and/or burned. In the West Bank, 44% of the waste is disposed of in the two sanitary landfills of Jenin Zahrat al Finjan and Jericho, while 22% of waste in Gaza is disposed in the sanitary landfill in Deir al Balah (Figure 5). There are 163 open/random disposal sites in Palestine, of which more than half are not in use, however not rehabilitated yet. Three sites are controlled, which means they apply daily cover, however no leachate collection, nor gas collection; while the remaining sites are active (Table 1). In addition, there are three active sanitary landfills in Palestine (Table 3) and one site is built and ready for use, which will start operations by beginning of 2014. Description of these four sites can be found in Table 2. In addition one site is planned in Gaza Strip (with committed funding) and one in the West Bank in Ramallah and Al Bireh Governorate (with committed funding). An expansion of Jericho site also is envisaged in the coming year, pending funding (Table 2).

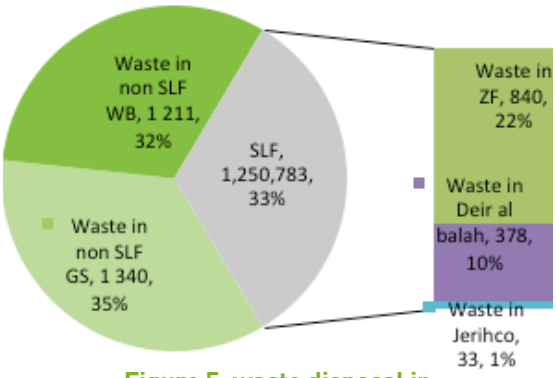

Figure 5: waste disposal in Palestine (2012) ton/day

Table 1: Number of disposal sites in Palestine by location

Governorate/ region	Dumpsites			No landfill gas collection yet		
	Total	Not in use	Controlled	SLF	Year of data	Source
Ramallah	83	41	0	planned 1	2013	JSC Ramallah and Al Bireh
Jericho	2	1	0	active 1	2013	Jsc Jericho (to be expanded)
Nablus	34	23	0	0	2013	EQA
Salfeet	10	2	0	0	2009	EQA
Qalqilya	7	7	0	0	2013	EQA
Jenin	0	0	0	active 1	2013	Jenin JSC
Tubas	0	0	0	0	2013	Jenin JSC
Hebron	1		1		2013	H&B JSC
Bethlehem	4	1	0	ready for use 1[12]	2013	H& B JSC
Tulkarm	12	11	0	0	2013	EQA
Jerusalem	1 Israeli managed			0	2009	EQA
Gaza strip*	9	1	2	1 operational + 1 planned	2012	Feasibility study GS
Total	163	87	3	6		
		53%	2%	4%		

** 6 sites in Gaza are along the side streets, these were Transfer stations locations and became random sites.*
Source: UNDP - PAPP; DHV ENFRA TECC (2012) Feasibility Study & Detailed Design for Solid Waste Management in the Gaza Strip
Rehabilitated sites are not in the list above:
a) 85 sites rehabilitated between 2001 and 2007 in Northern West Bank - see case study 2
b) 10 sites rehabilitated in Hebron with a total area of 5.5 hectares; and 3 sites in Hebron with a total area of 2.3 hectares during the past 3 years.
c) 2 sites rehabilitated in Tulkarm in 2010, one has been converted into a transfer station, the other has been rehabilitated (total size of second is 2.5 hectares)

11- It is estimated that during April 2014, additional 400 tons were diverted to sanitary landfills, increasing disposal in SLF to about 45%
12- Operational testing for partial waste quantities started in April 2014.

Table 2: Planned sanitary landfills in Palestine

No	Location	Location	Capacity (cubic meters)	Capacity to build in phase I	Expected date of operation
1	Rafah – Gaza Strip**	Al Fukhari	15.99 million	phase I 215 dunums* out of 476 (i.e. 45%)	2015
2	East of Rammun – West Bank	Ramallah and Al Bireh Governorate	2.75 million	25%; 687,5000 m^3	2015
3	Jericho -	Jericho (expansion building cell 2)	50,000	50,000 m^3	2014

**Dunum is 0.1 hectare.*

*** Additional site is planned in GS, but no planning figures available yet.*

Table 3: Existing sanitary landfills in Palestine

No	Name	City	Open Year	Closure Year	Area (in hectares) Built	Design Capacity built (Million m3)	Amount of waste already disposed	Average height (in m) - Design	Current Annual capacity Ton/year	Population served
1	Zahrat Al Finjan	Wadi Ali – between Arrabeh and AJA	2007	2017	9.5	2.9	532	60	306,543	968,877
2	Al-Menya Landfill*	Al Menya	2013	2033	10	2.65	0	50	229,950	905,113
3	Deir El Balah	Deir Al Balah	1997	overdue/ should be closed no alternative yet far beyond capacity	NA	0.7725	1,600	NA	137,947	NA
4	Jericho Sanitary Landfill Fill - cell 1	Jericho	2007	2014	1.03	0.0685	64	6.5	11,500	40,805

** To be operated by the beginning of 2014* *NA – Not available*

In General, the joint service councils in cooperation with MoLG and EQA has been working on rehabilitation of sites. In addition to the 85 sites that were rehabilitated and closed between 2001 and 2007 in northern governorates in the West Bank 15 sites were rehabilitated in since 2010 in north and south of the West Bank. A big group of dumpsites is not in use at the moment due to transfer of waste from random dumpsites to ZF SLF, particularly in the northern governorates in the West Bank (see case study 2). Fifty percent of the non-used dumpsites are in the Governorate of Ramallah and Al Bireh, it is planned to close these dumpsites within the coming three years, funding for closure is partially provided by KFW to the JSC of SWM in the governorate.

It is important to indicate that the biggest obstacle to improving solid waste management remains the political situation. All land that can be used to construct waste disposal facilities is located in "Area C", according to OSLO agreements division of land. Hence permits are required not only from Palestinian relative institutions, but also from the Israelis. Licensing of environmental facilities, including waste facilities has been delayed for years in Palestine. The project in Ramallah has been in planning phase since 2003, and up to date the license for construction is not granted yet. While planning phase ends up taking a long time, the use of random dumpsites remain the only alternative.

In 2012, PCBS indicated that there are about 563,546 Israeli Settlers in the West Bank (including Jerusalem).[13] UNEP has estimated in 2003 that Israeli settlers produce 2 kg/c/day (excluding hazardous waste).[14] Even if this waste generation per capita has not increased, it means that these settlers produce 411,389 tons/year (excluding waste produced from Israeli industrial areas in the West Bank). About 80% of the waste generated from these Israeli settlers is disposed of in random dumpsites in the West Bank[15], making 0.33 million tons/year that is disposed in random dumpsites.

Composting of municipal waste

There have been two attempts for composting in municipal waste in Gaza Strip and both failed due to lack of market for compost. Both composting sites stopped operating. In Deir Al Balah, piloting of composting of solid waste was attempted, however due to limited compost market, the pilot was stopped.

The second pilot was built by the end of 2011 in Rafah. The land is owned by Rafah municipality and utilities are also paid by the municipality. A NGO (Palestinian Environmental Friends Association) was running the plant, and the rest of the operations were fully subsidized by UNDP from December 2012 till June 2013. As soon as UNDP subsidy stopped, the plant stopped operating. During the operational period a total of 70 ton/day entered the site, of which 20-30% was sent to the disposal site of Rafah municipality utilizing the municipality's solid waste collection equipment. The design capacity of the site was for 120ton/days. The NGO could not sell the compost to farmers. The NGO conducts some sorting of recyclables, although amounts are not documented and selling price was not provided by the NGO. Operational costs of the facility are not available).[16] Photos can be found at the following link (see footnote).[17]

Recovery of materials and recycling

Recycling is practiced at very small scale in Palestine, mainly hard plastics are recovered (PP, HDPE, ABS). In Gaza Strip, recycling is highly linked to availability of raw materials, which in turn depends on siege and ability to import raw materials (legally and illegally) (Table 4).

Table 4: Plastic recycling in Gaza Strip: source feasibility study[18]

Year	Ton/year	% of plastic	% waste
2010	10,000	20%	
2011	1,000	2%	Less than 0.5% of waste in GS.
2008/2009		90 %	

In the West Bank there was only one study conducted about recycling. In 2010, recycling was about 6,400 tons/year;[19] which is equivalent to less than 1%.In total recycling in both GS and WB is less than 1% of the waste. Furthermore, it can be estimated that most of the recovered material is cardboard; metal is

13- Number of Settlers in the Settlements in the West Bank, by Year and Region, 1986-2012. http://www.pcbs.gov.ps/Portals/_Rainbow/Documents/Time%20Series%20%20E.htm
14- UNEP (2003). Desk study on the environment in the occupied Palestinian territories.
15- ARIJ (2007) Status of the Environment in the Occupied Palestinian Territory.
16- (source: Atef Jaber, Palestinian Environmental Friends Association) http://www.pefrafah.org.ps/
17- http://www.demotix.com/news/1474373/gaza-starts-its-garbage-sorting-service-ease-environmental-crisis#media-1474017
18- UNDP – PAPP; DHV ENFRA TECC (2012) Feasibility Study and Detailed Design for Solid Waste Management in the Gaza Strip January 2012.
19- Musleh, R. Al Khatib, A. (2010). An assessment of solid waste sorting and recycling in the northern and southern West Bank, and identification of suitable pilot projects for implementation in Hebron and Bethlehem Governorates. IMG

not accounted for as no data are available. Figure 6 presents the distribution of waste recovered in West Bank.

Table 5: Recycling in west bank – Source (recycling study -img [20])

Year	2010
Plastic	2.38 t/day - 868.7 t/year
Cardboard	442t/month - 5,304t/year
Metals	No data but most of metals are collected or sold prior to becoming waste.
Glass	0.5ton/day - 183ton/year
Total	**6,356t/year - Less than 1% of waste in the West Bank**

In general there are slightly less than 200 persons in Palestine who are waste pickers, recovering recyclables from disposal sites and transfer stations. The amounts recovered by these waste pickers are not known.

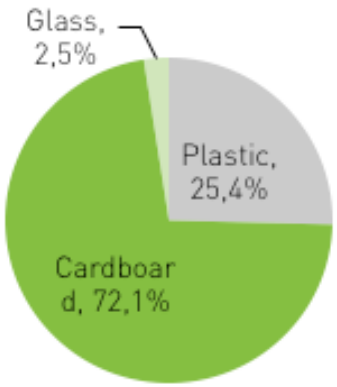

Figure 6: Distribution of waste recovered in the West Bank. (Note metals are not included, since they are collected prior to becoming waste). Source: data in tables 4 and 5.

20- Musleh, R. Al Khatib, A. (2010). An assessment of solid waste sorting and recycling in the northern and southern West Bank, and identification of suitable pilot projects for implementation in Hebron and Bethlehem Governorates. IMG

2. NATIONAL MUNICIPAL SOLID WASTE MANAGEMENT POLICIES

2.1. POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

OSLO II - The Israeli-Palestinian Interim Agreement on the West Bank and Gaza Strip[21]

ANNEX III - Protocol Concerning Civil Affairs - Article 12 - Environmental Protection

The agreement indicates that there will be a transfer of environmental powers and responsibilities to the Palestinian Authority in the environment sphere, including licensing for crafts and industry, and solid waste including hazardous waste. However this transfer is limited to areas "A" and "B", and does not include "Area C" in which transfer of authorities will take place only after the final agreement between the two parties. Most of the West Bank is "Area C", hence the location of any waste facilities are subject to Israeli regulations and approvals.

This agreement gives the coordination mechanism to be taken between Palestinian and Israeli sides through an environmental coordination committee (however this committee is inactive since 2000), as well as it indicates that those standards to be taken by both Israeli and Palestinians should be according to the international recognized standards. These standards should be equivalent and compatible between the two sides in environmental aspects.

The agreement indicates that each side will act to protect the environment and prevent pollution. In addition, both sides agreed to adopt, apply and ensure compliance with internationally recognized standards concerning the use, handling, transportation and storage of hazardous waste, whereby each side was to take necessary measures to promote the proper treatment of solid and hazardous waste. However, until today, more than 50% of construction waste of Israeli is entering the West Bank, according to Haaretz (Israeli newspaper) "the ministry (of Environment – Israel) says that at least half of all construction debris is discarded at illegal sites. Much of it is dumped at illegal sites in the West Bank" [22] . Both sides shall respectively adopt, apply and ensure compliance with internationally recognized standards concerning the following: levels of pollutants discharged through emissions and effluents; acceptable levels of treatment of solid and liquid wastes, and agreed ways and means for disposal of such wastes; the use, handling and transportation (in accordance with the provisions of Article 38 (Transportation)) and storage of hazardous substances and wastes (including pesticides, insecticides and herbicides); and standards for the prevention and abatement of noise, odor, pests and other nuisances, which may affect the other side.

Palestinian Laws relevant to all kinds of waste

The major laws issued by the PNA related to solid waste management are: Basic Law (2003) the Environmental Law (1999), the Local Authorities Law (1997), and the Public Health Law (2004). The Basic Palestinian Law[23] (2003) identifies the right to a clean and a balanced environment as a basic right of

21- September 28, 1995. Washington, D.C, USA.
22- http://www.haaretz.com/news/national/1.538431
23- Official gazette – Palestinian Facts – special issue, July 2002. page 5-48

every Palestinian and that preservation of the Palestinian environment for the sake of both present and future generations is a national duty (article 33). Defining clean and balanced environment as a human right in the basic law is essential for the further laws issued on the environment, and for the protection of the environmental systems. Also this article indicates the importance of sustainable development, as the environment has to be preserved and protected for the sake of not only present but also future generations.

Palestinian Environmental Law

The Palestinian Environmental Law[24] establishes the general legal framework for solid waste management in Palestine. The law also provides a framework for EIA (Article 45), and subsequently the EIA Policy was issued[25]. According to the EIA Policy, solid waste projects are subject to EIA procedures identified in the EIA policy. The Palestinian Environmental Impact Assessment Policy (2000)[26] defines the activities subject to an Environmental Impact Assessment (EIA), basic principles underlying the policy, responsibility for implementation, the reviewing committee for EIA, stakeholder consultation, etc.

The provisions of the environmental law that are related to solid waste include:

1. Definition of solid waste (Article 1) ;
2. Definition of hazardous waste (Article 1) ;
3. National solid waste management strategy: Article 7 states that the Ministry of Environmental Affairs (MEnA) should develop a national solid waste management strategy in cooperation with relevant institutions and monitors its implementation by local authorities (LGUs and JSCs) ;
4. The Reduce Reuse Recycle (3Rs) principle: Article 8 states that all relevant parties within their own jurisdiction should take necessary measures to minimize waste generation and maximize reuse, or recovery of waste components or recycling of waste ;
5. Technical specification to waste disposal sites: MEnA has the mandate to identify technical specification for disposal sites (Article 9) ;
6. List of hazardous waste (Article 11): MEnA is mandated with issuing such a list. List was drafted however was not submitted for approval yet ;
7. Compliance to regulations on hazardous materials and waste (Article 12): handling of hazardous waste and materials should only be done in compliance with regulations, instructions and norms specified by MEnA, in coordination with the specialized agencies (these specifications are not issued yet) ;
8. Hazardous waste import and passing through Palestine: import is forbidden, while passing through requires a permit from MEnA (Article 13) ;
9. The law contains provisions for noise, air and waste water emissions that would be relevant to solid waste management facilities (Articles 19-30) ;
10. Designated sites for waste (Article 23): It is forbidden to litter, dispose, treat, or incinerate waste except in authorized sites designated for this purpose in compliance with the conditions determined by the MEnA to ensure the protection of the environment ;
11. Permitting of facilities: MEnA does not permit facilities; however it gives a prior environmental approval for facilities to obtain a permit from relevant institutions (Articles 46 – 48) ;

24- Law on the Environment (1999) Law No. 7 for the year 1999. Palestinian Facts in Feb. 2000, Issue 32, 38-70.
25- The Palestinian Environmental Impact Assessment Policy (2000). Ministerial Council approval in resolution No: 27-23/4/2000.
26- Ministerial Council approval in resolution No: 27-23/4/2000.

12. Inspection and enforcement (Articles 49-57) authorizes MEnA to do inspection and enforcement including stopping of projects and closing of facilities ;
13. Polluter pays principle (Article 74).

A draft classification of solid waste has been prepared by EQA in response to Article 6; it has the following waste classifications: 1) industrial waste, 2) construction and demolitions waste, 3) agricultural waste, 4) wastes from oils, fuel solvents and related materials, 5) municipal waste, 6) wastes resulting from handling and treatment of wastes and wastewater, and7) wastes from other sources. Further, the draft has detailed classification of hazardous waste.

Local Authorities Law

According to the Local Authorities Law[27], the Ministry of Local Government (MoLG) has the responsibility for setting general policies for the work of local units (LGUs and Joint Service Councils) and supervising their responsibilities, as well as financial and administrative monitoring on local units (Article 2). LGUs responsibilities include collection, transfer, and disposal of solid waste (Article 15a). According to this law, municipalities can provide their services directly, through private sector, or jointly with other municipalities through a Joint Service Council (Article 15a). The establishment of JSC is further regulated by the bylaw for Joint Service Councils issued in 2006[28]. In 2010, the MoLG has issued a strategy to further support joint councils' development, however the strategy excluded joint service councils for solid waste management.

Public Health Law

According to the Public Health Law[29], the Ministry of Health (MoH) is the responsible institution to issue a license to waste facilities (Article 2). Furthermore, the MoH in coordination with competent bodies shall determine the health hazards that negatively affect public health or the environmental health in any way possible (Article 39). The MoH in coordination with the relevant bodies shall issue specifications and instructions with regards to the transport, storage, treatment or disposal of hazardous materials and wastes (Article 42).

Medical Waste Bylaw (2012)[30]

The Medical waste bylaw identifies roles and responsibilities in medical waste management, definition of waste management, procedures and specifications for medical waste separation, storage, collection, transport, treatment as well as waste tracking.

Laws relevant to private sector participation

The following laws regulate the private sector participation in the solid waste sector:

- The Investment Law[31] gives financial incentives in the form of tax deductions to companies with capital

27- Law on Local Authorities (1997) Law No. 1 for the year 1997 Published in the Palestinian Facts in Nov. 1997, Issue 20.p5-34, 12.10.1997.
28- Basic Regulation on Joint Service Councils (2006).Regulation No. 1 for the year 2006.
29- Law on Public Health (2004) Law: No. 20 for the year 2004. Palestinian Facts, April 2005, 14-34.
30- Ministerial Cabinet Decision No. 10 for the year 2012, with regards to the bylaw of medical waste management and handling. Published in the Palestinian Facts (official gazette) on 27.02.2013.Issue 99.P77-111.
31- Law on Promotion of Investment in Palestine (1998), Law No. 1 for the year 1998.Published in the Palestinian Facts in June 1998, Issue 23, p5-27, 23.04.1998.

investment more than 100,000 USD; however, solid waste projects cannot benefit from this law without prior approval from the Ministerial Cabinet, while other sector can directly utilise this law ;

- The Local Authorities' Law[32] gives the right for LGUs to sign contracts with private sector companies as long as the duration is less than three years. Investments in solid waste are usually high, requiring more than three years to recover these investments, hence requires contracts on longer bases. Agreements longer than three years will require the approval from Minister of Local Government.

Ministerial decrees relevant to solid waste management

The following ministerial decrees are topic specific on issues relevant to solid waste management:

- A ministerial decree was issued by the Ministry of National Economy after discussion with MEnA that prohibits the import of the following items without prior approval from the two ministries: chemicals, chemicals' containers, used plastics, used asbestos, used oils, pesticides and insecticides without an Arabic label, used computers, and used computer parts[33] ;
- Ministerial decree[34] to use ZF landfill as the only authorized site for waste disposal for the northern governorates in the West Bank. It is important to note that after the operation of ZF in Jenin started, EQA issued a ministerial decree that prevent the use of any other site for northern governorates ;
- **The basic regulation on the Joint Service Councils of year 1996, and its update for years 2003 and 2006:** It provides a legal framework for the Joint Service Councils (JSCs) in term of financial and administrative issues, in addition to their mandate and responsibilities. It sets the relation between the JSCs and the MoLG as well.

Ministerial cabinet decisions relevant to strategic planning:

- **The Cabinet resolution no.53 for year 2007**:It is related to development of the national strategy for solid waste management and forming a steering committee for following up the development of the strategy from related institutions ;
- The Cabinet resolution no. 05/49/13, dated on 16 May 2010: it assigned the role of monitoring the implementation of the solid waste management strategy (2010-2014) to the national team for solid waste management. That team was before a steering committee for the strategy development as indicated in the previous resolution.

Drafted bylaws and instructions

The following bylaws and instructions have been drafted:

- Hazardous waste management bylaw ;
- Solid waste management bylaw ;
- Instructions and guidelines for closure and/or rehabilitation of random dumpsites.

32- Law on Local Authorities (1997) Law No. 1 for the year 1997 Published in the Palestinian Facts in Nov. 1997, Issue 20.p5-34, 12.10.1997.
33- Ministerial decree signed by the Minister of Ministry of National Economy on 21.08.2003.
34- Ministerial Decree No. 1 for the year 2008 with regards to accreditation of ZF landfill as the official landfill for solid waste. Issued by the Minister Environment on 12.06.2008.

