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# **UPDATED ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR GAZA SOLID WASTE MANAGEMENT PROJECT - P121648 ADDITIONAL FINANCING P171328**

**Final Report**

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**Municipal Development and Lending Fund**  
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## List of Abbreviations

AF	Additional Finance
AFD	French Development Agency
ARAP	Abbreviated Resettlement Action Plan
CCTV	Closed Circuit Television
CWMU	Coastal Water Management Utility
EA	Environmental Assessment
EPA	Environmental Protection Agency
EQA	Environmental Quality Authority
ESIA	Environmental & Social Impact Assessment
ESMP	Environmental and Social Management Plan
EU	European Union
FGD	Focus Group Discussions
GIZ	German Development Agency
GPRBA	Global Partnership for Result Based Approach
GRM	Grievance Redress Mechanism
GS	Gaza Strip
GSWMP	Gaza Solid Waste Management Project
GTZ	German Technical Cooperation
HCW	Health Care Waste
HDPE	High Density Poly Ethylene
IDA	International Development Association
IDB	Islamic Development Bank
IFC	International Finance Corporation
IVA	Independent Verification Agent
JAD	Joher Al-Diek Landfill
JICA	Japan International Cooperation Agency
JSC	Joint Service Councils
JSC-KRM	Joint Service Council for Solid Waste Management in Khan Younis Rafah and Middle Area Governorates
KYWWTP	Khan Younis Waste Water Treatment Plant
LGU	Local Government Unit
MDLF	Municipal Development & Lending Fund
MDP	Multi-Donor Supported Program
MoF	Ministry of Finance
MoH	Ministry of Health
MoLG	Ministry of Local Government
MoSA	Ministry of Social Affairs
MSF	Médecins Sans Frontières (Doctors Without Borders)



MSW	Medical Solid Waste
MWTF	Medical Waste Treatment Facility
NGOs	Non-Governmental Organizations
NIS	New Israeli Shekel
NSSWM	National Strategy for Solid Waste Management
OBS	Organizational Breakdown Structure.
OP	Operational Policy
OPT	Occupied Palestinian Terrority
PARC	Palestinian Agricultural Relief Committee
PCBS	Palestinian Central Bureau of Statistics
PDO	Project Design Outline
PDSU	Project Development and Safeguards Unit
PEF	Palestinian Environmental Friends
PHC	Palestinian Health Care
PM	Particulate Matter
PMMS	Palestinian Military Medical Services
PNA	Palestinian National Authority
PPE	Personal Protective Equipment
PWA	Palestinian Water Authority
RBF	Result-Based Financing
SSI	Semi Structured Interviews
SW	Solid Waste
SWM	Solid Waste Management
SWMC	Solid Waste Management Council
ToR	Term of Reference
TOU	Technical Operation Unit
TS	Transfer Station
UNDP	United Nations Development Program
UNDP-DEEP	United Nations Development Program- Deprived Families Economic Program
UNMAS	United Nations Mine Services
UNRWA	United Nations Relief and Works Agency for Palestine Refugees
USEPA	United States Environmental Protection Agency
UXO	Un Exploded Ordinance
WB	World Bank
WM	Waste Management
WMP	Waste Management Plan
WTP	Willingness To Pay
WWTP	Wastewater Treatment Plant

## الملخص التنفيذي

إن صندوق تطوير وإقراض الهيئات المحلية هي الجهة المخولة لتنفيذ مشروع إدارة النفايات الصلبة في قطاع غزة والذي يهدف إلى تحسين خدمات إدارة النفايات الصلبة في قطاع غزة. وفي ضوء النقاش لحصول مجلس الخدمات المشترك على تمويل إضافي لتشغيل المنشآت التي تم بنائها خلال مشروع إدارة النفايات الصلبة في قطاع غزة، فإنه كان من الضروري القيام بتحديث دراسة الأثر البيئي والاجتماعي لتناسب مع التغيرات البيئية والاجتماعية خلال السنوات الماضية وكذلك لتناسب مع التغيير في طبيعة أعمال إدارة النفايات الصلبة في قطاع غزة، وإضافة خدمة معالجة النفايات الطبية لمهام مجلس الخدمات المشترك. إن التمويل الإضافي يهدف إلى تشغيل كل من مكب نفايات الفخاري الصحي، ومحطتي ترحيل النفايات في خان يونس ورفح بالإضافة لتشغيل محطة معالجة النفايات الطبية في خان يونس، والتي تم بنائها من قبل وكالة التعاون اليابانية الدولية.

يهدف هذا التقرير إلى تحديث دراسة تقييم الأثر البيئي والاجتماعي لمشروع إدارة النفايات الصلبة في قطاع غزة والتي تم إجرائها أول مرة عام 2012، وتقديم خطط إدارة بيئية واجتماعية محدثة لكل من أعمال تشغيل مكب نفايات الفخاري، ومحطتي ترحيل النفايات في خان يونس ورفح، ومحطة معالجة النفايات الطبية في خان يونس، بالإضافة إلى أعمال جمع النفايات الثانوي والتي يقوم بها مجلس الخدمات المشترك.

يحتوي التقرير على تحديث لقاعدة البيانات الأساسية (Baseline Data) بالإضافة إلى تحديث للأثار المتوقعة من المشروع (Expected Impacts) وكذلك الإجراءات التخفيفية المقترحة (Mitigation Measures) وأخيرا خطة الرقابة والمتابعة (Monitoring Measures) خلال فترة تشغيل المنشآت التي تم ذكرها.

تتقسم قاعدة البيانات الأساسية إلى قسمين رئيسيين وهم:

- **قاعدة البيانات البيئية:** وهي تحديث لبعض ما ورد في قاعدة البيانات البيئية في تقرير تقييم الأثر البيئي والاجتماعي لعام 2012، ويحتوي التحديث على سرد لقراءات فحوصات المياه الجوفية والهواء الجوي المحدثة، وكذلك تحديث لكميات النفايات المتولدة في 2020، و معلومات محدثة عن المناخ من كمية هطول الأمطار وسرعة الرياح ودرجات الحرارة، كما أيضا اشتملت قاعدة البيانات البيئية على وصف عام للطرق في منطقة الخدمة، وكذلك المواقع الأثرية.
- **قاعدة البيانات الاجتماعية والاقتصادية:** وهي تحديث لبعض ما ورد في قاعدة البيانات الاجتماعية في تقرير تقييم الأثر البيئي والاجتماعي لعام 2012، ويحتوي التحديث على سرد لأخر إحصائات الخصائص الديموغرافية مثل عدد السكان وحجم الأسرة و معلومات إقتصادية مثل معدلات الفقر والبطالة في قطاع غزة، بالإضافة لمعلومات عن مستوى التعليم في قطاع غزة.

وقد تم استخدام عدد من وسائل التواصل المجتمعي خلال فترة الدراسة، والتي كانت موزعة حسب مواقع منشآت النفايات وكذلك كانت تراعي الحصول على المعلومات من مصادر مختلفة، كما كانت تراعي الجانب الجندي في الحصول على المعلومات. خلال فترة الدراسة، عقدت ورشة عمل مجتمعية مركزية لعدد متنوع من المستفيدين من المشروع، كما أقيمت ثلاث مجموعات بؤرية في كل من المناطق المحيطة بمكب النفايات ومحطة ترحيل رفح ومحطة ترحيل خان يونس (تشتمل على محطة معالجة النفايات الطبية أيضا)، فضلا عن جمع المعلومات بواسطة إستبيانات بيتية وخاصة فيما يتعلق برؤية المجتمع حول خدمة جمع النفايات الثانوي، و عقد لقاءات مع شخصيات ذات صلة منها على سبيل المثال شخصيات من مجلس الخدمات المشترك أو المزارعين حول مكب نفايات الفخاري، كما أيضا تم عقد لقاء تشاوري نسوي منفصل لإحداث التوازن في الحصول على المعلومات على أساس جندي متساوي.

إن قاعدة البيانات المتوفرة وبالإضافة لما تم استخلاصه من وسائل التواصل المجتمعية السابقة يتطابق بشكل كبير مع ما تم ذكره في دراسة تقييم الأثر البيئي والإجتماعي لمشروع إدارة النفايات الصلبة في قطاع غزة عام 2012، وقد تم تحديث بعض البيانات من مصادر أخرى. البيانات الأساسية اللازمة لإستكمال الدراسة متوفرة بشكل عام و هي بجودة مقبولة.

وقد تم خلال الدراسة توقع مجموعة الأثار البيئية والإجتماعية التي قد تتجم عن تشغيل منشآت النفايات سابقة الذكر ويمكن تلخيصها في النقاط التالية:

#### ➤ **مكب نفايات الفخاري الصحي:**

- **عملية إدارة النفايات الصلبة:** من المتوقع أن يكون للمكب الجديد أثر إيجابي على إدارة النفايات الصلبة بالمقارنة مع الوضع السابق، حيث يعتبر مكب نفايات الفخاري مكبا صحيا للتخلص من النفايات.
- **الخوان الجوفي:** من الممكن أن يتلوث الخوان الجوفي والتربة من عصارة النفايات المتجمعة في حال تسربها عبر طبقات التربة.
- **جودة الهواء:** من الممكن أن تتغير جودة الهواء بفعل إنبعاث الغازات من خلايا النفايات مثل غاز الميثان و ثاني أكسيد الكربون، كما أيضا من الممكن ان تتغير جودة الهواء بفعل الأغبرة الناتجة عن حركة الشاحنات خاصة في الأيام الجافة.
- **الضوضاء:** من المتوقع أن ينتج تلوث ضوضائي نتيجة تشغيل مكب النفايات، وكذلك حركة شاحنات نقل النفايات.
- **مواطن النباتات والحيوانات:** تم ملاحظة بعض الأراضي الزراعية في الأراضي القريبة من موقع مكب النفايات والتي قد تتأثر من عملية تشغيل المكب، كما أيضا تم ملاحظة العديد من الكلاب الضالة داخل موقع مكب النفايات والتي من الممكن ان تنقل التلوث إلى خارج موقع المكب.



- **المواصلات وحركة المرور:** من المتوقع أن ينتج تأثير سلبي أو تشويش على حركة المرور على الطرق الرئيسية والذي قد يؤدي لارتفاع نسب الحوادث المرورية، وزيادة خفيفة للإزدحام المروري بسبب مرور شاحنات جمع ونقل النفايات وتطابير بعض من محتوياتها على الشوارع.
- **إنتشار الأفات:** من المتوقع أن يكون هناك انتشار لبعض الحشرات في المنطقة مصدرها خلايا الطمر وبركة العصارة.
- **خطر الحرائق:** من المتوقع أن تتشب بعض الحرائق في خلايا الطمر ما يؤدي إلى أثار بيئية سلبية.
- **الصحة والسلامة المهنية للعمال:** وقد يتضمن هذا الأثر الخطر الفيزيائي من حركة أليات النفايات الثقيلة، وخطر تعامل العمال المباشر مع النفايات.
- **خطر إنهيارات كومة التربة:** هناك خطر متوقع من إنهيار بعض جوانب التربة التي تم تخزينها في موقع المكب، وذلك بسبب عدم استقرار بعض الجوانب ذو الميول الحادة.
- **خطر سرقة عصارة النفايات:** من المتوقع أن يتم سرقة عصارة النفايات كما حدث في موقع مكب نفايات مشابه في قطاع غزة، وذلك لإستخدامها بشكل غير قانوني في تسميد الأراضي الزراعية دون معرفة خطرها على الصحة العامة.
- **عدم إرتياح المجتمع المحلي:** من المتوقع أن يتأثر المجتمع المحلي القريب بشكل سلبي من مكب النفايات، قد يتأثروا من بعض سلوكيات العاملين الغير مرغوبة، وكذلك من حركة الشاحنات الكبير على الطريق المؤدي للمكب، وقد يتأثروا في بعض الأوقات من الرائحة أو إنبعاث الأغبرة الناتج من أعمال المكب.
- **حقوق العمال:** من المتوقع أن يعمل العمال في ظروف بيئية صعبة من خلال تعاملهم اليومي مع النفايات، وظروف خطرة من خلال عملهم في أليات ثقيلة وكذلك عملهم بالقرب من الحدود.
- **الإزدياد المتوقع على سعر خدمة إدارة النفايات الصلبة:** من المتوقع أن يزداد سعر التكلفة التشغيلية لإدارة النفايات الصلبة مع إستخدام مواقع النفايات الصحية الجديدة والتي تتطلب المزيد من الإجراءات البيئية والإجتماعية مثل إستخدام المعدات الثقيلة بشكل يومي لدمك النفايات وفرد طبقات الطين عليها لتقليل الأثار البيئية والإجتماعية. وقد ينعكس إزدياد سعر خدمة النفايات الصلبة سلبا على السكان خاصة على العائلات الفقيرة الغير قادرة على دفع الفواتير.
- **توفير فرص عمل:** من المتوقع ان يتم توفير عدد من فرص العمل مع تشغيل مكب النفايات الصحي، ما يشكل أثرا إيجابيا.
- **الأراضي في الطريق المؤدي للمكب:** من المتوقع أن يزداد سعر الأرض التي تقع على جانبي الطريق المؤدي لمكب النفايات بعدما تم إعادة تأهيله، ما يشكل أثرا إيجابيا.

### ➤ محطات الترحيل في خان يونس ورفح

- عملية إدارة النفايات الصلبة: من المتوقع أن يكون للمحطات الجديدة أثر إيجابي على إدارة النفايات الصلبة، وذلك من خلال تسهيل عمليات إدارة النفايات في مدينتي خان يونس ورفح بتكاليف أقل و آثار بيئية أقل بالمقارنة مع الوضع السابق.
- الخزان الجوفي: من الممكن أن يتلوث الخزان الجوفي من العصارة المتجمعة، ويمكن أيضا أن يتلوث من ناتج الحفرة الإمتصاصية بسبب عدم وجود شبكة صرف صحي في منطقة محطة ترحيل خان يونس.
- جودة الهواء: من الممكن أن تتغير جودة الهواء بفعل حركة شاحنات النفايات على الطرق الغير معبدة وخلال عمليات تحميل وتفريغ النفايات.
- الضوضاء: من المتوقع أن ينتج تلوث ضوضائي نتيجة تشغيل المحطة، وكذلك حركة شاحنات نقل النفايات.
- المواصلات وحركة المرور: من المتوقع أن ينتج تأثير سلبي أو تشويش على حركة المرور على الطرق الرئيسية والذي قد يؤدي لارتفاع نسب الحوادث المرورية، وزيادة خفيفة للإزدحام المروري بسبب مرور شاحنات جمع ونقل النفايات وتطايير بعض من محتوياتها على الشوارع.
- الصحة والسلامة المهنية للعمال: وقد يتضمن هذا الأثر الخطر الفيزيائي من سقوط العمال من أعلى أو إصابتهم وجروحهم، وكذلك الخطر من حركة أليات النفايات الثقيلة، وخطر تعامل العمال المباشر مع النفايات.
- إنتشار الأفات: من المتوقع أن تشغيل محطات الترحيل سترتب عليها إنتشار لبعض أنواع الأفات في المنطقة.
- عدم إرتياح المجتمع المحلي: من المتوقع أن يتأثر المجتمع المحلي القريب بشكل سلبي من مكب النفايات، قد يتأثروا من بعض سلوكيات العاملين الغير مرغوبة، وكذلك من حركة الشاحنات الكبير على الطريق المؤدي للمكب، وقد يتأثروا في بعض الأوقات من الرائحة أو إنبعاث الأغبرة الناتج من أعمال المكب.
- حقوق العمال: من المتوقع أن يعمل العمال في ظروف بيئية صعبة من خلال تعاملهم اليومي مع النفايات، وظروف خطرة من خلال عملهم في أليات ثقيلة وكذلك عملهم بالقرب من الحدود.
- توفير فرص عمل: من المتوقع ان يتم توفير عدد من فرص العمل مع تشغيل محطات الترحيل، ما يشكل أثرا إيجابيا.

### ➤ محطة معالجة النفايات الطبية في خان يونس

- **معالجة النفايات الطبية:** يعد معالجة النفايات الطبية باستخدام تقنية Autoclave نقلة نوعية وذات أثر بيئي إيجابي في التعامل مع النفايات الطبية في قطاع غزة مقارنة بالإجراءات التي كانت تتم سابقاً.
- **الخزان الجوفي:** من الممكن أن يتلوث الخزان الجوفي من تسرب العصارة الناتجة عن غسل غرف التعامل مع النفايات الطبية.
- **جودة الهواء:** من الممكن أن تتغير جودة الهواء بفعل الأدخنة الناتجة عن عمل جهاز Autoclave والذي يقوم بحرق النفايات الطبية وينتج عنه أدخنة يتم إطلاقها عبر المدخنة.
- **المواصلات وحركة المرور:** من المتوقع أن ينتج تأثير سلبي أو تشويش على حركة المرور على الطرق الرئيسية والذي قد يؤدي لارتفاع نسب الحوادث المرورية، خاصة وأن حوادث سيارات نقل النفايات الطبية ذات خطوة أكبر لما تحتويه هذه السيارات من مواد خطرة.
- **إنتشار الأفات:** من المتوقع أن تشغيل محطة معالجة النفايات الطبية سيزيد من انتشار لبعض أنواع الأفات في المنطقة.
- **الصحة والسلامة المهنية للعمال:** خطر تعامل العمال المباشر مع النفايات الطبية وإمكانية نقل العدوى لهم. بالإضافة لخطر التعامل مع الأدوات الثقيلة.
- **عدم إرتياح المجتمع المحلي:** من المتوقع أن يتأثر المجتمع المحلي القريب بشكل سلبي من محطة معالجة النفايات الطبية والتي قد تكون بسبب الرائحة أو انتشار الأفات في المنطقة.
- **توفير فرص عمل:** من المتوقع أن يتم توفير عدد من فرص العمل مع تشغيل محطة معالجة النفايات الطبية سواء لتشغيل المحطة أو لنقل النفايات الطبية، ما يشكل أثراً إيجابياً.

### ➤ أعمال جمع النفايات الثانوي

- **المواصلات وحركة المرور:** من المتوقع أن ينتج تأثير سلبي أو تشويش على حركة المرور على الطرق الرئيسية والذي قد يؤدي لارتفاع نسب الحوادث المرورية.
- **جودة الهواء:** من الممكن أن تتغير جودة الهواء بفعل حركة شاحنات النفايات على الطرق الغير معبدة وخلال عمليات تحميل وتفريغ النفايات. وكذلك من الانبعاثات الناتجة عن شاحنات النفايات.



- **الصحة والسلامة المهنية للعمال:** خطر تعامل العمال المباشر مع النفايات وإمكانية نقل العدوى لهم. بالإضافة لخطر التعامل مع الأدوات الثقيلة.
- **عدم إرتياح المجتمع المحلي:** من المتوقع أن يتأثر المجتمع المحلي بشكل سلبي من أليات الجمع والتي قد تكون بسبب الرائحة أو الإزدحام المروري.
- وقد تم إقتراح خطة إدارة ومراقبة بيئية وإجتماعية عند تشغيل المنشآت سابقة الذكر وذلك بالإعتماد على الزيارات الميدانية، وقاعدة البيانات البيئية والإجتماعية، وكذلك عقد اللقاءات التشاورية. ويمكن تلخيص هذه الخطة عبر النقاط التالية والتي تحتوي على الإجراءات التخفيفية لكل أثر متوقع:

#### ➤ **مكب نفايات الفخاري الصحي:**

- **الخوان الجوفي:** يجب متابعة نظام جمع للعصارة الناتجة عن النفايات وذلك لتجنب تلويث المياه الجوفية، والعمل على صيانتها بشكل دوري لضمان عدم تسريب العصارة.
- **جودة الهواء:** يجب استخدام الغطاء اليومي للنفايات (daily cover) للحفاظ على كميات الغازات داخل النفايات واستخراجها عند إغلاق المكب. كما يجب رش المياه خلال فترات العمل وذلك لتقليل الأغبرة، ويجب التحكم في سرعة شاحنات نقل النفايات، وإختيار مسارات مثلى لها لتقليل أثار الأغبرة التي قد تنتج.
- **الضوضاء:** يجب ان يتم تشغيل الشاحنات والألات بشكل أمثل بحيث يتم جدولة مواعيد تشغيلها وذلك لتقليل الضوضاء الناتجة عنها، وكذلك يجب وضع حواجز صوتية في حال تم تلقي شكاوي متعلقة بالضوضاء.
- **مواطن النباتات والحيوانات:** يجب العمل على توفير مكان بديل للكلاب الضالة وإخراجها من موقع المكب عبر التواصل مع المؤسسات المعنية برعاية الحيوانات الضالة.
- **المواصلات وحركة المرور:** يجب على شاحنات النفايات ألا تعمل خلال فترة ساعة الذروة، ويجب وضع رقابة محكمة على أي حوادث تحدث ويتم تسجيلها وأرشفتها، وعقد استبيانات دورية حول حركة شاحنات النفايات. كما يجب على جميع شاحنات النفايات تغطية النفايات خلال عملية نقل النفايات.
- **إنتشار الأفات:** يجب البدء بخطة مكافحة الأفات في الفترة ما بين أبريل و سبتمبر من كل عام.
- **خطر الحرائق:** يجب منع دخول الشاحنات التي تحمل نفايات مشتعلة، كما يمنع التدخين داخل موقع المكب.
- **الصحة والسلامة المهنية للعمال:** يجب على العمال إتباع الإرشادات وإتباع إجراءات السلامة والأمان، وكذلك الإستحمام كلما لزم الأمر. يجب على العمال الإلتزام بلبس ملابس الوقاية مثل الحذاء الأمن، القبعات الواقية، الفيسات

ذات اللون المميز، وغيرها من أدوات الحماية والتي تحمي العامل من التعرض للإصابة أو الضرر، كما يجب أن يتوفر صناديق الإسعاف الأولي في موقع العمل مع أشخاص مدربين على اجراء الإسعافات الأولية، وأخيرا يجب وضع خطط واضحة للانسحاب من الموقع في حالات الطوارئ.

- **خطر إتهيارات كومة التربة:** يجب أن يتم تسوية ميول كومة التربة لتكون ذات ميول مستقرة وغير قابلة للإنهيار.
- **خطر سرقة عصارة النفايات:** يجب ان يتم إغلاق موقع المكب بالكامل، وعدم السماح للدخول لغير المصرح بهم بالدخول، كما يجب ان يتم مراقبة مرافق المكب ومنها برك تجميع العصارة عبر الكاميرات.
- **عدم إرتياح المجتمع المحلي:** يجب إبلاغ السكان المحليين بمواعيد عمل المكب والخطط الإدارية لها، كما يجب أن يتم إستقبال الشكاوي وفق آلية واضحة للسكان والعمل على حلها. ومن الضروري العمل على التواصل المستمر مع السكان.
- **حقوق العمال:** يجب أن يتمتع العمال بكافة حقوقهم وفق القانون الفلسطيني فيما يخص بساعات الراحة ومكان الراحة والتغطية بالتأمين، وتوفير بيئة امن للعمل، وعلاوة المخاطرة.
- **الإزدياد المتوقع على سعر خدمة إدارة النفايات الصلبة:** يجب تنفيذ حملات توعية للسكان لتعريفهم بسبب إرتفاع سعر الخدمة، كما يجب إقرار نظام لإعفاء الأسر الفقيرة من الإزدياد في سعر الخدمة.

#### ➤ محطات الترحيل في خان يونس ورفع

- **الخزان الجوفي:** يجب مراقبة عمل شبكة تجميع العصارة وخزان العصارة، والعمل على صيانتها بشكل دوري. ويجب أن يتم تفريغ خزان العصارة بشكل دوري إلى محطة معالجة المياه العادمة.
- **جودة الهواء:** يجب رش المياه كلما تطلب الأمر ذلك على الطرقات الغير معبدة، وخاصة في الأيام الجافة.
- **الضوضاء:** يجب ان يتم العمل في ساعات النهار، كما يجب أن يتم صيانة دورية للأليات لتقليل حجم صوتها.
- **المواصلات وحركة المرور:** العمل على جدولة عمل أليات الجمع والكارات بحيث يتم الإبتعاد في جمع النفايات عن أوقات الذروة، كما يجب أن يتم تغطية الشاحنات خلال نقلها النفايات، والعمل على تسجيل كل حالات الحوادث والإصابات للعمل على الحد منها.
- **إنتشار الأفات:** يجب البدء بخطة مكافحة الأفات في الفترة ما بين أبريل و سبتمبر من كل عام.
- **الصحة والسلامة المهنية للعمال:** يجب على العمال إتباع الإرشادات وإتباع إجراءات السلامة والأمان، وكذلك الإستحمام كلما لزم الأمر. يجب على العمال الإلتزام بلبس ملابس الوقاية مثل الحذاء الأمن، القبعات الواقية، الفيسات ذات اللون المميز، وغيرها من أدوات الحماية والتي تحمي العامل من التعرض للإصابة أو الضرر، كما يجب أن يتوفر

صناديق الإسعاف الأولي في موقع العمل مع أشخاص مدربين على اجراء الإسعافات الأولية، وأخيرا يجب وضع خطط واضحة للانسحاب من الموقع في حالات الطوارئ.

- **عدم إرتياح المجتمع المحلي:** يجب إبلاغ السكان المحليين بمواعيد عمل محطات الترحيل والخطط الإدارية لها، كما يجب أن يتم إستقبال الشكاوي وفق آلية واضحة للسكان والعمل على حلها. ومن الضروري العمل على التواصل المستمر مع السكان.

- **حقوق العمال:** يجب أن يتمتع العمال بكافة حقوقهم وفق القانون الفلسطيني فيما يخص بساعات الراحة ومكان الراحة والتغطية بالتأمين، وتوفير بيئة امن للعمل، وعلاوة المخاطرة.

#### ➤ محطة معالجة النفايات الطبية في خان يونس

- **الخزان الجوفي:** يجب جمع العصارة في خزان منفصل عن خزان العصارة الخاص بمحطة ترحيل خان يونس، ويجب مراقبة عمل شبكة تجمع العصارة وخزان العصارة، والعمل على صيانتها بشكل دوري. كما يجب أن يتم إضافة الكلور للعصارة قبل نقلها إلى محطة معالجة المياه العادمة.

- **جودة الهواء:** يجب ان يتم العمل على تعديل تصميم المدخنة لتصبح ذات إرتفاع كبير.

- **المواصلات وحركة المرور:** يجب جدولة عمل سيارات نقل النفايات الطبية والعمل على إختيار الطرق الغير مزدحمة.

- **إنتشار الأفات:** يجب البدء بخطة مكافحة الأفات في الفترة ما بين أبريل و سبتمبر من كل عام.

- **الصحة والسلامة المهنية للعمال:** يجب على العمال إتباع الإرشادات وإتباع إجراءات السلامة والأمان، وكذلك الإستحمام كلما لزم الأمر. يجب على العمال الإلتزام بلبس ملابس الوقاية مثل الحذاء الأمن، القبعات الواقية، الفيسات ذات اللون المميز، وغيرها من أدوات الحماية والتي تحمي العامل من التعرض للإصابة أو الضرر، كما يجب أن يتوفر صناديق الإسعاف الأولي في موقع العمل مع أشخاص مدربين على اجراء الإسعافات الأولية، وأخيرا يجب وضع خطط واضحة للانسحاب من الموقع في حالات الطوارئ.

- **عدم إرتياح المجتمع المحلي:** يجب إبلاغ السكان المحليين بمواعيد عمل محطة النفايات الطبية والخطط الإدارية لها، كما يجب أن يتم إستقبال الشكاوي وفق آلية واضحة للسكان والعمل على حلها. ومن الضروري العمل على التواصل المستمر مع السكان.

### ➤ أعمال جمع النفايات الثانوي

- **المواصلات وحركة المرور:** يجب جدولة عمل سيارات نقل النفايات الطبية والعمل على إختيار الطرق الغير مزدحمة.
- **جودة الهواء:** يجب العمل على الصيانة الدورية للأليات لتقليل إنبعاثاتها.
- **الصحة والسلامة المهنية للعمال:** يجب على العمال إتباع الإرشادات وإتباع إجراءات السلامة والأمان، وكذلك الإستحمام كلما لزم الأمر. يجب على العمال الإلتزام بلبس ملابس الوقاية مثل الحذاء الأمن، الكفات الواقية، الفيسات ذات اللون المميز، وغيرها من أدوات الحماية والتي تحمي العامل من التعرض للإصابة أو الضرر.
- **عدم إرتياح المجتمع المحلي:** يجب إبلاغ السكان المحليين بمواعيد العمل، كما يجب أن يتم إستقبال الشكاوي وفق آلية واضحة للسكان والعمل على حلها. ومن الضروري العمل على التواصل المستمر مع السكان.

وتشمل أنشطة الرصد والمراقبة عمليات التشاور مع الجيران والمجتمع المحلي، والتي يجب أن يتم توثيقها مع الصور خلال فترة تشغيل المنشآت. إن خطة الإدارة البيئية التي تم إقترحها اشتملت بشكل واضح على تعريف للإجراءات التخفيفية المطلوبة والجهات المسؤولة عن تنفيذ كل منها، كما اشتملت على طريقة مراقبة ورصد تنفيذ الإجراءات التخفيفية و الجهات المسؤولة عن إجراء المراقبة وكذلك عدد مرات المراقبة. إن مسؤولية إجراء الوسائل التخفيفية تقع على عاتق مجلس الخدمات المشترك بالشراكة مع الشركاء المحليين مثل بلدية خان يونس ورفح، بينما تقوم وكالة مستقلة بمراقبة تنفيذ هذه الإجراءات، كما سيكون هناك دور فاعل للمجتمع المحلي في مراقبة أنشطة التشغيل عن طريق عقد الجان المجتمعية الخاصة بالمشروع زيارات دورية لهذه المنشآت.

## Executive Summary

The Municipal Development & Lending Fund (MDLF) is the delegated implementation agency for Gaza Solid Waste Management Project (GSWMP) which aims at improving the solid waste services in Gaza Strip. Regarding to the discussion of receiving JSC-KRM an additional fund to operate its waste facilities which were constructed under GSWMP, there was a need to update the Original ESIA of the parent project (GSWMP) to address all the environmental and social changes occurred in the previous couple of years, and to be fit with the update of operations of JSC-KRM facilities which witnessed a lot of improving and expanding in term of type of service i.e. operation of the medical waste treatment facility. The additional fund is aiming to operate all the new JSC-KRM facilities namely: Al-Fukhary (Sofa) Landfill, two transfer stations in Rafah and Khan Younis (in addition to the Medical Waste treatment facility located in Khan Younis TS). Moreover, to cover the operation of secondary waste collection.

This report aims to update the Gaza Solid Waste Management ESIA which was carried out in 2012, and provide updated ESMPs for operations of the new sanitary landfill, two transfer stations, and the medical waste treatment facility which was built by JICA, in addition to the operation of the waste secondary collection service.

This report presents an update to the Environmental and Socio-economic Baseline, in addition to updating the expected impacts, as well the suggested mitigation measures, and finally monitoring plans during the operation of the previous mentioned facilities. The Baseline consists of two main sections:

- **Environmental Baseline:** it contains the update of the original baseline, 2012 including the recent results of groundwater and ambient air quality, update of the generated waste quantities in Gaza Strip, update of climate statistics such as rainwater precipitation, wind, and temperature. As well, the environmental baseline included an overview of the internal roads in the service area, and heritage sites in Gaza Strip.
- **Socio-economic Baseline:** it contains the update of the original baseline, 2012 including the recent statistics of the demographic characteristics such as the population and family size, and update of economic data such as poverty and unemployment rates, in addition to the education rates in Gaza Strip.

During the study preparation, Different public consultation tools were used; they were distributed over based on the place of waste facilities, and the design of consultation keys took into consideration the gaining of data from diverse sources and considering the gender dimension. During the study period, central consultation workshop was held for different stakeholders, and three focus groups were carried out in the areas around the landfill and the two transfer stations (medical waste treatment facility located in Khan Younis TS). Furthermore, a household questionnaire was distributed to survey the local community view especially about the waste secondary collection service. Consultations were also included structured interviews with specific stockholders i.e. JSC directors, farmers around the landfill, and workers. Finally, in order to consider the gender dimension, a separate consultation

meeting was held for women in Khan Younis to discuss about their view about different issues related to waste management.

The available baseline data in addition to what was concluded from the public consultations were mostly available in previous ESIA of GSWMP, which was conducted in 2012, an update was carried out from other sources. In general, the available data was satisfactory.

**The main potential impacts** on environmental and socioeconomic aspects during the operation phase include the following impacts:

➤ Al-Fukhary (Sofa) Sanitary Landfill

- **Solid Waste Management:** The new disposal mechanism is better in term of the social and environmental aspects comparing to the previous situation. So that the new sanitary landfill is considered a positive impact.
- **Groundwater Aquifer:** The groundwater could be affected adversely by the leakage of the leachate through the soil layers.
- **Air Quality:** Air quality could be affected due to the emitted gases from the disposal sites such as methane and CO<sub>2</sub>, as well dust is expected to deteriorate the air quality due to the movement of heavy machinery.
- **Noise:** it is expected due to the operation of the landfill and movement of heavy machinery.
- **Fauna and Flora:** it was noticed the distribution of dogs in the landfill site, expecting them to transfer the pollution to the outside of the landfill site.
- **Traffic:** due to the movement of the incoming and outgoing waste vehicles, as well some of them are not covered.
- **Pests Impacts:** pests are expected to be found in the period April – September of each year due to the waste activities.
- **Fires Risks:** fires are expected in the disposal cells.
- **Occupational Health and Safety:** risks on the health and safety of workers are expected due to their close work with wastes, as well their work in the presence of heavy machinery. The site is also located near the border of Gaza Strip.
- **Erosions of the soil stockpile:** unstable sides of the excavated materials stockpile could be collapsed at anytime, which form a risk on workers in the site.
- **Steal of leachate:** stealing of leachate is expected as a lesson learnt from a similar landfill in Gaza Strip; the leachate could be used for fertilizing agricultural lands illegally without considering the high risks of using it.



- **Inconvenience of the local community:** community could be annoyed due to the movement of collection vehicles, odors, or dust. They also could be annoyed from some of undesired behaviour of workers.
- **Labor rights:** Workers are expected to work in difficult environment due to the daily contact with wastes, and their work near the border.
- **Higher Cost to Beneficiaries Communities:** The cost of SWM service is expected to increase due to the recent environmental and social measures such as using of heavy machinery at the landfill to compact and cover the waste on the daily basis. The increase of the service cost could affect negatively on some of families especially the poor families.
- **Creation of Job Opportunities:** it is expected to create some of job vacancies due to operating this facility.
- **Potential impact on the social and economic activities:** the cost of lands on both sides of the landfill access roads are expected to be increased after the rehabilitation of the access road.
- **Transfer stations in Rafah and Khan Younis**
  - **Solid Waste Management:** The new disposal mechanism is better in term of the social and environmental aspects comparing to the previous situation. So that the new transfer stations considered a positive impact.
  - **Groundwater Aquifer:** The groundwater could be affected adversely by the leakage of the leachate through the soil layers.
  - **Air Quality:** Air quality could be affected by dust due to the movement of heavy machinery and loading and unloading of wastes.
  - **Noise:** it is expected due to the operation of transfer stations and movement of heavy machinery.
  - **Traffic:** due to the movement of the incoming and outgoing waste vehicles and donkey carts, as well some of vehicles are not covered.
  - **Pests Impacts:** pests are expected to be found in the period April – September of each year due to the waste activities.
  - **Occupational Health and Safety:** risks on the health and safety of workers are expected due to their close work with wastes, as well their work in the presence of heavy machinery.
  - **Inconvenience of the local community:** community could be annoyed due to the movement of collection vehicles, odors, or dust. They also could be annoyed from some of undesired behaviour of workers.

- **Labor rights:** Workers are expected to work in difficult environment due to the daily contact with wastes.
- **Creation of Job Opportunities:** it is expected to create some of job vacancies due to operating this facility.

➤ **Medical Waste Treatment Facility in Khan Younis**

- **Medical Waste Management:** The new treatment technique (Autoclave) is better in term of the social and environmental aspects comparing to the previous situation (open incineration).
- **Groundwater Aquifer:** The groundwater could be affected adversely by the leakage of the leachate through the soil layers. Leachate is produced due to the washing of the facility and the equipment.
- **Air Quality:** Air quality could be affected by the emitted smokes of the short chimney.
- **Noise:** it is expected due to the operation of the facility.
- **Traffic:** due to the movement of the incoming and outgoing medical waste vehicles. Accidents with the medical waste vehicles are risky.
- **Pests Impacts:** pests are expected to be found in the period April – September of each year due to the medical waste activities.
- **Occupational Health and Safety:** risks on the health and safety of workers are expected due to their close work with medical wastes, as well their work in the heavy equipment (Autoclave).
- **Inconvenience of the local community:** community could be annoyed due to odors, or pests.
- **Labor rights:** Workers are expected to work in difficult environment due to the daily contact with medical wastes.
- **Creation of Job Opportunities:** it is expected to create some of job vacancies due to operating this facility.

➤ **Operation of the Waste Secondary Collection**

- **Traffic:** due to the movement of the collection waste vehicles, and some of them are not covered.
- **Air Quality:** could be affected due to dust emissions, and some of emissions due to running of the vehicles.
- **Occupational Health and Safety:** risks on the health and safety of workers are expected due to their close work with wastes, as well their work in the heavy machinery.

- **Inconvenience of the local community:** community could be annoyed due to odors, traffic, undesired behaviour of workers, or noise.

The Environmental and Social Management and monitoring plans were proposed based on the conducted field visits, updated environmental and social baseline data and the public consultations. The following is summary of the main mitigation measures for the main receptors that will be the responsibility of JSC-KRM:

➤ **Al-Fukhary (Sofa) Sanitary Landfill**

- **Groundwater Aquifer:** The leachate collection system and leachate lagoon should be monitored periodically and should be maintained on the monthly basis to prevent any leakage of leachate. As well monitoring of the groundwater quality twice a year.
- **Air Quality:** Daily cover should be used to secure most of the generated gases to be extracted at the closure phase. Water should be sprayed in the dry days to decrease the dust emissions, as well the speed of driving of waste vehicles should be limited.
- **Noise:** working in the daytime, and install barriers once complaints are received from community.
- **Fauna and Flora:** dogs to be getting out of the landfill site through the help of some of specialized NGOs.
- **Traffic:** Restrict transport trucks in the rush hours, strict monitoring to the road accidents as part of the monitoring plan , conduct monitoring survey to get the feedback of roads users and address any concerns, and other appropriate means to direct traffic safely through and around the project zone.
- **Pests Impacts:** pests management plan to be implemented from April – September focusing on the disposal cells, and the leachate lagoon.
- **Fires Risks:** daily cover to be applied, as well preventing any burnt waste to be unloaded in the disposal cell. Smoking is prohibited at the site.
- **Occupational Health and Safety:** workers should follow the safety measures. They should be covered by insurance, provided by PPE. Fire extinguishers and safety boxes should be provided at the site, as well a clear contingency plan should be trained to be implemented in the emergency cases.
- **Erosions of the soil stockpile:** gentling the slopes of the stockpile to be stable.
- **Steal of leachate:** CCTV system to be installed for monitoring, as well all the site should be secured by a fence.

- **Inconvenience of the local community:** increase the sharing information with the community and carrying out consultations with them. Channels for complaints should be clearly announced for public. Moreover, awareness companies will be a good tool for people to know more about waste management.
- **Labor rights:** Workers should be provided by all of his rights upon the Palestinian labor laws including the providing risk allowance, insurance, rest time and location, and safe environment.
- **Higher Cost to Beneficiaries Communities:** Awareness coamings should be carried out for community to let people know more about waste management costs. Poor families could be exempt from paying additional feels.

➤ **Transfer stations in Rafah and Khan Younis**

- **Groundwater Aquifer:** The leachate collection system and leachate tanks should be monitored periodically and should be maintained on the monthly basis to prevent any leakage of leachate. As well monitoring of the groundwater quality twice a year.
- **Air Quality:** Water should be sprayed in the dry days to decrease the dust emissions, as well the speed of driving of waste vehicles should be limited.
- **Noise:** working in the daytime, and install barriers once complaints are received from community.
- **Traffic:** Restrict transport trucks in the rush hours, strict monitoring to the road accidents as part of the monitoring plan , conduct monitoring survey to get the feedback of roads users and address any concerns, and other appropriate means to direct traffic safely through and around transfer stations.
- **Pests Impacts:** pests management plan to be implemented from April – September.
- **Occupational Health and Safety:** workers should follow the safety measures. They should be covered by insurance, provided by PPE. Fire extinguishers and safety boxes should be provided at the site.
- **Inconvenience of the local community:** increase the sharing information with the community and carrying out consultations with them. Channels for complaints should be clearly indicated and announced for public. Moreover, awareness companies will be a good tool for people to know more about waste management.
- **Labor rights:** Workers should be provided by all their rights upon the Palestinian labor laws including the providing risk allowance, insurance, rest time and location, and safe environment.

➤ **Medical Waste Treatment Facility in Khan Younis**

- **Groundwater Aquifer:** The leachate collection system and leachate tanks should be monitored periodically and should be maintained on the monthly basis to prevent any leakage of leachate. Leachate should be chlorinated before evacuation to the WWTP. As well monitoring of the groundwater quality twice a year.
- **Air Quality:** taller chimney should be installed for better dilution at the atmosphere.
- **Noise:** working in the daytime, and install barriers once complaints are received from community.
- **Traffic:** Restrict transport medical waste trucks in the rush hours. Medical waste trucks should use empty streets for avoiding the traffic and any potential accidents, as well medical waste trucks should clearly show on their body the sign of medical waste.
- **Pests Impacts:** pests management plan to be implemented from April – September at the site.
- **Occupational Health and Safety:** workers should follow the safety measures. They should be covered by insurance, provided by PPE and vaccination. Fire extinguishers and safety boxes should be provided at the site. All unauthorised people should be prevented to access to the facility.
- **Inconvenience of the local community:** increase the sharing information with the community and carrying out consultations with them. Channels for complaints should be clearly indicated and announced for public. Moreover, awareness companies will be a good tool for people to know more about medical waste management.
- **Labor rights:** Workers should be provided by all their rights upon the Palestinian labor laws including the providing risk allowance, insurance, rest time and location, and safe environment.

➤ **Operation of the Waste Secondary Collection**

- **Traffic:** Restrict transport of waste trucks in the rush hours. All vehicles should be covered during transporting of the waste, and leachate tank should be fixed in all vehicles to collect the leachate instead of leakage to streets.
- **Air Quality:** speed of driving should be limited, as well periodic maintenance should be conducted for all vehicles to reduce the emissions resulted from running of vehicles.
- **Occupational Health and Safety:** workers should follow the safety measures. They should be covered by insurance, provided by PPE, and first aid box in each vehicle.

- **Inconvenience of the local community:** increase the sharing information with the community and carrying out consultations with them. Channels for complaints should be clearly indicated and announced for public. Moreover, awareness companies will be a good tool for people to know more about waste management.

Monitoring activities includes consultation with neighbors and corresponding local councils, keep records and description for review and approval, taking same-point vantage photographs prior, during operation. The monitoring management plan includes the responsibility of conducting the mitigation measure, monitoring responsibility, approach of monitoring, and frequency of monitoring. It was the responsibility of JSC-KRM to conduct all mitigation measures with local partners such as Rafah and Khan Younis Municipalities. Independent Verification Agent (IVA) will monitor the compliance with the mitigation measures during operation of the previous mentioned facilities, and regular site visits will be conducted by the community social committee to monitor the operations.



## **1. INTRODUCTION**

### **1.1 Project Background**

The Gaza Solid Waste Management Project (GSWMP) was designed to improve solid waste management services in the Gaza Strip through the provision of efficient environmentally and socially sound waste management schemes through four components: (i) Construction of solid Waste Transfer and Disposal Facilities, (ii) Institutional Strengthening, (iii) Primary Collection and Resource Recovery, and (iv) Project Management. Under component one, a new sanitary landfill and its access road were constructed in the southern region of Gaza Strip with a capacity to serve three out of Gaza's five governorates until year 2027; and it is proposed to serve the entire Gaza Strip until the year 2040. In addition to construction of two transfer stations, one in Khan Younis and the other one in Rafah.

The Joint Service Council for Solid Waste Management in Khan Younis Rafah and Middle Area Governorates (JSC-KRM) was established in 1995 to provide secondary solid waste collection services, e.g., from communal containers<sup>1</sup>, and is responsible, in addition to the secondary collection, for the disposal services at the sanitary landfills in Dair El-Balah (Closed in July 2019), and Al-Fukhay (Sofa) Sanitary landfill (opened in July 2019 with 2 million cubic meter capacity) with daily input of 600 tons of solid waste. JSC-KRM is also expanding its services to include medical waste transport and treatment and the operation of at least two transfer stations constructed under the project.

The GSWMP is almost completed, and Additional Financing (AF) is proposed to cover part of the increased cost of operation for new waste facilities in the initial years while the JSC-KRM and municipalities are to establish adequate service quality and improve fee collection. AF will be included under component four of the parent project (Project Management). The proposed additional project activities under this component will include additional funds for project audit for Global Partnership for Result Based Approach (GPRBA) activities along with two additional sub-components:

- 4(e) Subsidies to JSC-KRM, municipalities and medical waste producers to support the cost of adequate delivery of JSC services;
- 4(f) financing of services of an Independent Verification Agent with the responsibility to verify the service delivery performance of the JSC-KRM, participating municipalities and medical waste producers.

As the GSWMP approaches completion under the parent project which provided the necessary infrastructure and institutional support for improved environmental conditions, AF is sought through a new project targeting the operation phase of the facilities provided under the project as means to sustain JSC-KRM service provision in compliance with high operational standards and World Bank operational policies. The AF will:

- Allow the service provider (JSC-KRM) to deliver quality solid waste services;

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<sup>1</sup> One to four cubic meter containers

- Strengthen the operational and financial capacity of JSC-KRM and municipalities;
- Ensure the project's operational and financial sustainability and increase the project's long-term impact; and
- Provide a practical basis for developing operational standards for landfills that can be applied across Palestine to further strengthen the solid waste management sector West Bank and Gaza.

The following table shows the progress status of the infrastructure activities of GSWMP

**Table 1: Progress status of the infrastructure activities of GSWMP**

Item	Progress Status	Financial Resource
<b>Al Fukhary (Sofa) Sanitary Landfill</b>	<ul style="list-style-type: none"> <li>- Construction completed in August 2019.</li> <li>- New heavy equipment vehicles were supplied by the project.</li> <li>- JSC-KRM took over the facility and equipment - started operation on 15<sup>th</sup> July, 2019.</li> </ul>	GSWMP (P121648)
<b>Closure of the existing dumpsite in Al-Fukhary (old dump site)</b>	<ul style="list-style-type: none"> <li>- Existing dumpsite was rehabilitated in parallel with the construction of the adjacent new landfill cells.</li> <li>- Complete closure design of existing dumpsite is underway with final bidding documents and drawings expected to be completed in November 2019; and closure works expected at the beginning of 2020.</li> </ul>	GSWMP (P121648)
<b>Three (3) transfer stations</b>	<ul style="list-style-type: none"> <li>- Khan Younis TS was constructed by United Nations Relief and Works Agency for Palestine Refugees (UNRWA) and currently hosts the medical waste treatment facility.</li> <li>- Rafah TS is at the final stages of construction and expected to be handed over to JSC in November, 2019.</li> <li>- Middle Area TS is not financed under the project; however, location of facility is still pending adherence to selection criteria.</li> </ul>	<ul style="list-style-type: none"> <li>i. Construction of Khan Younis TS was funded by IDB</li> <li>ii. Construction of Rafah TS: GSWMP (P121648).</li> </ul>
<b>Al-Fukhary (Sofa) Landfill Access Road</b>	<ul style="list-style-type: none"> <li>- Rehabilitation of the landfill access road was completed in July 2019.</li> </ul>	GSWMP (P121648)

Japan International Cooperation Agency (JICA) allocated part of its financial fund to the Palestinian people in establishing the medical waste treatment facility as a pilot project, with the financial support of and through the UNRWA and United Nations Development Program (UNDP). The JSC-KRM was the delegated implementing agency for this project; specifying its responsibilities as follows:

- (i) Transporting the Health Care Waste (HCW) -medical waste from the health-care facilities to the medical waste treatment facility (only the infectious wastes);

- (ii) Treating the received HCW by using an Autoclave (provided by Palestinian Ministry of Health - MoH); and
- (iii) Transporting the treated waste to the final disposal site.

While the MoH role is to segregate and store the HCW into three types (Sharps, Infectious, Noninfectious), noting that the pathogenic wastes have a separate treatment technique used by MoH. The Ministry of Local Government (MoLG), Environment Quality Authority (EQA), and the Ministry of Finance (MoF) are responsible for supervising the whole process to be in line with Palestinian regulations.

The medical waste treatment facility is located at Khan Younis Transfer Station and it started operation since 2018 with some stops due to technical issues. It receives the HCW from 47 clinics and one main hospital. JICA produced a management plan for this treatment facility and has prepared an ESMP which was approved by EQA in 2018. The treatment facility is expected to be expanded in terms of used technology, received HCW quantities, and source of energy; a new microwave will be supplied by JICA, and solar system will be installed by Qatar Charity at the end of 2019.

## **1.2 Assignment Objective**

The original GSWMP was assessed at Category (A) according to Operational Policy (OP) 4.01 Environmental Assessment (EA), as well an ESIA has been carried out and disclosed in 2012<sup>2</sup>. The proposed additional activities are similar to those of the original project (GSWMP) and the activities are not expected to pose additional environmental and social safeguards risks or impacts that would require a change in the project safeguards category (A) and covered by the set of World Bank safeguards policies effective at the time of appraisal. The Project Design Outline (PDO) remains unchanged and the scope of the AF is within the current GSWMP scope and area (Southern and Middle Gaza). The Safeguards Category will therefore retain “A” and AF preparation will apply the same approach of the parent project with an updated ESIA (Expected to be disclosed in 2020) to more explicitly cover the operation phase, pest management at the site and to directly feed into the performance targets of the Result Based Financing (RBF).

The AF project is complying with the EA Policy OP 4.01, Pest Management Policy OP 4.09, and the Involuntary Resettlement Policy OP 4.12. Pest Control Management Policy OP 4.09 is triggered in AF project due to the expected use of pesticides during the operation of JSC-KRM facilities. The Additional Funding project will be based on the GPRBA and following its requirements. The proposed project is also subject to the bank's policy (BP 17.50 – Disclosure Procedures) details the banks requirements for making operational information available to the public.

The updated ESIA will be an addendum to the original ESIA conducted in 2012, and it will mainly cover the environmental and social risks and impacts of the operation of the (GSWMP) facilities

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<sup>2</sup> Environmental and Social Impact Assessment of the Gaza Solid Waste Management Project  
[http://www.mdif.org.ps/Files/Docs/GSWMP%20ESIA\\_FINAL\\_19sep2012.pdf](http://www.mdif.org.ps/Files/Docs/GSWMP%20ESIA_FINAL_19sep2012.pdf)

namely; Al Fukhary (Sofa) sanitary landfill, Rafah transfer station and Khan Younis transfer station. The addendum ESIA will also cover the medical waste treatment facility funded by JICA and the secondary collection service provided by (JSC-KRM).

