SOLAR WATER HEATERS IN INDIA: MARKET ASSESSMENT STUDIES AND SURVEYS FOR DIFFERENT SECTORS AND DEMAND SEGMENTS

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Greentech Knowledge Solutions (P) Ltd
New Delhi -110078 (India)
Website: www.greentechsolution.co.in

PROJECT TEAM

Core Team

Dr Sameer Maithel, *Greentech Knowledge Solutions (GKS), New Delhi*
Mr Shailesh Modi, *Fourth Vision (FV), Ahmedabad*
Mr Minhaj Ameen, *Auroville Renewable Energy (AURORE), Auroville*
Mr Prashant Bhanware, *GKS, New Delhi*

Regional Teams

North
Dr Sameer Maithel & Mr Prashant Bhanware, *GKS, New Delhi*
Mr Anil Kumar, Ms Aesha Basri & Mr Saurabh Srivastava, *BTECON, New Delhi*

South
Mr Minhaj Ameen, Mr P J Tejas, Mr Hemant Lamba, Mr Erik Conesa, Mr Akshay Roongta, *AURORE, Auroville*

West
Mr Shailesh Modi, Mr Vimal Suthar, Mr Mintu Patel, Mr Vipin Thakur, *Fourth Vision (FV), Ahmedabad*

East
Mr S B Rath, Mr.Rahul Gon, Mr.Abhijit Kanungo, Mr. Tapan Laha, Mr.Smurtiranjan Dash, *Varun Techno Infrastructure Pvt Ltd, Bhaubaneswar*

North-East and West Bengal
Mr P C Sarma, Mr P.L.Ghosh, Mr Anupam Boral, Mr Avijeet Dutta, Ms Manikankana Majumder, Mr Amit Dhar, *N B Institute of Rural Technology, Kolkata, Guwahati and Agartala*

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Executive Summary

Solar Water Heater Market Assessment Studies and Surveys for Different Sectors and Demand Segments

1.0 Introduction

The present report addresses the following objectives.

- Understanding SWH market

- Projecting realizable demand for SWH till 2022

- Generating policy inputs (specific, separate studies on policy and regulation are underway)

The report is an outcome of work done by Greentech Knowledge Solutions Pvt. Ltd (GKS), New Delhi led consortium of consultants. The other members of the consortium are located at Pondicherry, Ahmedabad, Bhubaneshwar and Kolkata.

In addition to literature survey focused on global and Indian SWH market, we carried out a primary survey among 1000 users and non-users of SWH in household, commercial/institutional and industrial segments in 29 districts of India; selected in consultation with MNRE. We also held semi-structured interviews of 200 stakeholders- SWH manufacturers, dealers, SNA'S, banks, municipal corporations, electricity distribution companies, architects and builders. This was followed by analysis leading to demand projection and delineation of key areas for action to realize projected demand. The primary survey was followed by realizable demand projections.

