



# Report on the Solid Waste Management in MOROCCO

April 2014



The regional solid waste exchange of information and expertise network in Mashreq and Maghreb countries

**COUNTRY REPORT ON THE  
SOLID WASTE MANAGEMENT IN**

**MOROCCO**



April 2014



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Prepared

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# COUNTRY PROFILE on solid waste management situation in MOROCCO

April 2014

## BACKGROUND INFORMATION

Population:	32.95 million
Municipal Solid Waste (MSW) Generation:	6.852 million tons
Per Capita MSW Generation:	
- Urban areas	0.76 kg/day
- Rural areas	0.3 kg/day
MSW Generation Growth:	1.36 %
Medical waste generation:	21,000 (2010) tons/year
Industrial waste:	1.6 million tons/year
Hazardous waste:	289,385 tons/year
Agricultural waste:	n/a tons/year
C&D Waste:	n/a tons/year
Waste Tyres:	n/a tons/year
e-Waste:	30,300 tons/year
Packaging Waste:	55,000 tons/year

## TECHNICAL PERFORMANCE

### Municipal Waste (2013)

MSW Collection Coverage: (% of volume)	
- Rural areas	n/d
- Urban areas	85 %
MSW Final Destination:	
- Composted	<1 %
- Recycled	8 %
- Landfilled	37 %
- Openly dumped	52 %
Total number of landfills:	220
Number of Controlled Landfills:	15
Number of Sanitary Landfills:	
- Planned	60
- Under construction	5
- Constructed	-
- Operational	11

### Hazardous and industrial Waste:

Number of hazardous landfills or plants (Chemical and physical treatment):	18
- Public facilities	None
- Private facilities	18
- Planned (public)	4
Types of disposal and treatments for Medical waste:	21 operational shredders - sterilizers acquired by hospitals and private companies; autoclaving; incineration

n/a = not available

## Policy and planning environment

Morocco has undertaken a series of strategic actions to reform the waste management sector, such as: strengthening of the legal framework, implementation of solid waste management (SWM) programs, support for the National Household Solid Waste Program (PNMD), development of a national master plan for hazardous waste management, and reform of local taxation.

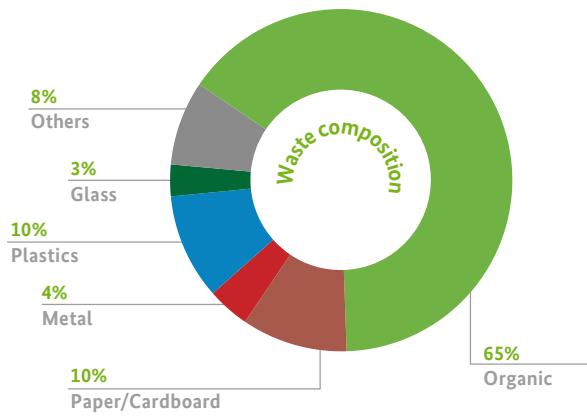
## Legal framework

- Law 28-00 on solid waste management and disposal adopted in 2006 governs and provides the general framework for the sector in Morocco;
- Application decrees and Dahirs support promulgate Law 28-00, and some are specific to certain waste streams;
- In addition, Morocco has adopted international and bilateral agreements that concern waste and the environment, such as the Montreal Protocol, the Kyoto Protocol, and the Protocol on the Prevention of Pollution of the Mediterranean Sea, the Basel Convention, the Stockholm convention on POPs.

## Institutional framework

### Household waste:

- Municipalities: responsible for municipal waste management;
- Ministry of the Interior / General Directorate of Local Authorities / Water and Sanitation Department (MoI /DGCL / DEA): technical and financial support;
- Ministry of Energy, Mines, Water and Environment / Department of Environment (MEMEE / DE): coordination, planning, monitoring and regulation.



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### Industrial Waste:

- Industrial sector: responsible for the management of their produced waste ;
- Ministry of Industry, Trade and New Technologies: promotion of waste recycling sectors, control and monitoring of cross-border flows.

### Medical waste:

- Managed by the Ministry of Health;
- Healthcare facilities are responsible for the management of their produced waste.

## Financial & cost recovery arrangements

### SWM Financing

- Local taxes;
- Subsidies from the government budget;
- Clean Development Mechanisms (CDM);
- The Municipal Equipment Fund (FEC).

### Costs of waste management

- Average cost of solid waste collection : 417 MAD /MT;
- Average cost of solid waste disposal in controlled landfills: 180 MAD /MT.

## Private sector involvement

**Waste collection** by private operators covers about 74% of the urban population in 106 Communes and 80% of the urban waste tonnage.

### Types of contracts:

**For collection:** Outsourcing management contracts with a major part of the investment by the subcontractor, and a portion by the municipality.

**For disposal:** BOT contracts (Build-Operate-Transfer) for the new sanitary landfills.

## Options for improvement

### Policy and Planning

- The improvement of private sector participation especially for industrial and medical waste;

- Planning and development of recycling, with a focus on sorting at the source and at the landfill site;
- Improvement of rural waste collection and disposal services;
- Structuring and support for the special waste stream sectors (waste tyres, oils, plastics, batteries, e-waste, green & agricultural waste, construction & demolition waste, industrial hazardous and non-hazardous waste, medical hazardous and non-hazardous waste).

### Financial Strengthening

- Improved funding and cost recovery mechanisms relating to waste management;
- The mobilization of additional financial resources by waste stream value chain and CDM development;
- The establishment of financial support mechanisms for private investment in projects to develop recycling and composting facilities;
- Revision of rules for payment to private operators.

### Regulatory Framework

- Implementing the national charter provisions and strengthening the legal framework by crafting and adopting the additional legal texts;
- Implementation of the Decrees issued and development of application Decrees;
- Establishment of emissions standards.

### Control and Monitoring

- The creation of adequate control structures, and monitoring the performance of private operators;
- The improvement of the Municipal Solid Waste public-private partnership agreement and terms of reference to clarify partner roles and mitigate potential problems that lead to MSW strikes and other service issues.

### Awareness Raising

- Strengthening education on solid waste management by establishing a permanent policy for awareness on solid waste management;
- Capacity building for local communities on solid waste management.

## LIST OF ABBREVIATIONS

**DE** Ministry of Energy, Water, and Environment;  
Department of Environment

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**DEA** Ministry of Interior, Water and Sanitation Department

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**DGCL** General Directorate of Local Authorities

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**MSW** Municipal Solid Waste

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**n/a** Not Available / Not Applicable

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**WtE** Waste to Energy

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## EXECUTIVE SUMMARY

Morocco has recently undertaken a proactive management policy in terms of Sustainable Development and Environmental Protection. Since the establishment in 1992 of a government department responsible for the environment, many initiatives and developments have emerged, including those relating to professional collection services, cleaning and disposal of household waste.

Support from the World Bank for the solid waste sector in Morocco with three loans of U.S.\$ 400 million has enabled the improved management of this sector, including:

- Improved professionalized collection rates by private companies in about 106 municipalities, equal to over 74% of the urban population in Morocco;
- Increased the rate of municipal solid waste disposed in controlled landfills to 37%, compared to 10% prior to 2008, 28% in 2010, and 33% in 2011;
- Created 15 controlled landfills, 11 of which are operational (Fes, Oujda, El Jadida, Essaouira, Rabat, Berkane, Figuig, Guelmim, Al Hocima, Agadir, Mohammedia-Benslmane, Nador, Dakhla, Laayoune and Khouribga) compared to 6 landfills prior to 2008, 10 landfills in 2010, and 13 in 2011;
- 6 controlled landfills are being built (Ifrane, Ouarzazate, Casablanca, Safi, and Tata);
- 26 uncontrolled landfills remediated to date, compared to 13 prior to 2010, and 19 in 2011;
- Waste pickers inclusion initiatives for the systematic consideration of social concerns at each level of the solid waste management (SWM) system.

During the last three years, both KfW and GIZ through German cooperation provided significant support for the industrial and hazardous waste sector to establish a National Hazardous Waste Plan and National Hazardous Waste Treatment Center (CNEDS), as well as a significant increase in private sector involvement in the management of medical waste. Considerable efforts will be required to structure the hazardous waste sector, including the following waste streams: industrial waste, medical waste, e-waste, construction and demolition waste, packaging waste, tire waste, and oils and lubricant waste.

The future National Hazardous Waste Treatment Center will provide Morocco with a better visibility of its hazardous waste stream in terms of quantity and content. It will also drastically improve the environmental management for collection, treatment, recycling and disposal. Today, only 8% of industrial waste is disposed of through the private sector. The remaining 92% is handled by the informal sector either in unauthorized dumps, controlled landfills for municipal solid waste, or it is stored.

## 1. INTRODUCTION

### 1.1. SOCIO-ECONOMIC AND POLITICAL SITUATION

The Arab Spring that has swept through the Middle East North Africa (MENA) region has largely bypassed Morocco, which has been spared of much of the violence and uprisings that have taken place elsewhere such as in Egypt or Libya. In 2011, in response to a call by the civil society for democratic reforms, His Royal Highness King Mohammed VI initiated deeper political reforms including a referendum on a constitutional reform. Following the referendum that was approved by the vast majority of the voters, parliamentary elections were held in November 2011, bringing the PJD to power, an Islamist party that had already been a recognized opposition party. These events have helped Morocco to gradually transition into a more democratic system.

The development and the socio-economic and urban dynamics that Morocco has experienced have encouraged the Kingdom to confront its waste problem and initiate reform of the solid waste sector. In 2006, the government enacted the first Solid Waste Law. The Kingdom of Morocco has set up an integrated strategy that includes a legal and institutional framework, the allocation of financial resources, and strategic plans and initiatives. It has developed a collection, treatment, sorting, storage, disposal and recovery system, which takes into account the specificities of the waste as it pertains to:

- Techniques (type and characteristics of the waste, collection techniques adapted to urban needs, the development of landfills, treatment process, recovery methods, etc.);
- Human and socio-economic issues (taking into account people living directly or indirectly from the recovery and recycling of waste, creation of new jobs, etc.).

### 1.2. SOLID WASTE FACTS AND FIGURES

In Morocco, the overall solid waste generation is 6.852 million metric tons. Urban waste generation is now approximately 0.76 kilos per day per capita, whereas rural waste generation per capita is about 0.3 kilos per day. Urban solid waste collection is regular and almost daily for an estimated 5.5 million metric tons (MT) per year. In 2013, urban solid waste collection covers nearly 85% of the waste generated in urban areas. Yet, only 37% of the total waste generated is disposed of in controlled landfills, although this figure has increased from 10% in 2008.

The solid waste management (SWM) infrastructure is also improving under the National Solid Waste Plan (PNDM), and is summarized in Table 1.

**Table 1: SOLID WASTE MANAGEMENT (SWM) INFRASTRUCTURE**

Landfill status	Number of landfills
Controlled landfills built	14
Controlled landfills under construction	11
Controlled landfills planned	5
Rehabilitated or closed dumpsites	60
Dumpsites planned for remediation	24
Dépotoirs planifiés à assainir	84

The industrial sector generates over 1.6 million MT annually of which approximately 289.385 MT is hazardous waste. Only 23.151 MT of the industrial hazardous waste is collected annually. All but 8% of this waste is disposed of in uncontrolled dumpsites and municipal landfills without prior treatment. Plans are now in place to establish a National Special Waste Treatment and Disposal Center (CNEDS), which will significantly improve the situation.

Medical and pharmaceutical waste is estimated at 21.000 MT/ year, of which 28% is hazardous.