This report is one of the main deliverables for the “Review and Update to the Environmental and Social Impact Assessment & Management Plans” Consultancy services agreement. It is reviewed and updated based on the recent project description (including the medical waste treatment facility), updated baseline information as well as institutional context.

### 1.3 Scope of Work

The joint venture between EcoConServ for Environmental Solutions and Universal Group (UG) were hired by MDLF to review & update to the Environmental and Social Impact Assessment (ESIA) & Management Plans of GSWMP. The main objective of this assignment as identified by the ToR is to review and update the original associated environmental and social assessment reports of the waste facilities managed by JSC-KRM namely (Al-Fukhary Sanitary Landfill, Rafah and Khan Younis transfer stations, and medical waste treatment facility) in addition to the associated waste secondary collection carried out by JSC-KRM. Five tasks have been identified in the ToRs as follows:

- ❖ **Task 1:** Field & project documents review.
- ❖ **Task 2:** Update of baseline data.
- ❖ **Task 3:** Assessment of potential impacts and proposed mitigation measures.
- ❖ **Task 4:** Preparation and/or updating of environmental and social management and monitoring plans.
- ❖ **Task 5:** Preparation of management plans.

### 1.4 ESIA Structure and Content

The Consultant developed an ESIA report structure that reflects the five tasks mentioned in the scope of work. The ESIA report content could be summarized as follows:

No.	Chapter	Content
1	<b>Introduction</b>	It presents an overview on the parent project and the additional finance project components. it also presents the consultancy service objectives and the scope of work
2	<b>Environmental and Social Impacts Assessment Methodology</b>	It sheds the light on the adapted methodology to accomplish the consultancy assignment. It presents the applied tools including surveying tools and the various methods used to engage local communities during the preparation phase of the ESIA. It also gives an overview on the key strengths and weaknesses of the consultant’s methodology of the assignment.
3	<b>Laws, Legislations and Institutional Setup</b>	It introduces an overview on the laws, legislations and institutional aspects in relevance to the parent project and its additional fund activities. It presents the local Palestinian laws related to solid waste management (SWM) as well as

No.	Chapter	Content
		other environmental regulations and standards. It also presents other international standards and safeguard policies including those of the World Bank and other international funding agencies
4	<b>Project Review and Analysis</b>	It presents the current situation of SWM in GS and identifies deficiencies which are the basis for the (GSWMP). It includes an identification of the project's components and description of their technical design details, proposed distribution of responsibilities among different project stakeholders, and the related safeguards instruments. This chapter also includes a review of the project rationale with a discussion of alternative technologies for solid waste management
5	<b>Environmental and Social Baseline</b>	It includes an updated environmental and social baseline at the project service area. It is considered the base to measure the potential impacts that the project may have on the various environmental and social parameters.
6	<b>Stakeholders Consultations</b>	It includes documentation for the process of stakeholder's consultation along with the ESIA cycle and in particular during the scoping and upon drafting the ESIA results. The followed consultations used different consultation tools (workshops, household surveying, structural interviews, focus groups...etc), moreover the gender dimension is well captured.
7	<b>Environmental and Social Impacts and Proposed Mitigation Measures for the Southern Section of the Project</b>	It includes an assessment of the potential environmental and social impacts that are expected from the project activities in the southern part during different stages. It measures the potential impacts on the various explored environmental and social parameters and will assess the nature and severity of the impacts.
8	<b>Environmental and Social Management and Monitoring Plans</b>	It presents the various mitigation measures to deal with the environmental and social impacts of high and medium significance. It also sets comprehensive management plan for the mitigation measure implementation including monitoring and institutional management plan

## 2. THE ENVIRONMENTAL AND SOCIAL IMPACTS ASSESSMENT METHODOLOGY

### 2.1 Secondary Data Collection

To prepare the updated ESIA, the Consultant has employed a participatory bottom up approach that depends on a diverse range of tools to serve the objectives of the various parts of the ESIA.

The consultant accessed large amounts of quantitative and qualitative information from various primary and secondary sources. Secondary data collection involved the review of information in previous reports and studies in order to extract background data about environmental and socio-economic characteristics of the project area.

Literature review also included consulting web-based resources. The secondary information helped in assessing the following:

- The environmental and socio-economic baselines of Gaza Strip in general and the targeted sites for the long-term developments related to GSWMP in particular;
- The project background, description, and elements;
- Baseline assessment for the existing SWM systems in place (equipment, resources, institutional role and the operation systems);
- The Palestinian legislation and the WB safeguard policies related to the project;
- The institutional and organizational framework relevant to the project;
- Environmental and social standards and guidelines for related environmental and social issues; and
- Previous experiences in similar projects.

The original ESIA report prepared in 2012 was one of the main sources of information to help the Consultant in obtaining and updating the baseline information as well as project specific information. Additional site/field investigation tools were also employed in order to collect information primarily.

### 2.2 Primary Data Collection

In addition to the literature review, structured site visits were undertaken to collect primary data directly from stakeholders in order to engage their perceptions about the project's predicted impacts. The main tasks and issues covered through the site visits and stakeholder consultations are:

- Environmental and social baseline and current situation;
- Stakeholders' perception of the project and the anticipated impacts;
- Stakeholders views and recommendations on the mitigation of predicted negative impacts; and
- Roles and responsibilities associated with the Environmental and Social Management Plan (ESMP).



The Consultant has identified and targeted five key groups of stakeholders which can cover the diversity of information source, more details about these targeted groups are presented in chapter (6), these groups included:

- Local communities including services' beneficiaries.
- Local communities near transfer or landfill stations.
- Workers who work officially in the services provision.
- Institutions in charge of services provision including governmental, semi-governmental and non-governmental.
- Land owners of the intended landfill stations who are also farmers and potential users of collected storm water.

Data was collected from different sources, but mainly all water and air quality measurements were carried out by JSC-KRM in cooperation with MDLF and EQA. The primary data collection method involved employing a number of qualitative and quantitative tools. The most important tools could be summarized as follows:

#### **2.2.1. Consultation Workshops**

Two consultation workshops were proposed to be carried out during the screening stage, and after preparing management and monitoring plans. The first workshop was conducted; it includes a scoping consultation session with the main objective of reviewing the ESIA scope of work and ToRs with stakeholders and obtaining stakeholders views on the issues that need special attention during the field investigations and analysis. Additionally, one plenary public consultation session was organized after drafting the ESIA in order to validate and review the study findings with the relevant stakeholders and potentially affected groups by the project. The results of the public consultations are included in this final ESIA. The various consultation and participatory activities largely contributed to enriching and validating the findings of this ESIA.

#### **2.2.2. Structured Questionnaire (Household Survey)**

A structured questionnaire was designed, tested and applied by the consultant in the field to collect quantitative data on the status of the current situation of SWM service and communities' views on the services quality, service providers, practices, service fees, and willingness and affordability to pay for the service. The questionnaire also investigated community awareness needs and local communities' recommendations for the secondary collection service. The Arabic survey questionnaire is attached **in (ANNEX III)**.

#### **2.2.3. Focus Group Discussions (FGD)**

The consultant has conducted three FGDs with three localities near the SWM facilities as JSC-KRM is managing three main facilities (Landfill and two transfer stations as the medical waste treatment facility is part of Khan Younis TS) to verify and to further investigate in a qualitative in-depth manner. The Consultant has designed guidelines/checklists to be used while conducting the discussions. The FGDs covered the same issues of the survey, and in addition it covered issues related to the impact of the operation of the facilities, the main issues covered are:

- Community views on the quality of solid waste services quality;
- Payment issues (amount and regularity), suggested improvements;
- Willingness to pay (WTP);
- Awareness needs and appropriate approaches;
- Views on the nearby transfer station/disposal sites;
- Community views of the complaints system; and
- Impacts from the operation of the SWM facilities.

#### **2.2.4. Semi Structured Interviews (SSI) and Informal/ Unstructured Interviews**

The SSIs allowed for interviewing 2-3 individuals from similar social groups/affiliation. The tool contained closed and open-ended questions. SSIs were adapted with various institutional representatives including the JSC-KRM, farmers adjacent to the landfill and formal workers.

#### **2.2.5. Additional Consultation Activities**

It is worth noting that the stakeholders' consultation activities were not limited to the activities mentioned above as public consultation event has been conducted to ensure that the gender dimension is well captured.

### **2.3 Strengths and weaknesses of the adopted ESIA Methodology**

The applied ESIA methodology involved a number of strengths that positively affected the quality of the gathered information and was highly informative for the ESIA process. The most important strength is that the applied methodology is that it enables the consultant to formulate the ESIA and the ESMP in the most practical manner driven from the adopted participatory approach during the ESIA preparation. The practical application of the ESMP in the future is expected to be efficient because the ESIA process has already enhanced the stakeholders' sense of ownership over the project and the project is a demand-driven intervention that local communities are ready to accept and contribute to.

The tools were carefully selected to suit the type of interviewed stakeholders and the issues that need to be investigated. For instance, informal interviews were conducted with the informal waste pickers during their work time, while tools like the structured questionnaire which included willingness to pay questions mostly targeted men groups who tend more to be the decision makers on financial and expenditure related issues on the household level.

Based on the previous experience and knowledge of the consultants and research team of the local settings, the survey and the FGDs samples were carefully selected to capture the various specificities of communities in the southern governorates. The selection of the four representative communities has been made against pre-determined set of criteria as explained above. Despite the relative limited size of the survey sample, the sample characteristics are generally consistent with the general socioeconomic characteristics of GS communities which will be explained in details in chapter (5) of this ESIA study. This includes characteristics related to education, economic conditions, poverty status, economic activities, etc. Moreover, the results of the survey pretest and the stated answers did

not reflect any significant variation within the selected interviewees inside each of the neighborhoods. In that sense, the consultant view was to maintain a small sample for the quantitative survey since it was anticipated that an increased number of questionnaires will not change the survey results. Complementary qualitative tools were employed to capture in-depth understanding of perception and views of various stakeholders' groups.

A combination of manual and computer software methods were used for the analysis of quantitative data to prevent the findings informatively.

### 3. POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

#### 3.1 Introduction

Solid waste management (SWM) in Palestine is regulated by several laws, reflecting the national strategy and waste management policy of the Palestinian Authority. In 2019, the most important policy documents and laws are as follows:

##### 3.1.1. At the Strategic Level

**The National Strategy for Solid Waste Management in Palestine (2017-22):** The NSSWM was adopted in August 2017, following the first National Strategy for SWM 2010-2014. The first strategy was set up in 2004 by the Ministry of Local Government (MoLG). It is considered as the global framework of all “*decisions, programs, activities and medium-term investment plans, aiming at developing the SW sector in Palestine*” (PNA 2010, page 5).

Updating what was done in the first NSSWM, the National Strategy (2017-2022) includes also the willingness to align the Palestinian SW policy on the Sustainable Development Goals of 2030, especially Goal 3 (Health and Well-being), as well as Goal 11 (Sustainable cities and human settlements). The strategic objectives of the current NSSWM are:

1. A modern and effective legislative and organizational framework for SWM;
2. Strong implementing institutions;
3. Effective and environmentally safe management of SW services;
4. Financial sustainability and efficient SWM services and activities;
5. Appropriate treatment and inventory of medical, hazardous and special waste;
6. A growing participation of the private sector in SWM;
7. A more participating and aware public;
8. Effective information and monitoring systems (PNA 2017, page 9-11).

**Table 2: NSSWM 2017-2022 Achievements By 2022**

Achievement	Status in 2017	Status in 2022
Percentage of recycled materials	< 1%	30%
Percentage of transferring organic materials into low quality compost for the purpose of coverage	2.5%	15%
Coverage of residential areas	95%	100%
Service coverage by JSCs	76%	100%
House separation of SW	0%	20%
Coverage of sanitary landfills	53%	100%

Among the strategic indicators chosen in this National Strategy to be reached in 2022, are also:

- 20% current random sites are rehabilitated in the WB and Gaza Strip;
- 50% sanitary landfills to have gas treatment systems;

- 80% of special waste in urban areas to be removed;
- 15% reduction of hazardous waste disposal;
- At least 6 recycling projects are implemented;
- At least 3 public awareness projects involving the civil society
- 100% municipalities/JSCs provide accurate information on SW (PNA 2017, pages 43-70).

### The Environment Sector Strategy 2017-2022

In its strategy 2010-2013, the Environment Quality Authority (EQA) planned to focus on 4 interventions: (i) The upgrade of SW collection and landfill disposal services, (ii) The closure/rehabilitation of random dumpsites, (iii) The implementation of the NSSWM, and (iv) The development of an initiative promoting separation and 3Rs principles (GIZ, 2014). In reference to the last adopted strategy (Sectoral Environment Strategy 2017-22 (EQA, 2017)), EQA focuses on the same previous four interventions generally, but the EQA Director General for Projects and International Relations, Mr. Abu Thaher, mentioned the 4 directions taken by the agency related to SWM: reduction of the pollution (reduction of solid waste included); encouraging reuse, recycling and recovery; investing the legal framework and institutional capacities; as well as developing waste awareness and education through campaigns and various activities<sup>Error! Bookmark not defined.</sup>

### The National Development Plan 2014-2016

The National Development plan (NDP) is a tri-annual plan presenting the Palestinian Authority's strategy in economic development and employment; good governance and institutions building; social protection and development, and infrastructure. The priority objectives in the SWM sector are to "improve solid, liquid and hazardous waste management systems, including collection, transportation and safe disposal" and "where possible to encourage recycling" (PNA, 2014, p.78).

Table 3: SWM Targets Planned For 2016<sup>3</sup>

Indicators	Baseline 2013	2016 Target
Households currently connected to SW collection services in %	95%	100%
Total SW disposed in sanitary landfills out of produced waste in %	40%	60%
Total SW recycled in %	12%	25%
Number of private SWM companies	3	9
Average daily SW generation per capita	0.80 kg	0.75 kg
Number of installations treating hazardous and medical waste	30	50
SW fee collection in %	85%	90%

<sup>3</sup> PNA, 2014, p.158.

### 3.1.2. At the legislative level

**The Municipal and Local government Law or Local Authorities Law No. 1 (1997)** defines the roles and responsibilities of the local authorities (Local Government Units (LGU) and Joint Service Councils – LGU and JSC), supervised by the MoLG. According to its Article 15, local authorities are responsible for the waste management in their own jurisdiction: the collection of SW in public spaces, its transportation and disposal, the management of a landfill facility, as well as the option to provide services through a private contractor, or to join with other municipalities through a JSC (GIZ, 2014). Article 15 mentions furthermore the need to take precautionary measures in public health in order to prevent any future pollution or epidemic outbreaks (Soufan, 2012).

**The Environmental Law No. 7 (1999, revised in 2003)** establishes the general legal framework for SWM in Palestine, including also hazardous waste management. It aims to reduce the negative effects of waste, to protect the environment and public health, to promote sustainable development, to develop inter-ministerial cooperation and standards, and to increase information and awareness. The most important provisions of this law related to SW are:

- Article 1: definition of the notions of solid waste and hazardous waste;
- Articles 7 and 9: the national role of the Environment Quality Authority (former Ministry of Environmental Affairs-MEnA) as the responsible entity to set up a strategic plan and to technically specify disposal sites;
- Article 8: Relating to the 3Rs (reduce, reuse and recycle), this article asks for the reduction of SW generation at the lowest level possible, as well as implementing re-use and recycling measures where possible;
- Article 10: asks the relevant actors for precautionary measures in storage and transportation of construction and demolition waste;
- Regarding hazardous waste: Article 11 proposes a listing of hazardous waste; article 12 forbids the use, treatment, storage and disposal of any type of hazardous waste, except under certain conditions and article 13 forbids any importation and limits crossing of hazardous waste on the OPT;
- Article 23: forbids dumping waste in non-designated sites;
- Articles 74 and 76 refer to the « polluter pays » principle (Soufan, 2012; GIZ, 2014).

**The Palestinian Environmental Impact Assessment Policy (2000)** describes the conditions, through standards and guidelines, under which any private or public development activity, in terms of environment protection, shall be implemented. Its aims are to protect Palestine environment's sustainability, as well as to prevent any irreversible or to mitigate any reversible damage from development activities. It gives a list of activities needing to conduct an Environmental Impact Assessment (EIA) or an Initial Environmental Evaluation (IEE).

**The Palestinian Law (2003)** asserts the right, in its article 33, to a “clean and a balanced environment as a basic right of every Palestinian” and the national duty for “preservation of the Palestinian environment for the sake of both present and future generations” (Soufan 2012, page 70).



**The Public Health Law No. 20 (2004)** defines the Ministry of Health (MoH) as the institution responsible for licensing SWM facilities (article 2.12). The MoH is also in charge of taking all the “necessary and precautionary measures” to confiscate and destroy all contaminated or potentially contaminating materials (article 10). In cooperation with other competent bodies, it is responsible for the determination of the work conditions for people in craft and industries that might affect their health (article 34). Finally, the MoH is in charge of regulating, in coordination with other institutions, the collection, storage, transport and disposal of hazardous wastes (article 42) (PNA, 2004; GIZ, 2014).

**The Medical Waste Management Bylaw (2012)** gives a definition of medical waste and a classification of its different types (articles 9 and 10), as well as instructions for its identification (art.12). The Bylaw also describes the procedures related to medical waste’s separation and collection (by waste types in chapter 3); the conditions for storage inside the health institution and for transportation outside (chapters 4 and 5). In its chapters 6 and 7, the Bylaw presents the treatment measures to be applied and specifies the locations’ requirements for treatment within and outside the institution, as well as the conditions for disposal of solid medical waste and waste water. The document furthermore describes the responsibilities of the Ministry of Health, the EQA, the local authorities and the licensee (chapter 8) and mentions the duties to exchange information between the stakeholders, and to prepare an emergency/contingency plan (PNA, Bylaw 2012; GIZ, 2014; ARIJ, 2015).

**The Law on the Encouragement of Investment in Palestine Law No. (1) of 1998, amended in 2004, 2011 and in 2014 (decree No. (7) Of 2014)<sup>4</sup>** aims to provide guarantees and incentives to private investment, through the Palestinian Investment Promotion Agency. Investment is protected from expropriation or nationalization in general (art. 7) and free transfer of all financial sources is guaranteed (articles 10-11). Income taxation exemption is provided to agricultural projects while tax reduction incentives for at least 5 years, through an incentive package contract, is allowed to any investment (articles 23-25)<sup>5</sup>.

**The basic regulation on the Joint Service Councils of year 1996 (updated in 2006):** defines the role and responsibilities of Joint Service councils. According to the (JSCs) official Statute, it is in charge of the followings:

- Planning for and supervising the sound implementation of solid waste collection and disposal;
- Founding and operating a sanitary landfill with provision of the necessary facilitations to ensure smooth daily operations;
- Provision of waste containers in the served governorates and maintaining regular maintenance;
- Organizing and implementing public awareness activities to raise the environmental sense of the public community;
- Organizing cleaning campaigns regularly;

<sup>4</sup> <https://investmentpolicyhub.unctad.org/InvestmentLaws/laws/201>

<sup>5</sup> Solid waste management was mentioned in the Law of 1998, requiring the approval of the Council of Ministers (art.4). In the amended Law of 2014, the sector is not explicitly mentioned.

- Guidance of the member local government units in whatever related to solid waste management in the fields of technical, legal, public health, environmental or social issues;
- Representation the member local government units in any events related to solid wastes;
- Planning for and implementing the methodologies of solid waste pollution reduction, proactive prevention, and waste recovery and recycling (GIZ, 2014).

In 2016, a new **JSC Bylaw** was adopted, which describes the conditions for forming/ending a JSC, the roles of the different members and representatives of the JSC, as well as the tasks and activities of the JSC (PNA 2016c; JSC Today, March 2018). A national Guideline on SW Tariffs was also produced the same year.

The **Solid Waste Management Bylaw** was drafted in 2018 and adopted in March 2019. This regulation describes the rights and obligations of the following actors:

- The “competent authorities” are responsible for developing a comprehensive plan for SWM, standards, procedures and strategies (art. 3), for supervising SWM (art.25), for control/inspection (art. 31);
- Waste producers’ obligations (art.6) and polluter pays principle (art.36);
- Service providers take safety and health measures (art.7), collection and transportation processes (art. 8,9), build/operate transfer stations (art.10), treat and dispose the waste (art.11), 30), and keep records (art.30);
- The landfill owner (art.13,14);
- The MoH, in monitoring the separation, collection and transportation of medical waste (art. 25)
- The EQA, in terms of hazardous waste treatment approval (art.26);
- The MoLG, regarding the establishment of a national waste registry compiling all information about waste management (art.29).
- Special conditions are required for landfills regarding operation, closing and rehabilitation (art. 12, 15, 16, 17) and for automated burning (articles 19, 20, 21), whereas random burning is forbidden (art.18). Reuse and recycling shall be encouraged (art.27). Waste management fees shall be proposed by service providers and approved by the MoLG (art.35).
- Hazardous waste should not be mixed (art.33) and its import submitted to the approval of competent authorities (art. 34);
- Municipalities and Joint Service Councils submit waste management fees to the Minister for approval (art.35);
- The Ministry of Local Government is entitled to give fines (art.36) (PNA, 2018).

In the matter of **Construction and Demolition waste**, the MoLG, with the support of JICA, finalized the draft of a new Bylaw in 2018, which was adopted in spring 2019, as well as a Guideline Manual on Construction and Demolition Waste (C&D) in the West Bank. The purpose is to ensure the proper regulation and reduction of any new C&D waste. The Bylaw and the Manual describe the

conditions for a C&D permit, the requirements for a waste disposal and recycling services plan, a hazardous material report about monitoring, collection, transportation and disposal, as well as the obligation to keep record and to report during and after any construction and demolition activities (MoLG-JICA, 2017b).

Lately, the Palestinian Environment Quality Authority has prepared a **list about hazardous waste** and drafted a **hazardous bylaw**, which shall be adopted in 2019 also. The EQA is also in the process to update the status of random dumpsites, landfills as well as transfer stations (PNA, 2017).

In reference to data about solid waste management, MoLG with JICA will publish a new SWM Databook, with updated figures from both JSCs and local municipalities in the summer 2019.

## 3.2 The Actors (National and local Levels)

SWM in the Gaza Strip is characterized by its diversity of actors and the complexity of different roles assigned to the different groups. In addition to public institutions like ministries, local municipalities, private sector or civil society.

### 3.1.3. At The National Level

- **The Ministry of Local Government (MoLG)** sets general policies about solid waste management and coordinates the activities of the Local Government Units (LGUs) and Joint Service Councils (JSCs). It provides them with the financial and technical support and is involved in several awareness projects with other ministries. It also monitors the execution of infrastructure projects including solid waste projects (GIZ, 2014). It is currently chairing the National Team responsible for the implementation of the adopted NSSWM<sup>6</sup>.
- **The Environment Quality Authority (EQA)** elaborates SWM at the strategic level; it develops the standards, procedures and guidelines for sustainable SWM (including hazardous waste management), determines the SW sites specificities, and promotes the reduction, recycling and reuse of solid waste. It has also a monitoring and inspection role in the application of adopted laws and standards. It is responsible for the approval of Environmental Assessment Impacts and for promoting environmental awareness among the Palestinian public. It furthermore provides expertise and ensures the implementation of the environmental protection (ARIJ, 2015; GIZ, 2014). Finally, the EQA has also an international role, as the institution responsible for the application of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal in the OPT (Palestine is a member since 2015).
- **The Ministry of Health (MoH)** is responsible for licensing and monitoring health institutions in general, and facilities responsible for medical waste management (article 2; Public Health Law-PHL, 2004). In addition, its Environmental Health department carries out research and data collection on water, air, hazardous waste and pollution. As mentioned above, the MoH has the role

<sup>6</sup> Following the Cabinet Resolution, no 05/49/13 of May 2010, the National Team replaces the Steering Committee in charge of the implementation of the Solid waste national strategies.

of issuing the conditions related to “transport, store, treatment, and dispose of the hazardous waste” (article 42, PHL, 2004), a role which is in conflict with the EQA’s responsibility (GIZ, 2014). The Medical Waste Bylaw adopted in 2012 attempts to clarify the responsibilities of each stakeholder.

- **The Palestinian Standards Institute (PSI):** establishes and adopts the national standards, as well as implements adopted international standards, among which the ones related to SWM. It chairs also a national committee which is responsible for developing the directives or the technical regulations (GIZ, 2014).
- **The Palestinian Central Bureau of Statistics (PCBS)** collects and disseminates the national data about SWM, through its website and regular surveys like the household, environmental, economic and medical environmental surveys.
- **The Municipal Development and Lending Fund (MDLF)** ensures the provision of funds for different projects (among which SW activities) to the local authorities and occasionally to the joint service councils (GIZ, 2014). MDLF is managing the Southern component of the Gaza Solid Waste Management project (GSWMP) since 2012 covering 3 of 5 governorates in Gaza Strip, namely the Middle Area, Khan Younis, and Rafah Governorates comprising approximately 64% of Gaza Strip’s total geographic area inhabited by 46% of the total Gaza Strip’s population, or approximately 800,000 people according the 2014 Palestinian Central Bureau of Statistics (PCBS) projections<sup>7</sup>. As well, MDLF is managing a grant for enhancing the primary solid waste collection and transport (secondary collection) through Municipal Development Program (MDP) since 2008.

#### 3.1.4. At the operational level

- **The Local Government Units (LGU):** they include the municipalities, village councils and project committees. LGUs are the main responsible local authorities for the collection, transportation and disposal of municipal waste. In 2018 there were 412 LGUs in the WB and 25 in GS<sup>8</sup>.
- **Joint Service Councils (JSC):** an association of several LGUs to provide one or more services to all member municipalities with the aim to reduce costs and to efficiently coordinate services. Two JSCs established in the Gaza Strip, one of them (north) is non-operational.
- **The United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA)** supervises the waste management of the 8 camps in Gaza, in coordination with municipalities and JSCs. Under its area of jurisdiction, the UNRWA support’s role is to provide services and manage the camps. The organization is responsible for collecting waste from the refugee camps, which will be disposed of at sites run by municipalities against monthly payment to the dumpsite operating organization. UNRWA has also given assistance to municipalities in the

<sup>7</sup> MDLF Website: [www.mdlf.org.ps](http://www.mdlf.org.ps)

<sup>8</sup> Figure adapted from MoLG-JICA 2017a data. JSC Ramallah informed that 2 of their LGUs split in two, thus there are now 70 LGUS and not 68 (interview on 6.2.2019).

Gaza Strip by being the channel through which equipment, provided by bilateral donors, has been provided to the municipalities.

- **The private sector:** some companies can be contracted by municipalities/JSCs for the collection, transportation or/and disposal of waste or the management of certain facilities (like transfer stations) and private companies own and directly manage recycling/recovering activities.

**Waste pickers:** Waste pickers are people who illegally collect some types of wastes such as plastics and sell it to sub-contractors/waste recovery factories. They don't have any right, are not vaccinated against disease, nor use any Personal Protective Equipment (PPE). They are usually very organized, but persons are always changing, so that no studies defined their numbers and conditions. They can be noticed in dumpsites and near street waste containers.

There are two types of waste pickers:

- **Waste pickers in landfills/random dump sites:** Mostly they are prevented to access to the landfill sites as ordered in Deir Al-Balah, and Al-Fukhary landfills, but it is difficult to prevent them to access to random dumpsites as they are open areas. Their presence in landfill sites is considered not safe, not only due to collecting waste without protective tools, but also due to the heavy machinery activities in landfill sites.
- **Waste pickers in streets:** they are found in Gaza Governorates, they are noticed collecting some materials such as plastics, and sometimes food waste. Mostly they are found in rich neighborhoods. Some of them are children and women.

### 3.3 International Environmental Assessment Guidelines

The following international assessment guidelines were considered in carrying out the present ESIA:

- EC directive 85/337
- EC directive 97/11/EC
- World Bank Operational Policy/Bank Procedures/Good practices (OP/BP/GP 4.01) and associated documents.

According to the WB Operational Policy on Environmental assessment (OP 4.01). Projects are assigned a category of A, B, or C, in descending order of environmental and social sensitivity. The GS SWMP falls under the environmental Category A which includes landfill subprojects (according to the classification – Potentially HIGH impacts, irreversible impacts even with mitigation that may occur and severe polluting impacts). These types of projects require a detailed ESIA to be conducted.

According to the OP 4.01, project-specific ESIA should include the following:

- Environmental and social baseline describing the existing environmental and social conditions prior to the project being constructed and operating.
- Identification of potential environmental and social impacts resulting from the project of concern.
- Comparison of alternatives sites, scenarios, technologies and designs.
- Mitigation Plan for potential impacts including monitoring.

## **World Bank Safeguard Policies and Guidelines**

The WB has ten environmental and social policies referred to as the Bank's "Safeguard Policies" that should be considered in its financed projects.

Based on the information to be collected of each project, the environmental initial assessment for each project is addressed through:

- Reviewing the safeguard policies and ensuring that the proposed project does not trigger a safeguard policy that makes it ineligible.
- Describing any safeguard issues and impacts associated with the construction of the project. Identifying and describe any potential large scale, significant and/or irreversible impacts.
- Describing any potential indirect and/or long term impacts due to anticipated future activities in the project area.
- Describing measures taken to address safeguard policy issues. Provide an assessment of project proponent capacity to plan and implement the measures described.
- Identifying the key stakeholders and describing the mechanisms for consultation and disclosure of safeguard policies, with an emphasis on potentially affected people.

Among the ten safeguard policies of the WB, five are considered by the Consultant to be relevant to the GSWMP and have been considered during this ESIA study, these are listed and discussed below:

- Environmental Assessment (OP 4.01);
- Involuntary Resettlement (OP 4.12);
- Pest Management (OP 4.09);

## **3.4 Capacity to Manage Municipal Solid Waste**

In this section we concisely discuss the overall capacity of the south joint service council JSC-KRM and municipalities under JSC umbrella in managing municipal solid waste, in particular secondary collection. Later in the report, information reflecting the capacity of the joint service council in each municipality is presented. The capacities of the municipalities are briefly presented. Finally, the role of the private sector in providing the secondary collection is also presented in this section.

### **3.4.1 Institutional Capacity**

#### **3.4.1.1 Joint Service Council for Solid Waste Management in Khan Younis, Rafah and Middle Area (JSC-KRM)**

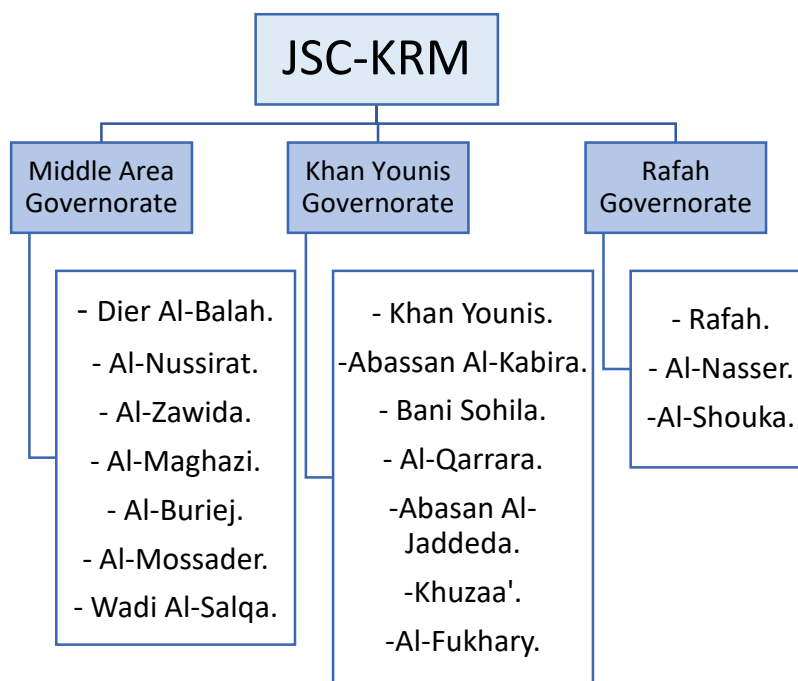
The mandates of JSC-KRM towards its member municipalities, are defined by its statutes of establishment as presented earlier.

JSC-KRM was established in 1995 and it is fully operational. It provides effective services for 17 municipalities that geographically cover around 64 % of Gaza Strip and host around 46 % of its population. JSC-KRM is responsible to collect and transfer the municipal waste for some of its member municipalities, through its own vehicles, since it owns, operates and control a fleet of vehicles.



In addition, JSC-KRM provides the disposal services for all the 17 municipalities and the UNRWA (which collects the municipal waste from the refugee camps in the three governorates) in Al-Fukhary sanitary landfill. Al-Fukhary landfill is owned, operated and controlled by JSC-KRM. The new sanitary landfill is equipped with heavy machineries, which is used in dumping the received waste. JSC-KRM also owns and maintains around 2000 containers which are spread in different neighborhoods in Khan Younis and Middle Area governorates. Figure 3.1 shows the member municipalities in the JSC-KRM. The council maintains comprehensive waste management records and produces informative periodic reports describing its operations in its provided services, which are:

- 1- Secondary collection service.
- 2- Disposal services.
- 3- Medical Waste Management service.
- 4- Transfer station service.
- 5- Community outreach and public awareness service.



**Figure 1: The Member Municipalities In JSC-KRM**

According to its Annual Report of 2018, the Joint Service Council for the Governorates of Khan Younes, Rafah and Middle Area, had a total staff of around 72 employees, including: 22 drivers, 20 workers, 2 mechanics, 2 technicians, 3 operators, 3 guards, 2 scale house operator, all organized under 3 technical departments led by 3 engineers in addition to the administration department consisting of an accountant and financial managers in addition public awareness unit of 7 personnel and unit manager (social specialist), 1 public relation, 1 Procurement clerk, 1 IT specialist, 1 Office boy, in addition to 1 part time legal adviser all under the direct supervision of the JSC's Executive Director



who reports to the JSC board. It is planned in the new OBS for the JSC-KRM which is under discussion in MoLG to include an environmental specialist in the council.

During the last 4 years, JSC-KRM got assistance through GSWMP to hire an environmental specialist from the period 2015 to 2017, besides a social specialist (with official title Communication and Outreach Officer) from the period 2015 to 2020. Both positions were working in JSC- KRM TOU under the supervision of JSC-KRM executive Director. After 2017, the environmental specialist in MDLF-PSDU was the only employee who implemented and monitored the environmental safeguards in GSWMP, and he was working under the supervision of the PSDU director.

**Table 4: Job Description of the Safeguards staff at GSWMP**

Environmental Specialist	Social Specialist (Communication and outreach officer)
<b>Job Description:</b> <ul style="list-style-type: none"> <li>- To oversee the compliance with the environmental safeguards that may be triggered by the Project;</li> <li>- Provide Environmental Assessment Reports for the project activities in line with WB and EQA requirements;</li> <li>- To have input into the design of the waste resources recovery pilot projects;</li> <li>- To keep abreast of the progress and results made by the work contracts, and Prepare progress reports on the different infrastructure activities of the project;</li> <li>- Assist the Financial Management Officer in planning their budget for meeting the operational costs of the contracts; and</li> <li>- Assist the Social Specialist in Planning the social awareness programs.</li> </ul>	<b>Job Description:</b> <ul style="list-style-type: none"> <li>- Communicate and coordinate with the local communities and the Project Affected People (PAPs);</li> <li>- Ensure the implementation of ESMPs, including carry out/coordinating monitoring of social certain parameters;</li> <li>- Identify and analyze key social challenges and opportunities in the targeted areas, and support the development of strategies, policies, key messages and advocacy opportunities to enhance the solid waste services in the region;</li> <li>- Implement and supervise data collection in relation to public perception, complaints, and request in relation to solid waste management services quality;</li> <li>- Ensure that social safeguards grievance mechanism is adhered to and successfully implemented;</li> <li>- Produce and coordinate of all reporting, media outreach and public information activities in GSWMP.</li> </ul>
<b>Report To:</b> PSDU Director	<b>Report To:</b> JSC-KRM executive director & PSDU Director

From reviewing the previous GSWMP semi annual reports, it was noticeable that the E&S team carried out different activities in the last 4 years, and they were qualified enough to deal with the different milestones in the project life, including the land acquisition issue and the waste pickers livelihood issue, in addition to implementing and controlling the mitigation measures in the ESMPs for all

the GSWMP sub-projects. And to maintain the same path at work, it is high recommended to keep the same E&S team working in the AF project, until this team either include legally in JSC-KRM crew, or train other sustain team to handle the future work in JSC-KRM.

#### **3.4.1.2 The Municipalities**

Overall, the capacity of the Municipalities for managing secondary collection of municipal waste is relatively developed. This is particularly true for the larger municipalities. Even though the capacity varies considerably from one municipality to the other, yet the minimum requirements are to a reasonable extent met. The overall capacity of municipalities for managing secondary collection services can be characterized as follows:

- The responsibility of secondary collection is clearly and consistently assigned, across all the municipalities, to the Health and Environment Departments. In a limited number of municipalities, the Health and Environment Department have regional cleanliness offices or officers.
- Most of the Health and Environment Departments have clearly documented job descriptions and differentiated responsibilities assigned to their staff.
- The senior staff of the Health and Environment Departments is generally competent and are quite knowledgeable of the areas of strength and weakness of the waste management systems in their municipalities. They are well informed about the main characteristics and composition of the waste, the human and physical resources available in the municipalities, requirements for planning of the service, the potential for recyclables ...etc.
- The Health and Environment Departments of the larger municipalities have the necessary management tools for running the secondary collection service. These include, but are not limited to, tools such as: waste quantities collection forms, operation schedules for vehicles and heavy equipment, maintenance and repair checklists, accidents reporting forms, field inspection forms ...etc.
- Documented operational plans for a large percentage of the municipalities exist. These operational plans are not necessarily comprehensive or detailed, but are in general relatively adequate. The planning exercise should however be further developed and improved.
- There are limited monitoring, evaluation and reporting activities. There are a few exceptions. In general, there is a deficiency in systematic solid waste data gathering activities, waste information system(s) and performance indicators for secondary collection activities.
- There is an obvious substantial deficiency in waste service fee collection. This could be partially attributed to inadequate institutional capacity for enforcement and fee collection. It is however not clear to the consultant if this is compounded by insufficient political will for enforcement. In this respect, there is consensus among the waste management officials that:
  - Enforcement of legislation is inadequate.
  - A significant percentage of the population is unemployed and/or cannot afford to pay the fees as they have more pressing priorities. Enforcement is not applied in this case.

It is agreed as well that there is a need to identify and activate tools/instruments for mobilizing local resources in order to recover the cost of solid waste management.

- The use of personal protective equipment (PPEs) by the workers is less than satisfactory. This has been clearly noticed across Gaza Strip.

## 4. PROJECT REVIEW AND DESCRIPTION

This chapter presents an overview of the SWM in the southern part of Gaza Strip including the history of the GSWMP, design of each waste facility and the different technologies proposed for operation. It also explains the operational performance of the GSWMP in terms of environmental and social risk management and monitoring as well as the implementation of the safeguard's instruments.

### 4.1 Solid Waste Management Overview

#### 4.1.1. Overview of the Gaza Strip

The occupied Palestinian Territory, as per the Oslo Agreements<sup>9</sup>, include the West Bank (East-Jerusalem) and Gaza Strip, which is about 6,220 km<sup>2</sup> (5,860 km<sup>2</sup> for the West Bank and 360 km<sup>2</sup> for Gaza Strip) with a total population of about 4.68 million people in 2017 (2.9 and 1.8 million in the West Bank and the Gaza Strip respectively).

The GS consists of five governorates, including a total of 25 villages and municipalities. It has a total surface area of 365 km<sup>2</sup>, a total length of 40 km and a variable width of 7-10 km. The main source of water in GS is the shallow aquifer that underlies the whole Strip. The population of GS is estimated at 1,900,000 including refugee camps in 2018. These are distributed between the five governorates. Population is expected to reach 3,196,098 in 2040 (UNDP, 2012). This has been calculated based on a regressive growth rate starting at 3.5% in 2011 and reaching 1.11% in 2040. This regressive growth has been assumed to be constant for all governorates.

**An increased population density, limited land area and limited water resources make a challenging situation for designing a solid waste management plan with respect to environmental and economic sustainability.**

#### 4.1.2. Solid Waste Generation Amounts

In 2020, the estimation of the total solid waste generated in Gaza Strip is still difficult, due to the lack of consistent data. German Development Agency (GIZ) estimated that 1.387 million tons of municipal solid waste were generated in 2014 by the Palestinians people (population of 4.29 Million in 2012<sup>10</sup>), with a generation rate of 0.94 kg/day per capita and a municipal solid waste growth of 4 % per year and 1% per capita<sup>11</sup>. Based on this calculation, SW daily amount in 2017 and 2018, respectively is estimated to be 1,709 and 1,726 tons. The following table shows the total population of Gaza Strip, the estimation of solid waste generation as well as the average generation per capita per day.

<sup>9</sup>The Oslo Accords consist in several agreements, signed between the Israeli Government and the Palestine Liberation Organization (PLO) during (1993 and 1995). The most important are the Declaration of Principles on Interim Self-Government Arrangements (Oslo I) and the Interim Agreement on the West Bank and the Gaza Strip (Oslo II). The aim of these agreements was to start a peace process and to reach, through several rounds of negotiations during the following 5 years, a peace treaty, based on the UN Resolutions 242 and 338. Both parties agreed on mutual recognition and the Palestinian Authority was created as an interim government in the Palestinian territories. In Oslo II, Areas A, B and C in the West Bank were defined. Key issues on borders, refugees and Jerusalem were to be negotiated until 1999. [https://en.wikipedia.org/wiki/Oslo\\_Accords](https://en.wikipedia.org/wiki/Oslo_Accords), accessed 19.02.2019.

<sup>10</sup> [https://www.pcbs.gov.ps/Portals/Rainbow/Documents/gover\\_e.htm](https://www.pcbs.gov.ps/Portals/Rainbow/Documents/gover_e.htm) accessed 11.10.2018.

<sup>11</sup> GIZ, 2014, page 15-16.

**Table 5: The estimated amount of municipal solid waste generated in the Gaza Strip (2017-2018)**

Item	2017	2018
<b>Total Population of Gaza Strip</b>	1,899,291 <sup>12</sup>	1,961,406
<b>Solid Waste Generation (Ton/Day)</b>	1,709	1,726 <sup>13</sup>
<b>Avg. Generation (Kg/ca/day)</b>	0.9	0.88

In 2019, estimations are close to 0.9 kg/day/capita average in the whole Occupied Palestinian Territory (OPT) as, in principle, the total waste generated constantly increases, each year, following the increase of the population and the evolution of life style and livelihood conditions. However, although the increase of population, the waste generation rate in Gaza Strip was decreased in the last two years. The following table shows the decline rate of waste generation in Khan Younis city (2017-2019). The decrease of the waste generation could be associated to the unstable economic conditions in Gaza Strip in this period.

**Table 6: Waste Generation in Khan Younis City (2017 - 2019)**

Item	Jan-17	Jan-18	Jan-19	Mar-17	Mar-18	Mar-19	Jun-17	Jun-18
<b>Generation (Ton/Month)</b>	4,255	3,955	3,951	3,948	3,722	3,392	4,558	3,825
<b>Decline rate</b>	-	7%	16%	-	6%	14%	-	16%

#### 4.1.3. Solid Waste Composition

The following table shows the results of three studies on the waste composition for the GS (UNDP, 2012). The results show a high organic content of around 65% for the solid waste. This percentage is key when calculating the density of the waste and the amount of gas which will result from aerobic and anaerobic chemical decomposition.

**Table 7: Solid Waste Composition in Gaza Strip**

Component	MoP, 2010	EQA, 2007	UNDP/DHV, 2011
<b>Paper</b>	10.0	8.0	8.4
<b>Plastic</b>	12.0	8.0	16.1
<b>Organic waste</b>	65.0	70.0	65.4
<b>Metals</b>	5.0	3.0	2.8
<b>Glass</b>	3.0	6.0	2.3
<b>Other inorganic</b>	5.0	5.0	5.0
<b>Total</b>	100	100	100

<sup>12</sup> PCBS Census 2017 and 2018 final summary. <http://pcbs.gov.ps/Downloads/book2383.pdf>

<sup>13</sup> Estimations based on landfills records and the estimation of waste quantities dumped illegally.

#### 4.1.4. Solid Waste Collection and Transfer Stations

In the OPT, waste collection and transportation are organized mainly by municipalities, JSCs and the UNRWA (for refugee camps). Depending on the area, either the member municipalities or the UNRWA ensure primary collection (from houses to containers) or people throw the waste into fixed placed containers; then Local Government Unit (LGU)/JSC/UNRWA's vehicles collect the containers' wastes and transfer them to the landfill in which disposal occurs (from containers to landfill).

In the Gaza Strip, this process is clearly applied in the Southern governorates (i.e. Deir al-Balah, Khan Yunis and Rafah governorates), whereas some complications were found in the Northern governorates (i.e. Gaza and North Gaza governorates). The JSCs keep continuous contact with the health and environment departments in member municipalities to ensure harmony between the secondary and primary collection. It is worth to mention that the council's vehicles serve the governorates on a daily basis under specific and organized working shifts and pay special attention to the peak periods. The following figure shows the cycle of solid waste management cycle.

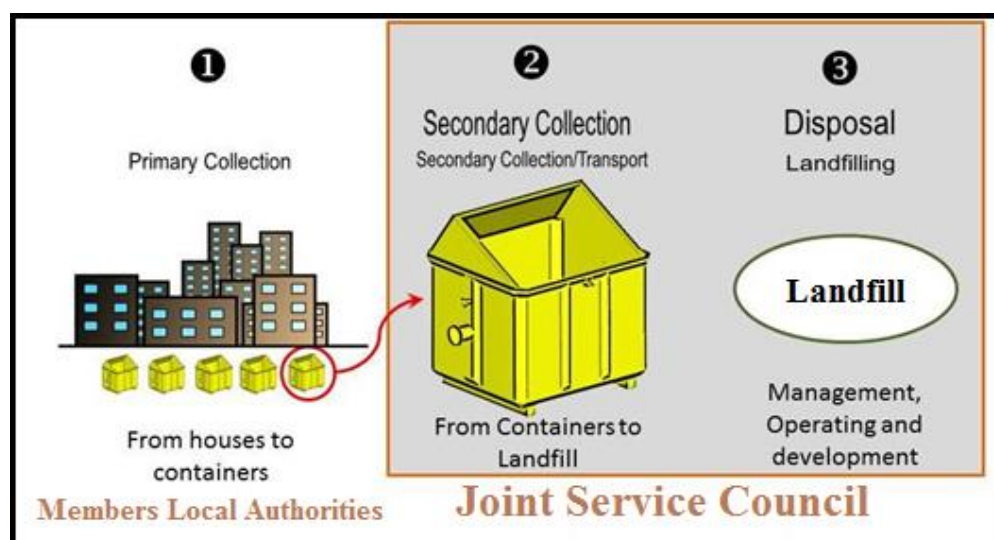


Figure 2: Solid Waste Management Cycle (JSC-KRM Annual Report, 2015).

In general, there are no estimates on percentage of the *un-collected* waste in urban, rural, and camps areas. In 2015 in the West Bank and Gaza strip, **about 94.5% average of households** had access to solid waste collection services: either from a local authority (78.8%), UNRWA (9.4%), private contractor (0.3%) or by other means (4.6%) (PCBS, 2015). A survey conducted within the ESIA Study for GSWMP in 2012, showed that 80% of the surveyed areas receive their services from the municipalities, whereas about 17% of people receive UNRWA services. The rest of the respondents receive the services from other institutions. The informal sector is not active in solid waste collection in the Gaza Strip. In the main urban centers (main cities of Gaza Strip), collection coverage is close to 100%, while the middle size towns classified as urban areas, have lower rates of solid waste collection than those in the urban centers.

Currently, there are three solid waste management service providers in the **Gaza Strip**: Joint Service Councils for Solid Waste Management; and 25 municipalities. In addition to the above, UNRWA provides solid waste management services free of charge in the 8 refugee camps located throughout the Gaza Strip.

Primary collection is applied with street sweepers with wheelbarrows or donkey carts in Gaza; and rear-loading compactors and tipper crane trucks which empty wheeled waste containers with a capacity of about 1 m<sup>3</sup>, are most commonly used. Hook-lift (also called Roll-on Roll-off – RoRo) containers are also found in most cities. Crane-tippers/skip loaders were mostly designed as part of the German Technical Cooperation/SWM council (GTZ/SWMC project); each truck has a hydraulically-operated truck-mounted crane which lifts and empties containers into a large body which can be closed at the top by pivoted flaps, and is emptied by tipping. The bodies of these trucks, like the containers they use, were fabricated in Gaza. A crew of two - one driver and one assistant operate the trucks. A new system, which is used in conjunction with crane tipper trucks, is house-to-house collection using a small agricultural tractor, which has a trailer at the rear to enable it to carry 1 m<sup>3</sup> container. When full, the container can be left at the roadside for a crane tipper to pick up and empty. Another basic tool in primary collection is donkey carts which started since the fuel crisis in 2008, and it continued and grew up for more than 10 years. This tool collects waste from households to large street bins (Roll on/off containers). Donkey carts collect more than third of the primary collection in Gaza Strip, and about half of Gaza City waste<sup>14</sup>.

The following table shows the assessment of donkey carts in Gaza.

**Table 8: Assessment of Donkey Carts In Gaza (MDLF, 2017b).**

Municipality	Gaza	Khan Younis	Rafah	Jabalya	Biet Lahya	Beit Hanon	Dier Al-Balah	Total
No. of Donkey carts	215	62	59	45	6	5	7	506
Capacity ton/day	322	93	86	65	10	7	11	594
Capacity %	48%	62%	57%	46%	10%	14%	14%	

<sup>14</sup> Ecoconserv & Universal Group. (2017). Studies for optimizing waste collection (Consultancy service to MDLF).





Image 1: Donkey Cart Removing Waste to Roll On/Off Container, Gaza Strip

**For inner areas of the municipalities with relatively narrow streets:** Residents place their wastes in reused plastic bags in front of the buildings, donkey carts (Municipality) transfer the waste to transfer stations, if relatively close, or else to sub-transfer stations (large container bins of 6, 8, 20, 24, 28, 30 m<sup>3</sup> capacity) or to the more commonly available 1 m<sup>3</sup> bins.

**For areas with relatively wide streets:** Residents place their wastes in plastic bags or small bins in front of the buildings, Workers accompanying compactors collect the piled plastic bags (containing waste) from building to building, compactors transport the collected waste to the landfill directly.

**For areas with relatively wide streets and in main roads:** In districts where roads are wide enough, bins, usually of 1 m<sup>3</sup> capacity, are placed every 100 – 200 meters and within short distances from residential units. Tipper cranes and/or compactors collect waste from the bins and transfer it to landfill.

**For semi-urban areas and areas with unpaved roads:** In this case, tractors-trailers are more commonly used to collect the waste. The tractors collect waste in reused plastic bags from building to building and transport it to transfer station or directly to landfill<sup>15</sup>.

The Secondary Collection is managed by either the JSC or Municipality itself or UNRWA based on the region. JSC-KRM collected more than third of waste secondarily (from the container to the disposal site) in 2019. JSC-KRM was provided through the GSWMP by waste dumping trucks to be used for secondary collection; 7 compacts and 3 roll on/off vehicles were provided in addition to hundreds of containers, knowing that JSC-KRM owned 16 of tipper crane vehicles (11 of them in service until now and used for secondary collection). The following table provides a detailed assessment for the JSC vehicles and containers.

