

PROMOTING THE USE OF SOLAR THERMAL APPLICATIONS IN SOUTHERN AFRICA THROUGH SOCIAL NETWORK

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Abstract

Tourists usually come to Southern Africa to enjoy the sunny weather and many of them wonder why so little use is being made of the plentiful sunshine. Paradoxically, on one hand they observe a situation where there is far less sunshine yet relatively more solar water-heaters in the developed nations, and on the other hand, lots of sunshine but quite a few solar applications in operation across Africa. Research has not yet globally addressed the potential reasons for this inconsistency and its remedies. Our study seeks to fill this knowledge gap by investigating the much larger circle of the renewable energy fraternity. Through a survey, we probe online community members' perceptions and inclination towards actively supporting solar water-heating projects in Southern Africa. Our results show that generally, individual members are willing to support the region's solar market. However, due to a perceived lack of knowledge about the benefits of SWHs among Africans, online communities would be more prepared to contribute towards knowledge enhancement. Simultaneously, the sponsors would also expect some accountability and responsibility from the beneficiaries. Our work generates some insights for setting funding agendas and designing effective communication strategies that may influence the outcomes of fund-raising campaigns.

Keywords: Solar water-heaters, online communities, perceptions, funding, knowledge.

1. Introduction

According to meteorological records large parts of Southern Africa receive twice the annual radiation of Central Europe with a monthly distribution of sunshine far smoother than that in Europe, yet in the most industrialised country of the African continent, namely South Africa, only about 3.6 kWth of total collector capacity per 1,000 inhabitants are in operation compared to 31.5 kWth in Europe [1]. This is despite the high demand for hot water, for example as discovered by recent studies conducted with the health, educational and social institutions across Zimbabwe [2]. All along, local manufacturers and overseas exporters of solar-thermal systems have been aware of the obvious contradiction between the abundance of sunshine hours and the virtual invisibility of solar equipment, and their poor success in boosting demand for their products as experienced on other continents. A few studies that have noted this kind of under-development have somehow hinted that the reasons for the observable inconsistencies are both manifold and intertwined.

Firstly, the typical long dry spells and deserts often imply lack of water in general, and even more so, lack of piped water. Only in urban areas and larger towns can one find stored or piped water. In the hot and humid regions of Africa, people often require and prefer cooling systems. For these reasons, to a majority of the citizens, the availability of hot water does not appear to be a major concern as typified by the low relevance they attribute to it. Instead, access to water is much more fundamental [2]. Nevertheless, social institutions such as hospitals, orphanages and schools need hot water for disinfection and other sanitation purposes [2]. In the last years, these facilities have depended on electricity, which however is characterized by constant supply shortages and black outs. For example in 2007, the Southern African Power Pool (SAPP) exceeded the threshold of assured power supply resulting in shortage, thus heightening the need to seek alternatives for energy reserves [3].

In view of these developments, an accelerated expansion of coal power plants appears to be a much more affordable solution to some circles. Yet, this would also see an increased emission of CO₂, and simultaneously chain up much of investment budget for years to one or two projects. While the Democratic Republic of Congo has huge reserves of hydropower and no significant local industrial consumer, its energy could be exported to Southern Africa. Nonetheless, the associated costs of transportation would be enormous and the lines would have to run through a politically unstable region, which would threaten the viability of such an initiative. Another potential solution would be wind energy, but this only comes into question for a few coastal stripes, given that the wind speed is generally much lower in Africa than in Europe and/or America [4]. Consequently, what Southern Africa has left as an optimal and sustainable solution seems to be the use of solar thermal energy for water-heating, as well as in other areas such as power generation, production of heat for industrial processes and cooling.

