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Public–private partnership in solid waste management sector in the West Bank of Palestine

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Abstract
Palestine, being a developing country, faces lots of obstacles and deficiencies in the existing solid waste management (SWM) field. In wake of these circumstances, it seems hard for the public sector to run sustainable SWM systems. The overall objective of the research presented in this paper was to study the current status of the SWM field in the West Bank of Palestine under the perspective of potential private sector involvement. For this purpose, twelve Joint Service Councils (JSCs) for solid waste management were investigated. Out of them, only two are currently having a Public–Private Partnership (PPP) contract for the management and operation of the transfer station and the sanitary landfill. On the other hand, two JSCs are currently making arrangements and implementing studies for future PPPs on waste-to-energy, biowaste management and recycling projects. Jenin and Tubas Joint Service Council (JSC) had 3-month-duration PPP contract for the implementation of a recycling project, which is a worst case scenario as it failed to meet its objectives. The parameters that could encourage JSCs or ease the implementation of PPP in local SWM field are analysed. Overall conclusion is that sustainability can be accelerated once the government—represented by the Ministry of Local Government (MoLG)—is involved; providing legal support to local authorities and incentives to potential contractors in order to encourage them to join PPPs. Parameters that are believed to facilitate PPPs include the following: development or updating existing laws and regulations, facilitation of licensing procedures, and activation of the Investment Promotion Law. Feasibility and market analysis study implementation will indicate the appropriate actions required locally to achieve environmental and financial sustainability in all contracted PPPs.

Keywords Joint service councils · Waste management · Public–private partnership · Municipality · Developing countries

Acronyms

PPP	Public–private partnership
DC	Developing country
JCS	Joint service council
LGU	Local government units
MoLG	Ministry of local government
MSW	Municipal solid waste
SWM	Solid waste management

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Introduction

The generation of Municipal Solid Waste (MSW) is increasing in urban areas. Several factors in the Developing Countries (DCs) are affecting the MSW generation, such as urbanization, high population growth and economic development (Sukholthaman et al. 2017). Therefore, effective and efficient management of MSW is required in order to protect the health of the citizens, to facilitate development and to support the productivity of the economy to achieve a sustainable livable environment for everyone (Al-Khateeb et al. 2017; Zaidi and Nasreen 2016).

There are various ways to define MSW. Generally, it is described as any garbage, refuse or other material that is discarded from domestic, industrial, commercial and agricultural activities. Considering the composition, MSW includes organic waste, paper and cardboard, glass, metal, plastics and textiles. Therefore, MSW is considered as a mixture of substances in which some are considered potentially hazardous to health (Schlueter 2017).

The amount of MSW generated globally is growing at a harsh rate. According to Schlueter (2017), it is estimated that MSW generation will increase from 1.3 billion tons/year in 2010 to around 2.2 billion tons/year by 2025 (Schlueter 2017). Moreover, the MSW has become a big problem worldwide due to rapid urbanization. It is estimated that the urban population in the world will rise by 66% by 2050 compared to only 54% in 2014. According to the United Nations, most of this growth is expected to occur in DCs (United Nations, Department of Economic and Social Affairs, Population Division 2015). This growth will further increase the production of MSW (Muneera 2012) and intensify the existing challenges towards its management. Future development will be affected as a consequence of big cities' complex and broad characteristics (Schlueter 2017).

In order to achieve sustainable management of the generated waste, the basic steps required are collection, transportation, sorting, treating, recycling, disposing and, of course, monitoring. All involved stakeholders should be engaged in these processes. Otherwise, the mismanagement of the waste will pose additional risks to all social and economic sectors (Kattoua et al. 2019; Schlueter 2017).

Several health and environmental problems occur because of the mismanagement of MSW or the lack of sustainable SWM facilities; uncollected waste dumped in the streets encourages insects to breed and diseases to spread and collected waste dumped in random dumpsites or being open-burnt causes air pollution (Muneera 2012). Therefore, careful attention should be taken towards SWM field organisation (Holmes 1983). The quality of services is an important factor along with cost-effectiveness. However, most of the DCs are facing additional difficulties in SWM due to legal issues, like the insufficient information about regulations, financial restrictions and technical issues, like the inadequate collection facilities in terms of lack of facilities or facilities with low capacity or suitability of technology applied (Ahmed and Ali 2006; Schlueter 2017). The DCs are still using unsophisticated methods, such as open dumpsites and open burning, proving that overall waste management is still largely random and uncontrolled (Al-Khatib et al. 2007).

According to Schlueter (2017), two to three billion people did not have access to sustainable SWM services in 2015. Moreover, the urban waste generation per year in low- to middle-income countries is estimated to increase from 369 million tons (2010 average) to 956 million tons (2025 average). Therefore, the increased quantity of waste and the variable composition urge the need for a SWM in developing cities of the world (Schlueter 2017).

In Palestine, the SWM sector has drawn great interest at all levels because of its ascertained and direct impact on the social, economic and environmental local conditions. Moreover, certain factors, such as the political situation, urbanization, unqualified staff and inadequate technology, pose significant challenges for Palestine (Al-Khatib et al. 2010). For example, in the West Bank of Palestine (where the available area for final disposal is limited), currently, there are only three sanitary landfills—Zahrat Al Finjan in Jenin district, Al-Minya in Bethlehem district and Jericho in Jericho district. The establishment of a new sanitary landfill in Ramoon, in Ramallah and Al-Bireh districts, has been investigated, and all environmental permissions have been received from the EQA to be commissioned. Unfortunately, the implementation of this important infrastructure has been stopped by the Israel authorities. In the Palestinian Territory, solid waste disposal in sanitary landfills constitutes only 33% of the waste. The rest is disposed in random dumpsites and/or burned (German Cooperation (GIZ) 2014). There are around 100 random dumpsites distributed in the West Bank and Gaza Strip (Applied Research Institute—Jerusalem (ARIJ) 2015).

Similarly, to other DCs, the Joint Service Councils (JSCs) for SWM and municipalities in Palestine are facing many problems in managing and supervising the applied SWM systems efficiently (ARIJ 2015). Although donors have spent considerable amount of funds to provide collection, transportation and disposal facilities to locals, there is still a need for technical development of human capacities and rising of public awareness (Khatib, 2011) to increase effectiveness.

In the field of SWM in the West Bank, 12 JSCs are currently working with the Ministry of Local Government (MoLG) through the ministry's department called the general directorate of the JSCs (SWEEPNET 2014). They mostly face the following two main challenges: The first one is the increasing demand for service provisions, like SWM, electricity, water, sewage, roads and public facilities. The second challenge is the financial commitment that is preventing them from covering their operating costs and making capital investments in new projects (New Vision 2009).

The MoLG made several achievements and adopted several relevant laws, legislations and strategic plans to achieve integrated SWM in Palestine. For example, MoLG launched the National Strategy for SWM (2010–2014), developed a charging system and planned and constructed two MSW sanitary landfills, one to serve the northern governorate "Zahrat Al Finjan" landfill and the second one to serve the southern governorate "Al Minya" landfill (SWEEPNET 2014). In 2017, the MoLG launched a new national strategy for solid waste management, 2018–2022, in which more attention was given to public–private participation and recycling of solid waste. It specifically mentioned that the private sector is welcomed to take initiatives and actively participate in the waste management itself or the development of waste management systems that will include recycling and energy generation. The former stated constitutes the strategic objective No. 6. The national strategy also mentions the monitoring of indicators regarding private sector's interest in separation and recycling projects. PP participation needs to be enhanced, utilized and invested in light of the available enabling environment and incentive systems, following the amendment made on the investment promotion law and the construction of three industrial zones in Jericho, Bethlehem and Jenin (MoLG 2017b). National strategy will be followed by a policy in order to raise awareness, set foundations and audit the creation of investment-enabling environment to further encourage the private sector participation and ultimately investment intention.