<sup>15</sup> Ecoconserv & UG, Assessment report of Studies for optimizing waste collection, 2017.

Table 9: Detailed assessment for the JSC vehicles and containers

Service provided by JSC-KRM								
Municipality	Vehicles Type	Average Weight (ton)/Trip	Trips/day	Status	No. of collection points	No. of Containers		
						1m <sup>3</sup>	4m <sup>3</sup>	Other (m <sup>3</sup> )
<b>Deir Al-Balah</b>	Tipper crane	7.5	2	Good	101	142	-	-
	Tipper crane	6.5		Weak	52	68	-	-
	Tipper crane	4	2	Weak	65	81	-	-
	Tipper crane	4	2	Weak	85	114	-	-
	Compactor	12	1	New Truck	18	-	20	-
<b>Al Musadar</b>	Compactor	10.1	1 trip/week		70	77	-	-
<b>Al Zawaidah</b>	Roll on/off	16	3 trips/week		1	-	-	1
<b>Al Nusirat</b>	Roll on/off	18.8	2 trips/day		1	-	-	2
<b>Wadi El Salqa</b>	Tipper crane	6.5	1	Weak	44	70	-	-
<b>Khan Younes</b>	Tipper crane	7	2	Good	118	178	-	-
	Tipper crane	7	2	Good	99	182	-	-
	Tipper crane	6	2	Weak	117	202	-	-
	Tipper crane	6	2	Weak	102	174	-	-
	Compactor	12	1	New Truck	88	63	31	-
	Compactor	12	1	New Truck	55	45	29	-
<b>Al Qararah</b>	Tipper crane	7.5	2	Good	179	295	-	-
<b>Bani Suhaila</b>	Tipper crane	6	1	Weak	29	74	-	-
	Compactor	12	1	New Truck	35	45	12	-
<b>Abasan Aljadeedah</b>	Roll on/off	20	4	New Truck	1	-	-	1 (36m <sup>3</sup> )
<b>Khoza'a</b>	Roll on/off	20	4	New Truck	2	-	-	2 (36m <sup>3</sup> )
<b>Rafah</b>	Compactor	12	1	New Truck	10	-	11	-

It is noticed in most cases that the number of the collection points is lower than the number of containers. The reason is the following: In some cases, the same collection point contains more than one container.

7 out of the currently operated tipper cranes are in a weak condition, while the other vehicles (5 Compactors, 2 Roll on/off) are in a good condition.

#### 4.1.5. Waste Disposal

Waste is collected and transferred to one of the two main landfills (Al-Fukhary & Johr Al-Deek Landfill) currently operating in the Gaza Strip, knowing that the third landfill in Dier Al-Balah was closed in 2019, and no longer used for waste disposal.

##### 4.1.5.1 Al-Fukhary (Sofa) disposal site

It is located within the administrative jurisdictions of Khan Younis Governorate which is located in the southern part of Gaza Strip. The site is situated approximately 5 km northeast of the former Gaza Airport, 6 km north-east of Rafah City, and 800 m from the Israeli border (the 1950 armistice line); it is bounded by Khan Yunis Waste Water Treatment Plant (WWTP) from the East, access road from the South, and agriculture lands from other sides. The closest residential areas to the site are Al-Fukhary and Al Buyuk areas which are at a distance of around 1,600 m and 1,700 m respectively.



Image 2: Al-Fukhary Sanitary Landfill and Existing Dumpsite (June, 2019)

Al-Fukhary (Sofa) disposal site is divided into two parts as follows:

- The existing dumpsite:** It was operated since 1996 by Municipality of Rafah, and it received the municipal solid waste from Rafah governorate only. The dump site was created over an area 26,000 m<sup>2</sup>, given that the height of waste reached up to 30 m in 2017 with a very steep side slope (1V:1H). The dumpsite does not utilize a liner system but only leachate collection pipe dissecting the 6-8m deep bottom over a silty clay layer; the leachate collection system was out of action few years after the operation of the dumpsite. The existing dumpsite was extended over adjacent 11,000 m<sup>2</sup> land in 2018 as a short-term solution to gentle the side slopes to be more stable and safer. Leachate collection system was created in the extension part in order to be connected with the leachate lagoon in the near future. The existing dumpsite continued receiving the daily coming waste (about 170 ton/day) until July 2019.

- **Al-Fukhary (Sofa) Sanitary Landfill:** this new landfill has a surface area of over 140,000 m<sup>2</sup>. It was financed mainly by the France Development Agency (AFD), the European Union (EU), and the World Bank (WB), and it is implemented by Municipal Development and Lending Fund (MDLF), through the Gaza Solid Waste Management Project (GSWMP). The new sanitary landfill is located adjacent to the existing dumpsite; the new landfill is lined and has a leachate collection system. Furthermore, it includes administration building, maintenance warehouse, storm water lagoon, and surrounding ring roads. It is operated by JSC-KRM since July 2019 by receiving waste from Middle Area, Khan Younis, and Rafah Governorates (17 municipalities which constitute JSC-KRM).

#### 4.1.5.2 Johr Al-Diek Landfill (JAD)

It was built in 1986 and extended in 1990, 2000, and 2013. The landfill is located in the south-eastern part of Gaza Governorate near the border line (the 1950 armistice line) with Israel. The total dumping area of the landfill in the first phase was 30,000 m<sup>2</sup>, the landfill was expanded with new liner, leachate collection system, and leachate lagoon bringing the total dumping area (footprint of the landfill) to 140,000 m<sup>2</sup>. Additional adjacent 120,000 m<sup>2</sup> has been acquired in 2018 to be used in the near future, knowing that the existing landfill is almost full. In this landfill, there was also a hazardous waste disposal cell, with encapsulation in concrete boxes. It is the only hazardous waste disposal site in Palestine.



Image 3: Johr Al-Diek Landfill Just After Short Time Of Rehabilitation

The landfill is operated by Gaza Municipality and receives an average of 700 ton/day from Gaza city and North Gaza governorates, knowing that the generated waste quantities are estimated at 1,100 ton /day; but the generated waste in North Gaza Governorate (Jabalia, Bet Lahya, Bet Hanoun, and Um Al-Nasr), which is about 400 tons/day, is transferred instead to one of the three random dumpsites

in Jabalia, Bet Lahya, and Bet Hanon. The accumulated quantity of waste in dumpsites in North Gaza estimated at 250,000 tons. Municipalities in North Gaza use part of external financial supports for transferring these quantities to Johr Al-Diek landfill.

#### **4.1.6. Waste Recovery**

In the Gaza Strip, two attempts of half automatic central separation units were conducted. One of them was in Rafah conducted by NGO – Palestinian Environmental Friends (PEF association) in cooperation with Rafah municipality, but it is stopped since 2013. The second one was conducted and operated by Gaza municipality; it was implemented in Johr Al-Deek Landfill site, and it is still under experimental procedures.

##### **4.1.6.1 Organic Waste Recycling (Composting)**

In the Gaza Strip, several attempts for composting have been performed in the last few years. Two of them were conducted by Gaza and Beit Lahia Municipality in the north of the Gaza Strip and another two by NGOs in Rafah city, one was in cooperation with Rafah Municipality. Further, there was some NGOs tried to produce compost but their attempts were terminated at early stages. Ministry of agriculture conducted composting plant which worked for a short period of time.

It is estimated that less than 1 – 2 % of the total solid waste flow is actually being composted in Gaza. The major amount of compost is imported from Israel. In Gaza, they use windrows active pile systems for composting. Size, shape and spacing of piles are determined based on waste composition, aeration equipment and size of the site. For turning the windrows, they use shovels, rakes, or with equipment such as a bulldozer and tractor.

The quantities of organic waste from both municipal and agriculture waste in Gaza Strip was around 800,000 tons in 2015 and expected to increase to 1,055,000 tons by 2040. Composting all quantities would produce around 480,000 tons and will reach up to 744,000 tons by 2040.

Gaza attempts and experiences of composting are not successfully due to low quality of the product and the high competition of imported compost. The quality of compost is influenced by the quality of raw organic waste and animal manure.

##### **4.1.6.2 Plastic Wastes Recycling**

Gaza strip produces about 300 tons per day of plastic wastes with percentage of 16.1% from the total waste generation in Gaza strip. There are around 15 grinding plastic workshops and around 74 factories in Gaza Strip. It is estimated that 10 tons are being recycled daily (250 tons monthly). This means that, currently, not exceed of 3% of the daily generated plastic wastes are being recycled in Gaza Strip. The main problems face the plastic recycling industry in Gaza strip are the shortage of energy and flocculating prices due to closure. Further, the prevention of having the required machines and equipment or spare parts due to current political situation. The capacity of Gaza market for plastic recycling is limited and small fraction of waste plastic can be recycled.



#### 4.1.6.3 Paper Wastes Recycling

Gaza strip produces around 145 tons per day of paper wastes with percent of 8.4% from the total waste generation in Gaza. There are only 3 paper recycling factories in Gaza Strip. It is estimated that 4 tons of paper wastes are being recycled daily (100 tons monthly). This represents around 2.2% of the daily paper waste generation recycled in Gaza Strip. The main challenges facing the paper recycling industry in Gaza strip are the shortage of electricity as well as its high cost, competition with the imported products and the high cost of establishing such factories. Further, the imported products have lower prices.

#### 4.1.6.4 Glass and Metal Recycling

In the Gaza Strip, there is no real glass recycling. Most of the waste glass is disposed to landfills. A very small portion is recycled as cullet for simple decoration and floor tiles purposes. In the same context, there are no recycling factories for the scraps and waste metals and factories exported the waste metals into Israel and Egypt.

### 4.2 Gaza Solid Waste Management Project Overview

The Gaza Solid Waste Management Project is a comprehensive strategic infrastructure and capacity building project, where MDLF is managing the southern component of the project covering 3 of 5 governorates in Gaza Strip, namely the Middle Area, Khan Younis, and Rafah Governorates comprising approximately 64% of Gaza Strip's total geographic area inhabited by 46% of the total Gaza Strip's population (approximately 800,000 people) in 2014. The 3 governorates are served by the JSC-KRM. The GSWMP is aiming at improving solid waste management services in the Gaza Strip through the provision of efficient and environmentally- and socially-sound waste disposal schemes, and initiating measures to improve overall solid waste management systems. Through the GSWMP, a sanitary landfill (Al-Fukhary) was constructed in the southern region of Gaza Strip with capacity to serve the 3 governorates until year 2025. The new facility was equipped to operate at high standard and it was complemented by a system of solid waste transfer stations in each governorate in addition to comprehensive capacity building program to improve service provision at the different stages of solid waste management, including the supply of new solid waste collection vehicles to the newly expanded JSC-KRM and its member municipalities accompanied by institutional strengthening measures and training. Two transfer stations were planned for the Middle and Southern regions of Gaza, one of which (Khan Younis transfer station) was constructed by UNRWA and the other transfer station (Rafah transfer station) was constructed through the GSWMP in 2019.

GSWMP is financed by the World Bank Group, the French Development Agency (AFD), and the European Union (EU). The project focuses the middle and southern region of Gaza Strip with MDLF as the implementing agency and in coordination with other financing partners (Islamic Development Bank – IDB) who are focusing on Gaza and the Northern Governorates. Following are the four components of the project:

- Component 1: Solid Waste Transfer and Disposal Facilities (USD 20.15M)

- Component 2: Institutional Strengthening (USD 1.65M)
- Component 3: Primary Collection and Resource Recovery (USD 5.10M)
- Component 4: Project Management (USD 3.95M)

#### 4.2.1 Disposal Site

Al-Fukhary (Sofa) landfill is a sanitary landfill covering 235,000 m<sup>2</sup> of land managed by JCS-KRM. It receives an average 600 ton/day of municipal waste from 17 localities from the three governorates of Rafah, Deir El-Balah, and Khan Younis in middle and south of Gaza Strip. The waste mainly consists of food waste, paper and cardboard, plastics and nylon, tin cans and aluminum, glass, and leather among other things. Around 60 to 90 waste vehicles come to the landfill on the daily basis. A control room employee is in charge of controlling access of trucks to the site and weighs incoming waste brought into the landfill site. The waste is then dumped at the disposal cell based on a specific filling sequence. A flagman directs the vehicles to the designated disposal area before unloading the waste as per landfill manager instructions. Then, a wheel loader levels the received waste. At the end of any working day, the waste is covered by a thin layer of clay (20 cm of sub-soil).

Al-Fukhary (Sofa) landfill site has the following features:

- Entrance area including weighbridge and control room;
- Building (190 m<sup>2</sup> on 3 levels) for JSC-KRM operation personnel staff;
- Maintenance Workshop (528 m<sup>2</sup>); Storm water drainage and storage pond (10,531 m<sup>3</sup> capacity);
- Disposal cell 1, divided in cell 1A and 1B (excavated up to 20 m below natural ground level), and slope 1:2 for sides with horizontal perm 5m width;
- Leachate pre-treatment (aeration lagoon, usable volume 6,000 m<sup>3</sup>), it is excavated to 2.75 m below natural ground level;
- Peripheral road (length 1,735 m);
- Old Dumpsite (40,000 m<sup>2</sup>);
- Stockpile of excavated soil (85,000 m<sup>2</sup>); and
- A fence surrounds the entire site.



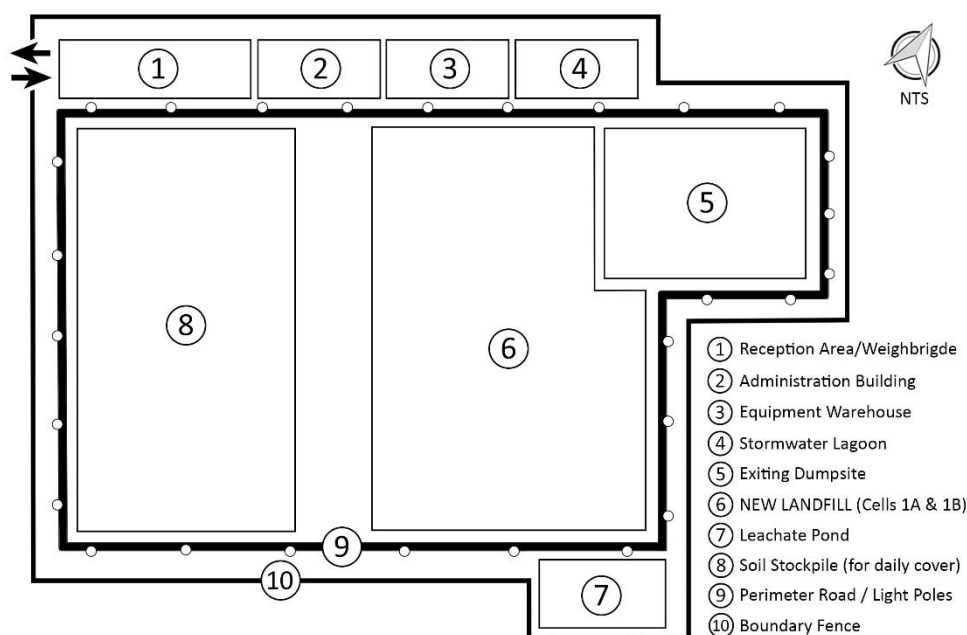


Figure 3: Schematic Layout for Sofa sanitary landfill in Al-Fukhary

Al-Fukhary (Sofa) Landfill is managed by JSC-KRM since July 15<sup>th</sup> 2019. It receives an average 600 ton/day of municipal waste from 17 localities in middle and south of Gaza Strip. More than 150 of incoming waste vehicles are received to the landfill on the daily basis; their access is managed by the control room employee which proceed with the weighting of incoming waste and controlling the access of vehicles to the landfill. The waste is dumped at the disposal cell based on a specific filling sequence, flagman (observer) is directing the vehicles for unloading of waste regarding to the landfill manager instructions, whereas a wheel loader is leveling the received waste. At the end of any working day, the waste is covered by a thin layer of daily clay cover (20 cm of sub-soil).

In the event of heavy rains, external storm water is collected by a storm water ditch surrounding the landfill site, and is directed by gravity to the storm water lagoon which is lined by a geo-membrane. Yet there are no plans to use the storm water for any purposes and will therefore remain stored until cleaned out by landfill workers from time to time. Alternatively, internal storm water and liquid waste will be collected through a geo-compost network (AFTIX) and then pumped to a leachate lagoon; which is also lined by a geo-membrane

#### 4.2.2 Transfer Stations

Two transfer stations were planned for the Middle and Southern regions of Gaza Strip, one of which (Khan Younis transfer station) was constructed by UNRWA and the other transfer station (Rafah transfer station) was constructed through the GSWMP in 2019. Rafah transfer station facility was designed to accommodate several functions given its unique location adjacent to a sorting facility, across one of most dense population areas in Rafah Governorate (Tal Al-Sultan), and on the route of new development projects (Saudi Projects 1 and 2). In the other hand, it was determined that the middle area had a different situation in terms of suitability of facility location, therefore efforts were

limited to further explore different alternatives for the middle area, which has a number of focused, yet scattered, populations spread across seven localities.

#### 4.2.2.1 Rafah Transfer Station

Two alternative locations for Rafah solid waste transfer station were proposed by Municipality of Rafah and JSC-KRM. Stakeholder consultation meeting was conducted to choose the most feasible location in term of environmental, social, and technical aspects. The consultation meeting was held in Municipality of Rafah in presence of the Designer, Traffic Specialist, Environmental and Social Assessment Specialist, Engineers of Rafah Municipality and JSC-KRM, and MDLF staff. Accordingly, the designer prepared several initial conceptual drafts for both locations for discussion.



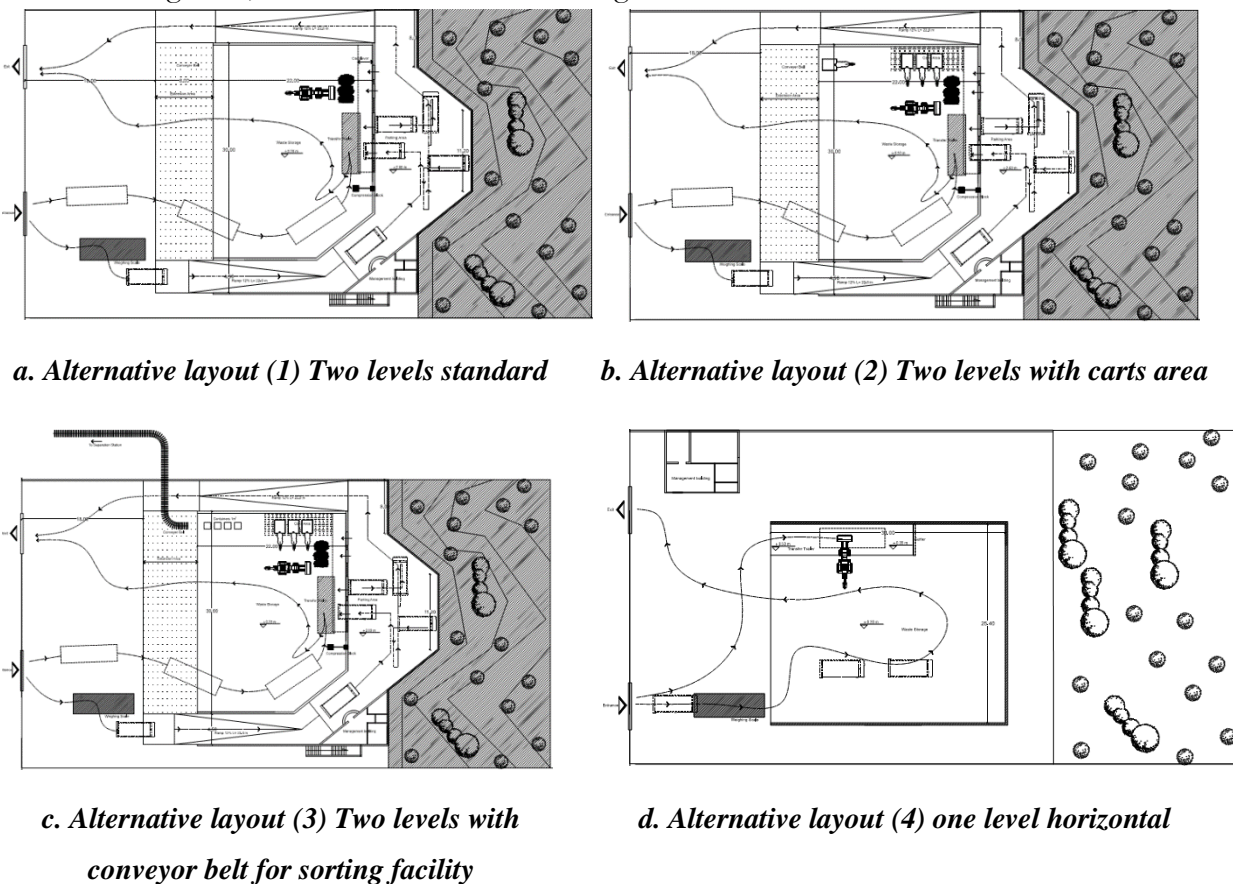
**Image 4: The proposed alternatives sites of Rafah Transfer Station**

The designer referred to Environmental Protection Agency (EPA) standards to measure the minimum required space of the transfer station. The approach to estimate the required tipping floor space is to begin with a base area of 4,000 square feet (371.6 m<sup>2</sup>) and add to it 20 square feet (1.85 m<sup>2</sup>) for each ton of waste received in a day (assuming the waste will be temporarily piled 6 feet high on the tipping floor). However, the available space for both locations is much higher than these limits.

Finally, it was agreed to exclude the second choice (location B) due to its location beside a steep cliff, and the limitation of future expansion, moreover the access roads of this location is limited and could be difficult for trucks to income and outgo from this location, whereas the first choice (Location A) is surrounded by WWTP, garden, and waste sorting facility, and it can be expanded in the future (if

needed), and it has a separate access road which will not impact any traffic jam for other activities. It is worth mentioning that (Location A) which its area is about 6,000 m<sup>2</sup> is fully empty and it is owned by the municipality of Rafah/JSC-KRM so that (location A) had been chosen.

The designer submitted four concept design alternatives for Rafah waste transfer station as shown in the following figure. The chosen alternative is also improved to be complied with the environmental and social safeguards, and to achieve the technical goal.



**Figure 4: Alternative concept designs of rafah transfer station**

The designer was requested to increase and change the location of planted trees to be as a barrier between the transfer station and the surroundings to mitigate any noise or dust emissions (if any), the location of the tree barrier is located against wind direction. The designer also requested to cover the working area by a steel shed, and to take into account to separate the leachate collection system. The transfer station is fully closed by a concrete wall and it included green areas for aesthetic aspects; its ground is also fully paved by concrete to prevent any leachate leakage. The designer was also requested to include a source of water for washing the working area and the solid waste trucks. The transfer station has two separate ramps for incoming and outgoing waste vehicles, and the design took into consideration the nature of incoming vehicles including trucks and donkey carts.

Rafah Transfer Station will be operated by JSC-KRM and Rafah municipality. It is expected to receive an average 60 ton/day of municipal waste from 60 donkey carts and more than 12 other vehicles on the daily basis. A control room employee is in charge of controlling access of trucks to the site and weighs incoming waste brought into the transfer station. Then, the incoming vehicles go up a ramp to the higher level of the transfer station, while the roll on/off containers will be located at the lower level in order to receive the unloaded waste. The roll on/off containers will then be transferred to Al-Fukhari landfill on a daily basis.

Leachate will be collected to the underground leachate tank with a capacity of 5m<sup>3</sup> by gravity through collection pipes and will be evacuated regularly. The wastewater network is connected to the municipality network. The leachate system is a separated system to avoid wastewater and storm water from mixing together. The expected quantities of leachate is about 1.5 m<sup>3</sup>/day.

Storm water will be collected separately at the transfer station and will be used for irrigation purposes or direct infiltration. The following figure shows schematic diagram for the operation of Rafah Transfer Station.

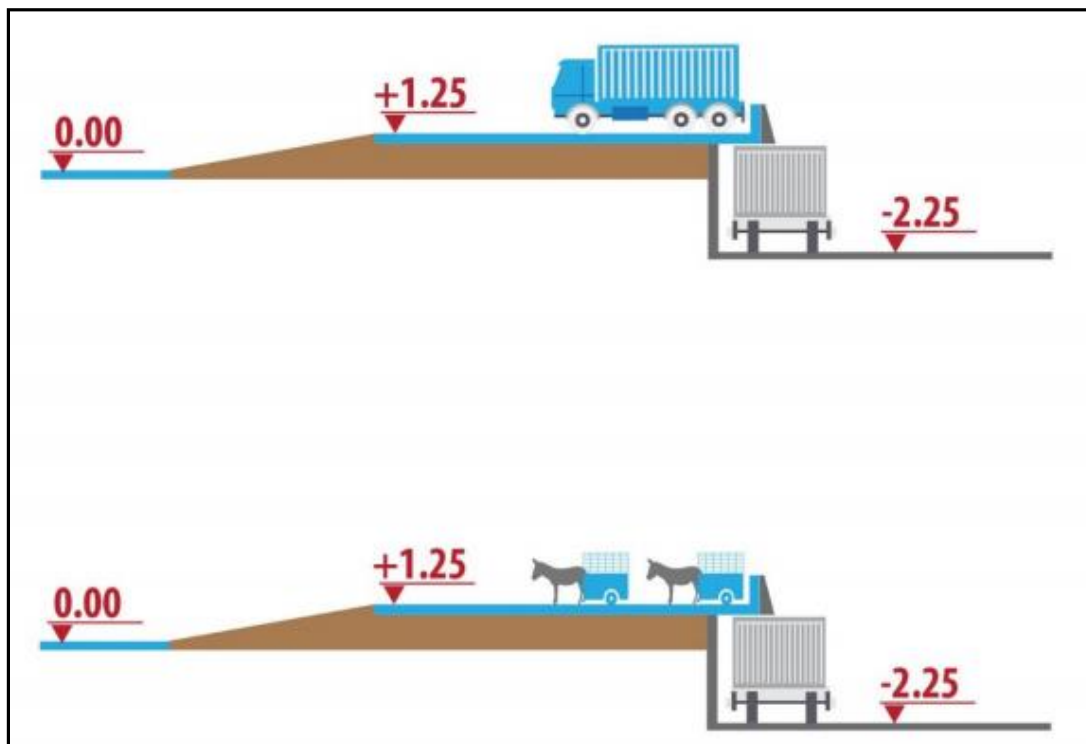


Figure 5: Schematic diagram for the operation of Rafah TS

#### 4.2.2.2 Khan Younis Transfer Station

Khan Younis solid waste transfer station site is located in the southern of the city. The total site area is 10,000 m<sup>2</sup> with facility footprint of about 3,000 m<sup>2</sup> (65×46 m). The transfer station is bound from the east by 18 m road (structural street No. 30). The construction of Khan Younis transfer station was



implemented by UNRWA, whereas Khan Younis municipality will operate it in close cooperation with JSC-KRM.

The transfer station is tiled, fenced and covered with a steel shed. It contains a separate leachate, sanitary drainage and storm water collection systems, and a storage tank for the collected leachate, other components are:

- Ramped Entrance 50 meters long for the vehicle's unloading the solid waste that coming from Khan Younis areas.
- Unloading area with 4 meters height with Ground slab of 15cm reinforced concrete.
- Exit area for the vehicle's uploading for roll on/off vehicles to transfer the solid waste to Al Fukhary landfill. This area ground slab of 15cm reinforced concrete.
- Control and guard room on the upper level of the site.
- Retaining wall and boundary walls.
- Roll on/off Containers, and solid waste containers area.

Khan Younis transfer station will be managed by JSC-KRM with Khan Younis municipality. It is expected to receive an average 40 ton/day of municipal waste. Leachate is collected to the underground leachate tank, and evacuated regularly. The wastewater will be collected in a percolation pit in Khan Younis TS.

### **4.3 Medical Waste Treatment Project**

#### **4.3.1 Medical Waste Collection Treatment and Disposal System**

Referring to the feasibility study of GSWMP which was conducted in 2012 by UNDP, it was agreed by all stakeholders to create and operate three autoclave treatment facilities in Gaza Strip (for instance Gaza city, Khan Younis, and Rafah). The study stated that the old used treatment technique (incineration) is not recommended to be introduced in the short-term plan.

JICA allocated part of its financial fund to the Palestinian people in establishing the Health-Care Waste Treatment Facility as a pilot project, Whereas UNRWA provided Health-Care Waste vehicles to be used for safe transport of HCW. Joint Service Council (JSC-KRM) is the delegated implementation agency for this project. The Ministry of Local Government, Environment Quality Authority and the Ministry of Finance are responsible for supervising the whole process to be in line with local Palestinian regulations.

Medical treatment facility site is located in the southern of Khan Younis city. The total site area is 250 m<sup>2</sup> (20.4×12.5 m). Health-Care Waste Treatment Facility is located within the boundary of Khan Younis Solid Waste Transfer Station, and it is bounded from the east by 30m road (structural street No. 18). The construction of Health-Care Waste Treatment Facility which will be implemented by JICA, whereas Joint Service Council (JSC-KRM) will operate it in close cooperation with Ministry of Health (MoH) and under the monitoring of Environment Quality Authority.

The Medical Waste Treatment Facility is operated by Joint Service Council (JSC-KRM) as it is the delegated implementation agency for this project. JSC-KRM is responsible for:

- i. Transporting the infectious HCW from the Health-Care facilities to the Health-Care Waste Treatment Facility;
- ii. Treating the received infectious HCW by using the Autoclave (provided by MoH) and
- iii. Transporting the treated waste to the final disposal site. The Ministry of Health role is to segregate and store the HCW into three types (Sharps, Infectious, Non-infectious) internally in the Health-Care Facilities. The pathogenic waste has a separate treatment technique used by MoH.

At the first stage, HCW is received from limited health-care facilities as a pilot project, the HCW firstly are collected in pins and stored in a storage room. Pins are filled by two third only and closed, and a warning logo is printed on pins before transfer them outside the health-care facility. JSC-KRM transfers the closed pins by two appropriate vehicles to the treatment facility. The received HCW in treatment facility will be stored in the storage room. The capacity of autoclave in each treatment cycle is about three filled pins, and the duration of each cycle is about 3 hours. The produced treated waste collected in special bags and transferred to the adjacent waste transfer station to be transferred to the final disposal site, whereas the empty pins are washed clearly before using them again. All quantities of received waste will be weighted, registered and achieved.

The leachate resulted from washing the facility is collected by a separate collection system, it will be received at the leachate collection tank. A special treatment will be followed to the leachate by chlorination before evacuation it to the WWTP.

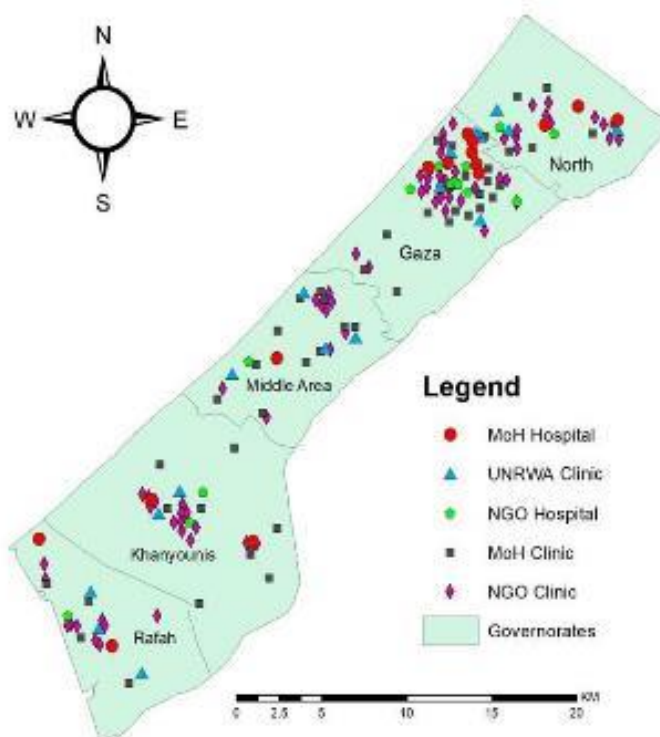
#### 4.3.2 Distribution of Health Care facilities per Governorate

There are 182 health centers distributed among five governorates in the Gaza Strip. The main providers are MoH, NGO's, UNRWA and Palestinian Military Medical Services (PMMS). The following table represents the distribution of Palestinian Health Care (PHC) centers per provider and district according to MoH report 2014.

Table 10: Distribution of phc centers by provider & district, 2014

Area	Governmental Hospitals	NGO's Hospitals	UNRWA Clinics	Governmental Clinics	NGO's Clinics	Total
North	3	2	3	8	13	29
Gaza	7	8	5	15	24	59
Middle Area	1	1	5	16*	8	31
Khan Younis	3	2	3	10	24	42
Rafah	2	1	5	5	8	21
Total	16	14	21	54	77	182

In 2018, JSC implemented site visits to each clinic of its jurisdiction area, it is confirmed that the governmental clinics in Middle area is 12 instead of 16. One clinic closed, one clinic changed to military services, and two clinics are located under the service area of Gaza Governorate instead of Middle Area. The following figure illustrates the distribution of medical centers in Gaza Strip based on geographical location.



**Figure 6: Medical Centers Distribution In The Gaza Strip**

#### 4.3.3 Medical Wastes Quantities and Composition

Few studies have been conducted in the Gaza Strip to determine the quantity and composition of medical waste. At the present moment health centers do not keep account of generated waste, therefore it is hard to estimate such quantity, as well as the amount of treated waste. In 2011, MoH estimated incinerated quantity as following:

- In Al Shifa Hospital incinerator 2.0 – 2.5 ton/month;
- In Nasser Hospital incinerator 1.5 ton/month;
- In European Hospital incinerator 1 ton/month.

Currently European hospital incinerator does not work and waste from European hospital is incinerated at Naser hospital incinerator.



In 2012, Italian NGO (COOPI) conducted a research study and made some measurements. The study concluded that waste generation in Gaza Hospitals is 1.306 kg/bed/day and 20% are hazards. Regarding UNRWA and NGO clinics, the study estimated that 60 g/outpatient are generated and 22% is hazards. For MoH clinics; the study estimated 25 g/outpatient and 20% of it is hazardous. Based on that; COOPI estimated medical waste generation in the Gaza Strip is 3,369 kg/day and 686 kg of it is hazardous. The study did not include the scattered small clinics.

In 2013; a study conducted at Islamic university of Gaza as M.Sc. study for medical waste. Waste sampling program at 12 MoH hospitals were conducted. The study measured the safety boxes and all other waste. Based on the study, medical waste generation is different from a hospital to another and ranges from 0.5 kg/bed/day at pediatric hospital to 2.5 kg/bed/day at Al Shifa hospital. The hospitals which have maternity departments (Emaraty, Al Aqsa, Naser, Al Shifa) generate more. In average; the study concluded that MoH hospitals generate 1.8 kg/bed/day of medical wastes an average.

In 2016, the Assessment study of JICA team revealed that medical waste production from inpatient at hospital is 1.88 kg/day where 14.8 % are infectious. The inpatients produce big amounts of normal waste as the families of inpatients do not depend of food provided by the hospital and always they bring home made food. In addition, the hospitals in Gaza are open 24 hours to visitors who bring food and sometimes consume food at hospitals. Another important issue is the number of staff, which is high in governmental hospitals which increase the amount of normal waste generated. In holidays, the amount of medical waste is reduced significantly; even though the number of inpatients is the same as other days. This could be due to decrease number of staff at holidays.

Emergency outpatients produce 100g of medical waste, 22.9% of which is infectious while external clinic outpatients produce around 80g of medical waste, 10.6% of which is infectious. These high amounts are due because outpatients conduct lab analyses inside the hospital instead of labs in external clinics, therefore their waste is counted with inpatients waste. The researchers noticed that the outpatients at external clinics spend few hours waiting the physicians where they consume some food. This is also increasing the amount of normal food.

Regarding UNRWA clinics which provide sufficient services to patients and the number of employees is less compared with governmental clinics. This resulted in less amounts of total waste. The infectious waste is around 7g/outpatient regardless the amount of total waste. The following table summarizes the results of sampling survey of 2016.

**Table 11: Daily Medical Waste Production Per Patient**

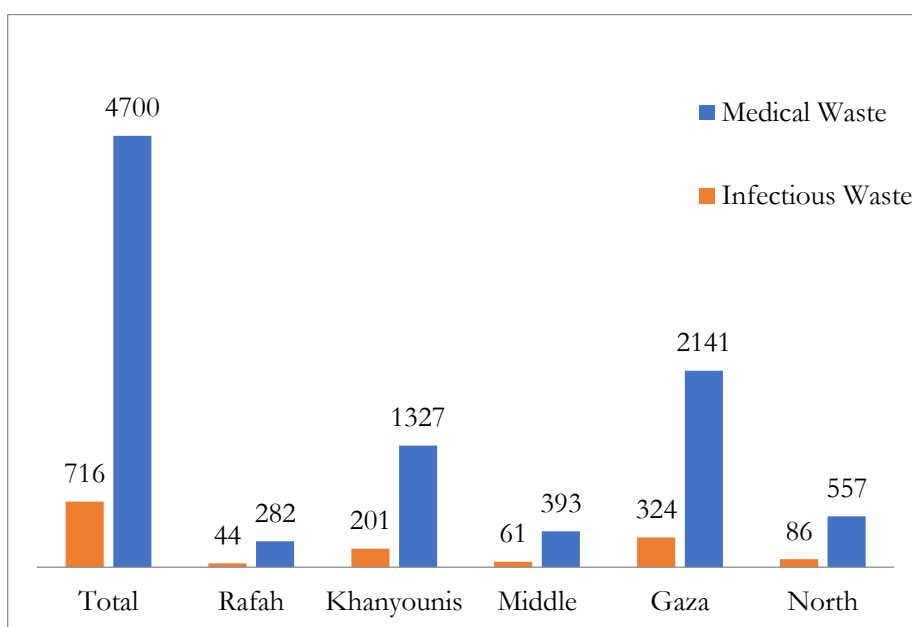
Type	Unit	medical Waste	%	Infectious Waste
<b>UNRWA Clinics</b>	g/outpatient	34	20.6	7
<b>MoH Clinics</b>	g/outpatient	73	9.6	7
<b>NGO Clinics</b>	g/outpatient	73	9.6	7

Type	Unit	medical Waste	%	Infectious Waste
Hospital Outpatients	g/outpatient	80	10.8	8.6
Hospital Emergency	g/outpatient	100	8.6	8.6
MoH Hospitals	Kg/bed/day	1.88	14.9	0.28
NGO Hospitals	Kg/bed/day	1.88	14.9	0.28

Source: JICA (2016) Final Report on the survey of medical solid waste in Gaza, Palestine

#### 4.3.4 Medical Waste Projection

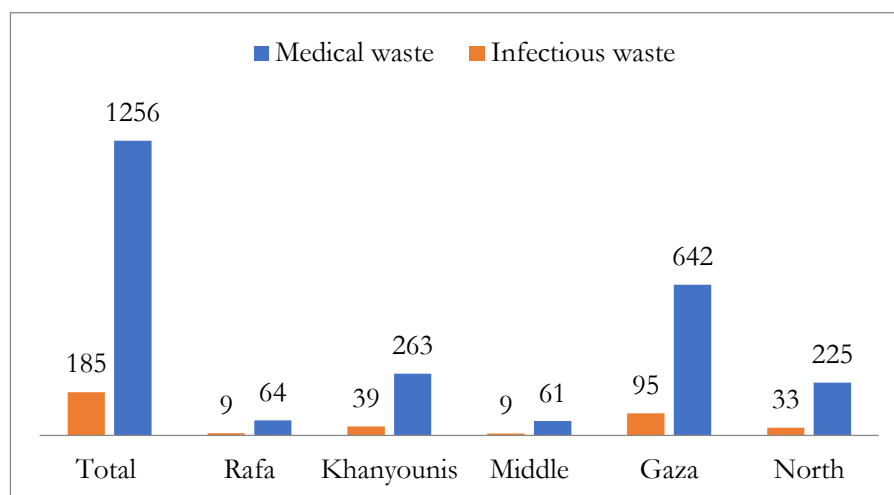
Governmental hospitals are the main producer of medical waste in the Gaza Strip. The following figure presents the production of medical waste per governmental hospital and the amount of infectious waste.



**Figure 7: Governmental Hospitals Medical and Infectious Waste per Governorate**

Source: JICA (2016) Final Report on the survey of medical solid waste in Gaza, Palestine

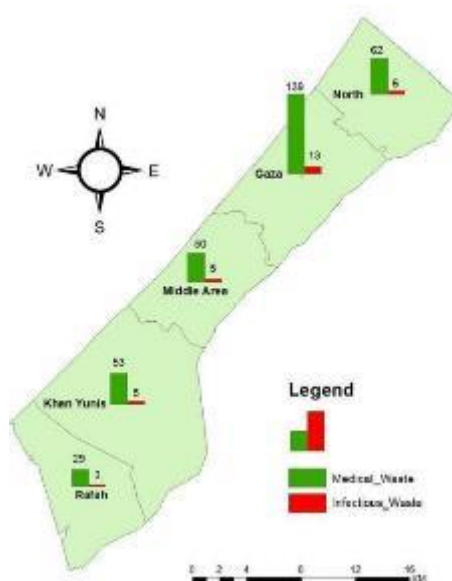
According to the above figure, governmental hospitals produce 4,700 kg/day of medical waste 716kg/day of which is infectious. These figures exclude pharmaceutical and pathological waste. NGOs hospitals produce 1,226 kg/day of medical waste; 185 kg/day is infectious as shown in the below figure.



**Figure 8: NGOs Hospitals Medical and Infectious Waste per Governorate**

Source: JICA (2016) Final Report on the survey of medical solid waste in Gaza, Palestine

Regarding governmental clinics; the quantity of medical waste produced daily is 333 kg/day and 32 kg/day of it is infectious as shown in the below figure.



**Figure 9: MoH Clinics Medical and Infectious Waste Kg/day**

UNRWA clinics are the second medical waste producers in the Gaza Strip. 465 kg/day of medical waste is produced in UNRWA clinics where 96 kg/day of which is infectious as shown in the below figure.

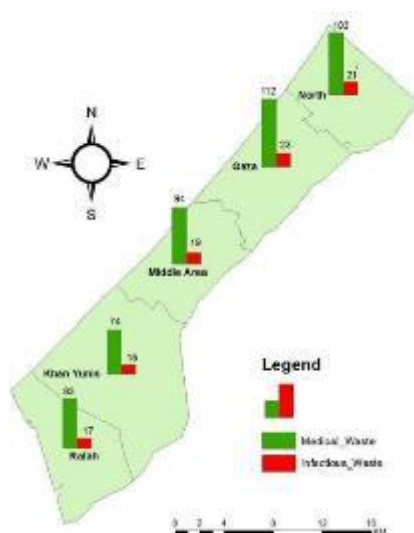


Figure 10: UNRWA Clinics Medical and Infectious Waste

There are 77 NGOs clinics distributed among the Gaza Strip and produce 407 kg/day of medical waste where 39 kg/day are infectious as shown in the below figure.

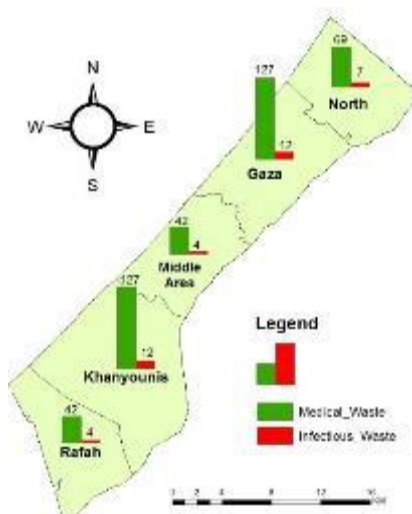
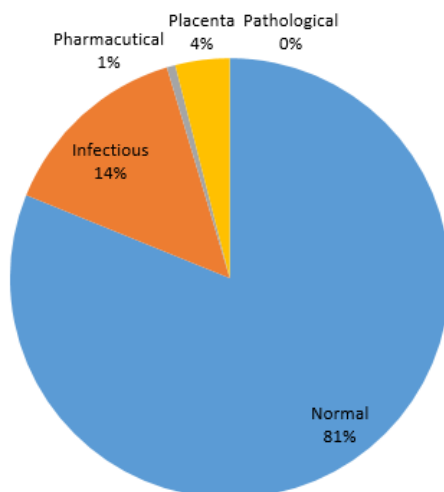


Figure 11: NGOs Clinics Medical and Infectious Waste

The total medical waste produced in the Gaza Strip is 7161 kg/day and 1068 of it are infectious. Gaza Governorate medical waste consists 44% of total waste, Khan Younis Governorate 26%, North Governorate 14%, Middle Area 9% and Rafah Governorate is the smallest producer 7% as shown in the below figure.



**Figure 12: Medical Waste Classification in Gaza**

Source: JICA (2016) Final Report on the survey of medical solid waste in Gaza, Palestine

#### **4.3.5 Target Service by JSC-KRM**

Governmental PHC centers (27 in number) and UNRWA's clinics (13 in number) in jurisdiction area of JSC KRM; namely Khan Younis, Rafah and Middle Area. The service will also include two departments of Al Shifa hospital specifically, laboratory and hemodialysis departments.

### **4.4 Environmental and Social performance**

The environmental and social risk management and monitoring, and the implementation of the instruments of safeguards were performing efficiently in the parent project "Gaza Solid Waste Management Project". Mainly two Abbreviated Resettlement Action Plans (ARAPs) were carried out and updated successfully for two targeted groups, as well ESMPs were prepared and took into effectiveness for different activities during the GSWMP implementation as an addendum to the original ESIA, 2012. Management and monitoring plans were followed by the project staff; Technical Operation Unit (TOU) and the Project Development and Safeguards Unit (PDSU), who exist under MDLF and they were supervised by the World Bank E&S specialists. All of the project documents including the environmental and social documents were disclosed on MDLF website, JSC-KRM website and Info ship (World Bank website).

#### 4.4.1 Abbreviated Resettlement Action Plans (APAP)

Mainly two ARAPs were carried out and updated successfully for two targeted groups (Landowners of the landfill site & waste pickers who worked at the old dump site and lost their source of livelihood due to the GSWMP”.

- **ARAP for Landowners:** An area of 235,000 m<sup>2</sup> of land was acquired in order to construct the landfill at Al-Fukhary south of Gaza Strip. Five of landowners were compensated based on official long and clear negotiations with them. The pricing of land was concluded by different independent land evaluators. All land owners were satisfied and they received their compensation before the launching of the construction activities of the landfill. The following table summarizes the land acquisition of each land lot including the names of each land owner.

**Table 12: Summary of Land Acquisition for Al-Fukhary Landfill**

#	Landowner Name	Area	Total Compensation	Date of
		X 1,000 sq.m	Amount	Compensation
1	Munir El Shaer	57.00	456,000 JD	23/02/2016*
2	Salah Al Din Shubair	19.84	109,120 JD	14/12/2015** 1/03/2016*
3	Saad Al Din Abu Snaima	11.36	78,160 JD	18/02/2016*
4	Ziad Al Shaer	57.00	1 <sup>st</sup> payment: 253,674.500 JD	04/09/2016**
			2 <sup>nd</sup> payment: 202,325.5 JD	26/09/2016**
			3 <sup>rd</sup> payment: 3,824 JD**	09/02/2017**
5	Radi abu Rida	90.00	Land swap of 72 governmental donums	22/09/2016***
		<b>235.20</b>	<b>Total payment: 1,099,280</b>	

\*Clearance approval by the landowner

\*\*Bank transfer date

\*\*\* Official registration of the 72 governmental donums for the landowner

- **ARAP for waste pickers:** sixteen of waste pickers worked permanently at Al-Fukhary old dumpsite; they were noticed everyday picking waste materials from the dumpsite. The waste pickers informed that the waste picking is the source of their livelihood. The construction of Al-Fukhary sanitary landfill and closure of the old dumpsite lead the JSC-KRM to prevent the waste pickers to access to the landfill site due to the risks of the construction works on their lives, a fence was installed to prevent the access of unauthorized people to the site during construction activities. Thus, waste pickers were required to have an alternative source of livelihood. All of waste pickers were temporarily worked in JSC-KRM and member municipalities for 11 months before they were merged in one of United Nations Development Program – Deprived Families Economic Program (UNDP-DEEP) which provide a small business for each of them. The implementation of the small businesses was supervised and followed up by both the project safeguard staff and UNDP-DEEP and their NGO partner Palestinian Agriculture Relief Committee (PARC). The following table summarizes the list of waste pickers & their small business.

Table 13: Summary of the list of waste pickers and their small businesses

No.	PAP Name	Received Project	Project Budget (USD)
1.	Jawdat Ahmed Al-Najjar	Livestock Food Shop	5,300
2.	Adham Jawdat Al-Najjar	Grocery Store	5,265
3.	Amjad Jawdat Al-Najjar	Livestock Food Shop	5,315
4.	Zuhair Jawdat Al-Najjar	Breeding sheeps	5298,9
5.	Suleiman Mahmoud Al-Najjar	Livestock Food Shop	5298,9
6.	Mohammed Suleiman Al-Najjar	Livestock Food Shop	5298,9
7.	Ahmed Suleiman Al-Najjar	Breeding sheeps	5298,9
8.	Fawzi Ibrahim Al-Najjar	Breeding sheeps	5298,9
9.	Fadi Ibrahim Al-Najjar	Breeding sheeps	5298,9
10.	Baraa Ibrahim Al-Najjar	Breeding sheeps	5298,9
11.	Osama Abdel-Qader Al-Najjar	Motorcycle Spare parts shop	5298,9



No.	PAP Name	Received Project	Project Budget (USD)
12.	Talat Abdel-Qader Al-Najjar	Motorcycle Spare parts shop	5298,9
13.	Hammoudah Ahmed Al-Najjar	Breeding sheeps	5298,9
14.	Sabah Al-Faramawi	Breeding sheeps	5,287
15	Jamal Al-Saiad Ahmed Al-Faramawi	Breeding sheeps	5,287
16	Adham Iyad Al-Faramawi	Cars maintenance workshop	5,287

#### 4.4.2 Environmental and Social Management and Monitoring Plans

ESMPs were prepared and took into effectiveness for different activities during the GSWMP implementation as an addendum to the original ESIA, 2012, i.e ESMPs were prepared for stockpiling of the excavated materials resulted from the landfill excavation works, for two transfer stations in Khan Younis and Rafah, for the rehabilitation of the access road of the landfill, for closure of the old dumpsites, and for construction of an interim short-term cell for waste disposal at Al-Fukhary.

All of addendum ESMPs were annexed in the project tendering documents in order to be implemented by contractors, knowing that the project safeguard staff followed up the management and monitoring plans to make sure the compliance of each project works with the environmental and social requirements as detailed in each of the ESMP.

