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Chapter 3: Methodology

3.1. General Purpose of the Survey

According to Oppenheim (1966), a survey is "a form of planned collection of data for the purpose of description or prediction as a guide to action or for the purpose of analysing the relationships between certain variables".

Considering the aim of identifying conditions most likely to lead to physical sustainability of low-cost sanitation programmes, the general purpose of the fieldwork was the investigation and description of the present conditions of the sanitation programmes selected for the case studies.

Although investigations on the technicalities of the systems were also carried out, the study was principally focused on the strategies for implementation and O&M of the programmes, especially institutional arrangements and programme integration with the beneficiary communities.

3.2. Specific Objectives

During the selection of the case study areas, six sanitation programmes were chosen (section 4.1.). The specific aspects investigated in each case study were:

   i.   Technical and social conditions for selection of the sanitation technologies;

  ii.   Technical parameters for the design of the systems;

 iii.   Financial aspects towards affordability;

 iv.   Implementation steps and stakeholders participation (consistence of the users involvement on the programmes);

  v.   Users' acceptability/satisfaction toward the sanitation programme;

 vi.   Possible social/health improvements brought upon the programmes; and

 vii.   Operation & Maintenance arrangements.

3.3. Investigation Requirements

The investigation of the aspects specified above would certainly require different approaches. Some of them may be fulfilled just by a *study of the documentation of the programme,* whilst others would require complementary information through *interviews* with stakeholders.

Observation would also be a useful method to collect information on the utilisation of the systems and on their O&M schemes. Additionally, for the measurement of the variables regarding data from the householders' point of view, the utilisation of a *structured questionnaire* seems to be the most appropriate tool.

These social survey methods are well-recognised instruments and are outlined below.

3.4. Social Survey Methods

Among the various social survey methods, the three considered most appropriate for this study were:

3.4.1. Informal Interviews

Informal interviews with key informants usually yield valuable information for social studies, allowing a better understanding of the situation and providing support for the definition of the final design of the survey.

Key informants can be people that in some respect had interacted with the variables to be studied. In the case of the sanitation programmes, the key informants would be the providers (politicians, designers) or would be among the members of the community (especially community leaders). Nevertheless, the main information obtained by these interviews should always be further investigated.

3.4.2. Observation

Observation techniques may be used both as a complementary method and as the main strategy for data collection in a social survey. The *participant observation* technique is based on the immersion of the surveyor in the day-to-day activities of the selected environment, having as its aim to perceive trivial facts related to the variables to be observed.

Controlled observation is applied when the survey aims to compare situations or observe determined behaviours toward the survey variables. In these cases, the surveyor is purely an "observer" and does not interact with either the selected people or the environment. In many cases this technique also requires a control group.

For factual data, however, *direct observation* may be enough to collect the desired information. In such cases, a factual recording form should be available to

register the situations observed. This technique is used in nearly all case studies investigated to collect data on the technical inspection of the sanitation systems units.

3.4.3. Questionnaires

A structured questionnaire can be a powerful tool for the collection of qualitative data on social surveys. Therefore, the design of questionnaires must be a carefully planned activity in order to avoid bias, decrease errors and enable the survey to provide reliable answers. To achieve this, the following steps are recommended (Oppenheim, 1966; Nichols, 1991):

1. ***Decisions concerning the data-collection method***: the main options of data collection methods on a questionnaire survey are: the formal interview, the mail questionnaire and self- and group-administered questionnaires. For the selection of the appropriate strategy, the costs demanded by each method, the time scale of the survey and the availability of personnel (trained or available for training sections) to conduct the interviews should also be considered.

2. ***Selection of respondents and how to approach them***: sampling procedures are usually required for the selection of respondents in large-scale survey (see section 3.5). The approach to the respondents should be planned and take into account the strategies for the introduction of the surveyor, explanations on the purpose of the research, confidentiality of responses and anonymity of respondents.

