Chapter 7
The Waste Informal Sector Impact in Mena Region

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7.1 Introduction

Improving urban waste management in the MENA Region is increasingly a real challenge imposed by significant population growth, real urban evolution, and the emergence of new consumption patterns. Despite all the efforts made by institutional actors to improve this sector, and despite considerable progress (improvement in collection, landfill and recovery rates), the general observation is that serious problems persist both upstream and downstream of the waste management cycle.

Stakeholders are faced with a service that is increasingly costly and a source of tensions and pressures that are difficult to identify. Decision-making and the completion of tenders have also become a delicate exercise, given the rapid evolution of the national legal arsenal and the slow implementation of the application texts, and the challenge of finding technical solutions adapted to the specificities of each city.

In the majority of MENA cities, waste pickers are informal actors operating on the margins of the waste value chain and play an important role in the circular economy system. These informal waste pickers have always been pushed to the

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margins, edges, and interstices of large cities and the "holes" of metropolises (Florin 2016).

Informal recyclers play a fundamental role in the urban solid waste management system. Their activity valorizes recyclables produced by households, businesses, and industries. Although it could allow the recovery of a more or less important portion of household and similar waste, the organization of this activity is currently limited to a few cooperatives of sorters at the level of the new controlled landfills, while it is still informal, unstructured, and not very profitable at the level of the cities.

In this context characterized by the complexity of the field and the multitude of stakeholders, there is a growing consensus on the need for a new integrated approach capable of capturing all aspects likely to improve the waste management system, particularly municipal solid waste. Analyzing the weak links of the current model, questioning the roles of all potential actors, should define new rules and rethink the roles required to continuously and efficiently improve the current situation.

The research methodology is based on interviews conducted in Morocco, Algeria, and Tunisia. It also relies on the review of existing literature and documentation on the subject in the MENA Region, observation of recovery, reclamation, and recycling activities.

7.2 The Informal Sector in the MENA Region's Urban Waste Management System

7.2.1 Waste Management Policies

Worldwide, urban waste management is considered as a public service, like water distribution or energy delivery. In most countries, this service is provided by local authorities as one of their municipal competences; those competences are usually being regulated by a national legal framework. As a general rule, waste management policy consists in putting in place the infrastructures (collection system, sanitary landfills and/or energy recovery plants, sorting and recycling facilities); setting up a separate collection system as well as waste transport, underpinned by a strong set of legislations; and establishing a sustainable cost recovery system based on the "polluter pays" principle, as well as respecting the waste hierarchy. This should be done in an integrated way (integrated sustainable waste management), meaning that:

- All physical elements (infrastructure) of the system, from waste generation through storage, collection, transport, transfer, recycling, recovery, treatment, and disposal, are considered.
- All stakeholders are involved, including municipalities, regional and national governments, waste generators/service users (including industry, business, institutions and households), producers (those who put products on the market which

become waste at the end of their life, including manufacturers, brand owners, importers and others in the supply chain), service providers (whether public or private sector, formal or informal, large or small), civil society and non-governmental organizations (NGOs) (which play a variety of roles, including facilitating the participation of other parties), international agencies, etc.
- All strategic aspects, including the political, health, institutional, social, economic, financial, environmental, and technical facets, are taken into account.

Waste management in developing countries is not conducted in such an integrated way and is most of the time characterized by not only an absence of waste collection (or at least an absence of separate collection) and disposal schemes but also an absence of adequate treatment facilities, – leading to improperly managed dumping sites – as well as by weakly enforced environmental and municipal solid waste legislation, when existing.

Solid waste management (SWM) is one of the most important environmental challenges that countries in the MENA region face. Indeed, "the rapid growth of the population, a booming economy, rapid urbanization, and high standards of living in the community have significantly accelerated the rate of solid waste generation" (Hemidat et al. 2022).

The MENA region countries suffer from an insufficiently regulated context, a lack of long-term planning, an over centralization of authority at national level, and a lack of cost recovery mechanism at national and local level. Notwithstanding, some countries do have a waste management strategy and legislations; however, most of them still do not have appropriate long-term vision, legislations, and strategies. Moreover, in countries where waste management laws and strategies exist, their enforcement, the other side of the coin, remains problematic.

In addition to that, when implementing waste management strategies, priority is given to the sanitation of existing dumping sites. Collection schemes, when existing, are mingled ones. So far, there is no systemic separate collection in any of the MENA countries.

It can be said that while sanitation of dumpsites and building of adequate infrastructures are increasing year after year, separate collection still does not exist in a systematic way. Separate collection schemes exist only as pilot projects, which end when donor funding expires.

Separate collection is usually considered as a financial issue for municipalities, since it leads to an important increase of the municipal budget, due to the lack of an adequate cost recovery system. Furthermore, since separate collection is handled by informal waste pickers, introducing separate collection schemes is concerning for local decision-makers who do not want to provoke a social crisis, as waste pickers could get less revenues in case a formal system would be put in place.

There exist multiple reasons for that situation: on the one hand, an inadequate governance of local authorities and, on the other hand, an absence of efficient fiscal and financial system allowing the concrete implementation of the waste strategy.

7.2.2 Collection System Context

– What should be collected and how should it be collected?

When talking about urban waste (or municipal waste), we intend to cover household waste and assimilated ones, made of an important organic fraction and a packaging/dry fraction (paper, cardboard, glass, metal, and plastic). The collection we deal with here is the dry fraction. Nevertheless, we must bear in mind that organic waste can be collected as (animal) feed in very poor areas.

In the MENA region, most of the time, municipal wastes are collected under the responsibility of the municipality, with some exceptions or less efficient systems in remote areas. It is well established that the selective collecting of household waste is largely carried out by the informal sector. "Recyclables" are collected by waste pickers (informal collectors), straight from household waste, with the result that much of this waste escapes the quantity of household waste collected by the municipalities and their delegates.

Waste pickers operate in two different modes.