2.2. STRATEGIES, ACTION PLANS AND INITIATIVES

The major strategies relevant to solid waste management include: the National Strategy for Solid Waste Management (2010-2014), the Environment Sector Strategy (2010-2013), the National Development Plan (2011-2013), the Strategic Framework for MoLG (2010-2014) and the Cross Sectoral Strategy for Palestinian Local Government and Administration Sectors (2011-2013).

National Strategy for Solid Waste Management (2010-2014)

The National Strategy for Solid Waste Management for the period 2010-2014 was approved in May 2010. The vision of the strategy is an "Integrated and sustainable management of solid wastes that contributes to achieving economic and social benefits to the Palestinian people". The strategy came up with eight strategic objectives, associated with 16 policies. Although, the Environmental Law assigns the responsibility for monitoring the implementation of the Solid Waste Management Strategy to MEnA, a recent Ministerial Cabinet Decision (No 05/49/13, dated 16 May 2010) assigned this role to the National Team for Solid Waste Management that is chaired by MoLG. This Team has the same formation of the Steering Committee that prepared the strategy, and it has the following members: MOLG, MENA, MOPAD, MOH, Palestinian Water Authority, Ministry of National Economy, and Ministry of Agriculture. The strategic objectives of the strategy are as follows:

1. An effective legal and organizational framework for SWM ;
2. Strong and capable institutions ;
3. Effective and environmentally-safe management of SW services ;
4. Financially viable and efficient SWM services and activities ;
5. Principles and mechanisms suitable for managing medical, hazardous, and special wastes ;
6. Increasing the participation of the private sector ;
7. A more participating and aware community ; and
8. Effective information and monitoring systems.

Environment Sector Strategy (2010-2013)

The Environment Sector Strategy (2010-2013) is the second Palestinian environmental strategy. It is important to indicate that MEnA will implement not all interventions identified in the strategy. Of the 19 interventions that will be implemented by other institutions the following are directly related to solid waste:

- Priority No. 2: the expansion of the service of solid waste collection and disposal in sanitary landfills to reach full coverage;
- Priority No. 4: closure and/or rehabilitation of random dumpsites.

Of the 48 interventions that will be implemented by MEnA, the following are directly related to solid waste:

- Priority No. 9: implementation of the National Strategy for Solid Waste Management;
- Priority No. 33: develop a plan to promote initiatives and systems to increase the reduction, separation, reuse, and recycling of solid waste as well as to collect landfill gas from sanitary landfills.

It is important to note that other interventions will impact solid waste management as well, such as the development of bylaws, instructions, and specifications; the development of the legal systems for

environmental management; the activation of monitoring of air, water and soil quality, the development of a system for management of hazardous wastes; and interventions to raise environmental awareness.

The National Development Plan (2011-2013)

Activities in solid waste management receive strong attention from the PNA, as two percent of the budget of the National Development Plan (NDP) (2011-2013) was allocated to solid waste management activities. The NDP included indicators on solid waste management (Table 6). The main objectives for solid waste management in the NDP are: to improve the service delivery of collection of solid waste, increase sanitary disposal of solid waste, improve cost recovery to ensure long term sustainability, and initiate recycling activities. However, achievement of these indicators by the end of the year is impossible.

Table 6: NDP indicators related to solid waste management

NDP Indicators	2013 Targets	2013 status
Percent of waste that is recycled	20%	<1%
Percent of households connected to solid waste collection service	97%	91.5%
Percentage of waste disposed in sanitary landfills	90%	33%
Percentage of established sanitary landfills	100%	4 out of 7

The Strategic Framework for MoLG (2010 - 2014) and the Cross Sectoral Strategy for Palestinian Local Government and Administration Sectors (2011 - 2013)

Of the sectoral strategic objectives identified in the Strategic Framework for MoLG (2010-2014), the following are related to the institutional aspects of solid waste management:

1. Increase the level of decentralization between MoLG and LGU's ;
2. Enhance the institutionalization of community participation ;
3. Strengthen partnership between the LGU's and the private and public sectors, as well as the civil society organizations in order to achieve sustainable development.

The goals, policies and policy interventions identified in the Cross Sectoral Strategy for Palestinian Local Government and Administration Sectors (2011-2013) are presented in Table 7 below.

Table 7: Goals, policies and interventions relevant to jsc or solid waste management

Goal	Policy	Policy Interventions
Enabling the sector institutions to acquire effective capabilities in administrative, technical and financial fields and reinforcing coordination and complementarities among them.	Improving the legal framework and institutional structure of the local government sector.	- Developing operational manuals and guidelines for Municipalities and the Joint Services Councils. - Developing systems to run regional and local services. - Enabling the governorate councils in leading the process of regional and development planning. - Developing regional and development plans at the governorate level.
	Increasing the quantity and quality of LGU local revenues.	- Developing and applying a methodological system to determine tariff and fees of the different municipal services. - Providing the LGUs with modern technologies to improve fee and local tax collection for the different municipal services. - In a transparent manner ensure that LGUs are regularly supplied with the government subsidies / allocations.

Institutional Framework

Following are presented the institutions that have a relation to solid waste management. Laws discussed in the previous section define the roles and responsibilities of these institutions.

- **Ministry of Planning**: ensure including the solid waste management among the national development plans as well as the related sectoral and sub sectoral strategies ;
- **Environment Quality Authority (EQA):** Develop national plans and strategies for solid waste management, determine the specifications of solid waste dumpsites, determine the instructions for hazardous waste handling or storing or treatment or disposing of or distribution, issuing the list/s of hazardous waste, promote and enhance the reduction of solid waste production as well as the reuse and recover the component or recycle it. Moreover EQA has the role of setting out the conditions needed to regulate the treatment, dumping, or incineration of solid waste. On the other hand EQA has a very important role in increasing environmental awareness and ensure availability of environmental information to the public. Applying the EIA policy is the role of EQA, as well as the monitoring, inspection of solid waste management facilities and ensuring environmental laws enforcement ;
- **Ministry of Local Government (MoLG)**: The ministry has the role of monitoring and inspection of the local authorities and the joint service councils and their activities, support them financially and technically, and follow up the implementation and execution of the infrastructure projects including the solid waste projects. Recently the ministry had chaired the steering committee of developing the national strategy for solid waste management as well as the national team for monitoring the implementation of that strategy, which was according to a cabinet resolution ;
- **Ministry of Health (MoH)**: The ministry has the role of giving the license for construction the solid waste management facilities like landfills. It has as well the role of applying the public health standards in the solid waste management activities. According to the public health law the ministry has the role of issuing the conditions related to transport, store, treatment, and dispose of the hazardous waste. That makes a conflict with the role of EQA in this regard since the environmental law gives EQA the same role ;
- **Palestinian Standards Institute (PSI)**: PSI has the role of developing and approving the national standards or implementing international standards. The standards related to solid waste management are among the scope of PSI standardization. More over PSI is chairing a national committee which is responsible for developing the directives or the technical regulations ;
- **Palestinian Central Bureau of statistics (PCBS)**: PCBS has the role of collection and dissemination of the national figures. Solid waste management is among the fields that PCBS tackles, since it has a periodic surveys regarding the household environmental surveys, economical environmental surveys (includes industrial establishments), and medical environmental surveys. Solid waste is a main issue in these surveys ;
- **Municipal Development and Lending Fund (MDLF)**: It has the role of channelling of funds (and in the future for lending) for different projects, activities, and investments to the local authorities and occasionally to the joint service councils, the solid waste projects and activities are among those activities ;
- **Joint Service Councils (JSCs)**: Implementing the national strategy of the solid waste management is an important role of the JSCs. Providing the service on behalf of the local authorities is another main role of the JSCs. On the ground JSCs are carrying out the management and operation of the landfills and do the job of collection and transfer in some localities, they proved better efficiency than the individual local authorities ;

- **Local Authorities**: They have the responsibility of waste management within their jurisdiction, in terms of collection, transport and transfer, and final disposal. Implementing the national strategy of the solid waste management is a main role of the local authorities.

2.3. PLANNING AND INVESTMENTS

Problems are always the same in the oPt regarding planning and investment, since plans are already there, not only for solid waste management but for all sectors. The shortage of funds and financial support always postpone the implementation of the plans. Future major investments are the sanitary landfill in the middle of the West Bank to which the KFW has committed 14 Million Euros, and the sanitary landfill in Gaza to which the World Bank in cooperation with EC and AFD has committed about 33 million Dollars. Details on projects implemented and ongoing can be seen in Tables 8 and 9 below.

Table 8: Ongoing – Future projects that have committed funding[35]

Project Name	Project components	Location	Donor contribution	Palestinian Contribution
Solid waste management Ramallah / Al Bireh	Sanitary landfill, transfer stations and closure of dumpsites and institutional development to the implementing agency (JSC)	Ramallah and Al Bireh Governorate	KFW 14 million Euro[35]	1.65 million Euro
Gaza Solid Waste Management Project	Sanitary Landfill (Al Fukhari), two transfer facilities, equipment provision, and closure of existing dumpsites. Institutional strengthening. Studies, supply of equipment and piloting in the area of primary collection and resource recovery.	Rafah	33.2 million USD[36]: EC 6.48 million USD AFD French Agency For Development 13.64 million USD. Government of Sweden: 0.64 million USD. Islamic Development Bank 0.8 million USD. World Bank 10 million USD. UNDP 1.6 million USD.	2.1 million USD
Grant Aid Project phase III	Solid waste equipment for collection and transfer Expansion of Jericho Landfill. Construction of materials recovery facility and associated awareness (Jericho).	West Bank and Jericho	JICA (about 10 million USD)[37].	NA
GZ-Southern West Bank Solid Waste Management	Sanitary landfill (Al Menya), transfer stations, equipment for recycling, collection, transfer and disposal, closure of dumpsites, technical assistance.	South West Bank (Almost completed).	Total 18 million USD[38] EC 5.6 million USD Italy: 0.4 million USD. World Bank 12 million USD.	2 million USD

35- *Source: JSC Solid Waste Management, Ramallah and Al Bireh Governorate.*
36- *Source: World Bank Website.*
37- *Source: JSC Jericho and Rift Valley.*
38- *Source: World Bank Website.*

Project Name	Project components	Location	Donor contribution	Palestinian Contribution
Output-based aid pilot solid waste management project	Encouraging private sector participation in operation of SWM facilities. The program provides subsides to local authorities to facilitate the payment for private sector, based on performance indicators.	South West Bank (Just started).	FC and the World Bank 8 million USD. [39]	-NA
Solid waste management Project for Bethlehem Governorate[40]	Technical assistance in Planning for SWM. Procurement of equipment. construction of waste transfer station, equipment maintenance workshop and garage. Awareness.	Bethlehem Governorate / West Bank	Arab Monetary Fund, managed by Islamic Development Bank / Aqsa Fund 2.9 million USD implemented by Bethlehem Development Foundation.	NA
Introducing the Concept of Environmental Governance: E-Waste as a Case Study in Idhna Locality	E-Waste and environmental governance	IDHNA – Hebron Governorate.	Funded by USAID through Catholic Relif Services; and implemented by ARIJ . No Estimate available on Budget.	NA
Hospital Solid Waste management in Palestine; generation, composition, and treatment: A comparative study from West Bank and Gaza Strip	Scientific Study – Medical Waste	West Bank and Gaza	Funded by Scientific Research Council – Ministry of Higher Education No Estimate available on Budget.[42]	NA

39- IFC http://www.ifc.org/wps/wcm/connect/8f571280422d8a8a8cd1cf6e26473d89/PPPStories_WestBankGaza_SolidWasteManagement2.pdf?MOD=AJPERES
40- Bethlehem Development Foundation Website.
41- http://www.arij.org/index.php/projects/on-going-projects/563-august-2014-introducing-the-concept-of-environmental-governance-e-waste-as-a-case-study-in-idhna-locality
42- http://www.arij.org/index.php/projects/on-going-projects/540-march-2015-hospital-solid-waste-management-in-palestine-generation-composition-and-treatment-a-comparative-study-from-west-bank-and-gaza-strip.

Table 9: Implemented projects [43]

Project Name	Location	Donor contribution	Status
GAZA UXOs clearance, Rubble removal and immediate support for improvement of solid waste service management in the Gaza Strip	Gaza Strip	Japan through UNDP 18,262,654 USD Of which, improvement of solid waste management (Million USD 4,898,255)	Completed
Solid waste management and composting in Beit Lahiya area	Beit Lahiya	Italy through CRIS 356,845 USD	Completed
Improvement of Solid waste Management in the oPt: Procurement of Equipment	Salfeet, Tulkarm, Jericho and the JRV, Bethlehem Governorates	Japan Through UNDP 5,522,062 USD 2007-2010	
Improvement of Medical Waste management in Ramallah	Ramallah hospital complex	Japan through UNDP 1,000,000 USD Aug 2007-April 2011	Completed
Southern West Bank Solid Waste Management Project (SWMP): Construction of road to the sanitary landfill	Southern West Bank Joint Services Council for Solid Waste Management (Higher JSC)	3.5 million USD –USAID road to sanitary landfill	Completed
Palestinians Municipalities Support Program funded by Italian Cooperation[44]	South of West Bank:	Total about 3 million Euro: 1. Medical Waste Management pilot project in Southern West Bank. 795,357.50 Euro 2. Strengthening the capacities of Hebron Joint Service Council for Solid Waste Management 812,658 3.Support to Higher Joint Service Council of Hebron strengthening the management capacity on plastic recycling 267,160 Euro 4. Technical Assistance for the Joint Service Council of Hebron and Bethlehem Governorates (JSC-H&B) through the strengthening of Management Capacity and Awareness Capacity 199,150 Euro. 5. Strengthen financial capacities of bethlehem jscswm and public awareness and community participation campaign 399,654 euro 6. Environmental policies and waste management's in the southern West bank area - Bethlehem governorate 395,250 Euro 7. Support to establish the technical operation unit of the higher joint service council for solid waste management of Hebron and Bethlehem. 40,000 Euro. 8. improving Solid waste Collection in southern West Bank by supplying steel containers 50,800 Euro (partially to Jerusalem).	Completed

43- Source: EQA.
44- Source: Program website: http://www.pmsp-itau.org/en/progetti?tid=All&tid_1=17

Project Name	Location	Donor contribution	Status
Solid Waste Management in Wadi Shaeer Joint Services Council	Wadi Shaeer member municipalities and village councils (Tulkarm Governorate)	Government of Italy through World Bank 0.55 million USD July 2008-April 2010	Completed
Solid waste equipment for collection and transfer	West Bank	EC – 2.9 Million Euro	Completed
Piloting of Recycling-design and equipment for piloting of recycling activities in Hebron. Support in Equipment for solid Waste Collection and Transfer for Hebron and other Governorates in the West Bank.	Recycling Hebron only. Equipment: West Bank	6.5 million Euro – by EC for Hebron and Bethlehem Governorates alone. About 7 million Euro by EC for Equipment in other areas in the West Bank. In total EC donated about 14 million Euro worth equipment to the Solid waste sector since 2008.	Completed

NDP budget for solid waste management:

According to NDP, it was suggested that solid waste sector will take 2% of the NDP budget. The distribution of the solid waste expenditures as planned can be seen in Figure 7 below. The Palestinian Government is currently working on the updated NDP. It is not clear, how much of this budgeted investment has been achieved.

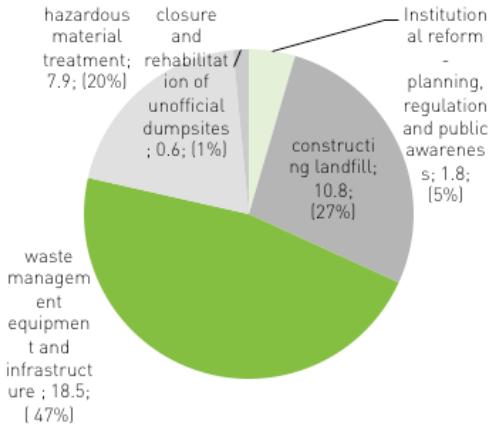

Figure 7: Budgeted investments in solid waste management according to NDP (2011-2013) in million USD.[45]

2.4. MONITORING

Solid waste monitoring is a shared responsibility of various institutions, for example monitoring of administrative aspects on municipalities and JSC is the responsibility of the Ministry of local government. Monitoring the health impacts is the responsibility of MOH, monitoring of the water resources is the responsibility of PWA. Monitoring the environmental aspects and implementation of EMPs is the responsibility of EQA.

EQA has a department of information systems that manages data produced by various projects and documents. In addition it has a GIS database which is being fed by various information from several projects. EQA is currently working on further development of its environmental monitoring information system.

PSI produces voluntarily standards, however, none has been issued relevant to solid waste. Palestinian standards become compulsory only if a bylaw specifies so.

PCBS has a department for Environmental statistic that produces regular and official data about various aspects including solid waste as part of their household environmental survey, Environmental Economic Survey, Environmental Survey for Health Care Centers, Environmental Survey for Education Sector, and

45 - Palestinian National Authority (PNA) (2011).National Development Plan 2011-2013- Establishing the State Building our Future, Palestinian National Authority, April 2011, Ramallah, Palestine.

localities survey. In addition, they have compiled a report on Environment and Sustainable Development in the Palestinian Territory (2010), and conducted once a dumpsite Survey (2001), and produced a publication titled brochure Palestinian environment in the figures (2009).

Although there are various institutions that have mandate in monitoring various aspects of waste management, up to date there is no waste monitoring system in Palestine. Currently, **there is no obligatory reporting for solid waste management** except for what is specified as part of the environmental management plans of EIA studies for solid waste management facilities.

There are several projects related to waste monitoring, some are applicable for limited areas such as the projects in the south and the middle of the West Bank, others are on the national level such as the ENP-SEIS[46], GLASS, and Sweep-net. It is worth mentioning that the ENP-SEIS has resulted to an agreement upon indicators for solid waste management. List of these projects can be seen in Table 10.

2.5. FISCAL, FINANCE AND ECONOMICAL STEERING INSTRUMENTS

The national strategy of solid waste management (2010-2014), calls for operational cost recovery of solid waste operations (Table 11). However, none of the interventions identified in the strategy were implemented so far.

Solid waste fees are identified at the local level by municipal and village councils and charged to waste producers. Ministry of Local government should endorse these fees before they become valid. The local Authorities' Law (1997) gives the municipalities the right to charge fees for services provided, including solid waste management service fee. In some local authorities, these fees are flat rate, while in other it is progressive. Fees are charged in either NIS or JD, they can be charged monthly or annually. Fees also vary from one locality to another. Localities charge households on various systems, depending on what works for them best; fees for solid waste management in localities can be found per person, per married couple, per household, per water meter, per electricity bill, per square meter, per room numbers. Furthermore, fees on commercial and industrial establishments also vary from one place to another, in some villages they identify special fees for certain types of establishments, in others it depends on the collection times per week, in others, it is a lump sum agreement, in others it is based on size of establishment. In all cases, local authorities do not conduct studies to determine the fees required to achieve cost recovery.

When local authorities come together to form a joint service council to provide solid waste services, be it collection or disposal, they pay a fee to the JSC. JSCs do not collect fees from citizens and waste producers, except for very limited individual cases.

The budget of municipalities is divided into three major budgets; operational, developmental and profit. Solid waste management is part the operational budget, while water and electricity are part of the profit budget. This means, that for water and electricity, the municipality has a cost center, that allows the calculation of costs, while for solid waste, it is distributed across the operational budget in combination with other services (format of municipal budget can be found on the link in the footnote[47]), leading to major difficulties even for municipal accountants to come up with estimates of costs.

46- EUROPEAN NEIGHBORHOOD AND PARTNERSHIP INSTRUMENT (ENP) - Towards a Shared Environmental System is a project that is being implemented in which Palestine is participating. The Shared Environmental Information System IS aims "to promote the SEIS (Shared Environmental Information System) principles in the ENP regions (South and East), through the development of national and regional environmental information systems in line with the EU approach". Through this project, indicators on municipal solid waste management were identified. The project is still ongoing.
47- http://www.molg.pna.ps/forms_details.aspx?id=6

Table 10: Projects relevant to monitoring of waste management undergoing in Palestine

Project Name	Project components	Location	Donor contribution	Palestinian Contribution
Capacity Building Project	Environmental Information system framework development	National / EQA	SWEDEN through UNDP	
Output-based aid pilot solid waste management project	Management information system for solid waste collection for Bethlehem and Hebron Governorates Subsidy to municipalities based on performance indicators in SWM (includes collection of information on performance, and financial sustainability)	Hebron and Bethlehem Governo-rates	IFC 8 million USD	
ENPI –SEIS Shared Environmental Information System	Development of Indicators on solid waste management as part of the overall environmental information system.	Regional/ EQA	EC Regional project, Palestine is a partner.	
Global analysis and Assessment of Sanitation and Drinking-Water GLAAS 2013 Project	Collection of information on solid waste management as part of sanitation sector of WHO. Publishing of global report.	Global /PWA	UN-Water ini-tiative, imple-mented by the World Health Organization (WHO) 2013 -	
Update of national report on solid waste management	Update of national Palestinian report and profile on SWM. Update of regional report on SWM. Collection of updated information on SWM.	National / MoLG	SWEEP-Net supported by GIZ and ANGED 2013	
Establishment of waste management information system for tracking waste quantities JSC Ramallah and Al Bireh	The computerized software will track quantities of waste from source and link the information to a billing system (as soon as the JSC starts the transfer and disposal operations).	Ramallah and Al Bireh governorate	KFW – part of accompanying measures to the investment program	

Table 11: National strategy for solid waste management (2010-2014) in relation to cost recovery

Strategic objective	Policies	Interventions	Key executing agency
Financial viable and efficient SWM services and activities	Reducing the cost of SW collection and transport	Prepare a guide for suitable technical, administrative, and organizational options suitable to reduce the cost of SW collection and transport	MoLG
		Delegate the collection and transport services to the joint service councils, especially in local authorities that offer these services at high cost	MoLG
	Achieving cost recovery and self-funding for SWM operating costs	Prepare a guide for the usable methods and alternatives to determine SW fees collection fees	MoLG
		Develop a system that includes solutions and effective mechanisms for SW fees collection from users to cover costs	MoLG

Municipalities do not achieve cost recovery with their fees; the remaining costs are covered through other municipal revenues, such as taxes, fees, tariffs, grants, or national government allocations. Municipalities

and local authorities cost recovery rates vary from one locality to another, depending on their fee amount, fee system, cost, and fee collection system. In a study conducted by the World Bank on 94 municipalities out of 134, the municipalities had cost recovery at about 25% in 2008 for solid waste services. Recent information (2013) FROM JSCs[48] indicates that local authorities cost recovery varies from 4% to more than 100% (see examples in tables 12 and 13 provided below).

