

5 INFRASTRUCTURE SERVICES IN TRUJILLO

5.1 INTRODUCTION

The use of infrastructure services by the urban poor is a key element in this research project. In this chapter, the various services are discussed. These are water, sanitation, electricity, waste disposal, and telecommunications. Each of these systems is discussed in separate sections respectively.

For each of these different services, the following research questions are answered:

“Which infrastructure services and in what quantities and quality are delivered within the poor urban areas of Trujillo?”

“How does the process of obtaining by and delivery of infrastructure services to the urban poor take place?”

What linkages exist between migration, migrants, infrastructure services and the process of delivery of these services?

Before discussing the infrastructure services into detail, a more general description of the importance and the differences between the various services is given below. All of the information provided here is specified in the respective chapters, where a more in-depth analysis explains the details and driving forces of these differences.

The importance of infrastructure services as a basic need is widely recognised, and has been elaborated upon in the theoretical background (chapter 2). The data from the questionnaires carried out in Trujillo show that the main perceived problem with regard to the current living circumstances is the lack of decent infrastructure services; 68% mentioned only infrastructure-related problems as the main problems, 13% only non-infrastructure service related problems, and 18% a combination of these two groups. The lack of decent water supply was by far the most mentioned problem, followed by the lack of decent sanitation facilities, and electricity supply. The collection of solid household waste and services related to telecommunications were hardly mentioned. (See Appendix C-4).

The coverage and the speed of expansion of the various infrastructure services differ substantially. There are services that take longer to install due to the more complex infrastructural requirements (sanitation, and to lesser extent water), but it is mainly the decision-making procedure and the actors involved that determine the timing of installation. This is visible with the electricity net, which has been installed rapidly in many parts of the recent settlements. This is also a result of the efforts of the electricity company that is willing to increase its coverage, and to provide intermediary solutions (provisional net). Something technically far simpler, the collection of solid household waste, is not carried out in most settlements. In the case of telecommunications, the system that requires connection to a physical network (landlines) is expanding slowly. Good alternatives (mobile phones and a newly developed type of landline) exist and are used extensively.

This happens with water provision too; the alternatives are used for a long period of time before the public net is installed. Alternatives are not used in the case of waste disposal, and only marginally in the case of sanitation. Thereby, the difference between the various infrastructure services in terms of expansion, coverage and the exploitation of temporary solutions are large.

The impact of migration is mainly visible through the emergence of new settlements at the city margins. Within those settlements, the impact of migration is much harder to determine; the place of birth, former locations and timing of migration are factors that do not explain the behaviour and characteristics of those living in the settlements. Nonetheless, the ratio of migrants in the recent settlements is high (as explained in the previous chapter) and their origin diverse. Thus migration is a driving force behind the formation of recent settlements. It is therefore relevant to inspect the on-going processes that are put in place to obtain and improve the infrastructure services.

There are differences between the three locations studied in the cases with respect to the infrastructure services offered and their quality. These differences can to a large extent be explained by the behaviour of the different actors. Alto Trujillo enjoys much more involvement from NGOs and the coordination and support from the municipality is decent. In La Esperanza the recent settlements are treated differently and get formal support, but practical actions remain limited. In El Milagro, there is very little involvement or interference by the municipality. This is the case in both the areas that fall under the populated centre El Milagro and those that are still property of the Regional Government. This has an important impact on most of the services, with the exception of telecom services.

The quality of the services (water, sanitation, etc.) can be compared via the perception of the end users. Respondents indicated the quality, using a five-point scale. There are no significant differences found for this indicator. The data often lacks a normal distribution, and is often skewed. This means that users find, for example, the quality of the services related to the delivery of water no better or worse than those of telecommunications. Significant differences are found when the different options for the specific each service are compared. This is done in the respective sections.

In the next sections, the different infrastructure services are discussed separately. The sub-chapters all have the same structure: firstly there is an elaboration on the current situation and developments concerning the coverage of the service. Then, there is a description of the conditions in the recent settlements as observed through the questionnaires. Following that, the actors that are active with that particular service and their strategies are discussed. Finally, I draw some conclusions concerning the three above-mentioned research questions for the respective infrastructure service.

5.2 WATER

5.2.1 INTRODUCTION

The delivery of drinking-water supply to the poor is one of the main challenges for the large Peruvian cities. The tackling this problem is done by a great many actors, and delivery of drinking water occurs in a variety of ways. These options differ highly in price, and occurrence in the recent settlements.

