Exploring Factors Influencing Adoption of Solar Water Heating Systems: An Empirical Analysis of Lebanon

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INTRODUCTION

- Lebanon is among the top ten markets for Solar Water Heaters (SWH) in the world according to the International Energy Agency (IEA).
- SWH has the most mature market in Lebanon due to:
  - the development of the technology itself
  - the implementation of national initiatives by the government to increase the installation of SWHs

Focusing on four interrelated aspects

- Policy
- Capacity Building
- Financial support
- Quality Control
SWHs allow households to save up to 25% of the total electricity bill.

**Electricity consumption by sector**

- Residential sector: 29%
- Commercial: 9%
- Industrial: 26%
- Technical Losses: 19%
- Government: 17%
- World Bank (2009); Energy Efficiency Study in Lebanon

**SWH adoption by end user group (sector)**

- Commercial: 74%
- Residential: 22%
- Industrial: 4%

This study studies drivers and challenges in relation to Lebanon’s goal of installing 1.5 million squared meters of installed SWHs by 2020, and lowering demand of conventional energy.

- Several challenges are still in market though, and need attention
- The commercial and industrial sectors still have low adoption rates
RESEARCH QUESTIONS

1. What are the challenges that potential SWH system adopters face, and affect decision-making of adopting SWH systems?

2. What are the organizational factors, government policies and other factors that influence SWH adoption in the residential and commercial sectors?
CONCEPTUAL ADOPTION FRAMEWORK OF HOUSEHOLDS
CONCEPTUAL ADOPTION FRAMEWORK OF COMMERCIAL SECTOR FIRMS
Based on Dieperink et al. (2004)’ integrative framework explaining diffusion of innovations in industry and The built environment.
METHODOLOGY

- Analyzed using CAQDAS (Atlas.ti).
  - A previously developed coding scheme based on theoretical approaches/empirical studies
  - Frequencies of the amount of assigned codes per theoretical items were interpreted and presented both per stakeholder

Secondary Data
- Reports
- Documentations

Multiple information sources

Primary Data
- In-depth interviews with 11 informants:
  - National Organizations
  - NGOs
  - End users
  - Contractors
  - Consultants
  - Banks

Perceived drivers/challenges
Stakeholders perceived views
# RESULTS

## Key events, policies, and initiatives

<table>
<thead>
<tr>
<th>Pilot projects</th>
<th>Standardization</th>
<th>Awareness raising</th>
<th>Financing</th>
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<tbody>
<tr>
<td><em>For households</em></td>
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<td><em>Public facility buildings</em></td>
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<td><em>Setting norms for SWHs on national level</em></td>
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<td><em>Public awareness campaigns</em></td>
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<td><em>Publicity</em></td>
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<td><em>Interest free loans</em></td>
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<td><em>$200 subsidy per system for households</em></td>
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<tr>
<th>Quality Control</th>
<th>Testing Facility</th>
<th>Capacity building</th>
<th>Building code</th>
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<td><em>National certification</em></td>
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<td><em>Guide for customers</em></td>
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<td><em>To ensure technical compliance with standards</em></td>
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<td><em>Workshops</em></td>
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<td><em>Training sessions; installers, manufacturers</em></td>
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<td><em>New buildings equipped with SWH installations</em></td>
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<tr>
<td><em>Not mandatory</em></td>
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**Households**

**Drivers**
- Perceived savings
- Loan incentives
- Subsidy
- Convenience
- Experience of peers
- Mass media
- Low investment cost
- Quality
- Observability
- Compatibility
- Supplier promotion
- Awareness
- Income

**Challenges**
- Roof space
- Piping cost
- Neighbors’ disapproval
- Cheap conventional energy
- Untrustworthy contractors
- Inconvenient installations in old buildings
- Absence of financial support for poor
Commercial Sector

Drivers

- Reducing bills
- Suggested by supplier/sector
- Supplier promotion
- Loans
- Competition
- Ownership
- Convenience
- Reliability
- Conventional energy price
- Environmental awareness

Challenges

- Lack of concern
- High investment cost
- Lack of confidence in SWH reliability
- Ownership of Building
Assessment of Research Model-Households

Adopter Characteristics:
- Income
- Type of Dwelling/roof space and piping costs
- Ownership
- Environmental concern/lifestyles

Demographic Characteristics:
- Age

Socio-Cultural Factors:
- Trust in supplier
- Communication (interpersonal, mass media)
- Neighbors’ disapproval

Policy:
- Soft loans
- Subsidies

Technology Related Factors:
- Relative advantage (low initial cost, low payback period, convenience, economic profit)
- Compatibility
- Observability
- Complexity

Adoption of SWHs
Assessment of Research Model-Commercial Sector

**MARKET AND SOCIETY**
- Competition
- Suggested by suppliers/sector
- Perception market demand

**GOVERNMENT**
- Supplier promotions
- Complying policy instruments
- Subsidies

**MACRO ENVIRONMENT**
- Environmental awareness
- Energy price

**TECHNICAL ASPECT**
- Technical fit/compatibility
- Convenience
- Reliability
- Complexity

**ECONOMIC ASPECT**
- Efficiency/saving money
- Payback period
- Investment cost

**CORPORATE CHARACTERISTICS**
- Company’s size
- Company’s policy
- Management involvement
- Routine

Adoption of SWHs
CONCLUSION

- Factors which influenced adoption of SWHs
  - Regulating installment of SWH systems in new buildings
  - Improving the quality of SWHs through setting national standards
  - Increasing the qualification of installers and manufacturers
  - Raising awareness for potential adopters through outreach campaigns
  - Providing interest free loans and subsidies
  - Perceived Savings
CONCLUSION...Cont’d

- Challenges that are limiting larger-scale uptake of SWHs in Lebanon:
  - **Residential sector households**
    - Limited space availability
    - High installation costs to ensure efficient functioning
    - Social problems (neighbors’ disapproval)
    - Cheap conventional energy
  - **Commercial sector**
    - High investment cost of collective SWH systems
    - Lack of confidence in reliability of collective systems

- **Recommendations:**
  - Providing financing measures for the poor
  - Introducing new technologies to overcome the space problem; SWHs installed on façade of buildings
Thank You
Questions?