- Part of them collect separately in the dumpsites, with or without adequate tools, in precarious conditions, regardless of hygiene and security. They usually collect the recyclables in landfill, generally located on the outskirts of urban centers, after the trucks in charge of collecting mixed household waste have taken the (unsorted) waste to the landfill. Only a few controlled landfills now have operational sorting lines where waste pickers are "employed" to carry out the sorting operations under better conditions. There are three sorting lines of this kind that are operational in Morocco: in Rabat, Meknes, and Marrakech.
- Others roam around the city's neighborhoods and rummage through the garbage (household and similar waste bins and industrial waste bins) to sort and recover all recyclable waste, especially PET bottles, metals, paper, and cardboard. The waste that is collected in the city is generally less dirty and soiled than the waste collected in landfills, since it is collected further upstream and can therefore constitute a better-quality recyclable material.

The means of collection and recovery vary according to age, location, and habitat: it can be realized on foot, bicycle, small or large carts, carts with donkeys, and three-wheelers.

The working conditions are harsh both from a sanitary and technical point of view. Their activity is not recognized and therefore informal.

– How is waste collection financed?

In developed countries, financial means rely on the application of the "polluter pays" principle applied as closest as possible to the producer of waste (the citizen, local taxes, and/or the consumer, extended producer responsibility (EPR) systems).

In those countries (mainly EU, North America, Canada), EPR systems/schemes have been implemented for many years and allow for a sustainable management of waste (by sustainable management, we mean a management where waste is

considered as a resource and is put back into a circular process, essentially thanks to selective collection and recycling activities adapted to the existing material flows).

Similarly, waste-related taxation is now applied at the local level and becomes an economic incentive for households that produce less waste (pay as you through system) or sort more. On the contrary, in developing countries, collection (and waste management) is most of the time financed by the general budget of the municipality. This budget is made of local taxes (tourism…) – without any connection either with the waste management service or with the quantity of waste produced – and subsidies from the national government. The cost of basic municipal waste management operations (collection and transport to the landfill) occupies a considerable portion of city budget in developing nations. It is therefore unthinkable for local authorities to implement a separate collection system without additional funding.

To address this budget deficit, several MENA countries have begun to think about developing an EPR system. Besides the usual problem of lack of legislation and appropriate facilities, they are then faced with the problem of the informal sector. This informal sector can only be part of the solution, but it needs formalization (in order to avoid unsound practices) and professionalization.

7.2.3 The Relationship Between the Informal and Formal Sector

Once collected, the recovered waste is usually sold by the waste pickers to various kinds of intermediaries and wholesalers. The size of the wholesalers depends on their premises: those located in the cities (generally in poor areas) have small premises (garages) and those located in the periphery have larger premises (sometimes up to 1000 m^2). They usually store, sort, and/or wash recyclable waste purchased from waste pickers or smaller intermediaries. Then, they sell it to wholesale shredders. At that stage of the process starts the "formal" sector. Some "shredders" are still informal, but others are patented recycling companies with storage facilities. After shredding, the material is resold to manufacturers.

Due to their poor conditions of work, lack of means (no storage place, no trucks, etc.), and lack of consideration, the first level of the chain (waste pickers) is exploited and poorly paid. The people working on the next level are slightly better regarded and so on, depending mainly on the quantity they can offer in once.

Without any doubt, the informal sector contributes significantly to the recycling rates of many cities in the MENA region (Hemidat et al. 2022). Thus, reducing the volume of waste sent to landfills, and environmental pollution, while creating local added value through the recycling market and informal employment opportunities.

However, despite these benefits, the informal sector is also associated with negative social and economic conditions, such as poverty, bad working conditions, exploitation, discrimination, child labor, social rejection, and lack of education.

Working as a waste picker is associated with low status and considered undesirable. There is a general disrespect for the work, thus producing low working ethics of workers and poor quality of their work.

In light of this situation, policy- and decision-makers are well aware of the contribution of the informal sector and consider the waste pickers as relevant stakeholders in their waste management systems. Nevertheless, they still have difficulties understanding how to formalize them, while improving their working conditions and socioeconomic situation, without threatening dozens of jobs provided by such a system. For sure, the right recipe depends on the socioeconomic and cultural context, which varies from one country/region to another.

Based on an international benchmark of proven initiatives, the main forms of support for the organization of the waste recovery business can be listed as follows:

- Creating a cooperative or association of waste pickers managed by an office.
- Encouraging wholesalers to establish a formal framework with micro-associations of waste pickers.
- Tripartite agreement: wholesalers/recyclers/municipality and service provider company.
- Developing a micro-credits system: For the purchase of materials and equipment or loans.
- Creating dedicated sorting centers (like the three ones in Morocco).
- Creating a municipal/intermunicipal development company.
- The recovery of recyclable waste sector has its own organization, rules, actors, and dynamics, specific to each territory. The solution must be tailored to these criteria or will not be a solution.

7.3 Waste Management: A Multitude of Actors

Approaches to the management of essential urban services in the MENA region have undergone profound changes in recent years. These changes are linked to public service reforms that have involved a wide variety of decentralization, liberalization, privatization, democratization, and participatory processes (Jaglin and Zerah 2012). In the case of urban waste, these changes are part of the modernization of the management of the service that has interested low- and middle-income countries in the last two decades and that has often referred to Western models based on centralized and technical approaches to waste collection and treatment, developed at the scale of the urban perimeter (Spaargaren et al. 2005). However, in MENA countries, modernization in MSW management is taking place with a multitude of actors, represented mainly by individuals or micro-enterprises, often belonging to the informal sector, already filling the waste collection, recovery, and recycling niches.

In local and national contexts of political, legislative, and administrative reforms of waste management systems, there is a reconfiguration of the relationships, roles and places of the different actors dealing with waste, as well as the emergence of

new actors in a sector that seems, all in all, increasingly lucrative. This growing profitability of waste is explained by the rise in raw material prices, leading to a renewed interest in secondary raw materials.

On an international scale, the increasingly precise organization of the materials chains, whether for recovery, processing, or export, raises the question of the international circulation of waste, whether formal or informal, official, or clandestine. The new international waste players deserve our attention. Finally, the global environmental context, the need to reduce waste, and the problems of its reuse, recycling, and treatment have become priorities that impact local and national policies, all the more so as waste production is constantly increasing.

