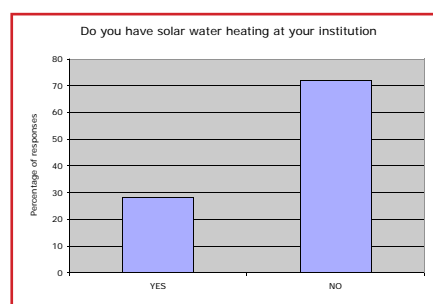
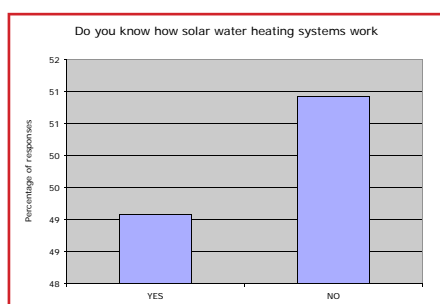


SOLAR ENERGY ZIMBABWE  
CONSERVATION OF THE BUSINESS CAPACITY FOR SOLAR WATER HEATER  
MANUFACTURING AND INSTALLATION IN ZIMBABWE

FINAL REPORT ON THE SURVEY ON DEMAND OF SOLAR WATER HEATERS IN  
THE INSTITUTIONAL SECTOR

Funded by the Austrian Development Agency

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## 1. INTRODUCTION

This is a final report on the work done under Work Package 3 of the ADA project “Solar Energy Zimbabwe” according to the contracts signed between Development Technology Centre (DTC) of the University of Zimbabwe and AEE INTEC-Gleisdorf on one side and Domestic Solar Heating P/L (DSH) and AEE INTEC-Gleisdorf on the other side.

The objectives of Work Package 3 are:

- 1) to obtain a detailed knowledge about the demand for solar hot water systems in the institutional sector as well as about the technical, social and economic barriers, which hamper the installation of the systems,
- 2) to come up with recommendations which help to overcome the barriers and which will assist the stakeholders to develop a strategy which facilitates the installation of solar water heaters.

This report presents the results of the survey to tackle objective (1). The findings from the survey will be useful in tackling objective (2) of the Work Package.

The field work for the study and the reporting was carried out in joint collaboration between DTC and Domestic Solar Heating P/L.

The Austrian Development Agency has been promoting the use of solar water heating in Zimbabwe since 1998. Since 2002 the economic climate has deteriorated to such an extent that most companies find manufacturing and installing solar hot water systems no longer viable. In its third phase the project is supporting the remaining manufacturers and installers of solar hot water systems to stay in business. To achieve this, the existing popular demand must be stimulated to generate orders for solar hot water systems. In times of frequent and long-lasting power cuts, the uninterrupted supply of hot water to institutions like hospitals, homes and boarding schools is of concern to the project funders. It is the calculation of the project that two goals can be achieved at one stroke, namely, boosting the demand for solar hot water systems and at the same time assisting essential institutions in investing in these expensive commodities. Even though it is not difficult to find applicants for the fifteen to twenty subsidised installations at hospitals and homes, the funders want to get a picture of the institutional demand for heated water across the whole country.

Hospitals, clinics, homes for the disadvantaged and other social institutions were chosen, because these have in the past been major consumers of heated water besides the hospitality sector and manufacturing.

To hospitals in particular and to some extent also to homes heated water is essential but the provision of this commodity becomes more and more difficult and costly. Zimbabwe is in short of foreign currency and the country can no longer afford to import electricity from the regional neighbours. Power cuts have become the rule of the day as the local capacity to generate electricity is only a fraction of what it was ten years ago. When there is no electricity, patients, little children and old people have to wash or shower in cold water. Some institutions have access to coal or firewood but the supply of these types of fuel is getting very unpredictable and expensive too. Logically, solar would be the best way out of this fuel bottleneck. The results of the survey throw light on the fuel situation at the institutions and to what extent solar technology is already in use or how soon they are planning to increase their water heating capacity. Interviewees were asked for what purposes they require the heated water and at what temperature levels and which day times. Another question put across to the representatives of the institutions is whether they can afford a change from conventional water heaters to solar. Assuming some institutions have the money to purchase a solar hot water system do they have the staff and financial means to maintain and repair the equipment. The awareness of the advantages and disadvantages of solar water heating systems amongst the interviewees is also of interest. The study report offers a list of real and perceived barriers hampering the institutions from using solar heated water and what intervention policies the interviewees would recommend to overcome the hurdles.

This study report is not only of interest to people concerned with running and maintaining institutions in the educational, social welfare and health sector but also to companies looking for new markets for their solar water heating equipment. The findings should also call the attention of planning departments of central and regional governments to the serious energy problem the institutions are confronted with.

## 1.1 METHODOLOGY

A comprehensive list of all institutions in Zimbabwe falling under in the category of interest was compiled to form part of this final report. The list of institutions was compiled from data sourced from National Association for Non-governmental Organisations (NANGO), (Annex 2) and Ministry of Education, Sports and Culture (Annex 3). List of private hospitals was obtained from Zimbabwe Association of Church Related Hospitals (ZACH), (Annex 4). However, the list of hospitals is not exhaustive since it does not include some government hospitals. Efforts to obtain a complete list of government hospitals from the Ministry of Health and Child Welfare were not fruitful.

More interviews were conducted at schools and homes than at hospitals. With the exception of private hospitals, officials in the health sector were unwilling to release “confidential” information about their institutions if they didn’t see a written permission from their ministry. From the beginning to the end of the survey the interviewers endeavoured to get the authorisation from civil servants of the Ministry of Health - but to no avail.

Nevertheless, a considerable fraction of the government hospitals was captured in the list (Annex 5), based on the general knowledge of the study team. It is estimated that this list captures over 50% of the government hospitals in the country that qualify in the category of District Hospital and larger (the size that may be expected to constitute reasonable demand for water heating). A few government hospitals could be interviewed after the persons in charge were assured that the names of the institution would not appear in the report.

All together, the following institutions were identified over the whole of Zimbabwe. There are

- 278 primary and secondary boarding schools;
- 125 private hospitals and clinics;
- 50 government hospitals of size District hospital and larger (estimate);
- 42 Children’s homes;
- 23 Old people’s homes;
- 16 Rehabilitation and Aids/Orphan Centres.

A survey was done by interviewing senior administrative staff at institutions, through an appropriately designed questionnaire (see Annex 1). The questionnaire addressed the following issues:

- socio-geographic information of the institution (type of service and location)
- existing and intended use of hot water at the institution (e.g. purpose for requiring hot water,
- temperature levels required for each type of use, number of beds at institution, whether or not the institution needs or intends an expansion of its hot water supply, etc.)
- hydraulic and other infrastructure at the institution, related to the feasibility of installing water heaters, type and service condition of existing water heating systems at the institution, availability of maintenance workshop, etc.
- maintenance problems for water heaters, maintenance costs, energy costs related to water heating
- awareness by institutions of the solar water heating technology and its capabilities as an effective alternative for most water heating requirements of the institutions; whether or not the institution owns and operates a solar water heater; capacities; service age; and source of finance for the SWH; perceived advantages/ disadvantages of use of SWHs; barriers encountered in the use or increased use of solar water heaters and suggested solutions.
- Ability or willingness to pay for solar water heaters (how much the institutions are prepared and able to invest in SWH); and the degree of autonomy the different institutions have in purchasing the SWH if they decide that they want them.

Due to some logistical constraints, the sample of institutions selected for interviewing was not randomly arrived at. Mainly those institutions that were easily accessible by Domestic-Solar-Heating vehicle and by public transport could be visited, limiting the sample to predominantly urban institutions and those near major roads. The remote institutions in the western provinces were visited and interviewed by the representative of Domestic Solar Heating.

One hundred and seven (107) institutions were interviewed either by physical visit or through post. Of these, one hundred and six (106) of the interviews were successfully completed whereas one was not completed. The institution that did not complete the interview argued that their institution is located in an area that is always overcast, so they are not interested in this solar technology.

The questionnaire was administered mainly through a physical guided interview by members of the

DTC research team together with representative of Domestic Solar Heating P/L, but in some cases, also through the post. However, of the 30 questionnaires administered by post, only 7 responses were obtained.

The idea of sending special questionnaires out via E-mail was abandoned quickly. The decision for dropping this method altogether was based on the sobering experience from the low return of questionnaires administered by post.

The reason for the low return of the posted questionnaires could be found in the unsureness of the respondents of how to answer the questions professionally without being guided through them. Even though the questions have been written in a fairly understandable manner the questionnaires still required the respondent to have a sound technical background. The questions also presume that the respondent or some other source of information has been working for the institutions for a long time and can give correct answers to questions which reach back several years. Many potential respondents might have found it difficult to meet both conditions.

Government institutions are underrepresented in the study as the interviewing team failed to get an authorisation letter from the Ministry of Health and Child Welfare and the letter from the Ministry of Education, Sports and Culture came late.

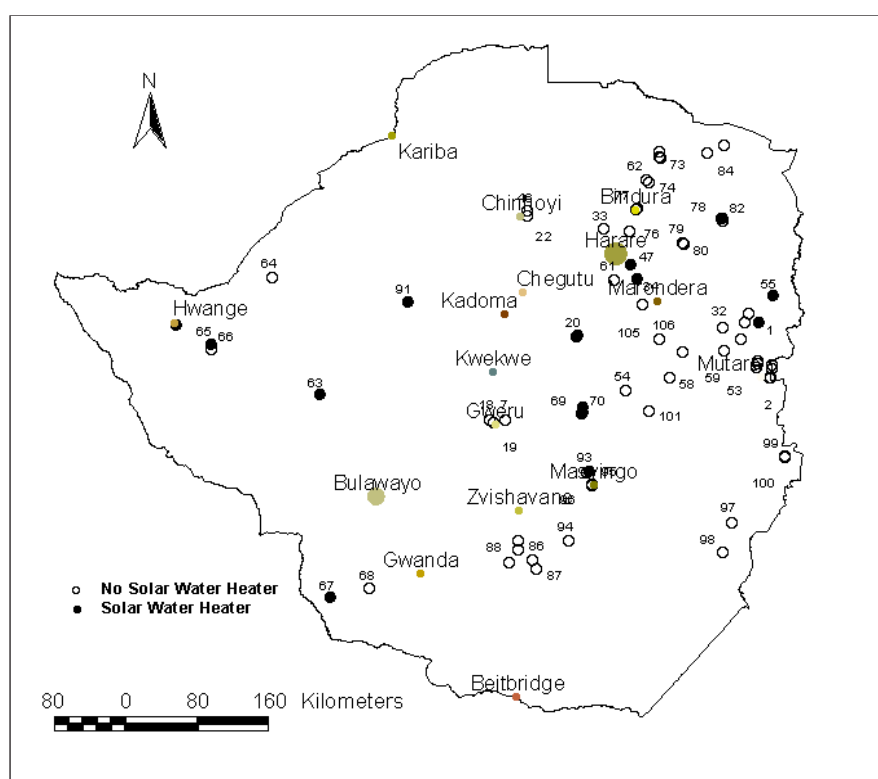


Fig. 1

Figure 1.1 shows the spatial distribution of the institutions successfully interviewed together with information on their ownership of solar water heaters.

The numbers in the maps indicate the exact number used for each institution in our SPSS database. Since anonymity was given as pre-condition to the interviews, the actual identities of the institutions are not revealed. However, if the actual identity of any institution(s) is specifically required, the information, which is available in our database, can be obtained from the authors subject to consultation and concurrence of the institution(s) in question.

The social statistical package (SPSS) was used to package and analyse the responses. This package is more versatile in the analysis of multi-variable social data with various correlations. Microsoft Excel was also used in tandem to custom some of the SPSS outcomes in a more presentable way. In many cases the figures speak for themselves and the authors refrained from describing obvious facts. The cross tabulations of some responses to questions in the survey questionnaire are shown in the following sections.

## 2. FINDINGS FROM THE STUDY

The findings from the survey are outlined in the following sections:

### 2.1. GEOGRAPHICAL ASPECTS

### 2.2. USE OF HOT WATER AT INSTITUTIONS

- 2.2.1. Number of beds at the institutions
- 2.2.2. Source of cold water for the institutions
- 2.2.3. Hot water storage capacities at institutions
- 2.2.4. Do the institutions have enough heated water
- 2.2.5. Purposes for which hospitals, schools and homes need heated water
- 2.2.6. Temperatures at which people want to use the heated water
- 2.2.7. Times at which people require heated water

### 2.3. EXPLORATION OF THE WATER HEATING SYSTEMS AS PRESENTLY USED AT THE INSTITUTIONS

- 2.3.1. Types of water heaters used
- 2.3.2. Storage tank capacities at institutions
- 2.3.3. State of the water heating systems and operating costs
- 2.3.4. Usage and performance of solar water heating systems

### 2.4. AWARENESS OF BENEFITS AND PROBLEMS OF SOLAR WATER HEATERS

- 2.4.1. Familiarity with solar hot water systems
- 2.4.2. Ranking of advantages and disadvantages of solar hot water systems
- 2.4.3. Obstacles to using solar heated water

### 2.5. ABILITY/WILLINGNESS TO PAY FOR SOLAR WATER HEATERS

### 2.6. SOURCE OF FUNDING FOR INFRASTRUCTURAL DEVELOPMENTS

- 2.6.1. Sources of funds for infrastructural development
- 2.6.2. Degree of autonomy of the institutions and ability to make quick decisions

Most of the graphs and figures speak for themselves so descriptions will only be provided where necessary.

For the purpose of analysis and presentation, and for usability of the results by market penetrators of different interests, the institutions can be divided into three categories, namely

- a) Educational providers (boarding schools and colleges);
- b) Health providers (hospitals, clinics, nursing homes); and
- c) Homes (children's homes, old people's homes, AIDS/orphanage homes and rehabilitation centres).

Figure 2 shows the ratio of institutions of the various sectors visited by the team compared to the total numbers identified. The sector of educational providers is the largest but most uniform one. The group of health providers is less homogenous and the homes differ even more from one another. For this reason and because the homes soon turned out to be the institutions where most of the solar hot water systems were recorded this sector was given higher attention than the other ones.

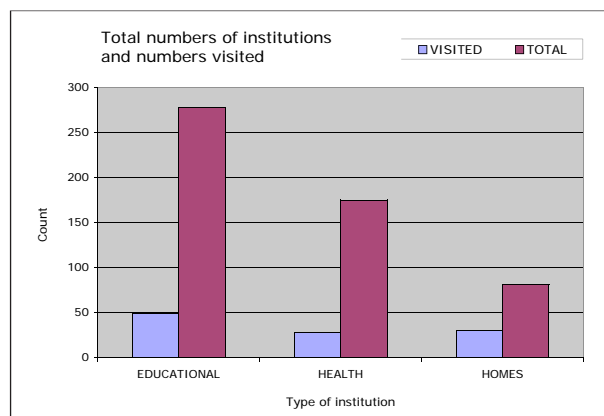


Fig.2

## 2.1. GEOGRAPHICAL ASPECTS

Before examining the technical aspects of the study attention has to be drawn to the institutions themselves, for example, where are they located - in rural or urban areas. The location of the institutions turns out to be major cost and time factor.

With the enormous cost of transport, rural institutions have to pay disproportionally higher prices for infrastructural improvements, including solar installations. Telecommunication to these remote places is down most of the time and some of the institutions visited are difficult to access by road. In many cases, finding out about these remote and needy institutions is only possible through their head offices in town. Once the names and addresses of remote institutions have been established, direct contact to these institutions is often only attainable by travelling to the very place and by seeing oneself whether there is need for a water heating system and whether they have sufficient infrastructure already on the ground to justify this kind of investment. Attempts to communicate with these remote institutions by post, telephone or E-mail are extremely time-consuming or forlorn.

Investigation of the geographical distribution of the institutions have come up with the following conclusions:

- The boarding schools are mainly found in the rural areas whereas the homes are mostly located in towns.
- Although the concentration of schools is highest in urban areas the rural schools are much stronger in absolute numbers. Almost every mission station in the rural areas can pride itself on a boarding school. Even town parents tend to send their children to schools far away from urban distractions. Many of the top-schools of the country are located deep in the bush. This was not a problem as long as transport was cheap and widely available. People began to rely more on telephone communication but in these days telephone lines are down for long times and teachers and service staff have to travel to the nearest business centre to collect mail and to receive and send out messages. Even in the years when transport was still available and affordable it required a strong-willed headmaster or Mission superior to bring solar technology to the remote schools.
- Percentage-wise the number of hospitals in rural and urban areas is very similar, contrary to the schools and homes. Hospitals need to be within reach of the centres of population. To run a hospital efficiently, electricity, water, well-maintained roads and a reliable communications network must be taken for granted at all times. These prerequisites are more likely to exist in and around towns but have failed even town hospitals of late.
- The homes offer accommodation to elderly people, orphans, abandoned children and homeless adults. Many people were made homeless by the farm expropriations and by the demolition of the so-called illegal structures by the security forces. The jobless and homeless flock to the urban areas, because they find more favorable conditions for hawking and begging there.
- The AIDS pandemic has left many orphans to be looked after by the extended family. The number of orphans and abandoned children with no relatives keeps on growing and more often charity organisations have to pick them up from the street to offer them a bed and something to eat.
- Even though twice as many homes are located in urban than in rural areas, church organisations and other charities are making efforts to open more care centres in the hinterland so that homeless children and adults can stay near their relatives and friends.

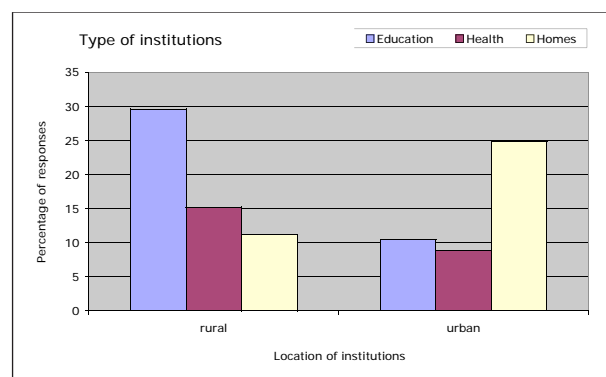


Fig.2.1

## 2.2. USE OF HOT WATER IN INSTITUTIONS

Private households can hold out for some days without hot water. In many boarding schools the boys and girls never enjoy heated water for showering or laundry and yet they grow up and remain healthy. Things are very different in hospitals and homes of small children and old people where lack of warm and hot water can create huge sanitary problems. In these institutions heated water is a genuine necessity.

Anyone who wants to sell water heating systems to homes, hospitals and even schools has to understand the habits of how the occupants of these institutions make use of the hot water available. Before making a proposal concerning the type and size of the water heating system, the salesperson has to investigate



1. How many beds the hospitals, schools and homes have in urban and rural areas,
2. Where do they get the cold water from, do they have piped water and are they connected to the electricity grid,
3. What are their current hot water storage capacities,
4. Do they have enough heated water,
5. For what purposes do occupants and staff of hospitals, schools and homes need the hot water,
6. To what temperatures do people want the water to be heated and
7. At what times do they require the heated water.

All these variables will depend on the type, location and size of institution.

### 2.2.1. Number of beds at the institutions

As can be seen in the diagram below, only a few institutions have been recorded with their number of beds between one and twenty. In the following paragraphs, therefore, this report will mainly focus on the institutions with more than 20 beds and these numbers will be compared with one another.

- The boarding schools of the educational sector clearly exceed the hospitals and homes in the group with more than 200 beds.

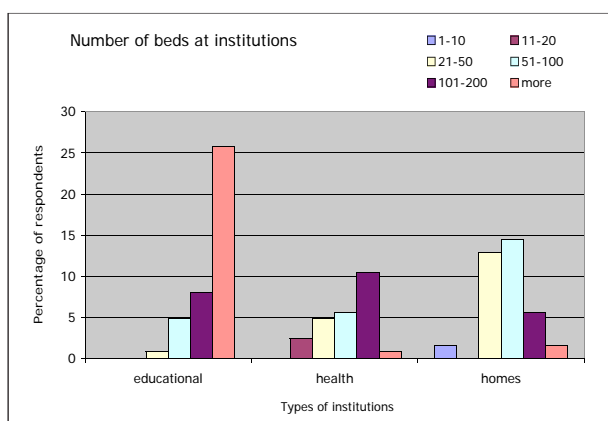


Fig.2.2.1a

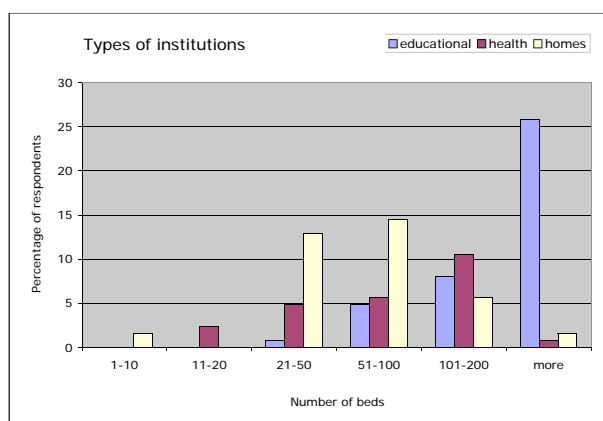


Fig.2.2.1b

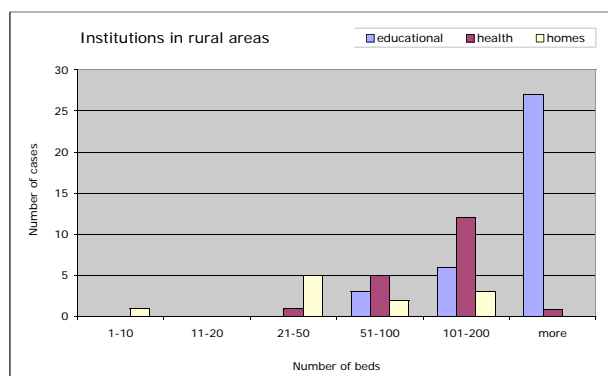


Fig.2.2.1c

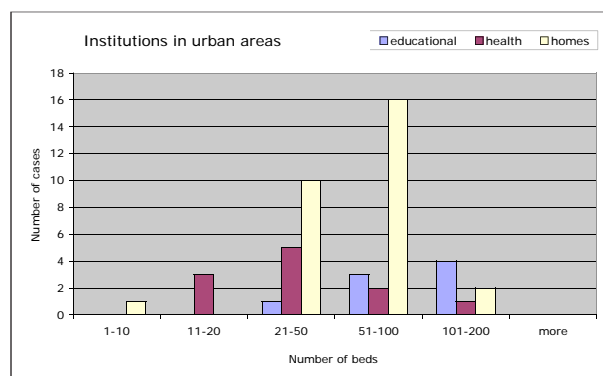


Fig.2.2.1d

- Schools with more than 500 boarders are quite common. Boarding schools can pack more individuals into the same space and need less staff to supervise the dormitories than hospitals and homes require to manage the wards and living rooms respectively.
- Around 20 percent of hospitals visited can provide beds for patients numbering between 51 and 100 and about 40 percent to up to 200 patients. The percentage of hospitals with more than 200 beds is negligible.
- The homes are strongest represented in the range of 21 to 50 and 51 to 100 beds but some of them can have up to 200 beds.
- When looking at the number of beds from the location point of view the data highlight that
- The big boarding schools with more than 200 beds are located almost exclusively in the rural areas and that the same applies to hospitals with beds for up to 200 patients. Only a few homes of this size can be found in the hinterland.

- The homes for destitute and aged people and for orphans have mainly been built in or near the cities.

### 2.2.2. Source of cold water for the institutions and are they connected to the electricity grid

All the institutions have a piped water system with house connections, which is a favourable condition for SWH installation. In some cases the pressure would be too low though to push the water up to a roof-mounted SWH.