3. ***Questionnaire framework and order of questions for each variable***: the sequence of questions can help to build-up confidence and keep the respondents interested in continuing to provide the answers. The adoption of a framework is recommended starting with general questions and gradually moving on to specific aspects. A "funnelling" framework is also a popular strategy to conduct the sequence of questioning.

4. ***Questions type***: the questions can be written in the form of a list of probable answers or as free-response (open) questions; however, the coding and the processing procedures must be adequate for the adopted type of question. Resources such as probe, skip and filter questions are also useful to increase reliability and make the questionnaire more friendly for both respondent and interviewer.

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3.5.   Sampling Criteria

The two main classifications for samples are: non-probability and probability samples.

3.5.1. Non-probability sampling methods

The **non-probability sampling methods** provide samples based on the judgement of the surveyor or on the needs of the survey. It is usually adequate for surveys of "hard-to-identify" groups, of specific groups or in pilot situations (Fink, 1995). In such cases, non-probability samples would be appropriate due to the difficulties in obtaining cooperation (or capability for answering the questions) among the potential respondents, or just because of the purpose of the study (i.e. pilot surveys).

The most common non-probability sampling methods are: *Convenience sampling* (where the sampled population is selected according to its availability for interviewing); *Snowball sampling* (when the persons surveyed are requested to indicate other persons for the same survey); *Quota sampling* (applied when it is necessary to estimate the percentage of sampling for different groups); and *Focus groups* (when a small group of a selected population is chosen for pilot trial before a larger survey).

3.5.2. Probability sampling methods

In the **probability sampling methods** all members of the target population have the same (and non-zero) chance to be selected, providing a statistical basis to make the sample a representative part of the target population. The main methods applied for probability sampling are: *Simple random sampling, Stratified random sampling* and *Systematic sampling*.

Simple random sampling is an almost unbiased probability method for selection of a sample. In this method, all the members of the target population receive a number that is then matched with the ones in a Random Number Table (Table 3.1.) or other pool tool (i.e. a computer-generated list of random numbers) providing, in this way, the sample population.

In the selection of households for the sanitation programme case studies, for example, the simple random sampling method could be applied by giving the houses sequential numbers on a map containing all households included within the target population. Using a random number table (Table 3.1) a number is chosen as a starting

point and, then a direction (horizontal or vertical) is determined for the selection of the sample numbers. Table numbers are matched in sequence (considering just the adequate figure - units, dozens, hundreds or thousands – depending on the size of the sample), defining therefore the households to be included in the sample population.

Table 3.1. - Random number table

7951	2257	3713	2251	8787	0475	1806	4328	0394	5752	9546	6241	6391	6881	2013
3476	4938	3030	1040	7821	8732	0890	0539	0386	0229	4020	6212	8989	4264	8738
2354	6217	6397	4452	9636	1291	4708	8747	3045	4629	4887	4269	1324	1153	6073
0242	7111	8223	6214	9296	4380	4885	5385	0352	3626	5649	3898	6182	4164	9660
7152	4503	4104	3607	5164	1690	9877	6536	5113	2852	5873	8459	0452	0417	1987
8674	0361	6652	0446	3064	6299	1841	8833	2724	0735	0429	8584	7512	5118	7745
5448	3932	2042	0559	0730	9695	1405	5741	4885	9212	4531	0068	2163	7377	4841
0195	0036	5426	6163	6348	6222	6989	4217	8397	7608	5562	2517	6124	6646	4251
8622	2115	2035	3945	5851	9531	8145	5798	8519	0361	9972	7441	1017	3108	6730
9247	3019	3527	7094	6336	6141	4270	8019	2283	1068	7485	7303	1168	6489	8338
7281	7885	5968	0933	7984	0072	0986	6746	7654	3451	4140	3014	0576	9320	9674
9578	3588	6639	0837	2435	1674	6491	7476	9462	3399	7713	8569	7936	2455	5786
0902	3244	1865	0817	2651	3265	9238	3982	9620	4769	2699	8218	0757	2916	4790
6694	7834	6977	2494	6370	2960	6446	3761	7348	2963	9372	2594	9246	5777	3427
3963	8453	2735	2488	7338	7199	0123	1688	4832	5658	2039	0149	2963	7342	6971
9924	5962	8787	2350	7622	6882	3558	0002	5031	2048	5381	7814	6943	4356	9218
7602	8191	8803	9179	9883	6747	6531	4312	1230	1696	3402	0171	7489	4374	5623
8749	6178	1446	6811	0639	2677	1887	1643	2326	9557	0534	9593	5645	0505	9063
7068	2917	7773	7084	4255	8967	9551	1753	3843	4353	0402	0876	8955	0546	3184
9229	3526	3321	8093	2705	5240	6586	6909	2197	2376	0974	2578	4116	4068	2803
9514	5832	3404	1545	7948	0701	3431	0113	8833	8977	6616	4059	6770	5729	4481
7903	5704	0840	4383	2213	5569	7118	7388	1566	5476	5770	1514	0886	8029	2994
3914	2116	0966	6078	6407	2039	1946	6162	2616	0030	7163	8631	8880	2017	1173
1223	2886	8408	8447	8420	8927	6830	6983	6706	7148	6619	7548	0003	9979	1393
0123	3306	3774	2533	1187	9589	6392	7889	7889	1933	9723	3626	8304	0073	6793