The main sources used for this section are the national census of 1993 and 2005 (INEI, 2003a; INEI, 2005a), the Environmental Atlas of Trujillo (MPT, 2003), data obtained from Sedalib (Sedalib, 2007a) and the survey carried out by the author, as well as from the interviews with the various actors.

5.2.2 CURRENT SITUATION AND DEVELOPMENTS

Water can be obtained in many ways. Since Trujillo is located in a desert, it is not possible to use natural rivers¹ or natural springs as sources of water supply in most parts of the city. Furthermore, rainfall is scarce and thus not an option for regular provision. This lack of natural water supply, combined with fertile soil, has led to the realisation of a large scale irrigation project: Chavimochic. The metropolitan area of Trujillo has benefited greatly from the investments of the project. Large amounts of good quality water² are transported to the metropolitan area and its agricultural surrounding, where it is used for either agriculture or consumption. (SUNASS, 2004b) In addition to this, groundwater is obtained from deep wells, going down to more than 100 meter in depth.

In the metropolitan area of Trujillo, there are the following types of water supply for drinking water:

Public net: The public net with in-house taps is the most commonly used mode of drinking water supply. The water is delivered via the public net to the house (front door), where a meter is installed to measure the amount of water used. From there on tubes deliver the water to personal taps (in-house or in the garden) and personal storage tanks.

Public tap: Public taps are taps outside the building, to which the water is delivered via the distribution net by the water company via a distribution net, and the taps are used by a block or various families. One person is made responsible for the payment to Sedalib.

Public basin: The public basin (*pozo publico*) consists of a covered basin with a tap. The tank is filled by water trucks/tanks, after which individuals buy smaller quantities from the person in charge. The basin is often constructed with bricks overlaid with cement. The basin cover can be of cement, reed with cement or wood with plastic.

Water trucks: Water trucks like those used to fill the public basins are also used to distribute water to the population directly. The water truck enters a neighbourhood where they fill the (personal) barrels, buckets and jerry cans of the queued population. Though private trucks operate as well, those delivering directly to the population (thus not via basins) are owned by the local governments.

Tricycles: Tricycles are used to deliver water to households. The tricycle carries 200 litres (55 US Gallon) in a plastic tank or (much less common) in an oil drum. The water originates from the public net, and is only sporadically tapped from the public taps.

Leakage: Storage reservoirs that are used to store and deliver water to the public net and taps are often located on hills and higher parts of the city. At the connections of the main pipes, water is often leaking or dripping. This water is collected by simply placing a bucket underneath.

These various sources are used throughout Trujillo, and their proportional use shares characteristics with the general Peruvian situation. Table 5.1 shows these differences between three areas (Peru, the department of La Libertad and the Province of Trujillo) for 1993 and 2005 (see Appendix F for absolute figures). In all these regions, the public net has become more important. The second most-used source in Peru and La Libertad are rivers, natural streams and similar sources. Their use has become much less important, though they remain the second most important source. Looking at the province of Trujillo, the single most important source is now the public net; and public taps have become much less relevant. Another interesting trend is the increased use of the shared public net, with a connection outside the building. In general, it can be concluded that the quality of the type of water supply is improving. Also, the variety of alternative sources for those that do not have a connection to the public net continues to exist.

Table 5.1: Types of water supply used in Peru, La Libertad and Trujillo Province in 1993 and 2005

	1993			2005		
	Peru	Department La Libertad	Province Trujillo	Peru	Department La Libertad	Province Trujillo
Public net	43.1	48.9	70.6	60.4	66.5	82.3
Public net outside building	3.6	1.1	2.0	7.1	4.7	3.4
Public tap	10.7	9.8	11.4	4.8	4.3	3.2
Public basin	11.6	16.4	7.2	7.4	9.8	2.8
Water truck	5.2	2.6	3.7	4.0	1.7	3.0
River etc	23.2	18.7	2.8	12.6	8.1	0.3
Other ¹	2.5	2.5	2.3	3.9	4.9	¹ 5.1
Total percentage	100.0	100.0	100.0	100.0	100.0	100.0

Notes:

1. The group 'other' is large for the case of the province of Trujillo in 2005, amounting to more than any of the other sources other than the public net. This indicates that other sources (i.e. tricycles and storage basin) are a very important alternative, or that the measurement error is very large.

Sources:

1993 data: INEI, 1993a, *Censos Nacionales 1993, IX de Población y IV de Vivienda*, Lima.

2005 data: INEI, 2005a, *Censos Nacionales 2005, X de Población y V de Vivienda*, Lima.