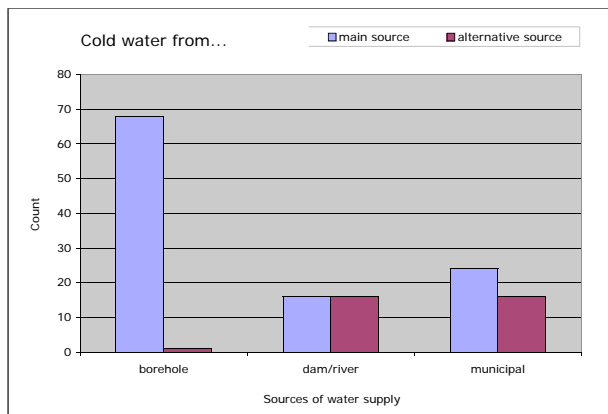


Fig.2.2.2a

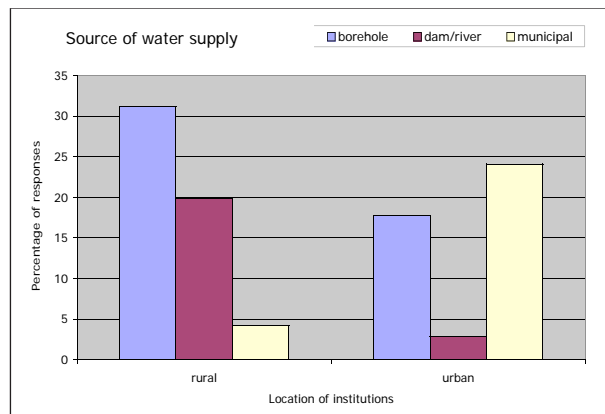


Fig.2.2.2b

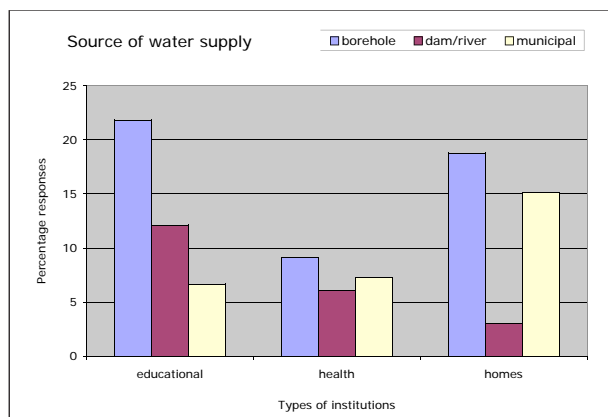


Fig.2.2.2c

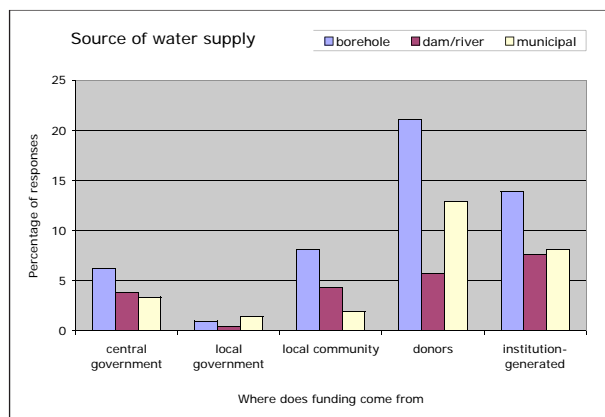


Fig.2.2.2d

The institutions interviewed by the team get their water almost equally from boreholes, dams or the municipality.

- The most prevalent source of water at the visited institutions was borehole/deep well, followed by municipal. Since borehole water is usually associated with calcium hardness, only closed loop solar water-heating systems incorporating a heat exchanger might be suitable at these institutions, to avoid clogging of the solar collector pipe-work.
- Only a third of the institutions use dam or river-sourced water.
- Nearly 50% of the institutions have a dual source of water.
- As to be expected, institutions in the rural areas cannot connect to a municipality and have to either sink a borehole or build a dam for their water supply.
- In urban areas the institutions use municipal water whenever possible but quite a few also have a borehole as a backup supply.
- When comparing the sectors of the institutions, the schools use mainly borehole and dam water which comes as no surprise as most of the schools are located in the rural areas where municipal water is usually not available.
- For the health sector one would expect a similar distribution of water sources as found for the educational and homes sector but the hospitals don't appear to have a clear preference for one of the water sources. Therefore, the results adduced above have to be treated with caution as the sample of hospitals interviewed is not big enough to be representative for the health sector.



- The homes are predominantly located in urban areas where boreholes and municipal are the most common water sources.
- Institutions supported financially by donors or those with sufficient revenues through fees are most likely to receive their water from boreholes or from the municipality, especially the institutions belonging to the educational or homes' sector.
- If the institution has got a borehole one can assume that the funding comes from donors in the case of homes or from fees in the case of schools.
- Local and central government play a negligible role in the funding of water services whereas the local communities contribute to some extent to water supply.

The supply with electric power is of importance when the clients prefer the solar water heaters to be backed up by electric heater elements. Where the solar water heating system needs a pump for forced circulation continuous supply of electric power is a requisite. Without electricity to circulate the heat transfer fluid even on the hottest day the water in the storage tank would remain cold.

- Only 4 out of 108 institutions visited were not connected to the electricity grid. Almost all of them are affected by power cuts though. Seventy percent of the solar water heaters recorded by the survey are of the stand-alone type and all of them work according to the thermosyphon principle, i.e., they use nothing but solar energy. During the chilly winter months without electric power the solar water heaters still make warm showers possible.

### 2.2.3. Hot water storage capacities at institutions

Instead of asking the interviewees how many litres of heated water are needed every day the survey team decided to investigate the water heating capacities of the respective institutions. This quantity is easier to establish than the consumption of heated water in an institution. From the hot water storage capacity one can infer the hot water consumption assuming that the heating system was designed and sized to serve all in-patients, students or orphans respectively.

- When looking at water heating capacities with respect to the location of the institution the rural areas have a preference for smaller tank volumes and the bigger heating capacities are found in towns. This can be explained by the distances to the rural institutions and by the complications involved with transporting big tank sizes and large tank quantities on bad roads to remote places.
- Because of the dominance of the schools in the category of number of beds one would expect the schools to pride themselves with the biggest storage capacities for water heating but they get

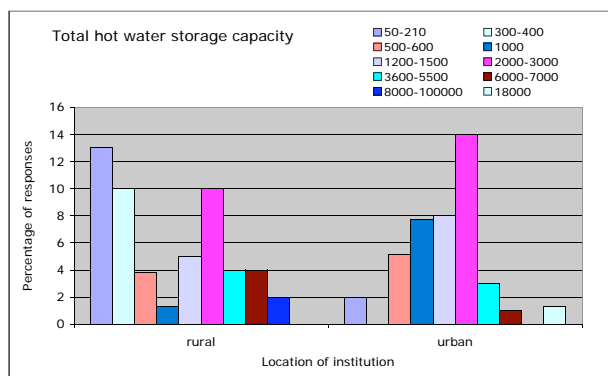


Fig.2.2.3.a

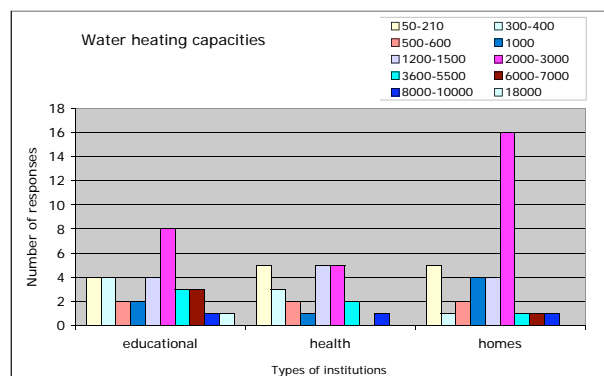


Fig.2.2.3.b

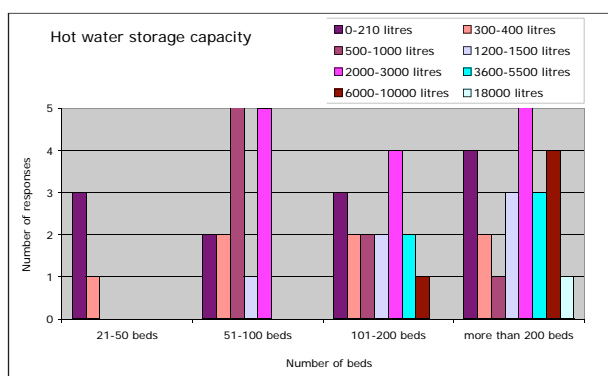


Fig.2.2.3.c

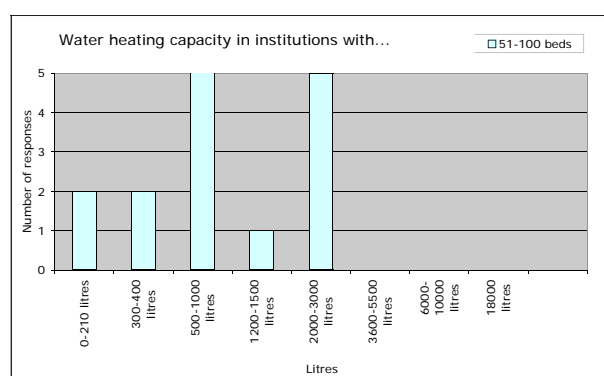


Fig.2.2.3.d

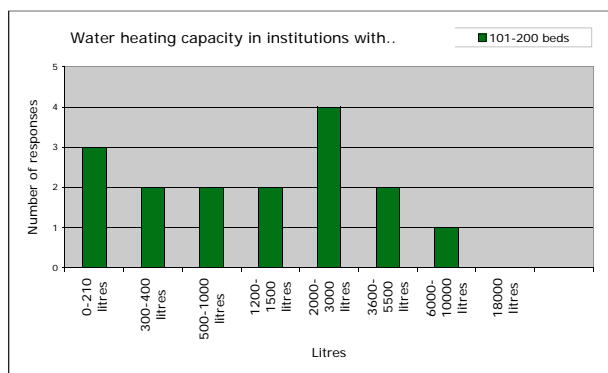


Fig.2.2.3.e

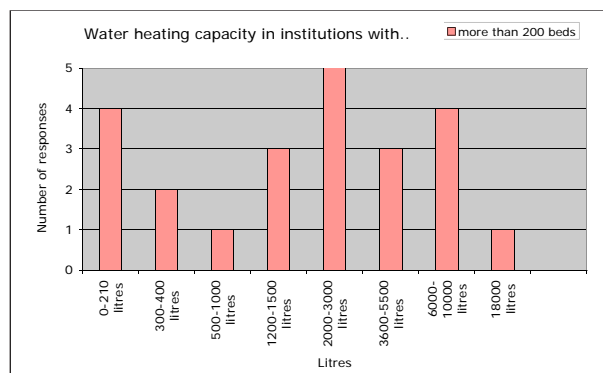


Fig.2.2.3.f

outdone by the homes in almost all ranges.

- Apparently, some institutions with more than 20 beds can do with less than two litres of heated water per bed which, in practice, means that the heated water is reserved for the kitchen and a few staff members while the pupils have to brave cold showers and wash their laundry in cold water throughout the whole year.
- In the educational sector the water heating capacity peaks in the range of 2000 to 3000 litres which give each occupant about five to ten litres of heated water per day, provided the heating system is working fine. In some boarding schools like Makumbi Visitation High School the 250 girls are divided into groups which take turns collecting the water in buckets. Depending on the amount of solar radiation they get 5 litres of heated water every day or every second day. The bucket systems has been introduced to limit the consumption of heated water per child to a maximum of five litres.
- The homes clearly dominate the range of storage capacities between 2000 and 3000 litres. They also own a number of small water heating systems which are most likely serving their staff members.
- No firm statements can be made about the institutions of the health sector as only a few could be interviewed. The picture which has been obtained is that the hospitals tend to have heating capacities between 1000 and 3000 litres and that capacities between 50 and 210 litres can also be found there.

#### 2.2.4. Do the institutions have enough heated water

A large majority of the institutions needs more hot water. Most of the institutions visited were constructed several tens of years ago and had never undergone reconstruction or extension. As government health care and social welfare are on the brink of collapse more patients, orphans and old people have to be accepted by privately owned institutions. Like many other parts of the infrastructure, the water heating systems were not designed for these ever increasing numbers of patients, pupils and orphans. In some boarding schools like Makumbi Visitation High School the girls are divided into groups which take turns collecting the water in buckets. The bucket systems has been introduced to limit the consumption of heated water per child to a maximum of five litres.

- On the need for up-rating the hot water supply at the institutions, 89% of the institutions require an increase in hot water supply.
- Of these, 9% require the increase in supply to cater for present demand; 14% only to cater for future demand; and 77% to cater for both purposes- present and future demand.
- However, when the institutions were asked whether or not they were planning to increase their hot water supply, a third of the respondents said they were not planning so. Lack of capital could be named as one of the reasons. Furthermore, the economic and political circumstances do not embolden them to invest into an uncertain future.
- One third of the institutions are planning to up-rate their hot water supply almost immediately. This was said 18 months

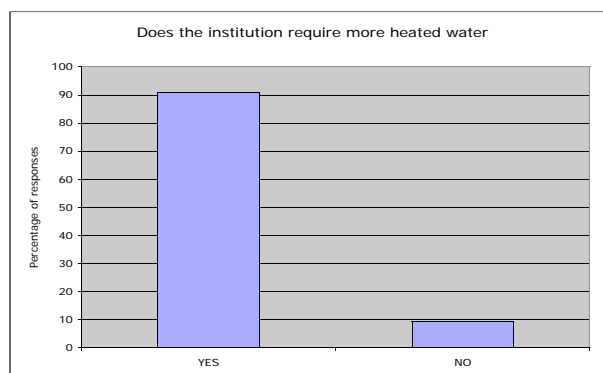


Fig.2.2.4.a

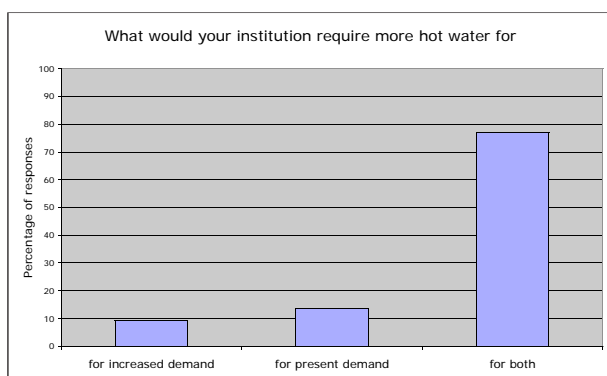


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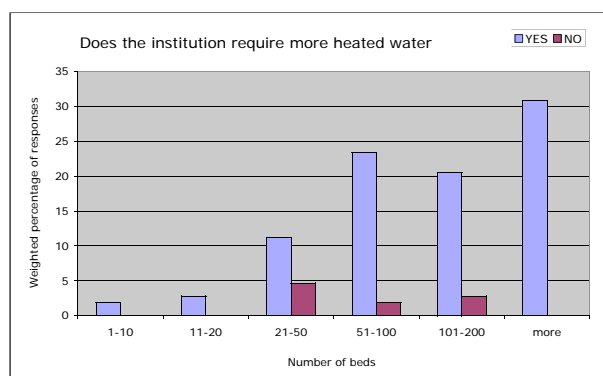


Fig.2.2.4.c

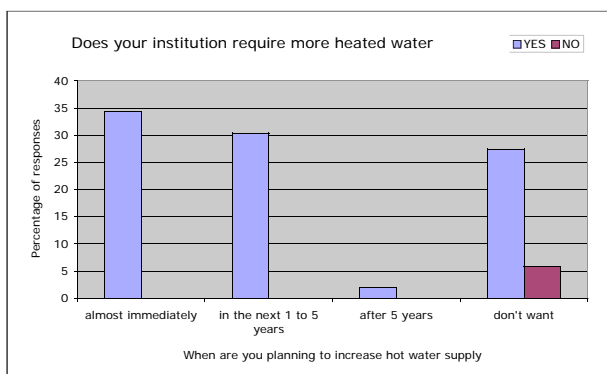


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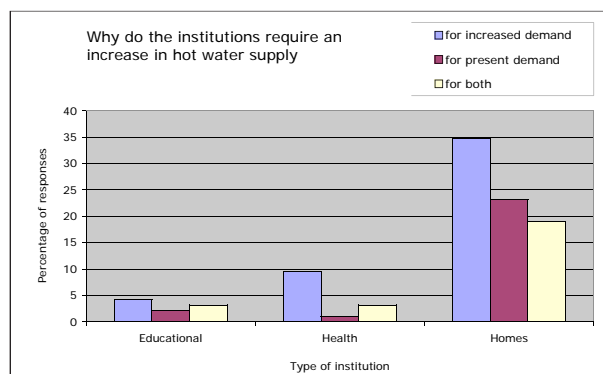


Fig.2.2.4.e

before writing the final version of the study report and in the meantime prices have gone up several thousand-fold.

- In the light of the hyperinflation many of the optimistic respondents might have dampened their enthusiasm and joined the group of the last third which is aiming for an increase of water heating capacity in the next 1 to 5 years.
- None of the institutions visited has such plans after five years.

#### 2.2.5. Purposes for which hospitals, schools and homes need heated water

Besides for cooking purposes, all institutions interviewed use heated water for different other socio-economic activities. 96% of the institutions use heated water everyday while 4% use hot water only sometimes.

The uses of heated water at the institutions are bathing/showering, laundry, kitchen and sterilisation. The distributions of uses are shown in the figures below once with respect to the types of institutions and once with respect to the location of the institutions.

- Sterilisation is of importance only to the health sector and to some homes.
- All institutions use heated water for showering, laundry and dish washing, be they in urban or rural areas.
- The use of heated water for laundry is less common at boarding schools in particular and in the

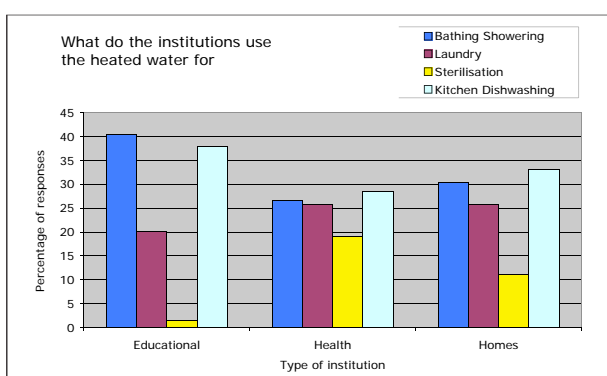


Fig.2.2.5.a

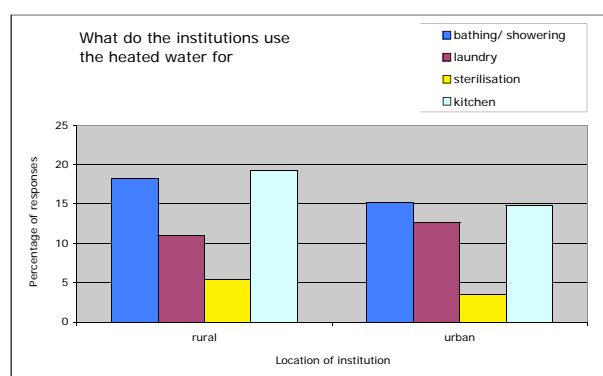


Fig.2.2.5.b

rural areas in general.

#### 2.2.6. Temperatures at which people want to use the heated water

The temperature at which water is required for different uses, as perceived by the respondents, varies amongst the institutions. Prevalently though, water for showering is wanted warm (37-45°C); for laundry and kitchen hot (46-60°C), and for sterilisation boiling water or steam is required. In order to cater for overcast periods, there is need for back-up systems to those institutions that require hot or boiling water for purposes like kitchen, laundry and sterilisation.

- The boarding schools consider warm and hot a necessity for ablution blocks and for dish washing. There is virtually no need for scalding or boiling water except for cooking purposes.
- Homes sometimes offer simple medical

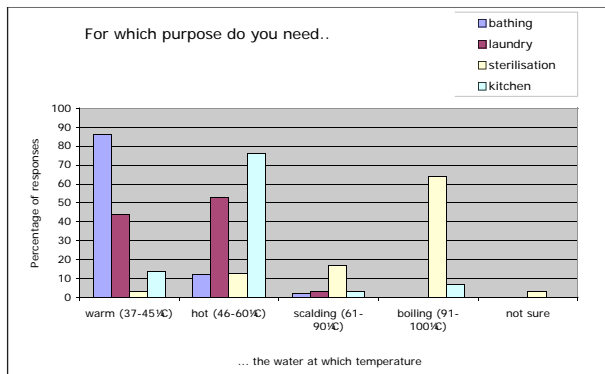


Fig.2.2.6.a

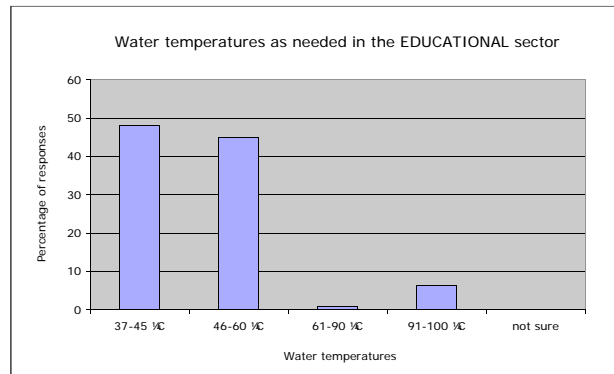


Fig.2.2.6.b

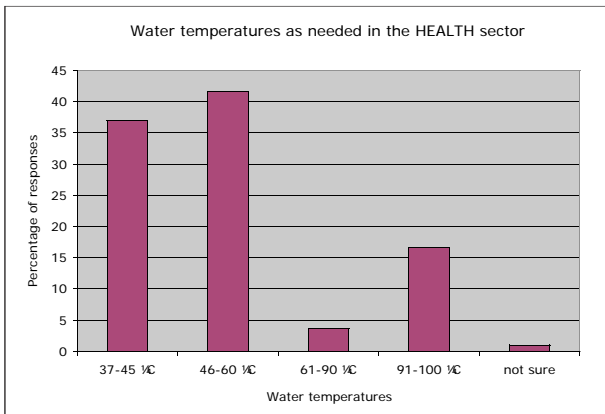


Fig.2.2.6.c

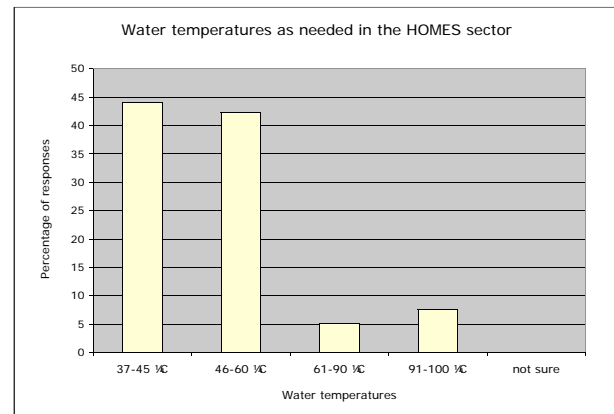


Fig.2.2.6.d

treatment and, therefore, in some cases need boiling water for sterilisation. Otherwise, they need heated water at warm and hot temperatures, just like the boarding schools.

- Hospitals have to do sterilisation on a daily basis and, accordingly, need quite a big volume of boiling water or steam. Compared to schools and homes their hot water consumption is higher than in schools or homes.

#### 2.2.7. Times at which people require the heated water

Requirements of heated water and habits of use differ from type to type of institution and even amongst the institutions of the same category. During the last couple of years though, the frequent power failures and the difficulties in obtaining coal, gas, petrol, diesel and firewood have changed the patterns from when people prefer to use the heated water to when the commodity is available. It's become routine that schools and hospitals in the rural areas have to go without heated water for days if not weeks. In urban areas where fuel is easier to obtain some schools, hospitals and homes start their generators to keep the essential services going but the generators are usually too weak for supplying all the electric geysers. Those with powerful generators have realised that heating water through the diesel generator is very costly and not sustainable.

- The figures illustrate that almost 90 percent of the institutions need heated water every day.
- In educational institutions teachers and pupils would prefer heated water for bathing/showering throughout the whole year but can live with water at ambient temperatures during the summer

months. The same applies to the laundry. Kitchen staff on the other hand require heated water all the time.

- As to be expected with health institutions, hot water is equally essential for all purposes. Hot water for laundry gets a slightly higher priority than in the other uses. Hospital laundry is a major consumer of heated water and, on top, hospitals need laundry water for the purpose of disinfection to be heated to higher temperatures than in schools or homes.
- Like with hospitals, warm and hot water is important to homes for all three uses, namely showering, laundry and dish washing. Especially in establishments for homeless and destitutes people stay there for up to a few months and enjoy cooked meals and warm showers. They bring their dirty washing and do their laundry using the facilities of the home. The owners of children's homes in most cases make sure that the very small children have warm water for showering and bathing. Little and sick children in orphanages suffer especially in the cold winter months when no heated water is available for bathing.

There is another way of studying the showering habits by looking at the number of beds and at what daytimes people of the institutions visited turn on the hot water tap.