The World Bank in cooperation with the JSC H&B has launched a new program to subsidize the solid waste operations of local authorities that is based on indicators of financial sustainability and quality of service. The total project cost is 8 million USD to be implemented in the coming four years.

JSC cost recovery ranges from 40% to 100% of operational costs, which varies from one location to another. The remaining is either recorded as debt or subsidized by international donors, MDLF (Gaza only), national government, and occasionally by big municipalities that are members of the JSC.

Table 12: Examples of cost recovery rates of solid waste services

<table>
<tr><th>Area</th><th>Cost recovery of operational costs</th><th>Source</th></tr>
<tr><td>Hebron Gov.</td><td>60%</td><td>JSC H&B (2013)</td></tr>
<tr><td>Bethlehem Gov.</td><td>50% , one municipality at 90% (Beit Jala)</td><td>JSC Bethlehem (2013)</td></tr>
<tr><td>Ramallah and Al Bireh Gov.</td><td>An average for 15 villages in Ramallah combined is 40% (range 4-121%); managed by LGUs.
Fees collection rate: 27 to 100% for 52 LGUS out of 68 (does not include 3 big municipalities).</td><td>JSC Ramallah and AL Bireh (2013), data from 2011.</td></tr>
<tr><td>Tubas Gov.</td><td>More than 100% - fees linked to pre-paid electricity meters.</td><td>IMG[49]</td></tr>
<tr><td>Jericho and Rift Valley Gov.</td><td>94%</td><td>JSC Jericho and Rift Valley</td></tr>
<tr><td>94 municipalities in the West Bank and Gaza Strip</td><td>2008 Financial year data:
Per Capita Expenditure 36.92 NIS/year
Per Capita Revenues: 9.65 NIS/year
Expenditures do not include indirect administration costs – only direct costs are included.
<table>
<tr><th>Size of municipality</th><th>per capita Expenditure (NIS)</th><th>Per capita revenues (NIS)</th><th>Cost recovery</th></tr>
<tr><td>smaller than 5,000</td><td>18.36</td><td>11.83</td><td>64%</td></tr>
<tr><td>5,001-10,000]</td><td>22.63</td><td>15.6</td><td>69%</td></tr>
<tr><td>10,001-50,000</td><td>30.66</td><td>12.77</td><td>42%</td></tr>
<tr><td>→ 50,001</td><td>47.12</td><td>5.47</td><td>12%</td></tr>
<tr><td>Based on Response of 94 Municipalities</td><td>36.92</td><td>9.65</td><td>26%</td></tr>
</table></td><td>World Bank[50]</td></tr>
<tr><td>Jenin Gov.</td><td>More than 100% (see table below).
<table>
<tr><th>Waste Generation (maximum)</th><th>Household size</th><th>Generation per family per year</th><th>fee per household</th><th>Cost</th><th>Cost recovery</th></tr>
<tr><td>0.7 kg/c/day</td><td>5.8[51]</td><td>1.5 tons</td><td>15 NIS/month = 180NIS/year</td><td>100 NIS/ton 150NIS/household</td><td>121%</td></tr>
</table>
Due to linking of waste fees to electricity pre-paid meters; fees collection is 100% from residential. However from commercial it is less than that.</td><td>JSC Jenin and tubas</td></tr>
</table>

48- Based on communication with JSCs.

49- Verification of the equipment needs for solid waste collection and transfer in the West Bank. Reem Musleh and Ammar Al-Khatib, IMG, July 2010.

50- The World Bank, Sustainable Development Department, Middle East and North Africa Region (2010).MUNICIPAL FINANCE AND SERVICE PROVISION. Report No. 52437-GZ.

51- http://www.pcbs.gov.ps/Portals/_PCBS/Downloads/book1815.pdf

Table 13: Cost recovery for solid waste in Gaza Strip (2010)

	NG	GM	DB	KY	Rafah	all**
cost NIS/month	757,000	1,665,208	299,560	332,895	397,272	3,451,935
cost NIS/year	9,084,000	19,982,496	3,594,722	3,994,740	4,767,264	47,029,973
billed (NIS/year)	500,000	1,000,000	269,228	280,000	394,500	2,443,728
cost recovery if fees collection at 100%	66%	60%	90%	84%	99%	71%
collected (NIS/month)	200,000	380,000	269,228	126,000	153,500	1,128,728
cost recovery	26%	23%	90***%	38%	39%	33%
fees collection Rate	40%	38%	100%	45%	36%	46%
cost of transport	8					
cost of disposal	7		20			
cost of collection	66.9	67.2	33.5*			
cost/ton	81.9	74.2			108.8	

**not full collection; remaining conducted by LGUs*
*** excluding UNRWA*
**** full cost recovery of operational costs and 90% of all costs*
Source: UNDP – PAPP; DHV ENFRA TECC (2012) Feasibility Study and Detailed Design for Solid Waste Management in the Gaza Strip January 2012.
NG: North Gaza JSC; GM: Gaza Municipality; DB – Deir Al Balah Council; KY – Khan Younis Municipality.

2.6. PRIVATE SECTOR PARTICIPATION POLICY

The private sector participation in the solid waste management is considerable low till now; mainly the solid waste management is being carried out either by Joint Service Councils (JSCs) or by the local Governmental Units (LGUs). UNRWA is carrying the management of solid waste in the refugee camps in the West Bank and Gaza Strip.

The participation of the private sector (PS) in solid waste collection is relatively low if compared to the service being done by the LGUs or the JSCs. PS is partially participating in some rural localities, PCBS indicated that less than 3% of the households receive their waste collection from private sector[52]. Private sector involvement in solid waste collection is limited to very small communities who contracts out a person who has an agricultural tractor and collects the waste and dispose it using its tractor.

On the other hand PS is carrying out the operation of the transfer station in Nablus (Sairafi transfer station) from which the waste collected is being transferred to the sanitary land fill of Zahet Al Finjan. Moreover, private sector is operating the transfer station of Ramallah city, and it is envisaged to operate the transfer stations of Hebron during 2013. Moreover, the private sector was contracted to operate the dumpsite of Yatta in Hebron governorate, and an international private company will operate the sanitary landfill and the two transfer stations in the southern areas of the West Bank (contract in process).

Although the laws and regulations to some extent are supporting the participation of the PS in the solid waste management systems, still the participation is not that considerable. More efforts and facilitation from the official institutions is needed in order to enable the PS to merge in solid waste management. Incentives for the PS are needed either in solid waste management systems.

The national strategy for solid waste management (2010-2014) has a strategic objective relevant to private sector participation as indicated in Table 14, however these interventions were not implemented. The laws relevant to private sector participation are mentioned in the legal section.

52- Palestinian Central Bureau of Statistics, 2013. Household Environmental Survey, 2013:Main Results . Ramallah - Palestine.

Table 14: National strategy for solid waste management (2010-2014) in relation to private sector participation

Strategic objective	Policies	Interventions	Key executing agency
Increasing the participation of the private sector	Creating an enabling investment environment that encourages private sector to participate	Provide incentives needed to encourage private sector to invest and participate in SWM	Ministry of National Economy (MNE)
		Prepare guides for private sector participation in SWM, including templates for standard contracts, participation options and methods for regulating of performance	Ministry of Local Government (MoLG)
		Implement a training program for local authorities and joint service councils, covering action for qualification of private sector, bids preparation and evaluation, contracts preparation and negotiations and performance monitoring tools	MoLG

Furthermore, the Cross Sectoral Strategy for Palestinian Local Government and Administration Sectors (2011-2013) have identified goals, policy and policy interventions relevant to private sector participation (Table 15).

Table 15: Goals, policies and interventions relevant to private sector participation from cross sectoral strategy for palestinian local government and administration (2011-2013)

Strategic objective	Policies	Interventions
Promoting Public Private Partnership approach (PPP) at the local government level to contribute in efforts of achieving sustainable local development.	Stimulating and establishing partnerships to create local development.	- Developing the legal and regulatory framework related to the PPPs at the local government level. - Enabling the Municipalities and increasing their readiness to meet requirements of PPPs. - Institutionalizing the process of partnerships at all levels. - Fostering and expanding successful partnerships between LGUs and private and civil society sectors. - Building partnerships as model cases in preselected regions/municipalities. - Establishing partnerships with the private sector to provide services in remote areas (outside the jurisdiction of Municipalities)

PS has some initiatives in solid waste recycling, table 16 shows some of those companies[53]. It is important to note that these companies are quite small in terms of their amounts recycled and in terms of number of employees.

In the newly approved Industrial law[54] approved on 4.8.2011, in its Article 18, the law states that industries that works on environmental protection has a priority to obtain additional incentives that would be identified by Minister of National Economy Decisions.

On the other hand private sector has a major role in the construction of the infrastructure projects of solid waste, like the sanitary landfills and transfer stations and closure and rehabilitation of random dumpsites. Consultancy business, studies and researches are among the fields that the private sector play a good role. Furthermore, private sector is providing services for GPS installation and software

53 - An assessment of solid waste sorting and recycling in the northern and southern West Bank, and identification of suitable pilot projects for implementation in Hebron and Bethlehem Governorates. Reem Musleh and Ammar Al-Khatib, IMG, July 2010.
54 - http://www.mne.gov.ps/MneModules/laws/ind11-8-2011.pdf

related to tracking of vehicles (two companies are active on this issue, one Palestinian cell phone company and one IT company), they provide their services to JSC Jenin, Bethlehem and Hebron. A third company has emerged in the market, the second cell phone company, and its system will be tested on solid waste vehicles during 2014.

Table 16: Some private sector recyclers in the West Bank

No	Designation	Origin	Fields of expertise	Place of projects
1	Sairafi Company/ Nablus Municipality	Palestine	Waste Transfer/ sorting	Nablus
2	Special Waste Solution (SWS)	Jordan/ to invest in ZF Landfill	Treatment and recycling of waste – project was not successful – stopped.	Jenin
3	Palestinian Recycling Company	Palestine	Treatment and recycling of waste - project did not realize.	Nablus
4	Green Palestine	Palestine	Treatment and recycling of waste – project did not realize.	Nablus
5	Al Bal'awi Company for Cardboard and Papers Recycling	Palestine	Collection of Paper and cardboard, pressing and export to Israel	Jenin
6	Union for Plastic Industries	Palestine	Sorting/ Recycling of Plastic	Al Shuyoukh
7	Al Andalus Company	Palestine	Sorting/ Recycling of Plastic	BaniNa'em
8	Hebron Glass and Ceramics Industry	Palestine	Glass Recycling	RasEljora-Hebron
9	Green City	Palestine	Transfer, transport of waste and sorting of waste at TS Cardboard export to Israel	Ramallah
10	Tadweer	Palestine	Cardboard collection, press and export to Israel	Ramallah

2.7. PUBLIC AWARENESS, EDUCATION AND COMMUNITY PARTICIPATION

Public awareness is one of the most important tools by which the attitude of the citizens could be changed and tailed toward environmental protection, and hence a better handling of solid waste. Public awareness was one of the issues tackled in the related laws and strategies. The law of environment, the law of public health did articulate the public awareness issues regarding public health and environment. The NSSWM considers one strategic objective regarding the community participation and awareness, under which some interventions were proposed:

- Developing and implementing community awareness programs, aiming at developing the behaviour of citizens;
- Institutionalize planning through partnership with concerned stakeholders;
- Institutionalize community awareness and participation tasks in the frameworks and plans of joint service councils and local authorities;
- Implement joint projects with civil society institutes to familiarize the informal sector with the technical and environmental and health aspects; and
- Establish avenues for dialogue and participation between governmental, private, and non-governmental sector.

The roles of implementing those interventions were given to the different stakeholders working in the field of solid waste (Table 17).

Other national strategies have addressed environmental awareness in general (i.e. not those relevant to special sectors, such as water, energy, biodiversity, climate change...etc), include[55] :

1.Gender in environmental issues with focus on water and solid waste management (2013-2017) ;
2. Strategy of the ministry of education (2011-2013) ;
3. Youth cross-sectoral strategy (2011-2013).

Table 17: Strategies addressing awareness

Strategy	Strategic objective	Policies	Interventions	Key executing agency
National Strategy for Solid Waste Management (2010-2014)	A more participating and aware community	Promoting partnership spirit and strengthening alliance between service providers and the serviced communities to enhance the awareness of SW issues	Develop and implement community awareness programs aiming at developing positive behavior of citizens and participatory approach between governmental and nongovernmental institution and stakeholders involved in SW issues at national, regional and local levels	EQA
			Institutionalize planning through partnership with concerned stakeholders	MoPAD
			Institutionalize community awareness and participation tasks in the framework of plans and joint services councils and local authorities	MoLG
			Implement joint projects with civil society institutes to familiarize the informal sector with technical, health and environmental aspects	EQA
			Establish avenues for dialogue and participation between governmental, private and nongovernmental sectors	Each institution as involved
Environment Sector Strategy (2011-2013)	Achieving a clean, safe and pollution free Palestinian environment	Promoting the behaviors associated with environment preservation and increasing public environmental awareness	Establish environmental clubs	EQA
			Complete the integration of environmental education into curricula at the different levels of education	Other than EQA (MOE)
			Activate the instruments or tools of environmental media	EQA
			Organize environmental awareness campaigns targeting different social segments	EQA
			Establish a national center for environmental training and education purposes	EQA
			Develop a plan to promote environment-friendly initiatives	EQA

EQA is currently finalizing the development of the national strategy for environmental awareness and training (2013-2020).The draft strategy has identified the current status, conducted SWOT analysis, and came up with the following draft main objectives:

1. Active and effective environmental media to increase environmental awareness ;
2. Environmental aspects are integrated in Educational curricula and activities in a creative manner ;
3. Good Environmental values are practiced by all segments of the community.

55- EQA (2013) Draft National Strategy for Environmental Awareness and Training (2013-2020).

Many of awareness activities and campaigns are being executed by different stakeholders including the governmental and non-governmental organizations, the municipalities, and the joint service councils, UNRWA and international agencies. Those activities do not follow a unified integrated plan or schedule, because there is no national strategy for environmental public awareness. Such activities are being executed either as one of the aspects in the solid waste management project like (Zahret Al Finjan landfill, Al Minya Landfill, Rammun Landfill, Gaza solid waste management projects), or in the environmental occasions like the world environment day or the world cleaning day or the Arab environment day. Other activities are being executed in cooperation with the schools and universities which target the students in general. Many environmental clubs had been established at the schools and universities in order to enhance the positive behavior toward the environment, and to raise the knowledge and awareness in the field. On the other hand the subject of environment was considered in the Palestinian curriculums at schools till the seventh grade, there are plans to expand that to other levels.

There are about 64 civil society organizations working in the environmental sector[57].The majority of these organizations are located in the West Bank. It is important to note that some of the organizations in the West Bank, have branches in Gaza Strip (Figure 8). Most of the civil society organizations are linked to each other through various networks. Table 18 provides list of the various networks, and for some even provides a list of member NGOs.

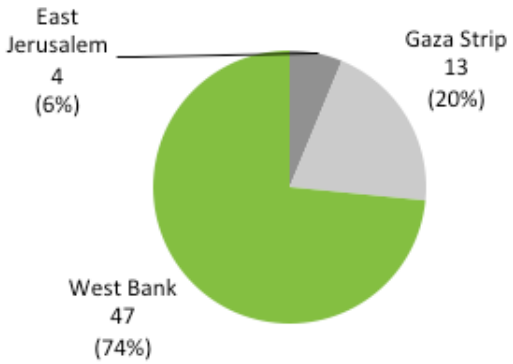

Figure 8: Civil society organizations working in the field of environment in Palestine source of information (Majdalani, 2012)[56]

Media is one of the important issues in the field of awareness raising. Media has started considering the environment and namely the solid waste in the episodes, news, reports, newspapers and so on. It is worth mentioning that in spite of those number of activities aiming at raising the awareness of people, still there are many problems and phenomena resulting from bad behavior of people. Those problems are like disposal of waste in open areas and along the streets, put fire into the containers in the streets, accumulating of wastes in the urban areas and between buildings, not paying the fees of solid waste collection for the service providers. Table 19 shows examples of the awareness programs and activities.

According to the study conducted by Heinrich-Böll-Stiftung– the most prominent national priority in the environmental field for NGOs are (in priority of order)[58]:

1. Environmental Awareness and Education (80%) ;
2. Land use and infrastructure ;
3. Water, Sanitation and Solid Waste Management "all key organizations and 52% of mid-level organizations directly tackle water, sanitation and solid waste issues directly and actively".

In Palestine community participation in solid waste management is practiced at the following stages:

1. Land zoning of local authorities are subject to public objections ;
2. Waste treatment facilities locations – all facilities are subject to environmental impact assessment, according to the policy of EIA issued by EQA and approved by the ministerial cabinet. Social impact assessment and community participation is part of the process ;

56- http://www.ps.boell.org/downloads/Mapping_Study_FINAL_with_new_cover.pdf
57- http://www.ps.boell.org/downloads/Mapping_Study_FINAL_with_new_cover.pdf
58- http://www.ps.boell.org/downloads/Mapping_Study_FINAL_with_new_cover.pdf

3. Containers location: many municipalities, particularly the smaller ones, agree with their citizens about the location of communal containers ;
4. Strategic planning at local level (including solid waste); local authorities have to utilize the guidelines developed by MoLG on strategic development and investment planning, which is a participatory planning approach. When deciding on alternatives and needs for future developments of own towns, citizen participate in identifying the priorities, objectives, and projects in the town, including those related to solid waste ;
5. Investment project funded through Municipal Development and Lending Fund (including equipment for solid waste collection) are subject to community participation in identifying priority project for any town that does not have an SDIP (i.e. a plan that was conducted in participation).

In Palestine, NGOs are not active in solid waste management services provision, however, in one case in Gaza Strip, an NGO has cooperated with municipality to operate a sorting and composting facility of municipal solid waste. The NGO utilized a grant from UNDP for provision of investment costs and operational costs for 1.5 years of the sorting and composting plant. The NGO could not sell the compost produced from the plant due to limited market for compost from waste, and lack of quality certification, the plant stopped operations in mid-2013 as soon as UNDP stopped their operational costs support.

Table 18: Organizations active in the environment – source of information (majdalani, 2012)59

Main network	Member Civil society organizations				
The Palestinian Environmental NGOs Network (PENGON)	MA'AN Development Centre (MDC)	Palestinian Agricultural Relief Committees (PARC)	Union of Palestinian Medical Relief Committees	Land Research Centre	The Palestinian Association for Cultural Exchange
	Palestinian Hydrology Group (PHG)	Roads and Environmental Safety Centre	Union of Agricultural Work Committees	STOP the Wall Campaign	Biodiversity and Environmental Research Centre
	The Palestinian Society for the Protection of the Environment	Environmental Media Centre	Arab Agronomist Association.	Arab Smiling Future Society	
Not registered in PENGON/but still supported by it	The Environmental Education Centre	Life Source			
The Emergency Water, Sanitation and Hygiene Group (EWASH)	House of Water and Environment	ARIJ	MDC	PARC	PHG
	Life Source	Palestinian Wastewater Engineers Group.	PENGON		
National network for civil societies (not necessarily in the field of environment	**Palestinian NGOs Network (PNGO)**		**NGOs Development Centre (NDC)**		
	134 members. Some environmental active NGOs are not members of PENGON and only members of PNGO, such as Applied Research Institute - Jerusalem (ARIJ)		Not related to environment directly, has two major roles: 1) Intermediation role between donors and civil society development. 2) Provides technical assistance to NGOs.		

59- *http://www.ps.boell.org/downloads/Mapping_Study_FINAL_with_new_cover.pdf*

Citizen satisfaction with services of solid waste collection provided is something that has just started in Palestine; MDLF contracted a private company to obtain information on citizens' satisfaction from municipal services (including solid waste collection). The survey has found that about two thirds of citizens are satisfied with the services of solid waste collection (Figure 9). MDLF is currently preparing their new evaluation of services. Ramallah municipality has conducted a citizen satisfaction survey for their services, including for solid waste management, and the JSC of Ramallah and Al Bireh conducted a detailed survey on awareness and opinion of citizens for the whole governorate on solid waste services. Furthermore, ARIJ[60] (an NGO) has worked on evaluating of solid waste services in Nablus municipality as a means to enhance accountability and transparency of services provision to citizens.