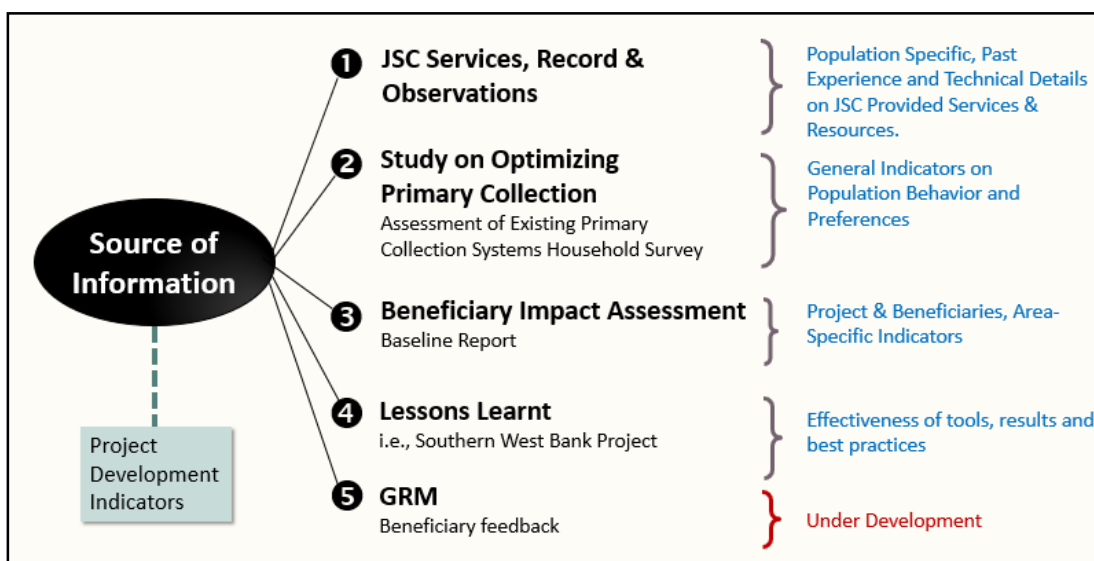
#### 4.4.3 Communication and Outreach Activities

Component 2 of the GSWMP is about institutional strengthening. This component would improve the solid waste services through improved management and public awareness, and it consists of: (1) Capacity-building for the Joint Services Council for Khan Younis, Rafah and Middle Area Governorates (JSC-KRM) and Technical Operations Unit (TOU), (2) Capacity-building for participating municipalities, and (3) Capacity-building for board members of the TOU and Public awareness campaigns.

In order to conduce proper activities under component 2, communication and outreach plans were prepared every 6 months, to communicate efficiently with the project's relevant stakeholders and to all target-groups and beneficiaries. It would also increase the awareness of people who live in Khan

Younis, Rafah and Middle Governorates, about the services provided by the Joint Service Council (JSC-KRM), as well the GSWMP activities, showing the impact of GSWMP actions on the resident's lives. In addition to enhance their engagement, it would improve the services in the area, through changing behaviors towards littering and disposal practices, and encourage the people to pay the piled collection fees.

Various sources of information were used to develop an effective communication strategy, since the behaviors and attitudes of the residents in Gaza Strip towards the waste disposal changes from place to place, so selecting the activities, methods and tools to improve their practices towards more efficient SWM should be systematic.



**Figure 13: Sources of information used to identify the current situation of the swm in the targeted area**

The communication and outreach plan include the analysis of the target-audiences (stakeholders), the message/s to be transmitted and the delivery means, that will be used to reach these audiences and achieve the relevant objectives, as well as the specific action plan along with specific timetable.

JSC-KRM has an awareness staff consist of 7 employees (all female) who are responsible to implement the outreach activities in the field.

#### **4.4.3.1 Communication and outreach plan Objectives:**

- 1- Promote the GSWMP activities (new sanitary landfill, transfer stations and the collection equipment and containers, studies,) effectively;
- 2- Increase the satisfaction of the community about the GWSMP infrastructures and reduce their concerns about the environmental and social negative effects;

- 3- Increase the awareness and enhance the engagement of the stakeholders in the project activities.
- 4- Promote the provided services of the JSC-KRM (secondary collection, disposal, landfill operation, workers efforts, health and hygiene benefits, management of the new facilities and the GRM);
- 5- Encourage the people to be involved in the SWM system through behavioral change;
- 6- Encouraging the people to pay the SW fees regularly and increase the percentage of the fees collection in the near future;
- 7- Show the impact of the GSWMP activities on the people's lives in the targeted areas.

#### 4.4.3.2 Communication and outreach Programs

The communication and outreach action plan consist of fixed programs, which activities differ every 6 months, these programs are:

- 1) **School Outreach Program:** Aims to increase the awareness of the school students from age 10 to 17 years in SWM and enhance their littering daily practices.
- 2) **Households Outreach Program:** Aims to increase the awareness of the households in SWM and GSWP, to reduce the concerns of the PAPs about the environmental and social effects of the project infrastructure and to increase the community engagement in enhancing the SWM.
- 3) **Universities Outreach Program:** Aims to implement awareness program in Universities and to implement initiatives and environmental activities inside the campus.
- 4) **Community Outreach Program:** Aims to increase the awareness of the residents in SWM and GSWMP and to increase the community engagement through implementing the events.
- 5) **Municipalities Coordinating program:** Aims to strengthen the relations with the municipalities in order to enhance the solid waste services in the area.
- 6) **Printings and Visibilities:** Aims to raise the awareness of the community information about the GSWMP and the provided services.
- 7) **Multimedia Outreach Program:** Aims to increase the awareness and engagement of the residents in the project activities, strengthen the relations with the community and develop a communication channels to promote for the provided services.

### Number of Beneficiaries (Jan 2019- Nov 2019)

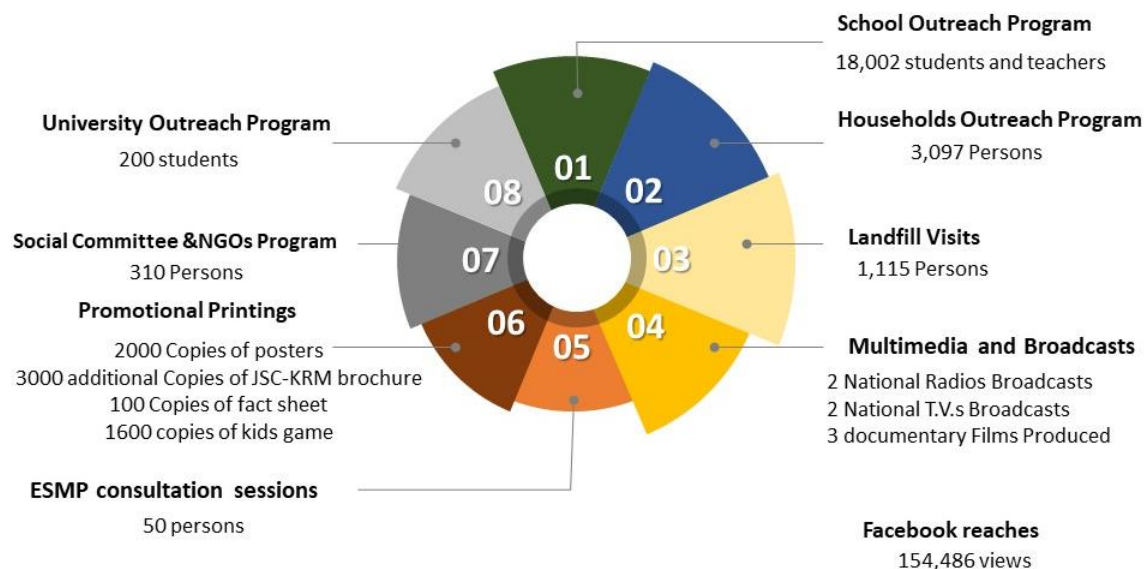


Figure 14: Beneficiaries Targeted By JSC-KRM (2019)

#### 4.4.3.3 Human Resources

The communication and outreach activities, used to be implemented through the Public Awareness and Outreach Unit in JSC-KRM, with deep cooperation with the development team in PDSU. Also, JSC-KRM used the good relationships with the member municipalities to conduct the field activities through the public relation departments and the environmental departments.

The public Awareness and Outreach Unit consist of:

- 1- The communication and outreach officer (the focal point in all the communication activities).
- 2- The public awareness team:
  - Khan Younis P.A. team (4 persons).
  - Dier Al-Balah P.A team (3 persons).

In addition, the social committee of the project, which were formed in 2016, used to be involved in implementing some activities in the neighborhoods.



Image 5: Awareness Session for The Participants of The Summer Camp In Khan Younis City

**Annex I** shows more details about the outreach and awareness activities conducted in 2019.

#### 4.4.4 Grievance Redress Mechanism

JSC-KRM used to receive the complaints about its provided services using different channels before January 2018, and the received complaints used to be managed and closed without documentation, there wasn't a recognized system for GRM.

At the beginning of 2018, JSC-KRM designed a new systematic way to receive the complaints and register them using a simple database (an excel sheet) as a first step. Then, in Oct 2018, JSC-KRM through the GSWMP, hired a consultant to develop an electronic complaint system based on the new JSC-KRM new website pages.

In June 2019, the new e-application for the e-complaint system was announced for the public through the social media, and the community started to submit their complaints, notes and suggestions through this application, this made it easier to register the information and requests automatically using the database of the website, in addition the admin of the GRM could receive the complaints 24/7, since the application and its control panel is up on the internet.

Many improvements were done on the system in the testing phase (June 2019-Oct 2019), and this is to ensure the availability, accessibility and the efficiency of the e-application; this lead to create another internal e-application on the same website only for member municipalities, which can be access to the website through a separated portal. It allows every municipality to have its control panel on the portal to submit and follow up its complaints on the JSC-KRM.

According the JSC-KRM records and reports, it is documented that number of received complaints and notes during 2019 were (90) complaints/notes through the different GRM channels **(Summarized in Annex II).**

JSC-KRM used the social media and printings, to announce about its GRM numbers and e-application link, for the community. As well two workshops were carried out for the municipalities' employees to introduce the system for them. But, yet JSC-KRM need to make more efforts to encourage the



community and the member municipalities to use the GRM system so it is highly recommended to develop a communication plan focusing on the complaint system. Also, it was noticeable that the existing GRM is not allowing the workers in JSC-KRM to submit their concerns about their working conditions, so this issue should be included in the coming development of the system.

#### **4.4.5 Community Consultation**

Many of consultation sessions and workshops were carried out by GSWMP project staff around all of waste facilities in different times. Various of groups were targeted including the women and children. Furthermore, hundreds of people were invited through different events to visit the waste facilities built under the GSWMP such as the landfill and Rafah TS. Consultations with community was facilitated by the member municipalities in addition to the social committee who participated in most of the consultation meetings. JSC-KRM has also different channels of information i.e the website, Facebook page and many of fact sheets distributed during the construction activities of all of facilities.



**Image 6: Consultation Meetings with The Community During the Implementation Of GSWMP**

#### **4.4.6 Environmental, Safety and Health**

Environmental, Safety and health procedures were followed in each waste facility during the construction period. Safety and health plan and emergency response plan were developed for each site, and a safety engineer was requested to work full time in each site.

All workers were vaccinated against tetanus, as well they were requested to follow all the safety and health procedures such as complying with wearing the Personal Protective Equipment (mainly vest, safety shoes, helmet, mask, and gloves). As well, workers received safety trainings including training conducted by United Nations Mine Services (UNMAS) to deal with any unexploded ordinance (UXO) found at any of project sites.

All project sites were secured by a fence to prevent unauthorized people to access to the construction sites, especially the waste pickers. Warning and informative signs were installed around all the site components.



A baseline groundwater quality tests were carried out for each site (landfill and transfer stations), because, these sites will be used for operation of waste in the future, so that groundwater tests will be required regularly and to be compared with the baseline.

Finally, the design of each facility took into consideration the environmental and social aspects, e.g. the protection of groundwater against the leachate generation, so that a liner was designed as well as leachate collection network was proposed to collect the leachate for treatment. The design of transfer stations were also closed, and took into consideration to collect the leachate for not polluting the surrounding environment during the operation of the facility.

## 5. ENVIRONMENTAL AND SOCIAL BASELINE

Most of the environmental and social baseline data were obtained through the review of information in the original ESIA of GSWMP<sup>16</sup>, where Rafah, Khan Younis and Middle Area Governorates were also covered. The environmental baseline data that was studied including meteo-climatologically conditions; ambient air quality; soil characteristics; geological survey; water resources; geophysical survey as well as fauna and flora. The social baseline in the original ESIA involved the neighboring communities to Al-Fukhary Dumpsite, temporary waste storage sites in Tel al Sultan-Rafah and Al-Namsawi-Khan Younis. The original ESIA revealed that the temporary waste storage sites located in Tel Al Sultan and Al-Namsawi is to mitigate the challenges of the long haulage distance to official dumpsite (Sofa dumpsite and Dier Al-Balah landfill) and frequent roads blockages that prevents from regular waste transport. Several interviews and consultation activities conducted in 2012 as part of the ESIA shown that local residents surrounding Tel Al Sultan and Al-Namsawi are suffering from odor and inconvenience resulting from the practice of burning waste on-site, the increase of rats, mosquitoes and flies. An update has been addressed in this chapter with more focus on the southern governorates, where solid waste management services are provided by JSC-KRM. The update shows that Al Namsawi waste storage site is completely closed and cleaned while Khan Younis transfer station is located around 1 km of the closed site at Al Namsawi, knowing that additional medical waste treatment facility was constructed within the boundary of Khan Younis transfer station, whereas Rafah transfer station was built in the same place of the old random dump site in Tal Al-Sultan. The update has been done mainly for physical and socio-economic aspects such as updating the ambient air quality and ground water quality, etc.

### 5.1 Environmental Baseline

#### 5.1.1 Ground Water Level

Ground water is the most precious natural resource in the Gaza governorates as it is the only source of water supply for domestic and agricultural use. Under natural conditions, groundwater flow in the Gaza Strip is towards the Mediterranean Sea, where it discharges to the sea. However, pumping over 50 years has significantly disturbed natural flow patterns. Large cone of depression was formed in the south where water levels reach 18 m below mean sea level near Khan Younis Transfer Station as shown in the following figure. The groundwater level at Rafah Transfer Station is between 11 to 12 m below the mean sea level, whereas it is 10 m below the mean sea level at Khan Younis Transfer Station. On the other hand, the groundwater level at Al-Fukhary Landfill is 50 m below the ground level, which is approaches to be the same of the mean sea level.

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<sup>16</sup> Environmental and Social impact assessment (ESIA) for Gaza Solid Waste Management Project: [http://www.mdlf.org.ps/Files/Docs/GSWM%20ESIA\\_FINAL\\_19sep2012.pdf](http://www.mdlf.org.ps/Files/Docs/GSWM%20ESIA_FINAL_19sep2012.pdf)

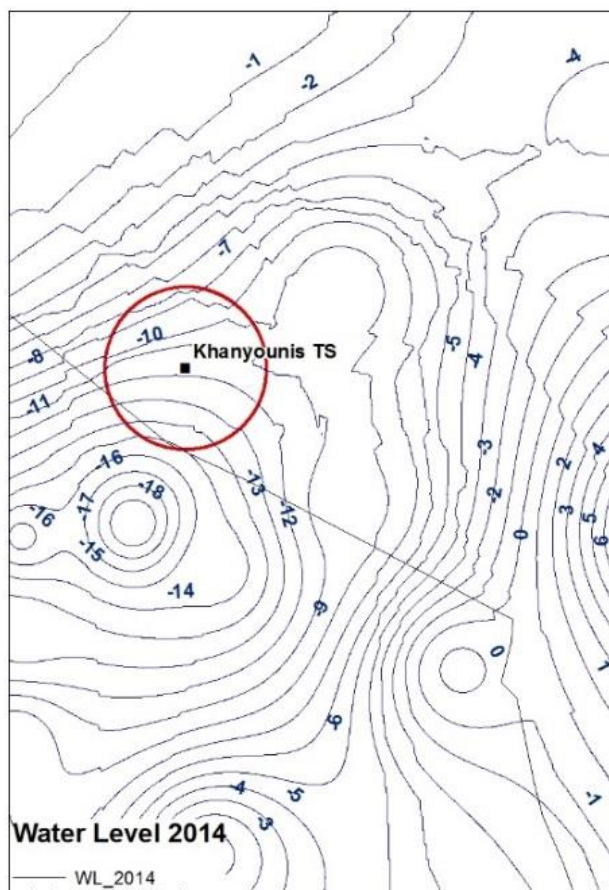


Figure 15: Groundwater level at Khan Younis Transfer Station (PWA, 2014)

The nearest groundwater well is located 800 m far from Al-Fukhary landfill, and it is not used for agriculture or drinking purposes due to its high salinity of water, whereas the nearest municipal well from Khan Younis and Rafah transfer stations are 1,300 m and 750 m consequently.

### 5.1.2 Ground Water Quality

Water quality of the coastal aquifer underlying Gaza has deteriorated harshly. The main groundwater quality problems are elevated chloride and nitrate concentrations. Chlorides are indication of the water salinity, and nitrates are indication of the presence of organic fertilizers, wastewater, sewage sludge and artificial fertilizers. In this updated ESIA the water quality is reviewed with respect to chloride and nitrate in addition to other chemical parameters to be as a baseline for comparison with any future results of the groundwater quality. For simplicity, the reference level over which the water is to be considered a source and under which the water is to be considered a sink is set as follows based on the World Health Organization drinking water guidelines:

- 50 mg/l for  $\text{NO}_3$
- 250 mg/l for  $\text{Cl}^-$

Four ground water samples were tested at Al-Fukhary (Sofa) Landfill in 2018. The following figure shows the upstream (samples 1,2) and downstream (samples 3,4). The following tables show the results of ground water quality tests and the quality of leachate produced at Al-Fukhary landfill respectively.

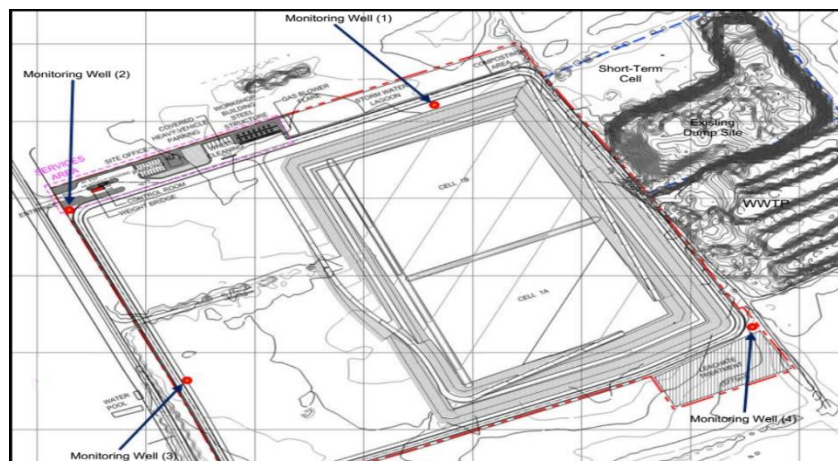


Figure 16: Locations of the assigned sampling points

Table 14: GW Monitoring Wells Results-Sofa Landfill (2018)

Parameter / Unit		Results				Palestinian Standards
		Sample 1	Sample 2	Sample 3	Sample 4	
pH		8.322	7.908	7.698	7.794	6.8-8.5
EC	μS/cm	6,100	15,400	15,450	9,500	-
TDS	mg/l	3,780*	11,480*	10,815*	6,175*	1,500
COD	mg/l	< 10	126	70	< 10	NA
BOD	mg/l	< 10	30	< 10	< 10	NA
Cl	mg/l	1,215*	4,582*	4,293*	2,556*	600
NO <sub>3</sub>	mg/l	62	41	33	103*	70
NH <sub>3</sub> -N	mg/l	0.5	0.7*	0.6*	0.5	0.5

\*Not complying with the PSI standards

Table 15: Leachate Monitoring Results – Sofa Landfill (2019)

Parameter / Unit		Sample 1- Results	Sample 2- Results
pH	-	7.7	7.7
BOD <sub>5</sub>	mg/l	2000	3600
COD	mg/l	31000	36000
TSS	mg/l	561	3827
NO <sub>3</sub>	mg/l	< 0.001	< 0.001
T-N	%	0.8123	0.7787
TDS	mg/l	47300	41700
CL	mg/l	15000	15000

<b>SO<sub>4</sub></b>	mg/l	136	118
<b>NH<sub>4</sub></b>	mg/l	8964	7740
<b>TOC</b>	%	1.12	1.96
<b>CN</b>	-	1.38	2.17
<b>As</b>	mg/l	< 0.001	< 0.001
<b>Fe</b>	mg/l	460	1900
<b>Mn</b>	mg/l	350	64.45
<b>Ni</b>	mg/l	45	7.6
<b>Pb</b>	mg/l	0.4	1.7
<b>Cd</b>	mg/l	< 0.001	0.3
<b>Zn</b>	mg/l	13.6	7.8
<b>Cr</b>	mg/l	330	58.3

Groundwater quality was also tested in both Khan Younis and Rafah Transfer Stations in 2018 before the operation of these facilities, knowing that they are expected to be operated in 2020. The following table shows the results of the groundwater quality for both transfer stations.

**Table 16: GW Monitoring Wells Results – Khan Yonis and Rafah TS**

Parameter / Unit		Kh-TS	Rafah-TS	Palestinian Standards
<b>pH</b>	-	7.975	7.13	<b>6.8-8.5</b>
<b>EC</b>	μS/cm	577	3190	-
<b>TDS</b>	mg/l	320	2,025.65*	<b>1,500</b>
<b>COD</b>	mg/l	< 10	-	<b>NA</b>
<b>BOD</b>	mg/l	< 10	-	<b>NA</b>
<b>Cl</b>	mg/l	55	709.78*	<b>600</b>
<b>NO<sub>3</sub></b>	mg/l	37	143.04*	<b>70</b>
<b>NH<sub>3</sub>-N</b>	mg/l	Nil	-	<b>0.5</b>
<b>K</b>	mg/l	1.19	7.7	<b>12</b>
<b>Zn</b>	mg/l	0.042	-	<b>5</b>
<b>Cu</b>	mg/l	0.012	-	<b>1</b>
<b>Cr</b>	mg/l	0.031	-	0.05

\*Not complying with the PSI standards

### 5.1.3 Surface Water

Three small wadies (Gaza, Beit Hanon and Salqah) cross the Gaza Strip from east to west but have little water in winter and dry in summer. Before 1976, flooding in the Gaza valley caused the closure of the main (North-South) Gaza highway for few days each year. Wadi Al Salqah which is crossing Deir Al Balah city, the estimated distance is more than 20 km to the north.

The potential for increased risk of flooding is not applicable as there is no big surface water catchment area in the vicinity of the waste facilities operated by JSC-KRM. However, there is potential for occasional surface water flows during the winter/wet season.

#### 5.1.4 Ambient Air Quality and Noise

Ambient air quality and noise measurements at Sofa landfill, Rafah and Khan Younis transfer stations including the medical waste treatment facility in the southern governorates were carried out in 2017. Carbon Monoxide (CO), Carbon Dioxide (CO<sub>2</sub>), Oxygen percentage (O<sub>2</sub>%), Noise level, Humidity, and Temperature were measured by using five portable devices. Results were found slightly high in Sofa landfill site due to the operation activities, whereas other results were found reasonable. The following table illustrates the baseline measurements results as well as the locations of measuring points.

**Table 17: Baseline measurements results In JSC-KRM solid waste facilities (2017)**

Point		Elevation	Coordinates		Atmospheric Temperature	Humidity	CO	CO <sub>2</sub>	O <sub>2</sub>	Noise
		m	X	Y	°C	%	ppm	ppm	%	dB
Al Fukhary Landfill	Point 1	56.5	31.26907	34.32375	19.3	41.1	22	449	19.24	56
	Point 2	59	31.26864	34.32381	19.5	35.5	31	580	19.4	68
	Point 3	56	31.26836	34.32371	19.5	35.7	30	550	19.5	37
	Point 4	56	31.26898	34.32492	20	35	21	1100	19.5	68
	Point 5	52	31.26908	34.32052	19.7	30	0	441	19.65	54
KH TS	Point 1	60	31.32159	34.27106	22	37	0	460	19.7	57
Rafah TS	Point 1	32	31.30786	34.23311	22	38.7	0	438	19.64	52

According to available information, the issue of air pollution in the Gaza Strip is attributed to the density of motor vehicles, and especially to the number of old vehicles.

Toxic gases, including Sulphur Dioxide and Carbon Monoxide, which harm the respiratory system, are released into the air as a result of the use of the large numbers of people who run home generators to compensate the shortage in electricity caused by Gaza's inability to run its power plant full-time due to the acute shortage of fuel. It is estimated that there are about 100,000 of these generators in use and that they consume about 500,000 liters of fuel per day (Birzeit University, 2016). The following figure shows the variation in SO<sub>2</sub> concentration in Gaza.



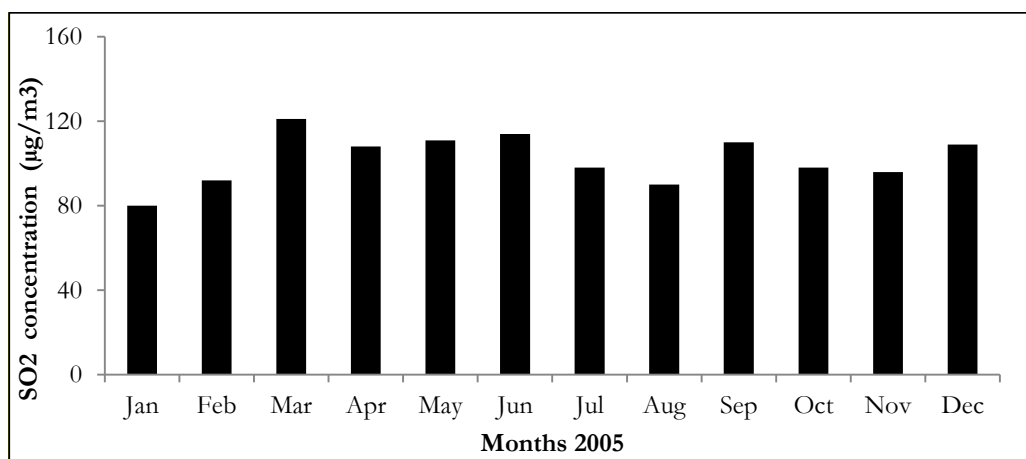


Figure 17: SO<sub>2</sub> concentrations in middle zone of Gaza In 2005 (EPRI, 2016)

While the following figure shows a comparison for NO<sub>x</sub> concentrations between Gaza Strip governorates, which indicates that Gaza City has the highest concentration of NO<sub>x</sub> as it is the most populated area in the Gaza Strip. On the other hand, Khan Younis governorate has the lowest NO<sub>x</sub> concentration which is about 18 µg/m<sup>3</sup>.

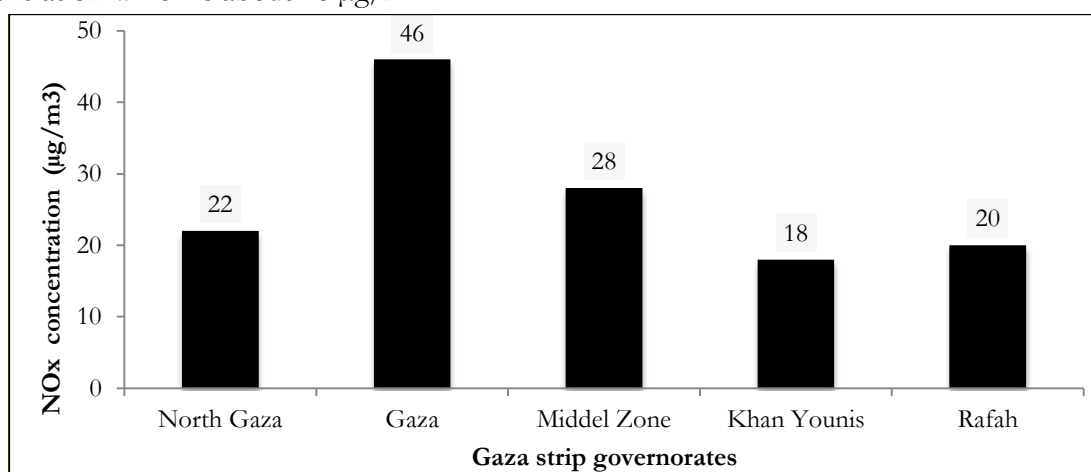


Figure 18: Nox Concentrations In Several Gaza Governorates In 2015 (EPRI, 2016)

## 5.1.5 Metrological Conditions

### 5.1.5.1 Climate

The proximity of the Mediterranean Sea has a moderating effect on temperatures and promotes high humidity throughout the year. There are two well defined seasons: the wet season starting from October to April, and the dry season starting from May to September. Peak months for rainfall are December and January. There is an abundance of sunshine in Khan Younis governorate with an average radiation of 5000 – 7500 kcal/m<sup>2</sup>/day in the summer. The mean annual solar radiation amounts to 2200 J/cm<sup>2</sup>/day. (PCBS, 2016)

#### 5.1.5.2 Temperature

The average daily mean temperature in Gaza Strip ranges from 25 °C in summer to 13 °C in winter, with the average daily maximum temperature range from 29 °C to 17 °C and the minimum temperature range from 21°C to 9 °C, in summer and winter respectively (PCBS, 2016)

#### 5.1.5.3 Humidity

The daily relative humidity fluctuates between 65% in daytime and 85% at night in summer and between 60% and 80% respectively in winter (PCBS, 2016).

#### 5.1.5.4 Wind

The following figure shows the average wind speed from 1997 till 2007. There is a considerable variation in the wind speed during the daytime, and the average maximum wind speed velocity is about 3.9 m/s. Storms can occur in winter when maximum wind speeds reach about 18 m/s. In winter the prevailing wind direction is SW with an average speed of 4.2 m/s and during summer the prevailing winds are from the NW sector (MENA, 2001).

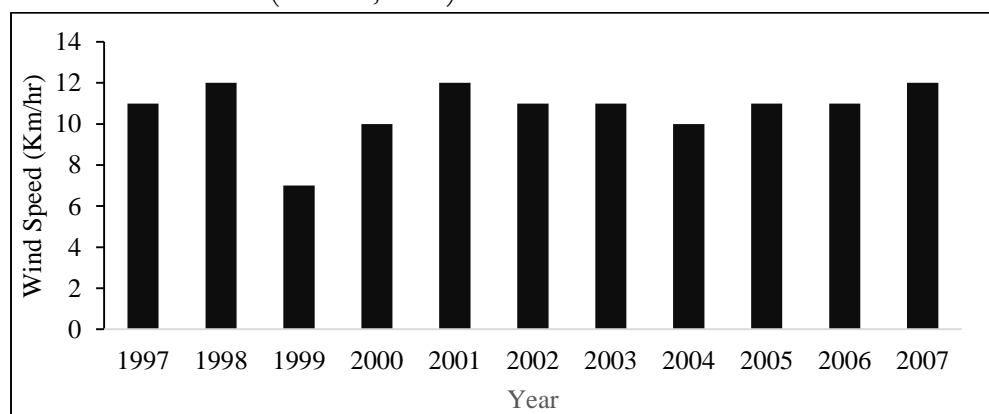


Figure 19: Average Wind Speed For Year 1997-2007 In Km/H

#### 5.1.5.5 Precipitation

Rainfall during the season 2015-2016 is 352 mm on average for the whole Gaza Strip. Rainfall is unevenly distributed and varies considerably by governorates from the North to the South. The average rainfall is calculated over the period 2015-2016 for 3 stations: Deir Al Balah, Khan Younis and Rafah rainfall stations. The following figure shows an average precipitation of 256-273 mm in the site of Khan Younis Transfer Station.

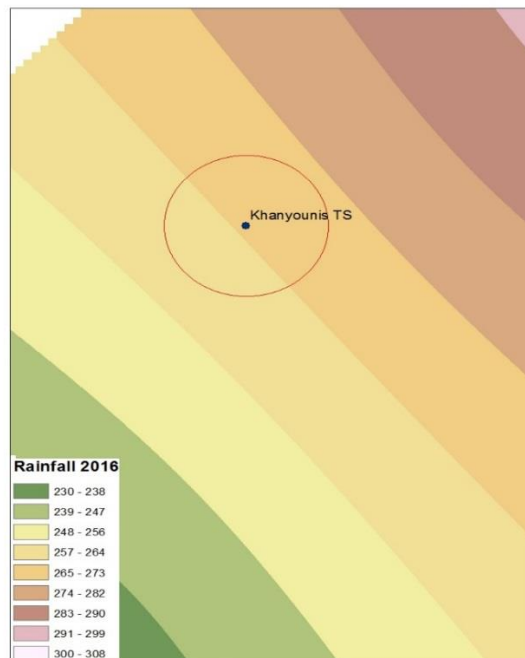


Figure 20: Annual Average Rainfall Data For Khan Younis And Rafah Governorates

### 5.1.6 Roads and Transportation

The access road to Al-Fukhary sanitary landfill was rehabilitated through GSWMP, its length is 2,500 m from Salah Al-Deen St. to the entrance of the landfill, and its width is 7.5 m.

Khan Younis Transfer Station area can be considered a very low traffic rate area taking into consideration that it is mostly a rural / agricultural area. Most of local roads within the project area are not paved. The access road is partially paved and has difference in elevation not exceeding 2.0 m. The paved part of the road is narrow and will not be adequate for the Solid Waste vehicles, therefore, it should be reconstructed. Figure 5.7 shows the built- up areas and the local and main roads at the transfer station site, it is clear that there are rare residential areas around the site and the main roads is more than 1 km faraway.

Rafah Transfer station and surrounding lands are owned by Rafah Municipality. The access road is exclusive for municipality facilities only, no expansion is planned for the access road, knowing that a traffic analysis was conducted by the TS designer, and it's found no traffic jam will be witnessed in the access road.

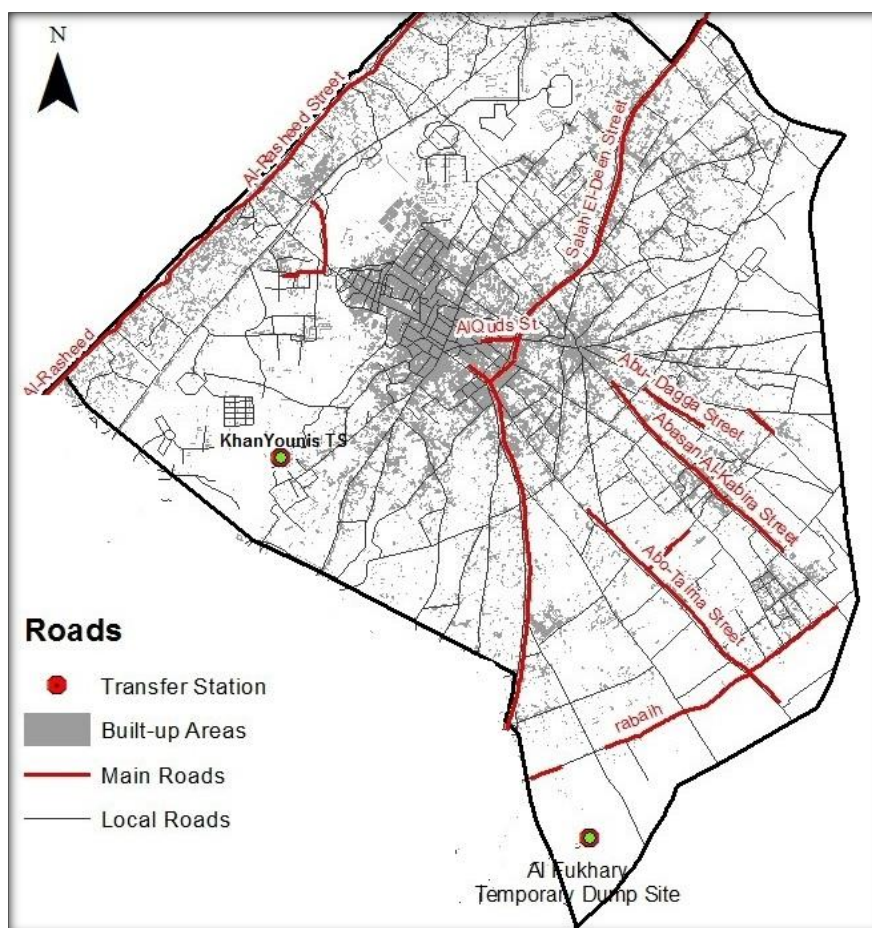


Figure 21: Local And Main Roads In Khan Younis Governorate

### 5.1.7 Land Use and Urban Planning

Most of the populations in the southern part of Gaza (mainly Rafah and Khan Younis governorates) are living in very dense built-up areas with lack of basic facilities, services and infrastructures. The built-up areas include almost all areas used for human settlements, such as residential, commercial, industry, public and private service, public open space etc. The following table shows land use category and its land area.

Table 18: Land Use Category In The Gaza Strip, Source: (IUG, 2014)

Land Use Category	Area _km <sup>2</sup>	% of the total area
Built-up areas	91.51	24.87
Citrus orchards	36.45	9.90
Greenhouses	8.14	2.21
Horticulture	17.74	4.82
Mixed agriculture	113.30	30.79
Natural vegetation/rainfed	16.01	4.35
Olives	48.13	13.08
Sand	35.39	9.62
Water	0.87	0.24
Total Area of Gaza	367.54	

Studying the Regional Plan of Gaza Governorates 2005, Urban development areas are to include land for most of the required purposes; residential, manufacturing industry, commercial, public and private services, without further subdivision, which will be undertaken through local planning processes.

The land is scarce and the pressure on it is increasing rapidly for all kinds of uses; urban, industrial, and agricultural uses. Agricultural land occupies about 72 km<sup>2</sup>, which is about to 65% of the total area of the Khan Younis governorate. It is expected that future expansion will be for the domestic use only (PCBS, 2016).

On June 8, 2016, the session of the Central Committee for Buildings and Organization of Cities No. 11 of 2016 had authenticated changing the use of assigned land parcel (No. 3 of parcel 2375) from agricultural use to public purpose (transfer station for solid waste). It sets out the notice procedures for any complaints according to the announcement issued by the Central Committee published in two journals (Palestine and Al Hayat) on Feb. 01, 2016 as of the article (18) of the Cities Regulation Law. A decision issued and the announcement of changing the land use from agricultural to solid waste transfer station.

The land of the Rafah transfer station is owned by Municipality of Rafah, the surrounded lands included facilities, such as Sorting Facility and WWTP, also owned by Rafah Municipality and their partners. The access road is leading only to Rafah municipality facilities and it is not used for people. The access road width is 12m and it is not expected to be expanded during construction or operation of the transfer station. The previous last use of the transfer station land was a temporary storage of waste in emergency cases.

The land use area surrounding Rafah transfer station as follows:

- From East direction is the solid waste sorting facility belong to Palestinian Environment Friends foundation, and the land owned by Rafah Municipality;
- From the West direction is sand dunes which allocate as green area;
- From the North direction is a garden and playground;
- From the South direction is Rafah WWTP.

The region included other industrial facilities such as stone crushers, and some factories in the eastern direction of the TS.

### 5.1.8 Cultural Heritage and Archaeological Resources

The cultural heritage environment means the historical and/or geographical settings of a certain historical site or area which is essential to the understanding of the site/area and which enhance the identity and character of the site or area. The value of these historical monuments and is embodied in the material demonstration of its stones, structures often beneath the visible surface or other materials represents events and man behaviors theoretically or practically. It should be kept and maintained accurately in a way to reflect its harmony historically and geographically with their origins.

Palestinian cultural heritage suffered tremendously from miserable negligence and consequent deterioration. During the first years of the Palestinian authority; there were some attempts to integrate these cultural objects in the overall development schemes in order to introduce cultural and economic benefit of their existence.

The Archeological sites and historical buildings vary between monuments, mosaic sites, mosques, churches and others. Generally speaking, these sites and buildings are suffering from the absence of adequate legislation of preservation of antiquities and monumental buildings.

These sites are located all over Gaza. Particularly; in the coastal zone they are concentrated in the Deir al-Balah area, on both sides of Wadi Gaza, and by the ancient port of Gaza City as shown in the above Figure 5.8. Sites from our century are mainly found in the cities, especially in the old city of Gaza. And no existence of cultural heritage site beside Khan Younis Transfer station.

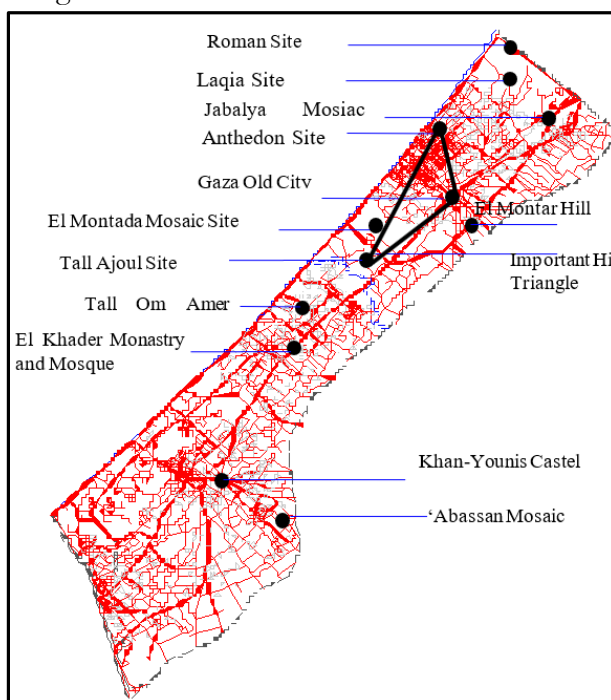


Figure 22: Overall Map For The Historical Sites Attractions In The Gaza Strip



## 5.2 Social Baseline Data

Social baseline data represent the existing situation in the areas which could be influenced by the project operation. Baseline data for Al-Fukhary landfill, Rafah and Khan Younes transfer station, medical waste treatment facility sites, and the secondary collection provided by JSC-KRM are presented in this chapter. The existing social conditions were studied in 2012 in the original ESIA, the following section will cover the updates in the baseline data mainly in the Southern Governorates, where solid waste management services are provided by JSC-KRM.

### 5.2.1 Demographic Characteristics

#### 5.2.1.1 Population and Population Projections

The population of Gaza Strip according to 2019 statistics is around 1.9 million. As could be observed from Table 5.6, the population growth in Gaza is high. The population projection calculated by the Feasibility Study (FS) assumed that gradual decline in population growth will happen starting from 2012. It is anticipated that population growth will reach 1.11% in 2040 after it recorded 3.5% in 2011.

**Table 19: Projected Population Growth in Gaza Strip Until 2040**

Year	Growth	North Gaza	Gaza City	Deir Al Beilah	Khan Yunis	Rafah	Total
2019	3,00%	414.260	708.735	300.300	386.588	256.480	<b>2.066.362</b>
2020	2,91%	426.688	729.997	309.309	398.185	264.174	<b>2.128.353</b>
2021	2,82%	439.105	751.240	318.310	409.773	271.862	<b>2.190.289</b>
2022	2,73%	451.488	772.425	327.286	421.328	279.528	<b>2.252.056</b>
2023	2,64%	463.814	793.513	336.221	432.831	287.160	<b>2.313.538</b>
2024	2,55%	476.058	814.462	345.098	444.258	294.741	<b>2.374.616</b>
2025	2,46%	488.198	835.231	353.898	455.586	302.257	<b>2.435.170</b>
2026	2,37%	500.208	855.778	362.604	466.794	309.692	<b>2.495.076</b>
2027	2,28%	512.063	876.060	371.198	477.857	317.032	<b>2.554.210</b>
2028	2,19%	523.738	896.035	379.661	488.752	324.261	<b>2.612.447</b>
2029	2,10%	535.208	915.658	387.976	499.456	331.362	<b>2.669.660</b>
2030	2,01%	546.448	934.887	396.123	509.945	338.321	<b>2.725.724</b>
2031	1,92%	557.431	953.679	404.086	520.195	345.121	<b>2.780.512</b>
2032	1,83%	568.134	971.990	411.844	530.183	351.747	<b>2.833.899</b>
2033	1,74%	578.531	989.777	419.381	539.886	358.185	<b>2.885.760</b>
2034	1,65%	588.598	1.007.000	426.678	549.280	364.417	<b>2.935.973</b>

Year	Growth	North Gaza	Gaza City	Deir Al Beilah	Khan Yunis	Rafah	Total
2035	1,56%	598.310	1.023.616	433.719	558.343	370.430	<b>2.984.418</b>
2036	1,47%	607.644	1.039.584	440.485	567.053	376.209	<b>3.030.975</b>
2037	1,38%	616.576	1.054.867	446.960	575.389	381.739	<b>3.075.532</b>
2038	1,29%	625.085	1.069.424	453.128	583.330	387.007	<b>3.117.975</b>
2039	1,20%	633.149	1.083.220	458.974	590.855	392.000	<b>3.158.198</b>
2040	1,11%	640.747	1.096.219	464.482	597.945	396.704	<b>3.196.098</b>

Source: Adopted from the Final Feasibility Study for SWM in Gaza Strip, 2011

### 5.2.1.2 Average Household Size

Data revealed a decline in the average of household's size in Palestine during the period (1997-2017) from 6.4 persons in 1997 to 5.1 in 2017. This average declined in the West Bank from 6.1 persons in 1997 to 4.8 in 2017, while it declined in Gaza Strip from 6.9 persons to 5.6 for the same period.

## 5.2.2 Socioeconomic Indicators

### 5.2.2.1 Unemployment and Economic Activities

According to statistics from PCBS in the third quarter of 2019, the unemployment rate between the Gaza Strip and West Bank is 45% in Gaza Strip, and 15% in the West Bank, with 21% for males and 41% for females.<sup>17</sup>

There is a large gap in the labor force participation rate between males and females, as 7 out of 10 of males are in the labor force, compared with 2 out of 10 of females. There is a significant increase in the participation rate of females between the Gaza Strip and the West Bank, where the percentages were 19% in Gaza Strip and 17% in the West Bank.

The employment rate between the youth (19-29 years old), who has diplomas or university degrees, reached 52% (68% female and 35% male). Also, the statistics showed that there are around 3% working children from age 10-17 years (4% West Bank and 1% Gaza Strip).

The number of workers in the local market was raised up between the years 2018 and 2019, since it was 8% higher in West Bank and 3% higher in Gaza Strip for the same period.

30% of wage employees in the private sector received less than the minimum wage (1,450 NIS) in Palestine. There is a significant increase in the wage employees in the private sector received less than the minimum wage in the West Bank from 10% to 12% between 2018 and 2019, while the percentage in Gaza Strip decreased from 80% to 72% during the same period.

Despite the low rate in the West Bank and Gaza Strip, the gap in the monthly wage rate remains high; 660 NIS in Gaza Strip compared with 1,038 NIS in the West Bank.

<sup>17</sup> [http://www.pcbs.gov.ps/portals/\\_pcbs/PressRelease/Press\\_Ar\\_13-2-2020-LF2019-ar.pdf](http://www.pcbs.gov.ps/portals/_pcbs/PressRelease/Press_Ar_13-2-2020-LF2019-ar.pdf)

#### 5.2.2.2 Poverty<sup>18</sup>

Palestine Central Bureau of Statistics finds that 29.2 percent of Palestinian individuals lived in poverty in 2017. In addition, 16.8 percent of Palestinians live below the poverty line. Individuals that live below the poverty line are unable to acquire the necessities of food, clothing and shelter.

Poverty is particularly acute in the Gaza and Palestine's refugee camps. While the 13.9% poverty rate in the West Bank is alarming; over half of the individuals in Gaza and 45.4 percent of individuals in refugee camps live in poverty. Additionally, 33.8 percent of Gazans and 29.3 percent of those in Palestinian refugee camps live below the deep poverty line.

It should be noted that poverty in Gaza is not limited to low levels of income. It is rather characterized by serious shortcomings in other dimensions. There is a serious level of insecurity in income, and food scarcity which results in highly vulnerable demographic segment in the local community. This is a result of strong reliance on external assistance, therefore maintaining sustainable livelihoods for large proportions of GS households is difficult. A large portion of families are suffering from the implication of war and blockage and are generally overwhelmed by the economic and political situation.

The high level of poverty was clearly observed during the field work conducted as part of the ESIA. Some of the observations include the domination of short-term employment contract opportunities, high rate of unemployment among youth including university graduates. This has various social implications on the household level. These observations are thought to be the key causes for poverty and insecurity issues.

#### 5.2.2.3 Literacy Rates and Educational Attainment

The latest statistics show that 96.3% of the population of Palestine is literate. This rate is even higher than that of the UNDP 2014 HDI "high human development" category average. Women have made great strides in literacy over the past two decades, with the rate jumping from 78.6% in 1995 to 94.1% currently. Amongst males, 98.4% are literate. Literacy rates are highest in the Gaza Strip, with a literate population of 96.8%, compared to 96% in the West Bank.

Indeed, the illiteracy rate in Palestine is one of the lowest in the world. Illiteracy is highest in rural areas (4.5%), compared to urban areas (3.6%) and refugee camps (3.2%). The rate is highly gendered, however, with 5.9% of women considered illiterate compared to only 1.6% of men. Palestine has made progress in the education of women, with the rate falling substantially from 20.3% in 1997 to less than 6% at present.

<sup>18</sup> [http://www.pcbs.gov.ps/Portals/\\_Rainbow/documents/poverty-atlas-technical-report2.pdf](http://www.pcbs.gov.ps/Portals/_Rainbow/documents/poverty-atlas-technical-report2.pdf)

## 6. THE PUBLIC CONSULTATION

The project is characterized by the importance and considerable weight given to socio-economic dimensions. The ESIA, thus, was produced in a highly participatory manner that managed to fully engage stakeholders' groups. The ESIA is particularly sensitive to the interests of the primarily affected vulnerable groups like communities adjacent to the facilities, and the local population near the waste disposal sites including waste transfer stations and landfill. Moreover, the ESIA gave high attention to the beneficiaries of the SWM, being the primary targeted groups for the improvements of the system, key players in maintaining the sustainability of the system and also a key group that could be affected economically from the increased service fees.

Consultation and participatory techniques were employed during the process of the ESIA preparation. As indicated under Chapter 2 of the ESIA, the methodology of the preparation of the ESIA involved a bottom-up approach that depended on a diverse range of tools to serve the objectives of the various parts of the ESIA. The Consultant accessed large amounts of quantitative and qualitative information from various primary and secondary sources.

### 6.1 Key Consultation Activities

The key consultation activities during the course of the project could be summarized in table 6.1 and detailed in the following sections.