Not much official data is available or has been made public yet for special waste streams, such as packaging waste, green and agricultural waste, construction and demolition waste, waste tires, oils and lubricant waste, e-waste or recycling. Although the qualitative and quantitative data will likely improve as the regulatory infrastructure strengthens, the sectors continue to transition from the informal to the formal, and once the hazardous waste facility (CNEDS) has been built and comes online.

## 2. NATIONAL MUNICIPAL SOLID WASTE MANAGEMENT POLICIES

### 2.1. POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

Law 28-00 on waste management and disposal governs and provides the general framework for the sector in Morocco. In addition, there are currently a total of 855 citations on waste adopted in the Moroccan legal code concerning the environment, a compilation of which can be found at the Ministry of Environment website:

[http://www.minenv.gov.ma/PDFs/recueil\\_des\\_lois\\_fr.pdf](http://www.minenv.gov.ma/PDFs/recueil_des_lois_fr.pdf). These citations include Decrees, and Dahirs, which are Royal Decrees. The main adopted texts on waste and the waste sector are:

#### Waste

- Dahir No. 1-06-153 of 22 November 2006 promulgating Law No. 28-00 relating to waste management and disposal;
- Decree No. 2-07-253 of 18 July 2008 on waste classification and determining the list of hazardous waste;
- Decree No. 2-09-139 of 21 May 2009 on the management of medical and pharmaceutical waste;
- Decree No. 2-09-284 of 8 December 2009 establishing the administrative procedures and technical requirements for landfills;
- Decree No. 2-08-243 of 17 March 2010 establishing the Committee on polychlorinated biphenyls (PCBs);
- Decree No. 2-09-538 of 22 March 2010 establishing the procedures for developing the National Hazardous Waste Management Plan.
- Decree No. 2-09-285 of 6 July 2010 Decree No. 2-09-285 of 6 July 2010 establishing the procedures for developing the prefectural or provincial master plan for the management of household and similar waste and the organization procedures for the public inquiry to this plan;
- Decree No. 2-09-683 of 6 July 2010 establishing the procedures for developing the regional waste management plan for industrial, non-hazardous medical and pharmaceutical, final, agricultural and inert waste, as well as the organization and procedures for the public inquiry related to this plan.

#### Plastic

- Law 22-10 dated 16 July 2010 prohibiting the manufacture and marketing of non-degradable bags;
- Decree 2817-10 of 19 April 2011 on criteria for the development of prefectural or provincial management of household waste and similar waste;
- Dahir 1-10-145 promulgating Law 22-10 on the use of degradable or biodegradable plastic bags, B0 n° 5862 of 5 August 2010;
- Decree 2-11-98 of 17 June 2011 on enforcement of Law 22-10 on the use of degradable or biodegradable plastic bags;
- Decree 3167-11 of 4 November 2011 on the application of Article 2 of Decree 2-11-98 of 17 June 2011 on the application of Law 22-10 on the use of degradable or biodegradable plastic bags.

Within an international and bilateral context pertaining to waste and the environment in general, Morocco has adopted the concept of sustainable development and ratified several international agreements concerning the environment, specifically the:

- Montreal protocol on Substances that Deplete the Ozone in 1992, the Vienna Convention and Amendments in London and Copenhagen in 1995;
- Convention on Climate Change in 1995 and the Kyoto Protocol in 2002;
- Basel Convention on transboundary movements of hazardous wastes in 1995;
- Stockholm convention on persistent organic pollutants (POPs);
- Protocol on the Prevention of Pollution of the Mediterranean Sea in 1999;
- Rotterdam Convention.

Within the association agreement framework, Morocco and the European Union cooperate actively on soil and water quality, the impacts of industrial development and the control and prevention of marine pollution (article 48).

The Investment Charter (1995) and the Royal letter dated 9 January 2002 also cite environmental issues.

## 2.2. STRATEGIES, ACTION PLANS AND INITIATIVES

Recognizing the risks posed by mismanagement of waste to the environment, Morocco has undertaken a series of strategic actions to reform the waste management sector:

### Strengthen the legal framework

The legal framework is the priority axis in Morocco for the reform of the waste sector. This was confirmed during the discussions on the National Charter for the Environment and Sustainable Development, which advocated the need to strengthen the legal framework on the environment. This commitment was reflected in the number of legal texts adopted and developed in the Section 2.1 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK.

### Implementation of Solid Waste Management programs

Several SWM programs are implemented in collaboration with international organizations. The aim is to ensure that Morocco has coverage with optimized infrastructure and waste collection services, in accordance with existing laws:

#### PGPE / GIZ 2002 - 2017:

The Environmental Protection and Management (PGPE) program is based on a favorable institutional, administrative and policy environment, and provides technical and methodological support by the German cooperation, GIZ. This program was updated in 2010 and another component was added to support Morocco in strengthening the capacity of local communities to implement National Solid Waste Program (PNDM) projects. An operational EPM plan was established in 2012 to optimize the German cooperation (GIZ) support in Morocco.

## National Solid Waste Program (PNDM) 2008-2022:

To cope with the challenges posed by the management of household and similar waste, the Ministries of Interior, Finance, and Environment jointly developed a National Solid Waste Program (PNDM), which aims to upgrade the management of municipal solid waste by 2022. From 2009-2011, the World Bank provided both financial and technical support for this program under Development Policy Loans (DPLs).

The objectives of this program were revised in 2012 to:

- Ensure the collection and cleaning of household waste to achieve a collection rate of 85% in 2016, 90% in 2020 and 100% in 2030;
- Ensure access to controlled landfills for household and similar waste for all urban centers (100%) by 2020;
- Rehabilitate or close all existing disposal sites (100%) by 2020;
- Modernize the waste sector by increasing professionalism;
- Develop the sorting-recycling-recovery chain, with pilot sorting projects, to reach a recycling rate of 20% by 2020;
- Expand and implement solid waste master management plans for household and similar waste for all prefectures and provinces in the Kingdom;
- Train and raise awareness among all stakeholders.

## National Master Plan for Hazardous Waste Management:

The Department of Environment initiated this plan in 2007 in collaboration with the German cooperation, KfW and GIZ. In 2013, the National Commission on hazardous waste adopted the plan and an engineering project identifies priority investments under this plan. The Ministry of Energy, Mines, Water and Environment (MEMEE) and KfW, as a financial partner in the future CNEDS, have approved the final version of the National Hazardous Waste Management Master Plan, which will be submitted for approval to the General Secretary of the Government (SGG) before signing the loan agreement and funding.

### The recommended priority investments are:

1. The development of a center of excellence that could quickly respond to changes in the hazardous waste sector and study and implement best practices as it pertains to the planning of treatment and disposal facilities. The center would also be a facility to train highly qualified staff to evaluate and handle hazardous waste. The center of excellence should also house a laboratory for the analysis of waste;
2. A short-term landfill to serve as a disposal facility;
3. A physical-chemical treatment facility;
4. Administrative measures to strengthen the monitoring of hazardous waste.

## Reform of local taxation:

The German Development Bank (KfW) and the World Bank have provided support to Morocco for the establishment of a financial sustainability system to develop the PNDM. According to the World Bank's website, an "effective result-oriented incentive mechanism allocating national financial resources to support municipalities" is a result of these efforts.

## Support for the National Solid Waste Program (PNDM)

To implement the PNDM, several support programs have been established including:

- Action Plan for the private sector: Standardized requests for bids were adopted in 2010 and a guide on the monitoring of delegated management was developed by GIZ Morocco;
- A program for household waste awareness and communication was adopted in 2011 and is now being implemented;
- Social support for waste recovery with the support by UNDP and the World Bank;
- Financial sustainability of the solid waste management program with the support of KfW and the World Bank;
- A training program with GIZ support.

## 2.3. PLANNING AND INVESTMENTS

The National Program for Household Waste Management (PNDM) covers the entire chain from collection to treatment. The total program cost is estimated at 40 billion MAD over a period of 15 years.

According to the PNDM quarterly report dated November 2013, the status is summarized as follows:

- Since the start of the PNDM, about 1.5 billion MAD have been invested by the State, in addition to partner financing, to support the creation, rehabilitation and operation of landfills as follows:
- 15 landfills have been established (Fez, Oujda, El Jadida, Essaouira, Berkane, Figuig, Rabat-Sale, Al Hoceima, Agadir, Guelmim, Nador, Dakhla, Laayoune, Benslimane-Mohammedia and Khouribga);
- 5 landfills are in progress: Ifrane-Azrou (98% complete); Safi (98% complete); and Tata (70% complete) and Ouarzazate;
- 11 controlled landfills are being developed (M'diq-Fnideq, Sefrou, Es-Smara, Tiznit, Taza, Boujdour, Oued Laou Group, Sidi Ifni, Settat, Marrakech and Tangier);
- 10 other landfills are expected to be developed within the framework of the 2014 action plan including: Berrechid, Ouezzane, El Hajeb, Sidi Kacem, Youssoufia-Chemaiya Group, Ouarzazate, Jerada, Errachidia and Tan Tan;
- 26 uncontrolled dumps have been remediated;
- 174 uncontrolled dumps are scheduled for remediation.

## 2.4. MONITORING

Under the PNDM program, the Program Management Unit (Unité de Gestion du Programme – UGP) is responsible for regular performance monitoring of waste management services for municipalities that have fulfilled the prerequisites for State support under the PNDM program. The UGP conducts site visits and is responsible for reporting through quarterly and annual reports in conformance with the PNDM annual action plans.

## 2.5. FISCAL, FINANCE AND ECONOMIC STEERING INSTRUMENTS

According to the World Bank, in 2003, the cost of environmental degradation due to solid waste was estimated at 0.5 percent of Morocco's gross domestic product (GDP), which was among the highest in the Middle East and North Africa region.

In response, the Kingdom of Morocco's National Municipal Solid Waste program (Programme National des Déchets Ménagers et Assimilés- PNDM) provides the framework to reform the municipal solid waste

(MSW) sector. Though 2012, the Department of Environment has allocated 1.36 billion MAD and the Ministry of the Interior has allocated 1 billion MAD to PNDM.

The PNDM also receives funding through international support. Under the World Bank Development Policy Loan Program (DPL) (2009-2017), the International Bank for Reconstruction and Development (IBRD) has made three loans totaling US\$400 million during the program period. Among other benefits to the solid waste sector, the DPL helped to increase municipal service tax, from MAD 1.4 million in 2008 to 2.6 million in 2011, and develop a carbon finance program under the CDM with a potential to generate revenue from 6 million tons of CO<sub>2</sub> equivalent by 2020.

In 2013, the third Municipal Solid Waste Sector Development Policy Loan of US\$130 million was granted by the World Bank to support continued sector reforms, create up to 70,000 jobs in waste recycling, improve access to urban collection and disposal services, improve accountability through regular monitoring, and ensure the environmental safety of waste management.

## 2.6. PRIVATE SECTOR PARTICIPATION POLICY

The Moroccan government encourages the involvement of the private sector in all aspects of the municipal solid waste (MSW) management chain, from collection to landfill management. According to 2013 data from the Ministry of Environment:

- Private companies service waste collection and cleaning for 74% of the urban population nationally;
- A total of 90 contracts have been established, valued at 1.78 billion MAD;
- The tonnage collected under these contracts is estimated at 4.3 million tons per year, which is 80% of the urban waste collection;
- The costs of the delegated management of collection services and cleaning of urban municipalities increased from 807 million MAD in 2007 to 1.78 billion MAD at the end of April 2013;
- The contract duration is generally 7 years;
- The average price of the collection service is about 411 MAD per MT;
- The average price of the controlled landfill service is 100 MAD per MT.

