

2nd MEDA Water Regional Event on Local Water Management

Knowledge, Attitude and Practices in Relation to Wastewater Management and Reuse: A Case of Lebanon

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Outline

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- Objectives
- Situation and Problem
- Study Area
- Methodology
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- Conclusions

Introduction

- Wastewater management, primarily in rural areas, is a problem confronting many developed and developing countries
 - *Worldwide, significant development has been made in wastewater treatment for urban areas as compared to rural areas which lag far behind*

Introduction

- Centralized wastewater collection and treatment systems are costly to build and operate **especially** in areas with low population densities and dispersed households
- Developing countries lack both:
 - *The funding to construct centralized facilities and*
 - *The technical expertise to manage and operate them*

Introduction

- **Alternatively**, the decentralized approach for wastewater treatment which employs a combination of onsite and/or cluster system is gaining more attention
 - *More reliable*
 - *Cost effective*
 - *Customized*

Introduction

- The lack of research and development activities in developing countries leads to the selection of inappropriate technology in terms of:
 - *The local climatic and physical conditions*
 - *Financial and human resource capabilities*
 - *Social or cultural acceptability*

HENCE...

It is essential to conduct research which is based on local requirements and conditions rather than adopting practices from other countries

Objectives

- Public education and participation in decision making are fundamental elements of any wastewater management program
- Hence, a survey on knowledge, attitude and practices relating to wastewater management and reuse in rural areas taking three villages in Al-Chouf Caza in Lebanon as a case example was conducted

Objectives

- Among the other objectives of this research work were:
 - Assess the performance and reliability of the existing decentralized wastewater treatment systems in three villages in Al-Chouf Caza in Lebanon
 - Draw conclusions and lessons for future wastewater management systems in other rural areas in Lebanon as well as other developing countries

The Starting Point: The PROBLEM!

- **In Lebanon**, while numerous projects are underway to construct wastewater treatment plants, up till now, there are virtually NO OPERATIONAL wastewater treatment plants
- Rural areas lack properly constructed and maintained on-site sanitation facilities
 - *Most communities are reported to use a rudimentary form of private cesspools*

The Starting Point: The PROBLEM!

Absence or delay in implementing a nationwide effective wastewater management strategy



Local communities and municipalities, primarily in Al-Chouf Caza, planned and implemented their own arrangements for decentralized wastewater treatment systems

The Starting Point: The PROBLEM!

- Most municipalities still lack the human and financial resources, management capabilities, and environmental awareness necessary to implement wastewater management in an environmentally sound manner