**Table 20: Summary of Consultation Tools**

Consultation Item		Description
1	The First Consultation Workshop	It was held on Nov. 28 <sup>th</sup> , 2019. More than 45 of stakeholders from JSCs, Municipalities, Ministries, EQA, UNRWA, UNDP, social committee and social representatives, academics, and NGOs attended to discuss the ToR of the assignment and the expected changes on the original ESIA. 13 of attendees (about 30%) were women.
2	Household Survey	It was carried out in December 2019 targeting 79 households in the serviced JSC-KRM area. The questionnaire was distributed mainly in areas serviced by the waste secondary collection to investigate about affordability, willingness to pay, and some of awareness issues. 89% of responders were men although the interviewee staff were ladies.
3	Focus group discussions	Three of focus groups were carried out in Al-Fukhary Landfill, Rafah Transfer Station, and Khan Younis Transfer station (including the medical waste facility). All attendees were men although announcements were for public. Affordability, willingness to pay, and some of awareness issues were discussed, and mainly the satisfaction of stakeholders was raised for discussion in each facility.
4	Semi Structured Interviews (SSI) and Informal/ Unstructured Interviews	SSIs were adapted with various institutions representatives including the Joint Service Council (JSC), farmers adjacent to the landfill and formal workers.
5	Consultation Meeting for women	It was clear from the previous consultation tools the limited contribution of women. A consultation meeting was held on February 16 <sup>th</sup> , 2020 to reflect

Consultation Item		Description
		the views of 27 women from the service area focusing on the secondary collection issue. The meeting was organized by a local NGO in Khan Younis in coordination with one of the project social committee.
6	Farmers Interview (Sofa Landfill)	Consultant investigated the willingness of farmers to get benefit from the collected stormwater for irrigation purposes.
7	Consultation with Informal Waste-pickers in Rafah	Informal waste-pickers in Rafah were consulted to make sure that their livelihood sources will not be affected by the
8	Final Consultation Meeting	The second consultation meeting will be conducted after finalizing the draft version of the ESIA.

### 6.1.1 The First Consultation Workshop

Two consultation workshops are proposed to be carried out during the screening stage, and after preparing management and monitoring plans. The first workshop was carried out on November 28th, 2019. Invitation were sent to about 60 stakeholders from different sides (governmental ministries and authorities, municipalities, NGOs, Social Committee, UNRWA, UNDP, Academics, consultants...etc); 46 of invited people were attended the workshop. The workshop was divided into two sections as the following:

#### Section One: Presentation

The presentation included two parts 1) the JSC-KRM activities and how it is improved through the GSWMP; each facility was presented in details and how it is operated, Hence JICA presented the part related to the medical waste operations, and the proposed improvements, whereas MDLF and JSC-KRM presented the remaining operations at Sofa landfill, Transfer stations, and the secondary waste collection, 2) The additional fund objectives and what are the changes between the original ESIA ToR and the new ToR for review and update the ESIA, 3) The ToR was presented task by task for the next section (discussion).

The presentation showed how does each facility was improved comparing with the previous situation i.e Rafah transfer station which enhanced the environmental conditions in Rafah city by converting the previous dumpsite in Tel Al-Sultan into a healthy and closed facility, as well it included a new maintenance workshop instead of the previous municipal workshop in Rafah which is located in a very dense area and it is considered as a source of noise, traffic and odors.





Image 7: Presentation Part of The Consultation Meeting

## Section Two: Discussion

The discussion was initiated by dividing the attendees into four groups, each group included a representative from the social committee, EQA/water authority/MoLG, Municipality, NGO, UNDP/UNRWA, Consultant/Academic in order to get the variety of ideas in discussion. The four groups were requested to discuss about all the expected impacts due to operation of facilities, and propose mitigation measures. The four groups were divided in terms of activities as the following:

- Operation of Al-Fukhary Landfill;
- Operation of Rafah and Khan Younis Transfer Station;
- Operation of Medical waste treatment facility (from source to the treatment facility); and
- Waste secondary collection.





Image 8: Discussion Part of The Consultation Meeting

### Outputs of the Consultation Meeting

The consultation of each group resulted in an expecting list of impacts as well mitigation measures. Results was presented by each group, and questions/inquiries were given by the remaining groups. The main headlines of the consultation outputs are presented in the below table.

Table 21: Outputs of Consultation Workshop

Group	Expected Impacts	Mitigation Measures
<b>Operation of Sofa Landfill</b>	<ul style="list-style-type: none"> <li>- Pests and Stray dogs;</li> <li>- Odors/deterioration of air quality;</li> <li>- Waste burns and fires;</li> <li>- Leachate impacts on groundwater/soil;</li> </ul>	<ul style="list-style-type: none"> <li>- Pest Management Plan should address the source of pests;</li> <li>- Plan for decreasing the dogs impacts to be prepared once complaints are received.</li> </ul>

Group	Expected Impacts	Mitigation Measures
	<ul style="list-style-type: none"> <li>- Noise resulted from heavy equipment and vehicles;</li> <li>- Inconvenience of the adjacent agricultural lands;</li> <li>- Safety of employees, and labor rights;</li> <li>- Safety of community focusing on the sensitive groups (women and children).</li> </ul>	<ul style="list-style-type: none"> <li>- A daily cover should be applied on the daily basis to prevent fires and decrease the odors;</li> <li>- Leachate treatment technology to be implemented at the site, and inspection of the leachate collection system to be carried out regularly;</li> <li>- Groundwater monitoring should be conducted regularly;</li> <li>- Work should be at day time only;</li> <li>- Complain system should be available for any potential complaints;</li> <li>- Safety plan and emergency response plan should clearly describe the hazards at the site, and avoid them;</li> <li>- The community safety plan is an important issue, and it is recommended to be prepared in coordination with the social committee and community representatives.</li> </ul>
<b>Operation of Transfer Stations</b>	<ul style="list-style-type: none"> <li>- Regarding to the inspection of groundwater, one observation well is not enough for inspection; it cannot observe once the pollution reaches to the groundwater if it is from the transfer station or the adjacent wastewater lagoons;</li> <li>- Storage of waste in emergency case would affect on the near localities;</li> <li>- Traffic are expected due to the incoming donkey carts and vehicles at the morning hours;</li> <li>- Pests and Stray dogs;</li> </ul>	<ul style="list-style-type: none"> <li>- Consulting with PWA to determine if more inspection wells are required at Rafah transfer station and determine the location;</li> <li>- During emergency cases, waste should not be stored in transfer stations, but other specified locations (determined in a separated study);</li> <li>- The waste should be transferred to the landfill on the daily basis; waste should not be stored for more than 24 hours;</li> <li>- Leachate tank should be isolated if it is not isolated, and it should be evacuated regularly;</li> <li>- Work should be limited to the day time only;</li> <li>- A traffic plan should be prepared by the municipality of Rafah, and a plan</li> </ul>

Group	Expected Impacts	Mitigation Measures
	<ul style="list-style-type: none"> <li>- Odors/deterioration of air quality;</li> <li>- Leachate impacts on groundwater/soil;</li> <li>- Noise resulted from heavy equipment and vehicles;</li> <li>- Safety of employees;</li> <li>- Safety of community focusing on the sensitive groups (women and children);</li> </ul>	<ul style="list-style-type: none"> <li>for donkey carts should be also discussed with JSC-KRM.</li> <li>- Pest management plan should also cover the transfer station, and it can be used once it is necessary;</li> <li>- Safety plans should be prepared for employees, and community;</li> <li>- Labor rights to be complied based on the Palestinian labor Laws.</li> </ul>
<b>Operation of Medical Waste Treatment Facility</b>	<ul style="list-style-type: none"> <li>- Impacts on the health and safety of workers;</li> <li>- Possibilities of mixing other waste at source which will received at the end to the treatment facility;</li> <li>- The quality of treatment could be deteriorated;</li> <li>- Odors and emissions could affect the workers and near localities;</li> <li>- Noise due to use of heavy machinery;</li> <li>- Leachate could deteriorate the groundwater/soil;</li> <li>- The transfer of the medical waste could expose a danger to the community.</li> </ul>	<ul style="list-style-type: none"> <li>- Good ventilation should be provided at the treatment facility;</li> <li>- Health and safety plan should be provided, moreover fire extinguishers and first aid boxes to be provided at the site, Workers should be provided by PPE and insurance to cover them;</li> <li>- The treatment facility should be cleaned by sterile materials;</li> <li>- Leachate should be separated, leachate tank should be isolated, and leachate should regularly be evacuated after chlorination.</li> <li>- Sorting of medical waste at source should be restricted, any noticed problems should be addressed with the administration of the hospital/medical center;</li> <li>- Transfer of medical waste should be conducted by closed vehicles which hold the hazardous sign;</li> <li>- The medical waste should not be stored at the treatment facility for more than 12 hours to prevent the odors;</li> <li>- Pest management plan should cover the treatment facility;</li> </ul>

Group	Expected Impacts	Mitigation Measures
		<ul style="list-style-type: none"> <li>- Labor rights to be complied based on the Palestinian labor Laws.</li> </ul>
<b>Waste Secondary Collection</b>	<p><b>Containers</b></p> <ul style="list-style-type: none"> <li>- Inconvenience of people from the place of containers instead of their houses;</li> <li>- Scattered waste around containers has an adverse impact (odor, rats, dogs, pests...etc);</li> <li>- Burning of waste in some containers is deteriorating the air quality and has an adverse impact on the human health;</li> <li>- The received waste at containers could include construction and demolition waste or any other waste (not MSW);</li> </ul> <p><b>Collection Vehicles</b></p> <ul style="list-style-type: none"> <li>- Some of vehicles used for transporting the waste are noticed without cover, and waste can be thrown down during travelling;</li> <li>- Impact on streets' safety, and traffic;</li> <li>- Impacts on the workers' health and safety;</li> <li>- The location of the landfill is far from the middle area, which enhance creating new small dumpsites.</li> </ul>	<ul style="list-style-type: none"> <li>- Awareness is the key to solve the problem of containers location, burning of containers, and the type of waste which is allowed to be received at containers;</li> <li>- Collection frequency should be organized in order to prevent creating scattered waste around the container, otherwise bigger containers can be replaced or more containers;</li> <li>- Fines should be sent to people who put other waste (not MSW) in containers;</li> <li>- Complaints system should be activated in the service area;</li> <li>- All collection vehicles should be covered during waste transport, and should not carry more than allowed quantity;</li> <li>- Leachate should be stored in the collection vehicle, and evacuated at the landfill;</li> <li>- Collection vehicles should follow a safety plan for workers and the community, the speed of travelling should not exceed 30 km/hr in city streets, and 50 km/hr in high ways;</li> <li>- Collection should be avoided in rush hours;</li> <li>- Construction of a transfer station/s in Middle area is necessary to enhance the collection process at that area;</li> <li>- Labor rights to be complied based on the Palestinian labor Laws.</li> </ul>

### 6.1.2 Household Survey

A questionnaire was designed, tested and applied in the field to collect quantitative data on the status of the current situation of SWM service and communities' views on the secondary collection services quality, service providers, practices, service fees, and willingness and affordability to pay for the service. The questionnaire also investigated community awareness needs and local communities'

recommendations for the secondary collection service. **The survey questionnaire is attached in Annex III.**

Local communities were purposively selected in four municipalities in the southern governorates of Gaza Strip namely; Khan Younis, Bani Suhaila, Wadi Alsalka and Deir Elbalah (mainly areas served by JSC-KRM in term of secondary collection). The Consultant has identified a set of criteria relevant to the study objectives and can reflect the overall view on SWM issues in southern governorates. In total 79 respondents were surveyed.

The data collection team consists of three qualified social surveyors (ladies for better access to houses) who were trained on applying the designed questionnaire. The team was supervised by the team leader on a daily basis. Data was entered using Excel and analyzed using SPSS. Table 6.3 below presents the key characteristics of the survey sample.

The secondary collection service is mainly carried out by either JSC-KRM, Municipalities, or UNRWA. Questionnaire was targeting only areas served by JSC-KRM, the sample size is almost 0.25% of the served population (about 300,000 inhabitants served by JSC-KRM in term of secondary collection in 2019).

**Table 22: Key Characteristics of The Survey Sample**

Variable	Number of respondents	% of the survey sample
<b>Gender</b>		
Male	70	88.6
Female	9	11.39
<b>Age group</b>		
18-24 years	15	18.99
25-39 years	26	32.91
Between 40 and 54	24	30.38
Above 55 years	14	17.72
<b>Educational Level</b>		
Illiterate	3	3.80
Read and write	5	6.33
Preparatory education	29	36.71
Technical education	10	12.66
University degree	29	36.71
Post graduate studies	3	3.80

Variable	Number of respondents	% of the survey sample
<b>Economic Activity</b>		
Small business	8	10.13
Unemployed	34	43.04
Vocational activities	5	6.33
Governmental Officer	22	27.85
Specialized jobs	4	5.06
Private sector employee	6	7.59
<b>Family size</b>		
Less than 4 members/family	15	18.99
5 to 9 members/family	54	68.35
10 members and more by family	10	12.66

### Outputs of the Household Surveying

The following views were driven from the analysis of results of the household survey, the household survey targeted 79 houses in the served area:

#### 6.1.2.1 Frequency of waste collection and Quality of Service

The frequency of service indicates that more than 48% of participants receive a daily SW collection service, of which only 3.8% receive the collection service twice a day.

**Table 23: Frequency of Collection**

Frequency of Collection	N	%
More than once a day	3	3.80
Once a day	35	44.30
Every other day	18	22.78
Twice a week	17	21.52
Once a week	4	5.06
Irregular	0	0.00
Total	79	100.0

In order to measure the quality of service, the targeted areas were asked about the coverage of waste transfer vehicles and if they notice waste littering around containers even after emptying the containers, the responds on these two questions is illustrated in the table 6.5



Table 24: Waste Accumulated Around the Containers

Waste accumulated	N	%
Yes	34	43.04
No	45	56.96
Total	79	100

#### 6.1.2.2 Solid Waste Management Services Fees and Affordability Issues

SWM services are known to consume large portion of the budgets of the municipalities. It is also widely recognized that the service fees collected from the beneficiaries of the service (local communities) is in general small and marginal and varies widely from one place to the other. In the Palestinian Territories, there is no adequate legal enforcement system. If bills for SWM services are sent by an entity but not paid, courts will not accept the case made by the local government or private enterprise because of the relatively small amount. Moreover, courts might well decide the defaulter is not able to pay. This is creating a serious challenge for the service operators who are not able to meet the financial demands of operating the system. Waste fee collection efficiency is, generally speaking, rather low. It is reported to vary between less than 10%, and around 60% being the most optimistic estimate.

Table 25: Average Monthly Income of The Targeted Households

Income (NIS)	Number of households	Percentage %
Less than 1000 NIS	33	41.77
1000-2000 NIS	38	48.10
2000-3000 NIS	4	5.06
3000-4000 NIS	2	2.53
More than 4000 NIS	2	2.53
Total	79	100

Results indicated that 72% of household targeted in the questionnaire are committed with paying for the solid waste management services. While the other 28% admitted that they do not pay for this service.

The largest portion of the survey sample (around 56%) stated that they pay amounts between NIS 5 to NIS 10. However, more than 34% of the samples indicated that they don't know the service monthly fees. Table 6.8 illustrate the monthly fees and percentage of respondents.

Table 26: Current Monthly Waste Management Fees

Monthly fees	N	%
<b>Nothing</b>	0	0.00
<b>1 :5 NIS</b>	0	0.00
<b>5 :10 NIS</b>	44	55.70
<b>10 : 15 NIS</b>	7	8.86
<b>15 : 20 NIS</b>	1	1.27
<b>Don't know / Can't remember</b>	27	34.18
<b>Total</b>	79	100.0

According to Habitat, the percentage of the monthly household income that can be freed for SWM in the developing world is 1.0 - 1.5% of the family income and according to some World Bank studies, this could even reach 1 - 3%. No accurate figures were found for the average family income in Gaza Strip. However, according to UNSCO, 2010, the average daily wage in Gaza is NIS 60. Under the assumption that large portion of the population is making a living from daily wages and assuming that only one person per family is working on daily wage basis, it could be argued that an average payment of NIS 15/household/month is regarded as a relatively high payment. Although the figure still falls within the World Bank suggested percentage of income, Gaza Strip case should be dealt with very carefully. The large portion of population living below the poverty line, the fact that most of income sources are insecure and of temporary nature add vulnerability to the households' income and make it possible to suggest that local population might be unable to afford for these service fees.

The majority of the interviewed local community members expressed concern and dissatisfaction with the heavy charges for other services which overload them. This could be, however, interpreted in two different ways. One view may suggest that the other service fees for gas, electricity, water and sanitation are already too high and, in some cases, take a significant portion of the family income and this is not an optimal situation in terms of sensitivity to the social issues. However, it could be, on the other hand, argued that the portion paid for SWM is still very limited compared to other services and that local communities should be less reluctant to accept payments for SWM. There is generally a need for raising the awareness with the fact that SWM service involves operational and management costs that could not be covered without setting tariff system and implementing efficient service fees collection system.

Reasons for not paying for the service were also investigated. The following table illustrates the possible reasons for not paying for the service and the percentage of people who voted for each reason.

Table 27: Reasons for Not Paying for The Service

Reason	Percentage of respondents%
The level of service is low	4.55
Cannot afford to pay	90.91
This service should be delivered for free	0.00
No one asks me to pay	4.55
Total	100

As illustrated in the table above, according to participants, more than 90% of them are not paying because of their unaffordability to pay. All participants agree that this shouldn't be a free of charges service, this was also confirmed by focus groups discussions with localities in Rafah and Khan Younis governorates.

#### 6.1.2.3 Community views on payment suitability for the offered service

Despite the fact that considerable portion of the surveyed households does not pay the fees as indicted above, 78.48% of the respondents expressed positive impressions about the suitability of the service fees to the offered service with the current payment while 21.52% thinks that the payment is too high compared to the level of services provided.

#### 6.1.2.4 Community view on best suitable fees and billing mechanism

More than 65% of participants indicated that they would fully commit with paying the fees in case of separating the SWM bill from other municipal services bills. The survey sample were also asked to choose what they see as the suitable SWM fees for the current service. The results of what people see as the best fees are illustrated in the below table.

Table 28: Community View on Best Proposed Monthly Waste Management Fees

Monthly fees	N	%
Nothing	10	12.66
1 :5 NIS	8	10.13
5 :10 NIS	49	62.03
10 : 15 NIS	8	10.13
15 : 20 NIS	4	5.06
Total	79	100.0

#### 6.1.2.5 Grievance Mechanism

64.5% of the surveyed sample indicated that they know about the grievance mechanism in JSC and municipalities, while the other 35.4% are either don't know if there is a grievance system or indicated that they didn't hear about such system in JSC or municipalities.

#### 6.1.3 Focus Group Discussions (FGD)

The Consultant has conducted three focus group discussions in December 2019 with three localities near the SWM facilities to verify and to further investigate in a qualitative in-depth manner. The Consultant has designed guidelines/checklists to be used during facilitating the discussions. The FGD covered the same issues of the survey (Secondary Collection), and in addition it covered issues related to the impact of the operation of the four facilities (Al-Fukhary Landfill, Rafah Transfer Station, Khan Younis Transfer Station including the Medical Waste Treatment Facility) the main issues covered are: Community views on SW services quality, Payment issues (amount and regularity), Suggested improvements, Willingness to pay (WTP), Awareness needs and appropriate approaches, Views on the nearby transfer station/disposal sites, and Impacts from the operation of the facilities.



Tour for Khan Younis FGD Attendees to Know  
More About Medical Waste Treatment Facility



Focus Group Discussion About Rafah TS

Image 9: Photos from the focus group discussions

## Outputs of the Focus Groups

Attendees of Al-Fukhary Focus Group informed that the new landfill solved many of the problems that were caused by the old dump site like odor and waste accumulation in the streets, they have also raised issues about negative impacts from the landfill operation, their main concerns were related to the leachate odor and the dust resulting from the operations needed for the daily cover.

Focus groups discussions in Rafah and Khan Younis revealed that the majority of the community see that the current fees are suitable for the offered services, but it's the economic situation that affects the fees collection rate.

Community adjacent to Khan Younis and Rafah transfer stations are not suffering from any negative impact as transfer stations are not operated yet, but they have fears related to the odor that may result from the station operation. The community is suffering from odor resulting from the medical waste treatment, they also mentioned that Mosquitoes spread significantly after the operation of the medical waste treatment facility.

It was obvious that the local community specially the one adjacent to Sofa sanitary landfill do not have a good communication with the JSC-KRM or municipality and the grievance mechanism is not clear for them. This requires the JSC and municipalities to develop a better communication plan with the local communities.

### 6.1.4 Semi Structured Interviews (SSI) and Informal/ Unstructured Interviews

The SSIs allowed for interviewing 2-3 individuals from similar social groups/affiliation. The tool was flexible to accommodate diverse type of questions including closed and open-ended questions. SSIs were adapted with various institutions representatives including the Joint Service Council (JSC), farmers adjacent to the landfill and formal workers.



Image 10: Interview With JSC-KRM Executive Director



An interview with a worker in Al-Fukhary landfill revealed that the only training he ever had was related to first aid, this shows that there is a lack of training programs related to SWM.

The following points summarize the current Labor Management and Health and Safety condition of JSC workers in the solid waste management field as informed by JSC-KRM executive director:

- All JSC-KRM workers, drivers, and employees are covered by insurance.
- All JSC-KRM workers and drivers are provided by Personal Protective Equipment (Vests, overall, safety shoes, gloves ..etc.) regularly. As well, workers are provided by safety training for more than three times in the last 4 years.
- All JSC-KRM workers are vaccinated against the tetanus, in addition to the Medical waste facility who are vaccinated against hepatitis.
- First Aid Boxes and Fire extinguishers are provided in all JSC-KRM facilities.
- Code of Conduct is provided for workers and drivers in most of JSC-KRM facilities (ANNEX V).
- Sick leave and personal Leave are provided according to the Palestinian labor law.
- Additional works are registered and workers are compensated either by “additional payment on the salary” or “additional days of personal leave”.
- Workers and drivers are supervised by in charge operation engineers in each governorate, each worker is required to submit a daily report at the end of the day.
- Workers are making the check on dumping trucks every day before starting the waste collection.



**Image 11: An Interview with A Formal Worker in The Landfill**

#### **6.1.5 Farmers Interview (Sofa Landfill)**

An interview with the farmers whose lands are adjacent to Al-Fukhary (Sofa) landfill revealed their acceptance to buy the storm water collected in the landfill facility for irrigation purposes. They are willing to pay 1 NIS per cube of water to JSC-KRM, But JSC-KRM informed they will provide for



free, but some of tests will be carried out to ensure the quality of storm water before using for irrigation.



Image 12: An Interview with the farmers adjacent to the landfill

#### 6.1.6 Consultation Meeting for Women

Since the number of the participated women in the household surveys and the FDGs wasn't sufficient, a consultation meeting with 27 women, lives in different neighborhoods in Khan Younis city, was conducted in one of the local NGOs in the city, and this NGO was chosen because its executive director is one of GSWMP social committee and he was attending the first consultation workshop in Dec 2019.

The aim of the consultation meeting, was to collect data and previews of the women about the secondary collection services in their areas, so the household survey main questions were used in this meeting.

Most of the participated women aged from 35 – 50 years old and there were 6 of them aged from 23-26 years old. About 82% of the participated women has no jobs (housewives).



Image 13: A Consultation Meeting with Women in Khan Younis City.

### Outputs of the Women Consultation Meeting

The following views were driven from the discussions in the meeting:

#### 6.1.6.1 Frequency of waste collection and Quality of Service

All the women confirmed that the collection service is very organized in their areas, 20% of them lives in areas without containers, so the municipality workers collect the waste from house to house using donkey carts, 50% lives in neighborhoods covered with 1m<sup>3</sup> containers, and the others lives in areas with 4m<sup>2</sup> containers.

The frequency of collection the wastes is once a day from all the areas of the participants, 40% confirmed that the collection is 6 days a week, since there is no collection in Fridays.

In order to measure the quality of service, the targeted areas were asked about the coverage of waste transfer vehicles and if they notice waste littering around containers even after emptying the containers, all the women live in an areas served by compactors, so they are not suffering from coverage issue, but they complained from the process of compacting the waste in the vehicle as soon as it evacuate the container, because of the leachate leakage on the road.

All the women suffer from the waste littering around containers and they said this caused by people who send their children to the containers.

One woman had a big concern from the 4m<sup>3</sup> container, besides her house, because a private medical center litter its waste in the same container, and she expressed her worries on the family health from burning this waste at night by the residents.

#### 6.1.6.2 Solid Waste Management Services Fees and Affordability Issues

The majority of the participants expressed concern and dissatisfaction with the heavy charges for other services which overload them. And they confirmed that the current economic crises in Gaza Strip, make it difficult to pay their bills, and they agree that 10 NIS is not sufficient for the cost of the collection and disposal services, but that is too much for the poor families.

### 6.1.6.3 Grievance Mechanism

90% of the participants in the meeting indicated that they don't know about the grievance mechanism in JSC and municipalities, while the other 10% heard about the complaint system of JSC-KRM through the public awareness team, but they didn't submit any complaint before. 25% of the participants prefer not to talk about their concerns for the official parties, because they think that may cause troubles for the poor waste workers in the area.

### 6.1.7 Discussion with Informal Waste-pickers

The informal sector can be mainly divided into two groups.

- A) Waste pickers who work in waste storage site for recovering recyclables.
- B) Street pickers who collect the recyclables from the waste bags in front houses and from the containers before they are emptied.

The number of **group (A)** is relatively restricted since the number of informal members engaged in the waste storage site could be roughly quantified from the field observation. The total number of the members of this group could be roughly quantified to be around 6 and they all exist in Rafah temporary waste storage site; this location is temporarily used until the operation of the new transfer station. The site also includes a demolition waste crusher which the waste pickers use as a source of income, knowing that the place of crusher will not be changed and will remain in the same place giving the chance for waste pickers to use it as usual even once the new Rafah transfer station will be in operation. Further investigation on this group revealed that this group receives assistance from the Ministry of Social Affairs (MoSA) and they are not the main breadwinner for their families, knowing that five of them are below 16 years old.

**Group (B)** of informal sector involves the street pickers who collect the recyclable from street containers or piles in front of the houses. This group works actively during nights and very early in the morning before the municipality shift starts for emptying street containers.

This group is distinguished by being heterogeneous and widely diverse. Operation under this group attracts numerous numbers of the poor from various ages and backgrounds. The group consists widely of school children who help their families in generating additional income. The daily income out of this job can be as low as 5 NIS per day but still can help the family. They are also very sensitive to the social stigma of their business. They feel ashamed to work during the daylight or to be interviewed. Quantifying this group was found to be very difficult. This mode of informal sector operation under this type is characterized by frequent daily ins and outs of the market. The market is daily attracting hundreds of members who seek temporary and quick source of income. Generally speaking, this group of the informal sector does not rely on the income obtained from selling recyclables as the main source of income. They usually have additional sources of income from similar types of marginal activities. It is worth noting that the increased number of informal members of Group B negatively affected the income of members of Group A who are working at transfer stations. Sorting and recovering recyclables from street containers result in waste arrival to the transfer stations and landfill with lower component of recyclables than it used to be.

In several cases the formal waste workers play the role of Group B of the informal sector by recovering and selling recyclables from the collected waste.



**Image 14: Waste Pickers in The Temporary Rafah Storage Site (Rafah Storage Site Includes Storage of Municipal Waste in Roll On/Off Containers, And Includes Construction and Demolition Crusher**

#### **6.1.8 The Final Consultation Workshop**

The second consultation meeting will be conducted after finalizing the draft version of the ESIA. The various requirements of the public consultation will be considered, including but not limited to:

- Identification and invitation of various groups of stakeholders as indicated above;
- The composition of the invited groups and their representation should be sensitive to the aspects of gender, poverty and vulnerability. Those groups who are likely to be marginalized and whose voices are usually not heard like women, children and youth should be encouraged to participate, generally along the ESIA process and in particular during the Public Consultation;
- The preparation and dissemination of Arabic non-technical executive summary before the workshop;
- Prepare and deliver presentation for the findings of the environmental and social aspects of the projects including all the proposed alternatives and the selected alternative, environmental and social considerations for this selection and the environmental and social management plan (ESMP) including the various mitigation measures;
- The comments and concerns that the participants will raise during the Public Consultation will all be addressed and the ESIA will be updated accordingly;
- The Consultant will make the best use of the previous experience and resource persons with experience in organizing and moderating such processes;

During the course of the ESIA, various qualitative and quantitative tools will be designed, tested and applied to gain local communities' prospective about the current situation, the potential impacts of the project facilities and the recommendations on how to mitigate any potential negative impacts and



maximize the social gains particularly for those groups who are too vulnerable to cope with such negative impacts such the informal sector of waste/recyclables pickers whose livelihoods might be drastically influenced by the project. The findings from the various participatory and consultative process will be integrated into the ESIA. These activities will strengthen the sense of ownership of local stakeholders to the project.

## 6.2 Consultation Reviews

The variety of consultation tools and variety of stakeholders help in creating a diverse of reviews and views, as well the gender dimension took into consideration to secure this diversion of thoughts. Most of the expected impacts were realistic, meanwhile the proposed mitigation measures were not fully realistic i.e. proposing to implement a waste to energy facility or trying the circle economy and circle waste management in the time JSC-KRM and municipalities are still facing a lot of technical problems as well a lot of problems of the community culture. Most of the proposed mitigation measures and reviews were reflected in chapter 7 and 8. The consultant put efforts to judge the reality of mitigation measures and try to optimize the management and monitoring plans to be applicable.

## 6.3 Recommendations

It was obvious that the local community specially the one adjacent to Sofa sanitary landfill do not have a good communication with the JSC-KRM or municipality and the grievance mechanism is not clear for them. This requires the JSC and municipalities to develop a better communication plan with the local communities.

Social Committee should take the lead to communicate the operator (JSC-KRM) and municipalities with the community as it is an active tool. Awareness programs could also be carried out in order to achieve two main goals: to let people know more about waste management, the cost of the service, and the importance of paying the service fees, and to let people know more about the operator and the established channels for complaints.

## 7. ENVIRONMENTAL AND SOCIAL IMPACTS AND PROPOSED MITIGATION MEASURES

### 7A. ENVIRONMENTAL IMPACTS AND PROPOSED MITIGATION AND MONITORING MEASURES

The assessment of potential impacts has been done through analyzing different project activities and envisaging possible changes to the environment. Each potential impact was qualitatively analyzed to classify its significance to three degrees as shown in the following table.

**Table 29: Degrees of Potential Impact Significance**

Degree		Definition
1	<b>major impacts</b>	Impacts with a reasonable likelihood that are likely to cause violation of applicable standards.
2	<b>medium impacts</b>	Impacts with a reasonable likelihood that are likely to cause violation of applicable standards only in combination with the impact of other sources.
3	<b>minor impacts</b>	Impacts which are not likely to cause violation of applicable standards whether on its own or in combination with other sources.

Further classification was illustrated for each impact into positive and negative impacts, direct and indirect impacts, and short-term and long-term impacts as well as clearly identifying any impact that may not be mitigated. The cumulative impact of WWTP and Sofa Landfill, the cumulative impacts of Rafah wastewater lagoons and Rafah transfer station site were studied, moreover cumulative impacts will be studied in different sites i.e. Khan Younis TS and medical waste treatment facility.

The consultant conducted a desk review of all the documents provided by JSC-KRM including but not limited to; as built design drawings, progress reports, and consultation documents. Also, many site visits were conducted to the JSC-KRM solid waste management facilities to check the comprehensiveness of mitigation measures, and its compliance with the environmental and social aspects during the construction phase. It was clearly observed that the design of Sofa landfill, Rafah TS, Khan Younis TS, and the medical waste treatment facilities are complied with the required environmental and social mitigation measures that was proposed in the original ESIA-2012.

The addendum ESIA will focus on the operation of JSC-KRM solid waste management facilities namely: Al-Fukhary Sanitary Landfill, Khan Younis and Rafah TSs, medical waste treatment facility, and secondary collection service.



## 7.1 Impacts of the Waste Facilities during Operation Phase

### 7.1.1 Odor Impacts

#### 7.1.1.1 Al-Fukhary (Sofa) Landfill Site

The impact of odor is normally considered a mere annoyance, as foul smells can rarely harm health directly. However, due to the nature of landfills, the odors produced can potentially be quite powerful and mainly contains a complex mixture of ammonia and hydrogen sulphide. The odor impacts could be the cause of public opposition to the proposed landfill site, the main sources of odor at the landfill site will be:

- Aerobic decomposition of organic wastes moved around the site and freshly disposed of in both the landfill and the composting/recycling station.
- Anaerobic decomposition of disposed of wastes over extended time periods. This will generate landfill gas which contains malodorous trace components.
- Landfill leachate collected and discharged to the leachate pond.

Organic waste will begin decomposing prior to reaching the landfill. Movement and placement of such waste along with agricultural waste within the landfill site will produce more odors. Once the waste is in place, continued decomposition will result in landfill gas which is a significant source of odor. Although the gas will be collected by a gas collection and flaring/energy recovery system as advocated by the proposed project, odorous gas may still escape the collection system or leaks out, these risks are discussed separately.

Landfill leachate is another source of odor. This will be produced from moisture that enters the body of the landfill waste and percolates through, dissolving and entraining environmentally harmful substances through diffusion and/or convection mechanisms. As proposed by the project, a drainage system will be put in place to collect the leachate in a pond for storage and treatment. Odor may therefore arise from the leachate that evaporates from the collection pond.

The nearest residential cluster to Sofa landfill was found at around 1,600 m from the nearest active cell and the nearest scattered house (a farm house which is only used during the morning) is located at a distance of 700-800 m from the nearest active cell.

Sofa is a sanitary landfill receives 600 ton/day of municipal waste from three governorates (Khan Younis, Rafah, and Middle Area) which mainly consist of food waste, paper and cardboard, plastics and nylon, tin cans and aluminum, glass, leather...etc. The waste is dumped at the disposal cell based on a specific filling sequence, flagman (observer) is directing the vehicles for unloading of waste following the landfill manager instructions, whereas a wheel loader is leveling the received waste. At the end of any working day, the waste is covered by a thin layer of daily clay cover (20 cm of sub-soil). External storm water is collected by a storm water ditch which is installed surrounding the landfill site, and it is directed by gravity to the storm water lagoon; The storm water lagoon is lined by a geomembrane. Yet there are no plans to use the storm water for any purposes. It will stay stagnant for long time. The storm water ditch is cleaned from the dusts by landfill workers from time to time.

Leachate, which resulted from the internal storm water and the waste liquid, are collected through the geo-composite network (AFTIX) and pumped to the leachate lagoon; the leachate lagoon is lined by a geo-membrane. Yet there are no plans to treat the leachate, and most likely part of the leachate will be evaporated, and the remaining will be treated biologically at Khan Younis Wastewater Treatment Plant (KYWWTP) as agreed between the operators of both facilities.

The potential odor impacts of the landfill operation are considered direct, negative with low significance and short term, which can be reduced to acceptable levels in the proximity of the sensitive receptors by following the landfill operational manual.

#### Mitigation Measures:

- An operation manual that should include waste progression plan in the cells, requirements for waste compaction in order to reduce the area exposed to air and adequately apply soil cover with a thickness of around 20 cm in order to prevent prolonged exposure of vulnerable wastes to the atmosphere.
- The application of daily cover should be modified so as to implement faster compaction and coverage of waste to effectively reduce the odor emissions.

#### Monitoring Activities:

- The complaints from neighboring residents near the landfill should be documented by the site manager, and he should report these complaints in the periodic monthly reports.

#### **7.1.1.2 Rafah and Khan Younis Transfer Stations**

Details of the design and operation of the transfer stations have been previously presented in Chapter 4 (Project Overview & Description). A typical transfer station functions as a site where primary collection vehicles unload their waste load, which is accumulated and re-loaded onto a larger transport vehicle to be taken to the landfill. The collected waste may begin to decompose prior to arrival and its movement close and around the site can release odorous gas. Potential odor impacts are expected to result during unloading and transferring waste from the small to the large vehicles, during waste storage on site, and action of the wind.

The odor impact during the operation phase could be classified as indirect, negative with medium significance and short term and could be reduced by applying the operational manual of the transfer stations and the mitigation measures presented below.

#### Mitigation Measures:

- An operation manual for the transfer stations should include the best practices for the process of loading\unloading waste at the transfer stations, cleaning the work area regularly, and the compaction of the waste inside the vehicle.
- Transferring the accumulated wastes at the existing transfer station on a daily basis.
- Covering the transported waste containers to the landfill.
- The remaining waste at the night (If any) should be put in roll on/off container and covered.

- Additional containers should be present at the transfer stations site in case of over capacity especially during peak hours or due to a technical problem with the compactors, in order to reduce the waiting period for the vehicles at the site and prevent any accidental overflow of the waste outside the container. The additional capacity containers should safeguard emergency periods where the landfill site may not be accessible.

#### Monitoring Activities:

- The complaints from neighboring residents and the transfer stations should be documented by the site manager, and he should report these complaints in the periodic monthly reports.

#### **7.1.1.3 Medical Waste Treatment Facility (MWTF)**

During the operation of autoclave machine, some odors are expected during the temporary storage of waste but for a short time of period. The site for the treatment facility locates inside a solid waste transfer station. The main source of the odor impact is expecting to result from the disinfectant odor inside the facility, from the vehicles that transfer the medical waste, and due the cleaning procedures

The odor impact during the operation phase could be classified as indirect, negative with low significance and of short term that could be reduced by applying the operational manual of the medical waste treatment facility and the mitigation measures presented below.

#### Mitigation Measures:

- An operation manual for the medical waste treatment facility should include the best practices for the operation of the medical waste treatment facility, and the use of the disinfectant.
- Provide adequate buffer area, such as trees, or fences, between treatment facility and potential receptors
- Ensure the periodic maintenance of Autoclave machine and the adequacy of the ventilation system.
- Transfer the HCW from medical centers to treatment facility, and treated waste from treatment facility to the landfill daily, no HCW is accepted to be stored for more than 24 hours.
- Evacuate the leachate tank periodically (weekly).
- Washing the unloading area and leachate tank periodically.

#### Monitoring Activities:

- The complaints from neighboring residents should be documented by the site manager, and he should report these complaints in the periodic monthly reports.

## 7.1.2 Deterioration of air quality by Dust/smoke/Gases

### 7.1.2.1 Al-Fukhary (Sofa) Landfill

The disposal of solid waste in an anaerobic environment causes decomposition of the organic components of the waste to produce landfill gas; this reaction starts gradually after the placement of the waste and is proportional to the moisture content of the waste body. The components of the landfill gas changes over time according to the maturation process of the organic matter, but it is mainly composed of methane, carbon dioxide and other minor constituents including Non-Methane Organic Carbons (NMOC) or Volatile Organic Carbons (VOC), ammonia and hydrogen sulfide.

The generation of landfill gas could cause negative impacts on the environment, including:

- The methane gas when present in air with concentrations between 5-15% could have an explosion potential which causes a safety risk. Because of the limited amounts of oxygen in the landfill this risk is minimum within the body of the landfill, but the risk would be higher in case the landfill gas migrated to the air with large concentration of methane;
- Ammonia, VOCs and hydrogen sulfide cause nuisance to surrounding areas;
- Both methane and carbon dioxide are greenhouse gases where methane has much more global warming potential than carbon dioxide (25 times in 100 years lifetime);
- The migration of the landfill gas through the soil could cause acidification of the groundwater due to the reaction between carbon dioxide in the landfill gas and the water to produce carbonic acid, especially that carbon dioxide is relatively dense gas that tends to move downwards; and
- The flaring/combustion of landfill gas causes air emissions of CO<sub>2</sub>, CO, NO<sub>x</sub>, Particulate matter and trace gases that impact the air quality in adjacent areas.

According to the landfill design there is a flaring system which will be installed at the closure phase. Flaring the gas will result in emissions of CO<sub>2</sub>, CO, NO<sub>x</sub>, PM among other trace gases, these emissions will be proportional with the rate of collected gas and, hence, will be minimum during the first years of landfill operation and will gradually increase until it reaches the maximum then it will gradually decrease. According to the United States Environmental Protection Agency (USEPA) Emission Factors Guidelines (Document AP-42) the maximum flow of methane gas is 77 million m<sup>3</sup> during year 2042 will generate an average of 1.6 gm/second of NO<sub>x</sub>, 29.3 gm/second of CO and 0.7 gm/second of PM. The impacts of these emissions on the ambient air quality could be quantifiably assessed using air dispersion modeling, but the surrounding area in the landfill does not include major sources of air pollution, except for transportation on Salah Al-Din Road 2.5-km from the landfill, therefore the flaring of the gas is not expected to have large impact on the ambient air quality. Because the air emissions may, in combination with other future sources not related to the project activities, cause breaching of ambient air quality standards this impact has been classified as indirect, negative and medium significance and short term.

The total CO<sub>2</sub> emissions for the whole combusted methane (1.612 million tons) will be 4.433 million tons over the whole landfill life, with a peak flow rate of 141,204 ton/year in year 2042. This makes the total CO<sub>2</sub> emissions from the landfill (CO<sub>2</sub> in landfill gas + combustion of methane) 12.494 million tons.

The gas collection system, along with the High Density Poly Ethylene (HDPE) liner and final cover, is considered a good engineering control process for minimizing the migration of landfill gas to the atmosphere or through the soil to the groundwater, the number of vents and radius of influence are sufficient to cover the whole landfill area.

On another hand, operation of the landfill will result in deterioration of air quality by dust due to the movement of waste dumping trucks in and out of the landfill, especially in the dry days. There are more than 150 vehicles access to the landfill daily, beside the operation of the landfill equipment which is also expect to produce dust emissions.

#### Mitigation Measures:

- It is recommended to perform trials to collect the gas before the cell is completely filled or during closure works.
- The lining system and final cover of the landfill should be properly maintained to keep their integrity, through ensuring adequate placing, adhering to waste filling plan, avoid overloading landfill cells and regular evacuation of leachate and gas.
- Using the daily cover to prevent any waste self-burning at the site.
- Water spraying in dry days to reduce the dust emissions.
- Reject any burnt waste to be received at the disposal cell to prevent the distribution of fires
- Ensure the waste filling schedule is followed as per the operation plan, as well the daily and final cover to be applied. The gas collection system will be installed at the landfill closure phase.
- All vehicles and heavy equipment working in the site should be maintained according to the maintenance schedule recommended by the manufacturer/supplier. Any vehicle that has high smoke emissions visibility detected should be promptly repaired.

#### Monitoring Activities:

- Keep records of dust visually,
- Record of the received complaints from the local community.

For the excavated material stockpiles, the following mitigation measures to be followed:

#### Mitigation Measures:

- Keep stable slopes of the stockpiles.
- Distribute safety signs around the stockpile site.
- Install red tap around the stockpile area to secure the access to the risky area.

#### Monitoring Activities:

- Maintain the slope of the excavated material stockpile not less than 1:2 and visually check it on a daily basis.

#### **7.1.2.2 Rafah and Khan Younes Transfer Stations**

The ambient air quality at the transfer stations were measured during the construction phase (as mentioned in chapter5), the results were found reasonably accepted.

Overall, the potential air quality impact during the operation phase is expected to be resulted from Dust emissions from trucks movement and transferring the solid waste, action of the wind on stored waste, vehicle movement around the site.

If no proper management is undertaken under certain circumstances, the impact will be considered to be indirect, negative, and long-term with medium significance.

#### Mitigation Measures:

- All vehicles and heavy equipment should be maintained according to the maintenance schedule recommended by the manufacturer/supplier. Any vehicle that has high smoke emissions visibility detected should be promptly repaired.
- Schedule the movement of vehicles carefully.
- Monitor and control the speed of waste vehicles.
- Covering the waste vehicles when transport the waste
- Water spray of the operation of the site.

#### Monitoring Activities:

- CO<sub>2</sub> emission rate of all vehicles used in the project should be documented from the manufacturer, the distance and fuel consumption should be documented and reported on monthly basis.
- Visual observation for high exhaust from vehicles.

#### **7.1.2.3 Medical Waste Treatment Facility (MWTF)**

The ambient air quality at MWTF was measured during the construction phase (as mentioned in chapter5), the results were found reasonably accepted.

Air quality deterioration can take place during the operation of autoclave machine. The project will not increase traffic volumes, reduce source-receptor distances or change other existing conditions to such a degree as to increase air pollutants emissions. No long-term impacts to air quality are anticipated.

However, the operation of the autoclave is not expected to impact the air quality negatively, potential air quality impact during the operation phase is expected to be resulted from air quality deterioration during the dust resulted from the transportation vehicles. If no proper management is undertaken under certain circumstances, the impact will be considered to be direct, short-term negative with medium significance.



#### Mitigation Measures:

- Ensure the operation and periodic maintenance of Autoclave machine and the adequacy of the ventilation system
- All vehicles and heavy equipment working in the project should be maintained according to the maintenance schedule recommended by the manufacturer/supplier. Any vehicle that has high smoke emissions visibility detected should be promptly repaired.
- Pavement/maintain of all access roads
- Schedule the movement of HCW vehicles carefully.
- Monitor and control the speed of HCW vehicles.
- Fully close of the HCW vehicles when transport the waste.

#### Monitoring Activities:

- CO<sub>2</sub> emission rate of all vehicles used in the project should be documented from the manufacturer, the distance and fuel consumption should be documented and reported on monthly basis.
- Visual observation for high exhaust from vehicles of HCW.

### **7.1.3 Contamination of groundwater and soil by leachate**

#### **7.1.3.1 Al-Fukhary (Sofa) landfill**

The produced leachate from the waste dumped in Sofa landfill is handled by leachate collection system of the cells base, a drainage layer which includes perforated pipes embedded in lowest elevation areas of the cells bottom which have enough inclination to collect the liquid in the pipes then by gravity to a collection pit at the lowest point of each Cell, then the leachate will be pumped up to a leachate pond.

These measures are believed to be sufficient for controlling the generated leachate , but if the leachate is not properly collected from the landfill body it could form stress on the base lining system, and raise the risk for loss of containment, as well as the offensive odor impact.

Using the analytical model results to predict the impact of the landfill on the groundwater, it can be observed that:

1. The maximum yearly amount of leachate from the landfill is expected to percolate through the landfill liner was estimated at 16,000 m<sup>3</sup>/year.
2. Based on the particle tracking simulations and the sensitivity analysis, the contamination tracks will migrate to around 1 km to 2 km away from the landfill within the next 30 years.
3. The chloride and nitrate values on the groundwater are exceeding the safe limits of drinking water, the effect of the disposed wastes at the proposed landfill was studied and the proposed landfill increased the chloride and the nitrate concentrations within 1 km to 2 km from the land fill.

The impacts of the leachate generation generally were controlled by the engineering measures implemented in the design of Al-Fukhary Sofa landfill. The risks of contaminating groundwater has been classified as long-term negative, indirect and of medium significance.

#### Mitigation Measures:

- The leachate pond should be regularly de-sludged and the removed sludge should be transferred back to the landfill.
- The leachate collection pumping station and correspondent piping network should be adequately maintained to ensure smooth operation.
- Regular maintenance shall always be planned during the non-rainy period. Spare pumps shall be available at the site to be used in the event of accidental breakdown of the operating pumps.
- Regular groundwater quality tests should be carried out at the downstream and upstream areas.

#### Monitoring Activities:

- Leachate pumped amounts should be reported on monthly basis.
- leachate analysis (COD, BOD, pH, TDS, total N, total P, heavy metals, TPH) should be carried out on semi-annual basis, while pH, COD and BOD should be carried out on quarterly basis.
- Groundwater analysis from 4 monitoring wells (two upstream of groundwater flow and two downstream) should be carried out.
- Amounts of sludge removed from leachate pond should be recorded with a manifest
- Secure the site by fence and monitor the site by CCTV to prevent leachate sealing.

#### **7.1.3.2 Rafah and Khan Younis TS**

During the operation of the transfer stations, a small amount of leachate will be generated. The leachate and water disposal using septic tanks will contribute in deterioration of ground water quality due to the absence of wastewater network in most area of Khan Younis. The impact significance is expected to be short-term negative, indirect and of low significance.

#### Mitigation Measures:

- Regular maintenance of the leachate tank and the collection pipes
- Sampling and testing of groundwater should be carried out regularly.
- Evacuate and transfer the Leachate to the nearest WWTP
- Sample test of leachate before dumping the leachate to the nearest WWTP
- Storm water should be drained by gravity or pumping to an empty area.

#### Monitoring Activities:

- Testing of ground water quality samples from monitoring well of each transfer station on semiannual basis.
- Visual observation of any erosion impacts during the rainy days.
- Leachate pumped amounts should be reported on monthly basis.
- leachate analysis (COD, BOD, pH, TDS, total N, total P, heavy metals, TPH) should be carried out on annual basis, while pH, COD and BOD should be carried out on quarterly basis.

### 7.1.3.3 Medical Waste Treatment Facility

Improper sewage disposal at the treatment facility and spillage of contaminated effluents such as oils and chemicals during the facility maintenance/ washing activities can be a source of contamination the water resources. The leachate produced from the MWTf is collected in an underground separated tank and then vacuumed to KYWWTP.

The Autoclave unit required periodic water source for the sterilization process, as well as for washing and cleaning purposes. The use of the existing water well in a continuous manner may have long-term indirect, negative low impacts of the current water resources and their uses.

#### Mitigation Measures:

- Conduct regular maintenance of the Autoclave unit to minimize service interruptions
- Regular maintenance of the vehicles used to transport the medical wastes
- Regular sampling and testing of groundwater
- maintenance of the leachate tank and collection system monthly
- Chlorination of leachate before evacuation.
- Evacuate and transfer the leachate to WWTP

#### Monitoring Activities:

- Leachate pumped amounts should be reported on monthly basis.
- Leachate analysis (COD, BOD, pH, TDS, total N, total P, heavy metals, TPH) should be carried out on annual basis, while pH, COD and BOD should be carried out on quarterly basis.
- Testing the ground water quality from the monitoring wells.

### 7.1.4 Risks of Receiving Hazardous Wastes

#### 7.1.4.1 Al-Fukhary (Sofa) landfill

In 2008 it was estimated that approximately a total of 800 tons of hazardous waste was produced in the GS, generated by different economic sectors. Sofa landfill did not accept any hazardous waste, each received car is investigated to ensure the absence of any hazardous waste.

However, with the current operation conditions, the significance of this impact is expected to be low, indirect, negative impact and with long term.

#### Mitigation Measures:

- All workers of the landfill should receive adequate training on the permissible list of waste to be received/rejected at the landfill site based on the JSC-KRM by-laws.
- Awareness of hazardous waste generators regarding the sorting at source in order to avoid a mixing of hazardous and non-hazardous waste.

- All workers in the landfill should be provided with anti-puncture gloves, steel-toe shoes, overalls and masks. Strict supervision on the compliance of hand sorters to this should be practiced.
- The list of prohibited waste should be clearly shared with municipalities.

#### Monitoring Activities:

- Amounts of identified hazardous waste received/rejected in the landfill and list of prohibited waste by JSC-KRM by-law should be documented and reported in the daily progress report.

### **7.1.5 Risks to Occupational Health and Hygiene**

#### **7.1.5.1 Al-Fukhary Sofa Landfill**

Besides the risks of exposure to hazardous waste discussed in the previous section, potential impacts on the health and hygiene of both the general public and on-site workers exists as a result of the nature of the waste. The main impacts associated with the project arise from the following:

- Low hygiene conditions
- Vermin attracted to the site (birds, rodents and insects) which can act as disease vectors.
- Risk of fires, explosions, subsidence, spills and accidents;

However, the landfill site is operated following the high standards for the landfills, all the following procedures are taken by JSC-KRM during the operation of the landfill:

- All workers, drivers, and employees are covered by insurance.
- All workers and drivers are provided by Personal Protective Equipment (Vests, overall, safety shoes, gloves ...etc) regularly. As well, workers are provided by safety training for more than three times in the last 4 years.
- All workers are vaccinated against the tetanus.
- First aid boxes and fire extinguishers are provided in the landfill..
- Code of Conduct is provided for workers and drivers (Annex V).