Figure 1. Primary Survey – 29 Selected Districts
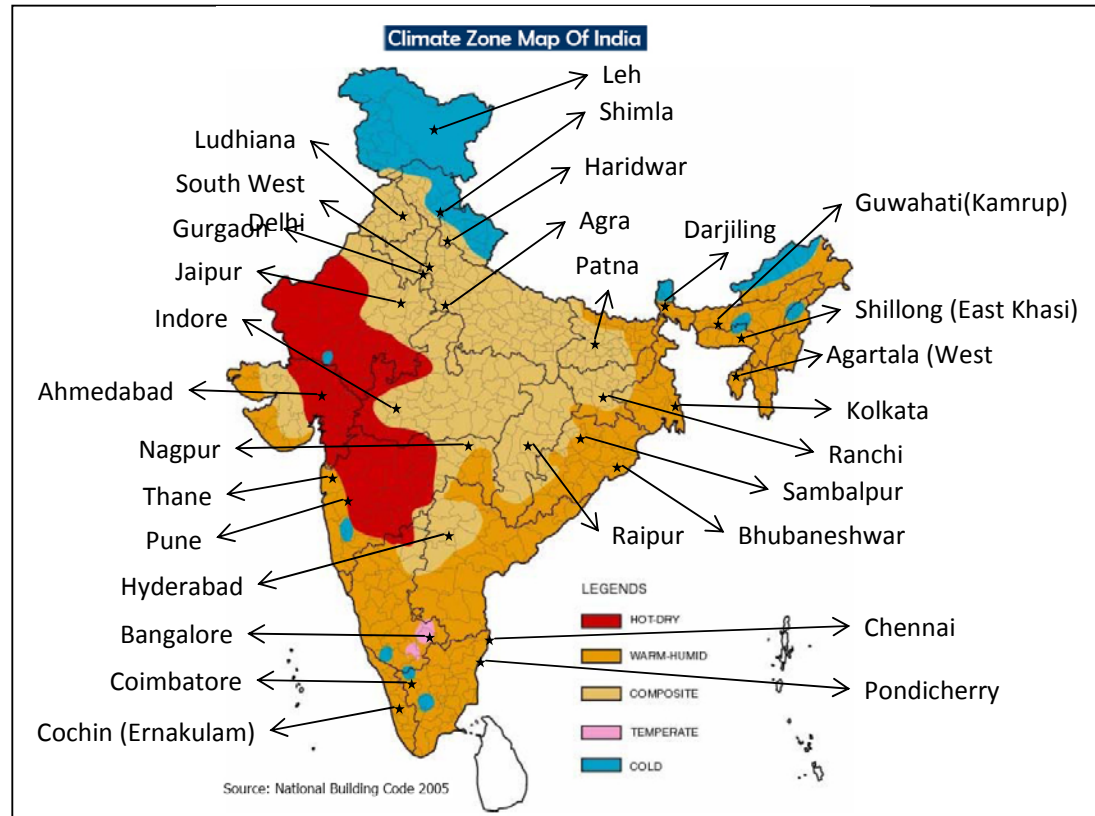
2.0   SWH Global Market

In 2008, the cumulative SWH capacity was 15 GWth. Growth in recent years has been 15% per year. There are estimated 40 million households (2.5% of the total) which were using SWH worldwide in 2004.

China is the leader; 10% of Chinese households use SWH; the target for 2020 being 30%. In 2008, 65.6% of existing global SWH capacity was in China; followed by European Union (12.3%), Turkey (5.8%), Japan (4.1%) and Israel (2.8%). The Indian share was 1.2%.

The residential sector is the mainstay of SWH in the two largest SWH markets; 98% of annual sale in China and 90% of installed capacity in Europe is in the residential sector. The market is urban-centric; 90% of installations in China are in urban areas.

While households-level SWH in Europe are installed predominantly in independent houses, it is both-independent houses and multi-storied buildings-in China.

3.0 Indian Market

The segment-wise statistics on Indian market are not available. Based on our work, we have pieced together the following picture.

Table 1. Estimated Breakup: Functional SWH Installations Till 2009

Sector	million m^2
Residential (80%)	2.108
Hotels (6%)	0.158
Hospitals (3%)	0.079
Industry (6%)	0.158
Other (Railway + Defence + Hostel + Religious places, other) (5%)	0.132
Total	**2.635**

* It is assumed that 85% of the installed SWH are functional

The sale during 2009 is estimated at 0.55 million m^2. The CAGR of cumulative installation during 1995-2000 was 8.23%. It spurted to 20.6% during 2000-04 and further to 24.6% during 2004-08, denoting overall CAGR of 16.8% over 1995-2008. The following explains demand upsurge in recent years.

- Growth in new urban housing; rising disposable income; increased propensity for consumer durables
- Arrival of ETC & improvements in supply chain
- Energy price hike
- Policy initiatives

4.0   Primary Survey: Key Findings

In the residential sector, there are 0.7 million SWH user households; 65% of which are concentrated in Karnataka and Maharasthra. There is overall satisfaction with product- experience; some concern being voiced over after-sale support. The use of SWH-water is mainly for bathing. The average size of the domestic installations that were surveyed is around 150 lpd. Among non-users, in states other than Karnataka/Maharashtra, there is sketchy awareness of the bare concept of SWH. The customers perceive it as a product suited for independent houses and not so much for apartment buildings. Hot water demand expressed though months/year and supply chains are important demand drivers. The high demand regions report hot water demand for ≥ 9 months/year, while the lower end is 4 months/year.