7.3.1 Increasingly Privatized Solid Waste Management

Solid waste management is a particularly significant challenge for developing countries, where resources are limited but urbanization is increasing. Municipalities operate within a limited framework: rigid laws, large numbers of employees due to the manual tasks involved in cleaning and collection services, and consequently the influence of unions on the overall organization.

Municipalities delegate waste management tasks in order to reduce costs, particularly wage costs: unlike employees of private companies, municipal employees are members of unions and their wages are high. Services can be delegated to private companies (public-private partnerships) or to NGOs.

According to Dorvil (2007), one argument in favor of public-private partnerships is that a private contractor is better able to control costs, respond to client needs, and adopt new technologies and better management practices.

In this section, we consider the case of three MENA countries: Morocco, Algeria, and Tunisia.

7.3.2 Laws Governing the Collection and Disposal of Waste in Morocco

Law n°28-00 on waste management and disposal (B.O. n° 5480 of December 7, 2006) is the first law in Morocco dedicated to the waste sector. It provides for the elaboration of three waste management master plans, at three different territorial levels, for three distinct types of waste: a national master plan for the management of hazardous waste; a regional master plan for the management of non-hazardous industrial, medical, and pharmaceutical waste and ultimate, agricultural, and inert waste; and a prefectural or provincial master plan for the management of household and similar waste. In the framework of the law n°12-90 on urban planning, the Urban Development Master Plan notes: “the places to be used as deposits for

household waste must be submitted to the communal councils concerned prior to their approval." In January 2007, the National Household Waste Program (PNDM), developed by the Secretary of State for Water and the Environment and the Ministry of the Interior, was allocated $4.3 billion over a 5-year period for the implementation of a national solid waste program. This program is a clear signal from the state to local authorities, who must now implement integrated projects to reduce untreated waste and increase recycling rates. The recent law n°54-05 relating to the delegated management of public services has strengthened the legal arsenal of public procurement, particularly for the delegated management of the solid waste sector.

Article 12 of law n°28-00 provides that the prefectural or provincial master plan for the management of household and similar waste is drawn up on the initiative and under the responsibility of the governor of the prefecture or province concerned, in consultation with a consultative commission made up of representatives of the councils of the communes and their groupings representatives of the prefectural or provincial council, representatives of the administration, representatives of professional bodies concerned with the production and disposal of such waste, and representatives of neighborhood associations and environmental protection associations operating in the prefecture or province concerned. The master plan takes into account the needs and potential of neighboring areas outside the territory of its application, as well as the possibilities of inter-prefectural or inter-provincial cooperation in this field. The plan is subject to a public inquiry. It is approved by order of the wali or the governor after the opinion of the prefectural or provincial council (B.O. N°5480 OF DECEMBER 7, 2006). The territory of each prefecture or province must be covered by a prefectural or provincial master plan for the management of household and similar waste as of the year 2011. It is drawn up for a period of 10 years. This plan determines, in particular, the objectives to be reached in terms of collection and elimination rates for household and similar waste; the appropriate sites for the establishment of elimination and storage facilities for this waste, taking into account the orientations of urban planning documents; a 5-year and 10-year forecast inventory of the quantities of waste to be collected and eliminated according to their origin their nature and type; an investment program for the same duration including the evaluation of the costs of realization of the controlled landfills and the installations of treatment, recovery, storage, or elimination of these wastes, as well as the rehabilitation of the noncontrolled landfills, the financial and human means necessary, the measures to be taken as regards information, sensitizing, and council.

The Communal Charter of 30/09/1976 entrusts local authorities with the responsibility of managing household waste (solid waste). Article 30 of the communal Dahir n°17-583 relating to the communal organization establishes that "the communal council regulates by deliberation the affairs of the commune and, to this end, decides on the measures to be taken to ensure the full economic, social and cultural development of the local community." By law n°28-00, the communes or their groupings are required to establish a communal or inter-communal plan for the management of household and similar waste, which defines the operations of precollection, collection, transport, dumping, elimination, treatment, and recovery and,

if necessary, sorting of this waste. Article 17 of the same law establishes that the communal or inter-communal plan must take into account the orientations of the prefectural or provincial master plan for the management of household and similar waste. It defines, in particular, the zones where the communes or their groupings are required to ensure the collection, transport, elimination, or recovery of household and similar waste; the routes, frequency, and timetables for the collection of this waste; the methods of waste collection; the frequency of cleaning operations by zone; and the zones where the transport and dumping of this waste are the responsibility of its generators. This plan is established for a period of 5 years and approved by order of the governor of the prefecture or province concerned. The municipalities or their groupings decide on the management methods of the public service of household and similar waste, by direct management, autonomous management, concession, or any other form of direct management or delegated management. When the management of this service is delegated, the operator is subject to the provisions of the law and its application texts. In addition, the municipality must organize awareness-raising activities to involve the citizen in the actions that the community undertakes to improve waste management (use of appropriate containers, ensuring the cleanliness of public roads, making efforts to sort waste upstream, etc.) and information sessions for the public on respect for the environment, the various types of waste, their disposal, etc. Regarding the collection and disposal of waste Role of the municipalities, Article 16 of Law No. 28-00 on the management and disposal of waste establishes that the communal public service of management of household waste and similar includes the collection, transport, disposal, treatment, recovery and, where appropriate, sorting of such waste. This service also includes the cleaning of roads, squares, and public places as well as the transport and elimination of cleaning waste, under the same conditions as household waste management.

7.3.3 Informal Waste Actors in Morocco

Informal recyclable material collectors are fundamental actors in the urban solid waste management system in most developing countries. Their activity valorizes recyclable materials rejected by households, businesses, and industries and is carried out in a context of low involvement of public authorities in source separation actions. This context is also marked by the saturation of landfills, illegal deposits, low collection rates, the increase in the quantity of household waste, and negative effects on the environment and public health. Although it allows for the recovery of a more or less important portion of these recyclables, the informal recycling activity is, most of the time, neither recognized nor supported by the authorities (Azaitraoui 2007).

The sector is relatively structured (the chain is complete, from the recovery of waste from garbage cans to the recycling industry) and the actors in the informal sector are numerous. We can identify (Soudi and Chrifi 2008) as follows:

Landfill collectors: They wait for the arrival and emptying of dump trucks to sort the waste and recover the maximum amount of recyclable products.