Hence, under these conditions, the impact on health and safety of workers and the general public is considered long-term direct, negative with moderate significance and the following mitigation measures should be applied in order to prevent the impact.

#### Mitigation Measures:

- More specific training program shall be conducted to the workers about safe working methods and good hygiene practices. Updating the program in accordance to the workers performance is necessary.
- Unauthorized entrance to the landfill site should be prevented specially waste pickers.
- Follow the health and safety plans instruction during the operation.
- The Safety Plan of the operation of the landfill should be followed, as well the emergency response plan

- Smoking is not allowed at the landfill site
- All workers in the landfill should be provided with anti-puncture gloves, Safety shoes, overalls and masks.
- Securing the deep areas by a fence to prevent the drowning in the storm water lagoon/ leachate lagoon.
- All of injuries should be documented, as well a report should be written after any of accident

#### Monitoring Activities:

- Availability of safety plan, PPE, safety training, first aid box, fire extinguishers, safety signs

#### **7.1.5.2 Rafah and Khan Younis TS**

Besides the risks of exposure to hazardous waste discussed in the previous section, potential impacts on the health and hygiene of both the general public and on-site workers exists as a result of the nature of the waste. The main impacts associated with the project arise from the following:

- Low hygiene conditions;
- Risk of fires, explosions, subsidence, spills and accidents;
- Accidents at the workshop.

The impact on the nearby communities is expected to be indirect, negative, long-term and of medium impact from movement of heavy machinery, the presence of pathogens, vectors and insects may increase the health risk.

The impact on worker health and safety is expected to be long term, medium impact can be affected by the possibility of; physical hazards from falling and injuries during operation, risks from movement of heavy machinery on roads, physical hazards from contact with disturbances, the presence of pathogens, vectors and insects may increase the health risk.

However, the transfer stations are expected to be operating according to the operation manuals and following the high standards for the transfer stations, all the following procedures shall be taken by JSC-KRM during the operation of the landfill:

- All workers, drivers, and employees are covered by insurance.
- All workers and drivers are provided by Personal Protective Equipment (Vests, overall, safety shoes, gloves ..etc) regularly. As well, workers are provided by safety training for more than three times in the last 4 years.
- All workers are vaccinated against the tetanus.
- First aid boxes and fire extinguishers are provided in the landfill.
- Code of conduct is provided for workers and drivers (Annex V).

Hence, under these conditions, the impact on health and safety of workers and the general public is considered long-term negative with medium significance and the following mitigation measures should be applied in order to prevent the impact.

#### Mitigation Measures:

- Safety plan should address all the safety issues at the transfer stations.
- More specific training program shall be conducted to the workers about safe working methods and good hygiene practices. Updating the program in accordance to the workers performance is necessary.
- Unauthorized entrance to the TS sites should be prevented
- Follow the health and safety plans instruction during the operation.
- The Safety Plan of the operation of the transfer station should be followed, as well the emergency response plan.
- Smoking is not allowed at the TS site
- All workers in the TS should be provided with anti-puncture gloves, Safety shoes, overalls and masks.
- All of injuries should be documented, as well a report should be written after any of accident

#### Monitoring Activities:

- Availability of Safety plan, PPE, First aid box...etc.

#### **7.1.5.3 Medical Waste Treatment Facility**

The most significant impact associated with the MWTF operation is the risk of health hazards for staff and nearby communities. These are mostly caused by not following the infection control protocols, not using proper PPEs, and not employing proper procedures for medical waste collection, transportation, storage, and final disposal. Improper offsite management poses safety risks for the staff carrying out this activity. These hazards include risk of cuts, pricks, gas poisoning, and other bodily injuries. The periodic inspection and maintenance activities for facility also pose safety risks for the workers, as well as facility staff. This impact is expected to have indirect, long-term, negative high impact. On the other hand, a high positive impact is resulted from the operation of the MWTF due to the health and environment protection and the proper management of medical wastes.

#### Mitigation Measures:

- Use of PPE wear by workers with fully commitment, special masks and overall wear should be provided for workers who work inside the facility
- Provide the required vaccination for all workers and drivers of the HCW treatment facility, and periodic examination should be made for them
- Provide First Aid kits and fire extinguishers.
- Conducting an operation plan, safety plan and emergency response plan for workers and for any potential fires inside the treatment facility.
- Adding complaint log for workers
- Archive of all quantities of received HCW, and don't accept any unsigned pins (don't have a printed sign)
- Drivers of HCW should be comply with the PPE wear



- Restricting the access for any un-authorized person into the treatment facility
- Training program for (Workers and drivers, Operation Engineer, and the mechanical technicians)

Monitoring Activities:

- Availability of safety plan, PPE, First Aid Boxes...etc
- Review of all labor rights.

**7.1.6 Pests Impacts**

Pest<sup>19</sup> Management is an approach that establishes a sustainable approach to manage pests by combining biological, cultural, physical and chemical tools in a way that minimizes economic, health and environmental risks. When well run, the modern landfilling process will avoid many potentially adverse environmental impacts. The rigorous application of cover material, proper compaction of wastes, and general “good housekeeping” are the most effective means of pest control.

This Pest Management Plan<sup>20</sup> (ANNEX VI) will be kept at Al-Fukhary landfill site as well as the transfer stations during operational activities and will be reviewed/updated as necessary. The plan will be amended or revised as project activities or conditions change or when supplemental information becomes available. This plan is prepared, and shall be implemented for the prevention and control of pests, it adopts procedures in the project work plan. The landfill transfer manager is to be familiar with contents of this plan.

The expected impact of pests is limited to few months (April – September). The source of pests in Al-Fukhary Landfill could be disposal cell, leachate lagoon, stormwater lagoon, and the old dumpsite. This impact is expected to have long-term, negative, indirect, medium impact in the landfill, whereas it is expected to be less severe in the transfer stations.

Mitigation Measures:

- Follow the pest management plan instruction during the operation (ANNEX VI).
- Apply pesticides as needed through an application plan that would give preference to biological pesticides, then to other pesticides with negligible impact on humans and minimum impact on untargeted species and the environment

Monitoring Activities:

- Type, quantity, date, location and method of application for all pesticides should be well documented and reported in the periodic monthly reports

<sup>19</sup> Pests are populations of living organism (animals, plants, or microorganism) that interfere with use of healthcare and other facilities for human purposes.

<sup>20</sup> Pest management plan is attached in ANNEX VI.

- The complaints about insects and rodents from neighboring residents from both the landfill and the transfer stations should be documented by each site manager, and he should report these complaints in the periodic monthly reports.

#### 7.1.7 Noise Impacts

##### 7.1.7.1 Al-Fukhary (Sofa) Landfill Site

Operation works include noisy activities related to machine operation in addition to the noise generated from the trucks entering or leaving the site. This will result in raising the background noise levels; depending, as mentioned earlier in this Chapter, on:

- the type of equipment and vehicles used on the site;
- the ambient noise level around the proposed site;
- the proximity of sensitive receptors;
- the length of time over which construction works are undertaken.

The main activities that are associated with high noise emissions are:

- Movement of Refuse Collection Vehicles (RCVs) in and out of the landfill site;
- Placement and compaction of waste;
- Application of daily cover material for waste.
- Operation of standby-generator
- Operation of convey belts and trommel separators in the recycling plant
- Operation of loaders and windrows moving machines in the composting plant

The nearest receptor is a farm houses about 700 m away from the site and accordingly noise impacts are not expected to be major. It is recommended to plant wind break trees around the landfill borders, especially in the northern and western borders around the recycling/composting plant, to maximize noise attenuation and, in turn, minimize noise impacts to neighboring areas.

It is anticipated that operation activities will not be operational during the late hours; therefore the impact on evening averages of ambient noise will be little. The impact of noise can be considered long-term, direct, negative and of medium significance.

#### Mitigation Measures:

- Key noisy equipment (such as generators, trommels, conveyor belts ... etc.) should be selected with minimum noise;
- Optimize the use of machines and noisy equipment (i.e. switching off when idle);
- In case the manager received complaints from neighboring areas regarding noisy operations acoustic barriers should be placed between the noise source and the location of the complaining neighbor.

#### Monitoring Activities:

- The complaints from neighboring residents from the landfill should be documented by the site manager, and he should report these complaints in the weekly reports.

- Maintenance of landfill equipment should be monthly conducted.

#### **7.1.7.2 Rafah and Khan Younis Transfer Stations**

During operation, noise at the transfer stations may result from the following:

- Increased vehicle traffic;
- Loading and unloading of waste, and

The impact of noise at transfer stations can be considered long-term, direct, negative and of medium significance.

##### Mitigation Measures:

- Key noisy equipment (such as generators, vehicles, etc.) should be selected with minimum noise;
- Optimize the use of machines and noisy equipment (i.e. switching off when idle);
- Planting of a wind break trees where appropriate to act as a noise buffer.
- Limiting operation works to day time.

##### Monitoring Activities:

- The complaints from neighboring residents from the transfer stations should be documented by each site manager, and he should report these complaints in the weekly reports.

#### **7.1.7.3 Medical Waste Treatment Facility**

The project site inside Khan Younis TS is located in a low density of residential area with no major industrial activities undertaken in the vicinity of the site. In addition to the noise produced from the TS activities, it is expected that the most prevailing activities in the operation of the Medical Waste Treatment Facility with high noise impacts are limited to the operation of the Autoclave treatment facility. As well as, the vehicles used to load and unload the medical wastes into the facility. Such impacts are assessed to be short term, negative and low significance.

##### Mitigation Measures:

- Limiting operation works to daytime
- Regular maintenance of Autoclave, vehicles and generator
- Schedule movement of transportation vehicles of HCW away of rush hours and in accordance with the TS vehicles.

##### Monitoring Activities:

- The complaints from neighboring residents from the facility should be documented by the site manager, and he should report these complaints in the weekly reports.

### **7.1.8 Visual Impacts and Aesthetics**

#### **7.1.8.1 Al-Fukhary (Sofa) Landfill Site**

The solid waste accumulation is an unfavorable seen, especially when it is with large quantities as the case in landfills, and also transfer stations and composting / recycling plants. The operation of landfills, transfer stations and composting/recycling plants is also associated with litter dispersion by wind which adds to the negative visual impacts. The operation of landfill equipment and generated dust from the earthworks also adds to the bad scene at the site.

The most effected groups by the visual impacts of the landfill, transfer stations and composting/recycling plants are the inhabitants of the close neighborhood who can see the waste from their places. Also, the users of roads that could view the landfill could be also impacted by the low aesthetic value of the area. Furthermore, if the Gaza Airport is operated during the project life, the aircraft passengers would see the landfill operations from low altitude during take-off and landing, but this issue is not foreseen in the near future so it could be regarded as negligible impact.

The operation of Sofa landfill is totally hidden from neighboring areas and nearby roads. Also during the operation on layers above the ground it is expected that active layers will be surrounded by embankments so that waste on the Cells edges would be compacted against them and the height of the landfill will be maintained with a safe slope, so these embankments will also hide waste filling operations from surroundings.

Currently, the old dump site at sofa landfill which is about 15-meter high, was covered and its slope was maintain and it is expected to be landscaping. The overall impact of the landscaping of the old dump site is expected to be positive. The impact from the new cell operation is expected to be minor.

When operating, the composting/recycling plants visual impacts are expected to be low. The windbreak trees that will be around the plant site and the roof over the compost piles will hide the waste and the trommel separators to most of the surrounding areas, especially that the nearest residential clusters are relatively far and their average height is relatively low (one or two stories).

#### Mitigation Measures:

- Provide adequate buffer area, such as trees, or fences, between the facility and potential receptors
- apply the daily cover to conserve the aesthetics conditions”
- Compaction of waste at the disposal cell to maximize the landfill lifespan and capacity

#### Monitoring Measures:

- Complaints from neighbors.
- Applying the daily cover.

#### 7.1.8.2 Rafah and Khan Younis Transfer Stations

The two transfer stations are surrounded by a wall fence which will prevent littering dispersion outside the site but will not hide the inside waste scene, however because the waste will be contained inside the containers there will be low visual impacts on the surrounding ground level areas, while the impact will be higher on elevated neighboring buildings. However, because the two transfer stations was used as open waste collection areas, new additional visual positive impacts would be added due to the transfer operations. Accordingly, the impact has been classified of low significance.

##### Mitigation Measures:

- The composting/recycling plant should be fenced with windbreak trees to minimize hide negative waste scene from the view of the neighboring areas.
- Covering the waste vehicles when transport the waste.
- Cleaning the site in a daily basis at the end of the operation activities.
- Provide adequate buffer area, such as trees, or fences, between the facility and potential receptors

##### Monitoring Activities:

- Complaints of neighbors from littering dispersion or about the general aesthetic value of the area should be reported in the monthly progress report of the site.

#### 7.1.9 Traffic “Impacts of the incoming and outgoing waste vehicles”

More than 150 collection vehicles will be transferred to the landfill on the daily basis, in addition to tens of collection vehicles and donkey carts who will collect the waste internally from the service area to the transfer station.

The operation of waste collection and transport vehicles is a key to prevent/minimize any traffic jam. Also, the speed of driving is an important factor to be addressed in order to decrease the possibility of accidents. As well, the unauthorized vehicles should be rejected from accessing waste facilities.

##### Mitigation Measures:

- Drivers should not exceed the speed of driving (20 km/hr) in the internal roads and in the landfill/transfer station sites. 40 km/hr is acceptable on the highway only.
- Traffic barriers and signs should be installed inside waste facilities, and the speed limit should be monitored.
- Schedule the movement of vehicles, operation of donkey carts should be addressed to prevent any traffic jam.
- The location of washing the waste vehicles should be address by the landfill/transfer station manager.

##### Monitoring Activities:

- Records of accidents, complaints from community.

#### **7.1.10 Impacts on Flora and Fauna**

The baseline study concluded that sofa landfill site lacks any presence of significant wetlands of important biodiversity or reproductive value. Furthermore, there is no presence of environmentally rare or endangered species breeding areas, habitats or protected living areas. However, it was found that diverse and abundant fauna species currently use the site for nesting, breeding or feeding. This is expected to be affected by the operation of the landfill as compared with the previous situation.

The impact on fauna and flora is short-term, negative with low significance due to the expected interruption of daily breeding, and feeding which take place at the moment as a result of the site controlled operation and daily waste covering. However, regarding the pollution and accumulation of contaminants in the terrestrial ecosystem which result from feeding on the waste, and the expected decrease in the number of stray dogs visiting the site, the impact is considered positive since this will cease to take place.

There are limited flora and fauna around the transfer stations sites that could be affected. However, the surrounding agricultural and rural areas may be affected from possible contaminants migration, the impact is expected to be long-term, negative low impact during the operation of those facilities.

The medical waste treatment facility is expected to positively impact the flora and fauna on the long-term.

The adequate operation and monitoring of the facilities, as well as the vegetation around the facilities will prevent and minimize the negative impacts.

## **7.2 Impacts of the Secondary Collection Services During the Operation Phase**

### **7.2.1 Air quality and Noise**

Air quality deterioration from release of dusts and gaseous emissions from exposed soil surfaces and vehicles movement noise impact is expected to be negative, short term, indirect and of medium significance.

#### Mitigation Measures:

- Maintain vehicles to be in good working conditions.
- Ensure exhaust fumes from vehicles conform to the applicable standards and specifications.
- Maintain equipment and machineries adequately to reduce noise levels.
- Working in the day time.

#### Monitoring Measures:

- Noise and air quality measurements.
- Complaints from the community.

### **7.2.2 Ground water**

Leachate should be properly managed to avoid ground water contamination. This impact is expected to be negative, indirect, short term and of low significance.



#### Mitigation Measures:

- Leachate should be stored in a separate tank in the waste dumping truck and to be evacuated in the landfill site.
- Waste dumping trucks should be washed regularly in the workshop or the landfill site, but it is not allowed to be washed outside.

#### Monitoring Measures:

- Amount of leachate evacuated regularly to the dumpsite.
- Site observation.

### **7.2.3 Occupational Health and Safety**

Occupational accidents and injuries from the use of machineries and equipment related to secondary collection activities, as emptying the containers, littering the solid waste, etc is expected to be negative, short term, indirect, and of low significance.

#### Mitigation Measures:

- Prepare a site specific HSE plan for workers addressing issues including; HSE rules and instruction;
- Emergency contingency plans; training of workers; Incident/accident reporting; Provision of First Aid with each vehicles.

#### Monitoring Measures:

- Health records about accidents & worker health status.

### **7.2.4 Traffic Congestion**

Since secondary collection vehicles is travelled in the public roads, then the risk of traffic congestion and increased risk of road traffic accidents and injuries as a result of movement of vehicles is expected to be medium, direct, negative and of short term impact.

#### Mitigation Measures:

- Develop a Traffic Management Plan (TMP).
- Traffic control measures to include: strict enforcement of speed limits, use of appropriate road safety signs and signalers and minimization of movement at peak hours of the day.
- Ensure submission of TMP is a condition in the procurement document for the contractor

#### Monitoring Measures:

- Records from the Ministry of Transportation.

### **7.2.5 Visual Impact and Offensive Odor**

The visual impact and offense odor are expected to results from the improper emptying of the containers, littering the solid waste during the vehicle movement, as well as the location and size of containers. This impact is expected to be negative, direct, short term and of high significance.

#### Mitigation Measures:

- Cleaning the site after emptying the collection vehicles.
- Cover the solid waste collection vehicles during transport the waste to the landfill site.

#### Monitoring Measures:

- Data records from the nearby community.

### Summary tables for the impact significance

Table 30: Summary of impacts during the operation of Al-Fukhary (Sofa) landfill

Impact	Positive/Negative	Time scale	Significance	Direct/Indirect
Odor impacts	Negative	Short-term	Low	Direct
Deterioration of Air Quality	Negative	Short -term	Medium	Indirect
Deterioration of the groundwater quality	Negative	Long -term	Medium	Indirect
Risks of Receiving Hazardous Wastes	Negative	Long -term	Low	Indirect
Risks to occupational health and hygiene	Negative	Long -term	Medium	Direct
Pests Impacts	Negative	Long -term	Low	Direct
Noise impacts	Negative	Long -term	Medium	Direct
Visual impacts and aesthetics	Positive			Direct
Traffic Impact	Negative	Long-Term	Low	Direct
Risks on flora and fauna	Negative	Short -term	Low	Indirect

Table 31: Summary of impacts during the operation of Rafah and Khan Yonis Transfer Station

Impact	Positive/Negative	Time scale	Significance	Direct/Indirect
Odor impacts	Negative	Short-term	Medium	Indirect
Affecting air quality	Negative	Long -term	Medium	Direct
Impacts on Ground Water	Negative	Short-term	Low	Indirect
Risks to occupational health and hygiene	Negative	Long -term	Medium	Indirect
Noise impacts	Negative	Long -term	Medium	Direct
Pests Impacts	Negative	Long -term	Low	Direct
Visual impacts and aesthetics	Negative		Low	Direct
Traffic Impact	Negative	Long-Term	Medium	Direct
Risks on flora and fauna	Negative	Long -term	Low	Indirect

Table 32: Summary of Impacts During the Operation Of MWTF

Impact	Positive/Negative	Time scale	Significance	Direct/Indirect
Odor impacts	Negative	Short-term	Low	Indirect
Affecting air quality by vehicles emissions	Negative	Short-term	Medium	Direct
Impacts on Ground Water	Positive	long-term	Medium	Indirect
Risks to occupational health and hygiene	Negative	long-term	High	Indirect
Noise impacts	Negative	Short-term	Low	Direct
Risks on flora and fauna	Positive	long-term	Low	Direct

Table 33: Summary of impacts during the operation of secondary collection

Impact	Positive/Negative	Time scale	Significance	Direct/Indirect
Ground Water	Negative	Short-term	Low	Indirect
Air quality and Noise	Negative	Short-term	Medium	Indirect
Occupational Health and Safety	Negative	Short-term	Low	Indirect
Traffic Congestion	Negative	Short-term	Medium	Direct
Visual Impact and Offensive Odor	Negative	Short-term	High	Direct

### 7.3 Cumulative Impacts

Cumulative Impact is a ‘combined’ impact which results from the interaction of two or more impacts, arising from a project to one or more other projects.

This section provides environmental assessment of the cumulative impacts associated with the operation of the JSC-KRM solid waste management facilities and the nearby facilities operation. It has not been possible to estimate the cumulative impact of the different components accurately, the consultant depends on all relevant available information to present an overall prediction of the cumulative impact. This section will present two cases of cumulative impacts. The first is the cumulative impact from Khan Younis Wastewater Treatment Plant (KYWWTP) and sofa landfill area. The second one is the cumulative impact from Rafah waste water lagoons and Rafah transfer station. Impacts considered to be of relevance to communities in the area are: • Noise and Dust; • Air Quality; • Health Impacts; • Ground Water Quality • Landscape and Visual Impact.

#### 7.3.1 Al-Fukhary (Sofa) landfill and KYWWTP

Sofa Sanitary Landfill with 235,000 m<sup>2</sup> Area, is currently serving the southern and Middle governorates of GS, the estimated amount of solid waste that the landfill receive is 600 ton/day. The operation of the landfill started in July 2019.

Khan Younis wastewater treatment plant (KYWWTP) is located nearby Sofa landfill. The plant capacity is 27,000 m<sup>3</sup>/day and it is operated by Palestinian Water Authority (PWA). The treatment plant includes of: pre-treatment including fine screening for grit and grease removal, aeration tanks, clarification tanks, tertiary treatment including sand filtration and UV disinfection, treated effluent

outlet pumping station, sludge treatment, gravity thickening, sludge drying on open drying beds and sludge composting. The effluent will be discharged to an infiltration basins in al Fukhary.

#### 7.3.1.1 Noise and Dust

The noise and dust impact of Sofa landfill operation is a medium significant that mainly results from the daily operation activities and the solid waste vehicles movement. The noise and dust impact at KYWWTP is low impact that mainly results when transporting compost or Grease.

The assessment concluded that cumulative noise impact is expected to be a medium significant negative impact as a result of the facilities operation. The dust impact is expected to have low negative impact resulted from the vehicles movement.

##### Mitigation Measures:

- Key noisy equipment should be selected with minimum noise;
- Optimize the use of machines and noisy equipment;
- Planting of a wind break trees where appropriate to act as a noise buffer.

##### Monitoring Activities:

- Ambient noise at the nearest residential areas from both sites should be measured frequently on an annual basis.
- The complaints from neighboring residents should be documented and reported by the site manager in the periodic monthly reports.

#### 7.3.1.2 Air Quality

The air quality deterioration mainly results from vehicles emissions and gas emissions from the treatment of the waste water and the decomposition of solid waste. Sofa landfill operation mainly results methane gas, while KYWWTP mainly operation results CO<sub>2</sub> as a pollutant. And since the dominant wind direction in the facilities area is toward east, it is expected that the eastern direction is the most affected. And hence there is no communities there, the assessment concluded that there will be a low negative significant cumulative air impact as a result of the facilities operation.

##### Mitigation Measures:

- All vehicles and heavy equipment working in the facilities should be maintained according to the maintenance schedule recommended by the manufacturer/supplier. Any vehicle that has high smoke emissions visibility detected should be promptly repaired.
- A buffer zone around the facilities site will decrease the air quality deterioration.
- Spraying water regularly will decrease the air quality deterioration.
- Pavement of all the access roads

### Monitoring Activities:

- CO<sub>2</sub> emission rate of all vehicles used in the project should be documented from the manufacturer, the distance and fuel consumption should be documented and reported on monthly basis.
- Periodic air quality measurements should be documented and analyzed.

#### **7.3.1.3 Landscape and Visual Impact**

Sofa landfill and KYWWTP are located east of Khan Younis Governorate (about 800 m from the eastern border of Gaza Strip), the surrounding areas are with a low population and are mostly desert or agricultural lands. The old waste water lagoons at Khan Younis and the old dump site at al Fukhary was affecting visual scene negatively. Although the construction of the facilities may have many negative impacts regarding the noise, air, and odour. The cumulative impacts from the operation of both KYWWTP and Sofa landfill in the area is considered a positive impact in comparison to the previous situation since it improves the landscape in the vicinity due to the development of green area and the cultivation of trees and flowers. In KYWWTP, replace the nuisance caused by the random disposal of solid waste to a sanitary landfill site in Sofa occurs. The operation of those facilities also leads to the pavement of Salah Al-Din street as an access road to the facilities, which lead to remove all the accumulated waste on the street sides to Sofa landfill, this enhance the visual scene in the area. But it is obvious that the streets lack to collection bins on its length, this may lead to the accumulation of waste again and results a negative impact regarding the visual and odor items.

#### **7.3.1.4 Ground Water Quality**

The water quality in the surrounding areas is very low, the surrounding communities does not use the ground water as a source of water neither for drinking nor for irrigation, since it has very high salinity. Hence any impact from the leachate of the landfill or the infiltration basins at KYWWTP will not affect the nearby lands and communities directly.

The cumulative impact on ground water from both Sofa landfill and KYWWTP has been presented in a previous study that shows there is a long-term low significant impact is expected to be resulted during the operation life-time of the two facilities.

The study -that was conducted on 2012 where the KYWWTP and Sofa landfill was not constructed yet- concluded that the transport of nitrate under the wastewater basins and old dump site will take approximately (33.9-34.42) years to reach and eventually contaminate the groundwater table, Since the wastewater basins have been used for only seven years, and the KYWWTP are constructed now to treat the wastewater, this means that they do not have any effect on the groundwater contamination up till now. Moreover, the old dump site was constructed in 1997 and now integrated to Sofa landfill; theoretically this means that the landfill has no effect on the groundwater contamination up till now.

#### 7.3.1.5 Health Impact

The old wastewater lagoons at Khan Younis was discharging the partially treated effluent to the sea. This results many problems to the surrounding area health and environment.

The old dump site at al Fukhary was affecting the surrounding communities negatively in terms of health due to the presence of mosquitos, rodents, flies, vermins, etc.

The operation of the facilities will have high positive impact on the health of the surrounding areas by improving the public health and environment conditions, decrease of diseases resulting from the accumulation of storm water in uncontrolled depression areas, termination of untreated wastewater discharge in sand dunes, polluting the aquifer, protecting the communities from water borne diseases, the mosquitos problem, removing the accumulated waste near their lands, and proper management of the landfill site.

#### 7.3.2 Al-Fukhary (Sofa) landfill – Old Dump Site

The old dump site was rehabilitated in parallel with the construction of the adjacent new landfill cells. Currently, the old dump is about 15-meter high, covered and its slope was maintaining and it is expected to be landscaping as part of the closure works expected to begin in 2020.

The overall impact of the landscaping of the old dump site is expected to be positive. The old dump site had many negative impacts like odor, waste accumulation in the streets, bad visual scene, risk on health due to the presence of mosquitos, rodents, flies, vermins, etc.

The closure and the landscaping of the old dump site will have a positive impact on the visual scene, the health and safety. Also, the concern of the produced leachate impact on the ground water is studied as mentioned in the previous paragraph, and no impact is expected on ground water.

#### 7.3.3 Khan Younis TS – Medical Waste Treatment Facility

Khan Younis TS was built over an area of 3,000 m<sup>2</sup>, it includes two main components; the waste operation area (tipping area), and the medical waste treatment facility. The transfer station is expected to receive 40 ton/day of waste, and will be operated by JSC-KRM and Municipality of Khan Younis. The transfer station sites consisted of: Entrance area including weighbridge and control room (is still pending); the operation area; Leachate network and leachate tank; storm water and wastewater (percolation pit is used for wastewater and fence/surrounding wall).

The Medical Waste Treatment Facility (MWTF) was constructed inside the Solid Waste Transfer Station in the southern of Khan Younis city. The total transfer station area is 3,000 m<sup>2</sup> in which the MWTF occupies an area of 250 m<sup>2</sup> (20.4×12.5m).

The MWTF components are; Vehicle discharge washing place, temporary storage room for filled containers, treatment room using autoclave and its accessories, containers washing room, storage room of clean containers, and separate leachate collection system to underground tank (8m<sup>3</sup>).

##### 7.3.3.1 Noise and Dust

The noise and dust impact of Khan Younis TS and MWTF operation is mainly results from the waste collection vehicles movement. The assessment concluded that cumulative noise impact is expected to



be a medium significant negative impact as a result of the facilities operation. The dust impact is expected to have medium negative impact resulted from the vehicles movement in the sandy roads.

Mitigation Measures:

- Key noisy equipment should be selected with minimum noise;
- Optimize the use of machines and noisy equipment;
- Planting of a wind break trees where appropriate to act as a noise buffer.
- Regular water spraying to eliminate the dust impact.
- Improving the access roads to the site.

Monitoring Activities:

- Ambient noise at the nearest residential areas from both sites should be measured frequently in an annual basis.
- The complaints from neighboring residents should be documented and reported by the site manager in the periodic monthly reports.

#### **7.3.3.2 Air Quality**

The air quality deterioration mainly results from vehicles emissions and gas emissions from auto clave. Hence the surrounding areas are considered a low densely areas, the assessment concluded that there will be a negative low significant cumulative air impact as a result of the facilities operation.

Mitigation Measures:

- All vehicles and heavy equipment working in the facilities mainly in the site should be maintained according to the maintenance schedule recommended by the manufacturer/supplier. Any vehicle that has high smoke emissions visibility detected should be promptly repaired.
- A buffer zone around the facilities site will decrease the air quality deterioration.
- Spraying water regularly will decrease the air quality deterioration.

Monitoring Activities:

- CO<sub>2</sub> emission rate of all vehicles used in the project should be documented from the manufacturer, the distance and fuel consumption should be documented and reported on monthly basis.
- Periodic air quality measurements should be documented and analyzed

#### **7.3.3.3 Landscape and Visual Impact**

Khan Yonis TS is expected to have a negative visual impact to the surrounding area from the handling of waste inside the facility. The MWTF is also to results a negative visual impact to the surrounding area from the vehicles movement mainly.

Cumulative impacts from the operation of MWWTF and the TS in the area, where considered a negative low impact, but by providing a proper management of waste, this impact will be minimized.

**Mitigation Measures:**

- All vehicles coming into\out from the site should be covered.
- A planted buffer zone around the facilities site will improve the landscape of the area.

**7.3.3.4 Health Impact**

The main impacts associated with Khan Yonis TS arise from; low hygiene conditions, vermin attracted to the site, movement of heavy machinery, and the presence of pathogens.

The main impacts associated with MWWTF arise from; not following the infection control protocols, not using proper PPEs, and not employing proper procedures for medical waste collection, transportation, storage, and final disposal.

The cumulative impact from the operation of the facilities is considered a negative medium impact.

**7.3.4 Rafah Transfer Station and RWWTP**

Rafah Transfer Station is located in the southern part of Rafah, to the south of Tal Al-Sultan area, near the Rafah Wastewater Treatment Plant (RWWTP) with a total area of about 6,000 m<sup>2</sup>. It was constructed over an area of 10,000 m<sup>2</sup>. The main access road to the site is a minor connecting road with 12 m width and 200 m long branched from the main street in Rafah (Abu Baker St.). It is expected to receive 60 ton/day of waste, and will be operated by JSC-KRM and Rafah Municipality.

RWWTP is located in the western part of the Rafah governorate at Tal-Sultan area around 500 m nearby the borderline with Egypt. The site is surrounded by sand dunes, The RWWTP site area is about 13.35 hectares with sandy road access from northern direction. The plant is operated by Coastal Water Management Unit (CMWU). The main components in RWWTP are grit removal, anaerobic ponds followed with two bio-towers and sedimentation pond with an effluent quantity of 13,000 m<sup>3</sup>/day.

**7.3.4.1 Noise and Dust**

The noise and dust impact of Rafah TS operation is a medium significant that mainly results from the solid waste vehicles movement. The dust impact at RWWTP are a low impact.

The assessment concluded that cumulative noise impact is expected to be a medium significant negative impact as a result of the facilities operation. The dust impact is expected to have medium negative impact resulted from the vehicles movement in the sandy roads.

**Mitigation Measures:**

- Key noisy equipment should be selected with minimum noise;
- Optimize the use of machines and noisy equipment;
- Planting of a wind break trees where appropriate to act as a noise buffer.
- Regular water spraying to eliminate the dust impact.
- Improving the access roads to both facilities.

#### Monitoring Activities:

- Ambient noise at the nearest residential areas from both sites should be measured frequently in an annual basis.
- The complaints from neighboring residents should be documented and reported by the site manager in the periodic monthly reports.

#### **7.3.4.2 Air Quality**

The air quality deterioration mainly results from vehicles emissions and gas emissions from the treatment of the waste water and the decomposition of solid waste. The RWWTP operation mainly results CO<sub>2</sub> as a pollutant, but since the waste in Rafah TS will be daily transferred to Sofa landfill, no gas emissions is expected to results. Still the main source of air quality deterioration in Rafah TS will be the vehicles emissions. Hence the surrounding areas is considered a low densely areas, the assessment concluded that there will be a negative low significant cumulative air impact as a result of the facilities operation.

#### Mitigation Measures:

- All vehicles and heavy equipment working in the facilities mainly in Rafah TS should be maintained according to the maintenance schedule recommended by the manufacturer/supplier. Any vehicle that has high smoke emissions visibility detected should be promptly repaired.
- A buffer zone around the facilities site will decrease the air quality deterioration.
- Spraying water regularly will decrease the air quality deterioration.
- Pavement of all the access roads.

#### Monitoring Activities:

- CO<sub>2</sub> emission rate of all vehicles used in the project should be documented from the manufacturer, the distance and fuel consumption should be documented and reported on monthly basis.
- Periodic air quality measurements should be documented and analyzed

#### **7.3.4.3 Landscape and Visual Impact**

Since Rafah TS is constructed over a random dumpsite, the existence of Rafah TS is considered to cause a positive impact to the surrounding area by providing a proper management of waste inside a closed area facility. A minor negative impact is expected to results during operation, but this can be prevented by applying the proposed mitigation measures. The operation of RWWTP is considered to have a minor negative impact since the surrounding areas are mainly sand dunes and the borders with Egypt.

Cumulative impacts from the operation of RWWTP and Rafah TS in the area, where considered a positive impact since it improves the landscape in the vicinity due to the replacement of the nuisance caused by the random disposal of solid waste to a transfer station site.

#### Mitigation Measures:

- All vehicles coming into\out from the TS should be covered.
- A planted buffer zone around the facilities site will improve the landscape of the area.

#### 7.3.4.4 Health Impact

Rafah TS is constructed over a random dumpsite that was affecting the surrounding communities negatively in terms of health due to the presence of mosquitos, rodents, flies, vermins, etc.

The old waste water lagoons at Rafah was discharging the partially treated effluent to the sea. This results many problems to the surrounding area health and environment.

The operation of Rafah TS and RWWTP will results a positive impact on the health of the surrounding areas by improving the public health and environment conditions.

The cumulative impact from the operation of the facilities is considered a positive impact.

#### 7.3.4.5 Ground Water Quality

A small amount of leachate is expected to results from the operation of Rafah TS, the improper leachate treatment may contribute in deterioration of ground water. A low negative impact is considered to results from Rafah TS operation.

RWWTP is currently connected to two post treatment plants that will pump the tertiary treated waste water to irrigating farms within Rafah Governorates. It is expected that operation of the irrigation scheme will improve the ground water quality.

The cumulative impact on ground water from both Rafah WW lagoons and Rafah TS has not been measured accurately. Although depending on the analysis of available data, a low negative cumulative impact is expected to affect the ground water quality if the proper management and monitoring to the leachate produced in Rafah TS and the tertiary treatment at RWWTP.

**Table 34: Summary of cumulative impacts of KYWWTP**

Impact	Positive/Negative	Time scale	Significance
Noise	Negative	Short -term	Low
Dust	Negative	Short -term	Low
Air quality	Negative	Short -term	Low
Landscape and Visual Impact	Positive		
Impacts on Ground Water	No significance		
Health Impact	Positive		

**Table 35: Summary of cumulative impacts of Rafah WW Lagoons and Transfer Stations**

Impact	Positive/Negative	Time scale	Significance
Noise and Dust	Negative	Short -term	Medium
Air quality	Negative	Short -term	Low

<b>Landscape and Visual Impact</b>	Positive		
<b>Health Impact</b>	Positive		
<b>Impacts on Ground Water</b>	Negative	Long -term	Low

Table 36: Summary of cumulative impacts of old dump site

Impact	Positive/Negative
<b>Landscape and Visual Impact</b>	<b>Positive</b>
<b>Health and Safety Impact</b>	<b>Positive</b>
<b>Impacts on Ground Water</b>	<b>No significance</b>

Table 37: Summary of cumulative impacts during the operation of Khan Yonis TS, MWTF

Impact	Positive/Negative	Time scale	Significance	Direct/Indirect
<b>Noise and Dust impacts</b>	Negative	Long -term	Medium	Direct
<b>Air quality</b>	Negative	Long -term	Low	Direct
<b>Landscape and visual impacts</b>	Negative	Short term	Low	Direct
<b>Risks to occupational health and hygiene</b>	Negative	Short -term	Medium	Indirect

## 7B. SOCIAL IMPACTS AND PROPOSED MITIGATION AND MONITORING MEASURES

The analysis of social impact examines the potential social risks associated with a project and explores how to address them so as to achieve the project's development objectives. It is generally characterized by being of subjective nature. Potential social impacts may range from the obvious, such as involuntary resettlement as well as social and political tensions, to more subtle impacts, such as institutional reforms that affect access to goods and services. The social management plan also included measures to maximize the potential positive impact and ensure that they are reaching the neediest groups. These measures are included in more details in the ESMP, while others are structured as separate set of recommendations by the end of the ESMP Chapter.

Due to this subjectivity that associates with the social impacts, the level of significance of the impacts was not done on numerical basis and was determined based on the Consultant technical judgment. The analysis of the impacts gave special attention to the concerns of stakeholders as part of the various consultation activities. The significance of the impacts was assessed based on the expected duration of the impact, the level of damage it may cause and the asset (s) that will be potentially affected. In assessing the significance of the impact distinction was made based on the impacts that are of most concern (need to be avoided, mitigated or compensated) and those that are considered to be less important because they are of temporary nature or because the affected groups will be able to cope with them.

## 7.4 Potential Socioeconomic Impacts

Main activities under the scope of this study are the operation of the Sofa Sanitary landfill operated in July 2019 and the intended operation of the transfer stations in Rafah and Khn Younis. The storage sites in Khan Younis and Rafah were closed in 2015. In Khan Younis, the municipality has established a closed system where waste is collected in large containers and transferred on a daily basis to the landfill, without allowing any scavenging activities. Scavengers were interviewed to investigate the impact on their livelihood. They stated that they have shifted their activities to collect waste from other random dump sites. For Rafah, the municipality has established a temporary storage site near the old one. Recently and after the operation of Sofa landfill, the amount of solid waste in Rafah temporary storage site has been decreasing significantly where only donkey carts use this site. Rafah waste storage site will be closed once Rafah transfer station is operated. However, the crusher on the site will remain in operation and scavengers will be able to benefit as usual. GSWMP is developed with the main general and core objective of protecting the public health and environment through developing and implementing a sustainable, cost-effective SWM system on the level of both the short and long term across GS. The project is expected to result in several positive socioeconomic impacts on population during operation. The most significant positive impacts are expected to relate to the improvement of the public health, environmental condition in the residential areas and creation of economic opportunities of the poor segment of the population through creating a number of job opportunities that can accommodate low and medium skilled labor.

However, the project is also expected to result in a number of negative socioeconomic impacts during operation. Sustaining the new SWM system will require the introduction of an updated tariff and service fees system which is predicted, also, to have negative impacts in particular on the poor segment of the population who cannot afford to pay. Alternatively, the waste collection and disposal operations may create inconvenience for the local community if they were badly operated. The workers are also one of the important factors to be studied, in order to secure their rights and protect them from any potential hazard.

The following sections of this chapter will present a description of the socioeconomic impacts of the project operation phase. Some of the explored impacts go beyond the limitation of the long-term investments of the project to cover more generic impacts predicted from the project operation phase. Management plan to address the potential significant negative impacts will also be illustrated below setting monitoring plan and institutional responsibilities for implementing the mitigation measures.

## 7.5 Potential risk on the labor engaged in waste management

### 7.5.1 On Workers

Several risks to workers from solid waste management can be greatly reduced by good operational practices at the landfill and transfer station sites. As part of the project, it is expected that safe working methods and good hygiene practices will be introduced. This could include introducing personal protective equipment during working on the sites, introducing health insurance coverage including regular checks as well as preparing the sites and ensuring the preparation, enforcement and monitoring of an emergency and contingency plan. Following the Standard Operation Procedures (SOPs) will be



the key to mitigate the potential risks on workers, as well labor rights should be addressed clearly and reflected on their daily work including providing them by the suitable rest time, and rest place, as well provide them by the risk allowance and all of rights as per the Palestinian Law requirements. Labor should be also trained especially in term of health and safety measures, as well a complaint channels should be clearly available for submitting their views and complaints, and from another side, they should be used as a channel to receive and document received complaints from the local community, especially those who work in the waste collection.

#### **7.5.2 On local communities (as general)**

The visual and health impact of the current inefficient primary and secondary collection systems specially the containers and waste accumulated around it appeared to be an issue for the local communities consulted during the preparation of the ESIA. There is a potential positive impact on the health of the local communities as a result of the improved collection service planned as part of GSWMP. Moreover, the hygienic operation of Sofa sanitary landfill site and the rehabilitation of the old dumpsite in Al Fukhary will result in improvements and protection for the environment including the valuable resource of ground water which is the main source of drinking water in Gaza Strip. This is considered to be one of the key positive returns predicted from the project operation. This is expected to have a positive impact on health of population and the protection of the natural resources. Hence, Negative impacts are also expected and may led to the inconvenience of the local communities such as the risks of accidents or traffic which is considered a significant risk on the community, as well noise could be an additional impact due to waste collection in unsuitable time.

Communication, outreach and sharing information with the local community, in addition to clearly indicate a grievance redress mechanism will help mitigating the potential impacts, and minimize any gaps between the operator and the community.

#### **7.5.3 On the neighboring communities to the landfill**

After the rehabilitation of the old dumpsite and the operation of the new Sofa Sanitary landfill in July 2019 with its sanitary conditions and the various environmental measures that will be considered will result in improving the conditions within the landfill and will be reflected on the neighboring area.

#### **7.5.4 On the neighboring communities to the existing waste storage sites, transfer stations and medical waste treatment facility**

It is predicted that the general operation conditions of the new transfer stations in Khan Younis and Rafah will be more hygienic compared with the old storage sites at the same locations and more attention will be paid to the regular cleaning of the site. Waste will also be removed more regularly and frequently to Al-Fukhary (Sofa) sanitary landfill. It is predicted that positive health, hygiene and visual impacts will be sensed by the neighboring communities.

#### **Impact Significance:**

The reduction of the negative health and safety impact resulting from the old poor storage sites is one important positive impact of high value to the local communities who will be the main receptors of these benefits. The impact could be classified as a positive impact of high significance.

## 7.6 Creation of Job Opportunities

The operation of the different components including the new sites namely (Sofa sanitary landfill, Khan Younis transfer station, Rafah transfer station and the medical waste treatment facility) requires additional human resources of various backgrounds and qualifications.

### 7.6.1 From the landfill

Sofa sanitary landfill is currently in the operation phase, there are 12 fixed term employees working on different managerial and technical tasks to accomplish the daily operations of the landfill. Moreover, the composting plant planned as part of Sofa sanitary landfill will possibly accommodate the waste pickers who are currently making a living from separating recyclables from other sites. The investment in the composting facility will have a positive impact on local employment in this relatively remote area.

### 7.6.2 From Khan Younis transfer stations

The transfer station will employ a few staff members to manage and operate the station and to manage and operate the hauling trucks, the operation phase is expected to have minimum impacts on the jobs creation as there will be only 4 employees in the TS during the operation phase.

### 7.6.3 From Rafah transfer stations

As in Khan Younis case, it is expected that the operation of the station will have a minimum impact on the job's creation (2-permanent guides, 1-operations engineer), Additionally for Rafah TS, a composting facility will be operated. The planned rehabilitation is expected to have a positive impact on employment.

### 7.6.4 From Medical Waste Treatment Facility

The medical waste facility operated in 2018 provided 7 fixed term employees, who are working either in collection or treatment process inside the facility.

#### Impact Significance:

In the dominating poverty of GS where unemployment is a serious challenge, local communities would benefit greatly from the creation of a number of job opportunities that will associate with the improvements of primary and secondary collection services and the other project components as part of GSWMP. This is considered as positive impact of high significance to the local communities. Moreover, integrating the informal waste pickers within the formal system would also be a positive socioeconomic impact of high significance.

## 7.7 Higher Cost to Beneficiary Communities Particularly the Poor

The operation of the long-term activities will require significantly higher revenues for SWM in order to maintain and sustain the system. Currently solid waste fees are around NIS 10: 12 per household per month. The refugee camps are exempted from waste charges. The efficiency of the service fees collection is a main challenge facing municipalities.

Based on the FS recommendations, NIS 4 per person per month, or 24 NIS per household per month (assuming a household size of 6 persons) will need to be collected in order to ensure covering the

needed operation cost. The survey prepared as part of the ESIA clearly showed that local residents in high income districts are more willing to pay in order to receive a better and more efficient level of service. Although some of these high-income areas are already paying twice to receive reasonable level of service, they are still even willing to pay more for service improvements.

It worth noting that the largest portion of the survey sample (around 49% of respondents) who showed willingness to pay more stated that they can pay a maximum 10 NIS monthly. This draws the attention to the importance of considering an appropriate level of payment that local residents can afford. Affordability is an important issue that should be carefully considered in drawing the tariff strategy for SWM. Within the poverty context in Gaza, the unsecured income and the relative high cost of other services. The economic interests of the local population, particularly the poor, should be taken into consideration before proposing any fees system that may overload them economically.

#### Impact Significance:

From a socially sensitive perspective, and particularly within the poverty conditions in Gaza, the project impact that hits the poor economically should be classified as negative impact of high significance. It should be noted, however, that several official and unofficial mechanisms are in place to exclude the poor from paying the service fees (e.g. Services provided by UNRWA to the refugees' camp). In several cases, the poor fees collection efficiency by the municipalities was attributed to the economic hardships that Gaza residents are facing. This leads the municipalities in many cases to drop some service fees from poor families, although this is not done within a structured official policy. The proposed mitigation measures below are expected to reduce impacts significance to a less severe level while working to attain a long term sustainable financial operation for the project through introducing new techniques.

#### Mitigation measures

There is a need to tailor socially sensitive programs for the fees charging system related to SWM to ensure that poor communities are benefiting, not overloaded financially and also to eliminate the sense of dependency on the government and donor agencies and replace it with a sense of ownership to the service and recognition for the financial commitments that it entails.

The mitigation measures below are divided into short term immediate measure and strategic or longer term measure. The section below also presents number of crosscutting measure that would help in attaining financial sustainability by engaging local communities.

##### **7.7.1 Short term measures**

#### **Municipalities and JSC to maintain the system of exempting/subsidizing poor families**

JSC is not collecting fees from the local community. The main beneficiaries from the JSC are the municipalities and UNRWA, hence, they are not maintain the subsidiary/exemption system. These mechanisms are to be maintained for target poor families. Families who can afford should be paying for the service and the poor families who cannot afford is should be exempted. The current approach of subsidizing the service to poor families or exempting the poorest should be sustained until the economic situation of the poor families is improved in the future. Current targeting mechanisms by UNRWA and other social solidarity and safety nets (e.g. the Ministry of Social Affairs) should also be maintained.

Moreover, introducing different-rates for the charging system is also a favorable mitigation measure that could be considered. As recommended by the Feasibility Study of the project, volume-based fees are considered fairer since neighborhoods with limited waste generation, which are the poorer neighborhoods, are considered to subsidize the services in neighborhoods where larger amounts of waste are produced. This is one example of how different rates could be introduced in a way that serves the project financial sustainability and reduce the financial load from the poor families.

### 7.7.2 Strategic measures

#### Design plans to stimulate further economic instruments for SWM revenues

SWM revenues should not be limited to the service fees as the main source. It rather should explore additional economic instruments and tools in order to enhance the collected revenues. Economic instruments generally refer to policies or tools that can be used to influence people's behaviour through financial incentives or disincentives to control pollution and improve cost effectiveness of environmental protection<sup>21</sup>. There are a number of innovative financial and economic instruments that should be considered strategically in order to gradually introduce different culture related to financial sustainability. There is a need to develop a comprehensive plan for these instruments. The development of the plan requires starting with assessment for the tariff system in GS and how to obtain cost recovery. Ideas related to the financial instruments include, but are not limited to:

- The producer responsibility or the **“extended producer responsibility” (EPR)** which assumes that producers are not only responsible for selling their products into the market, but also for ensuring the responsible management such product and materials following their useful life. Despite the limited production market in Gaza Strip. Initiating such instrument in the future with the potential increase in the number of local small industry is suggested.
- **Encourage the local recyclables market and the involvement of the informal sector:** the existing local private market in Gaza Strip for manufacturing recyclables should be encouraged and the role of the informal and the private sector should be stimulated in order to maximize the social returns of these activities. Providing subsidies, grants or micro/meso-finance to establish small and medium recycling industries should be considered. An active recyclable market would encourage other initiative like waste sorting at source and in this case local communities could benefit from reduced service fees or from selling the sorted recyclables. Although initiating a model for separation at source could be regarded as an inapplicable activity to the local communities in Gaza, the increased level of awareness with SWM related issues may stimulate a future potential for the success of such initiative in the future.
- Encourage **the principle of the ‘Polluter Pays Principle’ (PPP)** and engaged relevant organizations including the municipality and the Environmental Quality Authority (EQA) in enforcing this instrument. This instrument will help in improving the public behaviors in waste disposal issues and, in the meantime, will mobilize additional revenues for waste management.

<sup>21</sup> Reference: National Solid Waste Management Programme Report, 2011, ERM and EcoConServ

### 7.7.3 Crosscutting measure:

In addition to above mentioned measure, additional crosscutting activities can help significantly in eliminating the negative implication of this impact.

- Awareness raising and building local communities' knowledge about issues related SWM and the associated costs and the roles of local communities in sustaining the systems.
- Raising the profile of SWM including strengthening the recyclables market and encouraging community-based initiative in segregation at source

Further details about these measures are included under the section “Additional recommendations to maximize the social benefits of the project” below.

## 7.8 Potential impact on the social and economic activities of the neighboring communities

### 7.8.1 From the landfill

The only social and economic activity that could be affected is the farming activity in the farms that are much closed to the landfill. The farmers revealed that the dust resulting from the daily cover operations affects the production of their farms.

### 7.8.2 From Rafah Transfer Stations, Khan Younis Transfer Stations and Medical Waste Treatment Facility

The neighborhood of the TSs might encounter some limitations for the social and economic activities as a result of the location of the TSs with all the associated waste-related activities and the potential odor and visual impact.

#### Impact Significance:

This impact from the landfill is expected to be an impact of low significance. The same impact related to social and economic activities resulting from the establishment of the TSs is still uncertain impact and could be classified as an impact of moderate significance.