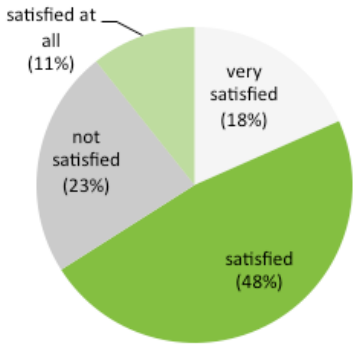

Figure 9: Citizen satisfaction with solid waste collection and disposal (2009) – MDLF survey[61]

2.8. NATIONAL CAPACITY BUILDING AND TRAINING INITIATIVES

Within the framework of Horizon 2020, 6 training courses were conducted in which Palestine has participated. For details please refer to table 21. Furthermore, all big investment programs are associated with capacity building components for implementing agencies; these usually are the joint service councils that manage the establishment and operation of solid waste facilities.

There are about 4000 persons working in solid waste management in Palestine in JSC and local authorities, distributed as shown in table 20.

Table 19: Workers in the solid waste sector (2007)[62]

Type of work	Total number	Fields of expertise	Place of projects
Total number of employee	903	420	1,323
Total Number of labor	1,400	891	2,291
Total number of workers	**2,303**	**1,311**	**3,614**

The Palestinian Working Group for Capacity Development in the Solid Waste Sector has developed with the support of GIZ in 2009 a training guide on occupational safety and health and principles of first aid for workers in the solid waste sector; the guide addresses the following issues: 1) occupational safety, prevention and hazards 2) work conditions and labor rights, 3) various types of solid waste vehicles and safety procedures, 4) waste components and hazards associated with exposure to waste, 5) occupational health in solid waste, and 6) first aid procedures. Although the guide was published and available at MoLG, it has not been used for training, except for the training conducted during the piloting phase. The Ministry of Labor has approved the training curricula to qualify for a component for vocational training.

60- http://www.arij.org/index.php?option=com_content&view=article&id=430&Itemid=62
61- ALPHA INTERNATIONAL (2009) MDP CLIENT AND CITIZEN SATISFACTION SURVEY: FINAL REPORT submitted to MDLF. http://www.mdlf.org.ps/Files/Docs/MDP_CLIENT_AND_CITIZEN_SATISFACTION_SURVEY.pdf
62- Musleh, R. (ed). Abu Rmeileh N. Training needs assessment of the solid waste sector in the occupied Palestinian territory. Unpublished Report (2009).

Table 20: Workers in the solid waste sector (2007)

PA& CP Programs and activities with reference to SWM	Key Partner (NGOs/Programs/Stakeholders)		
	Organization	Phone	Fax
Environmental Awareness program of EQA: a) Organization of environmental awareness events on various occasions (world environment day, etc) b) The environmental clubs c) Regular activities on environmental awareness d) Environmental awareness Publications	EQA	+970 2 2403495	+970 2 2403494
Public awareness raising program (southern West Bank Solid Waste Management Project)	Higher council for solid waste management (H&B)	+970 2 2216477	+970 2 2216478
Public Awareness raising program (Jericho and Rift Valley)	Joint council for planning and development Jericho and Rift Valley	+970 2 2320117	+970 2 2320117
Public Awareness raising program (Ramallah and Al Bireh governorate Solid Waste Management Project)	Joint service council for solid waste management	+970 2 2957977	+970 2 2955814
Environmental awareness program Ramallah Municipality: a) Healthy and environmental friendly schools program b) Environmental play contest c) Environmental summer camps	Ramallah municipality	+970 2 2945555	+970 22963214
Environmental protection program at MAAN (has a strong focus on awareness) a) Environmental publications b) Environmental awareness manuals c) Publication of the Electronic Environment & Development Magazine d) Conducting environmental awareness events	MA'AN Development Center	+970 2 2954451	
All programs of the NGO are environmental education and awareness (including SW) The organization organizes an annual conference on environmental awareness and education	Center for Environmental Education	+970 2 2765574	+970 2 2765574

Table 21: Horizon 2020 capacity building: solid waste 2010- july 2013 (Source: eqa)

	Training Workshop	Location	Duration	No. of Palestinian Participants
1	The organic waste cycle - a resource efficient model"	Egypt	13-15 December 2010	4
2	ISWM with particular focus on appropriate methodologies/ technologies	Palestine, Ramallah	22-24 November 2011	24
3	Tendering process and contracts in municipal solid waste management	Lebanon	22-24 March 2012	1
4	Minimizing Marine Litter in the Mediterranean	Sweden	21-23 May 2012	1
5	Pro- Poor Financing Strategies for municipalities Including Cost Recovery Options	Palestine, Ramallah	18-20 June 2012	19
6	Effective evaluation of performance, cost, recovery, viability and sustainability of projects (applied to cases of management and operation of landfills and solid waste systems)"	Palestine, Ramallah	9-11 April 2013	35

2.9. CAPACITY BUILDING REQUIREMENTS

Capacity building/ development and training programs are so important issues in the field of solid waste management in order to enable the institutions and personnel who are working in this sector to be able to follow up the continuous changes and development in this field. The industry of solid waste management is moving forward worldwide, and many steps should be taken nationally in order to cope with that.

The Labs, equipments, forms, and manuals required for carrying out the monitoring and inspections on the solid waste management systems are needed at official institutions like EQA as well as at the managers of the waste facilities (JSCs).Furthermore, accreditation of laboratory to sample and conduct analysis is another issue that remains insufficient. It is important to indicate, that the weakest point in waste management, remains environmental component of the system. Hence, it is of utmost importance to develop the environmental knowledge in waste management facilities and means to reduce and prevent environmental impacts and means to implement and report on the environmental management plans agreed upon during the licensing process. Furthermore, it is important to train both waste disposal facilities' and environmental authorities' personnel on gas collection techniques, landfill gas emissions, treatment of landfill gas, and monitoring. Furthermore, feasibility for energy generation from LGF is something that is not tackled yet, and requires capacity building.

Some service providers (like Jenin JSC, Hebron JSC, Bethlehem JSC) do use the GIS technique in the management of the system and the movement of the vehicles, however they do not utilize these tools to optimize waste management. Most of those providers do lack that technique, so it is so important to build the capacity of this issue for them. Lack of proper waste management information systems at the JSC level reduces their ability to manage waste, or their ability to provide the necessary technical support for member LGUs and to conduct planning in the sector at the governorate level. Some JSCs such as the JSC of Hebron and Bethlehem has recently tendered an assignment for waste management information system for solid waste collection, however the ability to use the system in other governorates is not clear yet. Obtaining information from JSCs is not an easy job, since many of their data are scattered across various departments, files, and some even available only in manual form. Hence, generation of regional data (at governorate level) and then aggregation at national level is a lengthy process, and is not done unless required by a certain user.

JSCs for solid waste management are legally bound to the JSC bylaw; however this bylaw was conducted with smaller JSCs in mind, and with those that provide services for planning and development mainly. There is a need for further development of the bylaw to accommodate for the increasing requirements of solid waste management, institutionally, administratively and financially.

The scientific research and development is one of the missed issues in the official institutions as well as the service providers even within the JSCs. The capacity of supporting this side and enabling those institutions to implement and carry out the needed researches is so crucial and needed. On the other hand the higher education in the field of solid waste management either in term of BSc, MSc or PhD is low and needed to be developed.

Institutionally, the structural organization of the LGUs and other stakeholders, if any, should be updated and developed in order to suite the solid waste management, and solid waste department or divisions should be identified and given clear roles and responsibilities. It is important to indicate, that most JSCs does not have an environmental planning and monitoring departments in their structures, thus hindering and limiting the environmental component of waste management.

There are about 4000 persons working in LGUs and JSCs in the field of solid waste management in Palestine. Most of them are labor and drivers. It is important to develop local performance indicators on solid waste management at LGUs level that will include labor number and qualifications in these indicators.

Capacities of the institutions related to the law enforcement should be developed, in order to enable those institutions to take actions with the violators and to play their roles well. Capacity to receive and follow up the public complains either at LGUs, JSCs or at the official institutions is needed to be developed.

Financially, the cost of the service is not defined well yet at most of LGUs, so it is so important to develop the capacities which enable them to have such figures, which will help a lot in planning and in enhancing the role of private sector in investing in the sector. More over the measures to maximize collection of fees and cost recovery are urgently needed to be developed. The most importantly in this aspect is the creation of special cost centers for waste management and addressing means of identifying fees and cost recovery strategies at LGU level.

Training is important to keep the staffs working in this field updated and aware of the latest technologies and methods of solid waste management. Some general subjects of solid waste management like types of waste, the daily handling of solid waste, relation of waste with environment and health issues, and the occupational health measures could be common issues for all the workers in solid waste management in LGUs or JSCs. More developed subjects of solid waste management like separation of solid waste, treatment and recycling, landfill operation and management, sanitary landfill construction, applying standards and specifications, and closure and rehabilitation of random dumpsites, could be subjects of training for the staffs who are responsible for implementing or following up such issues. Target groups could be from governmental, non-governmental institutions as well as from LGUs and JSCs.

The latest study (2009) targeted the LGUs and JSCs in both the West Bank and Gaza Strip aimed at defining the training and capacity building needs for those institutions. The study came up with the most training topics requested by the LGUs and JSCs as follow [63]:

- The waste classification ;
- The occupational health and safety ;
- The environmental impacts of waste ;
- The work ethic ;
- The promotion of recycling activities ;
- While the training topics most requested by employees themselves were as follow:
- Maintenance of vehicles ;
- Plans and equipment ;
- Environmental aspects of waste ;
- Waste minimization ;
- The applicability of various waste management options to Palestine ;
- Human resource management ;
- Occupational health and safety conditions ;

According to that study about 5% of employees in the West Bank LGUs indicated that they have had some training before, while 23.5% of employees have received previous training in Gaza Strip.

Strategic planning, developing of strategies and detailed action plans, monitoring the progress of implementing those plans and strategies, indicators definitions and production, producing the solid waste related figures and numbers, building databases and information systems are all important training subjects for the official institutions (governmental) and for those responsible for planning in the LGUs and JSCs.

The following issues should be addressed as part of the capacity building measures to allow progress on the national solid waste management strategy:

63- Training needs assessment of the solid waste sector in the occupied Palestiniain territory. Niveen Abu-Rmeileh and Reem-Musleh, GIZ, 2009. Unpublished report.

- Development of a guide on how to prepare developmental & operational plans for SW collection & transport by municipalities & JSCs. This guide should include institutionalization of community awareness & participation tasks ;
- Development of a unified system to check & monitor effectiveness for SW collection & transport ;
- Development of MIS at various levels, LGUs, JSCs, ministries and the links between them ;
- Formulation of indicators to monitor the environmental impacts of SW on air, surface water, and groundwater and soil ;
- Creation of environmental reporting system for waste facilities ;
- Prepare a guide for suitable technical, administrative & organizational options suitable to reduce the cost for SW collection and transport ;
- Prepare guides for private sector participation in SWM ;
- Prepare a manual on development and operation plan for SW collection and transport ;
- Develop standards for sanitary landfills and transfer stations ;
- Develop a system that includes solutions and effective mechanisms for SW fees collection from users to cover costs ;
- Training on closure of random dumpsites and their monitoring after closure ;
- Formulation of standards to collect, treat, and use landfill gas emitted from sanitary landfills ;
- Training and capacity building for industries and monitoring authorities on hazardous waste handling ;
- Training and capacity building programs for medical waste generators, JSC, and monitoring authorities on medical waste management.

2.10. NATIONAL INITIATIVES MULTI STAKEHOLDER EXCHANGE

There are no national initiatives for multi-stakeholder exchange and the institutions working in the waste sector are limited in numbers. Each type of organization acts through own networks, for example, NGOs through their various networks, Private sector through Palestinian federation of industries, engineering associations, chamber of commerce and municipalities through MDLF and Ministry of Local Government, and APLA, Joint service councils through the Ministry of Local government, Ministries among themselves through the ministerial cabinet or through their various technical horizontal channels. Donor coordination takes place in the thematic sub working group for solid waste together with the Palestinian government ministries.

The number of environmental actors is not that big, which makes communication and information exchange possible to some extent, although not effective. A national network for solid waste management is still an issue that needs addressing. Networking is an issue which needs to be developed in the field of solid waste management, since it is limited and minor efforts are being done in this regard. Relations with the international and regional networks and firms dealing with and interested in solid waste management are limited; SWEEP-Net is an example of such networks (Regional network). More relations are needed to be built and facilitated in order to achieve benefits and make use of such networking. Exchange of experience and knowledge on solid waste management, in addition to stay aware of new technologies and practices in solid waste management, as well as make use of the available expertise, and enhancing the scientific research and development are all among the benefits of networking. There are a lot of periodic and specialized international conferences in solid waste management. Sharing in and following up those conferences is very important.

On the other hand, the local and national networking is so important and should be enhanced. The stakeholders of solid waste management should have a national network including the governmental, nongovernmental, and private sector. That will help in improving the interrelations between them, as well as keeping them all informed about all developments and activities being implemented.

2.11. CASE STUDIES, BEST PRACTICES AND LESSONS LEARNED

Case Study 1: Integration of informal sector in waste management in Hebron Governorate - Towards Green Economy in the Waste Sector (for details see Annex 1 – case study 1)

CITY: YATTA

DATE: 2008 – ONGOING

Main issue and expected Outcomes

- Provision of alternative employment options for informal workers recovering recyclables from the uncontrolled dumpsite in Yatta after its closure and rehabilitation. Closure of site is expected by end of 2013 ;
- Integration of 29 informal workers in the newly established systems for solid waste management ;
- Prevention of children from working on the site, and their integration in schools and supporting their families with other means of income generation ;
- Support the informal sector with the creation of official workers union for waste pickers ;
- Support the informal sector in creating entrepreneurs in the waste sector or other sectors ;
- Support the informal sector by facilitating the negotiations of agreements with the recycling industries ;
- Support the informal sector by creating a local committee to advice and participate in implementing social protection activities for the workers ;
- Several social protection activities implemented.

Lessons learned:

- It is important to include the protection of the waste pickers as early as possible in solid waste management projects development and planning ;
- Importance of having active social workers at the waste management department to work on the integration and protection programs ;
- Highly important to conduct any integration programs with strong participation of the workers ;
- Children can be protected from working in the waste sector, if their families are provided by an alternative source of income ;
- To include part of the investment funds in waste projects for the benefit of the informal sector, as this will allow either provision of alternative opportunities, or creation of better conditions for working in the waste sector ;
- The importance of governmental local and national recognition of these people to protect them and develop their work in a more environmental, social and health manner ;
- Commitment of the waste provision agencies to support the waste pickers is very important to ensure the success ;
- Cooperation with existing national programs, civil society organizations facilitated the support to the waste pickers.

Case Study 2 - Towards improving solid waste disposal in Palestine – Zahrat al Finjan Landfill (for details see Annex 2 – case study 2)

LOCATION – WADI ALI – BETWEEN ARRABEH AND AJA

DATE: 2007 – ONGOING

Main issue and expected Outcomes

- Reduce random dumpsites for waste disposal ;
- Utilization of sanitary landfill for disposal of waste ;
- Reduction of environmental impact of solid waste management.

Lessons learned:

- **It was possible to rapidly utilize existing infrastructure to solve disposal problems in other areas in the west bank.** This has led to reduction in the number of random dumpsites in operation, as well has led to rehabilitation of some of those that are closed.
- **Expansion of services should be associated with planning for alternatives**: Planning for opening new cells has not started yet at ZF, although the land for expansion was already purchased by the JSC. The landfill life time will come to an end within few years (by 2016-2017), neither design nor approvals has been conducted yet. Furthermore, the JSC does not have the financial resources to establish new cells, and has not started fundraising for these cells. This is a major setback that should be addressed now, to plan properly for future disposal.
- **Rapid expansion of services could lead to insufficient environmental management**: The rapid inflation in waste acceptance has led to some weaknesses in operations, which mainly reflected on the environmental management of the site. For example, the JSC was not able to handle the increasing amount of leachate. As a result and to conduct corrective action, the JSC has constructed additional storage pool for leachate in the volume of 16,000 cubic meters, making a total capacity for leachate of 19,000 cubic meters. The JSC claims that this has resulted in solving the leachate problem at the site. Furthermore, the JSC was delayed in terms of starting the gas collection. Currently, the JSC is in the process of studying the feasibility of collecting gas and utilizing it for energy generation. The studies are still at early stages, as only recently the consultant company has submitted their inception report. It is important to indicate that the JSC should have started the gas collection much earlier, since the waste inside the landfill is under conditions that enhances biodegradation; through leachate recirculation to waste, warm temperatures, and limited sulfur content (no sludge or construction waste), and high organic waste content. Furthermore, leachate content indicate that biodegradation of waste has already reached methonogenesis phase. Recently, a fire occurred in the Landfill (October 2013).
- **Waste transfer could lead to environmental problems**: it is important to note, that traffic management, particularly for transferring wastes from other governorates, and the environmental protection during transport of waste was not accounted for in the expansion of services. There are no national standards on emissions of vehicles for solid waste, nor in relation to maximum distances of waste transfer. There has not been any study that calculates the environmental costs of transfer of waste. Furthermore, the social and economic impacts of transfer of waste in comparison to creation of additional sanitary landfill have not been conducted. Nevertheless, it is estimated that transfer of waste has less environmental impact than creation of a new sanitary landfill, particularly if standards on vehicles are imposed.

- It was observed that EQA is not enforcing the implementation of the environmental management plan (EMP) associated with the EIA for the site, and the JSC has not provided regular reporting as agreed in the EMP. Nevertheless, JSC provides occasionally information to EQA upon requests. This indicates a weakness in implementation of EMP on both the regulatory and inspection agency and on the implementing agency.
- **There are several reasons for insufficient implementation of Environmental Management including:**

1. Insufficiency in Human resources:
   - JSC does not have environmental monitoring department in the organizational structure, nor the sufficient human resources to do environmental monitoring ;
   - Insufficient staff for monitoring compliance and inspection of waste facilities at EQA.
2. Weakness of the laws and law enforcement.
   - The fines in the environmental law on violations are too small to create an incentive for compliance ;
   - EQA can suspend the environmental approval, which will mean that site will be closed and waste will be disposed of in a random sites again. This dilemma could only be solved by amending the fines of violations of the environmental law.
3. Capabilities of institutions:
   - Inability to implement the EMP, has to do as well with insufficient knowledge and understanding on how to implement the EMP and how to analyze the results of the monitoring. Hence, it is of utmost importance both JSC and EQA to be trained on the issue. This is important not only for this JSC, but for others JSC that will start operating disposal sites soon (one planned to operate in 2014, the other in 2015) ;
   - Lack of equipment for monitoring waste facilities at both EQA and the implementing agencies, is additional reason for limited compliance with EMPs.

2.12. UPCOMING INITIATIVES

Operation of Sanitary landfill in Al Menya Construction of Sanitary landfills in Gaza Strip and Ramallah and Al Brieh Governorate, expansion of the Jericho Sanitary landfill, construction of transfer stations, and Procurement of equipment are planned as part of the active investment programs. See Table 9 and 11.

3. INDUSTRIAL & HAZARDOUS WASTE MANAGEMENT

3.1. LEGAL AND INSTITUTIONAL FRAMEWORK

In addition to what was mentioned above (in MSW section) the following laws/articles are applicable to hazardous waste specifically:

Environmental Law [64]: Law No. 7 for the year 1999 regarding the Environment

The environmental law had a clear regulation that forbids the import of hazardous waste. Furthermore, the Law indicates that transport of hazardous waste through the country can only conducted with a special permit from EQA **(Article 13)**.The article is in lieu with Basel Convention, although Palestine was not able to ratify the convention due to its political status.

This law identifies waste, hazardous materials, and hazardous waste. It is also based on the polluter pays principle. The definition of hazardous waste based on this law is: waste generated by the various activities and operation or the ash thereof which preserve the characteristics of hazardous substance, where hazardous substance is defined as any substance of combination of substances, which because of its hazardous characteristics poses a danger on the environment as toxic, radioactive, biologically infectious, explosive or flammable substances. Also, this law identifies **(Article 12)** that handling hazardous waste, should be in accordance to terms, regulations, instructions and norms specified by EQA in coordination with specialized agencies. However, these norms and regulations are not issued yet, therefore, it is subjective to the opinion of the EQA employees. EQA is currently working on **drafting a by law for hazardous waste management**.

The Law on the Environment (1999) indicates that there is a further need to work on classification and listing of hazardous materials and wastes, by stating in Article 11 that EQA, in coordination with other official institutions, will issue such lists. EQA has **drafted classification and list of hazardous waste** (December 2011) in cooperation with relevant authorities and ministries. However, EQA has not submitted the list for approval. The draft list covers not only industrial hazardous waste, but also hazardous waste from other sources, such as agriculture, municipal waste, construction waste, oil lubricants waste, waste resulting from treatment of water and waste, and other sources such as e-waste, packaging waste, and waste resulted from maintenance services. Furthermore, within each type of the waste categories, hazardous fraction of the waste was classified in lieu with EC classification. A training course for 34 persons from various institutions was conducted on the drafted classification (Figure 10).