Despite this policy, there are recurrent problems with delegated waste management to the private sector. Some of the issues cited are: poorly written terms of reference; terms of reference that are not respected; the requirement to hire the qualified bidder with the lowest price, which can compromise the quality of service; payment deadlines not respected by the municipality to the waste services contractor, which can lead to problems with liquidity and periodic garbage collection service strikes; the municipality pressuring the contractor to fulfill provisions that are not specified in the terms of references, such as modifying the collection route to include newly constructed neighborhoods, or collecting construction debris or green waste that is not covered in the contractual obligations; the lack of regulatory authority, which hinders the potential for recourse, mediation and arbitration; procedural inefficiencies with the courts system; and an absence of regular coordination meetings between the public administration and the service contractor to address issues.

Due to these issues, several contractors have broken their contracts and left the market, for example the French subsidiary Veolia in Rabat and the Spanish subsidiary Tecmed in Tetouan. More efforts are required to develop a win-win public private partnership model for delegated waste management services in Morocco in order to provide healthy incentives for the service provider and ensure the quality of service necessary for the populations.

## 2.7. PUBLIC AWARENESS, EDUCATION AND COMMUNITY PARTICIPATION

As part of the support measures for the success of the National Municipal Waste Program (PNDM), an outreach and communication plan has been established. It is comprised of an audiovisual campaign (TV, radio and video spots); developing communication tools; a website that will be affiliated with the Department of Environment; and regional training workshops.

The World Bank's third municipal solid waste sector Development Policy Loan (DPL) granted in 2013 provides for a new public participation tool in Morocco: citizen report cards that will enable the public to provide feedback on their city's solid waste services. The DPL also aims to increase transparency via public information access to policy information and disclosure of contracts with private companies.

## 2.8. NATIONAL CAPACITY BUILDING AND TRAINING INITIATIVES

A training program was also implemented that aims to improve the skills of the participants (municipal management, trainers, etc.) on the environment and in particular on household and similar waste.

From 2011 to 2013 the training was developed on two modules. First, on the solid waste master plan, including the legal, institutional and financial framework; program management; support for the study to establish a provincial or municipal solid waste master plan; and stakeholder awareness on the importance of collaboration with all of parties involved. The second training module covered integrated solid waste management, which included the legal, institutional and financial framework; program management; collection, cleaning and management optimization techniques for solid waste; the basic principles of different treatment, disposal and recovery techniques; landfill development, management and remediation techniques; and stakeholder awareness on the importance of collaboration with all of parties involved.

A total of 12 workshops of two to three days each were held in 2011 and 2012 in 11 cities (Casablanca, Marrakech, Kenitra, Fes, Beni Mellal, Agadir, Errachidia, Nador, Oujda, Guelmim and El Jadida) for Local Authorities' staff from the 16 regions of the Kingdom. The 12 workshops totaled 33 days of training and were attended by 408 people including 341 Local Authorities, and 33 co-trainers from the Department of Water and Sanitation (DEA).

Since the program began in 2008, a total of 1,453 people have been trained. Of the 40 billion MAD budget for the National Municipal Waste Program, a total of 1.8% is allocated to communication, awareness, and training.

## 2.9. CAPACITY BUILDING REQUIREMENTS

Sustained efforts are required to improve the technical capacity of local communities for integrated solid waste management services, within the context of decentralization and to strengthen communication and awareness about the solid waste sector. The capacity building should be designed according to the objectives and timelines set by the PNDM and the regulations.

## 2.10. NATIONAL INITIATIVES MULTI STAKEHOLDER EXCHANGE

In Morocco, several networks are active for the environmental improvements. Some of the most important are:

## NECEMA: Maghreb Network for Environmental Compliance and Enforcement

Morocco has chaired this regional network since its inception. This North African network aims to develop cooperation among the North African countries in implementing environmental laws; strengthen institutional capacity of the network countries to promote compliance with environmental laws; encourage exchanges on environmental compliance and enforcement between North Africa and the rest of the world through the international network, INECE.

## Horizon 2020 Initiative for the cleanup of the Mediterranean

Morocco continued its activities in Horizon 2020. A national training on Education for Sustainable Development (ESD) in Universities took place in Morocco on 23-24 April 2013. The training directly contributed to the implementation of the principles of the Mediterranean Strategy on ESD, which should be adopted at a Ministerial level meeting in October 2013. Also, Morocco participated in sub-regional training workshops hosted by the University of Trieste in April and May 2013 on improving capacities to prepare and implement Pollutant Release and Transfer Registers (PRTR) as a uniform tool for monitoring industrial emissions in all Mediterranean countries.

## Waste cluster

Morocco continued its activities in the Waste Cluster network with outreach activities. The Waste Cluster network is a project funded by the European Union, under the framework of Cooperation in Urban Development and Dialogue (CIUDAD), and GEDUM - Promotion of a sustainable and integrated urban solid waste management system in the Maghreb countries.

A selective collection awareness campaign for paper and cardboard was conducted in Beni Mellal in partnership with the International German Cooperation (GIZ), the University Sultan Moulay Slimane, the CIUDAD programme, the city of Bamberg, Germany, and the recycling company Fritsche, with the aim to promote waste sorting and recycling and to help the city establish an environmental friendly integrated waste management.

## 2.11. CASE STUDIES, BEST PRACTICES AND LESSONS LEARNT

A significant portion of the waste sector in Morocco operates in an informal manner, particularly with regards to waste sorting, recycling, and disposal in uncontrolled facilities. The World Bank loan agreement to support the National Solid Waste program (PNDM) carries provisions that encourage waste collectors inclusion initiatives to ensure that waste collectors from the informal sector are systematically integrated into the sector restructuring and upgrading.

A successful example of this initiative is the Attawafouk waste collector cooperative that was developed with the assistance of an international NGO, Care, and the private landfill operator, Pizzorno. Implemented in June 2011 after the initial phases began in 2007, waste collectors from the informal sector working in the closed landfill in Akreuch were organized into a cooperative and work at the new sorting center at Oum Azza near Rabat, Morocco.

This project has achieved the following results:

- Informal sector organized by establishing a waste collection/sorting cooperative and providing technical and financial support for cooperative members (training, professional equipment, protective personal clothing, sales channels, administrative formalities, social security and health insurance registration, etc.);
- Waste sorter profession recognized through the creation of a cooperative;
- Vocational and career development potential established: ten members (with diplomas) now hold management positions within the sorting facility structure;
- Profile of waste sorters developed: 176 sorters including 22 women;
- Waste sorter revenue identified, with an average income of 110 MAD/ day and a minimum revenue of 100 MAD/ day;
- Stakeholders identified in the waste sorting/ recovery/ recycling cycle;
- Role of intermediaries established: purchase/ resale of sorted materials and compensation;
- Profile developed of waste sorters' recovered materials;
- Paid training of 8 months provided to each waste sorter;
- 150 families have retained their income while improving their working condition and are in the process of transition from the informal sector to the formal sector.

The lessons learned from the Attawafouk Cooperative project are:

- To include a provision requiring a social plan for the inclusion of waste collectors in Public-Private waste service provider contracts for controlled landfills;
- Transitions from the informal to formal sector must be systematically integrated into national or local government policy.

## 2.12. UPCOMING INITIATIVES

The World Bank has slated a third municipal solid waste sector Development Policy Loan (DPL) to continue providing support to Morocco in developing its solid waste management sector. The focus will remain on reforming the institutional and financial framework; providing financial and capacity building assistance to local authorities; advocacy and program communication. A larger focus will be given to social aspects through the development of recycling and sector strengthening that is aligned with Morocco's initiatives for regionalization.

## 3. INDUSTRIAL & HAZARDOUS WASTE MANAGEMENT

### 3.1. LEGAL AND INSTITUTIONAL FRAMEWORK

The management of the industrial and hazardous waste legal framework has been strengthened in recent years by the following:

- **Law 28-00 on waste management and disposal**, Article 9, which stipulates that the administration, in collaboration with local communities and professionals, must develop the National Hazardous Waste Management Plan;
  - Decree No. 2-09-284 of 08 December 2009 concerning the administrative procedures and technical requirements for landfills.
  - Decree No. 2-09-139 of 21 May 2009 on the management of medical and pharmaceutical waste.
  - Decree No. 2-09-538 of 22 March 2010 establishes the procedures for developing the National Hazardous Waste Management Plan.
  - Decree No. 2-09-683 of 6 July 2010 establishes the procedures for the preparation of the regional waste management plans for industrial waste, non-hazardous medical and pharmaceutical waste, ultimate waste, and agricultural and inert waste, and states the public inquiry procedures.
- **Law 12.03 on Environmental Impact Assessments**;
  - Decree no. 2-04-563 of 4 November 2008 on the role and operations of the National Committee on Environmental Impact Assessments (CNEIE).
  - Decree no. 2-04-564 of 4 November 2008 on the public inquiry procedures.
- **Law on road transport of dangerous goods** (including hazardous waste);
  - Decree No. 2-08-243 of 17 March 2010 establishes a PCB and Hazardous Waste Committee;
  - Decree of 7 January 2010 on administrative procedures and technical requirements for controlled landfills (including discharge of industrial and hazardous waste);
  - Decree No. 2-09-85 on the collection, transportation and treatment of certain waste oils;
  - Decree No. 2-07-253 of 18 July 2008 on hazardous waste classification;
  - Decree on waste incineration.

### 3.2. STRATEGIES AND PLANNING

Recognizing the threat posed to the environment by waste mismanagement, Morocco has undertaken a series of strategic actions to reform the industrial and hazardous waste management sector, namely:

- the Strengthening of the legal framework by adopting the texts cited above, in Section 3.1 LEGAL AND INSTITUTIONAL FRAMEWORK. The implementation of the adopted texts and the development of additional texts to fill the legal gaps represent one of the national environmental charter priorities;
- the Development of the National Hazardous Waste Management Master Plan (PDNGDD):

The Department of Environment, in collaboration with the German cooperation, initiated this PDNGDD plan in 2007. The National Commission on Hazardous Waste was established in 2011. It is estimated that the Moroccan industrial sector produces about 1.6 million tons of solid waste per year, 289,385 of which are hazardous waste. As only 8% of this tonnage is disposed of through the formal sector via

private companies, the majority of the waste is disposed of in uncontrolled dumps and municipal landfills without treatment. The Department of Environment has thus initiated the establishment of a National Special Waste Treatment and Disposal Center (CNEDS), with support by the German Cooperation (GIZ and KfW), which will have an annual capacity of 44.000 MT.

The PDNGDD objective is to build facilities and provide equipment for the disposal of hazardous waste, and develop an appropriate system of integrated hazardous waste management in Morocco with monitoring and adequate supervision in accordance with international environmental standards and legislation in force in Morocco. This system should include the following components:

- Collection, recycling, transfer, and treatment of hazardous waste in the main economic regions of Morocco;
- Recovery of hazardous recyclables;
- Production of substitute fuels;
- Incineration of certain types of hazardous and industrial waste.

This system should ensure and achieve a rate of collection, treatment and disposal of hazardous industrial waste as follows:

- At least 45% by 2020;
- At least 65% by 2027;
- At least 80% in 2033;
- At least 90% after 2033.

### 3.3. FINANCING

According to Law 28-00 on waste, producers are responsible for waste collection and treatment. In Morocco, private operators provide services for the industrial sector with varying prices depending on the amount and type of waste, and the type of treatment or service. These prices range from 600 MAD per MT for landfilling, 400 MAD per MT for solidification prior to landfilling, 900 MAD per MT for inorganic physico-chemical treatment in a local facility, 800 MAD per MT for organic physico-chemical treatment in a local facility, 2.600 MAD per MT for physico-chemical treatment in a central facility, and 800 MAD per MT to store the hazardous waste.