There is no doubt that there are still several shortcomings in the current systems in different aspects of SWM. For example, the MoLG (2017a) reported that there are many challenges and weaknesses of JSCs in the West Bank, such as general lack of strategic planning, low quality of reporting and information practices (both in relation to MoLG and the population), tariffs that do not include costs of depreciation in some JSCs, lack of service quality standards, lack of standard operating procedures in financial management and other areas, JSCs that do not generate enough own incomes to finance future development projects, low involvement of citizens and low level of information provided to citizens on the activities of the JSC. Moreover, many JSCs are characterised as "project driven", and their activities do not sustainably follow-up the outcomes of the projects when their duration ends and financing is not existent anymore (MoLG 2017b).

There are many examples of recycling practices identified in the private sector in Palestine. For example, plastic is collected throughout Gaza by the informal sector, which presents high efficiency in recovering recyclable materials from the streets and garbage containers. It is estimated that approximately 50,000 tons of plastic waste is produced in Gaza each year, and, in 2010, it was estimated to be around 10,000 tons per year, corresponding to 20% of overall generation. The collected plastics are grinded to flakes in various grinding local facilities. The grinding facilities buy the plastic waste from the collectors for 500–1500 NIS/ton and sold at 1000 to 3000 NIS/ton (depending of the plastic type) to a series of 40 companies which use them as secondary raw material to their production process of plastic products. Those products' price ranges from 6000 to 7000 NIS/ton, whereas their production cost is approximately 4000 NIS/ton. Overall, procedure profit is approximately 40% (UNDP—PAPP 2012) and, at the same time, contributes largely into the establishment of local circular economy patterns.

In Gaza, there are few composting initiatives. Currently, approximately 5000 tons of compost is produced in Gaza and sold for 10 NIS/20 kg bag (about USD 3/20 kg bag), corresponding to 500 NIS/ton (about USD 150/ton). The costs for compost production in Gaza are estimated at approximately USD 68/ton of compost. Based on the preliminary market analysis, the creation of a successful sustainable compost market can be

achieved if the quality of the compost is improved and its outcomes are disseminated to local farmers in order to be convinced to use it in their cultivation; and this finding should be considered (UNDP—PAPP 2012).

JSCs have to find new options for capital sources in order to effectively manage generated waste; a process they bear the sole responsibility. Given that DCs have inadequate financial and human resources, they may not provide adequate services to all of their citizens (Schlueter 2017).

Circular economy may also present the opportunity to keep the added value in products for as long as possible, eliminate waste generation and increase secondary material application (European Commission 2014). For example, application of source separation in biowaste for compost production offers the opportunity to produce fertiliser and, on the same time, to minimise the disposed fraction and expand the lifespan of existent sanitary landfills, decreasing simultaneously the required capital for new facilities' investment. The alternative is the cooperation of key players in the field of waste management (e.g. private sector waste recyclers), who, based on the Palestinian "investment law", are encouraged to form such partnerships since besides other benefits they get a percentile of tax exempt (SWEEPNET 2014).

The shortcomings of the municipalities and councils should not be a dead end towards their services to the citizens but a chance to start a dialogue with the private sector and participate in new and promising partnerships. Private sector partnerships with the municipalities are considered successful for managing MSW in developed countries. However, the situation in DCs imports several bottlenecks due to uncertainty of political situation and administrative drawbacks in the bidding processes and the formulation of contracts (Schlueter 2017), as well as lack of support.

Literature review

According to the World Bank (2011), the term "public private partnership" (PPP) can be defined as an agreement in which the responsibilities are shared between the public and private sectors. This arrangement should be formed with a specific and clear goal to deliver the public services effectively and efficiently by a third party (World Bank 2011). Also, PPP indicates that there is a relationship between public and private entities in different sectors, which differs in characteristics depending on the sector objectives (Zaidi and Nasreen 2016).

PPPs are considered as an essential mechanism for a desired solution and not an option to solve the problem of service delivery (Quium 2011). In DCs, the services provided by the partnership usually include those that cannot be provided by the public sector solely because of lack of resources and expertise (Forsyth 2005).

PPP has become a potential alternative for SWM, instead of the traditional services provided by the local governments. DCs in Africa and Asia have applied and managed several models of partnership, in which the private and public sectors worked together to develop plans and create values and shared responsibility, providing sustainable SWM services (Sukholthaman et al. 2017).

The realization of the significance and profitability of the PPP is growing in both sectors. Efficient PPP implies the allocation of the obligations, tasks and risks among the contracted parties in the agreed and optimum way. Usually, the government contributes in the transfer of assets, investment capital, environmental awareness, social responsibility and ability to mobilize political support. On the other hand, the private sector usually contributes in the investment and makes use of its expertise in commerce, management, operations and innovations in order to manage the project efficiently (Zaidi and Nasreen 2016).

The debate on the privatization of local public services is shifting from an ideological one to a systematic discussion of the economic and political factors that play a role in determining the service delivery form (Gradus et al. 2014).

International research investigated the performance difference of the local services provided by the public and the private sectors. The local services provided by the private sector were efficient before 2000. However, recent literature shows that the cost-efficiency of the services provided by the public and private sectors is normative and not positive. For example, several studies of US local governments indicated that the expenditure difference between the services delivered by the government or outsourcing is not clear. On the other hand, some international studies show that contracting with the private sector can be sometimes cheaper than providing the service by the public sector (Soukopová et al. 2017).

Moreover, there is a rising attention towards the cooperation of governments with the private sectors,

and various questions are raised on the potential benefits of the public sector. For example, EU institutions and local public authorities are focusing on the cooperation with the private sector through PPP. They suggested implementing preliminary PPPs before the contracting of the full package of service provision (Soukopová et al. 2017).

Pros and cons of PPP in SWM

The PPPs' pros are wide and of a large variety. PPP can enhance delivery of SWM services because both public and private sectors perform in the most effective way and penalties set out are faced by the private sector, in case a service is not delivered as contracted. The governmental-introduced risks are reduced due to the private sector on-the-job training and motivation to make the most out of business opportunities and to maximize the investment returns. PPP allows the private sector to implement investments in a long term, which will enhance the service and reduce the operational costs for the public sector (Zaidi and Nasreen 2016).

On the other hand, there are several cons for the PPPs that are location-oriented. In most PPP projects, the cost depends on data background, such as population, waste generation, collection and total area. However, those data are not accurate and not reliable especially in DCs due to lack or low frequency in the conduction of statistical field research (Zaidi and Nasreen 2016).

Moreover, there are several other financial problems in PPPs when applied in DCs related to depreciation of capital, uncertainty of political and budgetary system, opportunity costs, lack or insufficiency of legislations and regulations, etc., which are not facilitating the formation of PPPs (Zaidi and Nasreen 2016).