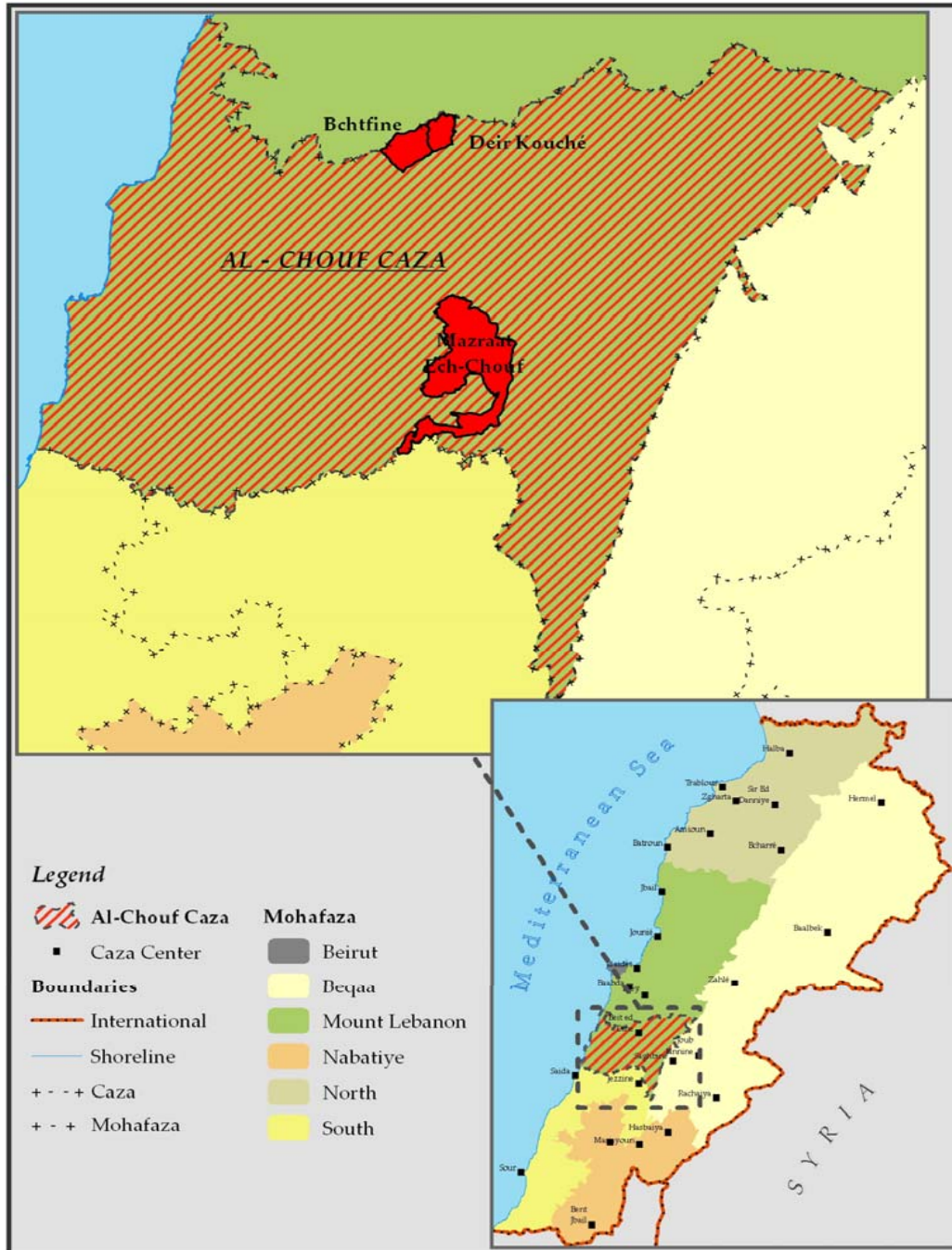
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- The effectiveness of these systems particularly with regard to the quality of the treated effluent warrants evaluation

Study Area

- Three villages in Al-Chouf Caza employing three different wastewater treatment systems were chosen
- Noticeably, a small number of villages have wastewater treatment plants that are not operational awaiting the completion of the sewerage network or are under construction

Study Area



Study Area

- A form of secondary wastewater treatment (activated sludge) plant with a design population of 3,500 people is employed in the first village, Bchetfine
- The treated effluent is discharged into a nearby river

Study Area



Study Area

- In the second village, Mazraat Al-Chouf, the treatment plant comprises 3 successive ponds
 - *The raw sewage enters the first pond and follows continuous treatment in successive ponds*
 - *The process is natural and is carried out by the action of algae and bacteria*
 - *Around 400 households are connected to the treatment plant*
 - *The effluent percolates into the ground or flows into a nearby river*

Study Area



Study Area

- The third village, Dier Kouchi, is limited to cesspools and sanitary pits as the case in almost all the other villages in Al-Chouf Caza

Methodology

- Effluent samples from the existing decentralized wastewater treatment plants in the three villages were collected and analyzed
 - *Physical, chemical and microbiological parameters as indicators*

Methodology

- Pollutant removal efficiency of the existing wastewater treatment systems was assessed in comparison to international standards for effluent discharge

Methodology

- 115 households were selected randomly on-site in each village
- Questionnaires were divided between the three villages proportionately based on their corresponding approximate household number

Methodology

- A structured questionnaire was used for the data collection
- The questions aimed first at knowing the villagers' level of knowledge regarding the issues of wastewater in their villages
- The second aim was getting to know their practices in that field