Among the financing tools introduced by Morocco to assist the industrial to implement clean systems and technology is the Industrial Pollution Fund (FODEP), which is implemented in cooperation with KfW and other Moroccan partners.

Regarding the project to establish a National Special Waste Elimination Center (CNEDS), the total investment is estimated at 981.7 million MAD between 2015 and 2035. The investment plan is scheduled as follows: 280-982.000 MAD for Phase I (2015 – 2020); 321.841.000 MAD for Phase II (2020 – 2025); and 378.851.000 MAD for Phase III (2025-2035). Support will be provided by the state and KfW to reduce treatment costs and encourage manufacturers to take their waste to the center. A tariff system with economic incentives will be established to minimize the financial impact of treatment.

### 3.4. COLLECTION, TREATMENT, AND DISPOSAL

The socio-economic development and population growth that Morocco has experienced in recent decades have led to an increase in the quantity and complexity of the quality of special waste produced by the industrial sector. In 2013, the Moroccan industrial sector produced about 1.6 million MT of solid waste, of which 289.385 MT is hazardous waste.

In the absence of an appropriate collection, treatment and disposal infrastructure, nearly all hazardous waste produced by the industrial sector is disposed of in uncontrolled dumps, municipal landfills, on nearby land, in abandoned quarries or along rivers, without any treatment or control. This process is often subcontracted to informal operators, who sort the waste that has resale value and dispose of the rest of the waste considered hazardous. This informal system has resulted in serious consequences for public health, the environment and the future socio-economic activities in the country.

### 3.5. PRIVATE SECTOR INVOLVEMENT

The fuel supply systems in several cement plants have been remodeled to enable co-incineration of many types of waste, which provides the industrial sector with another method of hazardous waste disposal. The Moroccan cement industry signed a voluntary agreement in which it undertook to respect international standards in the field of co-incineration. Incineration rates range from US\$263 per metric ton paid by cement companies to waste producers for high-energy combustibles, and up to US\$1,315 per MT paid by waste producers to cement companies to incinerate hazardous waste. The project period will run from 2013 – 2015. Its objective is environmental and resource protection by processing and co-processing of quality assured alternative fuel for the cement industry out of commercial, industrial and municipal solid wastes.

GIZ has partnered on a project with the companies Les Cimentiers de l'Atlas (CIMAT) and ThyssenKrupp Polysius, AG (Germany) to convert waste to energy in the Moroccan cement industry.

According to the project documentation, the co-processing of pre-treated waste as an alternative fuel in cement plants is widely implemented in industrialized nations. It helps to reduce waste volumes, conserve natural primary energy resources, contributes towards reduction of emissions on landfills and has a positive effect on the energy costs for the cement industry. However, the feasibility of such a concept in Morocco remains challenging because of a lack of capacity and suitable competence by relevant stakeholders. Furthermore, the characteristics and quantities of non-hazardous solid waste from municipal, commercial or industrial production are relatively unknown.

### 3.6. CASE STUDIES, BEST PRACTICES AND LESSONS LEARNED

The CGEM published a guide to industrial waste in May 2012, which includes best practices outlined in this section. Training and information are inexpensive ways to manage waste and follow good practices that vary according to the nature of the waste, its consistency and its level of hazard. Overall, these practices are based on simple, inexpensive and effective actions for managing and reducing pollution. For example:

- Sort hazardous and non-hazardous waste to reduce contamination;
- Separate waste before and during storage to reduce contamination;
- Opt for big bags for packaging materials received, instead of bags and other containers and drums, in order to prevent hazardous waste at the end of the production process;
- Ensure adequate means for selective collection (specific bins, presses, etc.);
- During warehouse delivery and storage, operations provide holding tanks to limit losses and contain leaching of wastes;
- Maximize recycling and recovery of waste production (internal or external);
- Educate all staff on the operations of waste management plans.

A waste management process should be conducted in parallel to these good practices. Within the methodology, a systematic identification, assessment and management of waste should be conducted. This requires the implementation of a process and procedures that staff and management recognize and adopt as part of their goals. This approach should be part of the waste management plan based on:

- Prevention;
- Establishment of a materials audit of the production process;
- Identification of discards and losses;
- Identification of waste;
- Geographical identification of waste production areas;
- Evaluation of waste streams;
- Documentation of monitoring;
- Identification of reuse and recycling streams;
- Design of an internal waste management plan including collection and selective storage.

Good waste management practices can reduce up to 20-25% of problems related to waste management with an almost immediate return on investment.

### **3.7. UPCOMING INITIATIVES**

With regards to strengthening the legal framework, the draft decree establishing the procedures and conditions for granting authorizations from transboundary movements of waste is now being finalized. The legal basis in Morocco should be established per the Basel Convention and its implementing regulations. The proposed system would probably cause the export of large quantities of hazardous and industrial waste. Regardless of the legal situation, the State is considered responsible for its orderly implementation. It is therefore recommended that the State creates a legal instrument for the management of these sensitive activities and subsequently establish the corresponding authority.

The decree on the transboundary movement of waste is in draft form and applies to all waste, both hazardous and non-hazardous. Such decrees are supported by other decrees that specify the details for their application. These application decrees are of critical importance for implementation and regulations as they reduce the margin of error in interpretation by providing concrete and practical instructions.

As for human resources, the Department of Environment has recruited the first inspectors (civil servants) and plans to increase the number.

## 4. MEDICAL WASTE MANAGEMENT

### 4.1. LEGAL AND INSTITUTIONAL FRAMEWORK

The legal and institutional framework for the management of medical and hospital waste is reinforced by the following legal texts:

- Law 28-00 on waste management and disposal, Section V on medical and pharmaceutical waste;
- Decree 02-09-139 dated 21 May 2009 on the management of medical and pharmaceutical waste;
- Law on road transport of hazardous goods (including medical waste);
- Decree No. 2-09-538 dated 22 March 2010 establishing the procedures for developing the national master plan for the management of hazardous waste (including medical waste);
- Decree No. 2-09-683 dated 6 July 2010 establishing the procedures for developing the regional master plan for the management of industrial waste, non-hazardous medical and pharmaceutical waste, final waste, agricultural waste, and inert waste and the organization of the public inquiry procedure relating to this plan.

Law No. 28-00 on waste management and disposal requires that, in Section V on medical and pharmaceutical waste:

- «.... medical and pharmaceutical waste must be specifically managed to avoid damage to human health and the environment » (Article 38, Paragraph 1);
- «The management of medical waste and pharmaceuticals are set by regulations»;
- «.... the discharge, storage, treatment, disposal or incineration of medical waste and pharmaceuticals are prohibited outside of designated areas established per Regional Master Plans (on industrial, non-hazardous medical and pharmaceutical, and residual, agricultural and inert waste. )» (Article 39);
- «.... The collection and transport of pharmaceutical and medical waste are subject to authorization by the administration ... » and «The granting of this authorization is subject to the conditions specified in Article 30.» ;

Law 28-00, Section V provides the legal basis for Decree 2-09-139. Decree 2-09-139 defines medical and pharmaceutical waste, distinguishes between medical and pharmaceutical waste, and classifies it into four categories, according to their nature and characteristics. The Moroccan Waste Catalogue also defines hazardous medical and pharmaceutical waste.

Decree No. 2-09-139 relating to the management of medical and pharmaceutical waste (Chapter 3 / Section 1) also concerns the transport of hazardous waste:

- «.... the underground disposal of medical and pharmaceutical waste at their place of generation is prohibited.»

For the institutional framework, the Waste Act states that producers of hazardous medical waste are responsible for processing their waste and the State will draft the national master plan on hazardous waste and the regions will prepare regional plans for the management of non-hazardous medical waste.

The Ministry of Health is responsible for the management system for medical and pharmaceutical waste. The Ministry of Health and the authorities under its tutelage provide the authorizations required for all management operations of medical and pharmaceutical waste. The Ministry of Environment and Ministry of Equipment and Transportation have certain monitoring capacities.

## 4.2. STRATEGIES AND PLANNING

Recognizing the threat posed to the environment by the mismanagement of medical waste, Morocco has undertaken a series of strategic actions to reform the medical waste management sector:

- Strengthening the legal framework by adopting the texts cited above. The enactment of the adopted texts and the development of others to fill the legal gaps represent one of the priorities of the national environmental charter;
- Development of the National Hazardous Waste Management Plan (Plan Directeur National de Gestion des Déchets Dangereux - PDNGDD), which includes hazardous medical waste. This plan will:
  - Assess the quality and quantity of medical waste produced in Morocco and its impact on the environment.
  - Define legal, organizational, financial and technical gaps in the sector.
  - Develop the concept of medical waste management based on the involvement of the private sector.
  - Encourage and involve private companies in medical waste management.

Given the estimated waste stream of medical and pharmaceutical waste of 21,000 MT per year, the technical capabilities of the current disposal process are sufficient to handle all the medical and pharmaceutical waste. Nevertheless, action must be taken to improve the collection, sorting, and transport:

- Waste sorting should be organized and standardized in hospitals;
- The collection and transportation must be provided by accredited private companies in compliance with hygiene standards and proper security with reference to future Decrees on the transport of dangerous materials, the Law n°28-00, and the decree on the management medical and pharmaceutical waste, which clearly specifies the conditions, measures and obligations to be met by any organization performing the collection and transport of medical and pharmaceutical waste;
- The treatment must be done in compliance with European standards.

## 4.3. FINANCING

Per Law 28-00, waste producers are responsible for the collection and treatment of medical waste. Private operators in Morocco provide services to hospitals and clinics with varying prices depending on the amount and type of waste. These prices vary between 7 to 11 MAD/kg. Transportation costs range between 0.75 and 2 MAD/kg.

Public hospitals have a budget line item in their annual budget for the collection and treatment of waste.

## 4.4. COLLECTION, TREATMENT AND DISPOSAL

Based on 2013 data contained within the National Hazardous Waste Management Plan, medical and pharmaceutical waste from hospitals in Morocco is estimated at 21,000 MT per year, of which 6 MT per year is hazardous medical waste (about 28%). The distribution of this waste is not uniform within the country, with the Rabat-Salé region and the greater Casablanca area as the largest producing regions due to their population density and density of medical facilities.

No standardized system of treatment exists in Morocco. Each hospital opts for its own solution, in particular the:

- Outsourcing of waste management to private companies;
- Establishment of waste disposal units - sterilizers via direct exploitation or via subcontractors;
- Disposal of waste at public landfills.

Over the past decade, the Ministry of Health has provided, with the support of WHO, a total of 21 hospitals with waste disposal units - sterilizers that are located in the cities of Tetouan, Kenitra, Fez, Laayoune, Taza, Sefrou, Nador, Meknes, Berkane, Khémisset, Agadir, Safi, Beni Mellal, Tangier, Bouarfa, Al Hoceima, Es-saouira, Settat, Tan Tan, Casablanca and Oujda.

Despite the legislation in place, in the absence of an appropriate disposal infrastructure, most hospitals and medical centers tend to dispose of their hazardous waste in an uncontrolled manner, such as in municipal landfills, on site, or nearby, but also in abandoned quarries, along rivers or in uncontrolled dumps. This method removing hazardous waste disposal poses a serious threat to the health of the Moroccan population.