Itinerant waste pickers: They work mostly at night or at least before the municipal service truck arrives. They drive through the city in a cart and collect recyclable waste from the garbage cans.

The garbage collectors: To improve their income, they sort the recyclable waste in the collection truck in order to sell it to wholesale intermediaries. However, this activity is not allowed in private waste management companies.

Intermediary washer/sorters: Usually located in working-class neighborhoods, they store, sort, and/or wash recyclable waste purchased from reclaimers or smaller intermediaries. They then resell it to wholesale shredders. They are therefore simply traders in the material.

Wholesaler-shredders: They are mainly located in Casablanca. They collect the plastic recyclable waste from the reclaimers and then grind them before reselling them to the industrialists.

The recycling industries: There are an estimated 9500 mikhali (recyclers) in Morocco, who operate at landfill sites or in cities, with an average income of no more than 35–60 DH (3–5.50 €) per day. The incomes of intermediaries and wholesalers would be much higher than those of reclaimers, as their intermediation margin would reach 50%. At this level of the sector, the beginning of industrialization can be observed: crushing, processing, and organized transport. The reclaimers are sometimes subsidized by an intermediary (salary advances, purchase of carts, loans, etc.). Similarly, there are certain special relationships between recovery companies and wholesalers (establishment of specifications, exclusive supply in the case of the paper-cardboard and glass sectors, etc.). Recovery companies are mainly located in Casablanca; paper and cardboard are directed to Kenitra.

7.3.4 Laws Governing the Collection and Disposal of Waste in Algeria

We had to wait for the establishment of the Ministry of Territorial Planning and Environment in 2000, so that we can for the first time in Algeria feel a certain strategy, whether in waste management or in the environment in general.

The texts of application in the field of the household and assimilated waste in Algeria are the following ones: Law N°90-08 on the communal code; Law N°01-19 of 12/12/2001 on the management, control, and elimination of waste; Law N°03-10 of 19/07/2003 on the protection of the environment within the framework of sustainable development; Executive decree n° 02-175 of 20/05/2002 on the creation of the National Agency of Waste; Executive decree n° 02-372 of 11/11/2002 relating to packaging waste; Executive decree n° 04-199 of 19/07/2004 fixing the methods of creation, organization, functioning, and financing of the public system of

treatment and recovery of packaging waste "ECO-JEM"; Executive decree N° 04-210 of 28/07/2004 defining the methods of determination of the technical characteristics of the packagings intended to contain directly food products or objects intended to be handled by the children; Executive decree N° 04-410 of 14/12/2004 fixing the general rules of installation and exploitation of the installations of treatment of waste and the conditions of admission of these waste at the level of these installations; Executive decree 07-205 of 30/06/2007 fixing the modalities and procedures of elaboration, publication, and revision of the communal plan of management of the household and assimilated waste; Inter-ministerial decree of 06/04/2004 fixing the technical characteristics of the plastic bags intended to contain directly food products (MATET – PNUD). The law n°01-19 of 27 Ramadhan 1422 corresponding to December 12, 2001 relating to the management, the control, and the elimination of waste aims at fixing the methods of management, control, and treatment of waste, on the basis of the following principles: (1) the prevention and reduction of the production and harmfulness of waste at the source; (2) the organization of the sorting, collection, transport, and treatment of waste; (3) the recovery of waste through its reuse, recycling, and any other action aimed at obtaining reusable materials or energy from this waste; (4) the environmentally sound treatment of waste; and (5) the information and awareness of citizens on the risks presented by waste and its impact on health and the environment, as well as the measures taken to prevent, reduce, or compensate for these risks (Journal Officiel de la Republique Algrienne, 2001). This legislative effort was then consolidated by a regulatory and institutional system that resulted in the implementation of communal waste management plans; the introduction of ecological taxation; the creation of the National Waste Agency (AND); the establishment of a national system for the recovery and recycling of packaging waste to promote the emergence of a national waste market and encourage the development of activities in the field of waste sorting, recycling, and recovery; and the implementation of an ambitious national program of integrated municipal waste management.

A PNAE-DD, a National Action Plan for the Environment and Sustainable Development, was drawn up in 2002 with timetables for reflection and implementation. He notes: "as regards urban waste, it must be noted that, with the exception of the Algiers landfill for which precautionary measures have been taken, no global approach has been undertaken to date". The budgets allocated are most often used to acquire collection equipment while the issues of site selection, facility management, operator training or public awareness are not addressed. The non-rational and insufficient management of solid waste results in the pollution of water tables, the appearance of gas fumes, the proliferation of mosquitoes and rodents, impacts on public health due to the incineration of waste in landfills, economic losses (non-recycled materials, lack of composting, loss of land, etc.) and aesthetic losses (degradation of the environment, loss of income, etc.) and aesthetic losses (landscape degradation) (MATET 2002). The option chosen for the treatment and elimination of waste is the creation of technical landfill centers (CET). At the same time, a national household waste management program, PROGDEM, was launched to provide municipalities with waste management master plans. The three actions

implemented within the framework of PROGDEM are the elaboration of master plans of household waste management, the realization of technical landfills and the acquisition of material means, and the closure and rehabilitation of illegal dumps. This program consists, in particular, of reorganizing the municipal administration in charge of waste management, strengthening the collection and transport capacities of the municipal services in charge of waste management, opening up the public urban waste management service to private investment and concessions, implementing a training and technical assistance program for local authorities, and setting up appropriate collection equipment (MATET undated).

In accordance with Article 107 of Law No. 90-08 of 7 April 1990 on the commune code (Title III: Responsibilities of the commune; Chapter VI: Hygiene, sanitation, and environment), the commune is responsible for maintaining public hygiene and sanitation, particularly with regard to the evacuation and treatment of wastewater and solid urban waste (Journal Officiel de la Republique Algrienne, 1990). According to the provisions of Law 01-19 relating to the management, control, and elimination of waste (Article 32), "the management of household and similar waste is the responsibility of the commune in accordance with the legislation governing local authorities" (Journal Officiel de la Republique Algrienne, 2001).