Thus the province of Trujillo, in general, has a high coverage of the public net, with other sources being much less important. However, the differences between the districts of the province are large, and the net coverage in the less central and less densely populated districts is much lower. The data for the three districts shown in table 5.2 illustrates these differences (see Appendix F for an overview of all districts).

Between 1993 and 2005, the coverage of the public net has increased in all areas except El Porvenir. The main part of the neighbourhoods with public taps has been connected to the public net, thereby making the use of public taps proportionally much less common. The use of water trucks has become less common in central Trujillo, but not in the northern suburbs La Esperanza, El Porvenir, Florencia de Mora and Huanchaco. From this it can be concluded that although the expansion of the public net has been ongoing, the alternative sources that are not directly related to Sedalib still play a vital role.

Table 5.2: Types of water supply used in three selected districts of Trujillo Province in 1993 and 2005

	1993			2005		
	Trujillo central	La Esperanza	El Porvenir	Trujillo central	La Esperanza	El Porvenir
Public net	87.2	65.0	77.2	89.7	84.8	72.2
Public net outside building	4.4	0.3	0.4	5.5	0.7	3.6
Public tap	7.5	28.6	9.4	1.4	3.5	8.3
Public basin	1.1	1.0	1.5	1.0	0.8	2.1
Water truck	2.6	2.0	6.3	0.5	2.4	5.7
River etc	0.3	0.7	0.6	0.0	0.0	0.0
Other 1	1.4	2.4	4.6	1.9	17.9	18.2
Total %	100.0	100.0	100.0	100.0	100.0	100.0

Notes:

1. Again, the measurement error for the year 2005 contains a large share of the alternatives or measurement error for the public net.

Sources:

1993 data: INEI, 1993a, *Censos Nacionales 1993, IX de Población y IV de Vivienda*, Lima.

2005 data: INEI, 2005a, *Censos Nacionales 2005, X de Población y V de Vivienda*, Lima.

The development of the public net of Trujillo shows how it has followed the expansion of the city, as can be seen on the map of Appendix F Figure 1. One of the main features of today's network is that the highly interconnected system does not include the whole of the metropolitan area of Trujillo; Huanchaco (excluding El Milagro), Moche, and Salaverry are dependent on a relatively autonomous system. This part of the public net is not separately treated in this thesis. The oldest part of the public net of Trujillo dates back to 1930; part of the first distribution net north-east of the city centre is still intact, and most of the city centre's network that was built between 1951 and 1970 is still used. This part of the network has proven to be problematic, due to obsolescence and the increased pressure on the system, and needs to be replaced urgently³. The network in the less central areas of the city is much younger. Most of the network of the northern districts Florencia de Mora, la Esperanza and El Porvenir was established between 1971 and 1990, when the military governments invested heavily in infrastructure in the poorer areas⁴. The expansion of the network between 1990 and 2001 did not keep up with the urban expansion and catching up in the earlier expanded areas was still the main characteristic of the programme. (MPT, 2003) In the Investment

Programme 2005-2010, the expansion of the networks in those more recent areas have high priority. Included are the neighbourhoods Las Palmeras and Nueva Jerusalén (district La Esperanza) and large parts of the populated centre Alto Trujillo (Sedalib, 2007b). From the above, it can be concluded that the bulk of the maintenance that needs to be done has to be carried out in the central part of Trujillo. The network nowadays covers most of the city, yet the outward expansion of the network needs to continue to cover those areas not yet serviced. The most recently established areas are not yet included in any investment programme, so it is safe to say that before 2010 no public net will be installed.

The use of public taps as a main source remains common in absolute terms, their proportional usage has decreased. Recent data illustrates that they are mainly used in La Esperanza, where about 112 taps were used in May 2007. This number is similar to 2005, and with an average of 15.6 registered users/households per tap, about 1,717 households are using taps (Sedalib, 2007a). This number is considerably higher than the 1,042 households from the 2005 census data (INEI, 2005a), and could easily be much higher, as informal agreements can be made between the representative of the neighbourhood and its inhabitants⁵. The total number of taps (see Appendix F , table 5) has not changed much over the last five years. They were used as temporary solutions in Florencia de Mora, and recently new taps have been installed in Huanchaco. In Alto Trujillo⁶, they have hardly been installed, mainly because the coverage of the public net is low, thereby making it technically difficult to create enough pressure to supply to the taps as used in the current systems⁷. Since expansions in the net are ongoing, new possibilities for installing public taps will arise and their use as an alternative source in the expansions of the city can be expected to remain large.