#### 4.5. PRIVATE SECTOR INVOLVEMENT

In Morocco, private companies operate nine of the twenty functional waste disposal units in Morocco, including for the medical and pharmaceutical waste management sector. Three companies dominate the Moroccan market (ATHISA Maroc, SEISS Environnement and T. OZONE) and render services at rates between 7 and 11 MAD/kg. Private companies currently handle about 45% of medical waste products nationwide. Moroccan cement manufacturers also handle expired medicine that does not contain much chlorine.

The legal framework was strengthened on 21 May 2009 by the adoption of Decree No. 2-09-139 on medical and pharmaceutical waste management that establishes the rules for sorting, packaging, collection, storage, transport and disposal of medical waste. The Ministry of Health has established a standardized Request for Bids template and a list of typical loads on the conditions of collection and transport of medical and pharmaceutical waste by private companies. Permission to transport the waste is issued by the Ministry of Health after consultation with a committee composed of representatives from the departments concerned.

The processing system used by the operators is to crush and sterilize medical waste. The authorization for the collection and disposal of medical waste is issued by the Ministry of Health on the advice of a committee composed of representatives from the Ministries of Environment, Transport and Health in accordance with specifications defined per Law 28-00 on Waste.

The medical waste sector has attracted foreign investors in Morocco. This is due to public incentives for the private sector, including the:

- Strengthening of the legal framework;
- Creation of specific line items for the treatment of medical waste in the annual budget of hospitals;
- Development of a tender specifications template for the management of medical waste;
- Development of good practice guidelines for management of medical waste by the Ministry of Health with the support from the WHO and GIZ;
- Strengthening of monitoring;
- Training of hospital technicians on good practices of medical waste management.

## 4.6. CASE STUDIES, BEST PRACTICES AND LESSONS LEARNED

The Mohammed VI CHU (the University Hospital Center) in Marrakech is committed to improving its waste management system both internally as well as regionally. The CHU in Marrakech is the main medical and pharmaceutical waste producer in the Haouz region. Its 963 beds produce 123 MT per year, equal to 350 kg per day. The CHU future production, after expanding facilities by 586 beds, is estimated at 600 kg per day or 220 MT per year.

Medical waste production by other facilities in the region is estimated at 180 MT, thus a total of 400 MT in the Haouz region. However, the sector is scattered, and often health centers, offices, clinics, dental offices are not covered in the statistics, waste collection or waste disposal.

The Marrakech CHU eliminates its hospital waste through private subcontractors. In mid-2012, the Marrakech CHU began a selective sorting system that has considerably improved the quantity of medical and pharmaceutical waste going to the municipal landfills:

**Table 2: QUANTITE DES DECHETS MEDICAUX ET PHARMACEUTIQUES QUI VONT DANS LES DECHARGES MUNICIPALES**

	2012		Difference	%
	Before sorting	After sorting		
Production (kg)	9,781.13	5,756.82	4024,31	41

According to a SWOT (Strengths, Weaknesses, Opportunities, Threats) evaluation of the Marrakech CHU, its strengths have been noted as:

- Hospital management is committed to sustainable development;
- Medical officers are competent and dynamic (10 people);
- Nurses are aware of the risks linked to medical and pharmaceutical waste.

The SWOT evaluation weaknesses have been documented as:

- A high turnover of interns and support staff responsible for waste sorting;
- Out of stock of packaging supplies;
- Delay in waste collection (→72 hours);
- Liquid waste is not collected and does not have a specific treatment;
- Lack of waste depositories in intermediate locations within the hospital;
- Waste management traceability is insufficient;
- Lack of understanding about cytotoxic and pharmaceutical waste;
- Medical and pharmaceutical waste is often disposed of and collected in full bags without the protection of a rigid container or bin.

### **Mohammed VI CHU – Marrakech: Rules for responsible waste management**

- Follow separation and sorting guidelines;
- Pay attention to packaging and marking;
- Observe the time and conditions of storage;
- Inform and train staff;
- Measure the quantities produced by types of waste;
- Contract all external services;

- Develop partnerships;
- Know the final destination for each type of waste;
- Ensure compliance of treatment methods;
- Assess accurately the costs of waste;
- Produce the least amount of waste possible.

## 4.7. UPCOMING INITIATIVES

New initiatives to improve and develop Morocco's medical waste sector are to:

- Implement the provisions of the national environmental charter;
- Enable the implementation of the Waste Act;
- Encourage the widespread involvement of the private sector to collect, treat and properly dispose of all medical waste;
- Implement the monitoring and control system for medical waste;
- Implement the outreach program;
- Implement the training program;
- The Ministry of Environment has committed to establishing regulations for the implementation relating to Decree No. 2-09-139 [21 May 2009] on the management of medical and pharmaceutical waste, and to establishing the procedures for developing the regional master plan for industrial, non-hazardous medical and pharmaceutical and residual waste, agricultural and inert waste management.

## 5. GREEN WASTE & AGRICULTURAL WASTE

### 5.1. LEGAL AND INSTITUTIONAL FRAMEWORK

- The following legal and institutional framework governs the green and agricultural waste stream:
  - Law 28-00 on waste management and disposal:
  - Law 28-00 Article 2 defines agricultural waste as: Any organic waste generated by agricultural livestock or gardening activities;
  - Law 28-00 Article 10 stipulates, "Within five (5) years of the date of publication of this Law, the territory of each region must be covered by a regional master waste management plan for industrial, non-hazardous medical and pharmaceutical, final, agricultural and inert waste."
- Law 28-00 Title III: Management of inert waste, agricultural waste, residual waste and non-hazardous industrial waste:
  - Article 24: Subject to the provisions of Article 28 below, inert waste, residual waste, agricultural waste and non-hazardous industrial waste must be deposited by their generators or by persons authorized to manage the premises and disposal facilities designated for this purpose by the Regional Master Plan under the control of municipalities or their relevant associations and officers commissioned for this purpose.
  - Article 25: The municipal department responsible for the management of municipal solid waste and, where applicable, the persons entitled thereto may receive and manage inert waste, agricultural waste, residual waste and non-hazardous industrial waste, with a levy on services. The rate of the fee shall be determined by the municipal council, in accordance with Law No. 78-00 concerning municipal charter, Article 69. In addition, the council shall determine the route, the pace and schedule of this type of waste collection.
  - Article 26: The agricultural waste and non-hazardous industrial waste cannot be treated as household waste on the basis of an analysis report required, if necessary, by the municipality and conducted by an accredited laboratory. In this case, the waste can be transported and deposited separately within controlled municipal solid waste landfill sites.
  - Article 28: Notwithstanding the provisions of Article 24 above, biodegradable agricultural waste can be recycled or disposed of in farms that produce them.
  - Law 28-00 Article 48 Classifies controlled landfills by the type of waste they can accept. Landfills classified as Class 2 can accept agricultural waste.
  - Law 28-00 Article 70 stipulates the penalties from 10.000 to 2.000.000 MAD and 6 months to 2 years imprisonment for improper collection, transport, stocking and disposal of hazardous agricultural waste.
- Decree No. 2-09-683 of 6 July 2010 establishing the procedures for developing the regional waste management plan for industrial, non-hazardous medical and pharmaceutical, final, agricultural and inert waste, as well as the organizational procedures for the public inquiry related to this plan.

### 5.2. STRATEGIES AND PLANNING

Law No. 28-00 on waste management and disposal is a fundamental planning tool. It provides for the development of three waste management master plans on three different territorial levels: the National Hazardous Waste Management Master Plan; Regional Waste Management Plans for Industrial Waste,

Non-Hazardous Medical and Pharmaceutical Waste, Final Waste, Agricultural Waste and Inert Waste; and Prefectural and Provincial Master Plans for the Management of Household and Similar Waste.

These three areas each have a component related to communication and awareness, which will likely be combined into a single national program. However, under the current National Plan, only the National Hazardous Waste Management Plan is being taken into consideration.

National quality standards for green and agricultural waste recycling products (i.e. compost, recycled products, fertilizer, pesticides, etc.) need to be established.

### 5.3. FINANCING

Financing within this sector will certainly become more feasible once the legal and regulatory framework has been further developed to encourage private investment. Norms and standards also need to be put into place on a national level, harmonized with international specifications, for the byproducts of green and agricultural waste, in order to ensure environmental, worker and consumer protection throughout the value chain and to be able to eventually access export markets for the potential byproducts.

Previous funding to develop the technical capacities within the sector has come from the MOROCOMP project funded by the E.U. Life program.

### 5.4. COLLECTION, TREATMENT AND DISPOSAL

An official, comprehensive study on agricultural waste has never been conducted to assess the details on relevant quantities, which may explain the discrepancies within the available data. According to Chapter 4 on Waste of a report issued by the Department of Environment entitled "State of the Environment in Morocco" based on a sampling of the greater Casablanca region, a total of 125.266 MT was estimated in 2005. Approximately 60% of the national waste that goes to controlled municipal landfills is organic waste.

Data available from 2000, published on the Ministry of Environment website by the Department of Environment estimates non-hazardous industrial waste from the agribusiness sector at 531.830 MT, which equals 55% of the total production from the non-hazardous industrial waste sector. In 2000, hazardous industrial waste from the agribusiness sector was estimated at 9.630 MT, which is equal to 8% of the hazardous industrial waste.

In 2000, 23% of the total volume of industrial waste was reused in the manufacturing process or sold to third parties for re-use or recycling (bagasse from sugar mills, pomace from traditional olive oil mills, wool waste, rubber, wood, some metals, etc. For treatment, cement factories incinerate a portion of industrial waste from the agribusiness sector using waste-to-energy techniques.

### 5.5. PRIVATE SECTOR INVOLVEMENT

The green and industrial waste byproducts sector (compost, organic fertilizer, etc.) in Morocco has great potential but is still in its infancy. However, some companies within the private and non-profit sector are taking the lead in building the industry's foundation.

For example, a new initiative by a Swiss non-profit company, Elephant Vert, is scheduled to come online in Meknes end of 2013 or early 2014 to manufacture organic pesticides and organic fertilizer. Elephant Vert will collect organic waste locally to use as a raw material in order to produce an estimated 60.000 MT per year of product.

## 5.6. CASE STUDIES, BEST PRACTICES AND LESSONS LEARNT

Green waste composting pilot projects in different municipalities across Morocco have unfortunately not yet succeeded. These units have quickly experienced operational difficulties, and the fundamental problem of adapting composting techniques to the specific conditions in Morocco.

The very limited use of compost in Morocco and the main composting units' failure can be explained by several factors, including:

- Insufficient control of the composting process;
- Lack of technical capacity;
- Governance and policy not suitable for encouraging investments in composting projects;
- Excessive mechanization is an asset but requires specialized periodic maintenance, for which technical and financial capacity is lacking;
- Lack of market studies on compost demand;
- Lack of a business marketing policy.

Eco Compost Maroc also cites the main issues, a company working to establish its venture in the Rabat-Salé region near the Oum Azza municipal landfill currently operated by the group Pizzorno:

- The type of machinery imported from Europe, which should be adapted to local conditions and constraints.
- Lack of awareness by households and farmers who are the primary raw material suppliers of green and agricultural waste, and the end customer who will purchase the final product (i.e. organic fertilizer, compost, etc.)

## 5.7. UPCOMING INITIATIVES

Based on current legislation, the green and agricultural waste sector will be developed based on individual Regional Waste Plans that are to be established per Law 28-00 on waste.

## 6. PACKAGING WASTE

### 6.1. LEGAL AND INSTITUTIONAL FRAMEWORK

The current legal framework is based on:

- Law 28-00 on waste management and disposal
  - Decree No. 2-07-253 of 18 July 2008 on waste classification and determining the list of hazardous waste, including packaging waste.