- Bathing/showering takes place mostly in the morning (5 am to 9 am), although some bathing also takes place during mid-day, late afternoon and night times.
- As can be seen, there is not much difference in the draw-off of heated water between the summer and the winter months.
- Across the whole range of numbers of beds the majority of people take a shower or have a bath in the morning hours, be it in the hot or in the cold season.
- However, on a summer afternoon one will find more people of the 100 - 200 beds group taking a shower than on a winter afternoon. Certainly, this can be attributed to pupils of boarding schools showering after sports and also to residents of homes and to hospital patients taking advantage of the not-so-chilly water coming out of cold water tap in

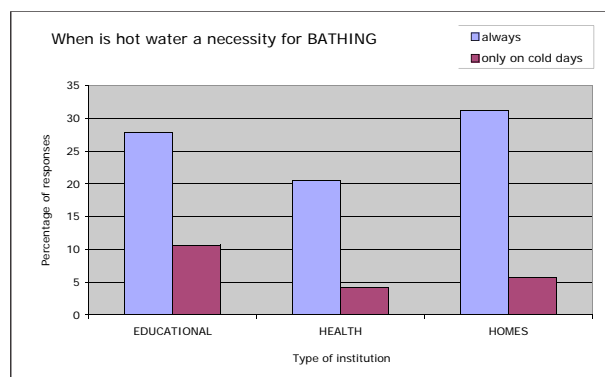


Fig.2.2.7.a

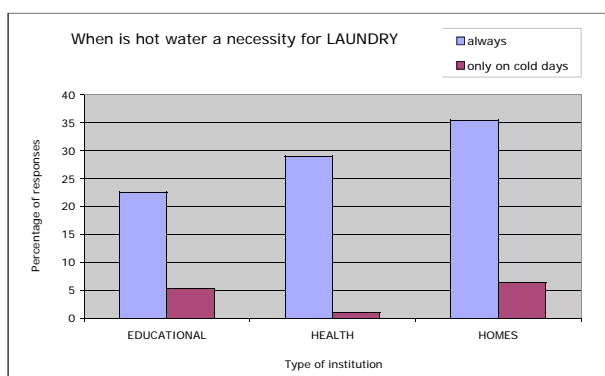


Fig.2.2.7.b

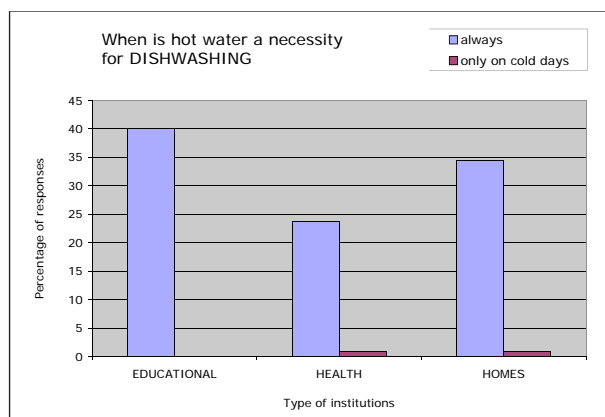


Fig.2.2.7.c

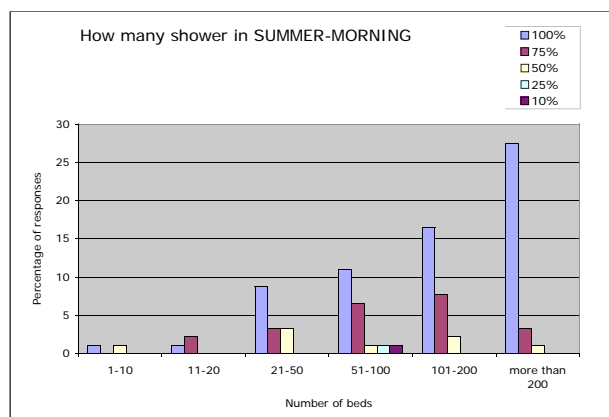


Fig.2.2.7.d

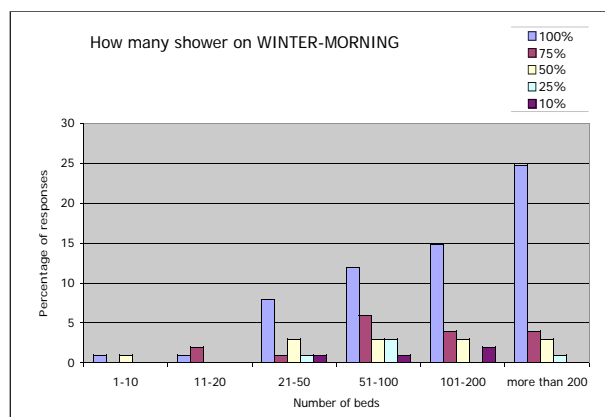


Fig.2.2.7.e

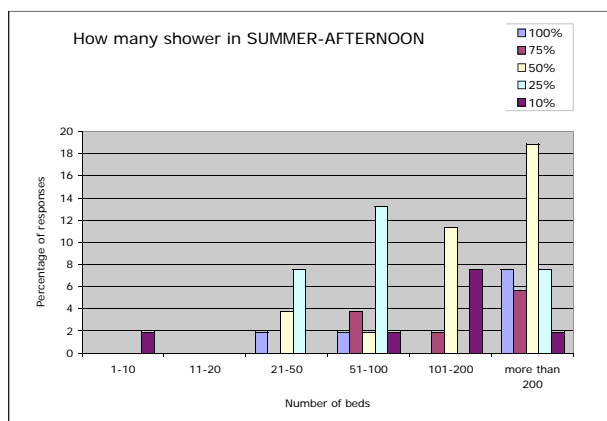


Fig.2.2.7.f

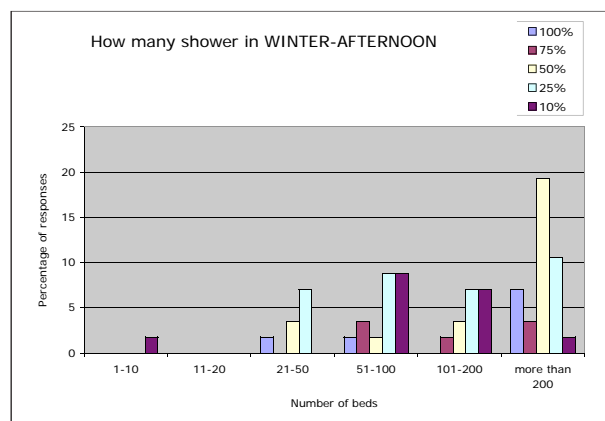


Fig.2.2.7.g

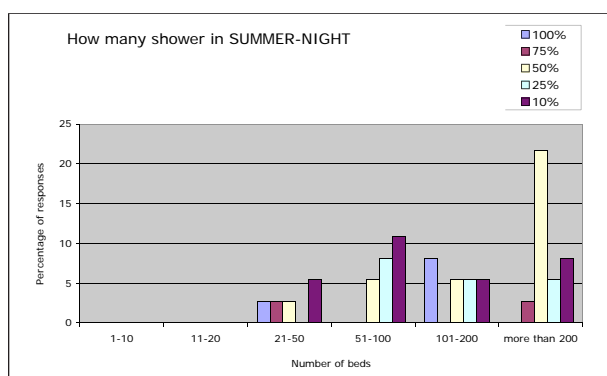


Fig.2.2.7.h

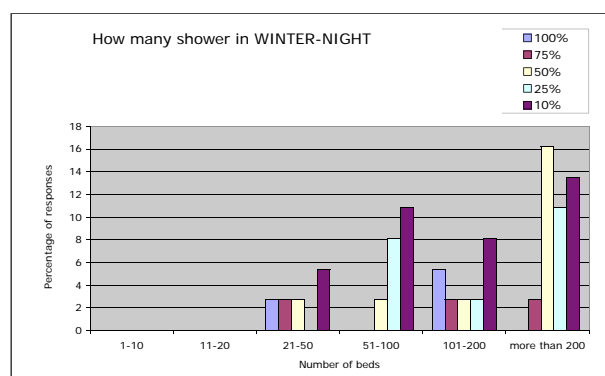


Fig.2.2.7.i

the afternoon.

- This distribution of people taking showers at different times of the year changes though when comparing summer and winter nights. For some reason, more people turn on the tap on a winter night than on a summer night.

## 2.3. EXPLORATION OF THE WATER HEATING SYSTEMS AS PRESENTLY USED AT THE INSTITUTIONS

Historically, the first water heaters were using firewood. With the construction of roads and the introduction of heavy vehicles, coal became a significant source of fuel. To firewood and coal was added electric power which was very cheap and the supplies were reliable.

Since the last ten years though wide areas of the country have been experiencing a reversion to the old firewood boilers and to water heating on open fire as the supply of electric power has become extremely erratic. In the rural areas, a high percentage of electric geysers can not be used anymore as the institutions have been deprived of electricity.

### 2.3.1. Types of water heaters used

- Statistically, almost fifty percent of the schools, hospitals and homes use electricity for water heating.
- In practice, many new power lines erected with foreign money remain cold and so do the electric geysers.
- Coal is out of reach as the production has slumped and transport can no longer be organised.
- Far-seeing missionaries introduced solar water heaters to some remote schools and hospitals. Countrywide solar water heating plays a slightly bigger role in urban than in rural areas.
- Amongst the three groups of institutions the homes are the strongest users of solar water heating whereas in the educational sector the number of solar units installed is smaller than of any other type of water heaters.
- In the health sector solar water heating is second only to the electric geysers but by a large margin. The survey does not include any government hospitals and, therefore, the health sector might be misrepresented in terms of water heating systems in use. If a comparable number of private and public hospitals had been interviewed the relative percentage of solar systems amongst the water





Fig.2.3.1.a

- Top left: Firewood water heater in Gokwe
- Top right: Residential solar hot water system at Brunapeg Mission Hospital
- Centre left: Coal and firewood boiler at Mater Dei Hospital/Bulawayo
- Centre right: Open-fire water heating at Driefontein Mission Hospital
- Bottom: Electric geyser at Mater Dei Hospital/Bulawayo

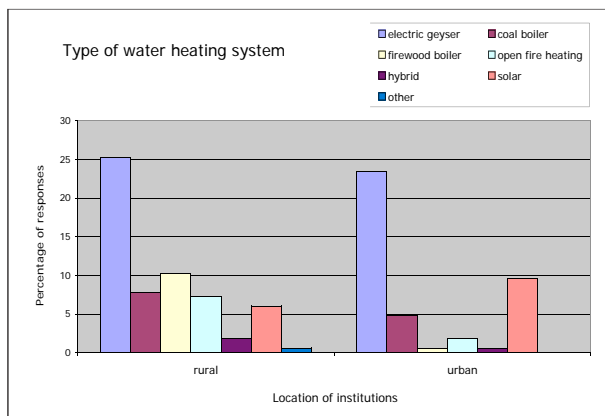


Fig.2.3.1b

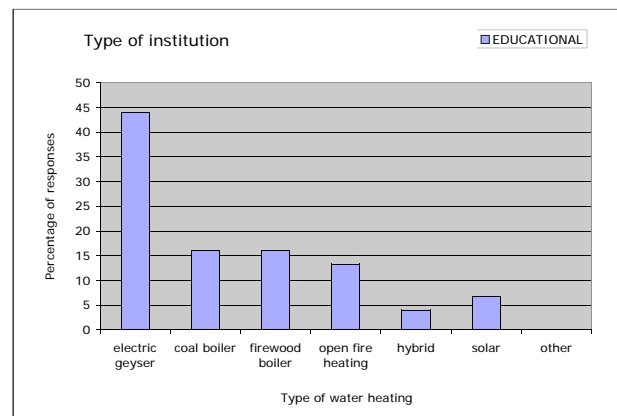


Fig.2.3.1c

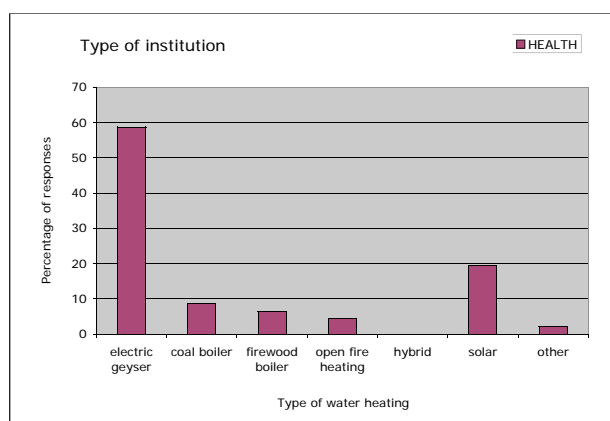


Fig.2.3.1d

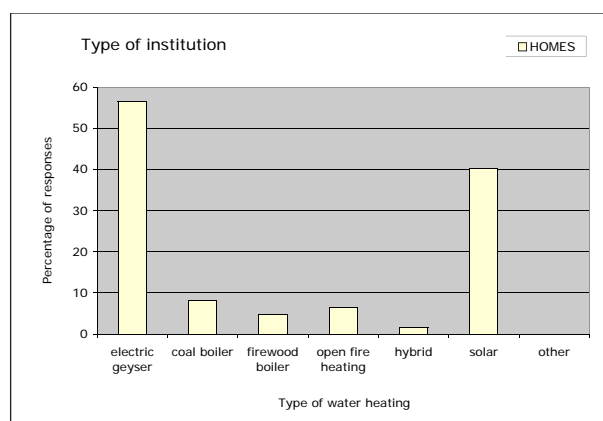


Fig.2.3.1e

heaters would have come out lower.

In this context it will be of interest how the various types of water heating systems in use reflect on the percentage of electricity consumption associated with water heating.

### 2.3.2. Storage tank capacities at the institutions

One would expect the hot water storage capacities of the institutions to closely grow with the number of beds.

- This is true of the ranges 3600-5500 litres, 6000-10000 litres and 18000 litres.
- The 500-1000 litre volumes are mostly found in institutions with 51 to 100 beds, to a lesser extent in institutions with 101 to 200 beds and even fewer in institutions with more than 200 beds.
- The most common hot water storage volume appears to be in the 2000-3000 litre range.
- Hot water storage capacities of 0-210 litres and 300-400 litres can be found in all institutions with different numbers of beds.

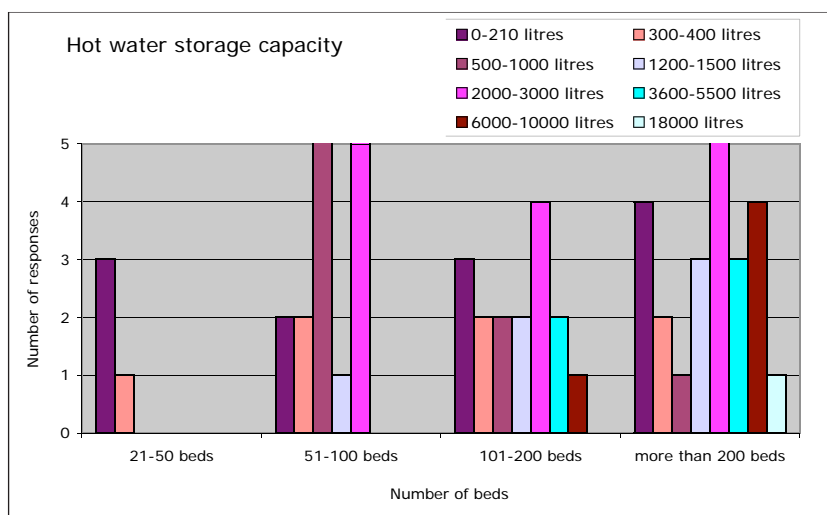


Fig.2.3.2a

The question is now which types of heaters the institutions use to heat up water in small, medium-size and large storage volumes.

- Electric geysers can be found to heat all storage volumes except the extremely large one but most dominantly the volumes up to 3000 litres.
- The coal boilers are frequently found in big rural boarding schools where substantial water volumes have to be heated especially during

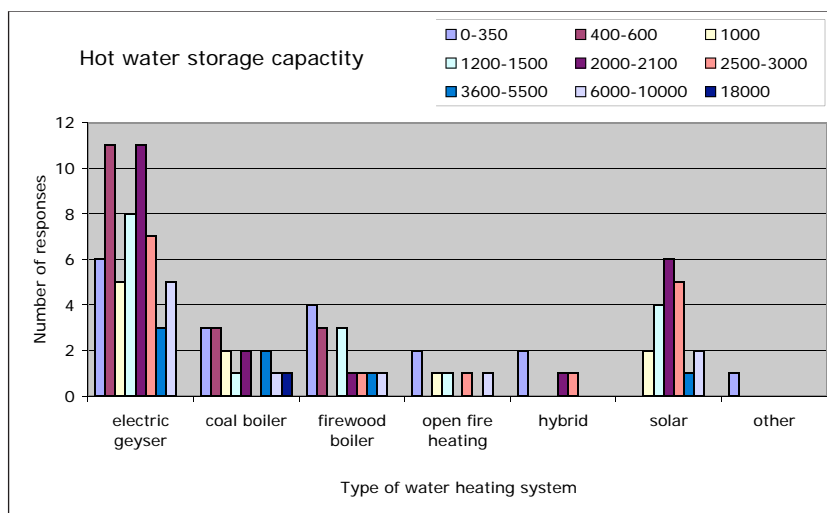


Fig.2.3.2b

the cold season.

- The same can be said of firewood boilers.
- Open fire heating is not very common but institutions will have to resort to this type of heating more often if the supply of electricity and coal does not improve in future.
- Solar heating has been used by a number of institutions for many years, in particular by the homes.
- The solar-heated tank capacities the interviewers came across are between 1000 and 3000 litres.
- The majority of the solar installations consist of one to five tanks of up to 300 litres capacity.

### 2.3.3. State of the water heating systems and operating costs

Most institutions visited by the interviewers have been operating for the past 10 to 20 years; some of them even as long as 40 years. The coal and firewood boilers are probably as old as the institutions but might have been supplemented or replaced by electric geysers or solar systems at a later stage. In some way, wear and tear affects all parts of the water heaters but most of the time the portions which are exposed to the heat source.

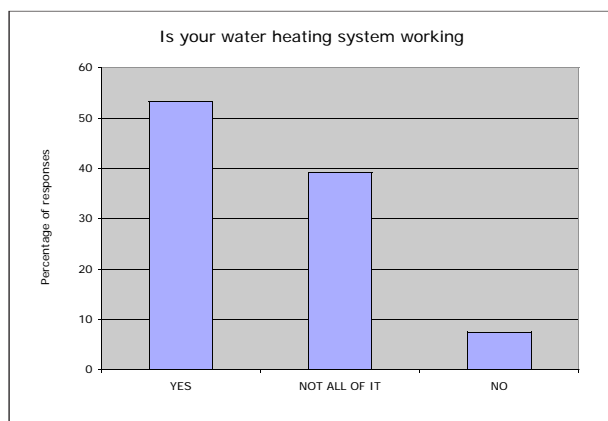


Fig.2.3.3a

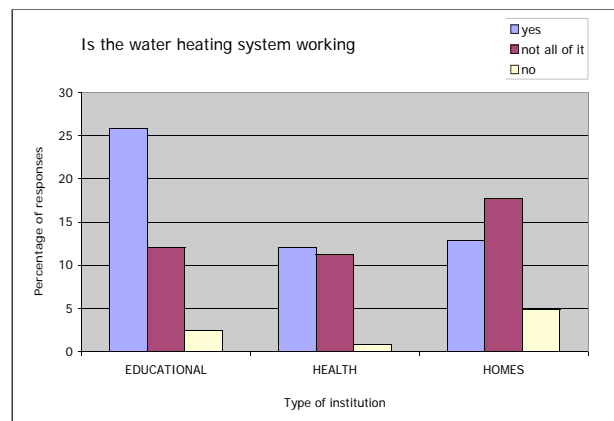


Fig.2.3.3b

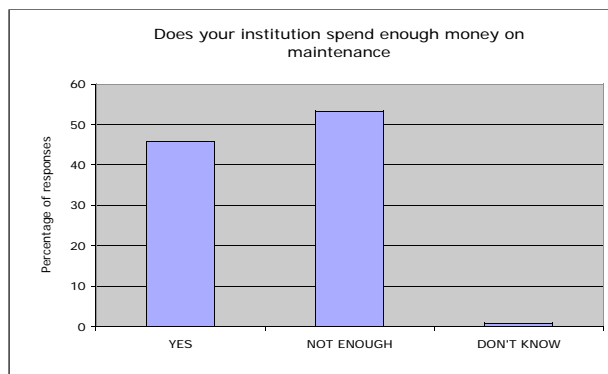


Fig.2.3.3c

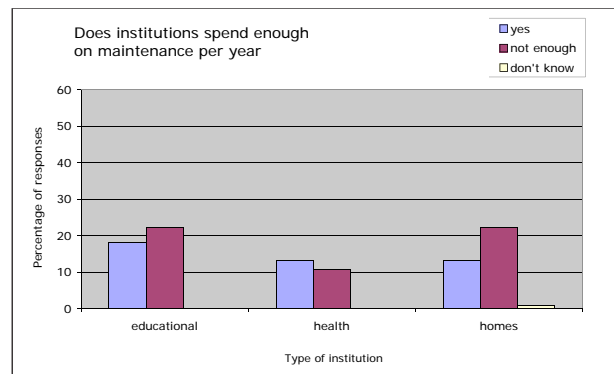


Fig.2.3.3d

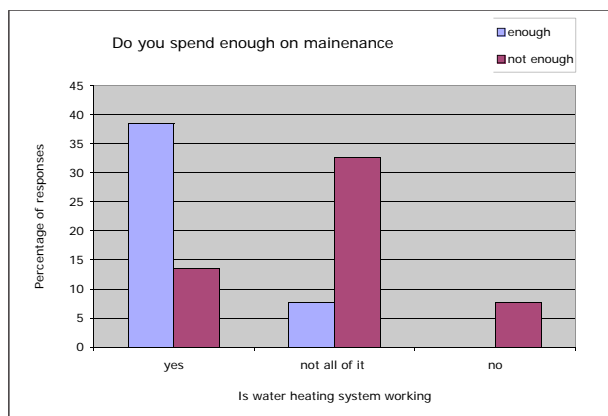


Fig.2.3.3e

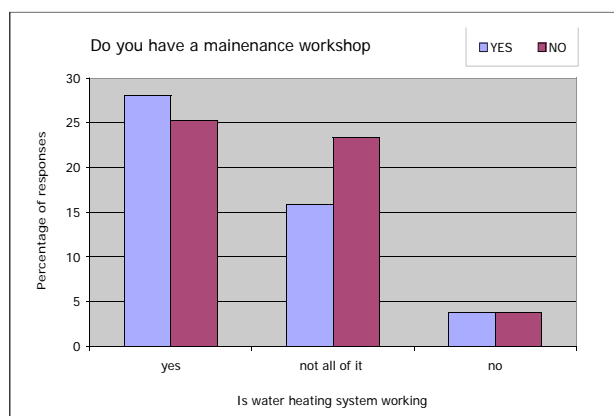


Fig.2.3.3f

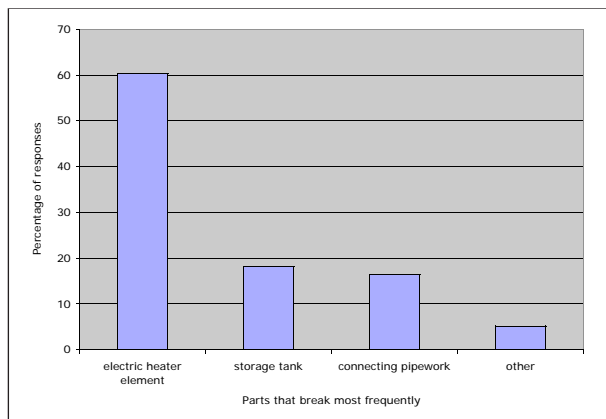


Fig.2.3.3g

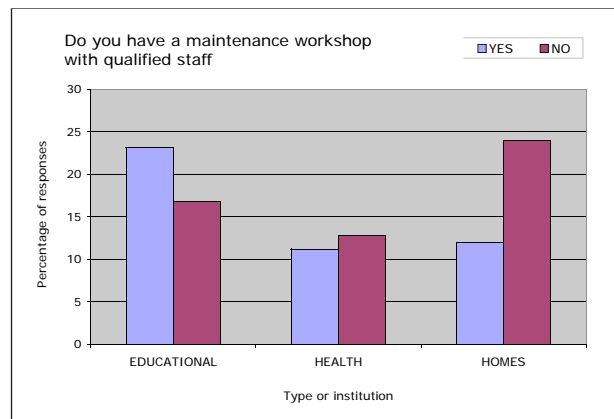


Fig.2.3.3h

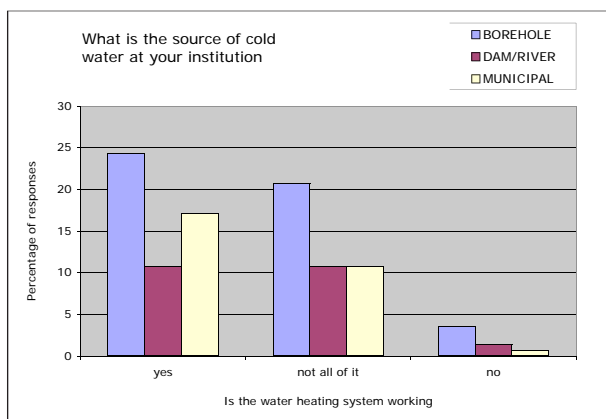


Fig.2.3.3i

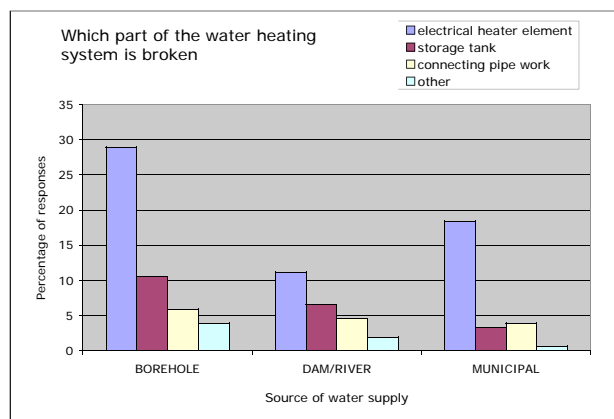


Fig.2.3.3j

It was learnt during the interviews that the grading of a water heating system as working or not working satisfactorily can be quite unreasoned. When water heaters are not able to meet the hot water demand of the users then they blame it on the equipment. Most of the heaters were designed for a certain number of users but nowadays many heaters are operated far above their limit. Solar water heaters need the sunshine and boilers require firewood or coal which can all be in short supply from time to time. On top of this, one can only get hot water out of the heaters if cold water flows in. The problem of the heaters is quite often the problem of the cold water supply.