To obtain a sample where it would be necessary to measure the variables of more than one group identified within the target population, it may be necessary to use the *Stratified random sampling* method to obtain a representative number of members from each group. For this, the different groups are identified and samples are determined as simple random samples for each of them.

The *Systematic sampling* method is based on the selection of each nth element of the target population, which should be arranged in sequence. For the example of the sample of households, a map containing all members of the target population would be obtained and then a walking orientation should be defined for the survey. A starting point is defined and then each nth household is selected for the sample.

Following this methodology, a situation commonly observed is that selected households may not be available for inclusion in the survey. In this case, other

alternatives should be previously specified, such as the selection of the previous or the following household in the sequence (but keeping the original one as the basis for the selection of the next household). The systematic sampling method should not be used, however, if repetition occurs within the target population or if it is arranged in intervals.

3.6. Summary

Considering that the case studies selected for this survey are not to be directly compared with each other (the objective is rather to provide a picture of each one), the same research approach was not always applied for the aspects investigated in the different Case Studies.

The research approaches were mainly applied as suggested on Table 2.11 and were based on the descriptions presented in this Chapter. The specific applications of the methods are further described in the Case Studies Results (Chapter 4); nevertheless, the table below (Table 3.2) presents a summary of the methods applied for the aspects investigated in each Case Study.

Table 3.2. – Summary of the Methods Applied for Investigation of the Aspects Assessed

Aspects investigated	Case Study 1	Case Study 2	Case Study 3	Case Study 4	Case Study 5	Case Study 6
Technology's Selection	Doc. Review Interviews	Doc. Review	Doc. Review Interviews	Doc. Review	Doc. Review	Doc. Review
Design	Doc. Review	Doc. Review	Doc. Review	Doc. Review	Doc. Review	Doc. Review
Financ.Aspec	Doc. Review	Doc. Review	Doc. Review	Doc. Review	Doc. Review	Doc. Review
Implementat	Interviews	Doc. Review	Interviews Quest.survey	Doc. Review Quest.survey	Interviews Doc. Review	Interviews Quest.survey
Acceptability /satisfaction	Quest.survey	Quest.survey	Quest.survey	Quest.survey	Quest.survey	Quest.survey
Social/health improvem.	Observation	Quest.survey	Quest.survey			Observation Quest.survey
O&M arrangements	Doc. Review Interview Observation Quest.survey Tech. Inspec.	Doc. Review Observation Quest.survey Tech. Inspec.	Doc. Review Interview Observation Quest.survey Tech. Inspec.	Doc. Review Observation Quest.survey Tech. Inspec.	Doc. Review Interview Observation Quest.survey Tech. Inspec.	Doc. Review Interview Observation Quest.survey Tech. Inspec.