### 6.2. STRATEGIES AND PLANNING

One of the National Household Solid Waste Master Plan (PNMD) objectives is to support Municipalities in developing their sorting - reuse - recycling sector, to which it has allocated 1.8% of its 40 billion MAD annual budget. The objective set is 20% of waste recycled by 2020.

A medium and long-term solution needs to be developed for the treatment and disposal of hazardous waste, including contaminated packaging waste, on a national level.

### 6.3. FINANCING

Morocco continues to explore new revenue sources and mechanisms for generating additional revenues and finance the plastics recycling sector, such as the introduction of eco-taxes on packaging waste, which should be adopted in January 2014. Once the Decrees for the application of eco-taxes are in place, a 1.5% tax will be imposed on the sale, importation and end products made of plastic. The eco-tax on plastic is expected to generate 240 million MAD annually, which will be allocated to the National Funds for the Protection and Enhancement of the Environment (FNE).

### 6.4. COLLECTION, TREATMENT AND DISPOSAL

The collection, treatment and disposal of both hazardous and non-hazardous packaging waste are currently performed by the informal private sector. According to the National Hazardous Waste Management Plan, no specific figures are available for packaging waste. However, about 55.000 MT/year of hazardous waste comes from recycling, which can be attributed to waste oils and contaminated packaging waste (paper, plastic and scrap metal). The estimated packaging waste in 2005 in the greater Casablanca region was 4.745 MT per year.

Due to the unavailability of data on packaging waste and the unstructured recycling sector, it is plausible that the majority of packaging from MSW that is collected in urban areas is disposed of in municipal landfills without prior sorting or treatment. The exception to this would be glass packaging, due to local demand by the private sector for this raw material, as discussed below in section 6.5 PRIVATE SECTOR INVOLVEMENT.

72% of the total volume of industrial waste is stored in factories or industrial on-site or near-site facilities, and 5% is deposited in controlled landfills or unsanitary dumps. A considerable portion of this industrial waste is comprised of contaminated packaging.

120,000 tons of raw materials are used annually in the manufacture of plastic bags. Between January 2011 and October 2012, only 1,485 MT were recovered as part of an agreement on waste-to-energy incineration between the cement manufacturers and the Ministry of the Environment. This is an insufficient amount to encourage investment in this sector. The collection and incineration of plastic bags costs about 20.000 MAD per MT, which is more than the production of virgin resin itself, which currently costs about 12.000 MAD per MT. The incineration of plastic bags is therefore not currently a realistic disposal solution.

## 6.5. PRIVATE SECTOR INVOLVEMENT

According to a 2008 World Bank analysis report by Saâd Belghazi on social and poverty impacts by the municipal solid waste sector reform in Morocco, the private sector is mostly active in one specific area of packaging waste: recycled glass. As there is no formal recycling sector, the informal sector and private sector collaborate for the recycling of glass packaging. This arrangement is stimulated by demand for clear glass from the local glass production industry, which helps to divert a significant portion of the glass packaging waste from ultimate disposal in the municipal solid waste facility.

SEVAM, a glass manufacturer operating in Morocco, is the largest local producer of hollow or container glass, with 76% share of the sector. SEVAM purchases the glass recovered from about 300 wholesalers. Wholesalers are downstream a value chain that starts with street pickers who recover glass packaging from garbage bins in streets and landfills. These street pickers sell to semi-wholesalers who consolidate and bundle the recovered glass, and sell to wholesalers who clean, sort and separate clean glass from colored glass. Colored glass is resold to the handicraft sector.

Industry leaders such as SEVAM have initiated efforts through CGEM (the General Confederation of Moroccan Enterprises) to lobby local authorities to find a solution via delegated waste management contracts to provide a system for sorting at the source or at the time of collection. With an effective sorting system in place the industrial producers, who use waste streams in their manufacturing, can be assured adequate and satisfactory quality for recycled raw materials such as recycled glass packaging waste.

The planned national hazardous waste facility, CNEDS, does not plan to accept packaging waste. As such, contaminated packaging waste collection, treatment and disposal will remain within the realms of the private sector, including through waste-to-energy incineration by cement producers. However, legal conditions must be developed and implemented for the recycling and hazardous waste treatment sector to meet sufficient environmental, health, technical and organizational standards.

## 6.6. CASE STUDIES, BEST PRACTICES AND LESSONS LEARNT

Best practices for packaging waste and contaminated packaging waste will differ depending on the type of packaging waste (household, industrial, medical, etc.), the type of packaging material (paper & cardboard, plastic, wood, metallic, and glass) and the type of contamination (radioactive, biological, chemical, etc.). Some examples are:

1. Establish national legislation on recycling;
2. Citizen and sector awareness on the issues surrounding packaging waste;
3. Conduct a waste audit to identify the recycling streams within a business;
4. Waste prevention and waste reduction by buying in bulk, investing in reusable and recyclable items, packaging optimization, packaging life-cycle evaluation, etc;

5. Appropriate sorting and labeling using international symbols to indicate the substance of contamination (radioactive, bio-hazard, chemical hazard);
6. Disposal by a specialized company for transport of specific types of waste.

## 6.7. UPCOMING INITIATIVES

The success of the packaging waste sector and the new fiscal instrument, the eco-tax on plastic, will depend on the creation of a selective waste sorting sector, that is efficient, effective and based on waste sorting at the source, as well as a comprehensive policy framework that provides for regulation, enforcement, incentives and a healthy environment for investment by the private sector.

## 7. CONSTRUCTION & DEMOLITION WASTE

### 7.1. LEGAL AND INSTITUTIONAL FRAMEWORK

Construction and demolition (C&D) waste is defined per Article 2 of Law 28-00 on Waste (2006):

- “Inert waste means any waste that does not produce physical or chemical reaction such as waste from quarrying, mining, demolition, construction or renovation and does not consist of, or is contaminated with, dangerous substances or other pollution-generating elements”;
- Law 28-00 Title III: Management of inert waste, agricultural waste, residual waste and non-hazardous industrial waste:
  - Article 27: In case of lack of appropriate techniques for the treatment and disposal of inert waste, it can be used for filling quarries. It can also be used to enhance, treat or dispose of other waste categories, with the exception of hazardous waste.
- Inert and hazardous construction and demolition waste are further defined and itemized in Annex I, Code 17 of Decree No. 2-07-253 of 18 July 2008 on waste classification and determining the list of hazardous waste.

### 7.2. STRATEGIES AND PLANNING

Construction and demolition waste is generally excluded from the household waste management services agreement between a municipality and its delegated solid waste services provider.

According to the contract agreement template between communes and landfill operators, inert waste (demolition materials, excavation, etc.) received by the landfill must be deposited separately in a place other than the bins to be landfilled. The operator will later use this type of debris to cover waste or for the development of tertiary access roads, if they are of an appropriate nature.

### 7.3. FINANCING

In Rabat, which is the only municipality that has established a separate construction, demolition and green waste contract, the financing is entirely provided by the municipality. For example, the 7-year contract between the municipality of Rabat and the company Sita El Beda for these services amounts to 142.800.000 MAD, which is equal to 20.000.000 MAD per year, at a cost of 171 MAD per ton.

### 7.4. COLLECTION, TREATMENT AND DISPOSAL

It is difficult to determine the total amount of national construction and demolition annual waste. According to the Ministry of Environment's website, a total of 334 MT of C&D waste was produced in Casablanca in 2005. However, an article entitled Enquête: Ces chantiers qui polluent by Soufiane Chakkouche published by TelQuel in June 2013 estimates 7 million MT per year for this waste stream. This same article provides an overview of the management of construction and demolition waste stream that is cause for concern:

This type of waste is classified as Class 2 (inert) or Class 3 (hazardous), and there is a national shortage of Class 2 and Class 3 disposal facilities. Most of this waste stream is disposed of through illegal dumping into uncontrolled areas, which means that the waste producer covers only the cost of transport.

## 7.5. PRIVATE SECTOR INVOLVEMENT

Rabat is the only municipality documented in the PNDM quarterly report that has delegated the collection and disposal of construction and demolition waste, along with green waste, under a separate contract to a waste management company. This is the case of the Commune of Rabat, who has made a 7-year contract (starting in 2008) with Sita Al Beida. According to the statistics, approximately 90% of the construction, demolition and green waste are collected, which is equal to 119.500 MT.

## 7.6. CASE STUDIES, BEST PRACTICES AND LESSONS LEARNT

Best practices are based on the reduce-reuse-recycle-renew approach, which is a key element of green architecture or green building. Much of construction and demolition materials can be reused or recycled, which reduces waste and pollution, conserves natural resources, reduces greenhouse gases due to manufacturing and transportation-related emissions, and provides cost savings.

Another good practice is to deconstruct all or part of a structure, rather than demolish a building, with reuse as a primary aim. Deconstruction enables the building components to be carefully dismantled for reuse or recycling instead of being demolished, and landfilled. This approach is often more cost effective than disposal.

Some non-hazardous C&D materials that can be reused or recycled are:

Acoustical ceiling tiles;	Asphalt;	Asphalt shingles;
Bricks;	Cardboard;	Carpet and pad;
Concrete;	Dirt;	Drywall;
Fluorescent lights and ballasts;	Insulation;	Land clearing debris;
Metals;	Office waste (paper, cans, glass, plastic bottles and cardboard);	
Paint;	Plastic film from packaging;	Porcelain;
Window glass;	Wood.	

## 7.7. UPCOMING INITIATIVES

Under the National Hazardous Waste Plan, the installation of a solidification/stabilization (S/S) facility (STASO) is planned. This facility will enable the treatment of 6.473 MT per year of various types of hazardous industrial solid waste, including contaminated construction and demolition waste.

## 8. WASTE TIRES

### 8.1. LEGAL AND INSTITUTIONAL FRAMEWORK

Law 28-00 on Waste (2006) covers tire waste, which is itemized in Annex I, under Code 16.01.03 of Decree No. 2-07-253 dated 18 July 2008 on waste classification and establishing the list of hazardous waste. It is not classified as hazardous waste and is assumed as non-hazardous.

### 8.2. STRATEGIES AND PLANNING

Morocco aims to establish an effective organization of the collection and treatment of vehicle waste, which is adapted to the national context.

In 2012, the consulting firm Impact Plus was reportedly commissioned by the Department of Environment to conduct a feasibility study on the tire industry. The results of the study are not yet publicly available.

### 8.3. FINANCING

In parallel to the commissioned study, the Ministry of Energy, Mines, Water and Environment has been examining the operations of several European networks. In May 2012, the Ministry organized a delegation from the government and the private sector (namely representatives from the Moroccan cement sector) to visit France to examine the economic, financial, and business model for the collection of tires, physical organization of flows preparation and grinding, traceability, incineration, etc.

### 8.4. COLLECTION, TREATMENT AND DISPOSAL

According to Article 1.1 of the template provided by the Ministry of Interior for the Contract Agreement on the Management Delegation of Public Service for the Design, Construction, Financing and Operations of a Controlled Landfill, only municipal solid waste and non-hazardous waste can be disposed of in the municipal landfill, which includes tires.

However, there is currently no structured system in place to collect tire waste, and its recovery requires strict supervision. To date, used tires primarily serve as a raw material to produce manufactured goods (shoes, buckets and containers, etc.) or to fuel steam and pottery kilns, which are not equipped for filtration of air emissions.

### 8.5. PRIVATE SECTOR INVOLVEMENT

The cement industry has proposed to incinerate tire waste under waste to energy (WtE) programs, in order to reduce their energy bill, as it currently imports 1.4 million MT of petroleum coke at 1.200 to 1.500 MAD per MT to fuel their furnaces.

