

Task 01 – Week 01

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Research skills 2



(MGM 777-1)

عرض لرسالة ماجستير

يقوم الطالب بعمل عرض لرسالة ماجستير موضحاً خطوات البحث العلمي المتعارف عليها والتي اتبعها لدراسته العلمية



Teaching Intensive, Research Informed

University of Bolton
Civil Engineering department
MRes of Research in Environmental Management
ENV7008 Dissertation

MSc Environmental Management

Risk Assessment

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**Adoption of Sustainable Municipal Solid Waste
Management System for the KSA**

April 2019

بحث الماجستير

- Research paper published by University of Bolton.
- College of Civil Engineering.
- Part of the Mres of Research in Environmental Management.

- **Research Title :**

**Adoption of Sustainable Municipal Solid Waste
Management System for the KSA.**

By:

Abdulaziz Hammas

- Published on: April 2019.

الشرائح التالية توضح سرد الرسالة المختارة



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University of Bolton
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Adoption of Sustainable MSWMS for the KSA

Prepared by: Abdulaziz Hammas
Student ID: 1710910

Outline

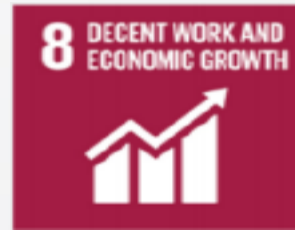
- **Abbreviations.**
- **Introduction.**
- **Problem Definition.**
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- **Methodology.**
- **UK GHGE Modelling.**
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- **Comparison of UK and KSA.**
- **Alternative.**
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List of Abbreviations

- MSWMS: Municipal Solid Waste Management System.
- GHGEP: Greenhouse Gas Emissions Potential.
- GHGEGP: Greenhouse Gas Emissions Generation Potential.
- GHGESp: Greenhouse Gas Emissions Saving Potential.
- IGES: Institute for Global Environmental Strategies.

Introduction

- MSWM and Sustainable Development.



- Adverse environmental, social and economic impacts could result from improper MSWMS.

Problem

- KSA generate about 16M tonnes of MSW.
- Implemented MSWMS is old and inefficient.
- Collect and landfill and/or dump.
- KSA signed and agreed upon UNO SDG's.



Aim & Objectives

- The main aim of this research is to compare the environmental impacts resulting from the current MSW management practice implemented in KSA with the international practice, and to develop a proper and sustainable approach that suits KSA.
- The comparison will be focused on the GHGE associated with the waste management practices (i.e. collection, transportation, disposal, etc.).
 1. To research the best practice of sustainable MSWMS (focusing on the UK).
 2. To compare the international MSWMS practice with the existing practice in KSA by investigating relative case-studies (focusing on GHG emissions).
 3. To develop the most appropriate MSWMS that suits KSA.

Methodology

- Sustainability by GHGE evaluation.



- IGES-GHG Calculator. (Excel)
- UK & KSA.
- Limitations:
 1. Considerations of certain MSWM practices only.
 2. Internal data set for certain Southeast Asian countries.
 3. Availability of all required data inputs.

UK GHGE Modelling

- Consideration of transportation, mix-waste landfilling, recycling, composting, and incineration.
- Secondary data needed published by Department for Environment, Food and Rural Areas.

<i>million tonnes and % change</i>								
		Energy recovery	Incineration	Recycling and other recovery	Backfilling	Deposit onto or into land (landfill)	Land treatment and release into water bodies	Total
2012	UK	1.6	5.9	91.5	14.1	48.6	31.4	193.0
2014	UK	1.9	7.6	96.3	21.7	48.2	29.8	205.4
Change	UK	22.3%	27.7%	5.2%	53.6%	-0.8%	-5.0%	6.4%