7.3.5 Institutions Responsible for Waste Collection and Disposal

Role of the Municipalities The Law n°01-19 of 27 Ramadhan 1422 corresponding to December 12, 2001, relating to the management, control, and disposal of waste endows the municipalities with the responsibilities to elaborate and implement the municipal waste management plans as planning and management instruments. These plans must be consistent with the wilaya development plan and approved by the wali. Their role is also to continuously improve the conditions of waste collection and disposal by regulating the conditions under which waste is presented for collection. They also set the standards and conditions for the collection and disposal of waste, rationalizing the collection routes. In particular, they establish specifications specifying the obligations of the companies responsible for waste collection and disposal, by providing users with sealed containers. In addition, the utilities designated in Section 32 include the following:

- The setting up of a system for sorting household and similar waste with a view to its recovery
- The organization of the separate collection, transport, and appropriate treatment of special waste generated in small quantities by households
- The setting up of a permanent information and awareness system for inhabitants on the harmful effects of waste on public health and/or the environment and on the measures intended to prevent the said effects

- The implementation of incentives for the development and promotion of sorting systems for household and similar waste (Journal Officiel de la Republique Algrienne 2001).

Role of the Wilaya The Wilaya's environmental department assists the municipality through, for example, the implementation of the communal waste management master plan.

Delegation of Urban Waste Management Services The participation of the private sector in waste management is practically absent in Algeria. Therefore, the authorities have decided to promote incentives to stimulate the participation of this sector (creation of micro-enterprises) in activities related to waste management. Under the form of contracts or concessions, the activities of collection, operation of landfills, recycling, sorting, and composting can be subcontracted. The National Environment and Pollution Fund (FEDEP), the National Waste Agency (AND), and the National Agencies for Supporting Youth Employment (ANSEJ) and Investment Development (ANDI) are called upon to assist in the support and implementation of viable projects. In Séâàètif, the APC (Assemblée Populaire Communale) decided to delegate the collection of household waste in six suburban areas on January 1, 2009 (peripheral cities such as Aïn-Trick, Cheïkh Laïfa and Abid Ali), to six micro-companies created in this framework. This "experiment," the first of its kind in Algeria, was motivated by the growth of the city and the need for greater resources to manage the collection. These micro-enterprises were created by young university students with the support of ANSEJ, which provides a facilitating framework since they benefit from a tax exemption for the first 5 years and support for the management of the company. These micro-enterprises obey a set of specifications drawn up initially by the ANSEJ management, then later with the environmental management; an agreement is signed between the municipality and each micro-enterprise, which must have a 12-ton capacity tipper and hire 10 workers. These companies currently manage only the collection but also have the possibility to invest in sorting and are about to start working at the site of CET to extract recyclable materials, through contracts with the APC (Azaitraoui and Moretto 2012).

7.3.5.1 Informal Waste Actors in Algeria

Following the implementation of technical landfills in Algeria, a measure responding to an emergency in the field of waste management has been put in place within the national program of municipal solid waste management. However, recycling/recovery is still underdeveloped in the country. In this context, selective collection and waste sorting projects are about to be launched by the Ministry of Land Management and Environment (MATE). Informal recovery activities, which are rather developed in the country, should be taken into account in the context mentioned above; informal but spatially and economically organized, the recovery sector includes informal reclaimers from the landfill and the city, intermediaries, and

wholesalers. The informal reclaimers do not really have a name; the French semantic of chiffonnier is the one most often used in the press. The term zabaleen, which is sometimes used to refer to reclaimers, actually refers to those who produce the waste and is, therefore, quite apart from its pejorative aspect, not appropriate to refer to reclaimers.

7.3.5.2 Laws Governing the Collection and Disposal of Waste in Tunisia

In the field of waste management, Tunisia has a strategic reflection at the central level, the local level being strongly supervised by the State via ANGed (National Agency of Waste Management), agency in charge of planning and adopting the strategies at the national level.

The organic law of the communes and the law n° 96-1996 relating to waste and the control of their management and elimination constitute the two basic regulatory texts governing the solid waste sector in Tunisia. At the national level, the laws governing the collection and disposal of waste are the following: the framework law 92-122 of December 29, 1992, creating the fund of depollution whose object is the financing of the projects of appropriate management of the solid waste; the law n°96-41 of June 10, 1996, relating to waste and the control of their elimination; the law 97-11 of February 3, 1997, carrying promulgation of the code of the local taxation; the law 2001-14 of January 30, 2001, fixing the methods of collection, transport, storage, and treatment of the non-dangerous waste; the law 2003-80 of December 29, 2003, creating the "Fonds de Propreté de l'Environnement et de l'Esthétique des Villes" (Cleanliness Fund for the Environment and the Aesthetics of Cities); and the decree 2005-2317 of August 22, 2005, creating ANGed and entrusting it with the mission of waste management at the national level by the elaboration and implementation of plans, programs, and national projects related to the management of waste. The National Solid Waste Management Program (PRONAGDES) was the strategic framework for waste management for the period 1995–2006. The new strategic framework, renamed PROGIDD (Programme National de Gestion Intégrée et Durable des Déchets), will cover the period 2007–2016 (SWEEP-NET/AMRA Consulting, 2010). Its two main overall objectives are to improve environmental protection through the implementation of integrated and sustainable waste management and to promote the quality of life of citizens. To achieve these objectives, the national strategy will be based on two basic principles: prevention, by reducing the source and environmental damage caused by waste, and the participatory approach, by involving the various stakeholders in the different stages of waste management, from design and planning to implementation. The overall objectives are detailed in four specific objectives which are the reduction of waste quantities; the treatment, recycling, and recovery of waste; the improvement of the legal and financial institutional framework of waste; and the improvement of communication, consultation, awareness, and data control in this sector (Ferchichi, 2010).

At the local level. The organic law of the communes 95-68 published in 1995 entrusts the communes with the responsibility of household waste management at the local level.

7.3.6 *Institutions Responsible for Waste Collection and Disposal*

The Ministry of the Environment and Sustainable Development develops the country's general policy on the environment and land use planning and proposes a regulatory framework in this area; it supervises the budgeting of plans, programs, and actions undertaken by the implementing body, ANGed. It supervises the National Agency for Environmental Protection.