## 8.6. CASE STUDIES, BEST PRACTICES AND LESSONS LEARNT

Internationally, there are several main management approaches to tire waste. The first focuses on producer responsibility and the establishment of a regulatory framework. In practice, this could include an environmental tax or Ecotax in the sales price of tires and vehicles to finance the collection and recycling of this raw material. Lifecycle management is another approach where tire producers take responsibility for their tires from production to recovery and disposal.

However, these types of approaches may be impractical in Morocco because of the prevalence of the informal sector and consequently it would be difficult to determine traceability. In some countries, such as France and Germany, used tires are shredded and used as a component in the production of new tires.

## 8.7. UPCOMING INITIATIVES

### Future policy framework

According to the National Hazardous Waste Plan report dated June 2013, the Ministry of Energy, Mines, Water and Environment is in the process of concluding three policy framework agreements to establish specific sector-related legislation for lead/ acid batteries, oil waste and used tires. The procedures for the chemical analysis for hazardous industrial waste for these sectors still need to be established. Under the PGPE program, GIZ has expressed its intention to develop these procedures. Also, many regulations on technical standards need to be established for disposal facilities, vehicles, etc. Compliance with European standards should be considered.

### Future outreach and collection program

The National Hazardous Waste Plan also provides for an eventual management system for hazardous waste from vehicle repair and maintenance facilities. A committee comprised of stakeholders (mechanics association, environmental protection and monitoring entities, etc.) would monitor this system. The mechanism would provide for awareness efforts for vehicle service facilities to understand their regulatory obligations with regards to waste management. The mechanism would also offer a waste collection service for tires, used oil, and other vehicle service waste.

## 9. OIL & LUBRICANTS WASTE

### 9.1. LEGAL AND INSTITUTIONAL FRAMEWORK

- Law 28-00 on Waste (2006) covers waste oils and lubricants, which are itemized as either hazardous or non-hazardous waste per Annex I, under Code 13.08 of Decree No. 2-07-253 dated 18 July 2008 on the Moroccan Waste Catalogue;
- Decree No. 2-09-85 of 6 September 2011 on the collection, transportation and treatment of certain waste oils;
- A reasonable hazardous waste management system requires compliance with international standards relating to rotary kilns and emissions. The specific legal framework is composed by Decree 02-12-172 on waste incineration and the agreement between the cement manufacturers and the Government concerning the co-processing and disposal of waste in cement kilns.

### 9.2. STRATEGIES AND PLANNING

According to the National Hazardous Waste Plan report dated June 2013, the Ministry of Energy, Mines, Water and Environment is in the process of concluding three policy framework agreements to establish specific sector-related legislation for lead - acid batteries, oil waste and used tires. The procedures for the chemical analysis for hazardous industrial waste for these sectors still need to be established. Under the PGPE program, GIZ has expressed its intention to develop these procedures. Also, many regulations on technical standards need to be established for disposal facilities, vehicles, etc. Compliance with European standards should be considered.

### 9.3. FINANCING

The CNEDS project represents an investment of about 240 million MAD. In its approved design, the CNEDS project will include a treatment facility for wastewater containing lubricants and oils.

According to the National Hazardous Waste Plan report from June 2013, the way that this waste stream is handled should improve because Decree No. 2-09-85 of 6 September 2011 on the collection, transportation and treatment of certain waste oils is now in force. The current quantity collected is still small, about 5.000 MT per year. The collection rate would improve significantly once the cement industry pays appropriately for this alternative fuel.

Plans for a partnership agreement for the creation of a collection, recycling and disposal unit of used oils in Morocco has been agreed to by the Ministry of Energy, Mines, Water and Environment (MEMEE), the Professional Association of Cement (APC) and the Moroccan Oil Association (GPM) in order to create a pathway to improve the collection and recycling of waste oils and to prevent unauthorized use and hazardous waste disposal.

## 9.4. COLLECTION, TREATMENT AND DISPOSAL

The estimated amount of waste oil produced is 100,000 MT, and the estimated quantity of this waste oil that is collected is 10,000 MT. The difference is unaccounted for.

As the informal sector currently handles most of the waste collection and disposal, waste oils are used to fuel the public baths and communal ovens, and also dumped unlawfully into nature. Although the law classifies these materials as hazardous, in practice they are not treated as such. Many efforts have been made in terms of legislation for the transport of hazardous materials, but according to reports, the sector is in disarray because there are no specific regulations. It is estimated that over 80% of the activity of storage, collection and transport of these materials is ensured by unauthorized structures. This has also led to a lack of traceability for the waste treated by the informal sector.

Two kinds of approved operators can manage disposal: cement manufacturers and authorized gas stations. In Morocco, there are no statistics on the recovery of these oils through service stations as most producers prefer to deal with the informal sector to due cost reasons.

## 9.5. PRIVATE SECTOR INVOLVEMENT

Certain types of waste oil are especially appreciated by the cement industry, which has already organized small collection systems for this type of hazardous waste. The cement industry incinerates about 48.000 MT of hazardous waste, including waste oils and lubricants, in kilns. However, the Ministry must ensure that this waste is incinerated in facilities that meet the safety requirements and emissions per European regulations.

About 55.000 MT per year of hazardous waste are recycled. This includes some of the waste oils and contaminated packaging waste (paper, plastic and scrap metal). This service is currently conducted by the informal private sector. The CNEDS national hazardous waste treatment facility project does not have plans to build its own hazardous waste recycling facilities. As such, this activity will remain with the private sector. However, legal conditions must be created and implemented for the recycling sector to meet adequate environmental standards, health, and organizational techniques.

## 9.6. CASE STUDIES, BEST PRACTICES AND LESSONS LEARNT

The National Hazardous Waste Management plan advocates the following best practices for small quantities of hazardous waste, including waste oils, though with no specific formulation or commitment for their implementation. During the construction of facilities for the treatment of hazardous waste, decentralized reception facilities could be made to complete the hazardous waste management system. Municipalities could deliver small quantities of hazardous waste they have collected. From the reception facilities, these small amounts of hazardous waste may be transported in large quantities to treatment and disposal facilities.

Good environmental management of municipal waste should establish a separate collection system for small quantities of hazardous household waste. This allows for non-hazardous household waste collection and treatment or sustainable landfilling of household waste to be less threatened by hazardous materials (reduced landfill leachate toxicity, etc.).

Oil and lubricant waste can be highly toxic, and a threat to environmental health and water supplies if the recovery, treatment and disposal are mismanaged. This waste stream can also be a valuable energy resource since it can be recycled, re-refined and re-used. European states have been global leaders in the reduce-reuse-recycle approach to oil and lubricant waste. It would be interesting for Morocco to conduct

a baseline study to identify the best practices and guidelines for the Kingdom and its municipalities to follow in this regard, including funding mechanisms. It would be important to include rural and farming communities in this study, because they are considerable waste generators for this stream and in order to ensure their access to eventual recycling centers.

As with all other waste streams, the key to success will be in defining and regulating the oil and lubricant waste recycling market to ensure environmental protection and economic growth from value added opportunities.

## 9.7. UPCOMING INITIATIVES

About 6.000 MT per year of oil residues from the cleaning of vessels is subject to a special treatment and disposal technique. It has been recommended to give the Port Authority control of the delivery and local treatment of the waste. Some amounts may also be processed by the physical-chemical treatment facility (UPC) of the National Special Waste Disposal Center (CNEDS).

Oil-water mixtures are typically produced in service stations and ports. Oil based waste should be treated in decentralized facilities for oil separation. Port areas and large cities are thus suitable places for these decentralized facilities. When oil and water are separated in decentralized facilities (TPCo-Local), the resulting wastewater can be released into the sewage system for the municipal wastewater treatment plant, and the oil waste can be incinerated in a waste-to-energy system.

According to the June 2013 report on the National Hazardous Waste National Plan, the Moroccan government should ensure the following with regards to incineration and the cement industry:

- Controlled application of the Decree on co-incineration with strict standards per Decree 2-12-172;
- Itemized reporting by recycling companies for waste oil and improvement of their environmental protection and safety performance;
- Detailed price controls for the industrial sector and waste eliminators/ incinerators.

## 10. E-WASTE

### 10.1. LEGAL AND INSTITUTIONAL FRAMEWORK

The Technical Report on the Assessment of e-waste management in Morocco, by Salah Eddine Laissaoui (CMPP) and David Rochat (EMPA), published in 2008, is the primary source document for the information contained within this section on e-waste.

The Moroccan legal system is comprised of a set of laws that apply to waste management, and would therefore concern e-waste management:

- Law n°28-00 relative to waste management and disposal;
- Law n° 10-95 on water;
- Law n°13-03 on air pollution;
- Law n°12-03 on environmental impact studies;
- Law n°11-03 on the protection and development of the environment.

Waste Electrical and Electronic Equipment (WEEE), also known as e-waste, does not currently have any specific legislation in Morocco. However, Law 28-00 on waste management and disposal does allow for the provision to craft application decrees for specific types of waste, such as e-waste.

The Information and Communication Technologies (ICT) sector, falls within the framework of e-Morocco, a broad strategy developed by the government in partnership with both public and private stakeholders represented in the ICT strategic committee. This strategy aims to promote the Moroccan ICT sector both nationally and internationally, and to improve the sector's structure and regulations through institutional programs and actions. An e-waste strategy group was formed under this committee.

### 10.2. STRATEGIES AND PLANNING

The Ministry of Energy, Mines, Water and Environment has coordinated and established a National e-Waste Strategy group.

The public and private sectors have developed strategies to develop the ICT sector, under the framework strategy called e-Morocco. However, sustainable e-waste management has not been specifically addressed. Nonetheless, both sectors are involved with environmental protection initiatives, for example the government initiatives for Environmentally Sustainable Industrial Development, the National Hazardous Waste Management Plan, and the CGEM's Social Responsibility Charter, which is a private sector initiative. In order to implement these initiatives into action, the existing conventions and strategies need to be amended to take e-waste management into account.

### 10.3. FINANCING

- The Industrial Pollution Control Fund (FODEP) is involved in the financing of pollution control projects through grants in combination with loans provided by banks and with self-financing by the private sector;

- The ANPME, which aims to develop and implement advice and support programs geared towards the creation, promotion and modernization of businesses through financial assistance for SMEs;
- The Technology Dissemination Network (RDT), which aims to assist SMEs with a needs assessment for innovation projects or technological development;
- The Hassan II Fund for Economic and Social Development;
- The National Human Development Initiative (INDH), which incorporates social issues into the national economic and development priorities.

In addition, the following organizations provide technical assistance:

- Moroccan Centre for Clean Production (CMPP);
- National School of the Mineral Industry (ENIM);
- Moroccan Association of Waste and Environment Experts (AMEDE);
- Moroccan Ministry of Employment

## 10.4. COLLECTION, TREATMENT AND DISPOSAL

There are significant discrepancies between official statistics and the 2008 e-waste report as it pertains to the estimated annual e-waste generated in Morocco. The June 2013 report on the National Hazardous Waste Management Plan estimates annual e-waste at 3.083 MT per year, equal to just 1% of the total national hazardous waste. However, the 2008 e-waste report estimates this quantity to be 30.300 MT annually. These discrepant figures could be explained by the fact that there is no formal sector that is specialized in e-waste management, with the exception of dismantling operations and several industrial recycling initiatives. As such, the traceability of waste and the collection of data are more challenging.

With regards to the recycling infrastructure, the informal sector collects 90% of scrap metal. The majority of this collected metal is exported to foreign smelters. In parallel, due to the unstructured sector, the opportunity cost is that the local metallurgical industry imports costly raw materials, valued at US\$ 286 million.