Methodology

- The 6 sections of the questionnaire were the following:
 - **Water**: Water scarcity and its timing, water sources for domestic and drinking purposes, and water born illnesses during the past 5 years
 - **Wastewater**: Sewage network availability, means for getting rid of wastewater, availability of non functional wastewater treatment plant, and acceptance of using secondary treated wastewater for irrigation

Methodology

- ***Septic Tank***: Soil type in the area, frequency of emptying the septic tank, location of sludge disposal after tank cleaning, estimation of the annual operation and maintenance cost for a septic tank, responsible party for the operation and maintenance of the septic tank, and existence of odor problem

Methodology

- ***Wastewater Treatment Plant/Ponds:*** Final destination of treated water, quality of treated water, interruption in the treatment plant/wetland functioning, and odor problems
- ***Willingness to Pay:*** Actual payment for the wastewater and willingness to pay for an improved service
- ***Demographics:*** Identification information, age, gender, educational level, and monthly income

Results and Discussion

(Performance Evaluation)

- The conducted field work, visual assessment and laboratory analyses of effluent discharges revealed that:
 - The existing systems for wastewater management in the studied villages in Al-Chouf Caza are either not properly functioning or operational but ineffective
 - Hardly achieve any treatment higher than primary

Results and Discussion

(Performance Evaluation)

- This **FAILURE** is primarily attributed to the inapplicability of the existing systems applied to the managerial and financial conditions in the villages as well as technical suitability

Results and Discussion

(Performance Evaluation)

- Almost all rural areas in Lebanon suffer from routine electricity disruption
 - *Wastewater treatment plants with mechanical processes that are energy intensive and need continuous electrical power are not effective without a backup generator*

Results and Discussion

(Performance Evaluation)

- The applications of conventional mechanical wastewater systems which are too complicated and too expensive are not expected to provide a sustainable solution
 - *Technologies used are most often beyond the capabilities of the local people to operate and maintain effectively and efficiently*

Results and Discussion

(Performance Evaluation)

- Major problems reported by municipalities in these villages are:
 - *Lack of human resources with technical operating experience*
 - *Financial resources*
 - *Management capabilities*
 - *Political commitment necessary to implement wastewater management in an effective manner*

Results and Discussion

(Survey)

- All respondents stated the summer season as the main time for water shortage
- The majority of respondents (93%) in the 3 villages relied on spring water as the main source of drinking water, while 7% stated that they purchase their drinking water

Results and Discussion

(Survey)

- Overall **70%** of the respondents had positive attitudes concerning the use of treated wastewater for irrigation purposes without noticeable differences among the 3 villages
- Almost two thirds (**57%**) of the respondents in Deir Koushi village stated that they do not empty their tanks
- About **29%** of the residents of Deir Koushi reported their willingness to pay for septic tank maintenance

Results and Discussion (Survey)

- In Bchetfeen, **30%** of the residents reported the river as the final destination for their treated wastewater, while **5%** said that treated wastewater is released in a nearby land and **65%** had no idea about the final destination of treated wastewater
- **32%** percent of the respondents rated the quality of wastewater as good or acceptable while **68%** reported poor quality for treated wastewater or did not have any information on this matter

Results and Discussion

(Survey)