All these local particulars have to be born in mind when reading the “treatise” on the state of water heating systems as in use at institutions visited in Zimbabwe.

- Countrywide, more than half the water heaters are pronounced to be in working condition and 40% in part.
- The educational sector has the best ratio of heaters working fine compared to the ones which are not fully operational.

Besides the cost of heating water the expenses incurred by repair and maintenance have to be looked at.

- A significant 53% of the institutions do not think they are spending enough money on maintenance and repairs to keep their water heating system working.
- Amongst the homes visited only about 40% can pride themselves that they spend enough on maintenance in contrast to the hospitals where the respective percentage is well above 50%.

The poor maintenance awareness is certainly a major factor why 40% of water heating systems are not functioning to satisfaction. The benefit of regularly servicing the equipment of the institutions manifests itself when putting the money spent on maintenance in comparison with the working condition of the water heating systems.

- There is an evident and strong coupling between the state of the water heating equipment and resources spent on the upkeep of the equipment.
- The electrical heating element is the most notorious cause of breakdown for the water heating systems. They are consumables, i.e., items to be used up and then to be replaced.
- Storage tanks and connecting pipe work don't seem to cause major repair and maintenance

costs.

- The question whether the institution has a maintenance workshop or not does not appear to influence the working condition of the water heating system. This proves that merely employing technicians and running a maintenance workshop are no guarantees for well functioning water heaters, if the workers are not given enough money to buy the spare parts and the tools.
- Comparing the various sectors of the institutions the educational sector is the best when it comes to workshop and maintenance staff whereas the homes lag far behind.
- Correspondingly, the in boarding schools two thirds of the water heaters are working in contrast to the homes where just about a third of the water heating systems are in working condition.
- As per Fig.2.2.1e, the large majority of institutions gets the cold water from the borehole. Therefore, one would have expected the calcium which is normally associated with borehole water to create more havoc in the water heaters and in the connecting pipework. In most parts of the country the source of the cold water cannot be blamed if the water heater is not functioning.

#### 2.3.4. Contribution of water heating to monthly electricity bill

As the majority of institutions uses electric geysers for heating water the average of the three last electricity bills was recorded as the operating costs. In the cases of coal and firewood heating it was difficult to work out the average monthly outlay and, therefore, these costs were not taken into account.

- In the first half of 2006 the institutions reported average monthly electricity bills ranging from about Z\$ 1 million to Z\$ 500 million which converts to bills between EUR 4 and EUR 2000.
- Of course, the absolute sum grows with the size, i.e. number of beds, of the institutions.
- The institutions with no solar water heating systems installed pay EUR 249 on average whereas the owners of solar water heaters

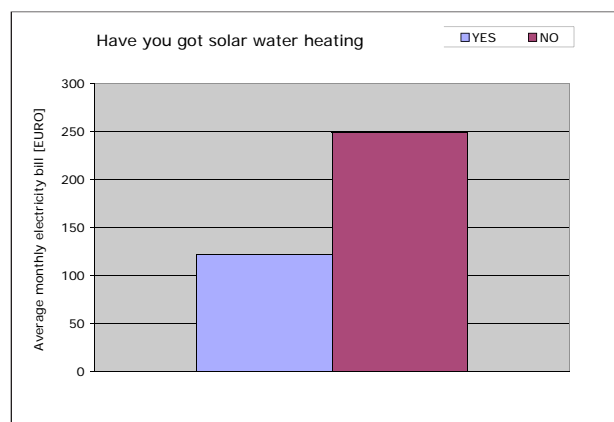


Fig.2.3.4a

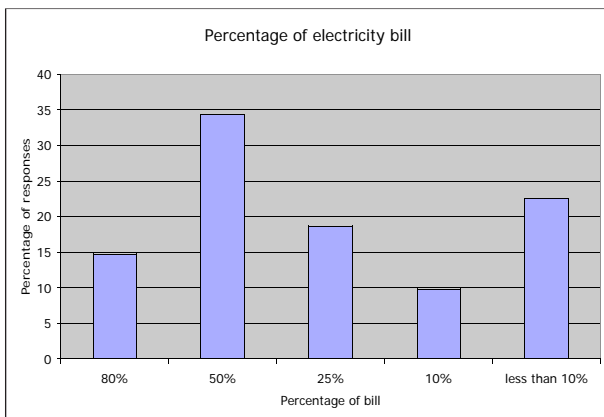


Fig.2.3.4b

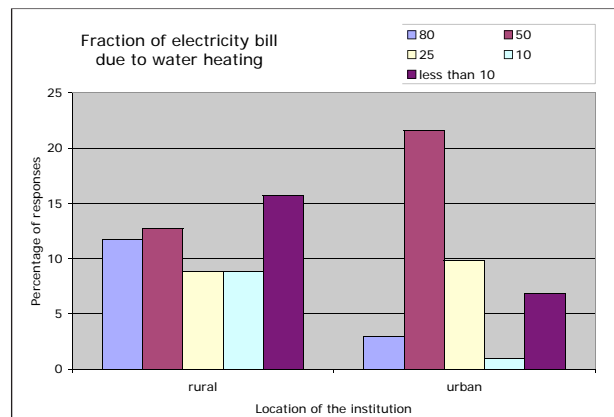


Fig.2.3.4c

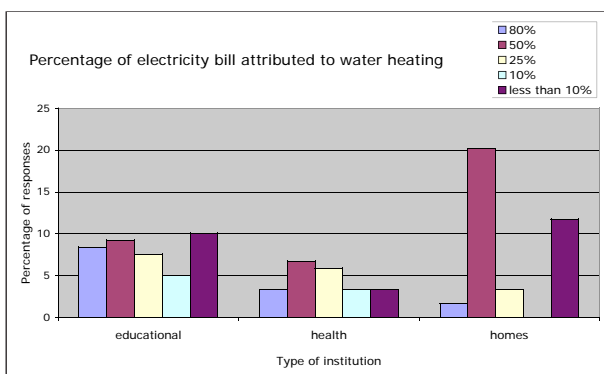


Fig.2.3.4d

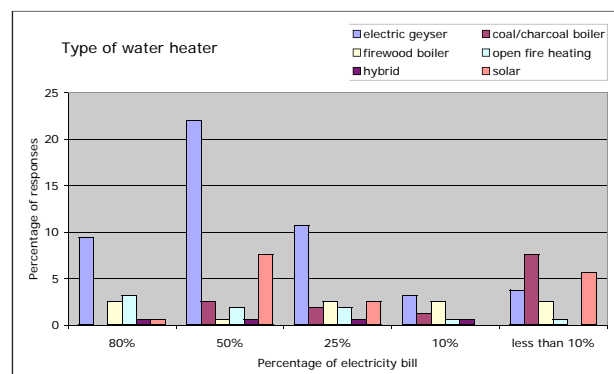


Fig.2.3.4e



can expect an average monthly bill of EUR 122, i.e., less than half of the ones without the solar heaters. The following graphs illustrate the institutions' perception of the contribution of water heating to their electricity bill and have to be read with caution. They are estimates and are not supported by any measurements.

- According to the study data almost 15 percent of the institutions visited think that water heating accounts for 80% of their electricity bill. In this set of institutions solar water heaters don't play any role. The high electricity bills and the absence of solar water heaters in the educational sector demonstrate beyond doubt that the over-dependence on electric geysers may turn out very expensive.
- Where electric geysers are employed for water heating the percentage of the total electricity bill is between 80 and 25 percent.
- About a third of the institutions interviewed attribute 50% of their electricity bill to water heating. In this group the electric geyser clearly dominates the other types of water heaters. Even though quite a few institutions of the 50%-group own solar systems they still have to use half of the electric energy for water heating. Without the presence of solar water heaters some institutions might have been pushed up the ladder to the 80%-club.

There are several explanations for the strong showing of the group with 10 and less than 10% of the bill associated with water heating.

- The lower end of the range is shared between solar and hybrid systems which make use of whatever is available at certain times, i.e., electricity, coal and firewood.
- Institutions in remote rural areas have to go without electricity for long periods which brings the bill down.
- In some cases water heating contributes little to the electricity bill, because they have not been connected to the grid yet and mainly use coal and firewood. Yet their bills for coal might be even higher than what other institutions of the same type and of comparable number of beds have to pay to the electricity utility.
- In the educational and health sector the percentages are fairly evenly distributed.
- The homes are the chief players in the groups of institutions which attribute 50% and less than 10% to water heating.
- When referring back to the illustrations (Fig.2.3.1c-e) where the various types of institutions are examined with respect to what apparatus they use for water heating, the explanation for the homes differing so clearly from the other institutions in terms water heating's contributing to the electricity bill is their reliance on electric geysers on one hand and on the use of solar hot water systems on the other hand. Obviously, solar water heaters were purchased by the funders to bring the running costs in general and the electricity bill in particular down.

### 2.3.5. Usage and performance of solar water heating systems

Most tank sizes of the solar hot water systems covered by the survey were below 300 litres. Due to their compact design an individual solar water heater can be given to each dormitory of the boarding schools, ward of the hospitals and unit of the homes.

The graphs relating to the solar hot water systems illustrate that

- About a third of the institutions visited do have solar water heaters. The percentage would certainly have come out lower had more government hospitals and schools participated in the survey.

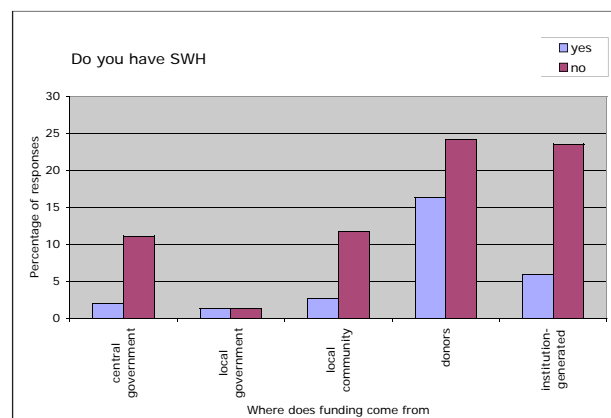


Fig.2.3.5a

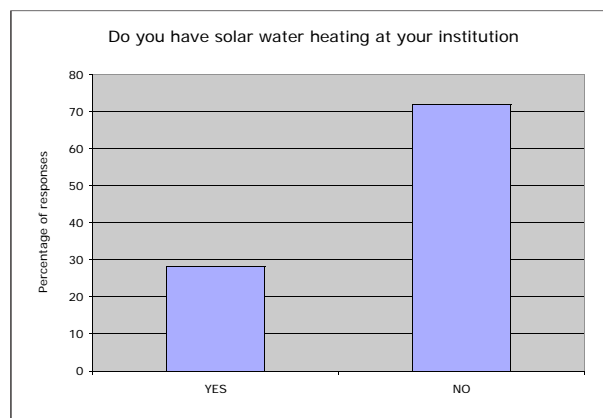


Fig.2.3.5b



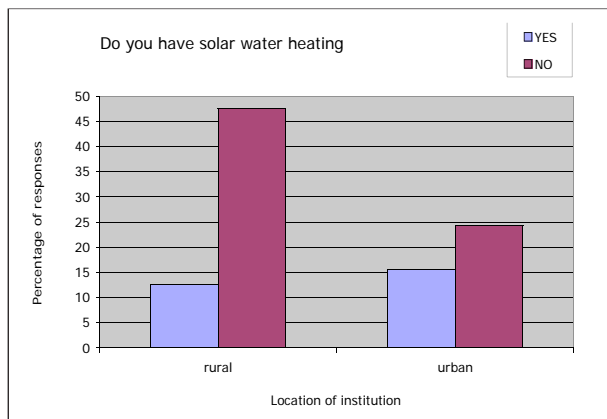


Fig.2.3.5c

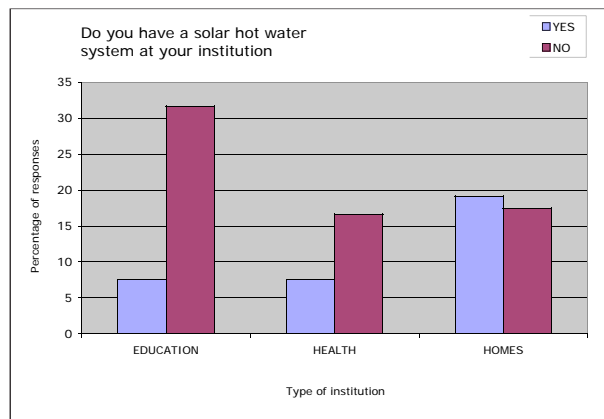


Fig.2.3.5d

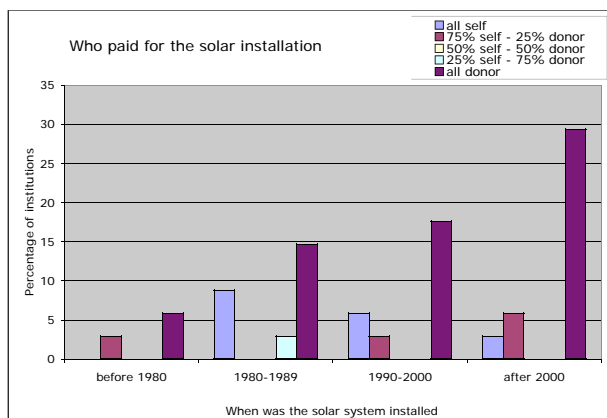


Fig.2.3.5e

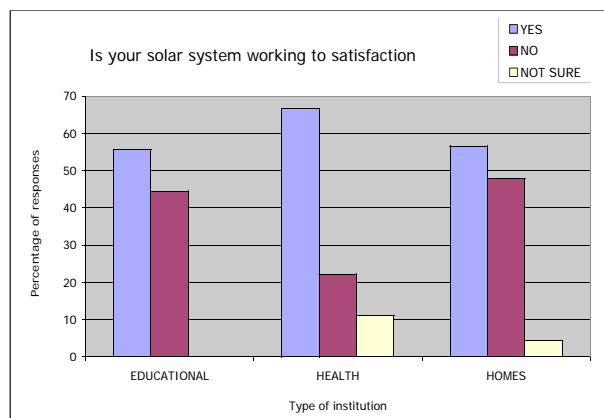


Fig.2.3.5f

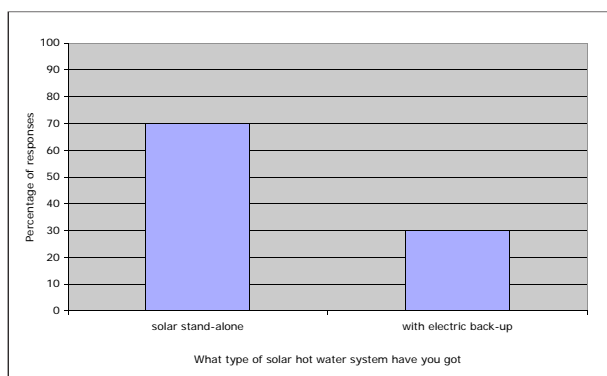


Fig.2.3.5g

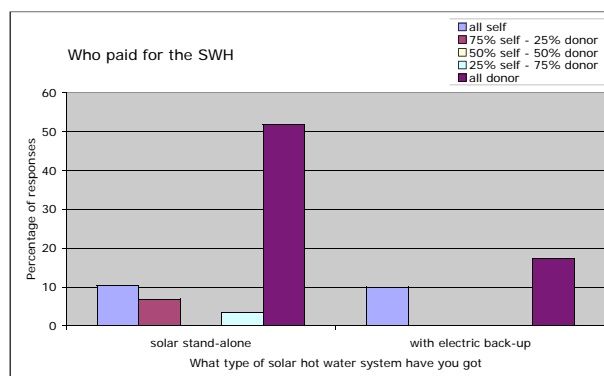


Fig.2.3.5h

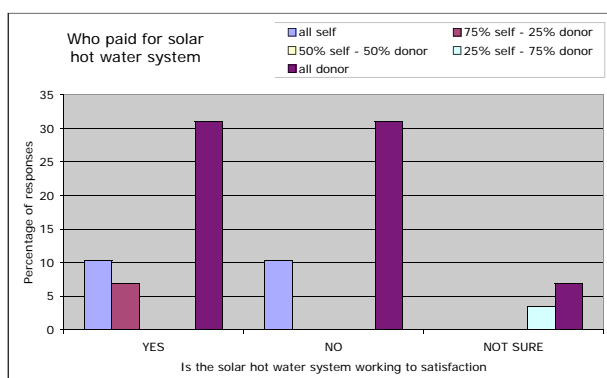


Fig.2.3.5i

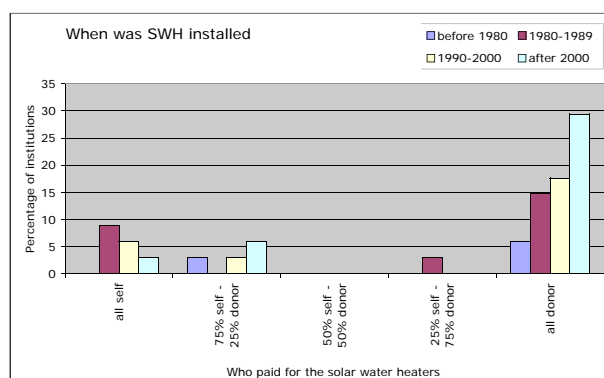


Fig.2.3.5j

- A clear majority of the institutions in the rural areas in general and of the health and educational sector in particular has no solar heated water.
- Solar water heaters have mainly been purchased by or donated to homes.
- Since before 1980 the percentage of donated systems has been growing steadily while the number of solar systems fully paid by the institutions themselves has dwindled to zero.
- Solar hot water systems normally don't replace or substitute electric geysers but bring hot water to institutions where there was no water heating available before.
- Understandably, the donors favour the installation of solar stand-alone systems as they expect the institutions to bring down their electricity bills. The recipient have to make do with the water heated by the sun.
- When comparing the sectors of the institutions, the hospitals report the best ratio of solar hot water systems in working condition to the ones not functioning.
- However, when talking of water heaters in general (Fig. 2.3.3b), the educational sector takes the lead.
- In both fields, whether or not the water heaters in general and the solar systems in particular are working to satisfaction, the homes have the poorest results.
- The working condition of the solar systems does not appear to depend on who paid for the equipment and the installation.
- Institutions with full autonomy, when it comes to making decisions towards the purchase of a solar hot water systems, don't manage their equipment better than the ones which have to ask various authorities.

## 2.4. AWARENESS OF BENEFITS AND PROBLEMS OF SOLAR WATER HEATERS

In the southern African region Zimbabwe is second only to Botswana when it comes to solar awareness and use of solar technology. According to Fig.2.3.4b, about a third of the institutions use solar systems to heat their water for showering, laundry and dish washing. Assuming that better knowledge about the benefits of solar water heating translates into higher usage of the technology, the following chapter will try to explore where the representatives of the institutions got the information from. Later they will be asked how they rank the perceived advantages and disadvantages of solar water heaters. This study also looked into the questions what the respondents consider the major barriers which hinder them from buying a solar water heating system and what the interviewees think should be done to remove these barriers.

### 2.4.1. Familiarity with solar hot water systems

- With independence in 1980 came the donors and the solar hot water systems for schools, hospitals and homes.
- The main beneficiaries though have been the homes for aged people, AIDS-orphans and for the destitutes. The schools and hospitals have not been as successful as the homes in tapping donor funds for the solar hot water systems and had to generate the funds themselves.
- Across the institutions visited a narrow 49% of the respondents admitted not to know how solar water heating systems work.
- More interviewees who know how the solar water heating systems work live in the rural areas than in towns.
- The educational sector is the only one where the percentage of YES exceeds the NO. The higher

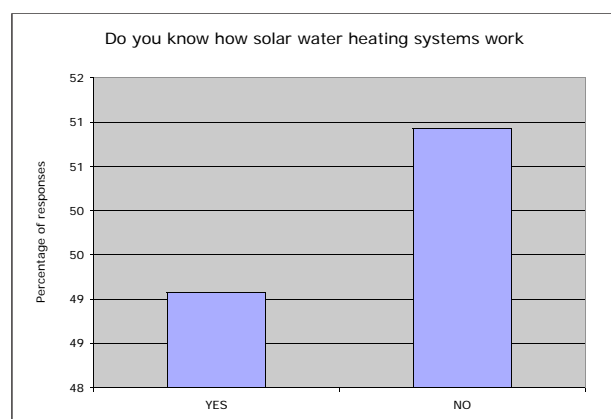


Fig.2.4.1a

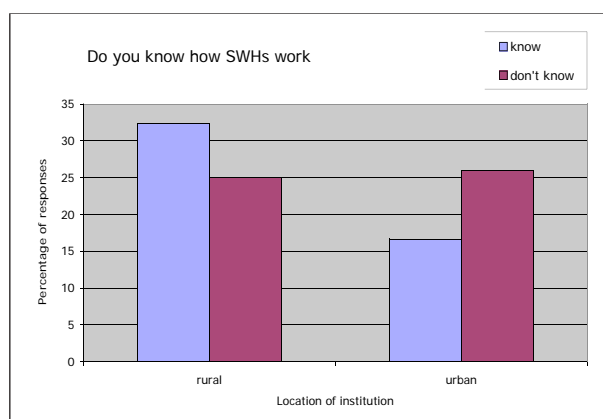


Fig.2.4.1b

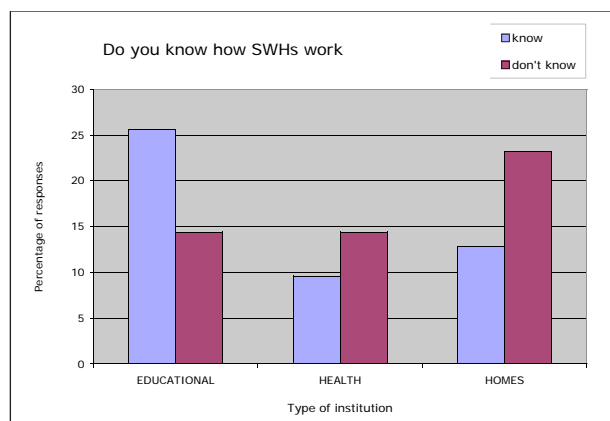


Fig.2.4.1c

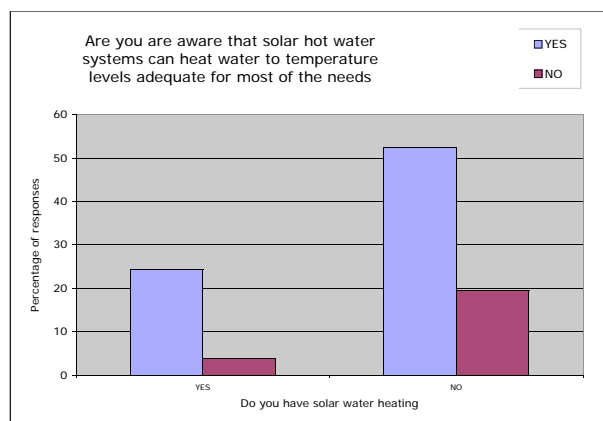


Fig.2.4.1d

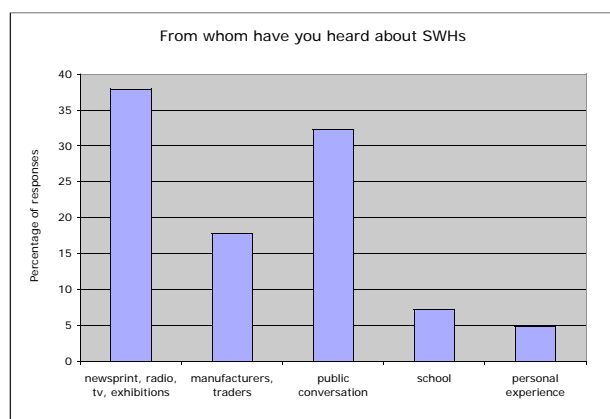


Fig.2.4.1e

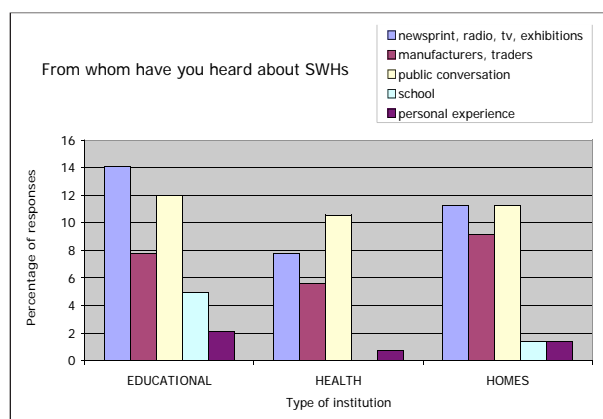


Fig.2.4.1f

presence of schools in the countryside is the reason for the concentration of the knowledge about the working of the solar systems in the rural areas. The better understanding of the mechanics of solar hot water systems does not inevitably result in increased use of the technology, as this study will reveal later.