#### Mitigation Measures

- In order to mitigate this impact, adherence to the proper management practices in various sites should be strictly considered in order to minimize transferring any negative impacts – to the extent possible - from outside the borders of the landfill and TSs. Full adherence to the management practices will help in reducing the negative impacts on the surrounding social and economic activities.
- Assist local communities in establishing community- based monitoring committees in order to follow up and report feedback on the management system and impacts on the communities to the PMU
- Community surveys and consultation to monitor the project impact on social and economic activities.

**Table 38: Assessed significance of expected impacts during the operation phase**

Impact	(+/-)	Likelihood and Severity	Significant	Mitigation Measures Effects
Reduction of the negative health and safety impact	+	High likelihood	Positive impact of high significance	No mitigation measures required
Workers' rights	+	Medium likelihood	Positive impact of medium significance	Labor rights should be implemented
Inconvenience of Local Community	-	Medium likelihood	Medium significance	Reduce the severity of the impact
Creation of Job Opportunities	+	High likelihood	Positive impact of low significance	No mitigation measures required
Stimulation for economic growth in the area	+	Medium likelihood	Positive impact of moderate significance	
Higher Cost to Beneficiaries Communities particularly the poor	-	Medium likelihood	Negative impact of high significance	Reduce the severity of the impact
Impacts on the social and economic activities From the landfill	+	Low likelihood	Negative impact of low significance	Reduce the severity of the impact
Impacts on the social and economic activities From the Transfer Stations	-	Medium likelihood	Negative impact of moderate significance	Reduce the severity of the impact



## 8. ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLANS

The Environmental and Social Management and Monitoring Plans are presented in this chapter, and they reflect the implementation procedures and mechanisms for the mitigation measures and monitoring activities of the expected impacts previously discussed in Chapter (7). The ESMP assigns certain tasks for different stakeholders according to their roles and responsibilities in the project. The roles of supervision and monitoring for the implementation of the various impacts are presented in the matrixes/tables from 39 to 46.

### 8.1 Institutional Setting of the ESMP

During the operation phase, JSC-KRM will be responsible on implementing the mitigation measures. Independent Verification Agent (IVA) will be responsible on the monitoring in cooperation with other partners such as EQA.

TOU-JSC have the capabilities to implement the mitigation measures during operation phase, but they may require an advance capacity building on environmental and social monitoring and reporting approaches, which can be assessed by the professionalization consultant. The capacity building could be also preparation of safety and emergency response plans, and how to operate facilities in the emergency cases such as the wars.

## 8.2 Environmental and Social Management Matrix

Table 39: Environmental and Social Management Matrix for Al-Fukhary (Sofa) Landfill Site During Operation Phase

Potential Impact	Proposed Mitigation Measures	Institutional Responsibility for Implementation	Responsibility of regulatory supervision	Means of supervision	
				Institutional Responsibility	Means of Monitoring
Environmental Impacts					
General Impacts	Standard Operation Procedures (SOPs) and operation manual should be followed	JSC-KRM	JSC-KRM	IVA	Review of progress reports and field supervision
Odor Impacts	Upgrade the rates of compaction and application of soil cover	JSC-KRM	JSC-KRM	IVA	Field observation
Deterioration of air quality by Dust/smoke	• Apply the daily cover to prevent any of waste self-burning at the site	JSC-KRM	JSC-KRM	IVA	Visual observation
	• Reject any burnt waste to be received at the disposal cell to prevent the distribution of fires				Visual observation
	• Ensure the waste filling schedule is followed as per the operation plan, as well the daily and final cover to be applied. The gas collection system will be installed at the landfill closure phase.				Review of progress reports and field supervision
	• All vehicles and heavy equipment working in the site should be maintained according to the maintenance schedule recommended by the manufacturer/supplier. Any vehicle that has high smoke emissions visibility detected should be promptly repaired.				Review of progress reports and field supervision
	• Water spraying especially in the dry days when dust is noticed.				Visual observation
	• Keep stable slopes of the stockpile				Visual observation
	• Distribute safety signs around the stockpile site				Visual observation

Potential Impact	Proposed Mitigation Measures	Institutional Responsibility for Implementation	Responsibility of regulatory supervision	Means of supervision	
				Institutional Responsibility	Means of Monitoring
	<ul style="list-style-type: none"> <li>Install red tap around the stockpile area to secure the access to the risky area</li> </ul>				Visual observation
Impacts on groundwater and soil	<ul style="list-style-type: none"> <li>The leachate pond should be regularly de-sludged and the removed sludge should be transferred back to the landfill.</li> </ul>	JSC-KRM	JSC-KRM	IVA	Review of progress reports and field supervision
	<ul style="list-style-type: none"> <li>The leachate collection pumping station and correspondent piping network should be adequately maintained to ensure smooth operation.</li> </ul>				
	<ul style="list-style-type: none"> <li>Regular testing of the groundwater quality at the downstream and upstream areas</li> </ul>				Review of progress reports and correspondence with WWTP
	<ul style="list-style-type: none"> <li>Regular maintenance shall always be planned during the non-rainy period. Spare pumps shall be available at the site to be used in the event of accidental breakdown of the operating pumps.</li> </ul>				
	<ul style="list-style-type: none"> <li>Secure the site by fence and monitor the site by CCTV to prevent leachate stealing</li> </ul>				Review of progress reports and field supervision
Risks of receiving hazardous wastes	<ul style="list-style-type: none"> <li>Workers of the landfill should receive adequate training on the permitted and prohibited list of waste to be received/rejected at the landfill site based on the JSC-KRM bylaws.</li> </ul>	JSC-KRM	JSC-KRM	IVA	Visual Observation and review progress reports
	<ul style="list-style-type: none"> <li>Awareness of hazardous waste generators regarding the sorting at source in order to avoid a mixing of hazardous and non-hazardous waste.</li> </ul>				Review of progress reports and field supervision

Potential Impact	Proposed Mitigation Measures	Institutional Responsibility for Implementation	Responsibility of regulatory supervision	Means of supervision	
				Institutional Responsibility	Means of Monitoring
	<ul style="list-style-type: none"> <li>The list of prohibited waste should be clearly shared with municipalities</li> </ul>				Review of progress reports
<b>Risks to occupational Safety, health and hygiene</b>	<ul style="list-style-type: none"> <li>The Safety Plan of the operation of the landfill should be followed, as well the emergency response plan.</li> </ul>	JSC-KRM	JSC-KRM	IVA	Review of progress reports and field supervision
	<ul style="list-style-type: none"> <li>More specific training program shall be conducted to the workers about safe working methods and good hygiene practices. Updating the program in accordance to the workers performance is necessary.</li> </ul>				Review of progress reports and field supervision
	<ul style="list-style-type: none"> <li>Prevention of unauthorized admission to the landfill specially the waste pickers.</li> </ul>				Review of progress reports and field supervision
	<ul style="list-style-type: none"> <li>Vaccination of all workers against Tetanus</li> </ul>				Visual Observation
	<ul style="list-style-type: none"> <li>Smoking is not allowed at the landfill site</li> </ul>				Visual Observation
	<ul style="list-style-type: none"> <li>Follow the health and safety plans instruction during the operation.</li> </ul>				Review of progress reports and field supervision
	<ul style="list-style-type: none"> <li>All workers in the landfill should be provided with anti-puncture gloves, Safety shoes, overalls and masks.</li> </ul>				Visual Observation
	<ul style="list-style-type: none"> <li>Securing the deep areas by a fence to prevent the drowning in the storm water lagoon/ leachate lagoon.</li> </ul>				Visual Observation
	<ul style="list-style-type: none"> <li>All of injuries should be documented, as well a report should be written after any of accident</li> </ul>				Review of progress reports and field supervision
<b>Pests Impacts</b>	<ul style="list-style-type: none"> <li>Follow the pest management plan instruction during the operation (Annex VI).</li> </ul>	JSC-KRM	JSC-KRM	IVA	Review of progress reports and field supervision
	<ul style="list-style-type: none"> <li>Apply pesticides as needed through an application plan</li> </ul>				Review of progress reports and field supervision

Potential Impact	Proposed Mitigation Measures	Institutional Responsibility for Implementation	Responsibility of regulatory supervision	Means of supervision	
				Institutional Responsibility	Means of Monitoring
	that would give preference to biological pesticides, then to other pesticides with negligible impact on humans and minimum impact on untargeted species and the environment				
Noise impacts	<ul style="list-style-type: none"> <li>Key noisy equipment (such as generators, trommels, conveyor belts ... etc.) should be selected with minimum noise;</li> </ul>	JSC-KRM	JSC-KRM	IVA	Review of progress reports and field supervision
	<ul style="list-style-type: none"> <li>Optimize the use of machines and noisy equipment (i.e. switching off when idle);</li> </ul>				
	<ul style="list-style-type: none"> <li>In case the landfill manager received complaints from neighboring areas regarding noisy operations acoustic barriers should be placed between the noise source and the location of the complaining neighbor.</li> </ul>				
Visual impacts and aesthetics	<ul style="list-style-type: none"> <li>Provide adequate buffer area, such as trees, or fences, between the facility and potential receptors</li> </ul>	JSC-KRM	JSC-KRM	IVA	Review of progress reports and field supervision
	<ul style="list-style-type: none"> <li>apply the daily cover to conserve the aesthetics conditions”</li> </ul>				
	<ul style="list-style-type: none"> <li>Compaction of waste at the disposal cell to maximize the landfill lifespan and capacity</li> </ul>				Field Observation
Impacts of the incoming and outgoing waste vehicles (Traffic)	<ul style="list-style-type: none"> <li>Drivers should not exceed the driving limit 20 km/hr inside the landfill site</li> </ul>	JSC-KRM	JSC-KRM	IVA	Visual Observation
	<ul style="list-style-type: none"> <li>Traffic barriers and signs should be installed to decrease the speed of driving</li> </ul>				
	<ul style="list-style-type: none"> <li>The unauthorized vehicles should be rejected to access to the landfill site</li> </ul>				

Potential Impact	Proposed Mitigation Measures	Institutional Responsibility for Implementation	Responsibility of regulatory supervision	Means of supervision	
				Institutional Responsibility	Means of Monitoring
	<ul style="list-style-type: none"> <li>Washing the waste vehicles and the place of washing should be approved by the landfill manager</li> </ul>				
<b>Fauna and Flora ex: distribution of dogs / birds at the landfill site</b>	Communication with animal welfare societies to deal with them.	JSC-KRM	JSC-KRM	IVA	Review of progress reports and field supervision
<b>Social Impacts</b>					
<b>Inconvenience to local community</b>	<ul style="list-style-type: none"> <li>Grievance uptake Channels to be created in the site for any coming complaints during operation</li> </ul>	JSC-KRM	JSC-KRM	IVA	Review of the monthly reports
	<ul style="list-style-type: none"> <li>Conduct periodic consultation sessions with the local community in Al-Fukhary to share information about the operational activities and the implementation of the mitigation measures, in addition to record their new concerns.</li> </ul>				Review of progress reports and field supervision
	<ul style="list-style-type: none"> <li>Develop and Implement a strong communication plan to share information with the community in the service area.</li> </ul>				Review of progress reports and field supervision
	<ul style="list-style-type: none"> <li>Use the multimedia and the social media to share photos and videos about the daily work to share it with the community.</li> </ul>				
	<ul style="list-style-type: none"> <li>Following up and managing the complaint system in JSC-KRM day by day.</li> </ul>				
	<ul style="list-style-type: none"> <li>Invite the stakeholders to visit the facility to strengthen the relationship with JSC-KRM and exchange the knowledge with the related parties.</li> </ul>				Review of progress reports and field supervision



Potential Impact	Proposed Mitigation Measures	Institutional Responsibility for Implementation	Responsibility of regulatory supervision	Means of supervision	
				Institutional Responsibility	Means of Monitoring
	<ul style="list-style-type: none"> <li>Restrict the communication between workers and the surrounding local community.</li> </ul>				
<b>Labor Rights</b>	<ul style="list-style-type: none"> <li>Ensure that all the workers in JSC-KRM are covered by the insurance</li> </ul>	JSC-KRM	JSC-KRM	IVA	Review of progress reports and field supervision
	<ul style="list-style-type: none"> <li>Ensure that all the workers can get the allowance according to the Palestinian Labor Law.</li> </ul>				
	<ul style="list-style-type: none"> <li>Sexual exploitation and abuse and sexual harassment should be controlled</li> </ul>				
	<ul style="list-style-type: none"> <li>Review the code of conduct of the workers in the facility and update it when it needed according to the registered accidents, behaviors and concerns and ensure that all the workers are aware about it.</li> </ul>				
	<ul style="list-style-type: none"> <li>Provide all the required hygiene and cleaning materials for the workers and enforce them to use it specially before taking their meals inside the facility.</li> </ul>				
	<ul style="list-style-type: none"> <li>Provide all the required first aid tools and store it in suitable and easily accessible place.</li> </ul>				
	<ul style="list-style-type: none"> <li>Conduct periodic meetings with the workers to listen to their concerns and encourage them to use the complaint system.</li> </ul>				
	<ul style="list-style-type: none"> <li>Provide suitable rest place for all workers at the site, and assign a rest hour for all workers</li> </ul>				
	<ul style="list-style-type: none"> <li>Prevent any child under the legal age to work at the site. Age verification should be conducted when engaging project workers and it should</li> </ul>				

Potential Impact	Proposed Mitigation Measures	Institutional Responsibility for Implementation	Responsibility of regulatory supervision	Means of supervision	
				Institutional Responsibility	Means of Monitoring
	be monitored to be not less than 18 years old.				
Higher Cost to Beneficiaries Communities particularly the poor	<ul style="list-style-type: none"> <li>Awareness raising and building local communities' knowledge about issues related SWM and the associated costs and the roles of local communities in sustaining the systems.</li> </ul>	JSC-KRM	JSC-KRM	IVA	Review of cost analysis reports
	<ul style="list-style-type: none"> <li>Raising the profile of SWM including strengthening the recyclables market and encouraging community-based initiative in segregation at source</li> </ul>				
	<ul style="list-style-type: none"> <li>Municipalities and JSC to maintain the system of exempting/subsidizing poor families</li> </ul>				
Potential impact on the social and economic activities of the neighboring communities	<ul style="list-style-type: none"> <li>In order to mitigate this impact, adherence to the proper management practices in various sites should be strictly considered in order to minimize transferring any negative impacts – to the extent possible - from outside the borders of the landfill and TSs. Full adherence to the management practices will help in reducing the negative impacts on the surrounding social and economic activities.</li> </ul>	JSC-KRM	JSC-KRM	IVA	Review of progress reports, field observation
	<ul style="list-style-type: none"> <li>Assist local communities in establishing community-based monitoring committees in order to follow up and report feedback on the management system and impacts on the communities to the PMU</li> </ul>				

Table 40: Environmental and Social Management Matrix for Rafah Transfer Station Site During Operation Phase

Potential Impact	Proposed Mitigation Measures	Institutional Responsibility for Implementation	Responsibility of regulatory supervision	Means of Supervision	
				Institutional Responsibility	Means of Monitoring
Environmental Impacts					
General Impacts	• Standard Operation Procedures (SOPs) and operation manual should be followed	JSC-KRM, Municipality of Rafah	JSC-KRM	IVA	Review of progress reports and field supervision
Odor impacts	• Transferring the accumulated wastes at the existing transfer station in a daily basis.	JSC-KRM	JSC-KRM	IVA	Field Observation
	• Washing of tipping area regularly	JSC-KRM, Municipality of Rafah			
	• Covering of the transported waste containers to the landfill				
	• The remaining waste at the night (if any) should be put in roll on/off container and covered				
Deterioration of air quality by dust caused by the operation of vehicles	• Water spray of the operation site.	JSC-KRM, Municipality of Rafah	JSC-KRM	IVA	Field Observation
	• Implement preventive maintenance program for vehicles and promptly repair vehicle with visibly high exhaust				
Contamination of groundwater and soil by leachate, and	• Maintenance of the leachate tank and the collection pipes should be monitored monthly	JSC-KRM, Municipality of Rafah	JSC-KRM	IVA	Field Observation and review of progress reports

Potential Impact	Proposed Mitigation Measures	Institutional Responsibility for Implementation	Responsibility of regulatory supervision	Means of Supervision	
				Institutional Responsibility	Means of Monitoring
<b>toilet drainage during operation phase</b>	<ul style="list-style-type: none"> <li>Evacuate and transfer the Leachate to the nearest WWTP</li> </ul>				Field Observation
	<ul style="list-style-type: none"> <li>Regular sampling and testing of groundwater</li> </ul>	JSC-KRM	JSC-KRM	IVA	Review of progress reports
	<ul style="list-style-type: none"> <li>Sample test of leachate before dumping the leachate to the nearest WWTP</li> </ul>				
	<ul style="list-style-type: none"> <li>Storm water should be drained by gravity or pumping to an empty area.</li> </ul>	JSC-KRM, Municipality of Rafah			Field Observation
<b>Risks to Occupational Health and Hygiene</b>	<ul style="list-style-type: none"> <li>The Safety Plan of the operation of the transfer station should be followed, as well the emergency response plan.</li> </ul>	JSC-KRM, Municipality of Rafah	JSC-KRM	IVA	Field Observation
	<ul style="list-style-type: none"> <li>More specific training program shall be conducted to the workers about safe working methods and good hygiene practices. Updating the program in accordance to the workers performance is necessary.</li> </ul>				
	<ul style="list-style-type: none"> <li>Prevention of unauthorized admission to the TS specially the waste pickers due to safety purposes.</li> </ul>				
	<ul style="list-style-type: none"> <li>Vaccination of all workers against Tetanus</li> </ul>				Review of KSC-KRM reports
	<ul style="list-style-type: none"> <li>Smoking is not allowed at the TS site</li> </ul>				Visual Observation
	<ul style="list-style-type: none"> <li>Follow the health and safety plans instruction during the operation.</li> </ul>				
	<ul style="list-style-type: none"> <li>All workers in the TS should be provided with anti-puncture gloves,</li> </ul>				

Potential Impact	Proposed Mitigation Measures	Institutional Responsibility for Implementation	Responsibility of regulatory supervision	Means of Supervision	
				Institutional Responsibility	Means of Monitoring
	<ul style="list-style-type: none"> <li>Safety shoes, overalls and masks.</li> <li>First aid Boxes and fire extinguishers should be provided at the site</li> <li>All of injuries should be documented, as well a report should be written after any of accident</li> <li>Safety Plan should address all the safety issues at the transfer station</li> </ul>				Review of progress reports and field supervision
Noise Impacts	<ul style="list-style-type: none"> <li>Limiting operation works to daytime.</li> </ul>	JSC-KRM, Municipality of Rafah	JSC-KRM	IVA	Field Observation
	<ul style="list-style-type: none"> <li>Key noisy equipment (such as generators, trommels, conveyor belts ... etc.) should be selected with minimum noise.</li> </ul>				Review of progress reports and field supervision
	<ul style="list-style-type: none"> <li>Optimize the use of machines and noisy equipment (i.e. switching off when idle).</li> </ul>				Review of progress reports and field supervision
	<ul style="list-style-type: none"> <li>Planting of a wind break trees where appropriate to act as a noise buffer.</li> </ul>				Field Observation
Disruption of traffic movement on the main roads by the coming and outgoing solid waste vehicles and increase the probability of accidents	<ul style="list-style-type: none"> <li>Schedule the movement of vehicles carefully.</li> </ul>	JSC-KRM, Municipality of Rafah	JSC-KRM	IVA	Field Observation
	<ul style="list-style-type: none"> <li>Monitor and Control the speed of Waste Vehicles.</li> </ul>				
	<ul style="list-style-type: none"> <li>Schedule the movement of vehicles and carts carefully; restrict transport trucks travel to the hours outside the rush hours</li> </ul>				
Visual Impacts and Aesthetics	<ul style="list-style-type: none"> <li>Provide adequate buffer area, such as trees, or fences, between the facility and potential receptors</li> </ul>	JSC-KRM, Municipality of Rafah	JSC-KRM	IVA	Field Observation
Pests impacts	<ul style="list-style-type: none"> <li>Follow the pest management plan</li> </ul>		JSC-KRM	IVA	Field Observation

Potential Impact	Proposed Mitigation Measures	Institutional Responsibility for Implementation	Responsibility of regulatory supervision	Means of Supervision	
				Institutional Responsibility	Means of Monitoring
	<p>instruction during the operation (Annex VI).</p> <ul style="list-style-type: none"> <li>Apply pesticides as needed through an application plan that would give preference to biological pesticides, then to other pesticides with negligible impact on humans and minimum impact on untargeted species and the environment.</li> </ul>	JSC-KRM, Municipality of Rafah			
<b>Social Impact</b>					
<b>Inconvenience to local community</b>	<ul style="list-style-type: none"> <li>Grievance uptake Channels to be created in the site for any coming complaints during operation</li> </ul>	JSC-KRM, Municipality of Rafah	JSC-KRM	IVA	Review of the monthly reports
	<ul style="list-style-type: none"> <li>Conduct periodic consultation sessions with the local community in Al-Fukhari to share information about the operational activities and the implementation of the mitigation measures, in addition to record their new concerns.</li> </ul>	JSC-KRM	JSC-KRM	IVA	Review of progress reports and field supervision
	<ul style="list-style-type: none"> <li>Develop and Implement a strong communication plan to share information with the community.</li> </ul>				
	<ul style="list-style-type: none"> <li>Use the multimedia and the social media to share photos and videos about the daily work to share it with the community.</li> </ul>				
	<ul style="list-style-type: none"> <li>Following up and managing the complaint system in JSC-KRM day by day.</li> </ul>				
	<ul style="list-style-type: none"> <li>Invite the stakeholders to visit the facility to</li> </ul>				



Potential Impact	Proposed Mitigation Measures	Institutional Responsibility for Implementation	Responsibility of regulatory supervision	Means of Supervision	
				Institutional Responsibility	Means of Monitoring
	<p>strengthen the relationship with JSC-KRM and exchange the knowledge with the related parties.</p> <ul style="list-style-type: none"> <li>Limit the communication between workers and the surrounding local community</li> </ul>				Field Observation
Labor Rights	<ul style="list-style-type: none"> <li>Ensure that all the workers in JSC-KRM are covered by the insurance</li> </ul>	JSC-KRM, Municipality of Rafah	JSC-KRM	IVA	Review of progress reports and field supervision
	<ul style="list-style-type: none"> <li>Ensure that all the workers took the required Vaccinations according to the MoH recommendations.</li> </ul>				
	<ul style="list-style-type: none"> <li>that all the workers can get the allowance according to the Palestinian Labor Law.</li> </ul>				
	<ul style="list-style-type: none"> <li>Review the code of conduct of the workers in the facility and update it when it needed according to the registered accidents, behaviors and concerns and ensure that all the workers are aware about it.</li> </ul>				
	<ul style="list-style-type: none"> <li>Sexual exploitation and abuse and sexual harassment should be controlled</li> </ul>				
	<ul style="list-style-type: none"> <li>Provide all the required hygiene and cleaning materials for the workers and enforce them to use it specially before taking their meals inside the facility.</li> </ul>				
	<ul style="list-style-type: none"> <li>Provide all the required first aid tools and store it in suitable and easily accessible place.</li> </ul>				
	<ul style="list-style-type: none"> <li>Conduct periodic meetings with the workers to listen</li> </ul>				

Potential Impact	Proposed Mitigation Measures	Institutional Responsibility for Implementation	Responsibility of regulatory supervision	Means of Supervision	
				Institutional Responsibility	Means of Monitoring
	<p>to their concerns and encourage them to use the complaint system.</p> <ul style="list-style-type: none"> <li>Prevent any child under the legal age to work at the site. Age verification should be conducted when engaging project workers and it should be monitored to be not less than 18 years old.</li> </ul>				Field Observation

Table 8-3. Environmental and Social Management Matrix for Khan Younis Transfer Station Site During Operation Phase

Potential Impact	Proposed Mitigation Measures	Institutional Responsibility for Implementation	Responsibility of regulatory supervision	Means of Supervision	
				Institutional Responsibility	Means of Monitoring
Environmental Impacts					
General Impacts	<ul style="list-style-type: none"><li>Standard Operation Procedures (SOPs) and operation manual should be followed</li></ul>	JSC-KRM, Municipality of Khan Younis	JSC-KRM	IVA	Review of progress reports and field supervision
Odor impacts	<ul style="list-style-type: none"><li>Transferring the accumulated wastes at the existing transfer station on a daily basis.</li></ul>	JSC-KRM			Field Observation
	<ul style="list-style-type: none"><li>Washing of tipping area regularly</li></ul>	JSC-KRM, Municipality of Khan Younis			Field Observation
	<ul style="list-style-type: none"><li>Covering of the transported waste containers to the landfill</li></ul>				
	<ul style="list-style-type: none"><li>The remaining waste at the night (if any) should be put in roll on/off container and covered.</li></ul>				
Deterioration of air quality by dust caused by the operation of vehicles	<ul style="list-style-type: none"><li>Water spray of the operation site.</li></ul>	JSC-KRM, Municipality of Khan Younis	JSC-KRM	IVA	Field observation
	<ul style="list-style-type: none"><li>Implement preventive maintenance program for vehicles and promptly repair vehicle with visibly high exhaust</li></ul>				

Potential Impact	Proposed Mitigation Measures	Institutional Responsibility for Implementation	Responsibility of regulatory supervision	Means of Supervision	
				Institutional Responsibility	Means of Monitoring
<b>Contamination of groundwater and soil by leachate, and toilet drainage during operation phase</b>	<ul style="list-style-type: none"> <li>• maintenance of the leachate tank and the collection pipes should be monitored monthly</li> </ul>	JSC-KRM, Municipality of Khan Younis	JSC-KRM	IVA	Field observation and review of progress reports
	<ul style="list-style-type: none"> <li>• Evacuate and transfer the Leachate to the nearest WWTP</li> </ul>				
	<ul style="list-style-type: none"> <li>• Regular sampling and testing of groundwater</li> </ul>				
	<ul style="list-style-type: none"> <li>• Sample test of leachate before dumping the leachate to the nearest WWTP</li> </ul>				
<b>Risks to Occupational Health and Hygiene</b>	<ul style="list-style-type: none"> <li>• The Safety Plan of the operation of the transfer station should be followed, as well the emergency response plan.</li> </ul>	JSC-KRM, Municipality of Khan Younis	JSC-KRM	IVA	Field Observation
	<ul style="list-style-type: none"> <li>• More specific training program shall be conducted to the workers about safe working methods and good hygiene practices. Updating the program in accordance to the workers performance is necessary.</li> </ul>				
	<ul style="list-style-type: none"> <li>• Prevention of unauthorized admission to the TS specially the waste pickers due to safety purposes.</li> </ul>				
	<ul style="list-style-type: none"> <li>• Vaccination of all workers against Tetanus</li> </ul>				Review of KSC-KRM reports
	<ul style="list-style-type: none"> <li>• Smoking is not allowed at the TS site</li> </ul>				Visual Observation
	<ul style="list-style-type: none"> <li>• Follow the health and safety plans instruction during the operation.</li> </ul>				Field Observation
	<ul style="list-style-type: none"> <li>• All workers in the TS should be provided with anti-puncture gloves, Safety shoes, overalls and masks.</li> </ul>				

Potential Impact	Proposed Mitigation Measures	Institutional Responsibility for Implementation	Responsibility of regulatory supervision	Means of Supervision	
				Institutional Responsibility	Means of Monitoring
	<ul style="list-style-type: none"> <li>First aid Boxes and fire extinguishers should be provided at the site</li> <li>All of injuries should be documented, as well a report should be written after any of accident</li> </ul>				Review of progress reports and field supervision
<b>Noise Impacts</b>	<ul style="list-style-type: none"> <li>Limiting operation works to daytime</li> </ul>	JSC-KRM, Municipality of Khan Younis	JSC-KRM	IVA	Field Observation
	<ul style="list-style-type: none"> <li>Key noisy equipment (such as generators, trommels, conveyor belts ... etc.) should be selected with minimum noise;</li> </ul>				Review of progress reports and field supervision
	<ul style="list-style-type: none"> <li>Optimize the use of machines and noisy equipment (i.e. switching off when idle);</li> </ul>				
	<ul style="list-style-type: none"> <li>Planting of a wind break trees where appropriate to act as a noise buffer.</li> </ul>				Field Observation
<b>Pests impacts</b>	<ul style="list-style-type: none"> <li>Follow the pest management plan instruction during the operation (Annex VI).</li> </ul>	JSC-KRM, Municipality of Khan Younis	JSC-KRM	IVA	Field Observation
	<ul style="list-style-type: none"> <li>Apply pesticides as needed through an application plan that would give preference to biological pesticides, then to other pesticides with negligible impact on humans and minimum impact on untargeted species and the environment</li> </ul>				
<b>Disruption of traffic movement on the main roads by the coming and outgoing solid waste</b>	<ul style="list-style-type: none"> <li>Schedule the movement of vehicles carefully.</li> </ul>	JSC-KRM, Municipality of Khan Younis	JSC-KRM	IVA	Field Observation
	<ul style="list-style-type: none"> <li>Monitor and Control the speed of Waste Vehicles.</li> </ul>				
	<ul style="list-style-type: none"> <li>Schedule the movement of vehicles carefully; restrict</li> </ul>				

Potential Impact	Proposed Mitigation Measures	Institutional Responsibility for Implementation	Responsibility of regulatory supervision	Means of Supervision	
				Institutional Responsibility	Means of Monitoring
vehicles and increase the probability of accidents	transport trucks travel to the hours outside the rush hours				
<b>Social Impact</b>					
Inconvenience to local community	<ul style="list-style-type: none"> <li>Grievance uptake Channels to be created in the site for any coming complaints during operation</li> </ul>	JSC-KRM, Municipality of Rafah			Review of the monthly reports
	<ul style="list-style-type: none"> <li>Conduct periodic consultation sessions with the local community in Al-Fukhari to share information about the operational activities and the implementation of the mitigation measures, in addition to record their new concerns.</li> </ul>	JSC-KRM	JSC-KRM	IVA	Review of progress reports and field supervision
	<ul style="list-style-type: none"> <li>Develop and Implement a strong communication plan to share information with the community.</li> </ul>				
	<ul style="list-style-type: none"> <li>Use the multimedia and the social media to share photos and videos about the daily work to share it with the community.</li> </ul>				
	<ul style="list-style-type: none"> <li>Following up and managing the complaint system in JSC-KRM day by day.</li> </ul>				
	<ul style="list-style-type: none"> <li>Invite the stakeholders to visit the facility to strengthen the relationship with JSC-KRM and exchange the knowledge with the related parties.</li> </ul>				
	<ul style="list-style-type: none"> <li>Limit the communication between workers and the surrounding local community</li> </ul>	JSC-KRM	JSC-KRM	IVA	Field Observation
Labor Rights	<ul style="list-style-type: none"> <li>Ensure that all the workers in JSC-KRM are covered by the insurance</li> </ul>	JSC-KRM, Municipality of Khan Younis	JSC-KRM	IVA	Review of progress reports and

Potential Impact	Proposed Mitigation Measures	Institutional Responsibility for Implementation	Responsibility of regulatory supervision	Means of Supervision	
				Institutional Responsibility	Means of Monitoring
	<ul style="list-style-type: none"> <li>• Ensure that all the workers took the required Vaccinations according to the MoH recommendations.</li> <li>• Ensure that all the workers can get the allowance according to the Palestinian Labor Law.</li> <li>• Review the code of conduct of the workers in the facility and update it when it needed according to the registered accidents, behaviors and concerns and ensure that all the workers are aware about it.</li> <li>• Sexual exploitation and abuse and sexual harassment should be controlled</li> <li>• Provide all the required hygiene and cleaning materials for the workers and enforce them to use it specially before taking their meals inside the facility.</li> <li>• Provide all the required first aid tools and store it in suitable and easily accessible place.</li> <li>• Conduct periodic meetings with the workers to listen to their concerns and encourage them to use the complaint system.</li> <li>• Prevent any child under the legal age to work at the site. Age verification should be conducted when engaging project workers and it should be monitored to be not less than 18 years old.</li> </ul>				<p>field supervision</p> <p>Field Observation</p>

Table 41: Environmental Management Matrix for Operation of The Medical Waste Treatment Facility



Potential Impact	Proposed Mitigation Measures	Institutional Responsibility for Implementation	Responsibility of regulatory supervision	Means of Supervision	
				Institutional Responsibility	Means of Monitoring
Environmental Impacts					
General Impacts	<ul style="list-style-type: none"><li>Standard Operation Procedures (SOPs) should be followed</li></ul>	JSC-KRM	JSC-KRM	IVA	Review of progress reports and field supervision
Odor	<ul style="list-style-type: none"><li>Transfer the HCW from Medical centers to treatment facility, and treated waste from treatment facility to the landfill daily, no HCW is accepted to be stored for more than 24 hours</li></ul>	JSC-KRM	JSC-KRM	IVA	Field Observation
	<ul style="list-style-type: none"><li>Evacuate the leachate tank periodically (weekly)</li></ul>				
	<ul style="list-style-type: none"><li>Washing the unloading area and leachate tank periodically</li></ul>				
Deterioration of air quality by dust caused by waste collection vehicles	<ul style="list-style-type: none"><li>Ensure periodic maintenance of autoclave machine as well as the ventilation system</li></ul>	JSC-KRM	JSC-KRM	IVA	Field Observation
	<ul style="list-style-type: none"><li>Pavement/maintain of access road</li></ul>	JSC-KRM/Municipal ty of Khan Younis			
	<ul style="list-style-type: none"><li>Schedule the movement of HCW vehicles carefully</li></ul>	JSC-KRM			
	<ul style="list-style-type: none"><li>Control the speed of HCW Vehicles</li></ul>				
	<ul style="list-style-type: none"><li>Fully close of the HCW vehicles when transport the waste</li></ul>				
Contamination of groundwater and soil by leachate	<ul style="list-style-type: none"><li>Sampling and testing of groundwater</li></ul>	JSC-KRM	JSC-KRM	IVA	Review of analysis results
	<ul style="list-style-type: none"><li>Maintenance of the leachate tank and collection system monthly</li></ul>				Field Observation and review progress reports
	<ul style="list-style-type: none"><li>Chlorination of leachate before evacuation.</li></ul>				
	<ul style="list-style-type: none"><li>Evacuate and transfer the leachate to WWTP</li></ul>				
Noise impacts caused by Waste Vehicles and Electrical Generator	<ul style="list-style-type: none"><li>Limiting operation works to daytime</li></ul>	JSC-KRM	JSC-KRM	IVA	Field Observation
	<ul style="list-style-type: none"><li>Regular maintenance of Autoclave, vehicles and generator</li></ul>				

Potential Impact	Proposed Mitigation Measures	Institutional Responsibility for Implementation	Responsibility of regulatory supervision	Means of Supervision	
				Institutional Responsibility	Means of Monitoring
	<ul style="list-style-type: none"> <li>Schedule the movement of HCW vehicles carefully away of rush hours and in accordance with the TS vehicles</li> </ul>				
<b>Workers Health and Safety</b>	<ul style="list-style-type: none"> <li>Comply with the Palestinian Labors Law in terms of workers health and safety, working hours, and workers insurance and risk allowance.</li> </ul>	JSC-KRM	JSC-KRM	IVA	Review the monthly reports, and field observation
	<ul style="list-style-type: none"> <li>Use of PPE wear by workers with fully commitment, special masks and overall wear should be provided for workers who work inside the facility</li> </ul>	JSC-KRM	JSC-KRM	IVA	Field Observation
	<ul style="list-style-type: none"> <li>Provide the required vaccination for all workers and drivers of the HCW treatment facility, and periodic examination should be made for them</li> </ul>				
	<ul style="list-style-type: none"> <li>Provide First Aid kits and fire extinguishers.</li> </ul>				
	<ul style="list-style-type: none"> <li>Conducting an operation plan, safety plan and emergency response plan for workers and for any potential fires inside the treatment facility.</li> </ul>				
	<ul style="list-style-type: none"> <li>Adding complaint log for workers</li> </ul>				
	<ul style="list-style-type: none"> <li>Archive of all quantities of received HCW, and don't accept any unsigned pins (don't have a printed sign)</li> </ul>				
	<ul style="list-style-type: none"> <li>Drivers of HCW should be comply with the PPE wear</li> </ul>				
	<ul style="list-style-type: none"> <li>Restricting the access for any un-authorized person into the treatment facility</li> </ul>				
	<ul style="list-style-type: none"> <li>Training program for (Workers and drivers, Operation Engineer, and the mechanical technicians)</li> </ul>	JSC-KRM	JSC-KRM	IVA	Review of the monthly reports
	<ul style="list-style-type: none"> <li>Install taller chimney for emitting smokes in higher atmosphere layers for better</li> </ul>	JSC-KRM	JSC-KRM	IVA	Review of progress reports

Potential Impact	Proposed Mitigation Measures	Institutional Responsibility for Implementation	Responsibility of regulatory supervision	Means of Supervision	
				Institutional Responsibility	Means of Monitoring
	dilution and less impact on community.				
Pests Impacts	• Follow the pest management plan instruction during the operation (Annex VI).	JSC-KRM	JSC-KRM	IVA	Review of progress reports and field supervision
	• Apply pesticides as needed through an application plan that would give preference to biological pesticides, then to other pesticides with negligible impact on humans and minimum impact on untargeted species and the environment				
Transportation and Traffic/Accidents	• Schedule the movement of HCW vehicles carefully	JSC-KRM	JSC-KRM	IVA	Field Observation
	• Strict monitoring to the road accidents and install signs				
	• Implement Safety measures to protect people from injury/infection				
Flora and Fauna	• Revegetation/Planting around the treatment facility	JSC-KRM	JSC-KRM	IVA	Field Observation
Expected fires and smoke	• Preparation an emergency response plan for any potential fires inside the treatment facility	JSC-KRM	JSC-KRM	IVA	Field Observation
	• Install taller chimney for emitting smokes in higher atmosphere layers for better dilution and less impact on community				
	• Provide First Aid kits and fire extinguishers				
Social Impact					
Local Community Health	• Transfer the HCW and the treated waste daily	JSC-KRM	JSC-KRM	IVA	Field Observation
	• Close the storage pins during transfer the HCW				
	• Fully close of the HCW vehicle during waste transfer				
	• Printing a warning sign on HCW pins, and vehicles to indicate it contains infectious HCW.				

Potential Impact	Proposed Mitigation Measures	Institutional Responsibility for Implementation	Responsibility of regulatory supervision	Means of Supervision	
				Institutional Responsibility	Means of Monitoring
	<ul style="list-style-type: none"> <li>Periodic maintain the pins and vehicles in order to prevent any leakage</li> </ul>				
Inconvenience of local community	<ul style="list-style-type: none"> <li>Grievance uptake Channels to be created in the site for any coming complaints during operation</li> </ul>	JSC-KRM	JSC-KRM	IVA	Review of the monthly reports
	<ul style="list-style-type: none"> <li>Information sharing with the community</li> </ul>				
	<ul style="list-style-type: none"> <li>Sort and process the received complaints</li> </ul>				
	<ul style="list-style-type: none"> <li>Acknowledge and follow up the complaints</li> </ul>				
	<ul style="list-style-type: none"> <li>Verify, investigate, and act to determine the validity of received grievance</li> </ul>				
	<ul style="list-style-type: none"> <li>Monitor, evaluate and provide feedback</li> </ul>				
	<ul style="list-style-type: none"> <li>Ensure documentation for any received complaint</li> </ul>				

Table 42: Environmental Management Matrix for Secondary Collection During Operation Phase

Potential Impact	Proposed Mitigation Measures	Institutional Responsibility for Implementation	Responsibility of regulatory supervision	Means of supervision	
				Institutional Responsibility	Means of Monitoring
Environmental Impacts					
Ground Water	• Leachate should be stored in a separated tank in the waste dumping truck, and to be evacuated in the landfill site	JSC-KRM	JSC-KRM	IVA	Field observation
	• Waste dumping trucks should be washed regularly in the workshop or the landfill site, but it is not allowed to be washed outside				
Air quality deterioration from release of dusts and gaseous emissions from exposed soil	• Maintain vehicles to be in good working condition.	JSC-KRM	JSC-KRM	IVA	Review of progress reports and field supervision
	• Ensure exhaust fumes from vehicles conform to applicable standards and specifications				

Potential Impact	Proposed Mitigation Measures	Institutional Responsibility for Implementation	Responsibility of regulatory supervision	Means of supervision	
				Institutional Responsibility	Means of Monitoring
surfaces and vehicles					
Noise and vibration from vehicles	• Maintain equipment and machineries adequately to reduce their noise levels	JSC-KRM	JSC-KRM	IVA	Review of progress reports and field supervision
	• Working in the daytime (6:00 am – 8:00pm)				Filed observation
Occupational accidents and injuries from the use of machineries and equipment	• Prepare a specific HSE plan for workers addressing issues including; HSE rules and instruction;	JSC-KRM	JSC-KRM	IVA	Review of progress reports and field supervision
	• Emergency contingency plans; training of workers; Incident/accident reporting; Provision of First Aid with each vehicle.				
Traffic congestion and increased risk of road traffic accidents and injuries as a result of movement of equipment	• Develop a Traffic Management Plan (TMP).	JSC-KRM	JSC-KRM	IVA	Review of progress reports and field supervision
	• Traffic control measures to include: - Strict enforcement of speed limits; - Use of appropriate road safety signs and signalers, and - Minimization of movement at peak hours of the day.				
Visual Impact and offensive odor	• Cleaning the site after emptying the collection vehicles.	Municipalities	JSC-KRM	IVA	Field Observation
	• Cover the SW collection vehicles during transport the waste to the Landfill site.	JSC-KRM, Municipalities			
Social Impacts					
Labors rights	• Ensure that all the workers in JSC-KRM are covered by the insurance	JSC-KRM	JSC-KRM	IVA	Review of progress reports and field supervision
	• Ensure that all the workers can get the allowance according to the Palestinian Labor Law.				

Potential Impact	Proposed Mitigation Measures	Institutional Responsibility for Implementation	Responsibility of regulatory supervision	Means of supervision	
				Institutional Responsibility	Means of Monitoring
	<ul style="list-style-type: none"> <li>Sexual exploitation and abuse and sexual harassment should be controlled</li> <li>Review the code of conduct of the workers in the facility and update it when it needed according to the registered accidents, behaviors and concerns. And Ensure that all the workers are aware about it.</li> <li>Provide the PPE for all workers and drivers, and ensure they use them</li> <li>Provide all the required first aid tools and store it in suitable and easily accessible place in the vehicle.</li> <li>Conduct periodic meetings with the workers to listen to their concerns and encourage them to use the complaint system.</li> <li>Prevent any child under the legal age to work in the waste collection</li> </ul>				
Inconvenience of local community	<ul style="list-style-type: none"> <li>Grievance uptake Channels to be created in the site for any coming complaints during operation</li> </ul>	JSC-KRM	JSC-KRM	IVA	Review of JSC-KRM Reports
	<ul style="list-style-type: none"> <li>Ensure documentation for any received complaint</li> </ul>				
	<ul style="list-style-type: none"> <li>Information Sharing with the Community, and increase the communication activities</li> </ul>				

### 8.3 Environmental Monitoring Matrix

Table 43: Environmental Monitoring Matrix for Sofa Landfill Site During Operation Phase

Potential Impact	Indicator	Monitoring Location	Monitoring Methods	Monitoring Frequency	Monitoring Responsibility	
					Self (Internal)	Regulatory (External)
Odor impacts	Odor complaints from	Landfill location	Recording and documentation of complaints	Monthly	JSC-KRM	IVA



Potential Impact	Indicator	Monitoring Location	Monitoring Methods	Monitoring Frequency	Monitoring Responsibility	
					Self (Intern-al)	Regulatory (External)
	neighbors					
<b>Deterioration of air quality by Dust/smoke</b>	Dust/smoke impacts	Landfill Site	Visual observation and documentation of complaints weekly	Daily	JSC-KRM	IVA
<b>Excavated Material Stockpile concerns</b>	Slope not less than 1:2	Stockpile location	Visual observation	Daily	JSC-KRM	IVA
<b>Impacts on groundwater and soil</b>	Testing of groundwater samples from monitoring wells	Four Monitoring wells	Lab test	Semi-annual	JSC-KRM	IVA
	Leachate pumped amounts	Landfill location	Data Documentation	Monthly	JSC-KRM	IVA
	Leachate analysis (BOD, COD, pH, TN, TP, TDS, heavy metals and TPH)	Landfill location	Lab tests	Monthly	JSC-KRM	IVA
	Amount of sludge removed from the pond	Landfill location	Data Documentation	Monthly	JSC-KRM	IVA
	CCTV records	Landfill location	Medical reporting on received cases	Weekly	Occupational health clinic	IVA
<b>Risks of receiving hazardous wastes</b>	List of prohibited waste "JSC-KRM bylaw"	Landfill site	Recording and documentation	Daily	JSC-KRM	IVA
<b>Risks to occupational health and hygiene</b>	Availability of safety plan, PPE, safety training, first aid box, fire extinguishers, safety signs	Landfill site	Visual observation	Daily	JSC-KRM	IVA

Potential Impact	Indicator	Monitoring Location	Monitoring Methods	Monitoring Frequency	Monitoring Responsibility	
					Self (Intern-al)	Regulatory (External)
<b>Pests Impacts</b>	Type, quantity, date, location And method of application of pesticides	Landfill location	Documentation of Data	Monthly	JSC-KRM	IVA
	Complaints from neighbors about insects and rodents	Landfill location	Documentation of complaints	Monthly	JSC-KRM	IVA
<b>Noise Impacts</b>	Noise complaints from neighbors	Landfill Site	Documentation of complaints	Weekly	JSC-KRM	IVA
	Maintenance of landfill equipment	Workshop	Logbook	Monthly	JSC-KRM	IVA
<b>Visual impacts and aesthetics</b>	Complaints from neighbors	Landfill location	Documentation of complaints	Monthly	JSC-KRM	IVA
	Applying the daily cover	Landfill location	Visual observation	Daily	JSC-KRM	IVA
<b>Impacts of the incoming and outgoing waste vehicles</b>	Recorded Accidents	Around the landfill site	logbook	weekly	JSC-KRM	IVA
	Received Complaints	Around the landfill site	logbook	weekly	JSC-KRM	IVA
<b>Fauna and Flora ex: distribution of dogs / birds at the landfill site</b>	Data records	Landfill location	Documentation of data	Monthly	JSC-KRM	IVA
<b>Inconvenience to local community</b>	Complaints from the local community	Local community	logbook	weekly	JSC-KRM	IVA
<b>Labor rights</b>	Review of all rights	Landfill location	Surveying/visual observation	Monthly	JSC-KRM	IVA
<b>Higher Cost to Beneficiaries Communities particularly the poor</b>	Cost Analysis indicators	All waste sites	Surveying/visual observation	Semi-annual	JSC-KRM	IVA

Potential Impact	Indicator	Monitoring Location	Monitoring Methods	Monitoring Frequency	Monitoring Responsibility	
					Self (Intern-al)	Regulatory (External)
Potential impact on the social and economic activities of the neighboring communities	Economic indicators	All waste sites	Surveying/visual observation	Semi-annual	JSC-KRM	IVA

Table 44: Environmental and Social Monitoring Matrix for Transfer Station Sites During Operation Phase

Potential Impact	Indicator	Monitoring Location	Monitoring Methods	Monitoring Frequency	Monitoring Responsibility	
					Self (Intern-al)	Regulatory (External)
Odor impacts	Odor complaints from neighbors	Transfer Station location	Recording and documentation of complaints	Monthly	JSC-KRM	IVA
Deterioration of air quality by dust caused by the operation of vehicles	Dust/smoke impacts Noise	Transfer Station location	Visual observation	Monthly	JSC-KRM	IVA
	CO <sub>2</sub> emission rate		Distances & Fuel consumption documentation			
Contamination of groundwater and soil by leachate	Testing of groundwater samples from monitoring wells	Monitoring Well at transfer Station location	Lab test	Semi-annual	JSC-KRM	IVA
	Erosion impacts for storm water	Transfer Station location	Visual observation	In the rainy days	JSC-KRM	IVA
	Amount of leachate pumped		Data documentation	Monthly	JSC-KRM	IVA
	Testing leachate (COD, BOD,		Lab test	Quarterly basis (pH,	JSC-KRM	IVA

Potential Impact	Indicator	Monitoring Location	Monitoring Methods	Monitoring Frequency	Monitoring Responsibility	
					Self (Intern-al)	Regulatory (External)
	pH, TDS, TP, TN, Heavy metals and TPH)			BOD, COD) and yearly basis for all parameters		
<b>Risks to occupational health and hygiene</b>	Availability of safety plan, PPE, safety training, first aid box, fire extinguishers, safety signs	Transfer Station location	Visual observation	Daily	JSC-KRM	IVA
<b>Noise Impacts</b>	Noise complaints from neighbors	Transfer Station location	Documentation of complaints	Weekly	JSC-KRM	IVA
<b>Pests impacts</b>	Type, quantity, date, location And method of application of pesticides	Transfer station location	Documentation of data	Monthly	JSC-KRM	IVA
	Complaints from neighbors about insects and rodents					
<b>Visual Impacts and Aesthetics</b>	Received complaints from local community	Local community	Logbook	Monthly	JSC-KRM	IVA
<b>Disruption of traffic movement on the main roads by the coming and outgoing solid waste vehicles and increase the probability of accidents (Traffic)</b>	Records of accidents, and complaints from community	around Transfer Station location	Logbook, visual observation	Monthly	JSC-KRM	IVA
<b>Safety Concerns in the Transfer Station Workshop</b>	Records of accidents, comprehensive Safety plan	Workshop	Logbook	Monthly	JSC-KRM	IVA

Potential Impact	Indicator	Monitoring Location	Monitoring Methods	Monitoring Frequency	Monitoring Responsibility	
					Self (Intern-al)	Regulatory (External)
Inconvenience to local community	Complaints from the local community	Local community	Logbook	weekly	JSC-KRM	IVA
Labor rights	Review of all rights	Transfer station location	Surveying/visual observation	Monthly	JSC-KRM	IVA

Table 45: Environmental Monitoring Matrix for Medical Waste Treatment Facility MWTF During Operation Phase

Potential Impact	Indicator	Monitoring Location	Monitoring Methods	Monitoring Frequency	Monitoring Responsibility	
					Self (Intern-al)	Regulatory (External)
Odor	Odor complaints from neighbors	medical waste treatment location	Recording and documentation of complaints	Monthly	JSC-KRM	IVA
Deterioration of air quality by dust caused by waste collection vehicles	Dust/smoke impacts Noise CO <sub>2</sub> emission rate	medical waste treatment location	Visual observation Distance fuel consumption documentation	Monthly	JSC-KRM	IVA
Contamination of groundwater and soil by leachate, and Toilet Drainage during operation phase	Testing of groundwater samples from monitoring wells	Monitoring Well at medical waste treatment location	Lab test	Semi-annual	JSC-KRM	IVA
	Records of leachate pumped amounts	Medical waste treatment facility location	Data documentation	Monthly	JSC-KRM	IVA
	Analysis of leachate (COD, BOD, pH, TN, TDS, TP, heavy metals and TPH)		Lab test	Quarterly for (pH, BOD and COD) and yearly for the rest parameters	JSC-KRM	IVA
Workers Health and Safety	Review of all labor rights	medical waste treatment location	Surveying/visual observation	Monthly	JSC-KRM	IVA
	Availability of safety tools (PPE, first aid box, etc)		Visual observation	Daily		

Potential Impact	Indicator	Monitoring Location	Monitoring Methods	Monitoring Frequency	Monitoring Responsibility	
					Self (Intern-al)	Regulatory (External)
Noise impacts caused by Waste Vehicles and Electrical Generator	Noise complaints from neighbors	medical waste treatment location	Documentation of complaints	Weekly	JSC-KRM	IVA
Transportation and Traffic/Accidents (Traffic)	Records of accidents, and complaints from community	Around medical waste treatment location	Logbook, visual observation	Monthly	JSC-KRM	IVA
Expected fires and smoke	Records of fire accidents	medical waste treatment location	Visual observation	Daily	JSC-KRM	IVA
Pests Impacts	Type, quantity, date, location And method of application of pesticides	medical waste treatment location	Documentation of data	Monthly	JSC-KRM	IVA
Local Community Health	Complaints from the local community	Local community	logbook	Monthly	JSC-KRM	IVA
Inconvenience of local community	Complaints from the local community	Local community	logbook	Weekly	JSC-KRM	IVA

Table 46: Environmental Monitoring Matrix for Secondary Collection During Operation Phase

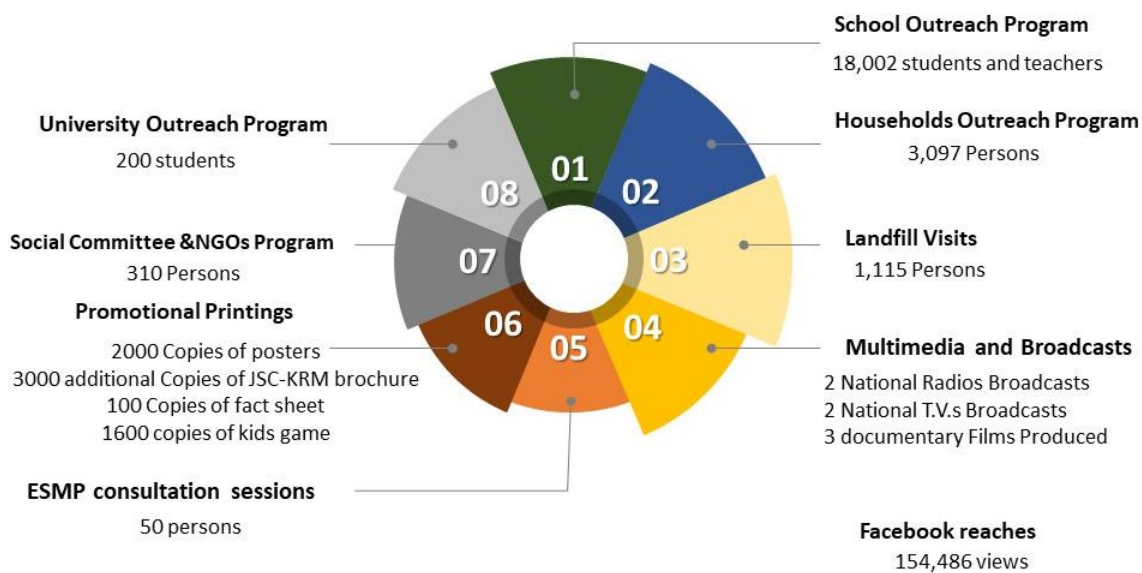
Potential Impact	Indicator	Monitoring Methods	Monitoring Frequency	Monitoring Responsibility	
				Self (Internal)	Regulatory (External)
Air quality deterioration from release of dusts and gaseous emissions from exposed soil surfaces and vehicles Noise and vibration from vehicles	Noise and air measurement	Take representative average noise and air quality	Annually	JSC-KRM	IVA
	complaints from community	Documentation of complaints	Monthly	JSC-KRM	IVA
Ground water	Leachate amount evacuated and transported to the dumpsite	Data documentation	Daily	JSC-KRM	IVA



Potential Impact	Indicator	Monitoring Methods	Monitoring Frequency	Monitoring Responsibility	
				Self (Internal)	Regulatory (External)
Occupational health	Health records about accidents and worker health status	Medical reporting on Received cases	Every 6 month	JSC-KRM	IVA
Traffic congestion and increased risk of road traffic accidents and injuries as a result of movement of equipment Occupational accidents and injuries from the use of machineries and equipment	Records from the ministry of transportation	Documentation of Data	Monthly	JSC-KRM	IVA
Visual Impact and bad odor	Data records complaints from community	Documentation of complaints	Monthly	JSC-KRM	IVA
Inconvenience to local community	Complaints from the local community	logbook	weekly	JSC-KRM	IVA
Labor rights	Review of all rights	Surveying/visual observation	Monthly	JSC-KRM	IVA

## ANNEX I: JSC-KRM outreach and awareness activities - 2019

**Number of Beneficiaries (Jan 2019- Nov 2019)**



### School's Outreach Program (2019)

Implementation period	Partners in coordination and implementation	Number of schools	Number of targeted students	Number of targeted teachers	Activities
<b>1<sup>st</sup> phase (Feb &amp; April 2019)</b>	Ministry of High Education, UNRWA and 9 Municipalities	All students from 11 to 17 years old	3,222 students	60 teachers	Designing an electronic competition student in SWM. This competition was designed and uploaded on the subpage of the new JSC-KRM website. A public broadcast on the social media was conducted to select 10 winners from the e-commutation and then a closing ceremony held to distribute 10 tablets on the 10 winners.
	Meeting sessions with parents in the schools	2 UNRWA Schools	80	0	Awareness session about the SWM
<b>2<sup>nd</sup> phase (Oct &amp; Nov 2019)</b>	Ministry of High Education, UNRWA and 3 Municipalities	36 Schools	14,635 students		(120) awareness sessions for students inside the classes, were conducted in the schools.