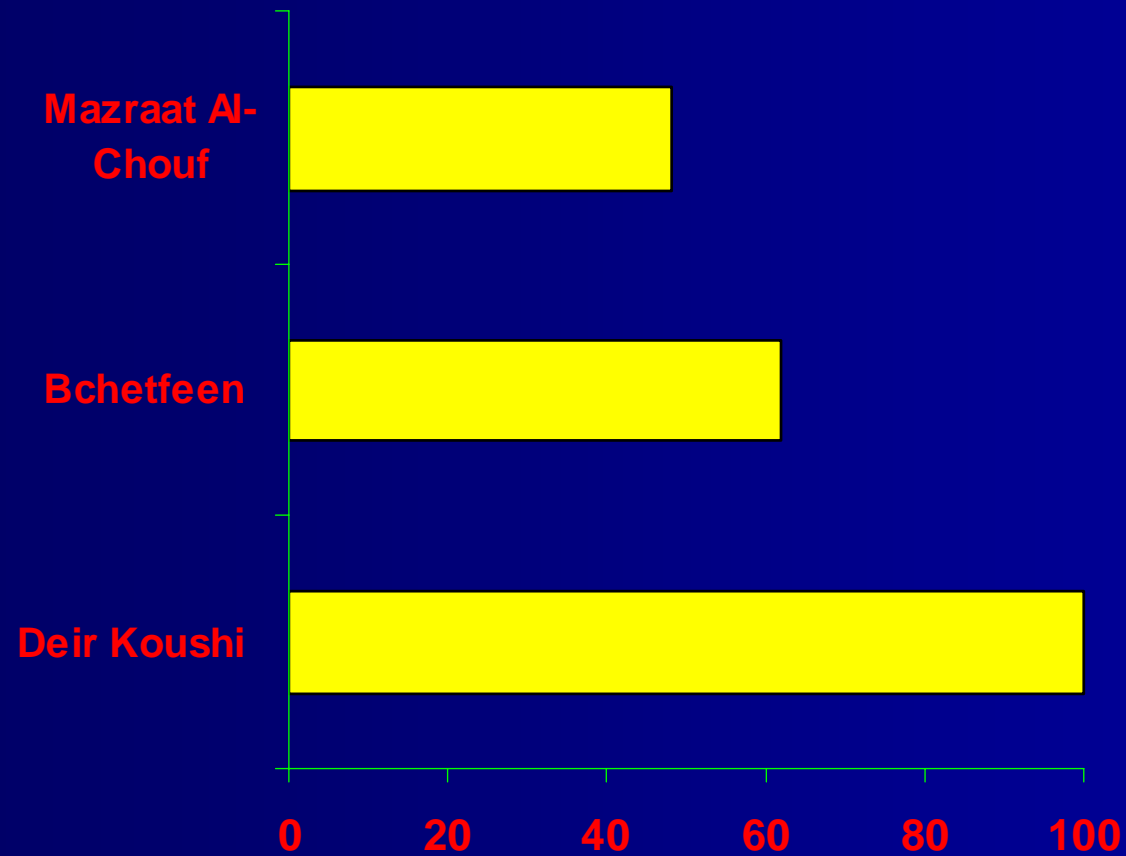
- In Mazraat Al-Chouf, a third of the sample (**33%**) stated a nearby land as the final destination for the treated wastewater, while **67%** reported not having any information regarding the final destination of the treated wastewater

Results and Discussion

(Survey)

- In general, the people believed that the taxes they have to pay for the sanitation are not that high, but still some of them do not pay
- Overall, only **59%** showed willingness to pay for the treatment of their wastewater with large variation across the villages
- In fact, all the respondents of Deir Koushi village demonstrated willingness to pay for wastewater treatment compared to **62** and **48%** of the respondents in Bchetfeen and Mazraat Al-Chouf, respectively

Results and Discussion (Survey)



Results and Discussion

(Survey)

- Respondents reporting having physical health problems were more likely than their counterparts to be willing to pay for the improvement of the wastewater sector
- Respondents who reported irregularities in the functioning of the wastewater system were more willing to pay to improve the wastewater sector as compared to others who perceived the process as functioning without problems

Conclusions

- It is very crucial to take into account the economic status of the community and the municipality in question
- There is no point in adopting the most advanced technology for wastewater treatment if there is no mechanism to ensure maximum efficiency
- It is important to predict whether a proposed technology can be supported by the existing institutions

Conclusions

- Even after a project has been successfully implemented, it will not be effective in reducing pollution and improving public health without a management structure to ensure effective operation of facilities
 - *The management structure must have adequate economic resources to fund maintenance and effective operation of the system*

Conclusions

- The uncritical adoption of international criteria for design of wastewater treatment plants and ignorance of the local conditions could result in wasted capital

Conclusions

- The most positive aspect revealed by the survey is the willingness of the local people in the three villages to pay to improve wastewater management and to reuse the treated effluent for irrigation which may be attributed to the unsatisfactory conditions of the existing system

Conclusions

- The fact that many people had no idea about the treated wastewater's quality and the final disposal location proves that there is some lack of knowledge among the local people

Thank You