- No matter whether they have a solar water heater or not, most respondents are aware that solar can heat their water to temperatures adequate for most of their needs.
- From personal experience and from what they have heard about the solar technology a clear majority of the persons interviewed consider it wise to switch to solar water heating.
- Even though the institutions of the homes sector are the keenest users of solar water heaters they also have a few representatives who are undecided about whether to switch to solar or not.
- In general, newsprint, radio, tv and exhibitions are the most effective channels to raise people's interest in solar water heating closely followed by public conversation.
- It should not surprise anybody that persons in charge of running the schools hear about solar water heating mainly from the print and electronic media and from public conversation. Manufacturers and traders come third before information gained during their years at school. Personal experience comes last.
- In the health sector knowledge about solar water heating is mainly passed on through public conversation, ahead of the media.
- The representatives of the homes get their knowledge almost equally from the media, the manufacturers and public conversation. Apparently, the traders are targeting at this group for the better access to donor money.

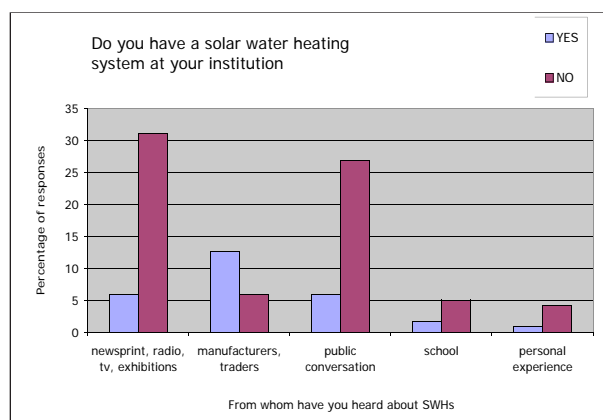


Fig.2.4.1g

- Around 50% of the institutions with solar hot water systems on the roofs get their first-hand information from the manufacturers and traders. This should motivate the traders even more to get as close to the potential customers as possible and to provide them with technical information.

#### 2.4.2. Ranking of advantages and disadvantages of solar hot water systems

When the sustainability and the economic/environmental advantages of using solar water heaters when compared to conventional water heaters was explained to the representatives of the institutions, the persons ranked these aspects in the order of importance to them. The ranking of each individual benefit is illustrated by two graphs, one showing the importance of the declared benefit as rated by all respondents and one distinguishing between institutions with solar water heaters and without.

- The advantage of solar water heaters that “Solar energy is inexhaustible” and was ranked the most important (Rank 1) by the largest number of respondents.
- “The sun does not send a bill” also received high ranking but the owners of SWHs awarded slightly lower marks.
- The environmental benefit of “SWHs use clean energy was given the least ranking by the majority of the persons interviewed. The issue of “no emissions” is not relevant to the institutions without SWHs but the statistics show a moderately stronger feeling of responsibility for the environment amongst the owners.

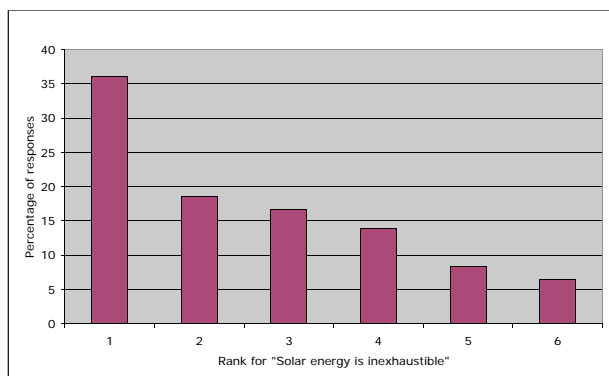


Fig.2.4.2a

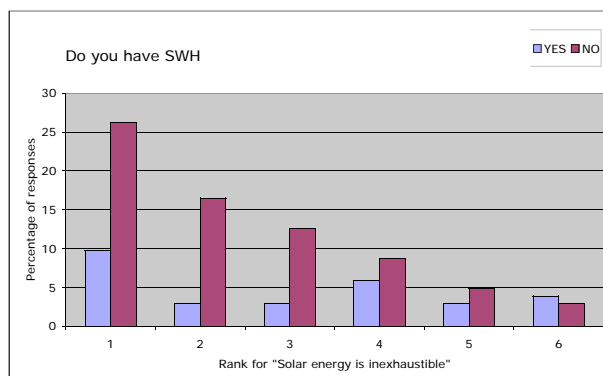


Fig.2.4.2b

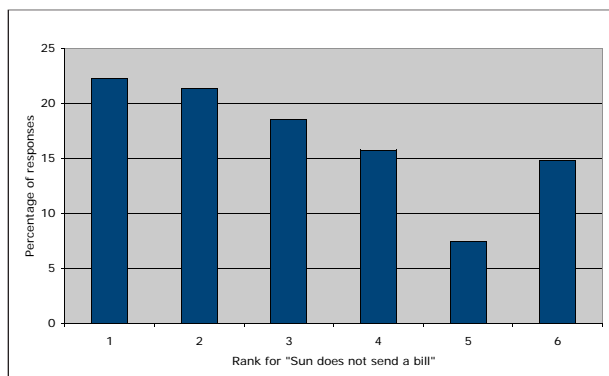


Fig.2.4.2c

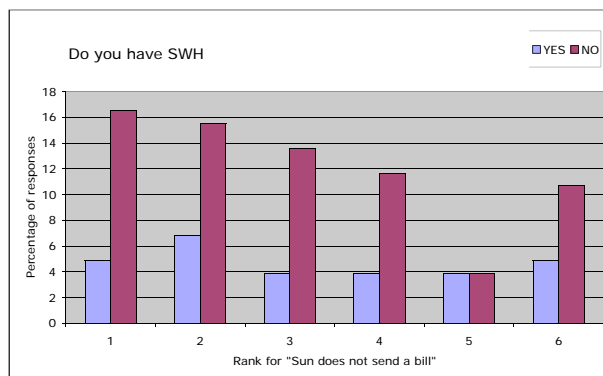


Fig.2.4.2d

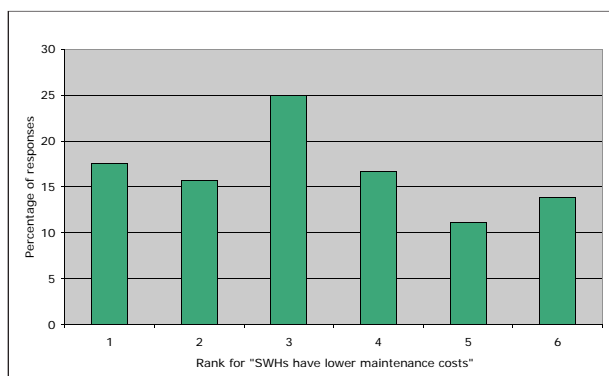


Fig.2.4.2e

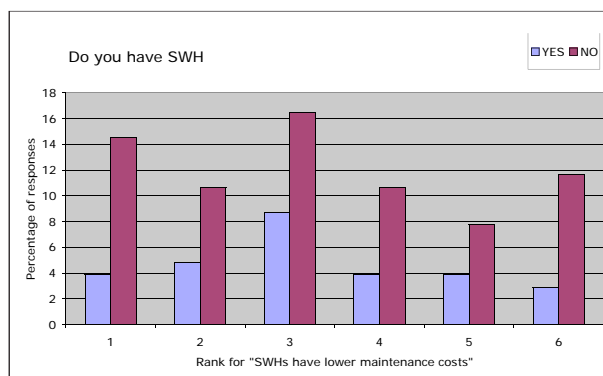


Fig.2.4.2f

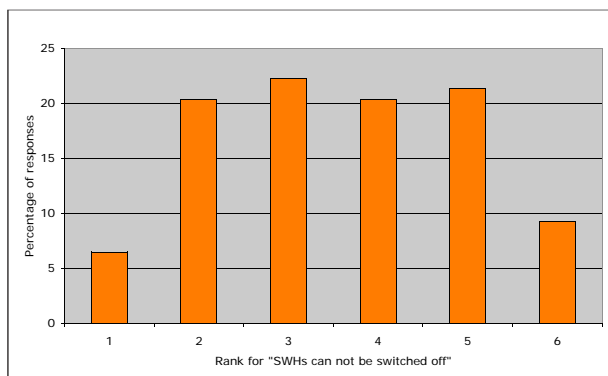


Fig.2.4.2g

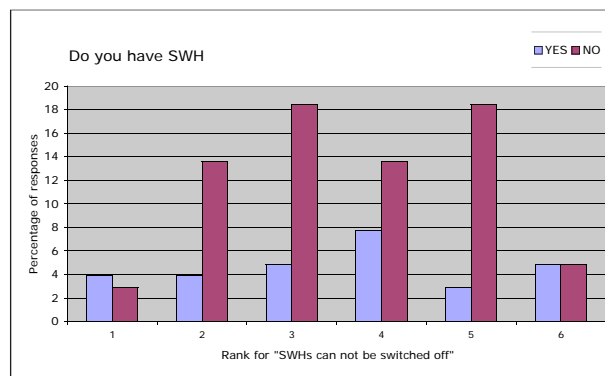


Fig.2.4.2h

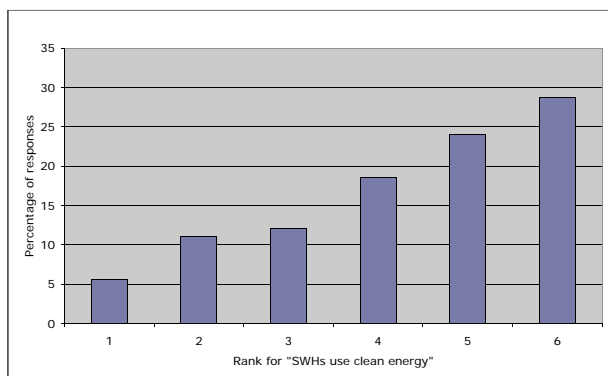


Fig.2.4.2i

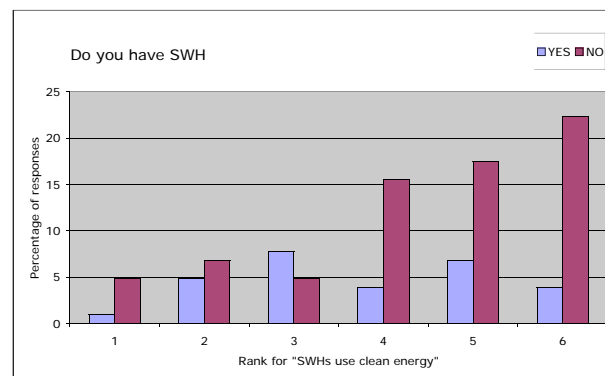


Fig.2.4.2j

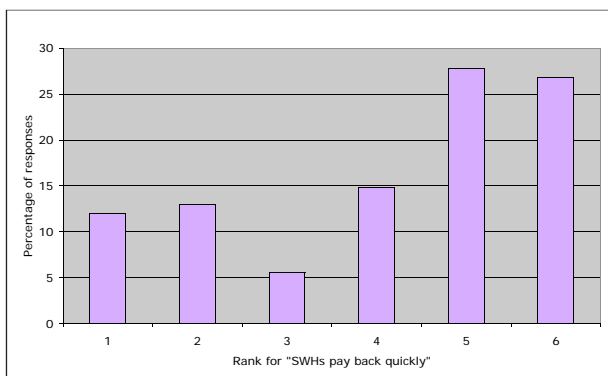


Fig.2.4.2k

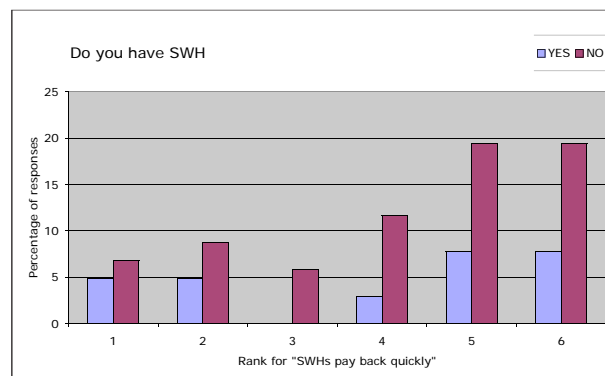


Fig.2.4.2l

- No matter whether the own a solar water heating system or not, people are not convinced by the

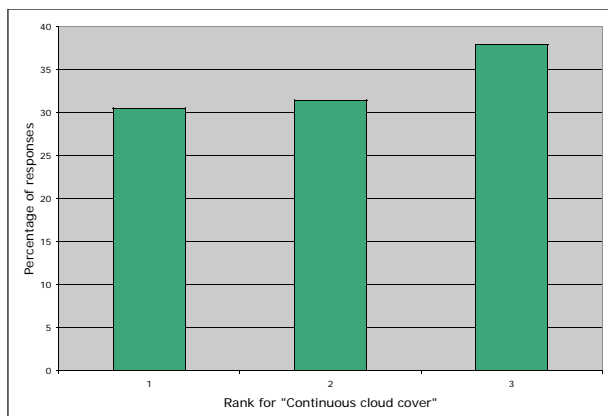


Fig.2.4.2m

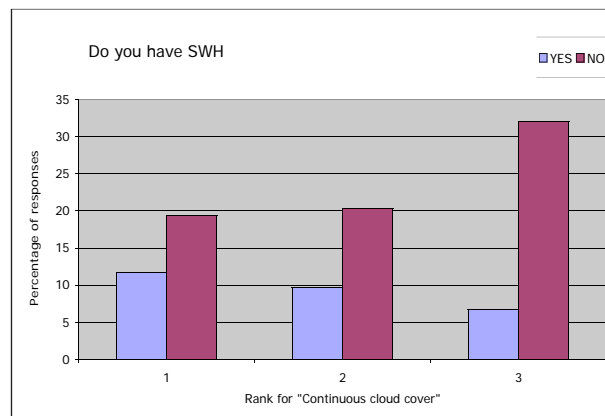


Fig.2.4.2n

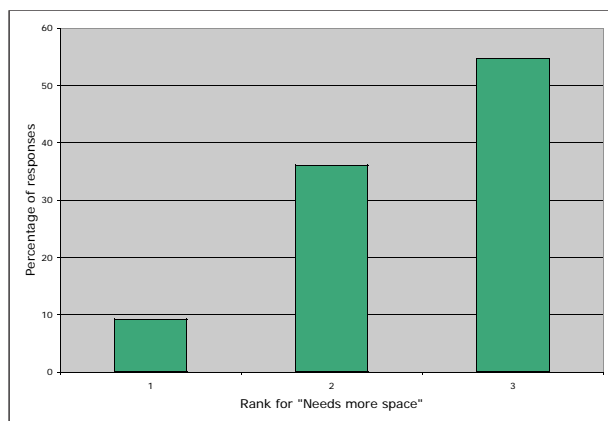


Fig.2.4.2o

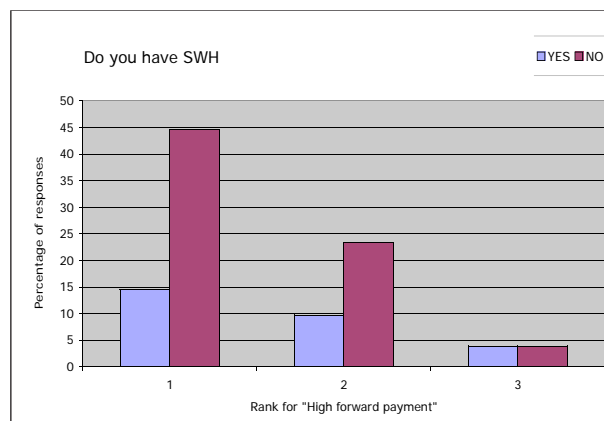


Fig.2.4.2p

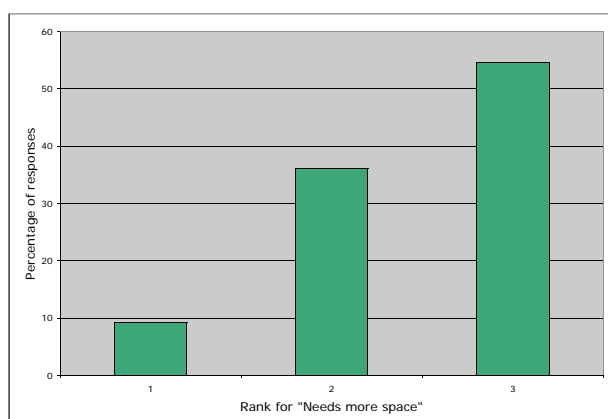


Fig.2.4.2q

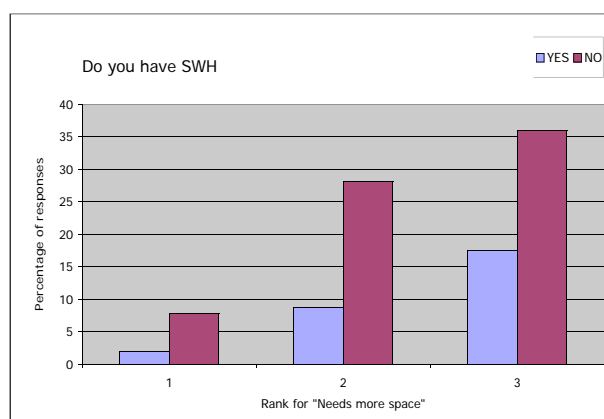


Fig.2.4.2r

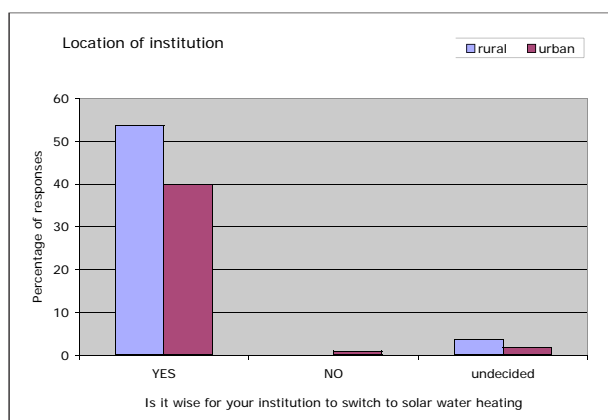


Fig.2.4.2s

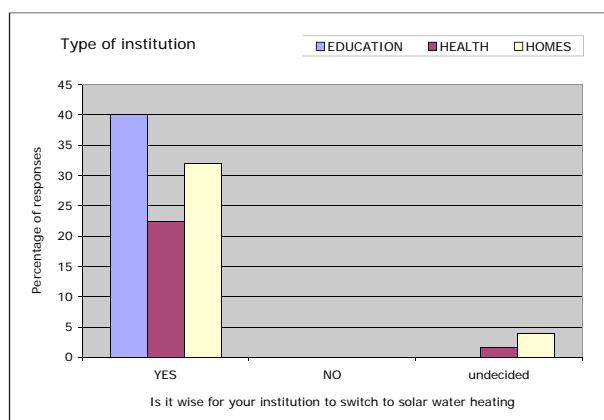


Fig.2.4.2t

statement that “In sunny countries (Zimbabwe) and if electricity tariffs are high, the SWHs pay themselves back quickly”.

- With respect to the benefit “SWHs cannot be switched off”, the respondents have no clear opinion as to whether the solar water heaters are in the position to cushion the frequent and long-lasting power-cuts by the electricity supplier.
- Concerning “SWHs have lower maintenance costs”, the owners of solar water heaters have a lower opinion than the ones without. Experience might have taught them a lesson. Some owners are disappointed by the frequent breakdowns and by the poor back-up services, that’s why they have their justified doubts about the lower maintenance costs as claimed by the proponents of solar water heating.

The corresponding distribution of responses for ranking of disadvantages of SWHs is shown in the graphs below. Similarly to the advantages, the left side of the graphs refers to ranking given by all respondents combined whereas the right side breaks the institutions up into groups with SWHs and without.

- The fact that high forward payment is required for the initial purchase of the SWHs is ranked as the most serious disadvantage. The owners of solar water heaters are a bit less worried about the



high forward payment than the institutions without. They have already gone through the process of discussions and opted for the investment despite the high cost.

- The bulkiness of the tanks and collectors is considered the least disadvantage by all respondents. The country might be short of many things - but not of roof space.
- The disadvantage that “For some few days in a year you might have no hot water supply because of continuous cloud cover” has received from the complete body of respondents almost the same number percentages for all ranks 1 to 3. When looking at this matter from the point of view of the owners then the issue of the weather becomes a more critical one. The owners disagree with the bulk of respondents in way that they see the cloudy periods as a disadvantage not to be ignored.

Asked to weigh the given advantages and disadvantages of using solar water heating, and then to decide whether or not it would be wise for their institution to switch to (increased use of) solar water heating, the majority of the respondents thought it is wise to do so. There are just a few in the rural areas and some representatives of homes who are undecided.

#### 2.4.3. Obstacles to using solar heated water

The most serious barriers hampering institutions from using (increased use of) solar hot water systems are, according to the respondents, as shown in the graphs below. The respondents could chose amongst a list of five well-known barriers and were asked to formulate two intervention strategies to be employed to overcome these hurdles.