Monitoring level of the service provision in the frame of PPPs is low due to the lack of a third independent party (Zaidi and Nasreen 2016). Furthermore, the involved citizens also play a considerable role in PPP and overall service delivery (Cointreau-Levine 1994). Their role may be altered to service partners instead of just service receivers through their cooperation and PPP support, which is as simple as fee payment obligation (Ahmed and Ali 2006) and being attuned to the provided guidelines. However, when illegal dumping is not prohibited and officially audited, the system application automatically fails; the number of participating citizens minimises and, thus, the fee per capita raises. Ultimately, the initially cooperating citizens are not even willing to participate anymore (Zaidi and Nasreen 2016).

PPP variations in developed and developing countries

Most of the experiences of PPPs are drawn by developed countries, such as United States and Britain, where the aspects are different in terms of technical, financial and social development as well as decision-making priorities. As a response to the pressure from the world's donor agencies, like USAID and World Bank, the DCs started to adopt PPPs in 1980s providing them an approach to economic development. However, the policy analysts and the development scholars are currently wondering if those PPPs are appropriate to the set priorities and actual needs of DCs (Ahmed and Ali, 2004).

The involvement of the private sector in SWM services differs from one country to another. While some municipalities involve the private sector in collection contracts, the others involve them in transportation or final disposal in landfills. The signed contracts and intervention sectors depend mainly on the municipalities' capacities or their development priorities that were already set. However, the level of involvement depends on the regulations and legislations of each country. For example, the joint ventures and the private finance initiatives are applied in developed countries based on the private sector's capacity and existing capitals to provide high-quality public services (Zaidi and Nasreen 2016).

In the United Kingdom, PPPs through the Private Finance Initiative (PFI), started in 1997. After that, the Local Government Association established an independent unit in 1996, called the PPP Programme. This unit facilitated the engagement of the local authority with the PPP through the PFI. Moreover, the UK government approved 16 schemes of an amount of £627 million through PFI credits (Zaidi and Nasreen 2016).

Another case study is the "Kirklees Metropolitan MSW Project in the United Kingdom". The project involved a 25-year joint venture contract between the "Kirklees Council (public side)" and the "United Waste Services Ltd (private side)" in order to implement an integrated SWM. The capital investment was about £41 million, and the contract encourages several techniques of reuse, recycling and recovery principles and decreases dependency on land filling. This experience was successful and further encouraged public sector to issue a set of tendering and shareholder agreements for other local authorities as well (Ridolfi 2004).

The aforementioned cases show that the public sector can achieve the set targets through the cooperation with the private sector and the level of understanding among them, ultimately, determines the projects' success level; the achievements and advancements mark the adequate control of the process (Zaidi and Nasreen 2016).

Another case in Delhi area showed that after the PPPs the SWM sector was remarkably improved. The private sector applied updated technical know-how, such as "GPS based traction system", for the vehicles to improve primarily vehicle coordination, system application and, most importantly, community participation. It was noted that the public awareness regarding source separation and waste segregation was remarkably improved (Talyan et al. 2008).

A multi-business enterprise called the "ITC" started in 2006 a PPP project in SWM in collaboration with the local municipality in "Saharanpur city" in northern India. The aim was to reduce and manage the quantity of MSW disposed in landfills. As a result, the government convinced locals to reduce waste by applying a mechanism of charging fees according to the generated waste weight. They also funded new technologies and processes for waste reduction (e.g. in the frame of contracted PPPs involving waste segregation, a number of waste-to-energy plants and composting units were established in different localities in collaboration with the private sector). As a result of solid governance and institutional, policy and market support, the partnership was successful on a large scale (Mohan et al. 2016).

Municipalities in Pakistan have involved the private sector to improve SWM services as well. The newly applied scheme improved several sectors, such as waste collection, waste transfer, street sweeping and, at the same time, the level of locals' environmental awareness due to noticeable positive impacts on the local health, social and environmental aspects. At the time, recycling and resource recovery were not options. The contract included the implementation of a billing system and a non-participation penalty list. Studies implemented proved that waste recycling would reduce service cost by five times, offering a room for improvement and an opportunity for further collaboration in registration, training and involvement of more stakeholders from the private sector (Zaidi and Nasreen 2016).

Municipality administration complexity and distinctiveness is the main reason that a direct reply to existent PPP considerations cannot be found in international literature. However, it is considered necessary to have PPP in several investment projects of the municipality. Solid waste management by PPP is recent in Brazil. For this reason, a study was conducted in the municipality of Sao Bernardodo Campo in the State of Sao Paulo, Brazil, to assess the provided services by PPP. Besides the identified success in management processes, the PPP resulted in a solid selective collection programme, reduced the amount of solid waste disposed to sanitary landfill, managed to start remediation processes on a degraded location (previously used as dumpsite), and, last but not least, stimulated the development and implementation of waste-to-energy plan (Marconsin and Rosa, 2012).

This paper aims to investigate the existing conditions for the conduction of partnerships in SWM, to determine the bottlenecks that need to be overcome and to highlight the strengths and weaknesses regarding potential PPP in the West Bank of Palestine. For this purpose, 12 Joint Service Council (JSC) representatives were questioned regarding the currently applied practices in order to get descriptive background, highlight necessities and provide recommendations for future actions.

Methodology

In order to achieve the objectives and obtain qualitative data on the topic of PPP of SWM in the West Bank, several methods were used to conduct this research. Firstly, the researchers implemented a desk review of all SWM-related data from government departments, organisational archives and local literature. To set the basis of the research, common trends of PPP across the developed and developing countries were also collected and categorised as per their effectiveness and overall results.

Next, the target group and the study area for this research were identified. The target group was decided to be representatives from the local JSCs that are currently responsible of the SWM in the West Bank (Palestinian territory) and which are administered and controlled by the directorate of the JSCs in MoLG, as shown in Table 1.

The 12 involved JSCs are located in Hebron, Bethlehem, North and North West Jerusalem, North East and South East Jerusalem, Tubas, Tulkarm, Nablus, Jericho, Salfit, Ramallah, Jenin and Qalqilya districts in the West Bank and are responsible for SWM in the West Bank. Eleven of them are responsible for MSW collection,

Table 1 Population and served local government units in the 11 districts of the West Bank

No.	JSC	No. of targeted LGUs	No. of served LGUs	Targeted population	Served population	Service (%) (population basis)
1	Jenin	93	91	314,010	274,820	88
2	Tubas	10	10	57,321	57,321	100
3	Nablus	58	21	392,391	135,137	34
4	Tulkarem	27	22	185,200	75,000	40
5	Qalqilya	30	29	113,594	109,713	97
6	Salfit	19	19	70,000	70,000	100
7	Jericho	17	14	61,176	53,405	87.3
8	Ramallah	68	0	370,000	0	0
9	North and South Jerusalem[a]	28	9	158,343	41,643	26
10	Bethlehem	36	28	205,572	141,693	69
11	Hebron	24	17	690,836	486,610	70
	Total	410	260	2,618,443	1,445,342	55

[a] This includes both North and North West Jerusalem, North East and South East Jerusalem JSCs (data book of solid waste management of joint service councils in the West Bank, Ministry of Local Government (MoLG) 2017, unpublished; 2017)

nine for waste collection and transfer only and two (Jenin JSC and Jericho JSC) for the management and operation of the landfill sites (disposal, human resources, equipment maintenance, leachate management, etc.), in addition to waste collection.