In the hotel sector, SWH experience exists across regions and hotel/guest-house standards. The provisioning recognizes year-round demand for hot water. The use of expensive petroleum fuels and electricity support the case for SWH. Roof availability, for 15 room upward capacity hotels, is not a significant barrier. However, capital cost is a major consideration. Among hospitals and hostels, awareness/exposure levels are low; compared to hotels. Supply hour management/regulation is a key advantage for both. Roof availability is not a noticeable constraint.

The SWH experience among industries is limited and scattered. Heating of boiler feed water is the major application. Some of the candidate industries –rice-mills, pulp and paper, tea-gardens, leather, textile processing-utilize biomass and coal; lengthening the payback period. It is industries utilizing oil-fired boilers-mainly dairy, fertilizer and sub-set of textile which are the prime markets for SWH. In addition, there are industrial canteens. The report enumerates geographical clusters, where SWH-relevant industries are concentrated.

In the rural sector, the households, *dhabas*, primary health-centers, hostels and village- industries (silk-reeling, textile-dyeing, puffed rice-making) are the main segments. The capital cost, recourse to biomass, lack of piped water supply, roof design/strength and virtual absence of supply chain are the roadblocks. The report highlights a low-cost innovative product introduced in Ladakh and a community-level

positive experience in Himachal Pradesh. The development of rural market warrants large, fresh work in terms of product-development, demonstration, policy and promotion of supply chain.

5.0   Industry Structure, Supply Conditions And Value Proposition

There are two technologies in vogue; flat plate collector and evacuated tube collector; the later has flourished on the strength of import of glass tubes from China. There are 113 approved Indian producers. The largest player market share is under 15%. The producers do not have nation-wide, SWH- specific brand equity. The dealer network is limited. The manufacturing is concentrated in southern India and Maharashtra. Barring ETC, there have not been any major product/technology breakthrough in last two decades. The system cost for a household varies from Rs. 20000 to Rs. 60000, depending on size and standard. It is positioned as an electricity-saving consumer durable. ESCO or pay-per-use models have not been attempted in a significant way.

6.0   Approach To Estimating Realizable Potential

The empirical data, over a period of time, in terms of SWH sale, its region-wise and segment-wise breakup and behaviour of relevant variations is not available. The present installations are concentrated in Karnataka and Maharashtra; compounding the inadequacy of data required for all-India model-building.

We were required to devote considerable effort to the task of estimating present and future stock of housing, hotel-rooms, hospital-beds, hostel-beds, etc. The establishment of hot water- consumption norms involved a probe into the applications and working out weighted average since norms vary across hotel/hospital categories.

We have identified the parameters driving demand and built three scenarios for demand projection-realistic or most likely; optimistic and pessimistic which are, both, considered less likely.

Our estimates in terms of SWH penetration and CAGR, for a given segment under the concerned scenario, recognizes the following.

- Historical trends and best-case (Karnataka) performance
- Assessment of potential based estimated growth for a given segment and its response to SWH; considering payback period prospect,
- Variations in SWH penetration vis-à-vis new and old buildings

7.0   SWH Potential Projection

Under realistic scenario, we estimate demand as follows [1].

Table 2. SWH potential under realistic scenario (cumulative million m²)

	2010	2013	2017	2022
Residential	2.58	4.25	7.68	15.74
Commercial/Institutional				
• Hotels	0.19	0.35	0.61	0.97
• Hospitals	0.10	0.17	0.27	0.43
• Others	0.18	0.27	0.39	0.52
Industry	0.19	0.33	0.57	1.05
Total	**3.24**	**5.37**	**9.52**	**18.70**

Residential sector would remain the largest sector and would contribute to 84% of the cumulative installations.
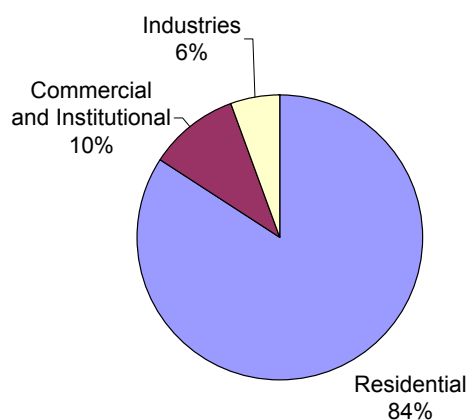

Figure 2 : Percentage-share of sectors in SWH installations 2022

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[1] 1 m² = 50 lpd

Under optimistic and pessimistic scenario, total demand is projected as follows.