Industrial waste according to the draft list has been divided based on source according to the following:

1. Wastes from Pharmaceutical Industry ;
2. Wastes from Chemical Manufacturing ;
3. Wastes from Paint Manufacturing ;
4. Wastes from Manufacturing of Ceramics and Glass ;
5. Wastes from Manufacturing of Wood ;
6. Wastes from Paper Manufacturing (Recycling) ;

64- Official gazette – Palestinian Facts – February, 2000. Pages 38-70

7. Wastes from Printing and Photographic Industry ;
8. Wastes from Manufacturing of Textiles ;
9. Wastes from Leather Industry ;
10. Wastes from Food Industry ;
11. Wastes from Plastic Industry ;
12. Wastes from Metal Processing ;
13. Wastes from Stone Industry.

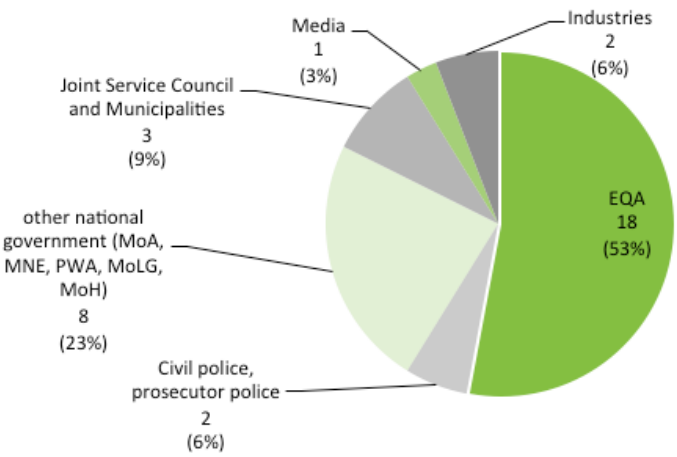

Figure 10: Distribution of trainees on classification of hazardous waste by institution (Source: EQA)

Public Health Law[65] : No. 20 for the year 2004.

Article 42 from the law indicates that the Ministry shall coordinate with the relevant bodies to determine conditions for transfer, storage, treatment or disposal of hazardous items; and no one is allowed to perform transfer, storage, treatment or disposal of hazardous items, unless this person is obeying the rules and conditions previously determined.

Weaknesses in the legal and institutional framework with regards to HWM can be summarized as [66]:

- Incomplete legislation ;
- Weak political will to enforce regulations on HWM ;
- Inability to enforce the laws in "Area C" ;
- Illegal import of hazardous waste ;
- Weak monitoring and enforcement legislative framework, tools, and instruments within "Areas A and B" as classified in Oslo Agreement ;
- Unclear roles and responsibilities of stakeholders
  - Unclear roles and responsibilities between the various national government agencies ;
  - Limited power of HZW management department at EQA ;
  - Lack of interface between the national and local level ;
  - Inappropriate conditions for Private Sector Participation.

3.2. STRATEGIES AND PLANNING

The Environment Sector Strategy 2011-2013 has identified one intervention relevant to hazardous waste that is "establish a system (legislative and physical) for the management of hazardous waste)". However, this intervention was not implemented. It is important to note that most of the interventions with even higher priorities in the strategy were not implemented due to lack of funding. The strategy was foreseen as a guidance tool to identify priorities of funding, without actually allocated the necessary resources for its achievement.

It is important to note that the NDP (2011-2013) incorporated 7.9 Million USD for hazardous waste treatment as part of the government priorities for the years 2011-2013; however this was not implemented due to lack of funding and dependency on external aid for funding developmental priorities.

65- Official gazette – Palestinian Facts – April 2005, Page 14-34
66- EQA 2010. Environment Sector strategy 2010-2014 and EL-Hamouz, A. (2010) - Final Report on the Development of a National Master Plan for Hazardous Waste Management for the Palestinian National Authority (PNA).

The national strategy for solid waste management has addressed hazardous waste in its interventions to respond to the strategic objective. Principles and mechanisms suitable for managing medical and hazardous, and special wastes are provided below in Table 22.

Table 22: Strategic interventions and policies in NSWMS relevant to hazardous waste

Policies	Interventions	Key executing agency	Status
Creating appropriate inventory and tracking systems for hazardous waste	Prepare and publishing a list of categories of hazardous waste	EQA	Drafted, not submitted for approval
	Prepare and implement a system to document, track, and update the data of hazardous waste (including types, quantities, sources and impacts)	EQA	One time inventory conducted, but system was developed.
	Prepare a plan for hazardous waste management	EQA	Drafted, not submitted for approval
	Prepare and implement a system to track the hazardous waste including documentation of transported material, its source, authorized transporting agency, treatment and disposal	EQA	Nothing done yet, but a draft bylaw for hazardous waste is under preparation.

EQA has drafted an Interim Action Plan for Hazardous Waste Management in December 2011 to be implemented in three years; however this plan was never submitted for approval. It can be observed from the objectives and the actions suggested in this draft action plan, that it is very ambitious and impossible to achieve them with the available financial and human resources in Palestine. Furthermore, the draft action plan has identified a detailed action plan for two hot spots; one related to leather industry, the other related to Galvanizing Industry (Table 23).

Table 23: EQA - Draft - Interim action plan for hazardous waste management (December 2011)

Objectives	Action
Strengthening of the regulatory, authorization and enforcement role of the PT authority in HZW management.	Preparation of a hazardous waste legal framework
	Development of a HZW By-law
	Preparation of technical standards and procedures for registration, licensing and monitoring of HZW generators, transporters and facilities, in the scope of the by- law.
	Adopt/insert procedures and penalties in the legal framework to ensure the efficient prosecution of environmental offenders
	Adopt/insert "Polluters Pays" principle in the legal framework to ensure proper financing of HZW management and disposal
	Preparation of a legal framework for hazardous chemical materials
Improve HZW related services for industry and municipalities.	Promote public-private partnerships, private sector ownership and operation, and cost shared provincial, district and municipal agreements with regard to sharing equipment, facilities and the development of educational materials and programs.
	Support of the JSCs to include HZW services in their portfolio and allow special charges for HZW services rendered
	Explore the use of economic instruments which support the "Polluter Pays Principle" i.e. waste related taxes, fees, charges etc

Ensure coordinated and uniform compliance monitoring and enforcement and Improve the separation of HZW and reduce the amount of HZW mixed with non HZW delivered at landfills.	Prepare compliance monitoring and auditing forms
	Produce identification / labeling methods for all containers and vehicles used to store and transport HZW
	Assign hazardous waste to disposal and treatment methods
	Enlarge the guideline on the Palestine Hazardous Waste List with recommendations on disposal and treatment methods and identify facilities.
	Enlarge the guideline on the Palestine Hazardous Waste List with recommendations for safe handling procedure.
	Enlarge the guideline on the Palestine Hazardous Waste List with identification and procedures for exports of HW.
	Register and accredit HZW service providers
	Promote self-regulation through the establishment of partnerships with manufacturers and retails.
	Facilitate regular contact between the various spheres of stakeholders to ensure coordinated and effective enforcement of HZW management plan by exchanging information and regular meetings.
	Collaborate with the industrial sector to separate HZW from non-HZW (and transfer HZW to centralized storage/suitable disposal facilities, when they exist)
	Conduction of various awareness programs
	Promotion of tax exemption for industrial sector that abides with HZW management.
Overview on HZW generators, transporters and treatment and disposal facilities; Increase HZW generator's capacity to identify HZW. Disseminate first data on HZW amount, type, storage, treatment and disposal facilities for PT authorities.	Preparation of lists of HZW generators, transporters, treatment and disposal facilities inside and outside PT
	Register the annual amount of generated HZW
	Establish cooperation with statistical office
	Prepare standard questionnaire for annual survey
	Implementation of an electronic register, data base for HZW
	Implementation of a periodical inventory on HZW
	Inform stakeholder about survey
	Implement survey
Provision of compliant and cost effective hazardous waste storage, treatment, disposal or export systems to meet the needs of safe final HZW disposal. Development of small hazardous waste transfer stations at strategic locations in the PT where the waste is separated and bulked for transfer to permitted HZW disposal facility or even directly to permitted recycling facilities. Establish regional collection points and interim storage capacity to encourage HZW generators to abide with the HZW law.	Feasibility study on a centralized HZW storage/s, regional collection points.
	Establishment of Interim Storage Capacity for HZW
	Clarify ownership and site selection
	Obtain environmental impact assessment or licenses
	Construction of HZW interim storage
	Establish regional collection points for hazardous waste
	Establish HZW transfer stations

Train inspectors, member of staff of the HZW department and stakeholders on HZW classification, management, control and emergency/spill response to improve separation and handling of HZW in industry.	Training on the application of HZW list and waste classification
	On-job-training EQA inspectors for HZW management issues
	Training member of staff of HZW department on general HZW management
	Training stakeholders for HZW management
	Training on export of HZW according to Basel Convention
	Training on OHS and emergency/spill response
	Education and awareness programs on effective enforcement with municipal officials
Strengthened communication between all stakeholders with regard to information dissemination of HZW management.	Research, benchmark and develop webpage for HZW information
	Establish a HZW reference centre at EQA
	Continue information hotline
	Promotion of the use of less hazardous materials
	Promotion of public awareness of HZW issues, risk and precaution
	Disseminate information to stakeholders regarding waste minimization opportunities (recycling, waste exchange)
	Promotion of awareness of consequences of poor HZW management (including health and safety impacts)
	Inform the waste generators on treatment and disposal methods / facilities on the web and by the hotline
	Initiate information desk in all stakeholders' ministries, publish information leaflets, guidelines fact sheets (on HZW of concern, recycling, in-situ treatment).
	Produce educational materials and conduct education and aware¬ness campaigns.
Development of proper hazardous waste management program in two hot spots	Management of hot spot 1- Leather Industry
	Management of hot spot 2 - Galvanizing Industry

3.3. FINANCING

From the central government, no financing schemes are foreseen. However, some municipalities such as the municipality of Zouk Mosbehtry to force the industries within its cadastral boundaries to be fully in charge of the management and safe disposal of the industrial and hazardous waste generated at their facility.

3.4. COLLECTION, TREATMENT AND DISPOSAL

It is estimated that 64% of the economic establishments' waste generation is generated from industrial ones[67] (Figure 11). PCBS estimated that 131,343.8 tons of solid waste per year is generated from industrial establishments in 2011.It is estimated that this waste is produced by a total of 15,340 industrial establishments, employing 62,832 persons[68] (Table 26)

Furthermore an inventory was prepared for EQA on hazardous waste and it was found that the total hazardous liquid waste is 424,071 ton/year, while total hazardous solid waste is 62,621 tons/year (Table 25).In addition to this, the Israeli industrial areas in the illegal Israeli settlements produce hazardous waste that is disposed of in West Bank. There are no actual estimates of the amounts of hazardous waste generated from these settlements, however only one industrial area has emitted at least 810,000 cubic meters of industrial wastewater that includes hazardous waste in 2001.[69]

67- Palestinian Central Bureau of Statistics, 2011. Environmental Economic Survey, 2011:Main Results . Ramallah - Palestine.
68- Palestinian Central Bureau of Statistics, 2008.Population, Housing and Establishment Census 2007,Economic Establishments: Main Findings. Ramallah - Palestine.
69- Arij (2007) Status of the Environment in the occupied Palestinian Territory.

Table 24: Cost of waste, wastewater and solid waste at economic establishments (PCBS, 2011)[70]

	NIS	%	Ton/Month	NIS/Ton
Total Monthly Payment From Economic Establishments for Water Consumed	1,292,100	10%		
Total Monthly Payment From Economic Establishments for Wastewater Disposal	3,074,000	24%		
Total Monthly Payment From Economic Establishments for Waste Disposal	8,346,600	66%	17,027	490
Total	12,712,700	100%		

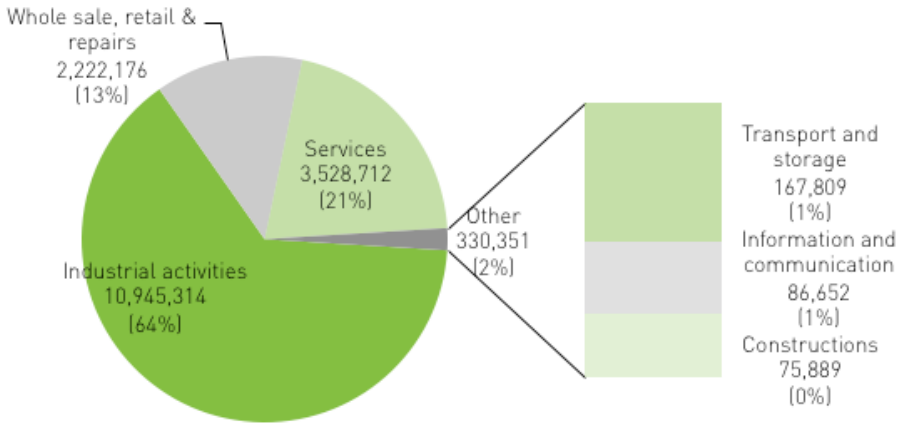

Figure 11: Waste generated from economic establishments (Kg/Month)[71]

Table 25: Cost of waste, wastewater and solid waste at economic establishments (PCBS, 2011)

Hazardous waste	West Bank	Gaza Strip	WB AND GS
Solid	58,660	3,961	62,621
Liquid	421,422	2,649	424,071
Total	480,082	6,610	486,692
Gaseous hazardous waste are not presented in this table			

Table 26: : Distribution of industrial establishment by type of industry

ISIC	Economic Activity	Total no. workers	No. of establishments
D	Manufacturing	62,832	15,340
15	Manufacture of food and beverages	11,731	2,548
16	Manufacture of tobacco products	315	25
17	Manufacture of textiles	1,852	399
18	Manufacture of wearing apparel	11,494	1,867
19	Tanning of leather; manufacture of bags	2,518	434
20	Manufacture of wood and its products	1,523	564
21	Manufacture of paper and its products	727	67

70-Palestinian Central Bureau of Statistics, 2011. Environmental Economic Survey, 2011:Main Results . Ramallah - Palestine.
71- Palestinian Central Bureau of Statistics, 2011. Environmental Economic Survey, 2011: Main Results. Ramallah - Palestine.

22	Publishing, printing and reproduction	1,565	307
23	Manufacture of coke, Refined Petroleum Products And nuclear fuel	38	5
24	Manufacture of chemicals & its products	2,263	235
25	Manufacture of rubber and plastic	1,393	191
26	Manufacture of non-metallic products	10,604	1,809
27	Manufacture of basic metals	333	70
28	Manufacture of metal products	7,669	3,665
29	Manufacture of machinery and equipment	800	221
31	Manufacture of electrical machinery	262	88
32	Manufacture of radio, TV equip.	100	26
33	Manufacture of medical, optical equip.	203	101
34	Manufacture of motor vehicles, trailers	49	10
35	Manufacture of other transport equipment	20	10
36	Manufacture of furniture	7,312	2,683
37	Recycling	61	15

More than 94% of the industrial waste generated is mixed with municipal waste either at the collection stage or at the disposal stage, as 75.5% of the industrial establishments discard their waste in the nearest container, 7.3% LGU collects their waste in separate containers, and 5.9% send their waste to the nearest dumpsite. The survey further indicates that 3.4% of the establishments uses random disposal of their waste. The remaining 8% of the establishments utilizes other means of waste handling that is not clarified in the survey (Figure 12).

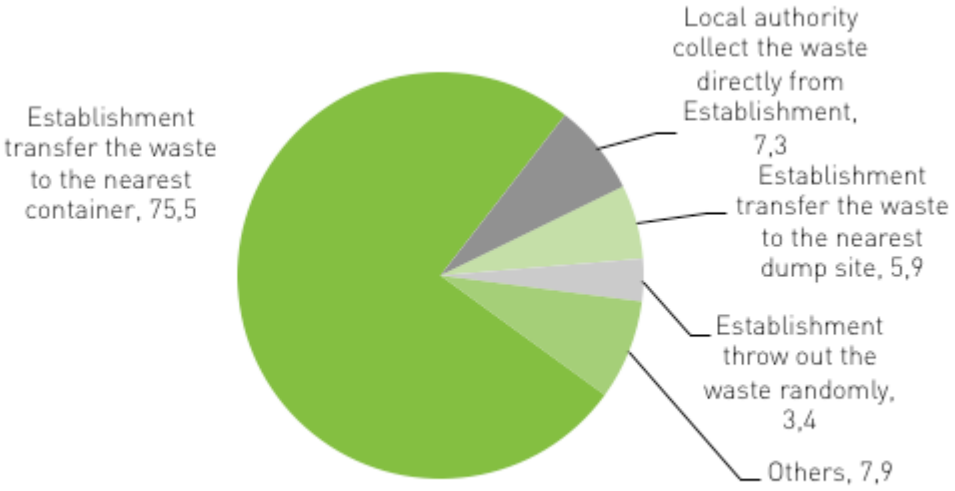

Figure 12: Handling of waste generated from economic establishments (PCBS, 2011)

It is important to note that collection of solid waste from economic establishment is mainly conducted by local authorities (or JSCs) (Figure 13).

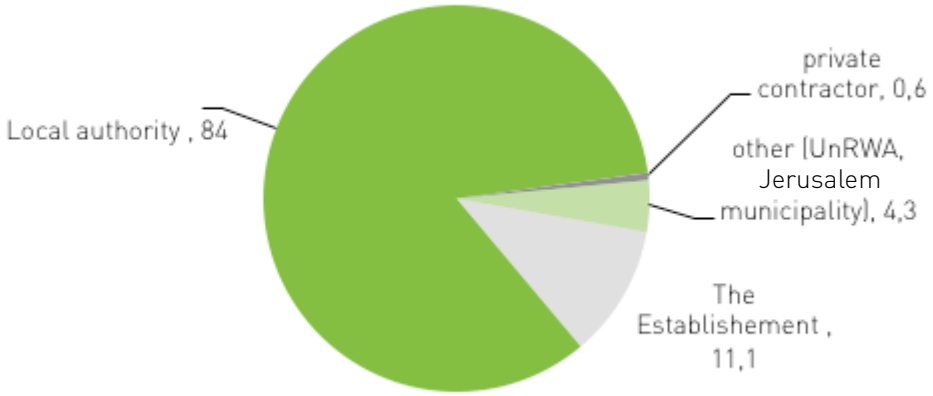

Figure 13: Economic establishments waste collection DOER (PCBS, 2011)

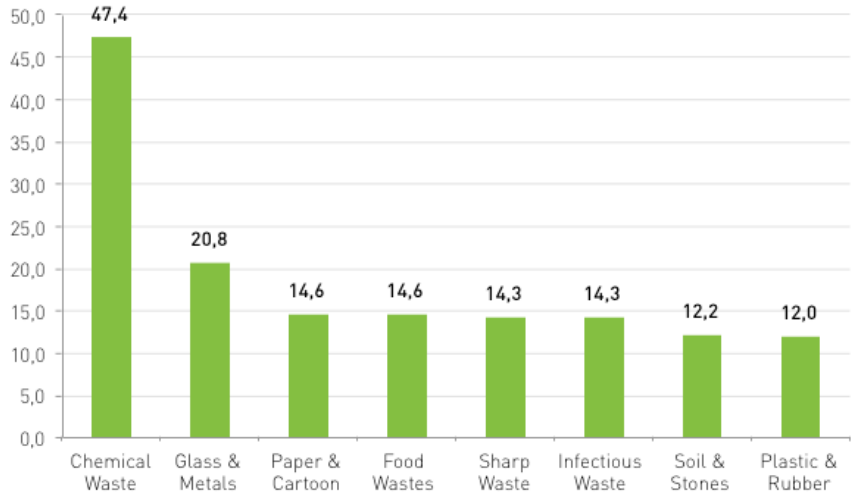

Figure 14: Percentage of economic establishment that separates waste by fraction of waste separated (PCBS, 2011)

According to the PCBS industrial survey, industries do separate some of their waste components (Figure 14). It can be observed that chemical waste separation takes place in 50% of the establishments and 14.3% separates infectious and sharp waste. Most economic establishments handles the waste manually (separated and the non-separated fraction); (figure 15).It is important to indicate that the separation does not mean necessarily that the waste is being recycled or sold or disposed of in a special manner. It has been found that most of the waste ends up in the disposal sites be it private or municipal owned. In few cases, even random disposal is practiced. Industries do not separate hazardous waste from municipal waste; furthermore those who separate hazardous waste do not have proper labeling packaging or storage of the waste within the facilities.[72]

72- EL-Hamouz, A. (2010) - Final Report on the Development of a National Master Plan for Hazardous Waste Management for the Palestinian National Authority (PNA).
Musleh, R. and NME.Abu-Rmeileh (2007). Hazardous industrial solid waste management in Ramallah city, west bank: current status and legal framework. Proceedings Sardinia 2007; Eleventh International Waste Management and Landfill Symposium, CISA publisher, Cagilari, 19. 355-356.
SAMHAN, Z., Y. ABU-SHANAB, NME. ABU-RMEILEH, and R. MUSLEH. 2008. Industrial Hazardous Waste Management in Occupied Palestinian Territory – Case Study: Ramallah Industrial Zone. Proceedings Chania 2008, 1st international Conference on hazardous Waste Management.1-3 October 2008, Chania – Crete, Greece.