According to a study conducted by the International Monetary Fund (IMF), local public investment paired with international assistance is the most practical way of getting solar water-heating projects in gear [5]. Yet for several reasons, there is still minimal progress of such undertaking. On one pole, the development of solar energy has been neglected by all but a few international aid agencies. However, since climate change and CO₂ trading have been filling the headlines, while conventional energy sources steadily become drained, solar has started to draw attention and gain in importance. On the other pole, African nations do not seem capable of funding the use of solar energy or developing the relevant technologies on their own, as substantiated through numerous observations. For instance, Africa's share of the world gross domestic product based on purchasing power parity is currently around 1% [6], which leaves very little room to manoeuvre and limited hope for the continent to jump-start a booming solar market without massive investment from advanced economies. The same study by IMF [5], therefore highlights the urgency of financial and technical assistance to African nations, if they are to be put in the position to exploit the enormous solar-thermal potential.

One way for interested parties to attract attention to this financial constraint and to generate aid would be through online communities. The growth in Internet use has seen a proliferation of online communities that provide information and resources, which considerably influence socio-economic issues [7]. For example, recent studies have shown the extent to which virtual networks contribute to product innovation, marketing processes and even commit personal resources to ensure the fulfilment of their community's agenda [8]. These observations imply that members of online communities could invest their resources into third world solar energy markets, should they be interested in doing so. However in order to tap them for support, one of the initial steps would require looking into their opinions and attitudes towards the subject, and from then on, understand what measures could be taken by practitioners.

Our study therefore addresses the question of what online communities perceive as the reasons for the limited utilization of solar water-heaters (SWHs) in Southern Africa, and the potential remedies for this issue. This work is deemed relevant in that it may extend our understanding of the predominant perceptions held by citizens of industrialised countries concerning the development of solar water heating projects across Africa. Consequently, this may assist practitioners in setting funding agendas, planning and designing effective communication strategies for cultivating the willingness of individuals and organisations to actively contribute to the breakthrough of solar energy applications in Africa. In other words, it may inform strategies for influencing the outcomes of fund-raising projects.

2. Research Methodology

A survey composed of 21 questions with predefined answers was administered online to collect data.

Respondents could choose multiple responses for an item. The survey items were extracted from an old study conducted in 2008 [2], and some common themes identified from ongoing discussions within communities of renewable technology enthusiasts, whose main focus was on solar energy and the environment. Before publishing the survey, it was tested by 10 survey pundits, which led to the refinement of the questions. The survey was then available online for three months beginning from February until April 2010. An online survey was chosen over other methods due to its potential to be accessed globally.

The sample consisted of members of three online communities, including numerous groups on Facebook and Yahoo that are centred on renewable energy and environmental themes [9, 10, 11, 12]. More than 290 participants viewed the survey in toto and 126 respondents completed the questionnaire, resulting in a completion rate of approximately 43%. The average age of the respondents was 36 years. About 72% of the respondents were males, 23% females and the rest 5% preferred not to answer. While their academic background varied, 62% of the respondents had completed university education, with the most common accomplishments being bachelor's and master's degrees. The respondents joined the diverse solar-related online networks for various reasons. Approximately 86% sought to learn more about the subject of SWHs, share experience and/or promote the use of SWHs; 13% aimed to present their solar companies or find customers; and 1% of the participants were searching for specific employment. The collected data was then analysed through frequencies and cross tabulations conducted with the SPSS programme.

3. Research Findings

Primarily, our findings show no perceptual distinctions based on respondents' gender or age. Rather, differences of opinion become more apparent when cross-tabulating the respective questions with the respondents' economic regional location and professional backgrounds, as subsequently presented. Apparently, it is edifying to profile right from the onset the factors that members of online communities regard as explaining the minimal use of SWHs in Africa. Most significantly, close to a quarter of the respondents attribute the limitation to a lack of disposable income for acquiring the systems, some ignorance (information deficit) about the benefits offered by solar water-heating technology, and the absence of pro-active policy by the governments to cultivate awareness. The results are presented in more detail by the table below:

Table 1. Perceived reasons for the lack of solar water heaters in Southern Africa