The JSC-H&B is also responsible in managing the Al Minya Sanitary Landfill, including its waste composting and sorting facilities, in addition to one medical waste treatment facility and two transfer stations, but it is not responsible for waste collection. On the other hand, Jenin and Tubas JSC is the manager of the Zahrat Al Finjan landfill.

The 12 mentioned JSCs cover 63% of the total Local Government Units (LGUs) in the West Bank of Palestine and 55% of the total population (Table 1), while the remaining areas are served by the LGUs.

In addition to the JSCs, the higher councils of the Zahrat Al Finjan and Al Minya landfills participated in the research since they are responsible for the management of the two sanitary landfills that are available in the West Bank and are in direct collaboration with most JSCs. Their role is very important in local SWM sector, and researchers judged that they might activate and facilitate participation of the private sector participation in this sector. Thus, the necessary feedback from these councils was obtained as well.

After identifying the target group and area, the survey questionnaire was developed in order to collect the raw data and assess the current situation and practices of the partnership in the SWM sector. The survey questionnaire targeted all involved sub-sectors in the SWM, namely technical, legislative, organisational and financial.

The survey consisted of the following six individual sections:

- The first section included general overview on the JSCs, such as the number of LGUs served, the population and the generated waste.
- The second section audited the technical aspects of the JSCs, such as the collection, transportation and disposal methods, the actual cost and the fee applied to the citizens.
- The third section observed the administration aspects of the JSCs, like the number of employees, the preparation of organisational structure and the financial and annual plans.
- The fourth section investigated the potential current experiences and practices in terms of PPP in SWM, including the services provided by the partnership, the main features and the type of agreement with the private sector and, finally, the technical and financial arrangement of the partnership.
- The fifth section aimed at the collection of information regarding the obstacles and challenges faced by the JSCs in partnerships and listed the existing requirements to form effective partnerships.

- The sixth section of the survey aimed at the collection of requirements and recommendations to increase the capacity of JSCs, private sector and MoLG in future implementation of PPPs in SWM.

Following the questionnaire development, researchers arranged and conducted interviews with the corresponding representatives of each JSC (e.g. executive directors). Filled questionnaires were collected, and the respondents were contacted by phone or email to provide additional information/clarifications. Overall, 14 questionnaires were filled by the 12 JSCs in addition to the Zahrat Al Finjan and Al Minya landfills.

All retrieved qualitative data from the interviews were collected and analysed. The current practices of PPPs in SWM were identified, and the challenges and recommendations were presented in sections divided to legal and institutional, financial and technical categories. The questionnaire included no predetermined answers; so, grouping of similar answers within the opinion section aided the formulation of inductive categories for further recommendations and discussion.

Results and discussion

The retrieved raw data formed a full and clear picture of the PPP involvement in SWM situation in West Bank, Palestine. They will be presented in the following format: I. SWM status (in terms of served population, financial and human resources that are required to apply the SWM system); II. PPPs (in terms of existing experience, involved challenges and recommendations for future actions).

SWM sector status in the West Bank

The existing facilities may be too few to satisfy the needs of the population, yet their existence is valuable for the sustainability of the SWM system in West Bank, Palestine.

The Zahrat Al Finjan landfill (managed by Tubas and Jenin governorate JSCs, which were established in 1997), is the final disposal location of waste coming from the governorates of Tubas, Qalqilya, Tulkarm, Nablus, Tubas (the latter by 80% of the generated fraction) and part of Ramallah and Al Bireh. Totally, the landfill receives approximately 1 million ton of waste per year which are transported after their compaction in the two transfer stations existing in Tubas and the western area of Jenin.

Al Minya landfill (managed by JSC-H&B, which was established in 2007) is the final disposal location of waste generated in those two governorates only. The council owns also two transfer stations—one on the western area of Hebron (Tarqumia) and second one on the southern part of Hebron. Overall, the landfill receives approximately 22,000 tons/month. MSW generated in Bethlehem governorate is transferred directly to the landfill and is not compacted in local transfer station.

Besides MSW collection and management, the Hebron and Bethlehem governorate JSCs implement projects targeting the management of other waste fractions as well, which are as follows:

I. Collection of recyclables (such as cardboard, plastic, metal and wood from allocated recycling bins). The latter is implemented in the frame of a project supported by the World Bank (the establishment of Brix) valued at $200,000, including the purchase of necessary equipment. The separation process is performed by the hands of council workers (17 employees) at the transfer station in the southern part of Hebron and at Tarqumia transfer station (8 employees). The monthly outcome is 200 tons of paper and cardboard, 150 tons of metals (all types), glass containers and plastic containers, 100 tons of wood and 50 tons of plastic (PE, PP). The Executive Director pointed out that "the project barely covers expenses, and revenues are from what is being sold". Lack of local markets leads into recyclable accumulation in storage units or is transported to the landfill, but the basic recyclable routes are the following:

    - Wood is sold for heating purposes to residents.
    - Carton is sold to Israeli recycling company.
    - Metal, plastic and glass are sold to the local market.

II. Waste tires. Car tires are collected from local garages/repair businesses, separated and shredded. Some of these secondary materials are sold to a private tile production company. However, large amounts accumulate due to lack of existing alternatives and are disposed in the landfill.
III. Medical waste management is organised. Wastes are collected by an appropriate vehicle or special car from local hospitals and transferred to a

processing unit in the transfer station at Tarqumia. After treatment that involves shredding and sterilisation, the waste is disposed to the landfill (approximately 700 kg/day).

The JSCs that are not responsible for the SWM facilities are collaborating with the aforementioned ones and aim at achieving high collection rates. Tulkarm and North East and South East Jerusalem JSCs apply fixed time–fixed place collection system. This is the case also for all the other ten JSCs, but, in their case, they apply secondary system for door-to-door collection in minor areas. Moreover, all JSCs have collection vehicles, in which all of them are compactor trucks with different sizes and need regular maintenance.

An overview of the SWM application in investigated JSCs is summarized in Table 2.

Considerable human and financial resources channelling into SWM and minimisation approaches support and encourage the significant efforts planned and implemented in West Bank, Palestine. The applied fees are the ones that support the system. LGUs charge the local population with a fee for SWM. The LGUs, in turn, pay a specific amount per ton of generated waste to the JSCs in order their waste to be managed (according to the local plan). Sadly, in many cases, the fees are not paid and the overall system is endangered to fail. In some cases, the external funding saves the implementation of applied projects that are mostly related to recycling. All financial aspects, including the total costs of SWM for the JSCs, the fees applied on LGUs, the level of the total cost recovery percentage and the citizens' charge per JSC, are presented in Table 3.

Human recourses are a basic foundation and a valuable asset in SWM and system application, as in any business. The total number of workers in the JSCs, the number of General Assembly and Board of Director members and the preparation of the annual and financial plans are presented in Table 4.

Private–public partnerships in SWM sector in JSCs of the West Bank

For the current practices of PPPs in the JSCs of the West Bank, it became clear that only JSC-H&B is currently having an agreement with the private sector for SWM. On the other hand, Salfit and Tulkarm JSCs are currently planning and studying the existing local requirements for the implementation of a partnership with private sector in the near future. In addition, Jenin and Tubas JSC (responsible for the Zahrat Al Finjan landfill) had 3-month contract under a PPP. The other JSCs have not yet applied such practices or agreements with the private sector, but they shared their opinion and recommendations that would encourage them to do so.