Concerning the complete set of available options, the three cases studied in Trujillo show that those different systems co-exist; none of the studied areas showed one exclusive system. The public net with in-house connections is not available in these areas, as it takes up to ten years before the public net is installed. The maps of Appendix F show in which part of the area the various water sources are located. It indicates that a relatively small part of the whole neighbourhoods is served by public taps (all outside the house). Often, a mixture of various services co-exist within the neighbourhoods of the recent settlements.

A variety of water services is used in Trujillo, where the public net is the most important service in most areas. The coverage of the public net is increasing. Therefore, areas where migrants have arrived are increasingly served by the public net. Differences between the various districts of Trujillo are still large. Coverage is lower in the northern districts, where the most recent areas exist. The most recent settlements are basically served by alternatives, as can be seen in the next section.

5.2.3 RECENT SETTLEMENTS

The delivery of water in the recent settlements occurs mainly via systems alternative to the in-house connections. In the three areas studied, the alternatives used are different for distinct. This variety makes for an interesting analysis, which is demonstrated clearly in the data from the questionnaire.

The usage of the different alternatives varies between the three cases, as can be seen in Table 5.3. Combined⁸, the public basins are the most common form in general; they are almost the only source used in Alto Trujillo, but are hardly used in Nueva Jerusalén. Tricycles appear only in El

Milagro, there they are used amply. This variety in popularity of services should always be taken into account when discussing the water situation in the recent settlements; they are discussed below in more detail.

Table 5.3: Usage of the different services in the three selected neighbourhoods.

	Alto Trujillo - 2B	El Milagro - VII	La Esperanza - NJ	Total %
Public basin	90.0	21.1	2.2	31.3
Public tap		20.0	50.0	26.3
Water truck		1.1	41.1	16.3
Tricycle		53.3		20.0
Other	10.0	4.4	6.7	6.3
Total %	100.0	100.0	100.0	100.0

Source:

Survey by author.

In the case of Barrio 2B in Alto Trujillo, the main source of water supply is via public basins. Water trucks only deliver indirectly to individual customers; they fill the public basins after which units are sold separately by the owner or executive. There is no network of public taps, nor do tricycles deliver water. The latter is hard due to the slope, which makes it hard to deliver. The alternative to the system of public basins makes use of the neighbourhood 2A, next to 2B; this area has in-house public net, they sell or provide water for free in small quantities to those living close by (for maps of water services for the three case studies, see Appendix F figure 2).

The case of Nueva Jerusalén shows more variety in used sources of water supply. This is particularly interesting since it is located close to Barrio 2B and borders with Alto Trujillo. The older part of Nueva Jerusalén (sector I) is connected to public taps, where branches of pipes are created by parts of a block. The more recent area (sector II) uses water delivered directly by water trucks. In the most recent settlement (sector III) there is no service, so that inhabitants of this area either go ask other families for some water (from public taps), or use the water leaking from the close by storage reservoir.

In the case of El Milagro VII, a wide variety of options is used as well. The oldest part is connected to public taps, though not everyone living close to a tap uses this service. Both the older and the more recent neighbourhoods make extensive use of the service provided by tricycles, and some privately owned basins exist. Despite the lack of formal coverage of the public in-house net, two households managed to get an individual connection to the public net⁹. The areas next to sector VII (both north and along the Pan-American Highway) have full coverage from the in-house public net. There is no contact with these areas, so that unlike in Alto Trujillo, this alternative is not exploited.

The situation in these three cases can be extrapolated, where the situation is highly similar to the rest of the recent settlements of the respective municipalities. Thus in all parts of Alto Trujillo where there is no public net, the service is provided via public basins. This means that because the density of public basins in this area is higher, costs of water delivery are lower, making this service more attractive. Tricycles are found in many areas of El Milagro, but nowhere in any of the other districts. The case of Nueva Jerusalén is characteristic for all of the recent settlements of La Esperanza; water trucks deliver directly to the population where no public net or taps exist. From

this it can be concluded that the physical characteristics, to some extent, but mainly the involvement of different actors and the existing system in neighbouring areas combined determine the actual system used.

The different systems of water delivery lead to a different amount used. The least amount used is by those that receive their water directly from water trucks- 55 litres/day per household. They receive their water two times a week, often on two days following each other; so that the amount that one can use during the week is limited by either the storage capacity (plastic buckets) or the total amount delivered. This explains this very low usage. Those using a basin use significantly more, 75 litres/day per household. Just as with the trucks, the water has to be carried to the house personally, which is both tiring and time-consuming. The users of tricycles and public taps use about the same amount; about 100 litres/day per household. Both these systems provide the possibility of receiving water every day or two days (often with public taps, the users are divided in two groups which share turns). Those that have most recently moved to a squatter settlement will often get only water from the trucks, except for all of El Milagro, where tricycles are available. The above shows that though all people living in the recent settlements use little water, there are still big differences due to the existing system of water supply.