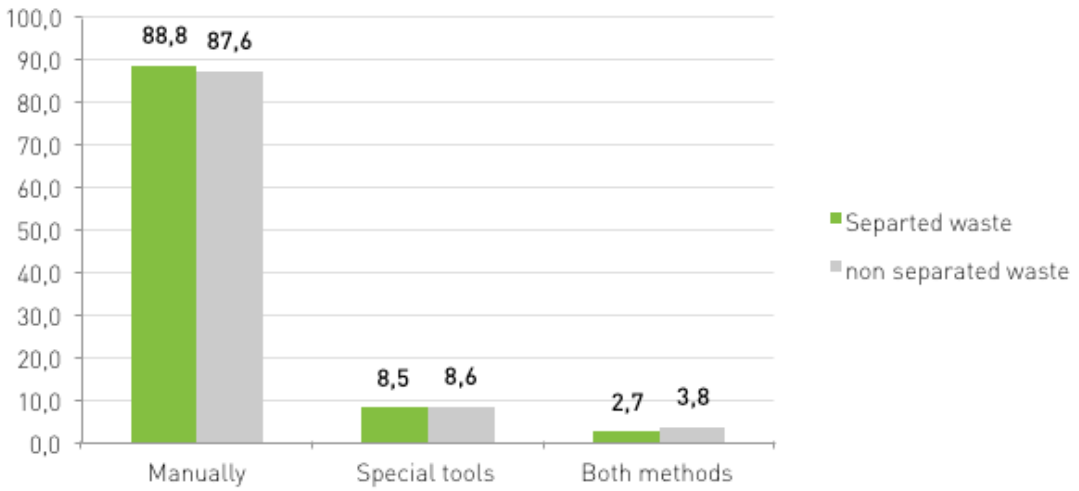

Figure 15: : Method of handling of waste in the establishments (PCBS, 2011)

Separate collection of batteries for export to Israel:

Many of the batteries are collected and sold to battery retailers who sell back to the Israeli batteries manufacturing. The batteries collectors are properly one of the few licensed contractors and transporters of hazardous waste[73].

Pharmaceutical industries– all pharmaceutical industries have ISO 14001 and GMP certificates. They dispose waste either under the supervision of MoH, or into the Israeli hazardous waste transport company, that in turn transports to the Israeli hazardous waste disposal Site (Rammat Hovave), which requires special permits from Israel environmental ministry and coordination with the Israeli occupation forces. The industries pay 8,000NIS per cubic meter. Waste disposed under the ministry of health, ensures that these wastes (especially when drugs or bad drugs are in question) will not be accessible to the public. It is important to note, that without proof of proper disposal, i.e certification from MoH or by the Israeli private sector company of hazardous waste management, the pharmaceutical industries will lose their ISO 14001 and hence will not be able to export to Europe any more.

Non operational facilities that were designed to treat hazardous waste:

1. Treatment facility in tanning industry in Hebron: an onsite liquid effluent unit to treat liquid hazardous waste of the tanning industry in Hebron was built in 2003, with the aim of separation of dissolved chrome and reusing it in the industrial process. The unit's investment cost was 100,000 USD, granted by USAID. The process leads to 99% recovery of dissolved chrome. Although this process has saved 60% of the raw chromium use in the targeted tanning industries, the unit has stopped operating in 2004 (one year after operations) due to Israeli banning of necessary chemicals used in the separation process, specifically sulfuric acid (H_2SO_4)[74].
2. Gaza city hazardous waste cell - A hazardous waste landfill cell was built in GAZA strip in 1998 with the support of EC; however the cell was never used due to lack of economic feasibility and due to lack of enforcement. Up to date, that cell is not in use (Feasibility study) - GS.
3. Mineral oil recycling industry – a plant was built in Deir Sharaf Village in the northern governorates to

73- EL-Hamouz, A. (2010) - Final Report on the Development of a National Master Plan for Hazardous Waste Management for the Palestinian National Authority (PNA).
74- EL-Hamouz, A. (2010) - Final Report on the Development of a National Master Plan for Hazardous Waste Management for the Palestinian National Authority (PNA).

recycle oil. The plant capacity is 20ton/day of recycled oil. Capital investment of this plant is 1 million USD. The plant is not in operation due to lack of expertise by the operator of the plant[75].

Hazardous waste and polluted soils generated from military activities

It is important to mention that bombing of buildings with explosives leads to debris that is contaminated and should be treated as hazardous waste. Furthermore, sites could be further contaminated by fires or the existence of chemicals at the location of bombed buildings. This is the case in Gaza strip, where between December 2008 and January 2009 over 3,000 sites were impacted by Israeli military actions leading to about 600,000 tons of debris (UNEP, 2009).The study did not conclude on how much of this debris is hazardous. Nuclear Waste from Dimona was dumped in the Palestinian Hebron area and in Gaza Strip (Eyre, 2010)[76].

3.5. PRIVATE SECTOR INVOLVEMENTSECTOR INVOLVEMENT

No private sector involvement in hazardous waste management, except for the collection of batteries and sale to Israel.

3.6. CASE STUDIES, BEST PRACTICES AND LESSONS LEARNED

A hazardous waste landfill cell was built in Gaza Strip in 1998; however the cell was never used due to lack of economic feasibility and due to lack of enforcement. Up to date, that cell is not in use. It is important to conduct feasibility study, and ensure that all system and instruments, financial, economic, infrastructure, and enforcement of law are coming together to make hazardous waste management systems work.

3.7. UPCOMING INITIATIVES

Two initiatives relevant to industrial pollution control that impacts industrial waste are taking place:

1) Plan Bleu is implementing a project Regional – Governance and Knowledge generation Project" with a fund from the World Bank. Palestine is one of the beneficiaries of the project. Environment Quality Authority is the local partner for this project. The project has initiated two assignments relevant to industrial pollution control as presented below:
   a) Inventory and Mapping of Industrial Pollution Sources in Palestine ;
   b) Supporting Industrial Pollution Abatement in Palestine (this is covering stone and marble industries).

2) UNEP – is implementing a pilot project on Pollution Release and transfer register.

75- EL-Hamouz, A. (2010) - Final Report on the Development of a National Master Plan for Hazardous Waste Management for the Palestinian National Authority (PNA).
76- Eyre (2010). Palestine – An Israeli dumping ground for radioactive/toxic waste. The Palestine Telegraph.8.June.2010. http://www.paltelegraph.com/columnists/peter-eyre/6338-palestine-an-israeli-dumping-ground-for-radioactivetoxic-waste.html

4. MEDICAL WASTE MANAGEMENT

4.1. LEGAL AND INSTITUTIONAL FRAMEWORK

Medical waste is considered according to the Palestinian Environmental Law as hazardous waste. The definition of hazardous waste in the law states: "waste generated by the various activities and operations or the ash thereof, which preserve the characteristics of hazardous substance which have no uses, such as atomic waste, medical waste, or refuse emanating from manufacturing of pharmacological products, medicines, organic solvents, dyes, painting, pesticides or any other similar substance." So, everything that is mentioned under the hazardous waste applies to medical waste. Furthermore, a new bylaw was approved in 2012 on medical waste and went in force on 27.2.2013. According to the bylaw, all institutions should correct their situation according to this law by 27.2.2014.

Medical waste bylaw for year 2012:

Chapter one - includes general issues and definitions:

Article 1 – includes definitions of medical waste, and various stages of medical waste management.

Article 2 – coverage – all institutions involved in any stage of medical waste management, or involved in medical waste generation.

Article 3 – covers primary and secondary sources of medical waste

Article 4 – identifies the roles and responsibilities of medical waste generators

Article 5 – includes issues relevant to occupational health and safety

Article 6 – includes the approval of manuals for management of medical waste within each institution that generates waste.

Article 7 – identifies the responsibility of the director of the institution.

Chapter 2 – has a detailed description and classification and characteristic of medical waste

Chapter 3 – identifies procedures for separation of waste, types and color of containers for various components of medical waste; collection of each of the following types of waste: sharps, infectious waste, chemical and pharmaceutical waste, pathological waste, radioactive waste, mixed waste, and other waste.

Chapter 4 – identifies means of storage and transport of various medical waste within an institution, including specification for storage areas.

Chapter 5 – identifies procedures, and responsibilities of transport of waste outside the medical waste generator institution. Further it includes preventive measures to be taken during transport, waste tracking, specifications of transport equipment, special conditions and reporting prior to transport and export of medical waste.

Chapter 6 – deals with treatment of medical waste, responsibility of waste generator, general conditions for waste treatment within the generator's premises, (detailed conditions to be issued by the Ministry of Environment), polluter pays principle, and that the fees for medical waste

treatment shall be identified by the owner of the medical waste treatment. Further, the identification of allowed locations for medical waste treatment should be specified by EQA in cooperation with the Local authority, and should consider that it should not cause damages and risks. Furthermore, the chapter defines the responsibilities for waste treatment units outside medical facilities, and how to obtain permits, and requirements for environmental approvals. The article defines the acceptable methods for medical waste treatment.

Chapter 7 – it discusses disposal of medical waste, and the requirements for treatment prior to disposal in sanitary landfills; further it indicates the monitoring and reporting requirements of sanitary landfill operators. The chapter has an article that specifies how to dispose of treated medical waste in the case of non-availability of sanitary landfills. Further, the articles in this chapter identify the types of wastewater that should be separated from regular wastewater, and separate treatment for the separated wastewater. The chapter specifies various preventive measures to be taken, and has articles that consider random disposal of medical wastewater as illegal act, and identify the procedures for treatment of the separated wastewater.

Chapter 8 – specifies the roles and responsibilities of the various institutions in monitoring and inspection, including the role of MoH, role EQA, role of local authorities, and role of the director of the various institutions (waste generators or managers of various steps of medical waste management) in each stage of medical waste management. Further, the chapter discusses information exchange.

Chapter 9 – discusses emergencies, plans of actions during emergencies, and how to prevent disasters.

The last chapter discusses the various options punishments in case of lack of compliance, including revoking of environmental approvals.

It is still remain to be seen, how the implementation of this bylaw will take place next year. The Ministry of Health (interview) indicated that they will enforce the law in 2014 in Hebron and Bethlehem governorate, since the JSC has already installed system for infectious waste treatment. They will start with implementation on infectious waste.

4.2. STRATEGIES AND PLANNING

A Master Plan for Healthcare Waste Management in West Bank/Gaza Strip was developed in March 2006. The master plan has laid the path for the drafting of the medical waste bylaw and for the implementation of the pilot project in Ramallah hospital complex. The master plan has conducted an estimated medical waste generation (hazardous) from hospital, described the status of medical waste management at the time, identified the various options for treatment of medical waste in the short, medium and long term. Further, it has identified the short term and long term actions required in the sector. The status of achievement is shown in Tables 27 and 28.

Table 27: Master plan for healthcare waste management short term actions and achievements

Short term actions	Status
Small autoclave in each hospital or HCF	Only in Ramallah hospital complex (one big autoclave unit for 4 hospitals); (600L) 2 units in the southern west Bank (private sector) 1 unit in Bethlehem under the directorate of MoH to treat sharps from primary care centers in the governorate of the ministry.
Ensure that all hospitals and HCFs are equipped with adequate numbers of colour coded bags for segregation and transport of HCW.	only in some hospitals.
Purchase properly designed vehicles for transport of HCW by municipalities. The exact numbers required will depend on local conditions in each municipal area.	Only in Ramallah municipality, and H&B JSC.
Provide training to HCFs staff on HCW segregation and the HCWM Guidelines, Provide training to municipal staff on safe transportation and landfill, Provide training to municipal managers on protection of groundwater and soil from leachate from HCW.	Only partially Only in Ramallah municipality, and H&B JSC. None.

Table 28: Master plan for healthcare waste management long term actions and achievements

Short term actions	Status
Examine the existing incinerators in Gaza and West Bank to determine if they are able to operate or to be refurbished, or if they need to be decommissioned and find new solution.	Current incinerators are running practically as uncontrolled that do not neither reach the necessary temperatures, nor they have an air treatment unit, all exhaust ends up to the patients' rooms.
Produce a recommendation and design for establishment of a central treatment facility in Gaza and three treatment facilities in West Bank (north, middle and south), for whenever transportation restrictions are removed. Treatment facilities shall include incinerators (and/or autoclaves, depending on the detailed design solution) and sanitary landfill disposal solutions (e.g. lined cells at existing landfills).	The strategy and the feasibility studies have identified the number of sanitary landfills. Central Medical microwave is currently available in Hebron Governorate.
Establish central treatment facility in Gaza and three facilities in West Bank, including new incinerators and/or autoclaves, following results of study. Facilities to include adequately engineered sanitary landfill solutions for HCW material.	Whether the option is one or three in the West Bank, it has yet to be identified (for hazardous waste); However, the sanitary landfills do not yet include a unit for hazardous waste management, although in Hebron, they have identified a unit for infectious waste.
Working with local municipalities, promote the development of properly engineered sanitary landfill solutions capable of accepting HCW material.	The National strategy has identified that the sanitary landfills for municipal waste are to be on a regional level (at governorate level at least); however the issue of hazardous waste cells has not finalized yet.
The HCWM Unit to implement a comprehensive inspection and monitoring plan to monitor and enforce all aspects of HCWM	There is a bylaw that has clarified the roles and responsibilities in medical waste.

The national strategy for solid waste management has addressed medical waste in its interventions to respond to the strategic objective: principles and mechanisms suitable for managing medical and hazardous, and special wastes (Table 29):

Table 29: Master plan for healthcare waste management short term actions and achievements

Policies	Interventions	Key executing agency
Treatment of medical waste before its final disposal according to "polluter pays" principle to limit its negative health and environmental impacts	Evaluate and disseminate the preliminary solutions for medical waste handling, based on the pioneer best practices of collection, transport, and treatment of medical waste in the cities of Ramallah and Gaza	MoH
	Update and implement the current plan for medical waste collection, treatment and disposal	MoH
	Establish a unified system and indicators for medical waste monitoring	MoH
	Develop a training program to elevate the capacity of institution involved in regulating and monitoring of medical waste management	MoH

As part of the project in Ramallah and Gaza (mentioned in the interventions above), the following has been developed:

1) Manual –to inspect and monitor medical waste;
2) Manual for hospitals on separation;
3) Operating manual for operating autoclave. However, further training to expand the experience to other areas was not conducted.

4.3. FINANCING

The bylaw of medical waste indicates that medical waste management should be based on "polluter pays principle". The bylaw allows medical treatment facilities to charge medical waste generators a fee. This fee does not require approval from any agency. It is based on voluntarily agreements between waste treatments facilities and waste generators. It is the responsibility of any waste generator to ensure that its medical waste is treated; it is up to the generator to do it on their own or pay for someone to do the treatment. Therefore, the bylaw, if enforced on medical institutions, will create a market for private sector to participate in the process.

The cost of treatment of infectious medical waste is currently estimated at 2.5 NIS/kg in Hebron JSC (MOH interview) (including transport and final disposal).

4.4. COLLECTION, TREATMENT AND DISPOSAL

It has been estimated that waste generation in hospitals in Palestine is about 1.3kg/day per bed[77].The total number of beds in Palestine including all governmental, non-governmental, UNRWA, and private sector is 5,414 (2011[78], with occupancy rate of 76.8%,Hence the annual generation rate of hazardous medical waste from hospitals is estimated at 1,968 tons in 2011 (Table30).

PCBS conducted an environmental survey in various years on health care centers (including hospitals) in Palestine starting 2001 until 2009. Furthermore, PCBS conducted surveys for governmental and non-governmental health care centers for the years 2007, 2010 and 2012.In addition, it has conducted one survey in 2001 for private sector health care centers. During these surveys, PCBS asked the health facility about their waste generation. Since none of the health facilities records their waste generation, the number depends on personal estimates of respondents and their knowledge of waste generation[79].

Furthermore, after 2008, data for Gaza Strip was based on estimations from prior years, due to difficulties in conducting the surveys in Gaza (Table 31).

77- Master plan for medical waste (2005)
78- Annual report of MOH (2011)
79- Palestinian Central Bureau of Statistics, 2009. Environmental Survey for Health Care Centers, 2009. Ramallah- Palestine

When comparing the results of the surveys that took place in 2004 with PCBS results of 2004 (Table 32), we notice a discrepancy of 89% between the two.

Table 30: Medical waste generation from hospitals based on the generation rate measured in the master plan for medical waste

Item	GS	West Bank	Palestine
Average generation rate of MW per hospital bed per day (2004 study)	1.306	1.290	1.297
total number of hospital beds in Palestine (2011)	2,251	3,163	5,414
Total bed occupancy rate (2011) (available only for MOH hospitals)			76.80%
Total Equivalent occupied beds (2011)	1729	2429	4,158
Total daily MW waste generation of occupied bed in hospitals per Day kg (calculated)	2,258	3,134	5,391
Annual Hospital waste Generation (calculated) ton	824	1,144	1,968
Monthly generation ton	68.7	95.3	164.0

Table 31: Medical waste generation in Palestine based on pcbs surveys (Tons per Month)

	2012	2010	2009	2008	2007	2006	2005	2004	2003	2001
Excluding private sector	376				705.5					439
Excluding private sector and excluding Gaza Strip		340								
All centers			1,201.9	990.5		426.1	472.9	380.9	512.6	
Private sector only										526.5
Waste generated in secondary centers				561	616.3	120.8	198.2	218.2	348.7	386
Percent generated by secondary centers				57%	87%	28%	42%	57%	68%	88%
Monthly generation ton	68.7	95.3	164.0							

(PCBS, Environmental Survey for Health Care Centers, various years).

Table 32: Comparison between medical waste generation estimations using medical waste master plan results and PCBS surveys

2004 data	MOH	Others	Total
Total number of beds	2735	1471	4206
Occupancy rate	81%	48%	69*%
Number of beds occupied*	2,215	705	2,920
Generation rate kg/day/bed	1.297	1.297	1.297
Waste (kg/day)*	2,873	914	3,787
Ton/year*	1,049	334	1,382
Ton/month*	87	28	115
Based on PCBS 2004 for secondary health care			218.2
Difference between PCBS and calculation based on survey for medical waste master plan*			89%

** calculated*

According to PCBS surveys, the waste generation from secondary health care centers ranged from 28% to 88%, with an average of 61%.These percentages vary a lot from one year to another, increasing the doubts of using the number from PCBS to estimate waste generation. Hence, it is recommended to present the estimation of medical waste generation based on the estimated generation rate per occupied bed that was measured during the feasibility study for medical waste. However, since this estimation was limited to generation rate from hospitals, it is important to estimate the waste generated from health care clinics as well. In order to accommodate for the primary health care centers, the average 61% contribution of secondary health care centers contribution to the medical waste is used. Hence, it can be estimated that the medical waste generated is estimated at 3,226 ton/year or 269 tons per month (2011).

Mostly, hospitals do not have medical waste treatment. Within hospitals, it can be found that one medical complex (4 hospitals) has a central autoclave. In addition, three autoclaves are available in Bethlehem governorates (private hospitals), and one autoclave in Bethlehem which is managed by MOH directorate. Three hospitals are running uncontrolled incinerators. A newly installed microwave will start operations by the end of 2013/beginning of 2014 to cover southern West Bank hospitals. A specified area for disposal of medical waste has been assigned in Jericho within the area of the sanitary landfill (but outside the landfill cell). All waste treatment and operations of these units can be found in Table 33. Medical waste other than infectious is not currently treated in Palestine.

Municipalities (or jscs) are the main institutions collecting medical solid waste (70%); furthermore, the institution itself collects the medical waste in 19% of the medical centers. It can be observed that UNRWA collects in 2% of the centers (most probably UNRWA centers in the camps), whereas the remaining 6% is collected by private contractor (Figure 16)

According to the survey of PCBS (2010) it can be observed that medical waste mostly ends in dumpsites, owned either by private or by local authorities, whereas about 1% are disposed randomly (Figure 17).