Current and future agreements in the West Bank are presented and analysed as per their achieved and anticipated results, correspondingly.

Current agreements

In JSC-H&B, the main partnership with the private sector is contracting with a Canadian company called "Aftamious Nickos" to operate the local transfer stations; transport compacted waste from the transfer stations to Al Minya landfill for final disposal. The agreement was signed on 2/9/2013, and the contract started on 25/3/2015.

The partnership is 50% financed by the World Bank and 50% by local authorities. The World Bank, through international financing cooperation (IFC) (which is responsible for drafting contracts), executed a complete study to form the partnership between private and public sectors. The recommended partnership is to cover the full administration of the existing transfer stations and landfills in the area and includes transportation fees and disposal of MSW. According to the environmental specialist at the JSC-H&B, the World Bank will support the partnership for 5 years, which may be expanded for 2 more years. In the frame of this contract, JSC-H&B is committed for a minimum amount of MSW transportation to the landfill. In addition, JSC-H&B has to compensate the private sector in case Israeli checkpoints change and end up in longer routes than those initially identified. The invoices are monthly, and the local authority should cash it out in 20 days after its receipt. Those invoices include the following:

- gate fee for transfer station services and cost of the transportation from the stations to the landfill (30 NIS per ton plus a value-added tax)
- gate fees for the final disposal to the Al Minya landfill (US$10/ton plus a value-added tax).

Overall, the World Bank compensates for half of the transportation and landfill fees (around US$8.5/ton is funded by the World Bank) and the remaining amount (US$8.5/ton) is covered by the LGU.

Table 2 SWM organisation in the investigated JSCs

JSC	No. of LGUs	Population	Served LGUs	Waste generated (tons/year) from the served LGUs	Remarks
Tulkarem	27	75,000	22	51,000 41,400 tons are primarily transferred to the transfer station, and 9669 tons are transferred directly to Zahrat Al Finjan landfill	Tulkarem City is partially served by the JSC, where 40% of the waste is collected by the JSC while the remaining quantity is collected by Tulkarem Municipality. However, all the collected quantity from Tulkarem City is transferred by the JSC
Salfit	18	70,714	18	32,172 (all transferred and dumped in random dumpsites)	The JSC collects MSW from all LGUs except the city of Salfit. The municipality of Salfit collects the waste of Salfit City and disposes it in a private random dumpsite
Ramallah	68	370,000	Ø	40,150 tons/year (collected by the LGUs using Ramallah JSC vehicles)	The JSC does not provide the service for any of the LGUs. The initiation of the service is linked to the construction of Ramoon landfill (a proposed sanitary landfill which will serve the middle area of the West Bank). Forty two of the LGUs are using the collection vehicles of Ramallah JSC to provide collection service for 163,000 people
Jenin	93	314,010	91	85,775	All collected wastes are sent to Zahrat Al Finjan sanitary LF. Fifty tons of the daily collected quantities are sent to the LF through a transfer station (35 km away from the LF). This transfer station serves the western villages of Jenin area and is managed by Jenin JSC
Tubas	10	57,321	10	13,140	All the collected quantities are sent to Tubas transfer station and, then, transferred to Zahrat Al Finjan sanitary LF by Jenin JSC
Nablus	58	255,332	21	30,660	74 tons out of 84 tons of the daily collected waste are sent to Al Sairafi transfer station and, then, transferred to Zahrat Al Finjan landfill by Nablus JSC. However, 10 tons of the daily collected waste is sent to dumpsites.
Qalqilya	29	109,713	29	31,025	All of the collected quantities are sent to Qalqilya transfer station and, then, transferred to Zahrat Al Finjan sanitary LF by Qalqilya JSC
Jericho	17	48,095	14	13,505	34.9 tons of the daily collected wastes are sent directly to Jericho sanitary LF. 2.1 tons are sent to Al Sairafi transfer station that belongs to Nablus JSC and, then, transferred to Zahrat Al Finjan sanitary landfill.
North East and South East Jerusalem	12	105,693	7	13,140	All the collected quantities are transferred to Al Minya sanitary landfill through Al Abdaly transfer station (25 km away from the landfill). There is another transfer station in the JSC area, located in Al Ram area (50 km away from the landfill), but this transfer station is not used by the JSC since it needs some rehabilitation (currently, it is used by Al Ram municipality only).
North and North West Jerusalem	16	52,650	12	2555	All the collected quantities are sent to dumpsites.
Bethlehem JSC	36	205,572	28	46,355	All collected quantities are sent directly to Al Minya sanitary landfill.
Hebron JSC	24	690,836	17	105,485	All collected quantities are transferred to Al Minya sanitary landfill, and 50% of the collected quantities are sent to the landfill via transfer stations. There are two transfer stations, Tarqumia transfer station (39 km away from the landfill) and Al Fahs transfer station (33 km away from the landfill). These two transfer stations are managed by Hebron and Bethlehem Higher Council.

A detailed feasibility study was prepared, and the outcome on the return-on-investment for the private sector was estimated to be 12%. The partnership project with the private sector in the field of management of transfer stations and management of landfill aimed to clearly raise the quality of service, but that leads to high cost, which is reflected on the value of the citizens' fee. This financial instability is occurring also due to the low rate of SWM fee collection (approximately 67% of the total actual amount). JSC-H&B emphasized that due to the adoption of high international standards and good practices in the work, the cost of the transfer and disposal of MSW is high. Regardless, the main reason for its success is external support of the World Bank that covers half of the transportation and landfill fees and conducts the feasibility study and agreement in a professional, clear and detailed manner. Nevertheless, this experience needs to be further supported by the government with respect to supporting the private sector in investment costs and tax exemption on services until the private sector is motivated to have this experience and willing to apply affordable charges that can be financially supported by the local community.

Future agreements under consultation

In 2014, Tulkarm JSC prepared a proposal called the "Green Tulkarm PPP project" and signed an agreement with an Italian Foundation (CHESVI) as a donor for the project. The main objective of the project was to contribute to improve the quality of life, health and hygienic conditions in Tulkarm. The project included signing two PPP agreements (not signed yet). The first one is with Thinnaba Cooperative Association for Agricultural Services (concerning urban biowaste), and the second agreement is with Al Aufi Company for the management of the collected cardboards, paper and plastics.

In addition, in Salfit JSC, a partnership draft contract is currently being negotiated with a German company and a local partner (Sun Company—Ramallah) but not signed yet regarding the generation of energy from MSW.

The PPPs that are under consultation are, hereafter, analysed per waste fraction:

Urban biowaste The collected agricultural waste will not be purchased, and vegetables from open markets and groceries and tree pruning sand will be transferred to the Thinnaba Association in order to produce compost and sell it afterwards to farmers. In addition, the association was funded to purchase a shredder by CHESVI.

For the arrangements with the Thinnaba Cooperative Association for Agricultural Services, the agreement mentions that Tulkarm JSC has to provide the biowaste shredding equipment and undertake the waste transfer to the association. On the other hand, the association has to deliver 7% of the amount of compost produced to the Joint Service Council and should make the maintenance of the equipment provided.