Implementation of the national policy. ANGed, created in 2005, is a public company under the supervision of the Ministry of the Environment, which is in charge of national waste management programs. It promotes the partnership between all the stakeholders and, in particular, between the local authorities, the industrialists, and the private sector. It helps and assists municipalities and industrialists in the field of sustainable waste management and prepares and implements awareness programs on waste management, in collaboration with environmental associations, in particular. It promotes systems and programs for the collection, recycling, and recovery of waste.

7.3.7 *The Eco-Lef Plastic Sector*

The state strategy foresees the setting up of technical disposal centers, essentially reserved for the burial of final waste, which implies that the state has set up in parallel mechanisms and tools for the recovery and recycling of materials contained in household waste: Eco-Lef is a public system of recovery and valorization of used packaging which was set up in 2001. Currently, almost all the industrial packers of water, soft drinks, juices, and milk derivatives adhere to the Eco-Lef system. A network of Eco-Lef points for the collection and transfer of packaging waste has been set up, particularly in large cities. The Eco-Lef point constitutes a primary reception center for packaging waste, by paid contribution, with a view to its recovery. This system can be a source of income for individual collectors. The main objectives of this project are to stimulate the packaging waste recovery market by giving this waste a market value, the "take-back price," and to involve local actors (municipalities, associations, waste collectors, etc.) more closely. Between 350 and 370 microenterprises have been created in Tunisia under this program, offering nearly 20,000 jobs for executives with a minimum of 4 years of higher education. Thus, the Ecolef, a scheme mixing social, economic, and environmental aspects, is a mechanism that works well, with rates of 90–95% of plastic recovery and interesting

consequences on the social level. The waste management channels that have been set up for recoverable waste are packaging, used oil and filters, accumulators, and batteries; other channels are being set up for used tires, paper, and cardboard (Azaitraoui and Moretto 2015).

7.3.8 Informal Waste Actors in Tunisia

Informal recovery is "semi-formalized" through the Eco-lef system, which accepts products only from approved establishments, but continues to have the population of informal collectors as its main base. The informal sector is therefore in the process of being formalized and is less prevalent than it was a few years ago; the means to achieve full inclusion of the informal sector remain to be implemented. Mostly men, the scavenging activity concerns a minority of women, who tend to work in the city, and children, for whom scavenging is a seasonal activity corresponding to the school vacations. The earnings from salvage work are between 3 and 12 dinars (1.50 and 6 €) per day, which compared to the daily salary of a municipal worker (5 dinars, or 2.50 €) remains reasonable; however, many salvagers are heads of families with many dependents. The work of recuperation remains physically and morally very difficult. The vast majority of reclaimers have a previous professional activity related to another field (handicrafts, construction, etc.), but reclaiming is a primary source of income. Although they have very little contact with other waste management actors, apart from wholesalers, reclaimers in the city are often in contact with residents who sort their materials and give them to them; this is an element that should be taken into account in a source separation program.

7.4 The Integration of Informal Waste Sector

The lack of urban solid waste management (SWM) policies that incorporate the informal waste sector (IWS) reinforces developing countries' negative perceptions about informal recycling. (Sembiring and Nitivattananon 2010). The majority of pickers continue to labor alone, often in hazardous conditions, putting their health at danger and leaving them subject to the recycling industry's exploitation (Silva de Souza and Mancini 2017). Poor and marginalized social groups engage in informal waste recycling as a means of generating cash and, in some cases, daily survival. The IWS is common in developing world cities. This is a disadvantaged population's adaptive response to scarcity. Informal recyclers frequently constitute distinct social groupings or belong to minorities, such as Egypt's Zabbaleen in Egypt (Wilson et al. 2006). Many countries have tried to integrate informal collection, but success stories are rare. Most integration courses have focused entirely on public policy and the legal collection system, leaving the private sector out of the picture (Xue et al. 2019).

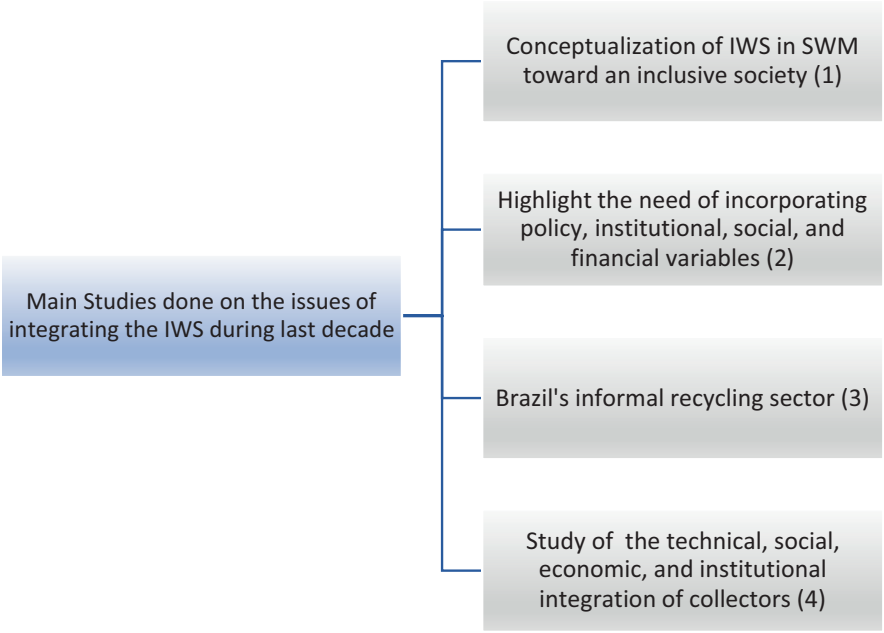

Fig. 7.1 Main studies on IWS integration during the last decade. (1) Sembiring and Nitivattananon (2010), (2) Aparcana (2017), (3) Silva de Souza and Mancini (2017) and (4) GIZ (2018a, b)

Several studies have been done on the issues of integrating the informal waste sector in developing countries, as shown in Fig. 7.1 (Sembiring and Nitivattananon 2010; Aparcana 2017; Silva de Souza and Mancini 2017; GIZ 2018a, b). In this context, authors proposed a contribution to a conceptualization of the informal sector's integration in SWM toward an inclusive society by emphasizing the problem that decision-makers face when integrating this informal sector (Sembiring and Nitivattananon 2010).

