Technology and Public Policy Options for Solid Waste Management:

Application to Recent Cases in the East Mediterranean

by

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Objectives

Discuss MSW challenges in less developed countries related to lack of public policies

Provide a brief description of a Case from the East Mediterranean

Present empirical results of public attitudes towards MSW management options

Trigger debate about the advantages and disadvantages of MSW management options
MSW is a natural daily product

There are several processes and technologies in MSW management that have evolved over the last few decades

Slowly a drift appeared between theoretical research and application

Key success factors are mostly about implementation rather than the attractiveness of the theory

The design of clear, simple, executable public policies is most important to secure acceptance and tangible results
A Hierarchy of Methodologies

Overall qualitative relationship between viable MSW management solutions and the developmental level of the community or country.

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### Tenets in Policy Design

**Clarity**
- What is the end-user expected to do?
- What level of involvement is expected of public managers?
- How would both parties measure success?

**Simplicity**
- Can the end-user keep up with the process?
- Is it incentive-based? Or top-down? Is there enforcement involved?
- Will there be any confusion about results?

**Ease of Implementation**
- Can the end-user keep up with the process?
- Will the plan materialize as expected?
- Will the end-result be perceived, evaluated in a common frame?
Tenets in Policy Design

- Challenges in less developed countries

- Clearly designed
- Easy to implement
- Simple to understand
- Positive Impact

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Research, policy frameworks ... and good intentions

MSW have issues common to less developed countries, case in point the crisis in Lebanon

Majority of MSW is household refuse

A 1995-1997 study was part of an Environment Emergency Plan

The greater Beirut area (GBA) was supposed to lead in terms of applying modern practices

A 2001 comparison showed 1.44 Mn actual tons compared to projected 0.99 Mn tons as yearly quantity
In 1998, policymakers decided to interrupt garbage dumps in Burj Hammoud.

The Naameh landfill, 18 km south of Beirut - a short-term alternative was born to accommodate landfilling till 2004.

Target capacity 2.2 Mn tons over six years … with a sole private contractor …

… but it remained open till 2015 … when it was shut down by escalation and pressure from inhabitants.
Public Unease about lack of clarity in direction

No government strategy? Can’t keep it home .... Have to throw it somewhere

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The intent was to

Use the Naameh landfill temporarily

Build awareness about modern techniques

Encourage triage

Phase Naameh out

... As you migrate to better solutions
A priority list was developed ....
Studies were conducted about MSW composition

<table>
<thead>
<tr>
<th>MSW Component</th>
<th>GBA (%)</th>
<th>Lebanon (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic</td>
<td>63</td>
<td>51</td>
</tr>
<tr>
<td>Paper and cardboard</td>
<td>18</td>
<td>17</td>
</tr>
<tr>
<td>Plastic</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Glass</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Textiles</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Metals</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Construction/Demolition</td>
<td>-</td>
<td>5</td>
</tr>
<tr>
<td>Other</td>
<td>-</td>
<td>2</td>
</tr>
</tbody>
</table>

Composition relatively high on organic components, which favors certain solutions over others.

(CDR 2012)
The composition did not change significantly in time.

Composition of MSW in Lebanon (2015 data)

- ORGANIC MAT'L: 53%
- CARDBOARD AND PAPER: 15%
- GLASS: 9%
- PLASTICS: 6%
- METAL: 5%
- OTHER: 12%

(NCR 2016)

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Landfills were the only solution [at high volume demand] put into practice for so long.

Incineration was not developed into the inclusion of clean air technology and energy recovery schemes.

Anaerobic digestion was still considered not ready for implementation.

Migration to a new solution reached a dead-end.
Contradicting opinions arose; public managers, civic society, end-users ....

Recipe for policy failure

Little attention was given to the “three tenets”
Rush for remedial actions ... a bit too late

In which bin should the plastic go ???

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Rush for remedial actions ... a bit too late

Shall we do the triage by hand? Right here in the neighborhoods? Was that even part of our job?
Public discontent escalated [2015-2016]

All technology solutions seemed remote ... and theoretical

Some suggestions were even ... so out of range ...

A proposal to literally “ship” garbage to other countries was put on the table ... and was withdrawn within weeks

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... in a rather transparent way ...

... pubic attitudes had to be gauged empirically
If it is to be burnt, it should not be done randomly
Empirical techniques were used to gauge public attitudes.

Public awareness-building about upstream triage

Privatization of part or all of the value chain

\[ Y = \beta_0 + \sum_{i=1}^{5} \beta_i X_i \]

Quality management in daily operations

Reliability of public management authorities

Challenges in daily operations and implementation
Some of the simple empirical techniques were used

<table>
<thead>
<tr>
<th>Public role upstream</th>
<th>Privatization</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{se}_1 = 0.052 (\geq \alpha = 0.05) )</td>
<td>( \text{se}_2 = 0.028 (\leq \alpha = 0.05) )</td>
</tr>
</tbody>
</table>

\[
Y = 0.955 + 0.0099 X_1 - 0.0468 X_2 + 0.5695 X_3 + 0.2787 X_4 - 0.1096 X_5
\]

<table>
<thead>
<tr>
<th>Quality management</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{se}_3 = 0.050 (\leq \alpha = 0.05) ).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Public authorities</th>
<th>Implementation Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{se}_5 = 0.032 (\leq \alpha = 0.05) ).</td>
<td>( \text{se}_4 = 0.048 (\leq \alpha = 0.05) ).</td>
</tr>
</tbody>
</table>
Local community brainstorming and commentary tool

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\[ Y = \beta_o + \sum_{i=1}^{5} \beta_i X_i \]
Excessive, mismanaged MSW raises serious health, logistical, economic, and political problems

The downside is exacerbated in less developed countries

Most desirable solutions comprise waste avoidance, and least desirable are traditional landfills

Incineration, energy recovery, and clean exhaust technology is worth exploring seriously
Empirical study tested public attitude towards

Upstream triage
Privatization, and Quality management
Technological implementation challenges
Reliability of public management

Follow-up research would benefit from a focus on

Collaborative schemes among household-level, municipal level, contractors and investors

Sustainable culture- and incentive-based solutions and less on top-down solutions
Thank you

*Please visit us soon*
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