The costs for the use of water differ significantly amongst the different systems (see Table 5.4). Those receiving water from trucks do not pay anything for this service. The water from taps is cheapest, about S/.2 per m³. This consists of the normal price for water as charged when connected to the public net, plus some added amount for the maintenance and similar activities. Much more expensive is the water from the basins; here the water is delivered via trucks, and sold in small quantities for S/.8 per m³. Basins can be privately owned or be an investment by a block of houses. When privately owned, the owner needs to recover the investment of the basin, and often wants to earn with the sales as well. Water from tricycles is the most expensive; about S/.15 per m³. The water is delivered to the house by a tricycles, the cyclist makes a living from this service, which increases the price of water significantly.

The affordability of the different services is clearly linked to the type of water supply used. Those with a tap spend only one percent of their income on water. Those with a basin spend a considerable share of their income, namely 5%. Those with tricycles spend 11% on average on water. When a household spends more than 10% of its income on water by the use of 20 litres per person per day, the service is considered to be unaffordable. Thereby, the delivery of water via tricycles is very expensive, also to international standards. Though water via basins is relatively expensive, it is considered affordable.

The usage and price combined show that the water received from tap is the cheapest (after the trucks that deliver for free), even whilst the usage of those using a tap is highest. The usage influences the expenditure (twice as much water used is twice as much paid), but does clearly not influence the monthly bill as much as the type of service used (see table 5.4 above). It is thus desirable for those living in the recent settlements to get connected to the public net as fast as possible, even if this means using public taps instead of in-house taps. Also, the investment on building a basin is recovered within weeks or days; this indicates that either the service of tricycles is deemed better than that of a basin, or that investments are hard to make.

Table 5.4: Usage and price characteristics for the different services.

	Household usage (litres / month)	Price per m ³	Expenditure per household per month	Expenditure / household income (%) ¹
Truck	1,671	-	-	-
Tap	3,068	2.1	4.6	1.2
Basin	2,274	8.3	18.0	4.8
Tricycle	3,000	15.0	44.4	11.4

Notes:

1. The household income was included in the survey in categories. The maximum value of the categories are taken, since they are closest to the expected income. The analysis is carried out at the household level and for the actual amount of water used. The average amount of water used is 22 litre per person per day.

Source:

Survey by author.

The expensiveness as perceived by the end users is in line with the prices paid; the responses are best explained by the price per m³, less by the monthly expenditure. Those with a public tap are very likely to consider the price very cheap or cheap, whilst those with service from tricycles are very likely to find the price very expensive. Those using either a public basin or any other service (except trucks) find their service slightly expensive. The price does not seem to change or vary over time; about 70% of the respondents had not experienced any change of price, whilst an increase was experienced by 18%. Hardly anyone mentioned a decrease in price (1%). Those with service from tricycles experience significant variations (between the summer and the winter period), whilst few using a different service noted any variations. From this it can be concluded that though the prices might not have fallen, they have not increased much either. Small changes in price might not influence the choice for a certain type of service, as prices are very different for each service.

The different types of service used are partly a result of the actions taken by the inhabitants. Most inhabitants have taken some kind of action upon arrival to get their water service improved. These come in several forms; personal action to get water, consulting someone to deliver water, and combined actions to get water. Individual actions consist of contacting a vendor, or asking at the neighbouring block; these seem to confirm the status-quo in the system used. More interesting are the combined actions, as they facilitate change. In the older part of Nueva Jerusalén (section I), cooperation of inhabitants was large, and combined efforts led to massive stealing from the public net and storage reservoir, after which a fine had to be paid. Though large (about S/.2,300), this was combined with investments from the inhabitants and the promise from Sedalib to install public taps, and for some years they have been using this service. In El Milagro, the combined investments in tubes and efforts (digging) also lead to the installation of public taps. Further expansion of the systems of public taps seems unlikely, as Sedalib is not in favour of them (see next section). Nonetheless, combined actions can lead to the improvement of the system; be it either by building basins or getting connected to the taps. Efforts to get the local president or authorities to improve the service from the trucks (e.g. visiting more often) did not show clear results, and tangible improvements were made.