In other study, the authors highlight the need of incorporating policy, institutional, social, and financial variables to increase the likelihood of a successful formalization process (Aparcana, 2017). While Silva de Souza and Mancini (2017) examine Brazil's informal recycling sector (IRS), focusing on the ongoing integration process by providing the history and context of this integration, as well as its economic, social, and environmental benefits and current obstacles.

Furthermore, other authors have deeply studied the technical, social, economic, and institutional integration of collectors in order to have a better knowledge of the difficulties in finding solutions. They try to answer the question: What sorts of collaborations and initiatives could help to enhance informal collectors' incorporation into service and value chains? (GIZ 2018a, b).

7.4.1 Role and Benefits of IWS Integration

Considering the waste management in circular economy context, the informal sector plays a critical role, and finding sustainable ways to integrate it into the value chain is critical (Diaco et al. 2020).

However, it will be difficult to persuade municipal officials and politicians to change their traditional strategies of repression, neglect, or cooperation with the informal recycling sector in favor of the integration with the formal SWM system. The recognition of the economic, social, and environmental benefits of informal recycling by individuals in positions of authority is a critical first step (Wilson et al. 2006)

Indeed, the numerous measures taken to develop appropriate IWS integration methods focused on improving waste workers' working conditions and livelihood outcomes. In the first place, alleviate both their vulnerability and improve their access to livelihoods through increased income (Paul et al. 2012).

In addition, integration of the informal sector has resulted in social, economic, and environmental benefits, such as increased income, poverty reduction, and resource preservation. In this context, continuing the integration process will benefit both the pickers and the municipality, as landfill costs will be reduced (Silva de Souza and Mancini 2017). In fact, increased waste collection and recycling activities, if done correctly, can boost the economic position of informal waste workers, and a focus on capacity building and training can guarantee that these employees benefit from the circular economy shift as well (Diaco et al. 2020).

The main roles and benefits of integrating the informal waste sector are illustrated in Fig. 7.2. Collaboration and integration of collectors into municipal waste can lead to new commercial opportunities, as well as new environmental services such as separate recyclables collection and environmentally suitable development (GIZ 2018a, b).

As a consequence, finding an informal collector integration solution is critical for ensuring the waste management sustainability (Xue et al. 2019). The IWS formalization will restore the dignity of informal waste pickers by providing stable job and social coverage and highlighting the beneficial impact and critical significance of their work in improving social, economic, and environmental outcomes (Diaco et al. 2020).

7.4.2 Barriers Affecting the Formalization of IWS

According to the author, the integration and ascension of the IWS remains a serious issue, as well as a gap in most developing nations' waste management legislation (Paul et al. 2012).

The goal of research into the barriers to integration is to provide different methods to analyzing formalization initiatives, with the objective of finding not only the

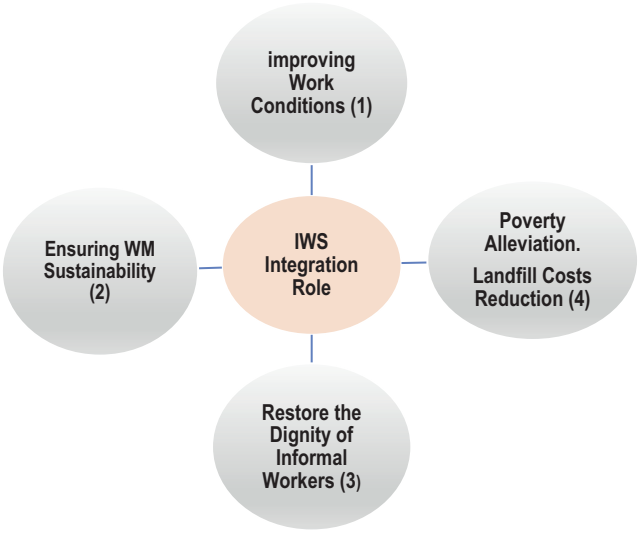

Fig. 7.2 Role and benefits of IWS formalization. (1) Paul et al. (2012), (2) Xue et al. (2019), (3) Diaco et al. (2020) and (4) Silva de Souza and Mancini (2017)

normal barriers but also the enabling elements that contribute to successful and long-term formalization activities. (Aparcana 2017)

The organizational problems of the cooperatives, the characteristics of the recycling market, the dependence on the public sector, and the low participation of the community are the main obstacles to the integration of SRIs in Brazil (Silva de Souza and Mancini 2017).

Some integration solutions have been viewed only through the perspective of poverty alleviation, taking into account collectors' economic survival strategies but ignoring the collection business model's long-term viability. The majority of informal sector integration attempts were affected by policy/legal and institutional obstacles, according to 20 cases of informal sector integration from ten low- and middle-income countries (Aparcana 2017) (Fig. 7.3).

7.4.3 Towards a Success of IWS Integration

The effectiveness of the process of integrating the IWS with formal waste management operations depends on a shift in public perception. It is critical for the citizens to know the link between recycling and better waste management (Ali 1997; Masood and Barlow 2013).

Collaborating with the informal sector to help them organize and add value to their recycled materials before selling them on is one step toward integration, since it allows them to climb up the hierarchy and extract higher value from recovered resources (Wilson et al. 2006).

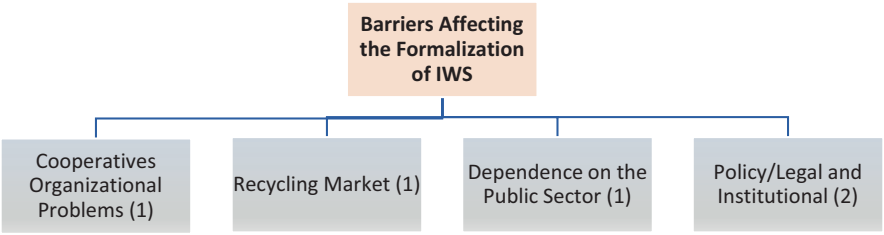

Fig. 7.3 The main barriers affecting the IWS integration. (1) Silva de Souza and Mancini (2017) and (2) Aparcana (2017)

In recent study, the authors suggest three assessment criteria for formalization initiatives:

(i) social mobilization and acceptance (social element);
(ii) stakeholder, legal, and institutional arrangements comprising roles, responsibilities, and management functions (policy and institutional element); and
(iii) financial and operational aspects (Zurbrügg et al. 2012). Integration with private companies or the public sector may need the use of an intermediary.