Although the project is in its initiation phase and it is difficult to assess the practical aspects, the project idea is considered as a good pilot idea. The cooperation with agricultural associations in the field of manufacturing compost from agricultural residues implements the circular economy aspects and imports benefits for the area. However, for the success of this partnership, agricultural companies, farmer associations, etc., need to participate and form a wide stakeholder group/agreement for the supporters to create and communicate the final product (compost) benefits and, ultimately, create a market for it. The involved municipalities should provide containers for separate collection of agricultural residues and communicate widely this activity to related stakeholders.

Recyclables The contractor will receive the collected amount of that waste, process it and sell it to interested parties. Tulkarm JSC will provide a car for (organised by the contractor) door-to-door waste collection and compaction for the contractor (funded by CHESVI).

For the arrangements with Al Aufi Company for plastic and paper, there are no specific financial arrangements between the council and the contractor. Tulkarm JSC should provide collection and compactor waste car for the contractor. On the other hand, the contractor should do the maintenance of the collection vehicle (provided by Tulkarm JSC) and the compactor (funded by CHESVI), and they will only collect, separate and sell recyclables with the specification that provides profitable income for them.

For the financial aspect, the preparation of simple financial feasibility study for the project illustrates the savings Tulkarm JSC will achieve, from not undertaking the responsibility to dispose cardboard to the Zahrat Al Finjan landfill; overall, it is estimated to be US$~ 50,000/year. However, savings resulting from the transfer of remaining waste to the Zahrat Al Finjan landfill are estimated to be less than US$736/year, in addition to the value of 7% of the generated compost.

Table 3 Financial and human resources of the existing SWM systems in the investigated JSCs

JSC	Total cost (NIS/ton)	LGU fee rate[a] (NIS/ton)	Residents' SWM fee (NIS/HH/month)	Recovery (%)
Tulkarm	165 Collection: 95 Transfer: 37 Landfilling: 33	133–173 (depending on the area)	15–17 (collected with the electricity bill)	98
Salfit	60 Collection: 60 No transferring and landfilling	10 NIS/HH/month	12–15 (collected with the electricity bill)	Ø
Ramallah	The JSC does not provide the service for any of the LGUs. The initiation of the service is linked to the construction of Ramoon LF (a proposed sanitary LF which will serve the middle area of the West Bank)	Ø	Ø	Ø
Jenin	135 Collection: 75 Transfer: 30 Landfilling: 30	170	15–18 (collected with the electricity bill)	82
Tubas	144 Collection: 97 Transfer: 17 Landfilling: 30	133	17–22 (collected with the electricity bill)	92
Nablus	125 Collection: 60.5 Transfer: 39.5 Landfilling: 25	125	15 (collected with the electricity bill)	92
Qalqilya	123.5 Collection: 47.5 Transfer: 43 Landfilling: 33	3.7 NIS/person/month	15–20 (collected with the electricity bill)	100
Jericho	237 Collection: 145 Transfer: 8 Landfilling: 29 Transferring and landfilling in Al Sairafi transfer station: 65	22 NIS/HH/month for single households. 32 NIS/HH/month for combined households.	17–22 (collected with the electricity bill)	100
North East and South East Jerusalem	247 Collection: 137 Transfer: 60 Landfilling: 50.5	137 the transfer cost is covered by the Israeli side during 2016, and the landfill fees is paid directly from the LGUs to the Higher Council	15–20 (collected with the water bill)	Ø
North and North West Jerusalem	There is no data available on the cost of SWM in N and NW Jerusalem JSC since the service was started recently and is partially provided by the JSC	Ø	15–20	Ø
Bethlehem JSC	138 Collection and transfer: 108 Landfilling: 30	120 This amount is for collection only because the LGUs pay the landfill fees directly to H and B Higher council	15–30 (collected with the electricity bill, the water bill or using a separate bill.)	Ø
Hebron JSC	126 Collection:88 Transfer:17.5 Landfilling: 30	105 This amount is for collection only because the LGUs pay the landfill fees directly to H and B Higher council	16–25 (collected with the electricity bill, the water bill or using a separate bill.)	Ø

[a] The fee is paid by LGUs to JSCs for the SWM services

Table 4 Human resources in the SWM sector in JSCs of West Bank, Palestine

No.	JSC	Total number of workers	Number of general assembly members	Number of board of director members	Preparation of plans
1.	Tulkarem	30 workers 6 management staff	27	7	Basic plan; annual plan; internal bylaw; organisation chart
2.	Salfit	25 workers 4 management staff	19	9	Basic plan; annual plan; financial plan; internal bylaw; organisation chart
3.	Ramallah	6 management staff	68	9	Basic plan; annual plan; financial plan; internal bylaw; organisation chart
4.	Jenin	110 workers 15 management staff	72	21	Basic plan; annual plan; financial plan; internal bylaw; organisation chart
5.	Tubas	12 workers 2 management staff	10	5	Basic plan; annual plan; financial plan; internal bylaw; organisation chart
6.	Nablus	30 workers 8 management staff	58	8	Basic plan; annual plan; financial plan; internal bylaw; organisation chart
7.	Qalqilya	48 workers 6 management staff	29	7	Basic plan; annual plan; financial plan; internal bylaw; organisation chart
8.	Jericho	24 workers 11management staff	17	5	Basic plan; annual plan; financial plan; internal bylaw; organisation chart
9.	North East and South East Jerusalem	12 workers 2 management staff	12	11	Basic plan; annual plan; financial plan; organisation chart
10.	North and North West Jerusalem	2 management staff	12	5	Basic plan; annual plan; financial plan; organisation chart
11.	Bethlehem JSC	49workers 6 management staff	36	13	Basic plan; annual plan; financial plan; internal bylaw; organisation chart
12.	Hebron JSC	61 workers 10management staff	24	7	Basic plan; annual plan; financial plan; internal bylaw; organisation chart

On the other hand, organising the informal sector (paper and cardboard collectors) significantly assists into environmental preservation, cost reduction and job position creation. Moreover, success key, in this case, is the provision of machinery and equipment by a donor institution, which also contributed to the project support, conduction of awareness programmes and outcome follow-up. However, the main problem in the field of cardboard and paper is the absence of a regional company to accommodate the separated cardboard and paper. Collected fraction is sold to an Israeli company at present, and stakeholders are facing additional cost and difficulties in transportation processes (boarders' security-screening processes). Therefore, it is important to conduct a feasibility study for the establishment of a factory for cardboard and paper and join a network of potential buyers in various countries.

Waste-to-energy The draft contract among Salfit JSC, the German company, and the local partner (Sun Company—Ramallah) states that Salfit JSC will be responsible in collecting the MSW and transporting it to the private company in order to produce electricity. If the agreement is signed, the commencement date will be 18 months after the signing date. The agreement type is BOT (Build–Operate–Transfer), and the lifetime of the partnership will be 20 years. Afterwards, the ownership of the project will be transferred to Salfit JSC, who can renew the agreement with any private sector partner while giving priority to the current partner.

The main features of the agreement are that Salfit JSC should purchase the land for the project, implement access road works and provide electricity for the operation. Salfit JSC should also be committed to transfer at least 36,000 tons of waste annually to the contractor's location from the local governmental units served and has to raise this amount in a period of 20 years to 120,000 tons per year from other LGUs. Salfit JSC will undertake the gate fee of the facility that is estimated to be $\sim$ 9.5/ton (payable within 45 days from the invoice issuing). On the other hand, the private company is not allowed to receive MSW from Israeli settlement, has the

right to search for sources of waste from other Palestinian communities and shares profits (not yet mentioned how in the agreement). Finally, the contractor should get approvals and licenses from the relevant authorities for the facility's construction and operation. Finally, yet importantly, they will make appropriate agreements with the electricity company as the energy generated by the facility will be provided to the national grid (under an agreed cost per kWh).