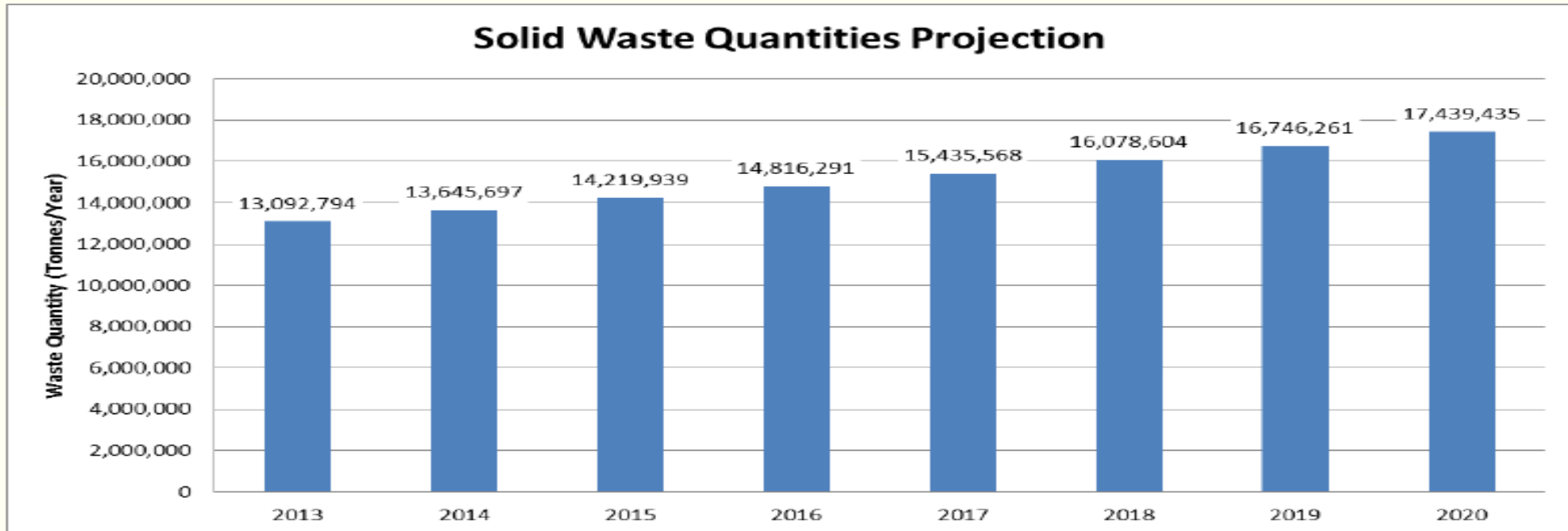
UK GHGE Modelling

MSWM practice	Net GHG emissions (Kg CO ₂ eq)	GHG emissions (tonne CO ₂ eq)
Transportation	781573.2	781.5732
Landfilling	596551004.3	596551.0043
Incineration	149427448	149427.448
Composting	-29554836	-29554.836
Recycling	-6010819219	-6010819.219
Total	-5293614029	-5293614.029

**Minus sign indicates GHGESP.
-63,523,368 tonnes of CO₂eq/year**

KSA GHGE Modelling

- About 16M tonnes of MSW generated.
- Recycling is limited to 10-15% only.
- Remaining is landfilled or dumped.
- Consideration for transportation, mix-waste landfilling and recycling



KSA GHGE Modelling

S #	Waste Categories	Fraction (%)	Components
1	Organic materials	65.5	Food waste and paper materials
	Food Waste	37.0	Food stuff, fruits and vegetable refuse, peel etc.
	Paper	28.5	Wasted Papers, cardboard, box board, bags, magazines, tissue papers, newspapers, toilet papers,
2	Plastics	5.2	Disposable glass, spoons, plates, wrapping films, wrapping film, bags, plastic bottles and polythene
3	Glass	4.6	Bottles, glassware, bulbs, ceramics etc.
4	Wood	8.0	All products comprised of wood
5	Textile	6.4	Cloths, dippers etc.
6	Metals/minerals	8.3	Cans, knives, wires bottles , aluminum cans, foils
7	Others	2.0	Leathers, rubber, fibers, rubber, yard waste, soils, tyres, appliances and electronics and appliances

KSA GHGE Modelling

MSWM Practice	Net GHG emissions (Kg CO ₂ eq)	Net GHG emissions (Tonne CO ₂ eq)
Transportation	781573.2	781.5732
Landfilling	1424350602	1424350.602
Recycling	-84996009.95	-84996.00995
Total	1340136166	1340136.166

16,081,634.4 tonnes of CO₂eq per year

Comparison of UK & KSA

KSA			UK		
Total MSW in GHG modelling: 16,078,604 tonnes			Total MSW in GHG modelling: 78,363,564 tonnes		
Practice	% of total	GHGP (tonne CO ₂ eq/tonne MSW)	Practice	% of total	GHGP (tonne CO ₂ eq/tonne MSW)
Transportation	n\a	0.00058	Transportation	n\a	0.00004
Landfills	98.3%	1.0812	Landfills	61.5%	0.1485
Composting	Not implemented		Composting	0.5%	-0.8556
Recycling	1.7%	-3.776	Recycling	28.3%	-3.257
Incineration	Not implemented		Incineration	9.7%	0.2359

Main issues are: high landfilling dependence and high organic content.

Alternative

- What if:
- Waste going to landfills is restricted to 50% of the total MSW generated.
- Recycling increased to 25% (composting of FW).
- Incineration implemented at 25%.

Alternative

Method	GHG potential (Kg CO2 eq/m)	GHG potential (tonne CO2 eq/m)
Transport	781573.2	781.57
Landfills	729962912	729962.91
Incineration	66514402.46	66514.40
Recycling	-503803703.1	-503803.70
Composting	-88653851	-88653.85
Total	204801333.6	204801.33

1. 2,457,612 tonnes of CO₂eq / year.
2. 16,081,634.4 tonnes of CO₂eq / year.
3. Almost 75% reduction.

Comparison of current and alternative scenarios

Currently implemented practices			Suggested practices		
Practice	% Implemented	GHG Generated (tonne CO ₂ eq/m)	Practice	% Implemented	GHG Generated (tonne CO ₂ eq/m)
Transport	n/a	782	Transport	n/a	782
Landfills	85-90	1,424,351	Landfills	50	729,963
Recycling	10-15	-84,996	Recycling	25	-503,804
Composting	0	0	Composting	25 (FW)	-88,654
Incineration	0	0	Incineration	25	66,514
Total	100	1,340,137	Total	100	204,801

Benefits

- Environmental
 1. Reducing associated GHGE.
 2. Reducing fossil fuel operations.
 3. Using compost in agricultural purposes.
 4. Promoting sustainable development.

Benefits

- Economic

1. Compost production.
2. Renewable energy production from incineration plants.
3. Reducing overconsumption of recyclables.
4. Providing employment opportunities .

Benefits

- Social

1. Increase social awareness about sustainable MSWM.
2. Promote social involvement in waste segregation.
3. Promote reuse concept among society.
4. Employment opportunities.



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Thank You