It is susceptible to political changes and would be more secure if incorporated in law and/or contracts, allowing it to function as a structural integration tool (GIZ 2018a, b).

In this context, it's important to conduct a complete waste characterization study in order to identify material potentials and establish new recycling programs that could provide more livelihood. opportunities for the IWS. The present material recovery system, as well as prospective new markets, should be clarified as part of this. It is crucial to conduct a stakeholder role analysis to identify potential supporters as well as the forces that stand in the way of improving the IWS integration process during the planning phase (Paul et al. 2012).

Velis et al. (2012) established the "InterRa" assessment tool, which is based on a typology for categorizing potential interventions to encourage the integration of informal recycling systems into a city's SWM system. The authors look at three main intervention areas (the SWM system, the materials and value chain, and society as a whole), all of which are supported by organizational and empowerment dimensions. According to the authors, a balanced development of all four intervention areas would boost the likelihood of formalization success. Furthermore, they claim that informal waste-recyclers' organization and empowerment is a critical aspect in enabling MSWM systems to evolve into more fully integrated systems (Velis et al. 2012; Aparcana 2017). The "InteRa" tool examines a collection of initiatives to integrate the informal sector into four categories: materials and value chain, social aspects, organization and empowerment, and solid waste management system (Silva de Souza and Mancini 2017). The "InteRa" tool has shown to be a very effective tool for analyzing integration efforts in a specific city and comparing the results to other examples (Silva de Souza and Mancini 2017).

7.4.4 IWS Formalization Countries Experiences

Many obstacles remain in integrating informal recycling with formal MSWM systems. One could argue that, despite 20 years of efforts to ameliorate the living and working conditions of Cairo's 60,000 Zabbaleen, government attitudes remain antagonistic. After years of deliberation over how to improve waste management services in the city, the authorities opted to privatize the whole MSWM system in 2002, awarding four contracts to international businesses to begin in January 2003 (Iskandar 2003; Wilson et al. 2006). It may be argued that a more cooperative approach, incorporating the Zabbaleen and NGOs working with them in the planning process before to privatization, would have been preferable to attempting to achieve an agreement after the contracts were let (Wilson et al. 2006).

As shown in Fig. 7.4, in developing countries we can find several approaches and tools for IWS integration. In the Philippines, the relevant local government selects and trains a devoted project management team, which later organizes and oversees the IWS integration process. Preparation and execution of pilot programs involves waste pickers for increased material recovery. Such programs should include a series of seminars or workshops where waste pickers can learn about and appreciate the municipal SWM enhancement program's efforts and transparency (Paul et al. 2012). The National Framework for the IWS in Solid Waste Management aims to integrate the IWS. The Philippines' National Framework for the Informal Sector in Solid Waste Management strives to integrate the informal sector by providing an enabling policy environment, skills and livelihood development, jobs, and secure social services (Aparcana 2017).

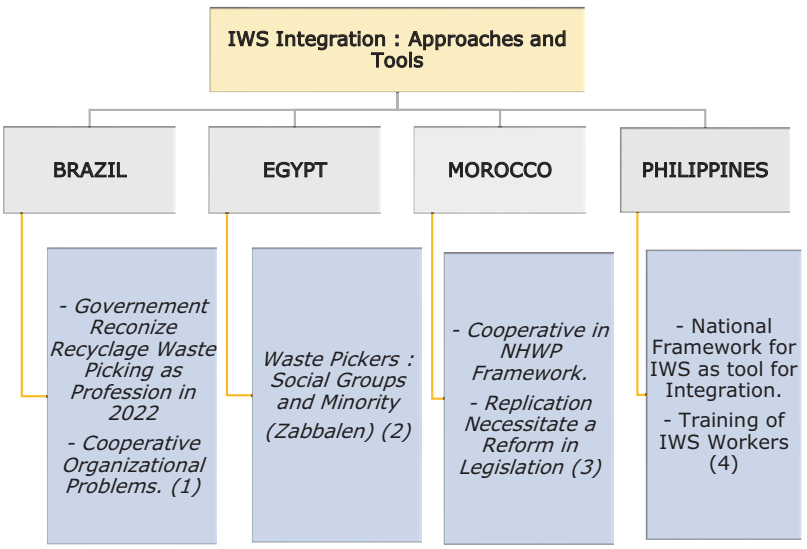

Fig. 7.4 Approaches and tools for IWS integration: some countries cases. (1) Silva de Souza and Mancini (2017), (2) Wilson et al. (2006), (3) Diaco et al. (2020) and (4) Aparcana (2017)

In Brazil, throughout the 2000s, social consciousness grew as a result of the formation of numerous social movements and increasing attention from the public sector. The Brazilian Work Ministry recognized recyclable materials picking as a profession for the first time in 2002, signaling the start of the integration process of Brazil's informal recycling sector. By federal mandate in 2006, recyclable materials created in all public buildings have to be delivered to picker cooperatives to assist generate cash (Silva de Souza and Mancini 2017).

In Morocco, the sorting center at the Oum Azza landfill (Rabat) proved to be a success as part of the National Household Waste Plan (NHWP). For a variety of reasons, replicating this approach in other kingdom cities makes sense. The replication will necessitate a reform in legislation that:

(i) Supports the structuration of those employees by developing a simple registration mechanism for those informal rag pickers in dedicated cooperatives, associations, or directly at recycling factories
(ii) Assists cooperatives and associations in training and equipping registered rag pickers with at least basic equipment to ensure their safety and efficiency. As recommendations for household waste sector, integrating informal waste pickers in local waste sorting and collection operations by putting up a simple registration mechanism for them in dedicated cooperatives or recycling plants (Diaco et al. 2020)

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