The remaining 10% of e-waste recycling and treatment is performed by the private and civil society sector and is discussed in the section below.

With regards to disposal, the planned CNEDS hazardous waste treatment plant would be a suitable solution for the disposal of e-waste components that cannot be reused, particularly lead-rich glass, plastics containing flame-retardants, and other toxic waste. As there will be a charge for the services of this plant, the issue of profitability must be addressed since currently these costs are primarily externalized onto society and the environment.

The cement manufactures that offer specialized waste incineration services do not accept e-waste, as they contain heavy metals above the acceptable limits and the plastics contain toxic flame-retardants.

## 10.5. PRIVATE SECTOR INVOLVEMENT

The largest metal processing units in Morocco are SONASID, Tube et Profil, Maghreb Steel, and Comptoirs Métallurgiques. Several small and medium smelting units are concentrated in the Casablanca, Rabat and Kenitra area.

The main companies involved in the formal recycling and/ or treatment sector are:

- ECODECHET purchases, repairs, dismantles non-reparable units, and recovers components. E-waste that cannot be reused is stored until a solution is found;

- ECOTECHNO developed a process to recycle and reuse electronic and electrical equipment waste;
- VALDEM (a subsidiary of SOVAMEP, France) recycles and exports scrap metal to Europe and Asia. This firm also treats e-waste for some Moroccan companies that pay for the service. The recovered metal is sold locally and material that cannot be reused is exported to France for treatment;
- IVSEP is specialized in e-waste treatment and recycling, with support from CMPP under the framework of the Ecologically Sustainable Industrial Development program;
- Groupe MANAGEM recycles electronic waste at the Guemassa facility. The process specializes in sorting and recycling electronic equipment for precious metals and non-ferrous metals to produce a blister in copper alloy, gold and silver.

Associations are also involved in the formal recycling sector. For example, the Collectique Association which issues certificates, and Ateliers Sans Frontières, which performs recycling and waste storage, and the Drosos Foundation that has formed a partnership agreement with Association Al Jisr for the collection and recycling of e-waste.

Although the informal sector dominates the e-waste collection activity, it is not very active in metal processing, due to the technical know-how and the investments that are required. The recovery of precious and special metals that can be found in certain types of e-waste does not yet exist in Morocco except for the metallurgical complex in Guemassa, which is specialized in metals such as copper, lead, zinc and cobalt.

## 10.6. CASE STUDIES, BEST PRACTICES AND LESSONS LEARNT

Some of the expert key recommendations for the Strategic Steering Committee provided in the Technical report on the assessment of e-waste management in Morocco are:

- Perform an international benchmarking to develop a system appropriate for Morocco;
- Formulate a specific application decree for e-waste management;
- Help to establish a sustainable e-waste system (policy, regulations, collection, transport, storage, dismantling, crushing/ mechanical sorting, management of hazardous e-waste disposal, recovery and export) and structure the sector to:
  - Explore investment and technical transfer opportunities for the development of national smelters to process the metal waste locally, which will provide a national supply of raw materials for the local metallurgical sector, reduce their imports of costly raw material, and provide an opportunity to significantly increase Moroccan exports.
  - Explore investment and technical transfer opportunities to create facilities for the recovery of precious and special metals.
- Develop an information gathering and surveillance system:
  - Although the OTI monitors the number of mobile phones and computers, no entity monitors the number of television sets and other electric and electronic equipment. It is important that a structure address this aspect in order to anticipate the e-waste in terms of quantity and quality.
  - Create an accreditation system for e-waste treatment and recycling entities, and/or incite them to certify their environmental management systems according to ISO 14001, EMAS, or other standards.

- Imports and charity donations of electronic or electric equipment from abroad should be entrusted to entities that will be required to ensure their traceability, so that when the product reaches the end of its useful life, the equipment is channeled into the e-waste management sector.
- Establish an extended producer responsibility (EPR) system for entities that import, produce and market electronic or electric products;
- Develop outreach, awareness and education programs and campaigns on the issues surrounding e-waste;
- Study and establish the required infrastructure for each stage of the e-waste value and disposal chain, for example:

#### **Collection:**

- Organize B2B collection circuits for the public and private sector B2C circuit for households, with door-to-door collection, district waste collection centers, etc.
- Before remediating uncontrolled dumps to develop controlled landfills, to remove any e-waste, for example by purchasing it from the informal sector.

#### **Transport**

- Encourage the acquisition of vehicles by operators in the existing informal sector through loans at subsidized interest rates, payment facilities, etc.

#### **Storage**

- Facilitate the acquisition of land to build storage for companies, wholesalers and semi-wholesalers operating in this area, in order to improve storage conditions (more space, specialized zones, competitive rates, etc.). This would mitigate open-air storage and leaching.

#### **Dismantling**

- Encourage existing initiatives and improve their environmental quality
- Organize the informal sector by establishing dismantling cooperatives and offer operators technical and financial support (training, professional equipment, personal protective clothing, etc.)

#### **Crushing / mechanical sorting**

- Develop and disseminate existing technology through technology transfer programs to improve environmental quality
- Support the Moroccan metallurgy sector or export to specialized firms.
- Examine each e-waste outlet, case by case
- Perform a technology watch; the switch to LCD televisions will generate a large volume of unwanted cathode-ray tube television sets. Processing technology should be upgradable, in order to prepare for the processing of LCDs.

#### **Management of hazardous substances**

- Evaluate the feasibility of e-waste treated and disposed of by the hazardous waste treatment plant (CNEDS) or at controlled landfills
- Promote initiatives to recycle e-waste by-products.

## 10.7. UPCOMING INITIATIVES

The Strategic Steering Committee established by the Ministry of Energy, Mines, Water and Environment is responsible for developing an e-waste management strategy and action plan in Morocco.

Also, the majority of e-waste collection and recycling in Morocco is conducted by the informal sector, as the formal sector is in its very early stages, with several initiatives just beginning to emerge and become operational. Companies that specialize in collection, dismantling and recovery are a new phenomenon in Morocco. They operate independently to collect waste from companies and separate the various components for sales on the national or international markets.

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

**FODEP** was established in 1998 under the Morocco-Germany cooperation, supported by a grant from the German Government (KfW). FODEP is involved in the financing of remediation projects through grants, in combination with bank loans, at 20% of integrated industrial process projects that aim to mitigate industrial pollution and resource conservation (water, energy, etc.), or at 40% of projects for the industrial process downstream that reduce pollution by establishing facilities for treatment or disposal of liquid and gaseous effluents and solid waste.

**The Clean Development Mechanism (CDM):** To implement and promote Morocco's CDM potential at national and international level, Morocco has established a CDM Designated National Authority within the Department of the Environment. This authority shall approve the plans before they are submitted to the CDM Executive Board. The CDM is a flexible Kyoto Protocol tool to help countries meet their reduction targets in greenhouse gas emissions. Developed countries can meet part of their commitments via the said Protocol, through projects in developing countries. These projects must contribute to sustainable development in host countries and are in the following areas: waste, energy efficiency, renewable energy and reforestation.

**GIZ:** Supports the development of the national policy and strategy for environmental protection: Capacity building; upgrading the industrial sector; improved hazardous waste management support.

**KfW:** Development of hazardous waste treatment facilities (CNEDS).

**World Bank:** Development of a sustainable institutional and financial strategy for good governance of solid waste management; development of recycling and recovery of waste; elaboration of a control and monitoring system, CDM planning, citizen evaluation of the national municipal solid waste program.

**JICA:** Capacity building, purchasing of equipment, and pilot projects for waste sorting in Tiznit.

**European Union:** Capacity building and pilot projects for waste sorting and recycling in Beni Mellal.

**UNDP:** Social support for waste recovery.

**International Bank for Reconstruction and Development (IBRD):** Loan provider for the development of the waste management sector.

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

- The National Solid Waste Management Program is supported through technical assistance from the World Bank, GiZ, JICA and KfW;
- KfW and GiZ support the project to establish a National Special Waste Center (CNEDS);
- Horizon 2020 supports Morocco for capacity building of officials responsible for solid waste management.

## 13. NEEDS ASSESSMENT FOR CAPACITY DEVELOPMENT UNTIL 2015

Morocco would continue to benefit from additional capacity building assistance in order to help to build upon Law 28-00 on Waste to develop further application decrees specific for each waste stream.

One of the major barriers to municipal waste management is late payment or non-payment by the municipality to the contracted waste management company, which results in sub-optimal Municipal Solid Waste management and occasional strikes. It would be beneficial to assist Morocco in further developing the contract template for their service provider provisions in order to strengthen the incentives for both the public and private partners to ensure a cost-effective and adequate solid waste service agreement.

Progress towards an orderly disposal of hazardous waste can be achieved by introducing special regimes for certain categories of waste such as e-waste or medical waste. Other countries, including the Maghreb countries can also serve as a model. SWEEP-Net is in a strategic position to gather and share best practices for each waste stream, coordinate potential financing partners, provide technical transfer solutions, and support capacity building.

## 14. CONCLUSION & RECOMMENDATIONS FOR SWEEP-NET ASSISTANCE

Over the past three years, Morocco has experienced a noted improvement in solid waste management through initiatives taken by various Moroccan stakeholders and support of international cooperation (World Bank, GIZ, UNDP, JICA, KfW). These efforts have resulted in:

- The strengthening of the legal framework with the adoption of several legal texts;
- The involvement of the private sector that provides solid waste collection services to 74% of the urban population under 90 different contracts with a turnover of 1.78 million MAD;
- The implementation of the National Municipal Solid Waste Program;
- Development and implementation of the National Master Hazardous Waste Plan;
- A total of 15 controlled landfills for MSW;
- A total of 26 remediated landfills;
- Greater involvement of the private sector through the development of standardized request for bid templates;
- The establishment of an outreach program for information and communication;
- The establishment of a program of social support and inclusion of the informal sector for waste recovery;
- The establishment of a training program to help local communities to achieve the projects planned under the PNDM;
- The establishment of the Industrial Pollution Fund (FODEP);
- The establishment of a Clean Development Mechanism (CDM).

Despite these improvements, it is recommended that further efforts include:

### Policy and Planning

- The improvement of private sector participation especially for industrial and medical waste;
- Planning and development of the recycling sector, with a focus on sorting at the source;
- Improvement of rural waste collection and disposal services;
- Development of industrial waste stream strategies.

## Financial Strengthening

- Improved funding and cost recovery mechanisms relating to waste management;
- The mobilization of additional financial resources by a waste stream value chain and CDM development;
- The establishment of financial support mechanisms for private investment in projects to develop recycling and composting facilities;
- Revision of rules for payment to private operators.

## Regulatory Framework

- Implementing the national charter provisions and strengthening the legal framework by crafting and adopting the additional legal texts;
- Implementation of the Decrees issued and development of application Decrees;
- Establishment of emissions standards per international norms.

## Control and Monitoring

- The creation of adequate control structures, and monitoring the performance of private operators;
- The improvement of the Municipal Solid Waste public-private partnership agreement and terms of reference to clarify partner roles and mitigate potential problems that lead to MSW service strikes and other service issues.

## Awareness Raising

- Strengthening education on solid waste management by establishing a permanent policy for awareness on solid waste management;
- Capacity building for local communities on solid waste management.

For this purpose, it is recommended that SWEEP-Net support Morocco to implement the above recommendations through the exchange of information and sharing of experiences and best practices between countries, the development of recycling and recovery sectors, hazardous waste management and cost recovery.

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The regional solid waste exchange of information  
and expertise network in Mashreq and Maghreb countries

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