Planned actions for improvement are much less common; about half report not to have any such intentions. Responses are dependent on their current situation; those receiving water from the trucks report that they want more storage, whilst those with public taps want to visit authorities to get the in-house net. People receiving water from the trucks are likely to want to construct basins, an action that is of the least interest to those serviced by tricycles. The area where the NGOs and

authorities have the most contact with the population, Alto Trujillo, is also the area where the inhabitants are most likely not to take any actions, and are less likely than the other areas to contact the authorities. This can indicate trust in the authorities, and support for their strategies. It can also indicate limited neighbourhood organisation, due to limited coherency and negative prospects. It is possibly a combination of both; people will wait or leave but not take much action. In many of the recent settlements, combined action has shown to be a means for improving waters services. Opportunities for further development and rapid recovery of investments exist in both La Esperanza and El Milagro.

The differences between the water systems in the various recent settlements are large. The situation concerning the delivery of water is different in each of them; they all share the lack of coverage from the in-house public net. The situation is similar in the recent settlements in the rest of each district, which shows that the physical characteristics are of minor importance. Different alternatives show different characteristics, which can be seen in the price, usage and satisfaction. Furthermore, they are partly a result of actions taken by the inhabitants, as well as by the various other actors involved in the delivery of water services.

5.2.4 ACTOR STRATEGIES

The existence of various ways in which water is delivered to the population means that different actors are involved. Furthermore, there are the different authorities (national, provincial, local) and NGOs that influence the delivery of each service. Their main strategies and influence are discussed in this section.

The privatisation process has somewhat changed the actors involved in the Peruvian water sector. The Peruvian market has been divided into urban and rural areas. In the urban areas, the sector consists of different companies (*Empresas Prestadoras de Servicios de Saneamiento*, or EPS), each responsible for a certain urban area and its inhabitants. They have been established since 1994 and can be of a public, private or mixed character. These companies have representatives of the municipalities. In addition to this the rural areas are served by municipalities and in the case of Lima, under authority of the national government. (SUNASS, 2004b, p. 17-29) In the case of Trujillo, Sedalib is the respective company, and the most important actor in Trujillo. This company has a board with representatives of the municipalities, thereby being of a mixed character.

An important distinction can be made between investments and maintenance. Maintenance is in all cases done by Sedalib, whilst investments in the expansion of the net are optional for Sedalib. In the current circumstances, this means that Sedalib does not invest much in expansions. Financing of new projects mainly comes from the central government. Such projects are thus financed by the central government, carried out by Sedalib, and all delivery of the water is done by Sedalib. In the past, groups of people living in the recent settlements were able to invest in pipes, so that they could get public taps connected. Sedalib is no longer supporting this strategy, claiming that the pressure is quite low and expansion of the net via public taps problematic for a guaranteed delivery⁸. This means that the best and the cheapest service provided in the recent settlements will not continue to expand. This will increase the demand for alternatives; thus more trucks will be needed in Trujillo to deliver water directly or via public basins.

Another important actor in the water sector is the supervising authority SUNASS (*Superintendencia Nacional de Servicios de Saneamiento*), which was established in 1992. Its function is to regulate, supervise, standardise and penalise the privatised companies as well as those that were delegated to institutions other than the state. (SUNASS, 2004b, p. 18-19) Their office in Trujillo has a limited capacity, and has just recently been installed (December 2006). Before that date, only limited supervision by Sedalib had taken place¹⁰. The office organises public discussion forums when important decisions must be made, therefore providing the opportunity for the representatives of the population to be heard. For many years, the lack of a decentralised office was a serious flaw in the functioning of the system. Furthermore, concerning complaints, their services are formally limited to those already provided by Sedalib, thus excluding any influence on the process of obtaining a connection of any type. This means that there is no involvement of SUNASS in the recent settlements, whilst representatives of these areas continue to visit and speak on public hearings organised by SUNASS. SUNASS could take up the role as a voice of the people in these areas in the future, within the existing legal framework.

By comparing the characteristics of the company Sedalib S.A. with the Peruvian average, some differences become apparent. As can be seen in table 5.5, the coverage for water by Sedalib is much lower than the national average. At the same time, the price for water is much higher and the average number of hours that the water is delivered daily much lower. This data for 2002 has not changed much, showing that the performance is lagging behind the national performance of water companies. (SUNASS, 2004a, p.31-33). The discussion on the efficiency also concerns the board, which still comprises mainly political positions, where SUNASS prescribes more technical staff involvement. To what extent the board makes decisions benefiting their own position is subject to an ongoing debate, but seems less relevant to the work of the company on the short term. On the longer term, quality improvements can be achieved.