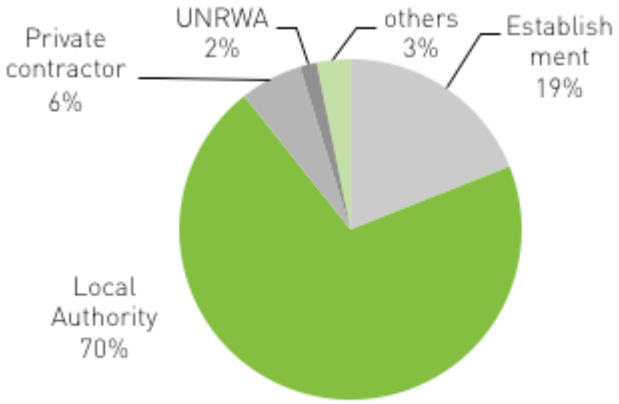

Figure 16: Doer of medical solid waste collection (PCBS, 2010)

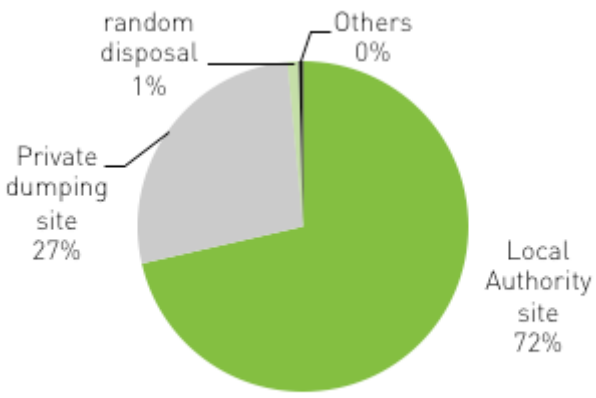

Figure 17: Location of medical solid waste disposal (PCBS, 2010)

Table 33: Medical waste treatment in palestine

Coverage area	Medical centers	Donor	Unit operators	Location	Technology	Transport	Estimate quantities	Capacity of unit	Cost (nis/kg)	Project
Ramallah complex	4 hospitals	Japan/ through UNDP	hospital	Ramallah inside the complex	Autoclave	Equip-ment for transport	250*kg/day	600L 50-75 kg/ cycle Operating* at 3 to 5 cycles per day.	(not calcu-lated, part of hospital administra-tion costs); cost of transport by municipal-ity part of overall sw costs.	Complete in operation
Hebron and Bethlehem Governorates	17 / 1311 Beds	Italian	JSC H&B	Hebron Transfer station / indus-trial zone of Hebron	Microwave	Equip-ment for transport	1000-1200kg/day	100kg/hr	2.5 (includes transport)	Installation complete, startup of operations expected by end of 2013.
Bethlehem Governorate	2 private hospitals		hospital	Inside each hospital	Autoclave	-	unknown	unknown	unknown	In operation
Bethlehem Governorate	Governmental Primary health care centers		MoH/ Di-rectorate of Bethlehem	Directorate of Health / Bethlehem	Autoclave	-	unknown	unknown	unknown	In operation
Waste Cell in Gaza	All Gaza Strip	EC	Gaza mu-nicipality	Gaza controlled dumpsite	Hazardous waste cell	None			Was not used due to high costs of opera-tions and inability of enforcing laws (no cost is available)	Not in operation, still empty
Uncontrolled incinerators in three different areas.	3 hospitals: 1. Jericho, 2. Nablus, 3. Gaza	Spain		Inside each hospital	Incinerators with no air treatment units		Unknown Jericho (40-50 kg/ week incinerated (only sharps and pathol-ogy	Unknown Jericho: 25kg/ hr; they hospital run it twice a week	unknown	In operation
Jericho	1 hospital (54 beds) +12 health centers	Japan	JSC	At the SLF	Separate Disposal in trenches at the speci-fied area in the landfill.	JSC equip-ment – skip lift of closed container (transport 2-3 times/ month)	280 kg/ month hospital Total 743kg/ month	3 trenches, each trench 3 years. already 1.5 trenches has been used. ***	unknown	In operation

**MOH provided the number of cycles, estimated quantities, capacity per cycle and size of unit.*
*** it is estimated that some of the private hospitals also operate similar incinerators. Final number is not available at MoH. As soon as the law is enforced, numbers should be automatically generated, since there is a reporting requirement in the medical waste bylaw.*
**** the area is 36mX32M the area has three trenches, 1 meter from each edge of the land, 1.5 meter between the trenches. Each trench is 1m width by 9 length. Each trench has a depth of 5 m. medical waste is covered by soil (no equipment is used to avoid damage to the waste buried. The land area itself has a fence (in addition to the fence of the landfill area.)*

The ministry of Health has a program that involves the collection of sharp boxes from all their governmental primary health care centers. The ministry ensures that these sharps are burned (the burning process is uncontrolled) to reduce risk of infections. In some areas, they send these sharps to transfer stations for municipal solid waste management.

As for occupational health and safety, the ministry of health provides free vaccination for all workers in the solid waste sector, provided that prior coordination between the municipality or JSC with the ministry has been conducted.

Most of the medical waste, regardless of its characteristics is disposed of together with the municipal waste without prior treatment. Except for few cases, such as Ramallah hospitals complex that has an autoclave, and the newly built facility in Hebron (not yet operational), medical waste is not disinfected, or processed.

4.5. PRIVATE SECTOR INVOLVEMENT

Up to date, there is limited private sector involvement in medical waste management (6% in 2010 involved in collection)

4.6. CASE STUDIES, BEST PRACTICES AND LESSONS LEARNED

The National Strategy for Solid Waste Management has identified the importance of documenting the case of Ramallah complex and disseminates the results; however this did not take place. The extent to which the system is functional is not known.

4.7. UPCOMING INITIATIVES

- Start up of operation of the project in Hebron and possible expansion to primary health care centers.
- Implementation and enforcements of implementation of the medical bylaw in southern governorates in the West Bank.

5. GREEN WASTE & AGRICULTURAL WASTE

5.1. LEGAL AND INSTITUTIONAL FRAMEWORK

There are no regulations about agricultural waste and only hazardous waste accruing from agricultural activities is regulated. There are specific articles on pesticides and insecticides in the environmental law (Articles 14 and 15) that indicates that EQA in cooperation with relevant institutions shall specify the environmental conditions for import, distribution, manufacturing, use, storage of insecticides, fertilizers, pesticides and other agricultural chemicals that could negatively impact the environment. Furthermore, the ministry will, in cooperation with relative agencies, put guidelines and specifications for agricultural chemicals that are allowed to be imported, manufactured, and distributed in Palestine. EQA should ensure that these standards are implemented. Furthermore, the agricultural law has an article that indicates that production, use, storage, distribution, and sale requires special permit from MOA and should be according to specifications of the ministry. Further, the law indicates that MOA will issue specifications to ensure proper tracking, safety of handling, and specifications of chemicals. MOA issues an annual list of permitted pesticides and insecticides.

In addition[80] to the environmental law, the agricultural law No. 2 for year 2003[81]: and its bylaws have special articles relevant to agricultural waste that are suspected with endemic and pandemic diseases. The agricultural law also provides general framework for animal diseases control (Chapter 4).Article 65 of the law, forbids discarding dead animals in the open, or in public places, and should be disposed off based on the regulations that will be set by MOA, and in coordination with respective ministries and authorities away from water resources. However, these regulations were not issued yet.

Furthermore, there are two regulations on animal diseases: 1) Law No. 43 (1945) issued by the British mandate (valid in Gaza and West Bank); and Law No. 39 for the year 1954 issued by the Jordanians and valid only in the West Bank. These bylaws define the procedures for animal disease in Palestine. The procedures in these laws are still valid, with regards to how to deal with an epizootic disease, starting from reporting, quarantine within the farm, disinfection, culling and disposal. The disposal can be conducted by the farmer on own land, or public land that does not have a fence. Also disinfection of the disposal area should take place.

Regulation on animal disease: epizootic diseases among poultry (Gaza only – 1928). The regulations identify the importance of disinfection of everything, feed, manure...etc, by either burning, or by burying in ground with quicklime. Further, the regulation identifies that disposal of culled and dead animals should be conducted local authorities either by burning or burying at a depth of one meter.

It is important to mention that since definition of solid waste in the environmental law includes agricultural waste, then all laws related to solid waste apply as well as to agriculture waste.

80- Musleh, R. (2007). Environmental Assessment and Environmental Management plan for WEST BANK AND GAZAAVIAN AND HUMAN INFLUENZA PREVENTION AND CONTROL PROJECT. August 2007. UNDP
81-Official gazette – Palestinian Facts – October 2003, Page 23-71

5.2. STRATEGIES AND PLANNING

The only strategy that addressed agricultural waste is the national solid waste management strategy (Table 34) :

Table 34: National strategy for solid waste management – Interventions relevant to agricultural waste

Strategic objective	Policies	Interventions	Key executing agency
Effective and environmentally safe management of SW services	Encouraging the reduction of SW quantities destined for landfilling	Implement pioneering projects for agricultural SW reduction and recycle in collaboration with the private sector and disseminate the relevant experience	MoA

The main challenges for composting are: lack of standards, the need to develop market for locally produced compost, and adaption of suitable technologies.

5.3. FINANCING

There is no financing for agricultural waste management at any level. Currently, compost produced from agricultural waste is sold as a product, and not seen as waste. Furthermore, manure is considered a fertilizer regardless if it is treated or not and is being purchased by farmers. Manure is the traditional and well known mean of fertilizing land.

Investment costs of composting plants for agricultural waste have been so far provided by external funds.

There are four cases reported that involve agricultural waste composting; one in the north of the West Bank (conducted by Dhinabbah agricultural cooperative); while the other three are in Gaza strip. Palestinian Friends Society (NGO) is running a composting plant in Rafah, a second project (however small in size) – a small pilot project at Beit Lahia in the north of the Gaza Strip, financed by the Italian Government, supported by CRIC (Italian NGO) and managed by the UNDP. The third composting plant of agricultural waste is located at Deir El Balah and is managed by the Ministry of Agriculture (funding source for this plant is unknown). Compost prices and costs are shown in Table 35.

Table 35: Prices and costs of compost

	Compost source	Gaza Strip	West Bank
Sale Price	Locally produced	10NIS/20kg bag =113 USD/ton ** (at 1 USD=3.55 NIS)	50 USD/ton** 12 NIS/25 kg bag of farm compost* =135 USD/ton. (compost made of a mix of manure and green waste)
Sale Price	Imported from Israel	250 USD/ton**	15 NIS per 25 kg bag = 170 USD/ton*.
Production Cost	Locally produced	68 USD/ton**	Unknown
	Manure cost		50 NIS per cubic meter*

Source:

** Musleh, R. Al Khatib, A. (2010). An assessment of solid waste sorting and recycling in the northern and southern West Bank, and identification of suitable pilot projects for implementation in Hebron and Bethlehem Governorates. IMG*

*** UNDP – PAPP; DHV ENFRA TECC (2012) Feasibility Study and Detailed Design for Solid Waste Management in the Gaza Strip January 2012.*

5.4. COLLECTION, TREATMENT AND DISPOSAL

According to the feasibility study report of Gaza Strip solid waste management, the Ministry of agriculture in Gaza has estimated total agricultural waste generation to 1200 tons per day, i.e. 440,000 tons/year. Very few of this waste is processed or composted. Agricultural waste mostly is burnt on farms, about 2% maximum in GS is being composted (Table 36). In the West Bank, the composted agricultural waste is so minimal that it does not reach even 1%. In a study conducted in Jericho (according to the study, agricultural activities in the area of the study forms 62% of the agricultural activity of the West Bank); it was concluded that the total waste generated (other than organic) in that area is 1,190,944 kg/year. This makes total West Bank production of agricultural non organic waste at 1,921 tons/year. There is no estimation of organic waste generation in the West Bank. Therefore, an estimation of the agricultural waste generated in Palestine is not possible at the time. Few composting demonstration projects are conducted by agricultural organizations. These are conducted as part of organic farming extension programs in the size of 50 kg/ per demonstration[82].

Table 36: Prices and costs of compost

Agricultural waste indicator	Value
Agricultural waste disposal in GS	
Burnt on farms (GS)	Approximately 90%
Collected by MoA (GS):	Locally produced
Used either: a) Fodder; b) fuel	Approximately 10%
Pilot composting plants in Rafah and Deir Al Balah	About 2%
Amount of compost generated	
in Gaza Strip	5,000 tons/year
Amount of compost generated in Dhinnaba (WB)	300 tons/year
Potential maximum compost application (if market exists)	
Gaza Strip	160,000??? tons/year
West Bank	unknown
Compost Sale	
Gaza Strip	To FAO and international financiers – distributed at either free or subsidized price to farmers (part of the food security programs)
West Bank -	To farmers members of the cooperative

In the West Bank, data on Agricultural Waste is limited. There was a study in Jericho and JRRV in 2006, which concluded that compost production is not feasible and it cannot be conducted by farmers due to insufficiency in experience. According to the study, green agricultural waste is mainly used as fodder and wood clippings is sold for either heating or bakery utilizing wood, or to carpenters.

5.5. PRIVATE SECTOR INVOLVEMENT

A private Palestinian company, PADICO, has developed plans to expand and operate the Beit Lahia pilot into a 3.5 ha recycling and composting plant. However, these plans have not been realized yet. In agricultural waste management, involvement of NGOs is much more significant than those of private sector, as

82- Musleh, R. Al Khatib, A. (2010). An assessment of solid waste sorting and recycling in the northern and southern West Bank, and identification of suitable pilot projects for implementation in Hebron and Bethlehem Governorates. IMG

it consists an integral part of their organic farming, food security, permaculutre, pest control, and other agricultural extension programs.

5.6. CASE STUDIES, BEST PRACTICES AND LESSONS LEARNED

None.

5.7. UPCOMING INITIATIVES

- Two initiatives might start by a cooperation of one NGO (House of water and Environment) and local authorities on composting.(EC project, still at early stages of the project, regions in discussion Ramallah and Jericho).
- Merger of the two composting sites (municipal waste and agricultural waste) in Rafah is envisaged.

6. PACKAGING WASTE

6.1. LEGAL AND INSTITUTIONAL FRAMEWORK

Packaging waste is considered part of the municipal solid waste and thus it is not addressed as a special stream in Palestine. Hence, all what applies to municipal solid waste applies to the packaging waste. Therefore, all packaging waste is collected and disposed of in a mixed manner with the municipal waste.

6.2. STRATEGIES AND PLANNING

Not applicable

6.3. FINANCING

Not applicable

6.4. COLLECTION, TREATMENT AND DISPOSAL

Not applicable

6.5. PRIVATE SECTOR INVOLVEMENT

No separate collection of packaging waste takes place as packaging waste is part of the solid waste stream, stored in the municipal solid waste containers, collected with the same vehicles, and disposed in the same location in a mixed manner. However, eight initiatives have been reported in cardboard collection and compaction in the West Bank:

- Cardboard collection in Jenin city (private sector) ;
- Cardboard collection in Hebron by JSC H&B ;
- Cardboard collection in Beituniya and Birzeit towns (Ramallah) – by private sector with the support of JSC of Ramallah and AL Bireh (3 private sectors were tried, none was to satisfactory level of the municipalities or the JSC) ;
- sorting of cardboard at Ramallah Transfer station (Private sector) ;
- Cardboard collection by JSC Jenin ;
- Cardboard collection at Sairafi transfer station (private sector in cooperation with informal private sector) ;
- Cardboard collection in Nablus municipality (partnership between municipality and private sector) ;
- Ramallah municipality collection of cardboard from big producers and sale to private sector managing Transfer station.

6.6. PRIVATE SECTOR INVOLVEMENT

There is some involvement of private sector in collection of cardboard from producers, who compact it and sale it to Israel.

6.7. CASE STUDIES, BEST PRACTICES AND LESSONS LEARNED

Not applicable

6.8. UPCOMING INITIATIVES

Ramallah Municipality took a decision to pilot a source separation of packaging waste, particularly Cardboard, metal, and hard plastics. However, implementation did not start yet.

7. CONSTRUCTION & DEMOLITION WASTE

7.1. LEGAL AND INSTITUTIONAL FRAMEWORK

- Article 10 of Environmental Law addresses construction and demolition waste. It indicates that all waste should be stored and transported in a manner that prevents environmental pollution ;
- The bylaw on buildings and zoning for LGUS does not include waste management as a requirement within the license ;
- There are no other laws relevant to construction waste.

7.2. STRATEGIES AND PLANNING

There is no financing for construction and demolition waste. However local authorities include insurance in their licensing fee. The insurance is not returned to the contractor in case of violations of the license. Some LGUs indicate in their license the location of disposal of C&D generated. In 2010, 120 to 150 NIS was paid per ton of demolition waste. The price is strongly influenced by the political situation. The price in Gaza Strip is influenced by three issues: availability of raw material; availability of demolition waste; and the amount of building projects (Feasibility Gaza). C&D is not recycled in the West Bank and there are no investments in the sector.

7.3. FINANCING

It is important to note that C&D quantities in the West Bank are not known. Collection and transport of C&D is the responsibility of the contractor (private sector) who is undertaking the works. Contractors tend to either randomly dispose C&D or dispose it of at locations assigned by the municipality, depending on the municipality license of works for the contractor. In many cases, municipalities direct these C&D to future roads. However in other cases municipalities choose a particular location and make it a C&D dump. There are no officially designated sites for C&D. The quantities recycled in the West Bank are limited to those used for the utilization of opening new streets (no record tracking of quantities in terms of volume or in terms of amounts). Furthermore, it is important to indicate that none of the sanitary landfills accepts this waste. In Gaza Strip with continued siege and limitations in construction materials, almost all C&D is recycled.

7.4. COLLECTION, TREATMENT AND DISPOSAL

Only one strategy addressed construction and demolition waste (Table 37)

7.5. PRIVATE SECTOR INVOLVEMENT

In 2010, approximately 1,000 people were involved in collection of debris throughout Gaza along the streets with donkey cards. This is mainly part of the informal sector. By now, almost all of the construction and demolition waste is collected and reused in Gaza Strip.

7.6. CASE STUDIES, BEST PRACTICES AND LESSONS LEARNED

None.

7.7. UPCOMING INITIATIVES

None.

Table 37: Strategic interventions relevant to C&D

Strategic objective	Policies	Interventions	Key executing agency
Principles and mechanisms suitable for managing medical, hazardous and special waste	Minimizing the negative health and environmental impacts of special waste	Formulate directives and standards for the collection, transport, recycle, and treatment of construction and demolition waste	EQA
		Implement pioneering projects in the field of reuse and recycle of C&D in collaboration with the private sector	MoLG
		Document and disseminate best practices in waste recycling	MoLG
		Take preventive measures by removing randomly disposed special waste and dispose of it in designated locations	MoLG

8. WASTE TYRES

8.1. LEGAL AND INSTITUTIONAL FRAMEWORK

Waste Tyres is considered part of the industrial waste and thus it is not considered as a special stream in terms of special regulations[83]. The procedures (2011)[84] for licensing maintenance workshops for vehicles issued by the Ministry of Transportation do not include any provisions on waste management.

8.2. STRATEGIES AND PLANNING

The national strategy for solid waste management (2010-2014) identified one intervention related to tyres that is: "Implement pioneering projects in the field of reuse and recycle of tires in collaboration with private sector (Table 38)".

8.3. FINANCING

No disposal or treatment fees are placed on tyres neither at the time of purchase nor at the point of disposal. There is only a pilot project for tires' recycling in the Southern area of the West Bank. The plant was given as a grant from the EC in the amount of 116,000 Euro (for metal separator and shredder of tires). The JSC also paid about 20,000 USD as civil works for the site. The capacity of the equipment is 10 tons/day. Currently, it is operating with a capacity of 3 tons per day. The JSC recovers 5% of small tires and 20% of bigger tyres as metal, which is sold to metal middle men according to the market price of metals. The rest is sent to the rubber shredder. The shredded tires are sold to an asphalt industry at a price of 400 NIS/ton delivered to the industry that is 2 km away). The collection is done by JSC. The exact cost calculation was not done yet at the JSC (operational costs of the machinery excluding transport of product and collection of tires is at about 150 NIS/ton); nevertheless, the JSC feels that the plant achieves cost recovery, as transport is being conducted with equipment already used for various solid waste management aspect and distances are not far.

8.4. COLLECTION, TREATMENT AND DISPOSAL

A generation rate of rubber from wasted tyres was estimated in the master plan for hazardous waste based on 2008 data of vehicles' number in the West Bank. The same methodology was used to update the number, using 2011 data for the West bank and 2010 data for GS. The number of vehicles in GS is assumed that has not changed in one year due to closure on Gaza strip and limitations of legal entry of vehicles and spare parts to GS from the formal crossings. Hence, the estimated generation rate of rubber from wasted tyres in 2011 is 5,550 tons/year. Calculations are presented below in Table 39 .

There is no treatment of tyres in Palestine. Informal sector burns tyres to recover the metal from them. This leads to significant environmental and health impacts. There is no quantification on the number of tyres burned by the informal sector, nor on the number of persons working in this sector. Some of the tires used, are fixed in local industries to produce used tyres for sale. These tyres are used again on cars,

83- *http://www.mot.gov.ps/Portals/_Rainbow/Documents/Guide/Transport_Tech_001.pdf*
84- *http://www.mot.ps/ar/files/pdf/procedures_guide/engineering_guide.pdf*

however their life time is limited (one factory in Ramallah). The JSC of Jenin is using some of the tyres to stabilize the slopes of the sanitary landfill. The sanitary landfill receives the tyres, as there is no other option for their treatment and/or recycling, they store them on site, until some national solution is found. Tyres are not allowed inside the cells of the sanitary landfills. Similarly, Jericho landfill does not allow tyres inside the site, however, if tyres were found they are stored inside the premises of the SLF. The sanitary landfill of Jericho utilizes semi aerobic treatment of solid waste, and hence the venting wells are protected with tyres from the heavy equipment working on the face of the landfill. Some NGOs utilize tires in the development of children play grounds. However, the amount utilized in these playgrounds is negligible in comparison to that generated.

Currently, the JSC H&B is in the process of piloting tyres recycling. The JSC in Hebron has imported equipment that recovers the metal from the tyres and shreds the rubber. Tires are accepted at JSC H&B, at the transfer station of Hebron, as part of this pilot project. The shredded waste is being used to pave sidewalks and playgrounds. The project has integrated one of the informal sector persons engaged in waste picking in the operation of this shredder. The plant is currently in its initial operation, and it is processing 3 tons per day.