- Most persons in charge of the institutions cited lack of capital to meet the high initial cost of purchasing solar hot water systems as the most serious barrier. The interviews were conducted in the first half of 2006 and one can assume that this problem of the want of capital has even become worse during the past eighteen months.
- They think that asking for more donations is the most promising way to receiving solar heated water.
- Making finance available would facilitate the acquisition of SWHs.
- Fund-raising and approaching government for subsidies is seen as the next auspicious strategy to adopt.
- At the bottom of the list of proposed answers to the funding debate one

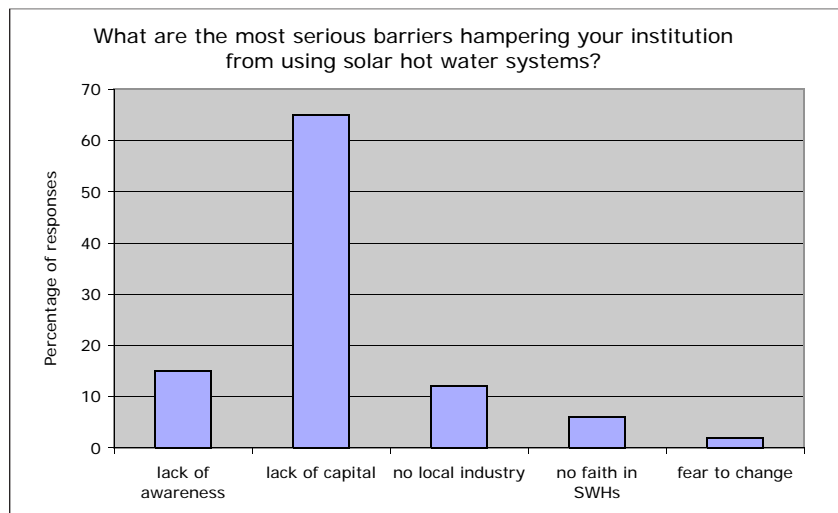


Fig.2.4.3a

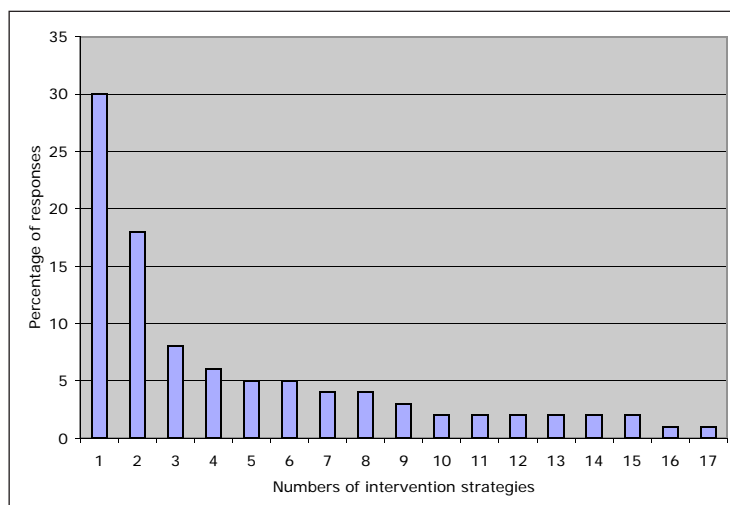


Fig. 2.4.3b

1	More donations
2	Awareness campaign
3	Make finance available
4	Don't know
5	More education
6	Provide more information
7	Government to subsidise
8	Fundraising
9	Speak to decision makers
10	More marketing
11	Subsidy for schools
12	Generate funds
13	Manufacture locally
14	Reduce costs
15	Provide back-up services
16	Wider stakeholdership
17	Government remove VAT and duty

finds “Generate fund”, “Reduce costs” and “Government remove VAT and duty”.

- Lack of awareness comes second in the list of barriers.
- Wide awareness campaigns and more education in the benefits and use of solar water heating are recommended.
- The decision makers need to be made aware of the economical importance of solar water heating technology and they should involve all stakeholders (manufacturers, traders, installers, customers, environmental organisations) in the promotion of solar water heating.
- No faith in SWHs and fear of change have little influence on whether people use of solar hot water or not.
- However, a few respondents consider readily available back-up services a prerequisite for higher confidence in solar water heating.

## 2.5. ABILITY/WILLINGNESS TO PAY FOR SOLAR WATER HEATERS

The ability or willingness of the institutions to lay out money for purchasing solar hot water systems was probed. The respondents were put in the picture that the cost of buying and installing a solar hot water system at institutional level is estimated to be around USD 120 per capita. The interviewees were then asked for how many people (or number of beds) their institutions would be able to provide solar hot water at this price. After answering this question the same persons were invited to look at the issue of purchasing a solar hot water system once again, but this time subsidised to the tune of 50 percent of the total cost. The ensuing graphs illustrate the responses of the persons with the willingness/ability to pay the full amount juxtaposing the right column of figures which serve as an indicator whether the representatives of the institutions visited would be more willing or able to purchase a solar water heating system provided they are subsidised.

- An overwhelming majority of 60% of the respondents would not buy a solar hot water system, if they had to pay the whole bill themselves. When offering them the same solar system at half the cost, the percentage of institutions who still cannot afford the investment decreases to 40.
- The rural institutions with more than 200 beds are the most keen ones on the subsidised solar waters.
- Amongst the various types of institutions the educational sector with 100 and more boarders responds most favorably to the plan of subsidised installations.

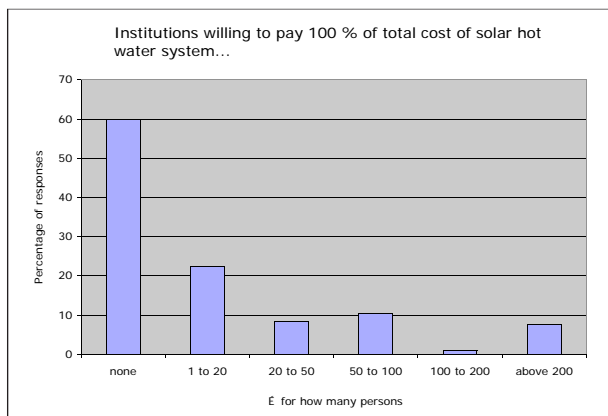


Fig.2.5a

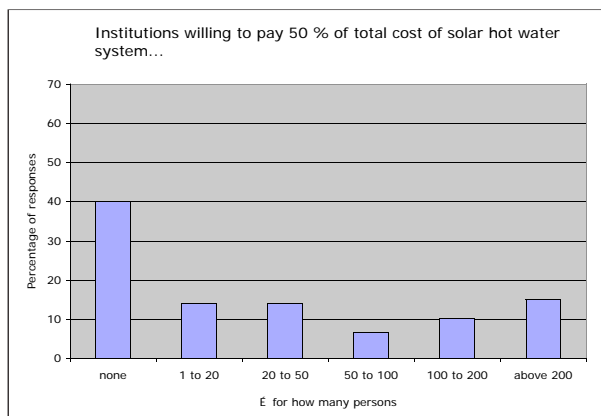


Fig.2.5b

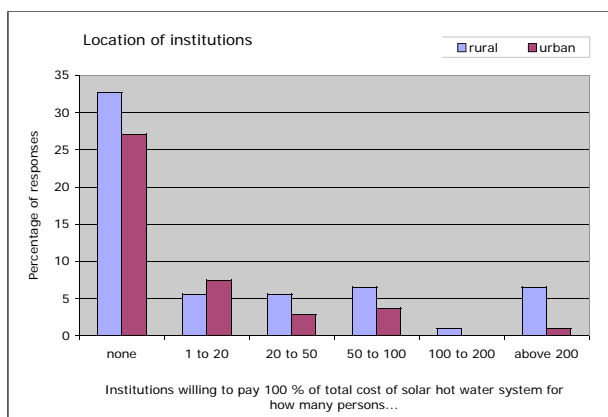


Fig.2.5c

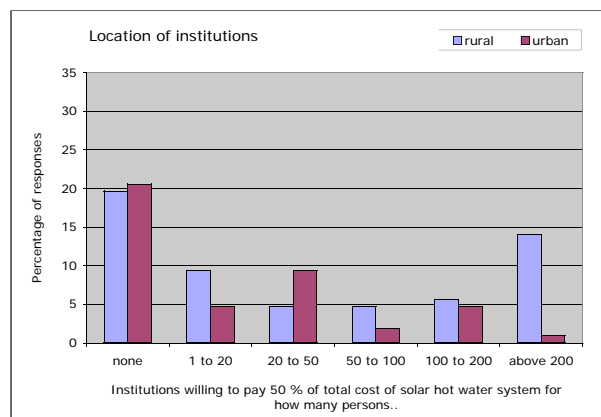


Fig.2.5d

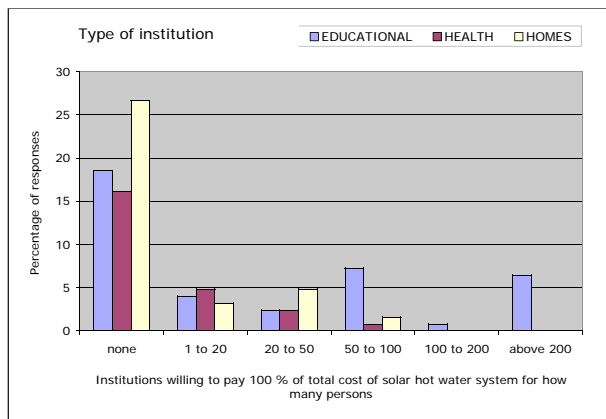


Fig.2.5e

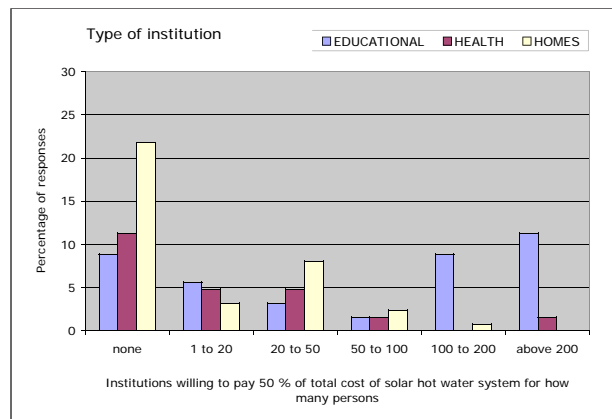


Fig.2.5f

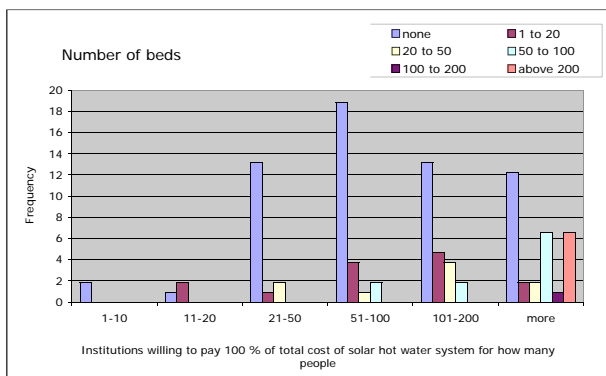


Fig.2.5g

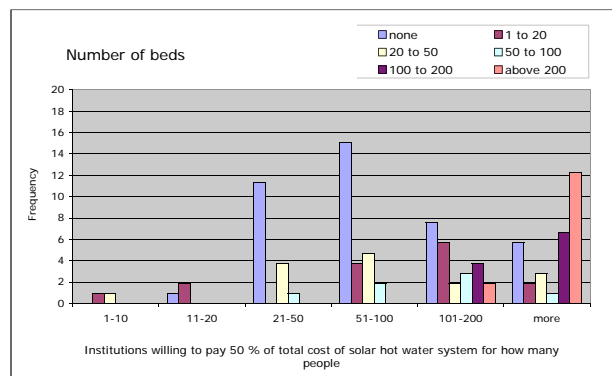


Fig.2.5h

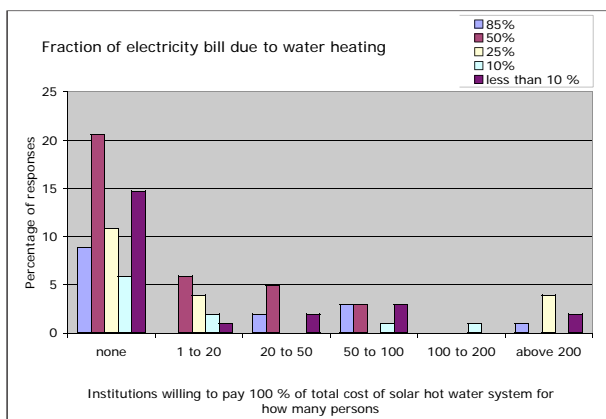


Fig.2.5i

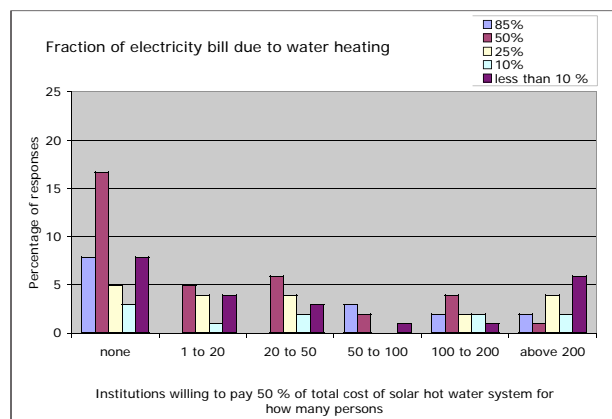


Fig.2.5j

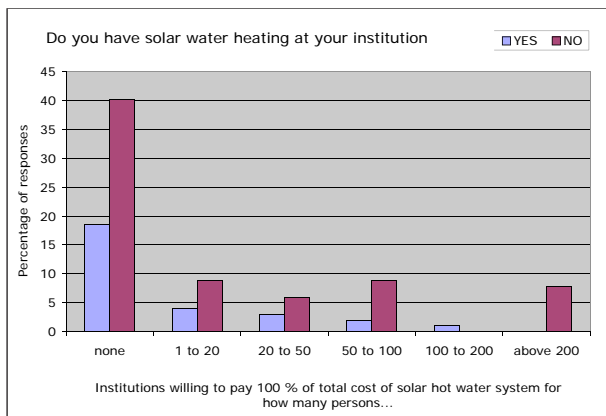


Fig.2.5k

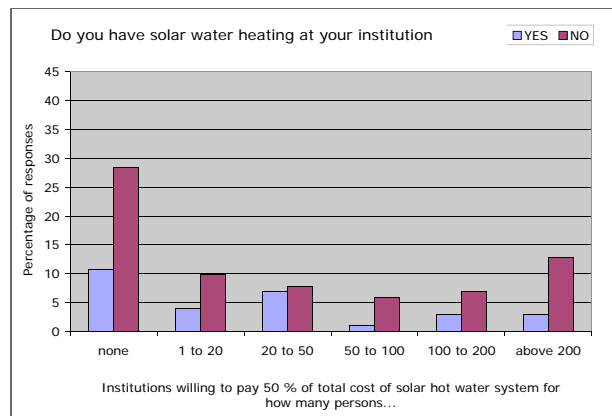


Fig.2.5l

- The electricity bill does not appear to have any influence on the decision. The distributions are very similar.
- The representatives of institutions with and without solar water heaters are similarly weakly inclined to capitalise on the opportunity of a subsidised installation. Nevertheless, one would have expected the institutions with solar experience to be more positive towards the subsidy offer than the ones without a solar record. This shows that the ones with solar heaters on the roof were just fortunate enough to get the systems installed before the days of hyperinflation. Now they are all more or less in the same boat and far fewer than before are able to raise the capital to pay 50% of the total cost.

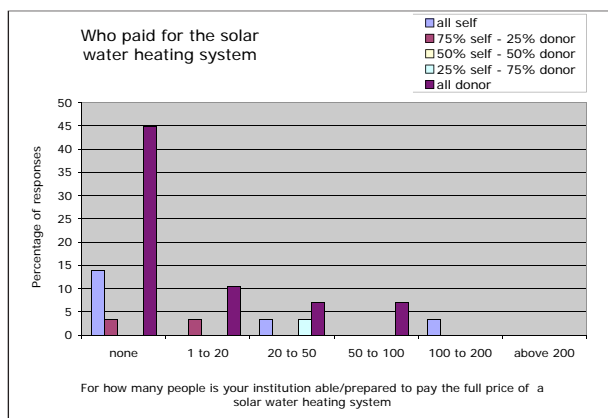


Fig.2.5m

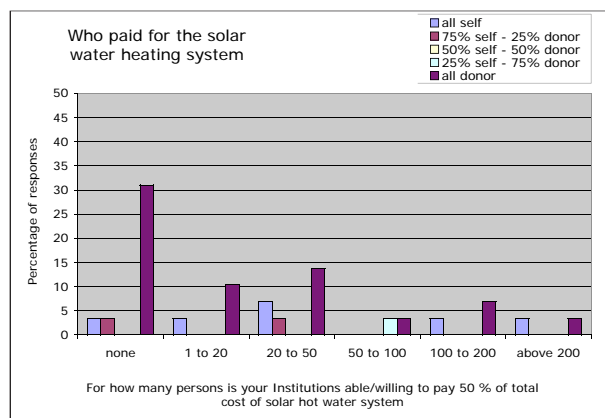


Fig.2.5n

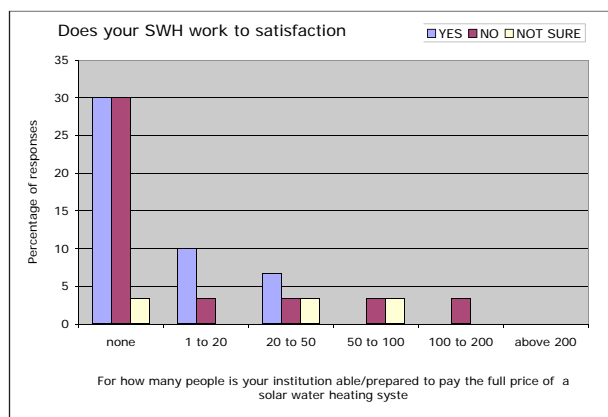


Fig.2.5o

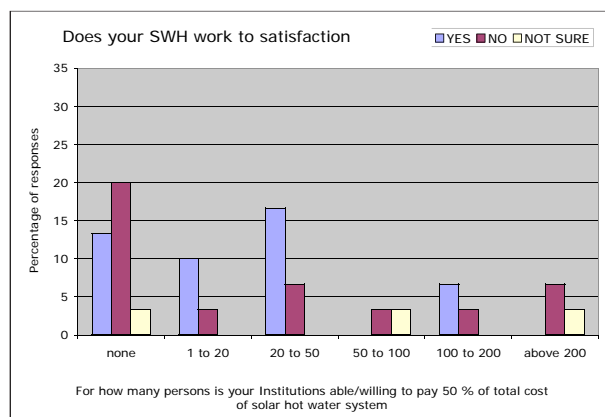


Fig.2.5p

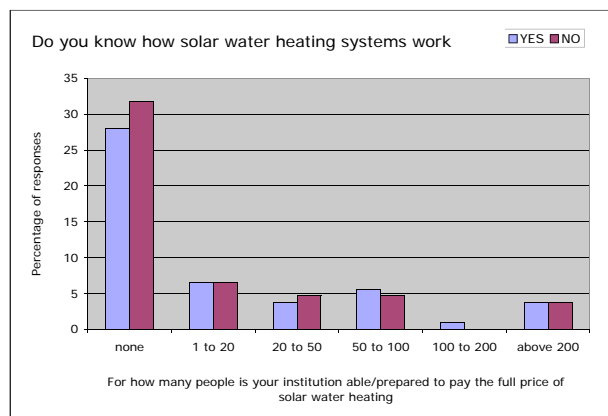


Fig.2.5q

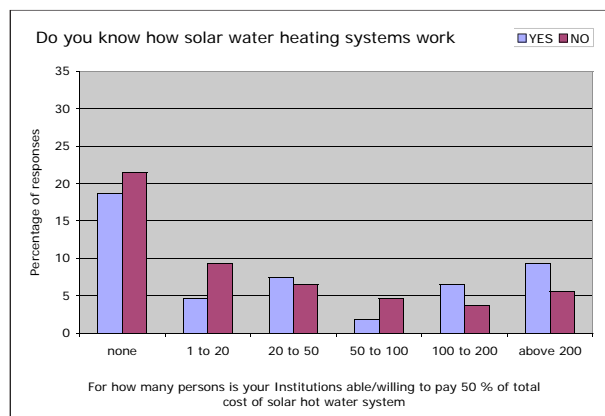


Fig.2.5r

- Almost half the institutions that have been given the solar systems for free in the past are not interested in more units, if they have to pay themselves this time. The offer of the investment cost being shared between them and a donor reduces the percentage of uninterested respondents to about a third.
- There is an evident split within the group of owners of solar hot water systems. Where the existing

system is working to satisfaction the readiness to invest in subsidised solar water heaters is freer and easier than amongst the owners of malfunctioning solar units.

- Knowing how the solar hot water systems work combined with the financial assistance from some donors raises the appetite for solar heated water.

## 2.6. SOURCE OF FUNDING FOR INFRASTRUCTURAL DEVELOPMENTS

The majority of headmasters of boarding schools, superintendents of hospitals and superiors of homes generally blame the decay of buildings and roads and the collapse of health and social services on lack of funds. In the past these institutions could call upon companies and farmers whenever they intended to renovate or add buildings. The same funders generously helped with money when the homes, hospitals or schools decided to upgrade their water heating equipment. The new farmers are far less generous.

### 2.6.1. Sources of funds for infrastructural development

a) **Institution-generated funds:** Like schools, hospitals continuously receive part of their income through fees charged to pupils and patients. This used to be a reliable source of income the institutions could budget with. In the days of hyper-inflation when food prices can go up by one hundred percent in one week the fees have to be constantly raised - topped up - to cover the most urgent expenditures. As a consequence, there is little or no money left for maintenance or for new investments.

This source of income is less available to the homes as they can not invoice the orphans, destitutes and old people who only receive a paltry pension or no pension at all. The homes are trying hard to promote income-generating projects yet their main revenues come from local and foreign benefactors.

b) **Central and local government:** Rural institutions tend to receive more funds from central government than urban ones. At the most, central and local government play a negligible role in the funding of all three categories of institutions. Even though most hospital staff and teachers still get their salaries from the central government there are practically no resources available for acquiring a new water heating system or up-grading and maintaining an existing one.

c) **Local community:** According to the study records, this is a body of people only the educational sector in the rural areas can reckon on. Parents committees may decide to add an extra percentage to the school fees in order to raise money for infrastructural improvements. In days when many parents find themselves unable to raise the base fee this option is reserved for the better off schools.

d) **Donors:** Both urban and rural institutions of all categories rely heavily on donations. Mission schools and homes have always counted on sponsors and benefactors. The majority of the homes would not exist without donor funding as they cannot expect any support from government or from a local community. Also hospitals have to increasingly turn to donors nowadays to be able to give basic help to the patients.

To support this endeavour as shown by the charities, solar companies need to contact their head offices and discuss ways of financing the purchase of solar water heaters for their old and new projects. In many cases staff working in the donor-offices have very limited knowledge about how solar water heaters work and what they can be used for. A mix-up with solar lighting is quite

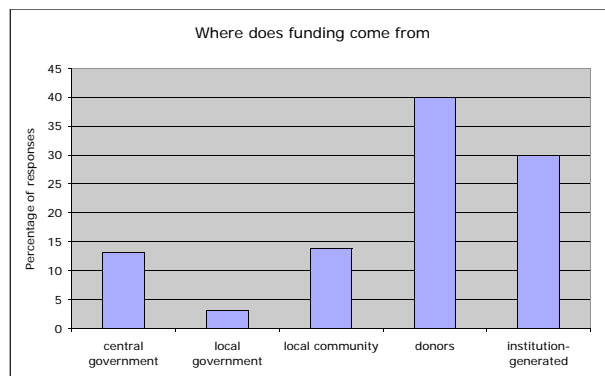


Fig. 2.6.1a

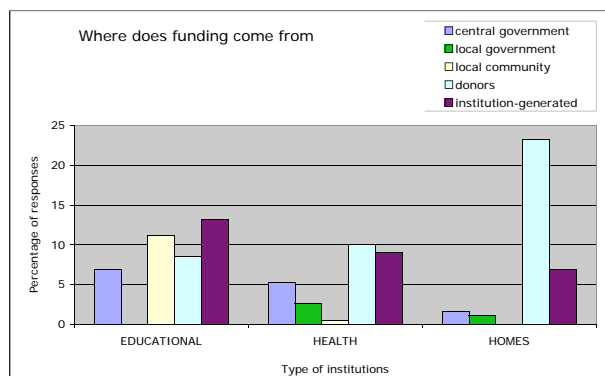


Fig. 2.6.1b

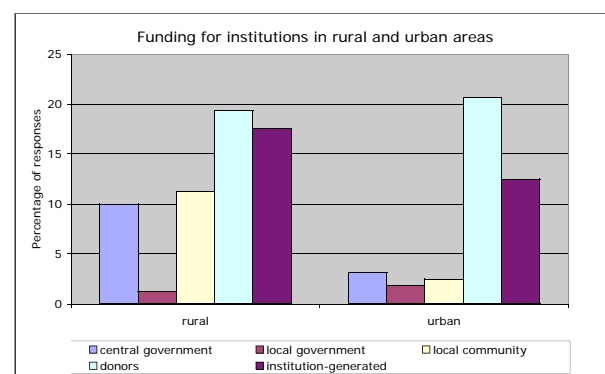


Fig. 2.6.1c

common.

Donors are usually sympathetic towards long-term solutions to the water heating problem. This dependence makes short-term investments very difficult.