Table 3. Demand projections under optimistic and pessimistic scenario (cumulative million m^2)

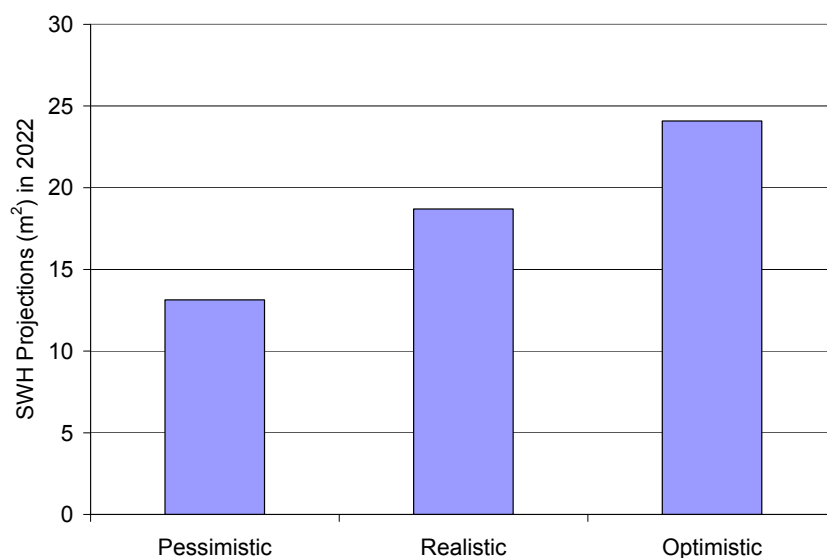|	Optimistic	Pessimistic
2010	3.41	3.22
2013	6.15	5.11
2017	11.63	8.16
2022	24.08	13.13

Figure 3: Comparison of projected SWH potential in 2022 for the 3 scenarios

The demand projection, under realistic scenario, implies SWH penetration in 1.78% of Indian households by 2022. In absolute terms, this is 5.25 million SWH-using households in 2022; for comparison there were 5.22 million water-purifier using households in India is 2008.

In the hotel and hospital segments, SWH penetration will reach 53% and 29% by 2022.

The demand projections under the realistic scenario are compared with the targets set for solar water heating in the recently announced Jawaharlal Nehru National Solar Mission (JNNSM) in the following table. The comparison shows a considerable gap between the targets set for the year 2017 and the projected potential. This indicates a need for having a much closer scrutiny of the JNNSM targets and the strategies to achieve the targets.

Table 4 Comparison of JNNSM targets and projected potential under realistic scenario

	JNNSM target (million m^2)	Projected potential (million m^2)
2013	7.0	5.4
2017	15	9.5
2022	20	18.7

8.0 Spatial Distribution of Projected Demand

Five states will lead demand-expansion, as is evident from the following table.

Table 5. Five top states
(cumulative SWH potential in million m^2 for 2022 under the realistic scenario)

State	Residential million m^2	Commercial/ Institutional million m^2	Total (Excluding Industrial) million m^2
Karnataka	3.72	0.16	3.88
Maharashtra	3.5	0.31	3.80
Tamil Nadu	1.53	0.14	1.67
Andhra Pradesh	1.08	0.09	1.17
Gujarat	0.90	0.06	0.96
%age of 5 states			**67.10%**

Further analysis of demand at the district level shows that a large part of the demand would come from selected urbanized districts. Some of the key districts (out of the 29 surveyed districts) which have large potential are listed in the table below.

Table 6: Selected districts with large SWH potential

(Cumulative SWH potential in million m^2 for 2022 under the realistic scenario)

District/Region	SWH potential (excluding industry) million m^2
Bangalore	1.94
Pune	1.11
National Capital Region	0.77
Thane	0.68
Hyderabad	0.58
Nagpur	0.38
Kolkata	0.36
Chennai	0.35
Coimbatore	0.33
Ahmedabad	0.29
Jaipur	0.27

9.0   Recommendations for Key Areas for Action

We have identified 10 key action points for MNRE and UNDP/GEF project. In our view these actions are important for relizing the potential of SWH in the country and achiving targets set under JNNSM. Please note that these do not follow any specific order of priority.