Table 38: Interventions in the national strategy relevant to waste tyres

Strategic objective	Policies	Interventions	Key executing agency
Principles and mechanisms suitable for managing medical, hazardous and special waste	Minimizing the negative health and environmental impacts of special waste	Implement pioneering projects in the field of reuse and recycle of tires in collaboration with the private sector	MoLG (undergoing currently in JSC H&B)
		Document and disseminate best practices waste recycling	MoLG
		Take preventive measures by removing randomly disposed special waste and dispose of it in designated locations	MoLG

8.5. PRIVATE SECTOR INVOLVEMENT

One person of the informal waste pickers was integrated in the shredding plant at Hebron. Asphalt mixing industry is purchasing shredded tires. Workshops for tire repairs (private) are cooperating in giving the JSC the used tires.

8.6. CASE STUDIES, BEST PRACTICES AND LESSONS LEARNED

The case in Hebron is at early stages to give results and lessons learned.

8.7. UPCOMING INITIATIVES

None.

Table 39: Estimation of generation rate of wasted rubber from tyres.

Unit	Kg*	no.	ton/year	no.	ton/year	no.	no.	no.	ton/year	ton/year
Region		WB	WB	WB	WB	Palestine	GS	WB	GS	Palestine
year		2008	2008	2011	2011	2010	2010	2010	2010	2010 GS/ WB 2011
private care	5	65,207	326	100,406	502	116,704	30,830	85,874	154	656
taxis	5	8,412	42	8,706	44	11,457	2,841	8,616	14	58
motorcycles	5	266	1	373	2	14,386	14,083	303	70	72
private buses	100	364	36	595	60	884	385	499	39	98
public buses	100	793	79	938	94	1,081	230	851	23	117
Trailers and semi trailers	200	296	59	910	182	842	149	693	30	212
agricultural tractors	100	728	73	921	92	1,566	736	830	74	166
road tractors	200	27	5	325	65	317	2	315	0	65
trucks and commercials	100	19,839	1,984	24,999	2,500	34,286	11,172	23,114	1,117	3,617
other vehicles?	200	804	161	471	94	943	473	470	95	189
total		96,736	2,767		3,634				1,616	5,250
Estimated Unregistered vehicles	20	15,000	300							300
Total estimated										5,550

**Kg of wasted per year per vehicle*
Source:
1) Palestinian Central Bureau of Statistics 2011, Transportation and Communication Statistics in the Palestinian Territory: Annual Report 2010. Ramallah-Palestine.
2) Palestinian Central Bureau of Statistics 2012, Transportation and Communication Statistics in the Palestinian Territory: Annual Report 2011. Ramallah-Palestine.
3) EL-Hamouz, A. (2010) - Final Report on the Development of a National Master Plan for Hazardous Waste Management for the Palestinian National Authority (PNA).

9. OIL & LUBRICANTS WASTE

9.1. LEGAL AND INSTITUTIONAL FRAMEWORK

Oil and lubricants waste are part of the hazardous waste; all what applies to hazardous waste; applies to oils and lubricants.

9.2. STRATEGIES AND PLANNING

Oil and lubricants waste are part of the hazardous waste; all what applies to hazardous waste; applies to oils and lubricants.

9.3. FINANCING

No special financing.

9.4. COLLECTION, TREATMENT AND DISPOSAL

According to the draft master plan on hazardous waste, total generation of used mineral oil from vehicles is 20,000 ton annually. Combined with contaminated filters with oils and lubricants, the estimated used mineral oil and lubricants is 29,400 ton per year (2010). The draft master plan indicated that the oil is not used and spilled, however in many workshops they are collecting and selling the used mineral oil to private sector. The final use or disposal by the private sector is unknown. Several cases of illegal burning of this used oil in bakeries were reported. Furthermore, the glass industry that produces handcrafted glass uses this mineral oil as well. Further the draft plan was able to estimate the fate of the oil as follows:

- 20% of used oil is illegally dumped or disposed in sewerage ;
- 10% is used burned in traditional bakeries, stone factories, and metal processing factories ;
- 70% is sold to Tahina factories for a price ranges from 120-160 NIS per barrel to be used as source fuel.

The burning process of oil is not properly controlled or regulated in Palestine. Emissions resulting from burning this oil contain SOX, NOX and lead, remain untreated. Cross contamination to produced food is not tested. In the past, a private sector invested about 1 Million USD in a plant in the northern parts of the West Bank (Dier Sharaf) to produce 20 tons/day of recycled oil; the plant has been out of operation for years (about five at least) due to inability of the operator to run it. As a result, all used mineral oil is currently handled improperly.

9.5. PRIVATE SECTOR INVOLVEMENT

Management is taking place by private sector; oily waste is illegally sold, illegally burned.

9.6. CASE STUDIES, BEST PRACTICES AND LESSONS LEARNED

Not applicable

9.7. UPCOMING INITIATIVES

None.

10. E-WASTE

10.1. LEGAL AND INSTITUTIONAL FRAMEWORK

According to the definition of hazardous waste in the environmental Law 1999, E-Waste is hazardous waste. Hence, all aspects addressed in the legal and institutional framework of hazardous waste applies to the E-Waste. No special articles on E-waste.

CEDARE has classified some Arab countries based on their E-Waste management into five categories: level I – low, Level II, Level III, Level IV, Level V – High, where Level I is the least developed and Level V is the most developed with regards to e-waste[85].

The Palestine situation with regards to management of e-waste was not classified during this initial assessment. Utilizing the same classification of CEDARE it can be found that Palestine is at level I in all aspects, legal framework, inventory, collection, recycling and reuse (Table 40). Furthermore, it is important to include another item in the evaluation relevant to monitoring and tracking of waste. This is missing in Palestine, even for the items that are collected to be sold and exported.

Table 40: Classification of the developmental level of E-Waste management in Palestine

Item	Status in Palestine	Level according to CEDARE classification
Legal Framework	No legal framework, strategy, or norms	Level I
Inventory	No Inventory	Level I
Collection	There is no collection	Level I
Recycling & Reusing Technology	There is no recycling/reusing mechanism	Level I

10.2. STRATEGIES AND PLANNING

All aspects identified in hazardous waste section are relevant to this section; as e-waste is classified as hazardous waste.

10.3. FINANCING

There are no taxes, tariffs for e-waste, neither at the points of purchase, nor at the disposal points.

10.4. COLLECTION, TREATMENT AND DISPOSAL

White goods are the only e-waste component that is being collected in Palestine. The total amount of white goods collected is unknown. Also the total number of collectors is unknown. Purchasing of white e-waste from source is becoming a formal business. There is no clear knowledge of the fate of these white goods. Many of these goods are purchased and being sold to middle men, then dismantled and metals is exported to Israel or Jordan. There is no control over the separation activities taken place in Palestine.

85- Hossam All aE-waste Management in the Arab Region: Status and Opportunities (CEDARE).

"Illegal e-waste imports have caused fertile land to have been converted to electronic graveyard"[86]. It is estimated that Idhna receives 200-500 tons per day (Hebron governorate). This case is not unique as similar practices can be observed in other communities such as Al Kum and Beit Maqdum and Al Yassaria. The example of Idha has been discussed in detail in a special study conducted by ARIJ. In Idhna there are 55 recycling establishments, with average number of engaged persons ranging from 12-38 workers (ARIJ). The size of these workshops is considered moderate to big in terms of Palestinian establishments, since 90% of Palestinian establishments have less than 5 workers involved. According to ARIJ, there are over 1,000 workers involved in the e-waste recycling sector, of which many are under the age of 16. Furthermore, illegal open burning in vacant land is common in the town as a quick means to collect the metals from e-waste. Idhna establishments deal mainly with the illegally imported waste in the West Bank. According to the environmental law, import of hazardous waste is a crime that is punished with life imprisonment. Legal, environmental and social monitoring are clearly lacking in this area. It is further important to note that these towns are located in Areas classified as "C" in OSLO. While waste illegally exported is being "recycled" in a non-environmentally manner, and in a manner that is negatively impacting health and social aspects (child labor), Palestinian e-waste, remains uncollected, and being disposed together with municipal waste.

Even though there is no inventory for e-waste, it is estimated that the amounts of e-waste are rapidly increasing. Official statistics on households owning various electronic equipments is on the rise (Table 41). For example, the number of households owning a computer has doubled between 2004 and 2011, whereas almost all household have TV sets. The percentage of households in 2004 which had TV set was already in about 94%, probably many of these households have replaced on in the process of replacing these TV sets. These numbers, although indicative of fast progress in terms of technology and communications, it is alarming on the increasing amounts of e-waste in Palestine, which is not yet addressed.

In 2011; there were already more than 2.9 million mobile subscribers in Palestine, and 65% of the population above 10 years old has mobile phones. It can be observed that mobile subscriptions are increasing exponentially. Furthermore, with rapid change and development in the mobile technology, it can be assumed that many of the older subscriptions have replaced their older phones into newer models and features. This means, that older phones are being discarded of into the waste stream, however the number of quantities of these discarded phones is not estimated.

Inventory on e-waste is not available yet, however all figures above indicate that there must big quantities of e-waste generated in Palestine. Furthermore, there is a lack of policies, legislations, and institutional arrangements to deal with e-Waste. All these factors combined should be seen as a warning sign for a problem that requires urgent addressing and special attention.

Furthermore, the table below shows that the use of electrical and electronic devices is also increasing significantly over the years. These all call for an immediate action to quantify the electronic waste generated and develop national institutional and legal setting to handle this hazardous waste problem.

The Report on the Development of a National Master Plan for Hazardous Waste Management was not able to quantify the e-Waste generated in Palestine, however it has indicated that e-waste if collected by municipality is discarded with the rest of the municipal waste and ends up in either dumpsites or the sanitary landfills. Some of the E-waste is recycled (there is no quantification or estimation of the number of recyclers in e-waste except for the information provided by Arij in Idhna).The hazardous master plan has indicated that the electronic devices are being practically disposed of outside the maintenance workshops, thus leaking their hazardous content into the soil.

86- http://www.arij.org/files/The%20impacts%20of%20electronic%20waste%20disposal%20in%20the%20occupied%20Palestinian%20territory.pdf

Table 41: Availability of technological equipment at households in Palestine for various years (PCBS)

PCBS (2011) [90]	2011	2009	2006	2004
Percentage of Households with Own Computer	50.9	49.2	32.8	26.4
Percentage of Households have TV sets	96.7	95.7	95.3	93.4
Percentage of Households with DVD	20.4	21	10.4	
Percentage of Households have a satellite dish in households with a TV set	93.9	92	80.4	74.4
Percentage of Households have Mobile Line	95	92.4	81	72.8
Number of Computers Per 100 Inhabitants	10.4	9.3	5.7	
Percentage of Households having a Printer	10.7			
Percentage of Households having a Digital Camera	12.2			
Persons 10 Years and Over with a Mobile Phone	65.2			
Number of mobile phone subscriptions	2,884,964			

10.5. PRIVATE SECTOR INVOLVEMENT

Heavily involved – recycling of e-waste – however no records available.

10.6. CASE STUDIES, BEST PRACTICES AND LESSONS LEARNED

None.

10.7. UPCOMING INITIATIVES

Environmental governance in e-waste management – The case of IDHNA. A project to be implemented by ARIJ.

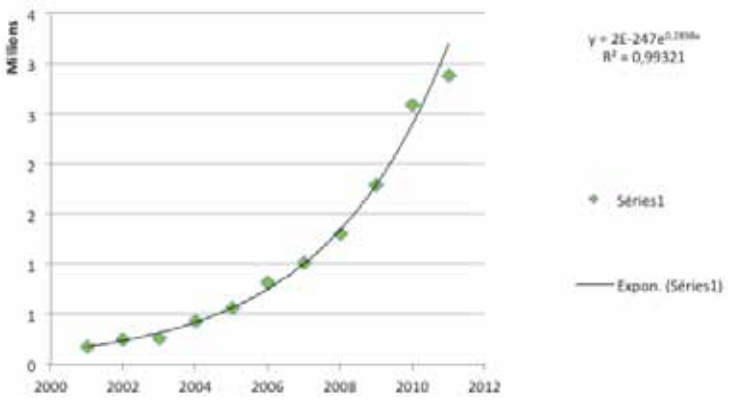

Figure 18: Number of mobile subscribers various years data (PCBS)[88]

87- Source: Palestinian Central Bureau of Statistics, 2011. Household Survey on Information and Communications Technology, 2011: Main Findings. Ramallah - Palestine.
88- Source: PCBS (2012). Transportation and Communication Statistics in the Palestinian Territory: Annual Report 2011. Ramallah, Palestine.

11. INTERNATIONAL FINANCIAL ASSISTANCE PROGRAMS (BI-, & MULTINATIONAL)

Donors are playing an important role in the field of development of the solid waste management sector in oPt. They started early their support to the sector since the establishment of the Palestinian National Authority. The donors mainly supported the fields of building the infrastructure like regional sanitary landfills and transfer stations, providing the vehicles and equipments to the local authorities, developing the capacities of the local authorities and the JSCs, and developing the capacities in the national strategic planning. The donors started to act in more organized and cooperated way since the establishment of the sector working groups by the Palestinian National Authority. The solid waste thematic sub working group was one of those groups that include the main national stakeholders in addition to the donors of the sector. Unfortunately, this working group has not convened for the past two years. The total funds that have been donated in the sector of solid waste management are about 72 million USD since year 1994 till 2008 [89].
The main donors in the sector could be listed as follow[90],[91],[92]:

The German Government: The German Government through its organizations, GIZ and KFW started its support to the solid waste management since 1994. One of the projects targeted the solid waste management in the middle Gaza. The other main project funded by the German Government was the solid waste management program in the oPt, which was executed on national and local level; Construction of sanitary landfill of Ramallah and Al Bireh Governorates (partial fund) with 14 million Euro was one of the main components.

The World Bank: It was active in the funding of the construction of the sanitary landfill in the north of the West Bank (Zahret Alfinjan sanitary landfill). In 2010 it started funding the construction of sanitary landfill in the southern part of the West Bank (Hebron and Bethlehem governorates), and it is expected to start operation in 2014. The project estimated cost is at 20 million USD. The World Bank is financed 12 million USD of the total estimated cost. It is worth mentioning that this project includes a component on pilot recycling "Innovation Window for Waste Recycling and Composting" funded by EC with about 1 M €.

European Commission: It has funded equipment for solid waste management in 2008 for the local authorities; and additional solid waste management equipments in 2012), that include primary and secondary collection equipment, transfer vehicles and compaction units for the West Bank. The estimated value is about 5.3 million Euros. More over it is planned to fund equipments and vehicles of solid waste management for the South West Bank among the regional project there. The value is

89- National Strategy for Solid Waste Management in the Palestinian territory 2010-2014.The Palestinian National Authority, 2010, Ramallah, Palestine.
90-An assessment of solid waste sorting and recycling in the northern and southern West Bank, and identification of suitable pilot projects for implementation in Hebron and Bethlehem Governorates. Reem Musleh and Ammar Al-Khatib, IMG, July 2010.
91-An assessment of solid waste sorting and recycling in the northern and southern West Bank, and identification of suitable pilot projects for implementation in Hebron and Bethlehem Governorates. Reem Musleh and Ammar Al-Khatib, IMG, July 2010.
92-The solid waste management thematic working group, Donors mapping (last updated January 2011).

estimated about 4-5 million Euros. That in addition o 3 million Euros equipment for West Bank for collection and transfer issues. In total it is estimated that EC has donated about 14 million Euros since 2008 into various equipments for solid waste collection, transfer and recycling.

The Japan Government: Japan has funded the construction of the sanitary landfill in Jericho, the institutional development of Jericho JSC, and the funding of the Jericho JSC strategy development among the project of solid waste management in Jericho and Jordan Rift Valley (2005-2010). That was in addition to provide equipment for solid waste management in the West Bank through the UNDP (2007-2010). Moreover it financed through the UNDP the project of medical waste management in Ramallah District (2005-2011). On the other hand the Italian cooperation did find projects related to employment generation through solid waste management in Gaza Strip (2006-2009). Removal and crushing of the debris and the construction waste in Gaza is among the projects being supported by the Italian cooperation (2010-2012).

AFD – co-financing of solid waste landfill in Gaza Strip and a major contributor to MDLF who in turn can fund some solid waste investment projects for local authorities.

Sweden – Co-financing of solid waste landfill in Gaza, and a major contributor to MDLF who in turn can fund some solid waste investment projects for local authorities.

Islamic Development Bank: Co-financing sanitary landfill in Gaza and construction of transfer station, storage/maintenance workshop in Bethlehem governorate.

12. INTERNATIONAL ASSISTANCE PROGRAMS (BI-, & MULTINATIONAL)

THE GERMAN GOVERNMENT

The German government provides technical assistance programs in the solid waste sector, mainly through KFW, as part of their accompanying measures to investments programs. In the past, GIZ was the main technical assistant program in solid waste in Palestine. The GIZ support to the PA in development of the National Solid Waste Management Strategy that was approved in 2010, as well as the solid waste management project in the northern Gaza Strip, and previous support to the JSC or Ramallah and AL Bireh Governorate. Currently GIZ role in technical assistance to solid waste was reduced from a full project to a sub component that covers only one developmental advisor and some activities in awareness.

UNDP

UNDP is implementing on behalf of various donors environmental projects, including solid waste projects in both the West Bank and Gaza. Many of the projects implemented by UNDP include technical assistance components, for example the medical waste project in Ramallah included capacity building programs for the system, support the national government in drafting of the medical waste bylaw. Further, UNDP funded the establishment and operation of the composting facility in Rafah that is managed by an NGO.

ITALIAN COOPERATION

Italian Cooperation has been supporting waste management in the Hebron and Bethlehem governorates. It financed a transfer station in Hebron (in 2010) with its respective equipment, waste collection containers, and various capacity building projects. Italian cooperation has financing two projects; one is for improving solid waste management and composting in Beit Lahya area in Gaza Strip, the other is improving the solid waste management in Wadi Shaeer Joint Service Council in the west Bank. Italian cooperation financed the project on medical waste in southern West Bank. All projects of the Italian cooperation are part of technical cooperation, rather than financial. These are mostly coming from either twinning agreements with municipalities in Italy, or from the municipal support program.

WORLD BANK

The World Bank is playing the technical assistance role to the thematic sub sector working group in solid waste management; also it provides some parts of its financial assistance to components of technical assistance.

EUROPEAN COMMISSION

The technical assistance provided by EC is mainly coming from the regional programs, which Palestine is a beneficiary. These include Horizon2020 and ENP-SEIS.

13. NEEDS ASSESSMENT FOR CAPACITY DEVELOPMENT UNTIL 2015

Establishment of environmental waste monitoring, inspection, compliance and reporting to be implemented by EQA and operators:

- Provision of equipment for environmental monitoring ;
- Accreditation of laboratories ;
- Develop the environmental knowledge in waste management facilities and means to reduce and prevent environmental impacts and means to implement and report on the environmental management plans agreed upon during the licensing process ;
- Capacity building on gas collection techniques, landfill gas emissions, treatment of landfill gas, and monitoring ;
- Development of local, regional (governorate level), and national levels environmental waste management information systems ;
- Development of complaints management systems on environmental issues related to waste management ;
- Formulation of indicators to monitor the environmental impacts of SW on air, surface water, and groundwater and soil ;
- Creation of environmental reporting system for waste facilities ;
- Develop standards and environmental operational guidelines for sanitary landfills and transfer stations ;
- Training on closure of random dumpsites and their monitoring after closure ;
- Formulation of standards to collect, treat, and use landfill gas emitted from sanitary landfills ;
- Training and capacity building for industries and monitoring authorities on hazardous waste handling ;
- Training and capacity building programs for medical waste generators, operators, and monitoring authorities on medical waste management.

Establishment of research and development on various aspects of solid waste management and develop the higher education curricula to allow introduction of solid waste management aspects in the curricula.

Financial sustainability of solid waste management at provider's level (LGU and JSC):

- Introduction of cost centers for solid waste management ;
- Development of tools and manuals on calculation of costs and tariffs (solid waste fees on producers) ;
- Capacity building on costs and tariff identification ;
- Capacity building to develop and implement strategies to achieve full cost recovery.

Training to develop capacities in Technical Operations of solid waste:

- General trainings targeting labor, drivers and other operational staff including on aspects: types of waste, the daily handling of solid waste, relation of waste with environment and health issues, and the occupational health measures ;
- Advanced training targeting managers of operations and governmental agencies: on separation of solid waste, treatment and recycling, landfill operation and management, sanitary landfill construction, applying standards and specifications, closure and rehabilitation of random dumpsites, and development of plans for solid waste management.

Increasing environmental governance in waste management:

- Development of the legal framework, drafting and working on laws and regulations relevant to various aspects of waste management ;
- Establishment of standards for compost ;
- Capacity building to the justice sector on solid waste management issues to support laws enforcement ;
- Support agencies in increasing community participation in solid waste management decisions ;
- Enhance awareness of communities on various aspects of SWM.

Hazardous waste management:

- Develop the legal and institutional framework for hazardous waste management ;
- Conduct an inventory on e-waste.

Construction and Demolition waste

- Conduct an inventory on C&D waste ;
- Develop a policy paper to address C&D.

14. CONCLUSION& RECOMMENDATION FOR SWEEP-NET ASSISTANCE

- Develop standards and environmental operational guidelines for sanitary landfills and transfer stations ;
- Review and amend the drafted bylaw on solid waste management to address new developments in the solid waste sector ;
- Capacity building to the justice sector on solid waste management issues to support laws enforcement ;
- Conduct inventory on e-waste ;
- Conduct inventory on C&D waste.

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