Sales people will have to learn the vocabulary of the charity activists and accept the fact that there is virtually no sustained human aid in Zimbabwe except from religious groups. Faith-based groups plan more long-term and feel attached to their institutions and the people living there. Secular funders tend to jump from development programme to programme and quickly abandon failed projects. Reliance on the generosity of benefactors requires the institutions to have a good reputation for responsible spending of the money entrusted to them.

#### 2.6.2. Degree of autonomy of the institutions and ability to make quick decisions

When contemplating trips to distant institutions they have to give hope of substantial orders, because the contractors do not want to waste time and fuel. This issue is not only of enormous importance to traders and installers of solar water heating systems but also to donors. Some institutions take a very long time to consult all stakeholders and to make up their mind whether they want and whether they can afford a new water heating system. Many institutions are run by so-called Trusts and Boards which are constituted by persons from legal, financial, political and manufacturing sector. Even though these bodies meet regularly, it needs a chairman resolved to the acquisition of a solar hot water system to receive a quick decision of the board members. The following graphs provide some insight into how autonomous the institutions are - or claim to be - when it comes to deciding about an infrastructural improvement.

Almost two thirds of all institutions interviewed consider themselves autonomous decision makers, most noticeably the homes. Reaching a decision about the funding of a new water heating system would in most cases not take longer than one month. This can be explained by the attitude of some well-organised owners and of their financial supporters that no valuable time should be wasted on lengthy discussions. Funding organisations quite often choose the recipients of their donations by the capability of the institution to quickly and efficiently carry out aid projects

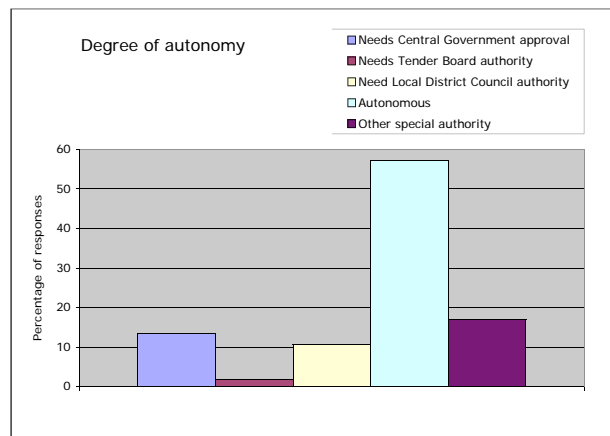


Fig.2.6.2b

decision making process may take up to one year. Concerning the question of investments into infrastructure the large majority of the schools regard themselves as self-governing, i.e., free from interference by central or by local government. Even if they wished to consult the central or district administration, they would not be able to do so due to frequent problems with the telephone line. However, their freedom of making quick decisions is limited by the obligation to consult the parents committee or local authorities/communities. These bodies can



Fig.2.6.2a

before they commit themselves to the fund-raising exercise. Quite often the founders and owners of the homes are also the fund-raisers which helps to avoid conflicts of jurisdiction but can create conflicts of interest.

Although considering itself to a high extent autonomous, the educational sector turns out to be a very bureaucratic one. They have the highest percentage of institutions where the

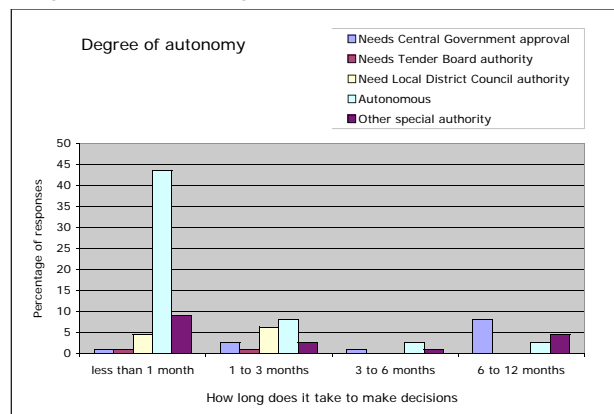


Fig.2.6.2c



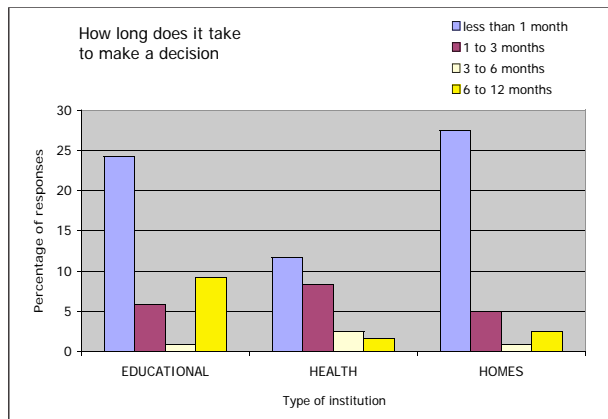


Fig.2.6.2d

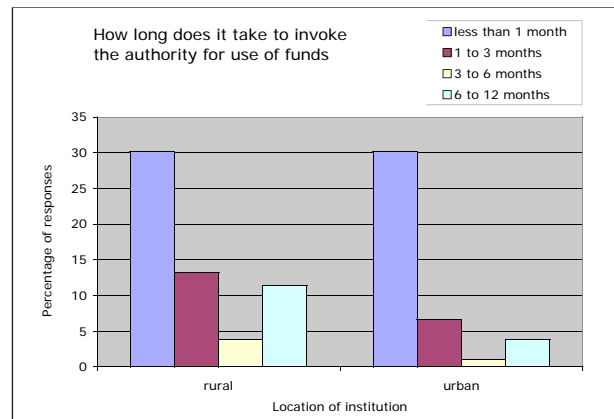


Fig.2.6.2e

cause long holdups, because in many cases the parents committees only meet once per school term, i.e., every four months.

A clear hierarchy and the ability to make swift decisions distinguishes the private hospitals from the health institutions run by the public sector. Were it not for the private hospitals the health sector would perform worse than the boarding schools in the “6 to 12 months” category. The public hospitals don’t appear in the study as no questionnaires were filled in by them. Being public institutions with a cumbersome command chain, these hospitals are not likely to excel as fast decision makers.

### 3. SUMMARY & RECOMMENDATIONS

The team of interviewers went out to explore the hot water situation on the ground of the hospitals, homes and boarding schools. Long distances were travelled and many days, if not weeks, were spent talking to headmasters, deputies, workshop staff, principals, matrons, administrators, chairmen and chairwomen to get 107 questionnaires filled in. After entering the data into the computer the software package generated a vast amount of frequencies and cross-tabulations. The summary leads to the following conclusions:

- Zimbabwe has over 500 institutions with an average of 120 beds/institution. The institutional sector in Zimbabwe has a potentially large market for solar water heating systems.
- At 40 litres/bed and assuming that under optimal conditions 25% of the institutions will purchase SWHS, the total hot water storage installation required is 600,000 litres.
- The corresponding area of solar collector can be estimated to be 12,000 m<sup>2</sup> (9.4 MW) at 0.02 m<sup>2</sup> collector area/litre of storage.
- With an insolation level of 2000 kWh/m<sup>2</sup>/annum, and assuming an overall efficiency of 40%, and a solar fraction of 75%, an electricity saving of 7.7 GWh/annum is possible - equivalent to the continuous output of a 800 kW power station just in this small sector.
- Due to increased demand, the majority of institutions need more heated water between instantly and the next five years.
- Coal-fired and wood-fired boilers remain cold, because the fuel is difficult to come by.
- Cold water for the heaters comes mainly from institution-owned boreholes and from water utilities.
- More than 90 percent of the places visited are connected to electricity grid which facilitates the use of electric backup. The installation of forced-circulation solar systems is not advisable due to unreliable electricity supply unless the pump and control unit are backed up with a battery.
- Most of the institutions use electric geyser for water heating which in many cases are useless in times of lengthy power failures.
- Maintenance of water heating systems only practised at a few places.
- Many electric geysers are out of order due to old age, or lack of spare parts or shortfall of money to buy the spare parts.
- Knowledge about how solar systems work is quite wide spread in the country but grasp is rarely followed by implementation.
- It has become apparent during the interviews that some respondents have unrealistically high expectations of solar water heaters.
- Others have a very bad opinion due to their own or third party experience with low-efficiency and cheap installations.
- The main source of information are the print and electronic media, followed by public conversation and advice provided by traders and manufacturers of solar components.
- People value highest that "Solar energy is inexhaustible" and that "The sun does not send a bill". The respondents are indifferent to the claim that "SWHS use clean energy" and don't believe that "SWHS pay back quickly".
- Amongst the few disadvantages of solar water heating systems the high forward payment needed for the initial purchase is considered the most serious drawback.
- A large majority regards the increased use of solar water heaters as wise but cannot afford the investment.
- About 20 percent of the institutions can pride themselves on using solar water heaters even though not all units are in working condition.
- The breakup of supply of electricity and combustible fuel will leave more institutions with no other choice but installing solar systems, if they want to carry on using hot water.

- The solar water heating systems were either donated to the institutions or paid with institution-generated funds.

## RECOMMENDATIONS

The global use of SWHs is driven by the socio-economic need for job creation, environmental concerns, energy security, national economy and peak demand reduction. Good solar conditions on their own do not necessarily lead to a SWH market penetration or lower prices.

For the sake of the highest national benefit, cost reduction and market penetration it is recommended that arguments of this nature should be put forward insistently to government, in order

- a) to remind them of their responsibility in the field of national energy security,
- b) to make clear that the main barriers of lacking awareness and higher initial costs are more readily overcome where national governments legislate supportive policies, such as
  - > removal of import duty for solar equipment;
  - > long-term budgets for subsidising the installation of SWHs in the institutional and residential, public and private sector;
  - > appeals to international finance or donor organisations for capital where public and private funds do not suffice,
  - > mandatory regulations in favour of solar water heating on all government buildings, in public and private houses, hospitals, schools and homes.

Other recommended steps include:

- Continuous training of local installation and maintenance companies in order to improve the quality of new installations and to set up the missing infrastructure for product back-up and maintenance.
- The institutions themselves need to be educated about the financial and strategic benefits of using SHWS in place of grid electricity for hot water supply. This can be done through organising a workshop(s) for institution representatives, where the benefits of SHWS are discussed together with strategies for raising finance for SHWS.
- Exhibitions of SHWS should be organised to showcase their applicability and potential for energy savings and reliable supply of hot water.
- As it will become more and more difficult for the institutions to generate their own funds, they will have to increase their efforts and attract new donors willing to sponsor the installation of solar technology.
- The traders and manufacturers will have to assist the institutions with technical advice and, in some cases, with connections to funding organisations.

## ANNEX 1: SURVEY QUESTIONNAIRE

**SOLAR ENERGY ZIMBABWE**

## Conservation of the Business Capacity for Solar Water Heater Manufacturing and Installation in Zimbabwe

Funded by the Austrian Development Agency

### Work Package Number 3: Targeted Market Development and Business Co- operation

## Survey Questionnaire

## Introduction

Good morning/ afternoon. I am \_\_\_\_\_ a Researcher from the Development Technology Centre (DTC) of the University of Zimbabwe. We are in the process of conducting a study to obtain detailed knowledge about the demand of solar hot water systems in the institutional sector as well as about the economic, social and technical barriers, which hamper the installation of the systems. Your sincere response to this interview will contribute greatly to the success of this study and will enable the researchers to make representative inference of the study problem in question. Your answers to this interview will be kept confidential and you need not provide your name to the interviewer. The interview will take approximately 30 minutes. Thank you in advance for committing your time to participate in this interview.

### Interview Identification

Date of interview \_\_\_\_\_/\_\_\_\_\_/\_\_\_\_\_  
Day Month Year

Interviewer Name \_\_\_\_\_

Interview Results (please circle number)                      1 Completed    2 Incomplete    3 Refused

Checked by Supervisor \_\_\_\_\_

## SECTION 1: SOCIO- DEMOGRAPHIC INFORMATION

101. Name and address of institution \_\_\_\_\_  
\_\_\_\_\_

102. Location of institution:      1. Rural                                  2. Urban

103. Type of institution

1. Educational provider (boarding school, college etc)
2. Healthy provider (clinic, hospital, maternity home)
3. Rehabilitation Centre
4. Children Old people's home
5. AIDS/ Orphan home
6. Other (specify)

## SECTION 2: EXISTING AND INTENDED USAGE OF HOT WATER AT INSTITUION

201. Besides for cooking purpose, do you use hot water for any other socio-economic activities at the institution?

1. Yes everyday                      2. Yes, sometimes                      3. Never

202. For what purposes do you use (or would you use) hot/warm water at the institution?

1. bathing / showering
2. laundry
3. sterilization
4. Kitchen (dish washing)
5. Other purposes (specify) \_\_\_\_\_

203. How hot do you / would you prefer your water to be for different purposes? (Type an 'x' in appropriate cell)

Purpose	Temperature Warm(37-45°C)	Level at Hot(46-60°C)	Which Scalding (61-90°C)	Water is Boiling(90-100°C)	Required Not Sure
Bathing					
Laundry					
Sterilisation					
Kitchen(dish washing)					

204. In which situations do you consider hot water a necessity at your institution? (type an "x " in appropriate cell)

Purpose	Always	Only on cold days
Bathing and showering for everybody		
Laundry		
Sterilization		
Kitchen (dish washing)		
Bathing for old people, children or the sick		

205 Number of beds in your institution

1. 1 to 10      2. 11 to 20      3. 21 to 50      4. 51 to 100      5. 101 to 200      6. More

206 When does bathing mostly take place at your institution and how many percent have their bath within the given time intervals?

Time of day	% of people at your institution taking bath during this time	
	Winter	Summer

207. Would your institution require more hot water?

1. Yes      2. No

208. For what purpose would your institution need hot water?

- To cater for increased demand in the future
- To satisfy present demand
- For both purposes

209. Are you planning to increase the hot water supply at your institution, and when?

- Yes, almost immediately
- Yes, in the next 1-5yrs
- Yes after 5 years
- No

### **SECTION 3: HYDRAULIC AND OTHER INFRASTRUCTURE AT THE INSTITUTION**

301. What is the source of water at your institution?

- Borehole / deep well
- Dam or river
- Other specify\_\_\_\_\_

302. Do you have a piped water system at your institution?

1. Yes      2. No

303. Are you connected to the electricity grid?

1. Yes      2 No

304. What type of water heating system do you have?

1. Electric geyser
2. Coal/ charcoal boilers
3. Firewood boilers
4. Open fire heating
5. Hybrid (combination of two or more systems)
6. Solar
7. Other (specify)\_\_\_\_\_

305. What is the capacity (in litres) of your hot water storage tank (s)?

1. \_\_\_\_\_
2. don't know

306. Is your water heating system working?

1. Yes
2. Not all of it
3. No

307. If not, what are the reasons?

1. Broken down
2. Discontinued because of high fuel/ electricity cost
3. Discontinued because of high maintenance cost
4. Other reasons (specify) \_\_\_\_\_

308. Do you have a maintenance workshop with qualified and experienced staff at your institution?

1. Yes
2. No

#### SECTION 4: WATER HEATING OPERATING COSTS INCURRED BY INSTITUTION

401. Does your institution spend enough money per year on maintenance and repairs to keep the water heating system functioning?

1. Yes
2. Not enough

402. Which part of your water heating system experiences most frequent breakdowns?

1. Electrical heating element
2. Storage tank
3. Connecting pipe work
4. Other (specify)\_\_\_\_\_

403. What was your electricity bill for the last month?

\$\_\_\_\_\_ per month

404. What fraction of the electricity do you think is due to water heating?

1	2	3	4	5	6
More than 80%	80%	50%	25%	10%	Less than 10%

#### SECTION 5: AWARENESS, USAGE, BENEFITS, PROBLEMS OF THE SOLAR HEATERS

501. Do you know how solar water heating systems work?

1. Yes
2. No

502. From whom have you heard about solar water heaters?

1. Newsprint, radio, TV, exhibitions, etc
2. Solar water heater manufactures, traders, etc
3. Public conversation
4. Other sources (specify)\_\_\_\_\_

503. Are you aware that solar water heaters can heat water to temperature levels, which you require at your institution?

1. Yes 2. No

504. Do you have a solar water heating system at your institution?

1. Yes 2. No

505. What type of solar water heating system?

1. Solar stand-alone (solar only) 2. Hybrid system (solar with electric back-up)

506. How many SWH units of the sizes listed have you got installed?

1. Up to 300 litres.....  
2. 300 to 500 litres.....  
3. 500 to 1000 litres.....  
4. 1000 to 2000 litres.....

507. When were the SWHs installed?

1. Before 1980  
2. 1980- 1989  
3. 1990-2000  
4. After 2000

508. Who paid for the SWH?

1. all self  
2. 75% self - 25% donor  
3. 50% self -50% donor  
4. 25% self- 75% donor  
5. all donor

509. Is the solar hot water system working to your satisfaction?

1. Yes 2. No 3. Not sure

510. Some of the advantages of solar water heaters when compared to electricity geysers or coal- fired boilers are listed in the table below. If you had to win over your boss to purchase a solar water heating system, which of the statements below would be most helpful and which less important? With your institution in mind, rank the advantages from 1 to 6 (with 1 as the most preferred rank and 6 the lowest rank).

Advantages	Rank
• solar energy is inexhaustible- the sun rises everyday	
• The sun does not send a bill	
• Solar water heaters have lower maintenance costs	
• Their energy source cannot be switched off under your nose by the power utility (ZESA say)	
• They use clean energy with no emissions to the environment	
• In sunny countries (like Zimbabwe) and electricity tariffs are high, they pay themselves back quickly	

511. Some of the disadvantages of water solar water heaters are listed below. Assuming a sales person wants to talk you into purchasing a SWH, which of the statements below would describe your doubts about the benefits of SWHs best? With your institution in mind, rank the disadvantages from 1 to 3 (Rank 1 is the most serious disadvantage)

Disadvantage	Rank
• For some few days in a year you might have no hot water supply because of continuous cloud cover	
• You need a high forward payment for the initial purchase of the solar water heating system	
• They need more space and surface area than the conventional electric geysers	

512. Weighing the above advantages and disadvantages, do you think it is wise for your institution to switch to solar water heaters.?

1. yes 2. no 3. undecided

513. Which is the most serious barrier hampering your institution from using (increased use of) solar water heaters?

1. Lack of awareness of the financial and environmental benefits of using solar water heaters
2. Lack of capital to meet the high initial cost of solar water heaters
3. Unavailability of a local industry to manufacture and provide back up services
4. Lack of faith in the reliability of solar water heaters in delivering a consistent hot water supply given the intermittent nature of solar energy
5. Fear to change from the traditional and time- proven methods of heating water

514. What should be done at your institution or on a broader base that you can get the solar water heaters?

1. ....
2. ....

#### **SECTION 6 ABILITY/ WILLINGNESS TO PAY FOR SOLAR WATER HEATER**

601. Assuming the power cuts are getting longer and more frequent and the management of your institution is contemplating the acquisition of solar water heaters, for how many people (of number of beds, etc) is your institution prepared and able to pay for solar hot water ? The cost of purchasing and installing a solar water heater system at institutional level is estimated at \$Z 20 million / capita.

1. None
2. 0 to 20
3. 20 to 50
4. 50 to 100
5. 100 to 200
6. Above 200

602. If the solar water heating systems are subsidised to the tune of 50%, how many people will you be prepared to provide with solar heated water?

1. 0
2. 0 to 20 people
3. 20 to 50 people
4. 50 to 100 people
5. 100 to 200 people
6. Above 200 people

603. Where does funding for infrastructure development at your institution come from?

1. Central Government (e.g. PSIP)
2. Local government (e.g. district council)
3. Local community (e.g. school development committee)
4. Donors
5. Institution generated funds
6. Other (specify) \_\_\_\_\_

604. If your institution decides to switch to solar water heating, what degree of autonomy does it have in using funds to purchase the solar water heaters?

1. Needs Central Government approval through PSIP BIDS
2. Needs Tender Board authority
3. Needs local District Council Authority or parents board authority
4. Institution has autonomous authority to use funds
5. Needs other special authority (specify) \_\_\_\_\_

605. Approximately how long does it take to invoke the authority for the use of funds?

1. Less than 1 month
2. 1 to 3 months
3. 3 to 6 months
4. 6 to 12 months



## ANNEX 2: LIST OF NON-GOVERNMENTAL SOCIAL CARE INSTITUTIONS IN ZIMBABWE (SOURCE: NANGO - NATIONAL ASSOCIATION OF NON- GOVERNMENTAL ORGANISATIONS)

CHILDREN'S HOMES		
Name		Location
1.	Abandoned babies committee	Harare
2.	Africa Child in Hand	Harare
3.	All Souls mission children's home	Mutoko
4.	Anna Bartono Centre	Chinhoyi
5.	Batsirai Group	Beitbridge
6.	Bezer Children's Home	Harare
7.	Cheshire Children's Home	Harare
8.	Children's House Association	Bulawayo
9.	Chinhoyi Orphanage (Good Shepherd Centre)	Chinhoyi
10.	Chinyaradzo Children's Home	Harare
11.	Chirinda Orphanage	Chipinge
12.	Chitenderano Homes	Harare
13.	Emerald Hill Children's Home	Harare
14.	Fairfield Children's Home	Mutare
15.	Forward in Faith Children's Home	Mutare
16.	George Fleming House	Harare
17.	Harare Children's Home	Harare
18.	Jairos Jiri Mukuwapasi	Rusape
19.	John Smale	Bulawayo
20.	Khayelihle	Bulawayo
21.	Makumbi	Harare
22.	Marist Camp	Norton
23.	Mathew Rusike Children's Home	Harare
24.	Midlands Training Centre	Gweru
25.	Mother of Peace Orphanage Community	Mutoko
26.	Mt. Mulleray Mission Orphanage	Nyanga
27.	New Dawn Children's Care Trust	Harare
28.	Pied Piper	Chinhoyi
29.	Queen Elizabeth Adventist	Bulawayo
30.	Robert Mugabe Children's Home	Mutare
31.	Sacred Heart Convent Orphanage	Rusape
32.	Sharon Cohen	Chitungwiza
33.	Shearly Cripps	Murewa
34.	Shingirayi Trust	Chinhoyi
35.	SOS Children's Village	Harare
36.	St Joseph House For Boys	Harare
37.	Thembiso	Bulawayo
38.	Tinotenda Help Centre	Harare/ Bulawayo
39.	Vimbai Nesu	Zvimba
40.	Westwood Cheshire Home for Disabled	Harare
41.	Zimbabwe Child Survival and Development Foundation	Harare
42.	Zimbabwe Children's Home	Harare
OLD PEOPLE'S HOMES		
Name		Location
1.	Batanayi	Gweru
2.	Boggies Trust	Gweru
3.	Borradail Trust/Training Centre	Marondera
4.	Bulawayo Society for the adult blind	Bulawayo
5.	Chirinda Orphanage	Harare
6.	Chitenderano Homes	Rusape
7.	Darby and Joan Centre for the Aged	Harare
8.	Eastern Highlands Trust	Mutare
9.	Edith Duly Nursing Home	Bulawayo
10.	Ekhuphumuleni Geriatric Nursing Home	Bulawayo
11.	Entembeni Homes Society	Bulawayo
12.	Fairways Homes for Aged Persons	Harare

13.	Helpage Zimbabwe	Harare
14.	Ida Wekwako Old Aged Home	Marondera
15.	Jairos Jiri Association	Masvingo
16.	Jairos Jiri Association	Bulawayo
17.	Jairos Jiri Association	Harare
18.	Mt Pleasant Senior Citizen's Trust	Harare
19.	Mutikizizi Old People's Home	Masvingo
20.	National Organisation For Development of the Disadvantaged	Harare
21.	Society For The Destitute Aged	Harare
22.	The B.S Leon Trust	Harare
23.	Zororai Homes Society	Mutare

#### Rehabilitation Centres

Name		Location
1.	Bulawayo Society for the Adult Blind	Bulawayo
2.	Dorothy Duncan Centre	Harare
3.	Jairos Jiri Association	Harare
4.	Jairos Jiri Association	Bulawayo
5.	Jairos Jiri Association	Rusape
6.	Jairos Jiri Association	Masvingo
7.	Masvingo Organisation For the rehabilitation of street children	Masvingo
8.	National Organisation for Development of the Disadvantaged	Harare
9.	Rukariro Rehabilitation Programme	Mutare
10.	St Giles Rehabilitation Centre	Harare
11.	Streets Ahead	Harare

#### 1.1.2. AIDS/ Orphan Homes

Name		Location
1.	Child Protection Society	Harare
2.	Chitenderano Homes	Rusape
3.	Fairfield Children's Homes	Mutare
4.	New Dawn Children's Homes	Harare
5.	SOS Children's Village	Harare