For the financial aspects, the private company has its own detailed feasibility study for the project, but they have not issued a copy or info yet due to confidential reasons. The capital cost of the project (undertaken by the private sector) is ~ 34 million dollars. Moreover, the electricity production is expected to be 4.4 MW per hour and since they expect 8000 operating hours per year, the production will be 35,200 MW per year. The selling price of the megawatt is expected to be agreed on $100/megawatt resulting in an average yearly income of 3.5 million dollars for the contractor. As mentioned before, the contractor will also collect gate fee from Salfit JSC for the amount of processed waste ($9.5/ton).

According to the information received from Salfit JSC, the amount of average waste collected annually is 35,300 tons, which is very near to the 36,000 tons of waste that Salfit JSC is committed to transport to the facility. The total amount of gate fee equals to US$0.342 (1.197 million NIS) per year ($9.5/ton ∗ 3.5 NIS/$ ∗ 36,000 ton/year) as dollar value is fixed to 3.5 NIS by agreement. The cost is covered by citizens' billing that is currently (2018) 17 shekels/month, in every household. The number of households according to the PCBS in 2014 is 12,859. So, the total collected amount is expected to be ~ 2,623,236 NIS. However, the operating expenses, according to the JSC's budget for 2014 is equal to 1,542,185 shekels, and, accordingly, there will be an annual deficit with the Council equal to 115,949 shekels, in addition to 72,000 shekels additional transfer fees (36,000 tons ∗ 2 shekel fees additional transport to the project site). This means that the annual total deficit equals to 182,949 NIS. To handle this potential loss, they currently search for PPP investment instead of increase of citizens' extra billing. Salfit JSC's chairman highlighted the fact that the fee is very high and recommended to decrease it to $8 for the first 5 years and, then, to further decrease it to $7.5, since they have the obligation to increase the amount of waste to be processed.

The PPP project will also contribute in creating new job opportunities and will support the private sector in other profitable projects. However, the experience of producing electricity from MSW still has not been applied on the ground in the Palestinian territories even though it is successfully applied in other countries. Therefore, the project needs governmental support in many areas, including tax exemptions, facilitations in obtaining licenses and the development of a fixed purchase price of electricity from private power production companies.

Past agreements

Jenin and Tubas JSC (Zahrat Al Finjan landfill) signed an agreement with a private Jordanian company to separate waste. This company is specialised in waste recycling and energy. The headquarter of the company is in Jordan, and it has branches in Dubai, United Arab Emirates, and in Milan, Italy. Also, the contractor has built a large project to recycle waste in Dubai with a capacity of 5000 tons/day and has carried out similar projects in Saudi Arabia, Tunisia and Jordan.

The agreement was BOT (Build–Operate–Transfer), for a 15-year duration. Jenin and Tubas JSC had to offer the free land and waste while the Jordanian company had to be responsible of all other expenses (machinery, equipment, operational costs, marketing). The contractor installed a sorting line and hired local staff to operate the facility. However, the project lasted for three months, and, unfortunately, the partnership collapsed due to various management and financial reasons, hereafter mentioned. The agreement was weak; the partner was in a financially weak status (did not invest in management activities and, thus, rushed to collect profits during the first three months to increase internal cash flow and had ~ 300,000 NIS in debts for diesel purchase in the first three operational months). Since the partner was not located in Palestine, it was rarely available for the conduction of the appropriate organisational meeting that led to weak overall management.

For the financial arrangements, the size of the investment from the contractor required around 2.5 million dollars. The Council's main objective was to reduce the amount of waste entering the landfill by 30%, which will increase the life of the landfill, as well as getting 15% of the net profits and create new job opportunities and markets. At the time of the agreement, there was no market in Palestine for recyclable paper and carton (the

closest one was a private Israeli company). This fact did facilitate neither the financial nor the administrational promotion of recyclables.

This case's bad example showed that the absence of a feasibility study and a detailed study of the generated waste (humid characteristics of MSW which affects the ability to separate waste according to specific ratios), of the local recyclable market as well as the lack of communication with the private sector partner lead PPPs to a dead end.

Challenges in implementing the PPP in SWM

The challenges faced by the JSCs were diverse in terms of political, technical, administrative, financial and legal aspects. Therefore, most of the JSCs consider it imperative to conduct feasibility studies before signing any agreement. In addition, they insist that the agreement must contain all technical, financial and administrative aspects and should include obvious and quick mechanism to resolve any conflict that might occur in addition to the inclusion of special conditions to end contracting. Hereafter, all challenge-research outputs are stated.

Financial As mentioned in the literature, there are several financial problems in PPP in DCs because usually the waste management projects do not include depreciation of capital; there is uncertainty of budgetary system and opportunity costs. Private sector companies, which enter a PPP, should have the required capitals to invest to avoid further financial problems in the application of the agreement terms. On the other hand, some of those projects are initially supported by external funding (e.g. World Bank) and they seem to be performing satisfactory. Once funding stops, they face sustainability issues since local authorities are unable to pay the high costs to maintain them, and they are reluctant to extra charge citizens due to local community opposition. Overall, they are automatically leaded to a decrease in the quality of SWM services provided or even the service pause (in case of recycling, composting and waste-to-energy). Technology transfer in DCs ends up in being very expensive and least effective. As Tulkarm JSC's representative mentioned "it is very important to have a donor institution that can support the PPP idea and provide machinery and equipment", but it is of added value to provide capacity building. The latter includes support for the conduction of awareness-raising programmes targeting citizens and on-the-job training of human resources. Only, then, the financial cost for the JSCs is limited in the long-term and provides sustainability.

Political JSC-H&B mentioned that one of the challenges was that the Israeli settlements around the landfill site discharge about 6% of the total waste entering the Al Minya landfill. However, the Israeli authorities do not pay for that waste and the council is responsible to bear the expenses incurred.

Technical Technical problems involve the technology application in relation to the quality and quantity of generated waste. For example, the generated MSW of high moisture minimises the separation ratio to lower levels than those theoretically indicated in literature, changing the proportion of waste separated to be lesser than the estimated break-even point. Similarly, the purchased equipment should be appropriate for the quality generated, the facility's minimum capacity and the minimum—existent—human resources of it, to avoid operational breakdowns that affect the overall production line.

Administrative Detailed market studies should precede the PPP contracts. Lack of local markets for compost or recyclables may increase operation costs and lead to recyclable accumulation to the point of their separation, minimising the recycling capacity. Marketing and operational plans for the sorted materials should pre-exist primarily for the PPP to work and secondly to encourage citizens' participation, recycling system application as well as other collaborations (e.g. circularity among local industries). In addition, institutional arrangements should be listed together with the background conditions for the preparation of action plans, in which both parties should agree. Jenin and Tubas JSC suggested that conditions and penalty options should be added to the contract in case of uncommitment of the contractor in applying the terms of the agreement. In a study conducted in Kampala, Uganda, aiming to compare the operations and discuss the effectiveness of PPPs in solid waste collection, the researchers resulted in confirming the global belief that the private sector is more effective than the public sector. The private sector clients are much more pleased than their public sector counterparts as per the provided services. However, the effectiveness of solid waste collection is susceptible to lack of transparency and corruption, involving both the public and the private sectors (Katusiimeh et al. 2012).