Why do you think there are so few solar water heaters in Africa as compared to other countries	Total responses for each perception	Responses based on economic region (%)							
		Africa	Australia & New Zealand	Central & South America	China & Taiwan	Europe	India	Mid. East	United States & Canada
Insufficient disposable income	24%	25%	10%	0%	7%	18%	4%	1%	36%
Information deficit	23%	28%	3%	3%	7%	29%	3%	1%	26%
Lack of pro-active policy by the governments	22%	32%	4%	1%	9%	24%	6%	1%	22%
Lack of piped water	11%	12%	9%	3%	9%	41%	3%	0%	24%
Low priority for hot water	9%	24%	10%	7%	7%	21%	3%	0%	28%
Little public acceptance of solar technology	6%	26%	16%	5%	0%	26%	5%	0%	21%
Relatively cheap electric power (where available)	5%	57%	7%	0%	7%	29%	0%	0%	0%

Further on, the respondents mostly tend to expect governments of industrialised nations to take the lead in promoting the use of solar thermals systems in Southern Africa, through their development aid agencies and NGOs that receive funding for environmental projects. Within the same sample, a majority of respondents in USA and Canada are convinced that individuals from all walks of life should spearhead the efforts more than the carbon credit traders. The key roles that industrialized nations should play consist of training installers and sales personnel (18%); appointing experts to initiate consultative dialogues with Africa's politicians on national and local level (17%); providing key components to facilitate local production (17%); encouraging companies currently polluting the atmosphere by using fossil fuels to switch to solar (14%); forcing companies consuming a high percentage of the national electricity production to go solar (12%); giving loans for generating demand to the welfare sector, private households, and commercial sector (9%); funding awareness campaigns (9%); and supplying full kits of components and installation teams to the needy (4%).

As individual contribution towards strengthening the solar market in Southern Africa, the respondents may potentially provide some training materials, facilitate networks between beneficiaries and the potential sponsors, and to a lesser extent, donate to solar projects targeted at social centres such as hospitals and schools. Mainly, the respondents within the marketing sector would be willing to supply education material, while those who use SWHs at home/work would be prepared to link aid recipients with potential donors, and the individuals who have installed a solar system themselves would donate to solar water-heating projects of their own choice. The manufacturers lead the group of respondents reluctant to assist personally. The results are summarized in more detail in the table below.

Table 2. Potential individual contribution towards promoting the use of SWHs in Africa

How could you assist?	Total responses for each perception (%)	Responses based on respondents' solar-related experience						
		Manufacturing	Marketing	Component development	Installation	Use of SWHs at work/home	Other experience	No experience
By providing relevant material for teaching	23%	23%	33%	30%	26%	27%	17%	18%
By linking the applicants to organisations or to individuals looking for projects worth being funded	21%	15%	22%	20%	11%	28%	27%	20%
Don't want to assist	17%	31%	17%	10%	15%	15%	28%	13%
By donating to selected solar water heating projects (hospitals, homes, schools, etc)	13%	15%	0%	10%	22%	15%	10%	13%
By funding, preparing and running training workshops	11%	0%	17%	20%	7%	9%	10%	13%
By paying into a general fund to be set up	8%	15%	6%	10%	7%	0%	3%	12%
By sponsoring stands at exhibitions	7%	0%	6%	0%	11%	6%	3%	11%

Notably, for the online community members to contribute in any form, several requirements should be fulfilled beforehand. Firstly, the beneficiaries have to prove they are able and ready to maintain the sponsored solar water-heating systems. Secondly, respondents predominantly look for some accountability and transparency in the administration and provision of aid, as well as guaranteeing that systems are mounted by well-qualified installers. Table 3 provides an overview of these findings more elaborately, based on the respondents' economic regional location:

Table 3. Prerequisites for providing individual aid for solar water-heating projects in Africa

Assuming you were to provide financial assistance or equipment, what would be your most important prerequisite?	Total responses for each perception	Responses based on respondents' economic region							
		Africa	Australia & New Zealand	Central & South America	China & Taiwan	Europe	India	Mid. East	United States & Canada
Recipients must be able and willing to maintain the solar system	31 %	24%	6%	1%	6%	31%	3%	1%	28%
Recipients must have a record of accountability and transparency	28%	27%	6%	3%	8%	20%	3%	2%	31%
Installations must be carried out by qualified installers	17%	27%	10%	5%	12%	23%	3%	0%	20%
Companies who apply for funding must not pollute the environment	14%	28%	3%	3%	9%	22%	0%	0%	34%
Recipients must be able to raise about 50% of the total cost	10%	21%	4%	4%	4%	25%	13%	0%	29%