### ANNEX 3: LIST OF BOARDING SCHOOLS (SOURCE- MINISTRY OF EDUCATION SPORTS AND CULTURE.)

	Primary Boarding schools			
Region	Prim_sec	Opmode	Name	Phone
1. Harare	1	3	ST. CATHERINE SPEC.	746734
2. Harare	1	3	HIGHLANDS	496444-6
3. Harare	1	3	MOFFAT	771175
4. Harare	1	3	SELBORNE ROUTLEDGE	796438
5. Harare	1	3	ST. GILES	791139
6. Harare	1	3	CHISIPITE JUNIOR	495950
7. Harare	1	3	BISHOPSLEA	740523
8. Harare	1	3	LILFORDIA	
9. Manicaland	1	3	CHENGETAI	020-67694
10. Manicaland	1	3	CHANCELLOR	020-61462
11. Manicaland	1	3	CHIPINGE	027-2229
12. Manicaland	1	3	MUTAMBARA CENTRAL	026-2751
13. Manicaland	1	3	HARTZELL	020-64733
14. Manicaland	1	3	NYAZURA	02583-3773
15. Manicaland	1	3	JOHN COWIE	025-2648
16. Manicaland	1	3	CHIMANIMANI	026-2230
17. Manicaland	1	3	MANZINDE	NIL
18. Manicaland	1	3	HILLCREST PREPARATORY	020-63120
19. Manicaland	1	3	MVURACHENA	027-237424
20. Manicaland	1	3	HIGHVELD	025-3291
21. Mash Central	1	3	BINDURA	071-6655
22. Mash Central	1	3	UMVUKWES	077-2402
23. Mash Central	1	3	AMANDAS	075-62381/2
24. Mash Central	1	3	TSAMVI	076-24585
25. Mash Central	1	3	BARWICK	0756-225829
26. Mash East	1	3	NHOWE C.P.S	078-2464
27. Mash East	1	3	BEATRICE GOVERNMENT	065 309
28. Mash East	1	3	MUREWA CENTRAL	078-22113/4
29. Mash East	1	3	NYADIRE	072-2802
30. Mash East	1	3	GODFREY HUGGINS	
31. Mash East	1	3	CHEMHANZA	022-2274
32. Mash East	1	3	WADDILOVE	079-20261

33.	Mash East	1	3	MACHEKE GOVT.	079 341
34.	Mash East	1	3	SPRINGVALE HOUSE	079-23598
35.	Mash East	1	3	MAKUNDE	078 2273
36.	Mash East	1	3	HOME PARK	0798-338
37.	Mash East	1	3	TONGOGARA	
38.	Mash West	1	3	BANKET	2303-066
39.	Mash West	1	3	DARWENDALE	069-351
40.	Mash West	1	3	RUBATSIRO	068 23233
41.	Mash West	1	3	DUDLEY HALL PRIMARY	062-2201-4
42.	Mash West	1	3	HARTLEY 1 PRIMARY	053-2201
43.	Mash West	1	3	KAROI PRIMARY	064-6369
44.	Mash West	1	3	SINOIA	067-22308
45.	Mash West	1	3	SIR JOHN KENEDY PRIMARY	068-22352
46.	Mash West	1	3	RYDINGS	6329 (064)
47.	Mash West	1	3	LOMAGUNDI COLLEGE	067-23223
48.	Mash West	1	3	BRYDEN COUNTRY	0532301/2395
49.	Masvingo	1	3	RATIDZO ZIMCARE	63579
50.	Masvingo	1	3	VICTORIA PRIMARY	62833
51.	Masvingo	1	3	BONDOLFI PRIMARY	7696
52.	Masvingo	1	3	GOKOMERE C.P.S.	62319
53.	Masvingo	1	3	EBENHAEZER PRIMARY	
54.	Masvingo	1	3	MURRAY MACDOUGALL	6234
55.	Masvingo	1	3	MUTENDI	2409
56.	Masvingo	1	3	HIPPO VALLEY	5151 OR 4146
57.	Masvingo	1	3	KYLE PREPARATORY	64198
58.	Mat North	1	3	SIR HUMPHREY GIBBS	09-70963
59.	Mat North	1	3	ST FRANCIS	09-63411
60.	Mat North	1	3	HILLSIDE	09-44179
61.	Mat North	1	3	JOHN SLAVEN	09-44319
62.	Mat North	1	3	KING GEORGE VI	09-60624
63.	Mat North	1	3	WHITESTONE	09-44041
64.	Mat South	1	3	USHER	083-367
65.	Mat South	1	3	ST CHRISTOPHER'S	084-22421
66.	Mat South	1	3	SACRED HEART	088-274
67.	Mat South	1	3	PORTLAND	
68.	Midlands	1	3	JAIRIS JIRI CENTRE	054-23741/2
69.	Midlands	1	3	MUDAVANHU ZIMCARE	054 50457

70.	Midlands	1	3	MNENE	0518-3202
71.	Midlands	1	3	DRIEFONTEIN	032-3004
72.	Midlands	1	3	LOWER GWELO	154 24243
73.	Midlands	1	3	MVUMA	032-523
74.	Midlands	1	3	KWEKWE PRIMARY	055 22510
75.	Midlands	1	3	SELUKWE	052-6343
76.	Midlands	1	3	SOMABHULA	054 24594
77.	Midlands	1	3	STANLEY	054 22423
78.	Midlands	1	3	ANDERSON	054-21864
79.	Midlands	1	3	MIDLANDS CHRISTIAN	054 24930
80.	Midlands	1	3	GOLDRIDGE PRIMARY	055-23561

		Prim_sec	Name	Phone	Opmode
81.	Harare	2	NYATSIME COLLEGE	070-24971	2
82.	Harare	2	ARUNDEL HIGH	04 335654/7	3
83.	Harare	2	EAGLESVALE SEC SCHOOL	664488/0	3
84.	Harare	2	CHISIPITE SENIOR SCH.	04 490714/5	3
85.	Harare	2	ST. GEORGES' COLLEGE	724650	3
86.	Harare	2	DANHIKO SEC SCHOOL	492382	3
87.	Harare	2	EMERALD HILL FOR THE DEAF	339282	2
88.	Harare	2	ALLAN WILSON HIGH	708080	3
89.	Harare	2	CHURCHILL BOYS HIGH	747088/94	3
90.	Harare	2	ELLIS ROBINS BOYS HIGH	302627/8	3
91.	Harare	2	GIRLS HIGH	720546	3
92.	Harare	2	MABELREIGN GIRLS HIGH	305171	3
93.	Harare	2	MARLBOROUGH HG	309088/9	3
94.	Harare	2	PRINCE EDWARD HIGH	792240	3
95.	Harare	2	QUEEN ELIZABETH GIRLS	796430	3
96.	Harare	2	F.D. ROOSEVELT GIRLS	747371	3
97.	Manicaland	2	CHIKORE HIGH	027-233419	3
98.	Manicaland	2	ST AUGUSTINE'S	020/222117	2
99.	Manicaland	2	MUTAMBARA HIGH	026-2717	2
100.	Manicaland	2	HARTZELL	020-64762	2
101.	Manicaland	2	ST PATRICKS	026-2498	3
102.	Manicaland	2	RATELSHOEK	027-2724	2
103.	Manicaland	2	NYANGA HIGH	029-8-524	2
104.	Manicaland	2	ST DAVID'S BONDA	029-2311	2
105.	Manicaland	2	JERSEY	027-2592	2
106.	Manicaland	2	MT SELINDA	027-4403	3
107.	Manicaland	2	KRISTE MAMBO	029-2379	3

108. Manicaland	2	REGINA COELI	0298-565	3
109. Manicaland	2	ST KILLIAN'S	02583-2793	3
110. Manicaland	2	ST BENEDICTS	02582-22861	3
111. Manicaland	2	EMMANUEL	0298-636	3
112. Manicaland	2	ST FAITH'S	025-3732	3
113. Manicaland	2	ST MARY MAGADALENE'S	0298-518	2
114. Manicaland	2	MAKUMBE	021-23501	3
115. Manicaland	2	NYAZURA	02583-581	2
116. Manicaland	2	RUSITU	026-25533	3
117. Manicaland	2	GIDEON MHLANGA	024-433	3
118. Manicaland	2	MARANGE HIGH	0204-23711	3
119. Manicaland	2	NYASHANU	021-2234	3
120. Manicaland	2	LYDIA CHIMONYO HIGH	026-2799	2
121. Manicaland	2	BIRIRI HIGH	026/2438	3
122. Manicaland	2	CHIBUWE	024-315	3
123. Manicaland	2	MUNYORO	020-82104	3
124. Manicaland	2	HILLCREST COLLEGE	020 61053	3
125. Manicaland	2	MUKAMBIRWA	NIL	3
126. Manicaland	2	CHARLES LLWANGA	0262753	3
127. Manicaland	2	ST MATTHIAS TSONZO	028- 25881	3
128. Manicaland	2	MAVHUDZI	02583-344	3
129. Manicaland	2	MUTARE BOYS HIGH	020/62301	3
130. Manicaland	2	MUTARE GIRLS HIGH	020-62673	3
131. Mash Central	2	BRADLEY	076-2757/251	3
132. Mash Central	2	MAVHURADONHA	076-2320	3
133. Mash Central	2	RUYA ADVENTIST	076-2654	3
134. Mash Central	2	MAZOWE HIGH	075-25603	2
135. Mash Central	2	ST.ALBERTS	057-258	3
136. Mash Central	2	HOWARD	0758-2517	3
137. Mash Central	2	NYAMATIKITI	076-2693	3
138. Mash Central	2	LANGHAM	077-2237	3
139. Mash Central	2	ST.PHILIPS MAGWENYA	058-23157	3
140. Mash Central	2	CHINDUNDUMA	076-2710	3
141. Mash Central	2	CHIPINDURA	071-6856	3
142. Mash Central	2	MUSHUMBI	058-295	3
143. Mash Central	2	CHINDUNDUMA II	076-2727	3
144. Mash East	2	ST PAULS MUSAMI	078-2051	3
145. Mash East	2	BERNARD MIZEKI	079/21181	2
146. Mash East	2	MONTE CASSINO GIRLS'	07798-240	2
147. Mash East	2	ST IGNATIUS COLLEGE	04-499403-6	2

148.	Mash East	2	CHRIST THE KING DARAMOMBE	056-27402	3
149.	Mash East	2	MUREWA HIGH	078-2113/4	3
150.	Mash East	2	NYAMUZUWE HIGH	072-2700	3
151.	Mash East	2	ST FRANCIS OF ASSISI	056-27603	2
152.	Mash East	2	VISITATION MAKUMBI	04 883914	3
153.	Mash East	2	ST ANNE'S GOTO	022 2947	3
154.	Mash East	2	WADDILOVE HIGH	079-23611	2
155.	Mash East	2	MT ST MARY'S	NIL	3
156.	Mash East	2	ST DOMINICS	04-499148	2
157.	Mash East	2	NHOWE	078/2464	3
158.	Mash East	2	KWENDA	022-422	2
159.	Mash East	2	NAGLE HOUSE	079-23370	3
160.	Mash East	2	PETERHOUSE	079-24951	3
161.	Mash East	2	ST JOHNS	074-2758	3
162.	Mash East	2	UZUMBA	078-2323	2
163.	Mash East	2	MANDEDZA	070-21647	3
164.	Mash East	2	NYADIRE	072-2490	3
165.	Mash East	2	MUTOKO HIGH	072-2484	3
166.	Mash East	2	ALL SOULS	2526	2
167.	Mash East	2	NYAHUNI (MAKUNDE)	078-2276	3
168.	Mash East	2	KUSHINGA	NIL	2
169.	Mash East	2	WATERSHED	079 23172	3
170.	Mash East	2	BIMHA	NIL	3
171.	Mash East	2	CHEMHANZA	022 279	3
172.	Mash East	2	GOROMONZI HIGH	074 2661/3	3
173.	Mash East	2	MARONDERA HIGH	079-23680	3
174.	Mash East	2	RUSUNUNGUKO SEC	073 22792	3
175.	Mash west	2	KUTAMA COLLEGE	069 325	3
176.	Mash west	2	SANDRINGHAM sec	062--3551	3
177.	Mash west	2	NGEZI HIGH	056 24306	3
178.	Mash west	2	MOLELI SEC	0628-44290	2
179.	Mash west	2	SANYATI BAPTIST HIGH	068 346/6	3
180.	Mash west	2	PRESBYTERIAN	065 3064	3
181.	Mash west	2	ST MARK'S DIOCESAN SEC	053--27868	3
182.	Mash west	2	NORTHCOT	04-308238	3
183.	Mash west	2	CHIKANGWE	064 6532	3
184.	Mash west	2	ST MICHAELS SEC	065 3360	3
185.	Mash west	2	JAMESON HIGH	068 2331\6	3
186.	Mash west	2	MSENGEZI SEC	0628--44259	2
187.	Mash west	2	CHINHOYI HIGH	067 22372	3
188.	Masvingo	2	ZIMUTO	039 7277	2



189.	Masvingo 2	GOKOMERE	63235	3
190.	Masvingo 2	MUKARO	030/2709	3
191.	Masvingo 2	CHINGOMBE II	030-25504	3
192.	Masvingo 2	JICHIDZA	034 22453	3
193.	Masvingo 2	CHIBI HIGH	NIL	2
194.	Masvingo 2	BEREJENA	036 464/2154	3
195.	Masvingo 2	MARGARETHA HUGO	7263	2
196.	Masvingo 2	LUNDI	036-412	3
197.	Masvingo 2	GUTU HIGH	030-2444	3
198.	Masvingo 2	DEWURE	030-2519	3
199.	Masvingo 2	MASHOKO	034-22704	3
200.	Masvingo 2	SILVEIRA	038-63057	2
201.	Masvingo 2	ST ANTHONY'S HIGH	22358	2
202.	Masvingo 2	PAMUSHANA	038-361	2
203.	Masvingo 2	SERIMA	030- 8 252	3
204.	Masvingo 2	MUTERO	030-2696	3
205.	Masvingo 2	HEBRON PAMBE SEC	NIL	3
206.	Masvingo 2	SOUTH EASTERN COLLE	031/3187	3
207.	Masvingo 2	MUTENDI	038 2400	3
208.	Masvingo 2	SHAZHAUME(BUDIRIRAI)	NIL	3
209.	Masvingo 2	VICTORIA HIGH	62549	2
210.	Masvingo 2	MWENEZI GOVT	NIL	3
211.	Masvingo 2	MALIPATI	014/2151	3
212.	Masvingo 2	RIVERTON ACADEMY	63266	2
213.	Mat north 2	INYATHI HIGH	085-217	3
214.	Mat north 2	JOHN TALLACH SEC	085-343	3
215.	Mat north 2	GLOAG SEC	085-2003	3
216.	Mat north 2	REGINA MUNDI SEC	089-8-372	2
217.	Mat north 2	ST.JAMES SEC	087-354	2
218.	Mat north 2	D. LIVINGSTONE SEC	03611	3
219.	Mat north 2	MARIST BROTHERS SEC	018-2701	2
220.	Mat north 2	KING GEORGE VI SEC	09-60624	3
221.	Mat north 2	T/HLABANGANA SEC	09-43487	3
222.	Mat north 2	HLANGABEZA SEC	055-8-321	3
223.	Mat north 2	TSHOLOTSHO HIGH	087-8-208	2
224.	Mat north 2	GIRLS COLLEGE HIGH	09-78118	3
225.	Mat north 2	BINGA SEC	015-330	3
226.	Mat north 2	GEORGE SILUNDIKA SEC	087-389	2
227.	Mat north 2	EVELINE HIGH	09-60562	3
228.	Mat north 2	FATIMA HIGH	089-244	3
229.	Mat north 2	FOUNDERS HIGH	09-463012	3

230.	Mat north	2	GIFFORD HIGH	09-68244	3
231.	Mat north	2	LUVEVE SEC	09-531124	3
232.	Mat north	2	MILTON HIGH	09-251582/3	3
233.	Mat north	2	NORTHLEA HIGH	09-69241	3
234.	Mat north	2	TOWNSEND HIGH	09-43375	3
235.	Mat south	2	MATOPO	0838 274/279	3
236.	Mat south	2	THEKWANI HIGH	019-2456	3
237.	Mat south	2	CYRENE	083-336/214	3
238.	Mat south	2	WANEZI	017-432	3
239.	Mat south	2	USHER	083-353	3
240.	Mat south	2	DOMBODEMA	NIL	3
241.	Mat south	2	MANAMA HIGH	084 / 3264	3
242.	Mat south	2	SOLUSI ADVENTIST	083-305/264	3
243.	Mat south	2	FALCON COLLEGE	088-331/2	2
244.	Mat south	2	EKUSILENI	NIL	3
245.	Mat south	2	MINDA SECONDARY	082-234	3
246.	Mat south	2	ZEZANI	016-3506	3
247.	Mat south	2	J Z MOYO HIGH	NIL	2
248.	Mat south	2	MZINGWANE	088-352	3
249.	Mat south	2	PLUMTREE HIGH	019-2484	3
250.	Mat south	2	TONGWE GOVT	086-2281	3
251.	Midlands	2	CHEGATO	151-7-2302	3
252.	Midlands	2	DADAYA	051-2303	2
253.	Midlands	2	HAMA	130-8-213	3
254.	Midlands	2	CHIKWINGWIZHA	054-27121	2
255.	Midlands	2	LOWER GWELO	54-24243	3
256.	Midlands	2	RIO TINTO ZHOMBE	055-20068	3
257.	Midlands	2	LORETO	558-381/2302	3
258.	Midlands	2	MASASE	016 - 4601	3
259.	Midlands	2	MUSUME	151-364	3
260.	Midlands	2	ST PATRICKS	54-32806	3
261.	Midlands	2	ANDERSON SEC	54-23424	3
262.	Midlands	2	HANKE	052-642515	3
263.	Midlands	2	SHUNGU	055-30112	2
264.	Midlands	2	PAKAME	052-64116	2
265.	Midlands	2	MIDLANDS CHRISTIAN COLLEG	054-23153/24	3
266.	Midlands	2	MNENE	051-3204	3
267.	Midlands	2	KUBATANA	NIL	3
268.	Midlands	2	CHAPLIN	54-22050	3
269.	Midlands	2	FLETCHER	054-60034	3
270.	Midlands	2	NASHVILLE	54-24330	3

271.	Midlands	2	NKULULEKO	55-34006	3
272.	Midlands	2	KWEKWE	055-23301	3
273.	Midlands	2	THORNHILL	54-23961/2	3
274.	Midlands	2	TONGOGARA	052-6295	3
275.	Midlands	2	ZHOMBA	NIL	3
276.	Midlands	2	GUINEA FOWL	23992,25893,	3
277.	Midlands	2	DAMBUDZO	051-255321	3
278.	Midlands	2	GOLDRIDGE COLLEGE	21353/63	3

# ANNEX 4: LIST OF PRIVATE HOSPITALS AS PRESENTED BY ZIMBABWE ASSOCIATION OF CHURCH RELATED HOSPITALS (ZACH)

Name	Location
1. Adventist Dental Practice(SDA)	Bulawayo
2. Adventist Orthodontic Clinic(SDA)	Highlands
3. Arnordine	
4. Arnoldine Clinic	Headlands
5. Avilia Hospital	Nyanga
6. Bazha Clinic	Figtree
7. Berejena	Masvingo
8. Bonda	Mutare
9. Bondolfi	Masvingo
10. Bumhudzo	Chitungwiza
11. Chibi	Nyaningwe
12. Chidamoyo	Karoi
13. Chikombedzi	Chiredzi
14. Chikore	Chipinge
15. Chikwariro	Mutare
16. Chikwingwizha	Gwere
17. Chikwizo	Mutoko
18. Chindenga	Rusape
19. Chinyadza	Gokwe
20. Chireya	Gokwe
21. Chitora	Mutare
22. Chitsungo	Guruve
23. Damarakanaka	Nyika
24. Daramombe	Chivhu
25. Denda	Kadoma
26. Dendera	Mutoko
27. Dindi	Mutoko
28. Driefontein Sanatorium	mvuma
29. Elim	Nyanga
30. Embakwe	Nyanga
31. Empandeni	Plumtree
32. Gandachibvura	Chivhu
33. Epworth	Harare
34. Gatsi	Hauna
35. Gokomere	Masvingo
36. Goredema	Kadoma
37. Gutu	Gutu
38. Gwenzi	Selinda
39. Hanke	Shurugwi
40. Holy Cross	Mvuma
41. Honde Clinic	Mutare
42. Howard	Howard
43. Hwange	Hwange
44. Jichidza	Masvingo
45. Kamativi	Jichidza

46. Kamativi	Masvingo
47. Karanda	Mt Darwin
48. Kariyangwe	Binga
49. Lower Gweru	Gweru
50. Luisa Guidotti	Mutoko
51. Lukunkuli	Hwange
52. Lundi	Masvingo
53. Makonde	Mhangura
54. Manama	Gwanda
55. Manyoni	Kadoma
56. Maranda	Mwenezi
57. Mary Mount	Mt Darwin
58. Masase	Mberengwa
59. Mashoko	Nyika
60. Mateme	Gweru
61. Mater Dei	Bulawayo
62. Matibi	Masvingo
63. Matopo	Bulawayo
64. Mbuma	Bulawayo
65. Mnene	Mberengwa
66. Morgenster	Masvingo
67. Mt Melleray	Nyanga
68. Mt St Mary's	Wedza
69. Mt Selinda	Chipinge
70. Mtanke	Kadoma
71. Mtora	Nembudziya
72. Mtshabezi	Gwanda
73. Mukaro	Gutu
74. Murambinda	Murambinda
75. Musiso	Jerera
76. Musume	Mataga
77. Mutambara	Nhedziwa
78. Mutero	Gutu
79. Mavonde	Mvuma
80. Mwerahari	Chivhu
81. Nenguva	Kadoma
82. Nhowe	Macheke
83. Nyadire	Mutoko
84. Nyahuku	Mutare
85. Nyangombe	Mutare
86. Nyashanu	Buhera
87. Nyazura	Nyazura
88. Fr O'Hea Mem.	Murombedzi
89. Old Mutare	Mutare
90. Pakame	Shurugwi
91. Phumula	Bulawayo
92. Regina Coeli	Juliasdale
93. Rusitu	Rusitu
94. St Albert	Centenary
95. St Andrews	Avondale

96. St Anne	Harare
97. St Anne	Bulawayo
98. St Augustine	Mutare
99. St Babra	Rusape
100. St James	Nyamandlovu
100. St Joseph	Maphisa
101. St Joseph	Kezi
102. St Joseph	Harare
103. St Luke	Bulawayo
104. St Michael	Beatrice
105. St Michael	Rusape
106. St Patrick	Gweru
107. St Patrick	Hwange
108. St Paul (Musami)	Harare
109. St Peters (Chisu)	Checheche
110. St Peters (Mandea)	Mutare
111. St Rupert	Chinhoyi
112. St Theresa (Chiru)	Charandura
113. St Therese (Chiduku)	Rusape
114. Sanyati	Kadoma
115. Serima	Chatsworth
116. Sessami	Gokwe
117. Shonganiso	Masvingo
118. Silveria	Nyika
119. Solusi	Bulawayo
120. Triashill	Rusape
121. Tshelanyemba	Maphisa
122. United Methodist Dent	Harare
123. Wanezi	Bulawayo
124. Zhombe	Kwekwe
125. Zimuto	Masvingo

## ANNEX 5: GOVERNEMENT HOSPITALS

### GOVERNEMENT DISTRICT HOSPITALS

1. Kwekwe
2. Gokwe
3. Zvishavane
4. Shurugwi
5. Mberengwa
6. Concession
7. Guruve
8. Plumtree
9. Beitbridge
10. Victoria Falls
11. Tsholotho
12. Chivi
13. Chiredzi
14. Mwenezi
15. Gutu
16. Chipinge
17. Rusape
18. Murehwa
19. Kotwa
20. Chihota
21. Karoi
22. Chegutu
23. Kadoma

### CENTRAL HOSPITALS

- |     |                  |             |
|-----|------------------|-------------|
| 24. | Harare Central   | Harare      |
| 25. | Parerenyatwa     | Harare      |
| 26. | Chitungwiza      | Chitungwiza |
| 27. | Mpilo            | Bulawayo    |
| 28. | United Bulawayo  | Bulawayo    |
| 29. | Bulawayo Central | Bulawayo    |

### PROVINCIAL HOSPITAL

- |     |                |           |
|-----|----------------|-----------|
| 30. | Gweru Hospital | Gweru     |
| 31. | Bindura        | Bindura   |
| 32. | Mutare         | Mutare    |
| 33. | Marondera      | Marondera |
| 34. | Chinhoyi       | Chinhoyi  |
| 35. | Gwanda         | Gwanda    |
| 36. | Masvingo       | Masvingo  |