Table 5.5: Indicators for company performance in 2002

Indicator	Sedalib SA	National Average
Coverage water	77%	83%
Coverage sanitation	71%	74%
Price [Soles/m ³]	1.70	1.33
Continuity [average hrs/day]	7.0	17.3

Source:

SUNASS, *La calidad del agua potable en el Perú*, p. 33, Lima.

The efficiency of the company is also improved via a reduction in the loss of water. The loss of water reached its peak of a stunning 45% in 2005, and has been decreasing since then. Sedalib has (temporarily) terminated the contracts of those connected households that did not pay. By doing so, the actual number of connected households decreased from January 2005 to January 2007, and is only recently increasing again (see Appendix F Tables 6 and 7). Furthermore, the disconnecting and sabotaging of meters has become higher priority for Sedalib. Of major concern here are mainly those connections that have been in existence for a longer period of time already, and much less the recently installed meters¹¹.

The municipalities have a direct say in Sedalib, while at the same time they have the option of providing other water services in those areas not connected to the public net. The latter is done only on a very limited scale; the municipality of La Esperanza has one truck freely delivering two

times 12 m³ per day to different settlements¹². Other municipalities have no such service at all, and their limited resources and lack of formal responsibility to provide water services are the main reasons not to provide them. The provincial government, with Mayor Acuña, have started to deliver water by truck to different areas. From January 2007 this was done with one tank of 8 m³, more were planned to be bought in autumn 2007¹³. Hereby, the provincial government delivers a limited yet essential service to the population in need, whilst gaining political support in return¹⁴. Possibilities for further expansion of this system exist, as the recent settlements will continue to grow and demand alternatives. In El Milagro, the trucks are not very popular; inhabitants often comment on the limited frequency of the visits of about once a week, with more frequent visits only around election time. If political support is desired; a well functioning, frequent and consistent delivery service is necessary. Since this service does not have to be provided for free, opportunities exist for such expansion by either Acuña or other investors.

In Trujillo, the only NGO active in the provision of water related aid is Circulo Solidario. They have built a great many public basins in Alto Trujillo, mainly with financial foreign (Spanish) support. They no longer continue to build these, as they consider it more efficient to focus on streamlining the investments and the building of the public net. Their influence on the population not served via the public net has been large in the past, especially in Alto Trujillo where the most basins were built. Due to strategic changes and different priorities, their direct involvement in the existing and future recent settlements, and their role in the water sector in general have become very limited.

From the above characterised setting and behaviour of the various actors, it can be concluded that the main focus is on Sedalib. This scenario has been created by a strong focus of the municipalities on Sedalib, whilst actively participating in the delivery of water to the urban poor that have recently settled. The involvement of NGOs is very limited, and has been focused almost entirely on Alto Trujillo. With new involvement of the provincial government, not only has the delivery of water to the most recent settlements improved, but a new incentive for other actors to meet the needs of the population has been created as well.

5.2.5 PRELIMINARY CONCLUSIONS

The delivery of water in Trujillo happens via different systems. These have developed under the influence of a city expanding continuously via squatter settlements; it are these areas that use distinctive alternatives. The public nets have gradually expanded, covering an increasing share of the city. The expansion of the network did not manage to keep up with migration and expansion of the city until 2001, this has changed since then and coverage is increasing. The need for alternatives will continue to exist, as it takes about ten years for the recent settlements to get connected to the public net.

The delivery of water via alternative systems differs highly in price and quality. The price paid for water per m³ is 15 times higher when using tricycles instead of the public in-house net, other services are also more expensive. The public taps as the best alternative. Since these will no longer be installed, the demand for an increase in the quality and a lowering of the price of the service is high, and will continue to be the demand of an increasing amount of people. Water from tricycles is not affordable to international standards, thus supply via basins is preferred. The migrants living in recent settlements do not receive support rapidly from NGOs or municipalities. It takes up to

two years before basins are installed. Often, neighbouring blocks provide assistance during this time, but this service is limited. Depending on the future rate of migration, possibilities for NGOs, private companies and especially municipalities to improve these services are many.