#### Households Outreach Program:

**Beneficiaries:** 3,097 persons

**Activities:** This program was implemented in cooperation with number of municipalities, in order to solve the behavioral problems in waste disposal of the residents of the targeted neighborhoods. The municipalities which were included in this program for 2019: Khan Younis, Abasan Al-Kabira, Al-Qarrara, Bani Sohila and Al-Nussirate.



### Household awareness campaign in Bani Sohila Town

#### National campaign 2019- waste reduction:

JSC-KRM implemented an awareness campaign for one week in three cities, as a part from the national campaign 2019, which was implemented by project team with supervision of the Ministry of Local Governorate and JICA, the following activities were accomplished:

- Distribute 2000 posters about the reducing waste generation in 3 main streets in Khan Younis city, Rafah city and Deir Al-Balah city.
- Conduct 3 awareness sessions for 200 women in Khan Younis and Rafah cities.
- Conduct 3 fun days for the 550 kids to increase their awareness in reducing waste.
- Distributing 1600 copies of kid's game "ladder and snake".







### National Campaign 2019- Waste reduction

Awareness session for the participants of the summer camp in Khan Younis city

#### Visiting the landfill:

Different people visited the landfill to gain experience from the project team about how to operate a sanitary landfill. Number of people visited the landfill during 2019 around 1,115 persons, from different clusters of the society such as:

- School students: JSC-KRM organized scientific school trips to the landfill for the students aged from 15-17 years old, full information about the SWM were provided for them and full description about the disposal operation were provided.



#### **Photo. Landfill visitors**

- Environmental bloggers from Gaza Strip.
- Solid Waste Management employees from the 25 municipalities of Gaza Strip.
- University students (Environmental Engineers and Civil Engineers).
- Members from the Association of Engineers from all governorates.
- Mayors from all municipalities.
- Social committees from all the member municipalities.
- Private sector members who are interested in SWM.

#### **University Outreach Program:**

Sharing the project lessons and outputs, and publishing the results and recommendation of the project studies, became a need to all the academics and interested stakeholders, in addition to the engineering students, so a Scientific Day about SWM was implemented on 26th November 2019, in Islamic University-Gaza, in cooperation with the Environmental and Civil Engineering Faculty. More than 200 persons attended that day (students, lecturers, NGO representatives, municipality's representatives and UNRWA employees, Representatives from JICA and employees from the related Ministries.

Different topics were represented and discussed in this event, such as:

- 1- GSWMP components and outputs.
- 2- JSC-KRM gained experience from GSWMP.
- 3- Medical Waste Management in Gaza Strip.
- 4- E-Waste Management in Gaza Strip.
- 5- Waste Recovery in Gaza Strip.
- 6- Primary Collection Study Results and Recommendations.

#### **Printings and Visibilities**

- Design, print and distribute 1,600 copies of kid's game.
- Print and distribute 3,000 copies of the new JSC-KRM brochure.
- Design, print and distribute 100 fact sheet for Rafah T.S.
- Design, print and distribute 2,000 posters for national campaign.
- Design, print and distribute 500 posters for landfill safety tips.

#### **Multimedia activities:**

JSC-KRM in cooperation with the PSDU produced different videos and published in the JSC-KRM YouTube channel:

[https://www.youtube.com/channel/UC4bE2\\_DUd0r0XwCobVM7oEw](https://www.youtube.com/channel/UC4bE2_DUd0r0XwCobVM7oEw)



## ANNEX II: Summary of Grievance Redress Mechanism - 2019

### GRM Existing Channels:

Since the establishment of JSC in 1995, different channels were used to uptake complaints but without a clear designed system:

- Phone calls: Direct phone calls to JSC departments in Khan Younis and Middle Area.
- Face to face: submitting the complaints directly to the public awareness team during their field visits to the areas, or visiting JSC departments to report about the complaint.
- Through the periodic inspection of the work by the JSC team of containers' status, routes of vehicles, vehicles and workers.
- Through the member municipalities recommendations during the monthly meeting.

After the development of the E-GRM, the old uptake channels still active, but with some improvements on the working mechanism to suit the new compressive system, so the approved active channels for JSC-KRM GRM are:

- Phone calls: Direct phone calls to JSC-KRM head quarter or to the departments in Khan Younis and Middle Area.
- Compliant box: the people who live near JSC-KRM facilities could submit their complaints through the boxes there.
- Face to face: submitting the complaints directly to the public awareness team during their field visits to the areas, or visiting JSC-KRM departments to report about the complaint.
- Daily working reports: the JSC-KRM fleet workers or drivers could submit their notes about the containers, neighborhood, municipalities collection points,, at the end of their daily trips, through registering it on the daily working reports.
- Facebook page: All the community could submit their complaints through the fakebook page inbox.
- E-application: which is uploaded on the official JSC-KRM website.

### Types of complaints

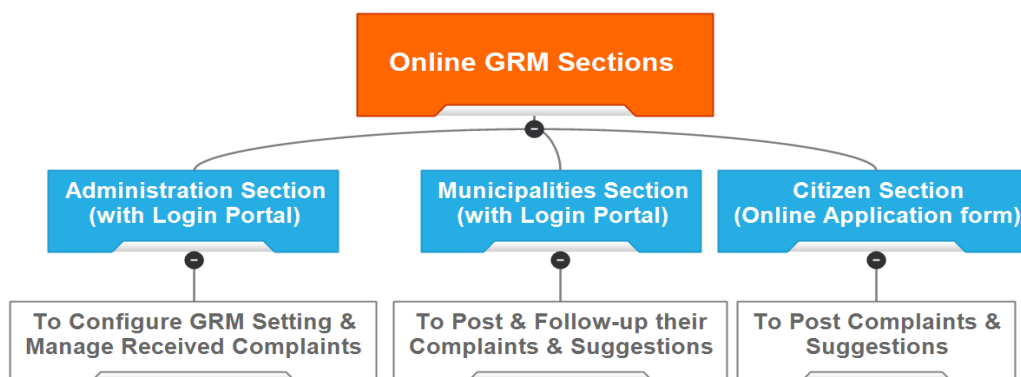
Since JSC-KRM provided service were expanded and developed over the last years, to include, operating the new landfill, the transfer station and the medical waste treatment, so the types of complaints also changed and developed over the different periods according to the following:

- During the construction period of the new facilities:

The complaint application which was developed and approved on Jan 2018, included types of complaints related to both the provided services (secondary collection and disposal) in addition to the potential complaints resulted from the construction works of the GSWMP components (landfill, Rafah Transfer station and the access road). And not only those types of complaints were listed in the electronic application, but there always was a blank box for other complaints, which any targeted person could report about.

- During the operational period of the new facilities:

As soon as the construction works in any facility were finished the category type of the complaints related to these works, were cancelled and other categories related to the operation were listed instead. Also, other addition was done on the types of complaints to add both the medical waste management services, and the public awareness services.



Classification of complaints during construction phase	Classification of complaints during operation phase
<b>Construction of AlFukhari Landfill/ Rafah Transfer Station Project</b> <ul style="list-style-type: none"> <li>- Deterioration of air quality by dust caused by construction/operation works</li> <li>- Noises caused by construction/operation machinery</li> <li>- Traffic Jam due to construction of access road</li> <li>- Dumping of waste around workplace</li> </ul>	<b>Al-Fukhari new landfill:</b> <ul style="list-style-type: none"> <li>- Odors from the landfill</li> <li>- Insects and rodents from the landfill.</li> <li>- Fire and smokes in the landfill.</li> <li>- Deterioration of water quality in the wells near the landfill.</li> <li>- High speed of the vehicles in the road to the landfill.</li> <li>- others</li> </ul>

Classification of complaints during construction phase	Classification of complaints during operation phase
<b>Medical Waste Management Project (Khan Younes Transfer Station)</b> <ul style="list-style-type: none"> <li>- Odors from the transfer station in the area</li> <li>- Not applying the safety and security instructions when collect and transfer Medical Waste</li> <li>- Employee Lack of commitment to safety and safety measures</li> </ul>	<b>Khan Younes Transfer Station</b> <ul style="list-style-type: none"> <li>- Odors from the transfer station in the area</li> <li>- Insects and rodents from the T.s.</li> <li>- Gazes and smokes from the T.S.</li> <li>- others</li> </ul>
<b>Collection Services from Containers</b> <ul style="list-style-type: none"> <li>- Delays on evacuation the containers on time</li> <li>- Leachate/oil spill from JSC collection vehicles</li> <li>- Dumping of waste around the container</li> <li>- Odors from waste containers</li> <li>- Burning the containers and the wastes</li> <li>- Request to move container from place to place</li> <li>- Random waste collection point</li> </ul>	<b>Collection Services from Containers</b> <ul style="list-style-type: none"> <li>- Delays on evacuation the containers on time</li> <li>- Leachate/oil spill from container or JSC collection vehicles</li> <li>- Odors from waste containers</li> <li>- Burning the containers and the wastes</li> <li>- Request to move container from place to place.</li> <li>- Request a new container.</li> <li>- Littering wastes around the container.</li> <li>- Random waste collection point.</li> <li>- Rubbles and sands in the container.</li> <li>- Others.</li> </ul>
<b>Deir al-Balah Landfill</b> <ul style="list-style-type: none"> <li>- Odors from landfill</li> <li>- landfill fire accident</li> </ul>	<b>Deir al-Balah Landfill</b> <ul style="list-style-type: none"> <li>- Odors from landfill</li> <li>- landfill fire accident</li> </ul>
<b>Others</b>	<b>Medical Waste Management Unit (Khan Younes Transfer Station)</b> <ul style="list-style-type: none"> <li>- Odors from the transfer station in the area</li> <li>- Insects and rodents from the T.s.</li> <li>- Gazes and smokes from the T.S.</li> <li>- Traffic jam in the main road of the T.S.</li> <li>- Deterioration of water quality in the wells near the T.S.</li> <li>- others</li> </ul>
	<b>Medical Waste Treatment Service</b> <ul style="list-style-type: none"> <li>- Leachate spill from collection vehicles</li> <li>- Delays on collection services.</li> <li>- The workers are not committed to the safety measures.</li> <li>- other</li> </ul>
	<b>Others</b>

### GRM Working Mechanism:

The new effective GRM, consist of multiple steps which are:

- 1- **Up taking** the grievances from the multiple well-known channels, registering it into the database (an excel sheet linked to the online application in the website control panel), an automatic ID number taken to every new record/application register in the database.
- 2- **Acknowledgment:** sending SMS for the person who submit the grievance through e-application to acknowledge him/her about receiving the complaint.
- 3- **Sorting and validation:** the system admin in JSC-KRM, sorts the received grievances based on its type and validity (check if it is related to the SW complaints or not), then the admin schedule the responses and actions to be taken into according to the priority of the complaint/note or suggestion, the classification for priorities are according to the following:
  - Urgent grievances will be replayed within (2) working days: complaints related to the safety issues for workers or for the community and complaints related to fire cases either in any facility or in the containers.
  - Medium grievances will be replayed (5) working days.
  - Normal grievances will be replayed within (10) working days.
- 4- **Verification, investigation and action:** the system admin refers the complaint to the related department inside JSC-KRM or to the related municipality if it was related to the primary collection services, the persons in charge take the suitable action, and then send back a replay to the system admin to inform about the solution of the complaint or the action taken.
- 5- **Closing the complaint:** as soon as receiving a replay about the response or the action taken, the system admin fill the information in the same record of the complaint to document the response and then close the record and send another SMS to the person who register his/her phone number to inform him/her about closing the complaint.

The above steps are applied for all the received complaints to the GRM in JSC-KRM, either its source was the community or the member municipalities and what is happen after Oct 2019. The system admin enters all the received complaints from all the channels neither than the e-application to the EGRM, in order to unify the database and get one comprehensive report, with mentioning the source of the complaint-receiving channel).

### ANNEX III: The household Survey – Arabic Version

استمارة استبيان للأسر بشأن دراسة تحديث الأثر البيئي والاجتماعي وخطط الإدارة  
لمشروع ادارة النفايات الصلبة في قطاع غزة

ديسمبر 2019

البيانات ستستخدم فقط في أغراض البحث العلمي

	رقم الاستمارة
	اسم البلدية
	اسم المنطقة
حضرية / شبة حضرية / ريفية	نوع المنطقة
	اسم الباحث
	تاريخ المقابلة

م	السؤال	الإجابة	الكود
أولا البيانات الأساسية للمبحوث:			
1.	نوع المبحوث:	<ul style="list-style-type: none"> <li>ذكر</li> <li>انثى</li> </ul>	1 2
2.	مستوى تعليم المبحوث:	<ul style="list-style-type: none"> <li>امي</li> <li>يقرا ويكتب</li> <li>التعليم الأساسي</li> <li>مؤهل متوسط</li> <li>مؤهل جامعي</li> <li>مؤهل عالي</li> </ul>	1 2 3 4 5 6
3.	الحالة الاجتماعية للمبحوث:	<ul style="list-style-type: none"> <li>أعزب</li> <li>متزوج</li> <li>مطلق</li> <li>أرمل</li> </ul>	1 2 3 4
4.	الفئة العمرية للمبحوث:	<ul style="list-style-type: none"> <li>25-18</li> <li>40-25</li> <li>55-40</li> <li>أكبر من 55</li> </ul>	1 2 3 4
5.	مهنة المبحوث:		
6.	كم عدد افراد الأسرة؟		
7.	ما صلة المبحوث برب الأسرة؟	<ul style="list-style-type: none"> <li>هو نفسه</li> <li>زوج/ زوجة</li> <li>والد / والدة</li> <li>أخ / أخت</li> <li>ابن / ابنة</li> <li>أخرى</li> </ul>	1 2 3 4 5



م	السؤال	الإجابة	الكود
ثانياً الوضع الراهن لخدمة جمع المخلفات الصلبة:			
8-	من الشخص الذي يقوم بإخراج القمامة من المنزل؟	<ul style="list-style-type: none"> <li>رب الأسرة</li> <li>ربة الأسرة</li> <li>البالغين الذكور</li> <li>البالغين السيدات</li> <li>الأطفال اقل من 12 سنة</li> <li>الأطفال من 13-18 سنة</li> <li>أخرى (تذكر): .....</li> </ul>	1 2 3 4 5 6 7
9-	ما نوع الحاويات المستخدمة؟	<ul style="list-style-type: none"> <li>صغيرة ( 1 كوب)</li> <li>كبيرة (4 كوب)</li> <li>أخرى</li> </ul>	1 2 3
10-	ما المسافة التي تمشيها للوصول للحاوية؟	<ul style="list-style-type: none"> <li>..... متر</li> <li>..... دقيقة مشي</li> <li>(اما المسافة بالمترا او الوقت الذي يمشيه للحاوية)</li> </ul>	
11-	هل تقبل بوجود حاوية في محيط منزلك؟	<ul style="list-style-type: none"> <li>نعم</li> <li>لا</li> </ul>	1 2
12-	ما هو التخوف الأساسي من وجود الحاوية بالقرب من المنزل؟	<ul style="list-style-type: none"> <li>عدم انتظام تفريغ الحاوية من الجهة المسؤولة.</li> <li>انتشار المخلفات امام المنزل</li> <li>المنظر غير جمالي</li> <li>عدم التزام الجيران بالتخلص من المخلفات داخل الحاوية</li> <li>وجود روائح كريهة، انتشار الباعوض، حدوث حرق للحاوية</li> <li>اخرى (تذكر): .....</li> </ul>	1 2 3 4 5 6
13-	هل تتراكم المخلفات حول الحاويات في شارعكم؟	<ul style="list-style-type: none"> <li>نعم</li> <li>لا</li> </ul>	1 2
14-	كم مرة يتم جمع المخلفات من الحاويات في شارعكم؟	<ul style="list-style-type: none"> <li>أكثر من مرة في اليوم</li> <li>مرة واحدة في اليوم</li> <li>يوم بعد يوم</li> <li>مرتين أسبوعياً</li> <li>مرة أسبوعياً</li> <li>غير منتظم</li> <li>أخرى (تذكر): .....</li> </ul>	1 2 3 4 5 6 7
15-	من الجهة التي تقوم بخدمة جمع المخلفات من الحاويات في المنطقة؟	<ul style="list-style-type: none"> <li>البلدية</li> <li>مجلس خدمات النفايات الصلبة</li> </ul>	1 2 3

م	السؤال	الإجابة	الكود
		<ul style="list-style-type: none"> <li>جهة أخرى (اذكر اسم الجهة):</li> </ul>	
16-	هل تقوم شاحنة النفايات بتغطية النفايات أثناء نقلها لمكب النفايات	<ul style="list-style-type: none"> <li>نعم</li> <li>لا</li> </ul>	1 2
17-	هل تلاحظ تناثر النفايات حول الحاويات حتى بعد تفريغ الحاوية؟	<ul style="list-style-type: none"> <li>نعم</li> <li>لا</li> </ul>	1 2
18-	موعد جمع النفايات	<ul style="list-style-type: none"> <li>في الصباح الباكر قبل ساعة الذروة ما لا يشكل أي إزدحام مروري</li> <li>في ساعات الذروة ما يعيق الحركة المرورية بشكل كبير</li> <li>في ساعات وسط النهار ولكن بعيدا عن ساعات الذروة</li> </ul>	1 2 3
19-	هل توافق على الانضمام لأنشطة تطوعية في الحي (حملات تنظيف) تستهدف تطوير خدمة جمع المخلفات الصلبة؟	<ul style="list-style-type: none"> <li>نعم</li> <li>لا</li> </ul>	1 2
20-	هل لديكم أي معلومات عن أضرار التخلص الغير سليم من النفايات (التجمع العشوائي، حرق النفايات،...)?	<ul style="list-style-type: none"> <li>نعم</li> <li>لا</li> </ul>	1 2
21-	ما هي أفضل الوسائل لنشر ثقافة النظافة والتخلص السليم من النفايات من وجهة نظركم؟	<ul style="list-style-type: none"> <li>الحملات التوعوية عبر وسائل التواصل الاجتماعي</li> <li>توزيع البوسترات والبنرات</li> <li>الحملات التوعوية في المدارس والروضات</li> <li>تنظيم لقاءات وندوات تثقيفية لربات البيوت</li> <li>أخرى</li> </ul>	1 2 3 4 5
22-	هل هناك نظام للتواصل مع البلدية/المجلس في حالة أي شكاوى من خدمة جمع المخلفات؟	<ul style="list-style-type: none"> <li>نعم</li> <li>لا</li> </ul>	1 2
23-	كيف تقومون بالإبلاغ عن الشكاوى؟	<ul style="list-style-type: none"> <li>الاتصال برقم الشكاوى في البلدية</li> <li>الاتصال الهاتفي مع مسؤولي تقديم الخدمة (قسم النظافة في البلدية /قسم الجمع في المجلس)</li> <li>تقديم طلب شكاوى الكتروني (الموقع الالكتروني للبلدية/المجلس)</li> <li>تقديم شكاوى في قلم الجمهور</li> <li>اخرى (تذكر):</li> </ul>	1 2 3 4 5
24-	ما نوع الشكاوى التي تقومون بالإبلاغ عنها؟	<ul style="list-style-type: none"> <li>عدم انتظام خدمة جمع الحاويات</li> <li>عدم التزام عمال النظافة بجمع القمامة من امام المنزل</li> </ul>	1 2

م	السؤال	الإجابة	الكود
		<ul style="list-style-type: none"> <li>سلوكيات عمال النظافة أو عمال سيارات الجمع</li> <li>سوء حالة عربات جمع المخلفات أو سوء حالة الحاويات</li> <li>حدوث حريق في حاوية</li> <li>اخرى (تذكر):</li> </ul>	3 4 5 6
		..... ..	
ثالثا: قابلية الدفع مقابل الخدمة			
-25	كم يبلغ إجمالي دخل الأسرة في الشهر؟	<ul style="list-style-type: none"> <li>أقل من 1000 شيكل</li> <li>من 1000 : 2000 شيكل</li> <li>من 2000 : 3000 شيكل</li> <li>من 3000 : 4000 شيكل</li> <li>أكثر من 4000 شيكل</li> </ul>	1 2 3 4 5
-26	ما هي الرسوم الشهرية المفروضة مقابل الخدمة؟ (يمكن الإطلاع عليها من فاتورة المياه أو فاتورة منفصلة)	<ul style="list-style-type: none"> <li>لا شيء</li> <li>1: 5 شيكل</li> <li>5: 10 شيكل</li> <li>10: 15 شيكل</li> <li>15: 20 شيكل</li> <li>لا أنكر / لا أعرف</li> <li>أخرى (تذكر):</li> </ul>	1 2 3 4 5 6 7
-27	هل تقوم بدفع هذا المبلغ؟	<ul style="list-style-type: none"> <li>نعم (انتقل الى سؤال 25)</li> <li>لا</li> </ul>	1 2
-28	لماذا لا يتم دفع المبلغ المطلوب؟	<ul style="list-style-type: none"> <li>لأن الخدمة سيئة</li> <li>لا أستطيع أن أدفع</li> <li>يفترض ان تقدم هذه الخدمة بالمجان</li> <li>لا أحد يطالب بالدفع</li> <li>أخرى (تذكر):</li> </ul>	1 2 3 4 5
-29	كيف يتم جمع الرسوم حاليا؟	<ul style="list-style-type: none"> <li>على فاتورة المياه</li> <li>في فاتورة منفصلة</li> <li>اخرى (تذكر):</li> </ul>	1 2 3
-30	هل ترى ان الرسوم الحالية مناسبة لمستوى الخدمة المقدمة؟	<ul style="list-style-type: none"> <li>نعم</li> <li>لا</li> </ul>	1 2

الكوود	الإجابة	السؤال	م
1	نعم	هل ستلتزم بدفع قيمة خدمة جمع	-31
2	لا	النفايات لو تم تقديمها بفاتورة خاصة منفصلة	
1	لا شيء	حسب تقييمك للخدمة الحالية، ما هو	-32
2	5:1 شيكل	باعثقادك المبلغ الذي يجب دفعه مقابل	
3	10:5 شيكل	الخدمة؟	
4	15:10 شيكل		
5	20:15 شيكل		
6	أخرى (تذكر):		
	.....		
	.		

## ANNEX IV: Attendance Sheet of the First Consultation Workshop

## GAZA SOLID WASTE MANAGEMENT PROJECT

Presentation Workshop,  
Update of ESIA Consultation Meeting  
28, Nov, 2019  
Signatures attendance



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## GAZA SOLID WASTE MANAGEMENT PROJECT

Presentation Workshop  
Update of ESIA Consultation Meeting  
28, Nov, 2019  
Signatures attendance



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GAZA SOLID WASTE MANAGEMENT PROJECT  
Presentation Workshop,  
Update of ESIA Consultation Meeting  
28, Nov, 2019  
Signatures attendance



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10.	رسم الدركيل	Jica			
11.	د. علي ج. هوزم	JSU-KRM			
12.					
13.					
14.					
15.					
16.					
17.					
18.					
19.					
20.					

10



## ANNEX V: Code of Conduct – JSC-KRM Facilities

Joint Service Council for Solid Waste  
Management for the Local Authorities in the  
Governorates of Khan Younis, Rafah and Middle Area



مجلس الخدمات المشترك  
إدارة النفايات الصلبة للهيئات المحلية  
في محافظات خان يونس، رفح والوسطى

### مدونة سلوك مكب الفخاري الصحي الجديد

تعتبر بنود مدونة السلوك هذه ملزمة لكافة العاملين في مكب الفخاري الصحي:

1. احترام مواعيد العمل، والامتثال المباشر لتعليمات رئيس قسم المكب في جميع الأوقات.
2. الحرص على تأدية العمل المكلف به بدقة وأمانة وإخلاص.
3. ضرورة الالتزام بإجراءات السلامة المتبعة في المكب وباللبس الواقي (فيست، خوذة، قفازات وكمامة وجه) طوال فترة العمل داخل المكب.
4. الامتناع عن التدخين في مرافق المكب المختلفة بشكل عام وبجوار خلايا الطمر وورشة الصيانة بشكل خاص.
5. الامتناع عن إشعال النيران في مرافق المكب لأي غرض كان.
6. متابعة النفايات الواردة للمكب وإبلاغ إدارة المكب عند رصد أي كمية من النفايات الممنوع استقبالها في المكب.
7. الالتزام بقواعد السلامة والأمان عند استخدام المعدات الخطرة أو الكهربائية.
8. الابتعاد عن أي جسم مشبوه والإبلاغ عنه فوراً.
9. الامتناع عن المشاركة مطلقاً في أي عنف بدني أو لفظي أو تهديد بالعنف لأي من العاملين أو الزائرين في المكب.
10. تبليغ رئيس قسم المكب عن أي مخالفة يرتكبها أحد العاملين أو الزائرين للمكب.
11. الامتناع عن الاحتكاك المباشر مع أي من جيران المكب والحفاظ على ممتلكاتهم واحترام عاداتهم الاجتماعية والثقافية.
12. الامتناع عن التسبب بأي نوع من المضايقات سواء اللفظية المباشرة أو غير المباشر وغيرها من أنواع المضايقات لأي شخص أثناء فترة العمل وخاصة من فئة النساء والأطفال.
13. احترام النساء والأطفال الذين يتواجدون في المكب بغرض الزيارة أو من جيران المكب وذلك بتقديم العون لهم في حالة طلبهم ذلك، وعدم انتهاك خصوصيتهم بأي شكل من الأشكال.
14. التبليغ عن أي من العاملين أو الزائرين في المكب ممن ينتهكون خصوصية جيران المكب بشكل مباشر أو غير مباشر.
15. المحافظة على الأجهزة والمعدات المستخدمة في العمل وعدم استخدامها لأغراض شخصية أو في أعمال خاصة أو بشكل يؤدي إلى تلفها.
16. الإبلاغ فوراً عن أي مرض مزمن أو عند الشعور بالإعياء وعن الأدوية والعقاقير التي يتلقاها العامل.
17. التعامل باحترام ولباقة مع زملاء العمل، والمحافظة على علاقات سليمة وودية معهم دون تمييز والحرص على احترام خصوصيتهم.
18. المحافظة على نظافة مرافق المكب بشكل مستمر.
19. الالتزام بالأماكن المخصصة لتناول الطعام وعدم الاقتراب من الأماكن الغير مخصصة لتناول الطعام.



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**Joint Service Council for Solid Waste**  
Management for the Local Authorities in the  
Governorates of Khan Younis, Rafah and Middle Area



**مجلس الخدمات المشترك**  
لإدارة النفايات الصلبة للهيئات المحلية  
في محافظات خان يونس، رفح والوسطى

20. الترشيد من استهلاك الكهرباء عن طريق التأكد من إطفاء الأجهزة الكهربائية والأنوار قبل ترك المكان.
21. التواصل المباشر مع رئيس قسم المكب في حالة رصد أي حادثة أو استشعار أي خطر داخل المكب.
22. الإبلاغ عن الزائرين الغير مصرح لهم الدخول في حالة عدم وجود مرافق من إدارة المكب معهم.
23. الإمتناع عن نشر أي معلومات أو صور عن موقع العمل سواء بالحديث مع الآخرين أو بالنشر على وسائل التواصل الإجتماعي إذ أنها من صلاحيات رئيس قسم المكب فقط.
24. يستطيع العامل تقديم شكاواه ومقترحاته بخصوص عمله في المكب من خلال استخدام صندوق الشكاوى أو الموقع الإلكتروني للمجلس أو أي من قنوات الشكاوى المتعارف عليها في المجلس.



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Management for the Local Authorities in the  
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**مجلس الخدمات المشترك**  
لإدارة النفايات الصلبة للهيئات المحلية  
في محافظات خان يونس، رفح والوسطى

## مدونة سلوك لسائقي سيارات جمع النفايات خلال تواجدهم داخل المكب

تعتبر بنود مدونة السلوك هذه ملزمة لكافة سائقي وعاملين سيارات جمع النفايات في مكب الفخاري الصحي:

1. عدم دخول المكب بدون إذن مسبق للزائرين، وتسجيل دخول سيارات الجمع لدى كاتب الميزان مباشرة.
2. التزام عمال سيارات الجمع باللبس الواقي (فيس، قفازات وكمامة وجه) طوال فترة العمل داخل المكب.
3. الالتزام بسائقي سيارات الجمع بالسرعة المحددة داخل المكب وهي 20 كم/ساعة.
4. التزام سائقي سيارات الجمع بغسل السيارات في الأماكن المخصصة لذلك بناء على تعليمات رئيس قسم المكب.
5. التزام سائقي سيارات الجمع بتفريغ حمولة السيارات في الأماكن التي يشير إليها مراقب المكب.
6. الإمتناع عن التدخين في مرافق المكب المختلفة بشكل عام وبجوار خلايا الطمر وورشة الصيانة بشكل خاص.
7. الإمتناع عن إشعال النيران في مرافق المكب لأي غرض كان.
8. عدم الإقتراب من الأماكن الخطرة لأي سبب كان بدون مرافقة مراقب المكب.
9. الحصول على موافقة من رئيس قسم المكب قبل تصوير أي من مرافق المكب أو الأعمال داخله.
10. المحافظة على نظافة مرافق المكب أثناء زيارته.
11. الابتعاد عن الآليات الثقيلة والمعدات الكهربائية.
12. الإمتناع عن التسبب بأي نوع من المضايقات سواء اللفظية المباشرة أو غير المباشر وغيرها من أنواع المضايقات لأي شخص أثناء فترة العمل وخاصة من فئة النساء والأطفال.
13. احترام النساء والأطفال الذين يتواجدون بالقرب من مكان العمل وتقديم الخدمة أو في أي مكان قد يصانفه السائق أثناء وقت الدوام الرسمي، وعدم انتهاك خصوصياتهم بأي شكل من الأشكال.
14. يحق للجمهور كافة تقديم الشكاوى والإقتراحات لإدارة المكب من خلال صندوق الشكاوى أو الموقع الإلكتروني أو أي من قنوات الشكاوى المعتمدة لدى المجلس.



## ANNEX VI: Pest Management Plan for Al-Fukhary Sanitary Landfill, Transfer Stations, and Medical Waste Treatment Facility

### 1. INTRODUCTION

Pest<sup>22</sup> Management is an approach that establishes a sustainable approach to managing pests by combining biological, cultural, physical and chemical tools in a way that minimizes economic, health and environmental risks.

When well run, the modern landfilling process will avoid many potentially adverse environmental impacts. The rigorous application of cover material, proper compaction of wastes, and general “good housekeeping” are the most effective means of pest control. This Pest Management Plan will be kept on Al-Fukhary landfill site during operational activities and will be reviewed/updated as necessary. The plan will be amended or revised as project activities or conditions change or when supplemental information becomes available. This Plan is prepared, and shall be implemented for the prevention and control of pests, it adopts procedures in the project Work Plan. The landfill manager is to be familiar with contents of this plan.

#### 1.1 Project Description

Al-fukhary (Sofa) landfill is a sanitary landfill over an area 235,000 m<sup>2</sup>, it is located east of Khan Younis Governorate (800 m from the eastern border of Gaza Strip), and it receives 600 ton/day of municipal waste from three governorates (Khan Younis, Rafah, and Middle Area) which mainly consist of food waste, paper and cardboard, plastics and nylon, tin cans and aluminum, glass, leather...etc. The landfill site is fully secured by a fence, and only one entrance gate is available for incoming and outgoing trucks which managed by a control room, as well the site is secured by two guards and a CCTV system. A second gate is available but closed, it is used only for some specific purposes. Risk **Assessment**

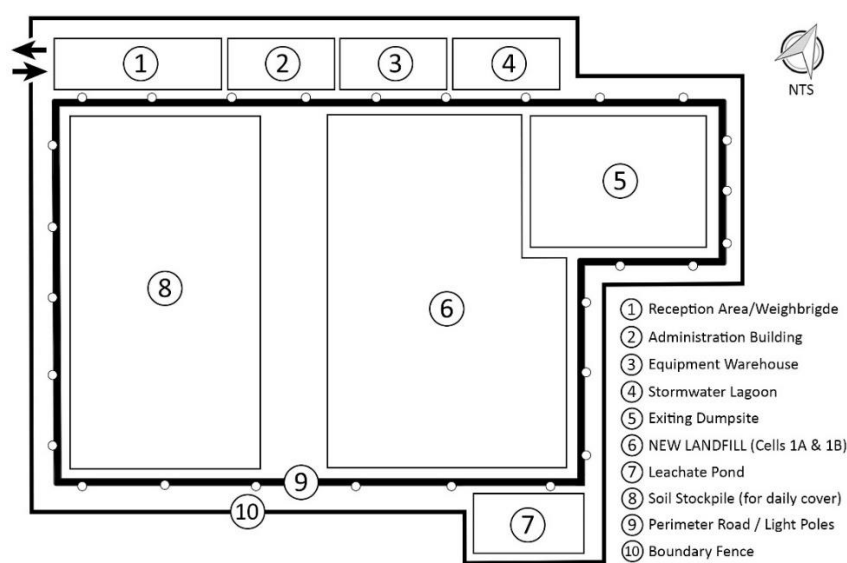
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<sup>22</sup> **Pests are populations of living organism (animals, plants, or microorganism) that interfere with use of healthcare and other facilities for human purposes.**

has been conducted for the site by UNMAS, and it was ranked as free of risks of unexploded ordinance (UXO), but its location near the boarder increases the possibility of emergency cases, furthermore, using of heavy machinery at the site indicates how risky is the work inside the site. The Landfill site is also included the old waste dumping site which is semi-closed by a clayey layer with a side slope 1:2 and height 30 m above the ground, and included excavated soil which is located over an area 85,000 m<sup>2</sup> with a height up to 14 m. Figure (1) provides schematic of the new sanitary landfill with all major facility elements.

#### 1.1.1 The landfill site components are:

- Entrance area including weighbridge and control room;
- Building (190 m<sup>2</sup> on 3 levels) for JSC-KRM operation personnel staff;
- Maintenance Workshop (528 m<sup>2</sup>); Storm water drainage and storage pond (10,531 m<sup>3</sup> capacity);
- Disposal cell 1, divided in cell 1A and 1B (excavated up to 20 m below natural ground level), and slope 1:2 for sides with horizontal perm 5m width;
- Leachate pre-treatment (aeration lagoon, usable volume 6,000 m<sup>3</sup>), it is excavated to 2.75 m below natural ground level;
- Peripheral road (length 1,735 m);
- Old Dumpsite (40,000 m<sup>2</sup>);
- Stockpile of excavated soil (85,000 m<sup>2</sup>); and
- Fence is surrounding all the site.



**Figure 1. Schematic of Sofa Sanitary Landfill in Al-Fukhari**

### 1.1.2 Operation of Al-Fukhary (Sofa) Sanitary Landfill

Al-Fukhary (Sofa) Landfill is a sanitary landfill which managed by JSC-KRM. It receives an average 600 ton/day of municipal waste from 17 localities in middle and south of Gaza Strip. More than 150 of incoming waste vehicles are received to the landfill on the daily basis; their access is managed by the control room employee which proceed with the weighting of incoming waste and controlling the access of vehicles to the landfill. The waste is dumped at the disposal cell based on a specific filling sequence, flagman (observer) is directing the vehicles for unloading of waste regarding to the landfill manager instructions, whereas a wheel loader is leveling the received waste. At the end of any working day, the waste is covered by a thin layer of daily clay cover (15 cm of sub-soil).

External storm water is collected by a storm water ditch which is installed surrounding the landfill site, and it is directed by gravity to the storm water lagoon; The stormwater lagoon is lined by a geomembrane. Yet there are no plans to use the storm water for any purposes. It will be stay stagnant for long time. The stormwater ditch is cleaned by landfill workers from time to time.

Leachate, which resulted from the internal storm water and the waste liquid, are collected through the geo-composite network (AFTIX) and pumped to the leachate lagoon; the leachate lagoon is lined by a geomembrane. Yet there are no plans to treat the leachate, and most likely part of the leachate will be evaporated, and the remaining will be treated biologically and sent to the adjacent WWTP for additional treatment regularly.

### 1.2 Expected Sources of Pests In The Landfill

The expected sources of pests in Al-Fukhary (Sofa) landfill are mainly:

- Leachate lagoon;
- Stormwater lagoon; and
- Waste (Mainly which include food waste).



### 1.3 Expected Sources of Pests in Transfer Stations

The expected sources of pests in transfer stations are mainly tipping areas and the areas of the waste operation (loading and unloading of wastes). The manager of transfer station will add any potential areas to be as a source of pests.

## 2. RELATED LAWS

For public health as reference for pest control, first law is Palestinian Public Health Law No. 20, second law is the Palestinian Environmental Law considers pesticides (pest control products) as a hazardous waste that shall be disposed safely. Where Article (14) Pesticides and Fertilizer states that “The Ministry, in coordination with the specialized agencies shall designate the environmental conditions for the import, distribution, manufacturing, use, and store of pesticides, substances, and agri-chemical fertilizers, which may pose hazards to the environment”. There is absence of pest management regulations related to landfill operation, but list of pesticides is accredited by Ministry of Health, Ministry of Agriculture, in addition to the list of accredited by WHO; KSC-KRM is to ensure using pesticides which is eligible by Ministry of Health, Ministry of Agriculture, or World Health Organization for the pest management purposes at Al-Fukhary (Sofa) Landfill, in addition to provide safe storage, provide availability of trained staff, and announcement procedure. MOH follows strict regulation and do update the pest control permissible lists, doses on yearly basis taking into consideration following the Israeli regulations which might be counted more restrict than World Health Organization regulations.

## 3. PEST MANAGEMENT PLAN

### 3.1 Al-Fukhary (Sofa) Landfill

The pest management plan at Al-Fukhary (Sofa) landfill will be implemented in three levels as the following:

### **Level (1) Pest Control by Pesticides**

This level of pest control depends on providing pesticides during the summer time (April – November), and it will be sprayed mainly on the leachate and storm water lagoons as shown as an orange area in figure (2), *Bacillus thuringiensis var israelensis* (BTI) pesticide will be used for combating the mosquito larvae. The frequency of spraying will be to provide the pesticides solution (BTI) every week (7 days) by a portable sprayer water-jet (Capacity 16 Liter). The mixing ratio is variable based on the type of water to be sprayed as the following<sup>23</sup>:

- Leachate Lagoon: Mixing ration of water and pesticide is (3%); 0.03 L pesticide: 0.97 L water.
- Stormwater Lagoon: Mixing ration of water and pesticide is (1%); 0.01 L pesticide: 0.99 L water.

Other means will be used to provide the (**Permethrin 20 %**) pesticide by using the fogger machine. The frequency of providing the pesticide is (every 3 weeks), the ration of mixing is 1,000 ml of pesticide: 5000 ml of fuel (1:5). This type of pesticide can combat most of flies.

### **Level (2) Pest Control by Mitigation Measures**

This level of pest control depends on implementing precautions procedures in the landfill in order to prevent the breeding of pests. This is applied in the disposal cells (Yellow color area). The precautions procedures to be taken are mainly compaction of waste, and coverage of waste (especially the food waste) by a layer of sub-soil (30 cm).

(Bromdiolone Bait) will be used to control of mice and rates, the distribution of baits will be determined and followed by the landfill manager.

### **Level (3) Monitoring other potential risks**

This level of pest control depends on monitoring other landfill areas whose potential to be a source of pests i.e. the old closed dump site as shown in figure (2) marked in purple

<sup>23</sup> Concentrations were collected from the manual of the producer company (Backtush)

area. Once this area noticed as a source of pests, the landfill manager should decide the appropriate actions to be taken.



Figure 2. Levels of pest management at Al-Fukhary (Sofa) Sanitary landfill

### 3.2 Pest Management Plan at Transfer Stations and Medical Waste Treatment Facility

The pest management plan at waste transfer stations in Khan younis and Rafah, and medical waste treatment facility in Khan Younis will be implemented as the following:

- **The main target area of pest control:** operational area (loading and unloading areas) in addition to any potential place to be as a source of pests according to the evaluation of transfer station manager.
- **Types, Frequency, and Mixing Ratio:** (Permethrin 20 %) **pesticide for flies and mosquitoes** will be used every three weeks in the summer period (April – November). **The ration of mixing is 1,000 ml of pesticide: 5000 ml of fuel (1:5).** **As well,** (Bromdiolone Bait) will be used for controlling the mice and rats regarding to the transfer station manager's plan.

#### **4. ENVIRONMENTAL AND HEALTH INSTRUCTIONS FOR PROCUREMENT OF GOODS, HANDLING AND STORING OF PEST MANAGEMENT MATERIAL**

JSC-KRM is to consider the following environmental and health instructions for procurement of goods, handling and storing of pest management material, noting that these measures are based on the international practices accepted by the World Bank and Palestinian environmental policies and standard.

##### **4.1 Instruction for Purchasing of Pesticides**

The procurement of any pesticide in a Bank-financed project is contingent on an assessment of the type, nature and degree of associated risks, taking into account the proposed use and intended users are accommodated to regulations, with respect to the classification of pesticides and their specific formulations, the Bank refers to the World Health Organization's Pesticides and their Application for the Control of Vectors and Pests of Public Health Importance, sixth edition (WHO, 2006) and Ministry of Health Pest Control List for the year 2016 where all pesticides must carry a valid license/certificate issued by the relevant authorities (MOH, Ministry of Agriculture (MOA) stating that the pesticide is licensed for use for public health purposes considering that it shall be well sealed, packed, and stamped. if by a chance the purchased pesticide is not complying with OP 4.09 Pest Management guidelines, then the pesticide purchases will be declared ineligible.

##### **4.2 The Permissible List**

The MOH approved list of pesticides for the year 2019 (updated annually), considering the active ingredient, the formulation and the use, where Municipalities are to ensure pesticides must carry a valid license / certificate issued by the relevant authorities (MOH, MOA) stating that the pesticide is licensed for use for public health purposes considering that it shall be well sealed, packed, and stamped. Noting that this list complies and more restrict than WHO acceptable pesticide list.

**Table 1. Insecticides approved by Ministry of Health 2019 (MOH, 2019)**

Active Ingredient	Use
Permethrol 20 % EC	- Control of flies and mosquitoes - It should be suitable to dilute in water for spraying and suitable for fogging application.
Almoxine 20% (Litre)	Control of flies and mosquitoes
كينامين بودرة كجم	Control of flies
Permethrol WB 25% (POW)	Control of flies
Round Up (Liter)	Herbicide
Dizictol 25%	Control of flies
راجون لتر	Control of flies
Diazinon 60% EC	Control of flies
Bacillus thuringiensis var israelensis	Control of mosquitoes
Solar	Control of mosquitoes
Baygon 20%	Control of flies
Ratemon g bait (Kg)	Control of rats and mice
Ratemon g Liquid	Control of rats and mice
Phostoxin Tablet	Control of rats and mice and flea
Sticky plate	Control of rats and mice
Bromdiolone Bait	Control of rats and mice
Bromdiolone Liquid (0.005%)	Control of rats and mice

The following tables list the allowed WHO material to procure mosquito larvae controls and verified to the market and eligibility in the Palestinian market as per MOH.

**Table 2: WHOPES-Recommended Compounds and Formulations for Control of Mosquito Larvae**

Insecticide <sup>24</sup>	Class group <sup>25</sup>	DOSAGE	
		General (G/HA)	Container breeding (mg/L)
Bascillus thuringiensis Israel ensis strain AM65-52, WG (3000 ITU/mg	BL	125-750 <sup>26</sup>	1-5 <sup>3</sup>
Bascillus thuringiensis Israel ensis strain AM65-52, GR (200 ITU/mg	BL	5,000-20,000	-
Temephos EC, GR	OP	56-112	1

In addition, the following criteria apply to the selection and use of pesticides:

- They must be in MOH and WHO list of recommended compounds.
- They must have negligible adverse human health effects.
- They must be shown to be effective against the target species.

<sup>24</sup> DT: tablet for direct application, GR: granule, EC: emulsifiable concentration, WG: water-dispersible granule, WP: wettable powder.

<sup>25</sup> BL: Bacterial Larvicide, BU: Benzoylureas, JH: Juvenile Hormone Mimics, OP: Organophosphates, SP: Spinosyns.

<sup>26</sup> Formulated product



- iv. They must have minimal effect on non-target species and the natural environment. The methods, timing, and frequency of pesticide application are aimed to minimize damage to natural enemies.
- v. Their use must take into account the need to prevent the development of resistance in pests.

JSC-KRM is responsible for purchasing needed pesticides and should follow special arrangements specified by the Palestinian Ministry of Health, these instructions are as following:

1. The contractor and pesticide supplier should include in the bidding documents a certification indicating that the offered material is licensed by the MOA / MOH as material accepted to be used with no effect on public health;
2. Certifications should be original and written in English or Arabic;
3. The material should include a data sheet clarifying the production date and expiry date clearly, which should not be less than two years from the date of purchasing the material by the municipality;
4. The materials should be inspected by a licensed laboratory (usually it is inspected by the laboratory at the MOH) and the cost of inspection should be covered by the provider;
5. Supply only pesticides of adequate quality, packaged and labeled as appropriate.
6. Pay special attention to formulations, presentation, packaging and labeling in order to reduce hazard to users, to the maximum extent possible consistent with the effective functioning of the pesticide in the particular circumstances in which it is to be used; and
7. Provide, with each package of pesticide, information and instructions in a form and language adequate to ensure safe and effective use.

#### **4.3 Measures for Using and Storing of Pesticides**

JSC-KRM is expected to use the pesticide during the summer semester starting in April until November in a specific frequency and shortly before the sun set. The following is a set of mitigation measures that shall be considered before and during spraying process of the pesticides:

1. Specify and inform adjacent land owners in advance about the spraying time and nominate in advance the number of workers responsible for the spraying.
2. Supervision of the spraying process should continue during the whole designated spraying period which usually during summer semester.
3. Storage of pesticide should be in a well identified storage space with limited access.

In addition, JSC-KRM will comply with the instructions provided in the pesticide package and those instructions promoted by MOH.