Legal Jenin and Tubas JSC emphasized that the lack of legislation framework on the agreements with the private sector constitutes a decisive parameter. Development of laws, regulations and licensing systems will lay the foundations, upon which a PPP may be built. To ensure PPP success, they need to affirm citizens' and industries' collaboration with the introduction of "Polluter Pay Principle" and source separation laws and regulations.

Recommendations for implementing the PPP

Whether the JSCs have current experiences in the PPP or not, they all have recommendations for the facilitation of future effective implementation of PPP in the West Bank. The recommendations were addressing the MoLG, the other JSCs and the private sector.

Ministries and authorities MoLG is expected by the JSCs to take under its umbrella the existing PPPs, as Pilot Projects, and offer them all required support in terms of license facilitation, extra funding (where necessary), capacity building, regulations update, etc. For example, enact regulations and legislations to encourage and facilitate the entry of the private sector participation in PPPs. The establishment of a special unit by the MoLG should be considered aiming to support JSCs and private sector in the preparation of feasibility or market studies, legal reviews of the agreements to be developed, etc. For example, in the case of JSC-H&B, MoLG should assist the board in the development of local strategies for landfill and transfer station management in the event of the end of the World Bank support (such as assist the search for other financial sources, study the possibility of raising the SWM fee charged to citizens or financially support the Council through the tax collected for road transport). Studies regarding electric power generation from landfill gas or biowastes would be also considered nationally and not locally, and the Palestinian Energy and Natural Resources Authority should take the responsibility of this work. Moreover, MoLG has to coordinate with the concerned authorities to develop the Investment Promotion Law and incorporate PPPs, grant additional incentives, such as tax and custom discounts on machinery and equipment purchase. Also, they should coordinate with donor institutions to provide funding for the purchase of land or specialised equipment.

Furthermore, EQA should work on the technical aspects to encourage the private sector in the management of MSW. In addition, MoLG should contribute in the development of mechanisms on the effective roadmap of SWM fee collection from citizens. This will encourage the private sector to implement projects related to the products of solid waste since the financial balance of the projects would be legally satisfied. In addition, the introduction of "Polluter Pay Principle" with respect to SWM fee at industrial companies is important. For example, there should be an extra charge for the collection and disposal of waste together with instructions on source separation from industry, as well as the enactment of fines, in case they do not comply. The latter will encourage the involvement of private companies in the field of social responsibility to support recovery, recycling and composting projects in local industrial parks under the JSC supervision. The Ministry of the National Economy should facilitate the licensing process and provide incentives of PPP projects in solid waste management.

JSCs All investigated JSCs encourage other JSCs to implement PPP projects because of their importance in the preservation of the environment, creation of job opportunities, encouragement of new investments and generation of green electricity (from biowaste). They consider important that all JSCs should prepare preliminary and detailed feasibility and market studies for the PPP project before implementation, to communicate with other JSCs to share gained experiences on PPPs in order to increase knowledge and to implement workshops with local authorities and ministries to raise people's awareness to gain further support on PPPs in SWM. For example, Ramallah JSC and the newly established Jerusalem JSCs have to establish communication with Al Minya landfill representatives and learn from their PPP experience on transfer station and landfill management. Finally, yet importantly, the JSCs have to follow up with partners to ensure their compliance with the conditions and instructions and to be in continuous communication (e.g. regular set meetings) to assess progress and evaluate the procedures and services applied by the private sector.

Private sector It is recommended to study the local market and to identify the routes and market, e.g. for recyclables or compost, which can be inserted in the local circular economy loop, create potential new

cascades or extend existing ones. Signing cooperation agreements with local industries even without the existence of any PPP may—financially—secure future PPPs. Most importantly, the private sector should have commitment to the terms of agreements signed that can be achieved only by the careful and detailed determination of the terms and conditions of the agreement as well as the determination and encouragement in future investments. Based on the experience in DCs, PPP performance is significantly influenced by affordability, consistency, economic status, flexibility, cleanliness, accessibility and coverage, as well as vehicle maintenance, number of waste collection vehicles, capacity, frequency, trip rate, quality of personnel and number of personnel (Aliu et al. 2014).

Conclusions and recommendations

This study aimed to explore the current PPP status in terms of JSC implementation experiences in the West Bank. Currently, only JSC-H&B is having signed agreements with the private sector. Salfit JSC and Tulkarm JSC are currently discussing the terms of their agreements with future contractors in order to implement them in the near future. On the other hand, Jenin and Tubas JSC (Zahrat Al Finjan landfill) had a 3-month (worst-case) experience of a PPP that was terminated as it was non-effective. The other JSCs do not have current practices or agreements with the private sector at present or plans to do so in the upcoming future, but they shared their opinion and requirements on a potential implementation scheme of PPP in SWM.

The survey results indicate that there are several challenges in the field of PPP in the West Bank in terms of institutional, regularity and financial mechanisms that need to be overcome so as to encourage and promote SWM partnerships.

In addition, absence of appropriate mechanisms to encourage the involvement of the private sector to invest in SWM was identified, in spite of the presence of the Investment Promotion Act, which exempts investors in the field of MSW tax (inactive on the ground). This Act needs to be updated and activated in the field of SWM, taking into account the option of PPPs and present all parties with incentives, e.g. tax minimisation and tax breaks on machinery and equipment. Primarily, the government must facilitate (without compromising the environment) the private sector in securing licenses and approvals from the relevant authorities in order to implement PPPs. MoLG could form a joint committee with all involved ministries to present local authorities and potential contractors with opportunities or project planning to encourage private sector stakeholders to contribute into the discussion in order for all obstacles to be overcome and accelerate the processes for the required approvals. MoLG is expected to act as a major sponsor to ensure that agreements do not conflict with the basic laws of the State of Palestine and collaborate with JSCs in order to review all agreements and contracts from legal point of view before the PPP contract signing in order to avoid project failures. Furthermore, new efforts should be directed at establishing appropriate PPP solid waste-related laws and procedures at the national and local levels.

In addition, MoLG should conduct special training programme for LGUs and JSCs for the preparation and evaluation of bids, negotiation skills, preparation of contracts, evaluation procedures and mostly develop guidelines for private sector stakeholders on the processes anticipated when forming a PPP in SWM services (model contracts, methodologies, etc.).

Regardless of the existence of various barriers, all JSCs highlighted interest in forming PPPs. Hence, they mentioned the necessity of drafting clear agreements and the inclusion of special conditions for the termination of contracts. The JSCs are key actors in PPP promotion in the field of SWM. Several contributions are required, and they also include citizens' training to support local SWM PPPs. JSCs should hold public meetings and awareness programmes to encourage waste source separation in terms of recyclables and biowaste, and promote compost production activities, which has good financial and environmental returns. In addition, JSCs should organise joint meetings with representatives from other JSCs to share their PPP experiences and train their staff in the field of building partnerships as well as monitoring and evaluation of the existing ones.

The private sector should also contribute in the promotion of PPP by preparing feasibility and credible market analysis prior to taking over any partnership; determining local market availability and raw material-required specifications and ensuring that contractors involved possess the working capital are few indicators that secure the joint cooperation's successful future and set a good example for others.

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