In addition, 60% of the respondents stress that before flooding the market with imported products of superior quality, local companies should be given more time to improve the quality of their own products and installation skills, under the guidance of technical advisors from overseas. However, the same respondents also opine that a year should be the optimal time span allowed between signing of a contract and the installation of a respective SWH. Moving on, as can be derived from the next table below, if the same respondents decide to invest in the solar water-heating sector, those based in Africa would prefer roles as marketers/consultants, whereas the ones located in Europe would relocate to Southern Africa as installers. The participants currently residing in USA/Canada would take on any role except marketing, while the respondents based in China and Taiwan would opt for distribution.

Table 4. Professions of potential investors

Assuming you want to invest in solar water- heating business in Southern Africa, in which capacity would you do so?	Total responses for each perception	Responses based on respondents' economic regional location							
		Africa	Australia & New Zealand	Central & South America	China & Taiwan	Europe	India	Mid. East	United States & Canada
Consultant/technical advisor	24%	21%	11%	4%	4%	18%	11%	0%	32%
Manufacturer of solar components	19%	27%	5%	5%	9%	23%	0%	0%	32%
Other	19%	14%	0%	0%	36%	14%	0%	5%	32%
Installer	15%	22%	0%	0%	6%	44%	0%	0%	28%
Marketing specialist	13%	47%	0%	7%	7%	27%	7%	0%	7%
Distributor of solar components	11%	15%	8%	0%	23%	31%	0%	0%	23%

To boot, potential investors especially the manufacturers, distributors of components and installers deem the following conditions as warranting an economic and responsible use of their financial assets:

protection of investment and property, governmental support schemes like tax incentives and subsidies and the availability of trained workforce, among others shown in the following table.

Table 5. Preferred critical factors for ensuring that funds are spent economically and responsibly

Which of the following preconditions would influence your decision to invest?	Total responses for each perception	Responses based on respondents' professional background					
		Manufacturer	Distributor of components	Installer	Consultant/ technical advisor	Marketing specialist	Other
Protection of investment and property	21%	25%	15%	17%	22%	21%	23%
Governmental support schemes like tax incentives and subsidies	17%	19%	15%	21%	15%	17%	17%
Trained workforce	15%	17%	5%	21%	24%	12%	0%
Qualified installers in centres of economic activity	13%	13%	8%	19%	15%	7%	9%
Existing distribution network for solar components	9%	6%	15%	12%	6%	7%	15%
Efficient banking system	8%	7%	17%	6%	3%	12%	6%
Stable currency	8%	7%	17%	4%	6%	9%	9%
Up-to-date communication network	5%	3%	8%	0%	6%	10%	6%
Other	4%	3%	0%	0%	3%	5%	15%

4. Conclusion

This study is one of the few published studies, if any, first to probe the readiness of solar-related online communities to support ventures on promoting the application of solar technology in Southern Africa. It has shown that, to begin with, the respondents expect the main promoters of solar technology in Africa to be governments of industrialised countries through their development organisations, NGOs receiving funds for environmental projects and research institutions focusing on the use of renewable energy. These entities are also trusted to have the competences for training installers and sales personnel, and for initiating supportive dialogue with Africa's politicians. This in contrast to other agendas [5], which call for the international solar water-heating industry to take the leading role.

Furthermore, individual members of the investigated online communities generally show a willingness to contribute their personal resources towards the growth of Southern Africa's solar market. However, these two observations: members' joining of networks to learn more about solar water-heating and share experience; as well as their perception of an immense lack of solar-related knowledge among African citizens, may explain two findings. Firstly, a majority of the respondents would rather link beneficiaries to aid organisations, and secondly they would provide solar-related teaching material, than pay into general funds, or financially contribute to the installation of solar water-heating systems for health and social welfare institutions. In other words, there is an underlying hesitance amongst the survey participants to personally fund solar water heating projects in Southern Africa.