9.1 Select high-potential districts for implementation

The analysis presented in the report shows that the adoption of SWH depends primarily on the demand for hot water, regulations, SWH supply chain and paying capacity of the users. As presented in the previous section, a large part of the demand is concentrated in urban centers. Given this reality, MNRE should identify 10-20 districts and focus its attention on implementing SWH programme during the first phase of JNNSM (2010-2013) in these districts.

9.2 Implementation through Electricity Distribution Companies

There is a need to provide soft-term loan and, depending on the region and building vintage, a financial incentive to promote the market over next 5 to 8 years. Electricity distribution companies are the most appropriate vehicle to operate the package. The customer will appreciate readily the proposition of electricity-saving, rebate on electricity bill and outgo on account of SWH- purchase for a specified period because the company will make a single, consolidated proposal; smoothening all transactions. The distribution companies are also best equipped to operate compulsory installation policy for new buildings as well as old ones requiring extra power. They will build a clear database of installations, loan/rebate provided, SWH- performance and electricity saving. MNRE should set-up a working group to initiate a dialogue with Ministry of Power, Electricity Sector Regulators and Electricity Distribution Companies to develop a SWH programme for implementation through Electricity Distribution Companies by 2011.

9.3 Implementation-Oriented Mandatory Regulations

Mandatory regulations would remain a very important tool for developing market for SWH. Thus, it is imperative that the SWH mandatory regulations addresses the essential legal, administrative and technical issues and outlines the implementation mechanism. Prioritization and phasing might help, e.g., the policy may focus on new buildings above a cut-off point and limit itself to selected cities initially; extending the target-constituency and city-list over time. MNRE should initiate work with selected (3-5) municipal corporations and state governments having prior experience in implementing SWH mandatory regulations to update the regulations and develop a fool-proof strategy for implementation.

9.4 Strategy for Multi-storied Buildings

Given the shift towards multi-storey residential buildings, addressing water heating in multi-storey residential buildings through solar water heaters would be the key to realize potential in residential sector. A package of mandatory regulations, techno-managerial solutions, working models and best practices and incentives is essential for multi-storied buildings. Existing buildings will warrant special incentive. MNRE

may set-up a task force to study the issues and for developing a comprehensive strategy for multi-storey residential buildings.

9.5 Targeted and Variable Incentives Package

The payback period in respect of SWH varies across regions. It is not practical to stipulate compulsory SWH-installation for old buildings. The incentive package needs to address regional and vintage differences. MNRE should develop targeted and variable incentive packages that takes into account the specific requirements of different regions, sectors and vintage of builings.

9.6 Rural Market Development

Rural market particularly in the cold region may offer large potential. In the report we have indicated the barriers and successful experiences. MNRE should work out a blue print for the development of appropriate products, supply chains and a policy package focused on developing rural market for SWH.

9.7 Strategy to strengthen SWH Supply Chain

We have already elucidated the problem-areas. MNRE needs to work on a package of fiscal/monetary/subsidy   policy   to   promote   industry-   consolidation, product/technology development appropriate to low/middle-income group market, visible and extensive distribution network, quality-standards and rating. It will help if the industry, on its part, works out a collective vision and strategy for realizing market-volume projected under the report. For example the industry and government can work together to constitute a fund of the order of around 5% of the annual turnover of the industry to be used for advertising and promotion.

9.8 Developing a database of SWH installations

Presently, there is no system for collecting information of SWH market and installations. Unavailability of this data was one of the main hurdles faced by the project team. MNRE should consider giving this responsibility to an independent

organisation to develop and maintain a data-base of SWH manufacturing, sales and installations.

9.9 Sector and Region Specific Market Assessment Studies

The present study should be seen as the first attempt to gain an understanding of the Solar Water Heating market. As indicated in the report there are several sectors which require more in-depth market assessment studies, two such sectors are industry and rural sectors. Amongst regions, cold region requires a detailed study. There is also a need to continue updating market assessment every alternate year.

9.10 Promoting Energy Service Company (ESCO) based models

For setting-up large SWH installations in commercial buildings, industries and large residential developments , ESCO approach has the potential to become the most preferred implementation arrangement. MNRE should develop an action plan to develop feasible ESCO models and create conducive environment for development of sustainable SWH ESCO businesses.