Moreover, the research participants also raise a number of issues that have to be addressed prior to channelling their aid to the continent. On one hand, they expect the recipients to show a record of

accountability and transparency. On the other hand, they value more the beneficiaries' willingness and capability to maintain a donated SWH, than their ability to financially contribute to the device's acquisition and installation. In addition a point to note is that, in the last years, a lot of attention has been given to the investment potentials in solar technology in Africa and to the real and perceived barriers [5]. However, the potential investors in this study underpin that the protection of their property in Africa would be a major concern to them.

While our study may bear several implications for practitioners and donors at least, creating and sharing knowledge with African citizens has been widely rated pivotal. There is manifest eagerness across a wide spectrum of solar energy enthusiasts to impart broad and deep expertise to Africans. This keenness is a potential that advocates of solar technology may potentially capitalise on, by tapping it for education programmes, not only in form of workshops for adults, but also through projects in schools, colleges and universities. At the same time, education and training may be a vital measure but should not be the end in itself. Investing in knowledge creation and dissemination should come together with convincing examples of solar installations perfectly well-adapted to the acute needs of households, hospitals, orphanages and old people's homes among other social welfare centres.

Another noteworthy implication is that, online communities may be rich sources of information and competences [8], however, organisations considering digging into this wealth of resources ought to be aware of the challenges embedded in relying on members to fill in any questionnaires, or participate in research conducted through websites hosted outside the community. For instance, the probability tends to be quite low, with one completed questionnaire to a thousand group members, as was the case with this study. Therefore, to collect market intelligence, organisations could permanently integrate researchers into such communities – without interfering with the mission of the network and risk opposition [7]. Alternatively, they could create their own communities which they would always probe for opinions and ideas from all over the world.

Our research is not without its shortcomings. As it did not seek to statistically test for any relationships among perceptions and attitudes – instead it simply aimed to obtain a general overview of opinions based on predefined dimensions – it may have obtained less in-depth insights. Hence, to enrich understanding of the subject, future research could address these shortfalls and be more explorative in nature. In particular, the evident reluctance amongst survey participants to personally contribute funds to solar thermal projects deserves to be elaborately scrutinised, to expose its causes. Along with that, the issues of education, competitiveness of imported solar components and applicability of system designs, would also require further inquiry.

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Appendix: Survey Questions

1. Are you a member of an online group which discusses wider solar water heating issues or do you visit related fora?
2. If Yes, what is the purpose?
3. Indicate how you got experience, if any, with solar water heating systems
4. Which advice should less developed countries follow to meet their current and future electricity demand?
5. In which economic region should solar water heating receive more promotion? (3 checks)
6. Why do you think there are so few solar water heaters in Africa as compared to other continents? (3 checks)
7. What should industrialized nations do, in order to increase the use of solar water heating in Africa? (3 checks)
8. When funding for solar water heating projects comes from industrialized countries and when deadlines have to be met, (what) should (be done)?
9. Who should take the lead in promoting the use of solar water heating technology in Africa? (2 checks)
10. How could you assist? (2 checks)
11. Assuming you were to provide financial assistance or equipment, what would be your most important prerequisite? (2 checks)
12. What would you consider as a critical factor for ensuring that funds are spent economically and responsibly?
13. As a donor, what is the time span you would allow between signing of a contract and installation of the respective solar water heating system?
14. If you were to invest in a solar water heating business in Africa, which regions would you choose? (2 checks)
15. Assuming you want to invest in a solar water heating business in Southern Africa, in which capacity would you do so?
16. Which of the following preconditions would influence your decision to invest? (3 checks)
17. Which source of renewable energy do you think has the highest potential in Southern Africa?
18. In which economic region do you stay?
19. What is your current academic or professional qualification?
20. Which of the following categories describes your age?
21. What is your gender?