The expansion of the public net is a clear result of migration towards the recent settlements, and the infrastructure is clearly adequate when this service is provided. Both the efforts from the national government (investments) and Sedalib are effective in the metropolitan area of Trujillo. Before the public net is installed, actor involvement and strategies are limited and of poor quality; leading to an ineffective and expensive service for many inhabitants of the recent settlements. The aid by constructing public basins improves this situation. Since Circulo Solidario has decreased their involvement, new possibilities for local authorities and NGOs are ample and changing. Political and financial gains are possible for those willing to invest in the recent settlements; especially since migration towards and the expansion of Trujillo continues to create new squatter settlements.

5.3 SANITATION

5.3.1 INTRODUCTION

Sanitation services are of poor quality in most of the more impoverished expansions of the Peruvian cities. The expansion of the public sewerage net is expensive and time consuming. Intermediary solutions are developed by the poor themselves, whilst involvement of other actors is scarce. This leads to a sub-optimal situation that causes illness and discomfort.

The main sources used for this section are the same ones as those for the section on water; the national census of 1993 and 2005 (INEI, 2003a; INEI, 2005a), data obtained from Sedalib (Sedalib, 2007a), the Environmental Atlas of Trujillo (MPT, 2003), and the data from the questionnaire as carried out by the author, as well as from the interviews with the various actors.

5.3.2 CURRENT SITUATION AND DEVELOPMENTS

Sewage disposal takes place in various ways. A main distinction between the various options is the use of a service that is connected to the public sewerage net, and one that is not. In the first case, an in-house connection is most common, though also public bathrooms exist. When there is no sewerage net available, various other options are used.

In the metropolitan area of Trujillo, the following sewage disposal systems are used:

Public sewerage net: individual households or collective public toilets are connected to the piped underground sewerage system. Payment is made for the connection only, not for the amount of users or usage.

Latrines: a small scale system where the sewage is disposed into an underground storage reservoir. The disposal can take place via pipes or directly via a hole in the covering element. The reservoir is made from cement, stones, wood or a combination of these materials. The reservoir is optionally ventilated. Cleaning and emptying is done by the owners of the latrine.

Cesspit: a hole in the ground in which the human waste is not stored, but dissipates into the ground over time. The hole can be either open or covered with mats, wood or a cement top. The walls of the shaft are sometimes reinforced with stones or wood.

Open field/none: close-by open areas or uninhabited ruins (former adobe houses) are used for sewage disposal. Often, users take no measures to prevent stench or other discomforts.

In practice, the differences between cesspits and latrines are not absolute; much a rather a variety of technologies executed with large differences in quality of workmanship are common. The same applies for the technological differences between cesspits and the use of an open field; often a simple hole is dug and covered after use of several weeks. The main difference here is the location and ownership; either in one's garden (cesspit) or further away (open field).

These different options as they are used in Trujillo differ very much in usage: most households are nowadays connected to the public net, others use a latrine or cesspit (see Table 5.6). The extension of the public sewerage system on a large scale is something that started after 1975 (Amemiya Hoshi, 2003, p. 89) when the military government invested heavily in the poorer areas of the city, thereby interconnecting the existing lines that had already been installed after 1951. Nonetheless, coverage is still far from full, and extension of the network takes place slowly, especially in the areas that have been recently expanding, as we will see below.

The most important option for those not connected to the public sewerage net is the use of cesspits or latrines. Contemporary developments show that this use of latrines or cesspits has not decreased very much, and with 16 percent coverage in 2005 this is an important system for many. In this respect, Trujillo is different from the national and departmental situation, since in Trujillo Province in 2005 only about 5 percent of the total number of households had no service whatsoever. This is partly due to the work of the NGO Circulo Solidario, and is also due to the expansion of the city; using a type of localised (rather than the neighbouring field or 'none') disposal was required, since there were less vacant areas surrounding the new settlements.

Table 5.6: Types of sanitation used in Peru, the department La Libertad and Trujillo Province in 1993 and 2005

	1993			2005		
	Peru	Department La Libertad	Province Trujillo	Peru	Department La Libertad	Province Trujillo
Public net	35.7	40.5	64.2	48.5	50.9	74.3
Public net outside building	4.3	1.9	3.0	4.8	1.8	2.8
Septic tank ¹	-	-	-	2.8	1.8	1.5
Latrine or cesspit	20.5	21.3	18.8	22.9	25.7	16.4
River, ditch or canal	1.7	1.2	0.7	1.6	1.3	0.2
None	37.8	35.0	13.2	19.3	18.4	4.7
Total %	100.0	100.0	100.0	100.0	100.0	100.0

Notes:

1. The category 'septic tank' was introduced in the National Census of 2005 only. The variety of septic tanks in 1993 was part of the category 'latrine or cesspit'.

Sources:

1993 data: INEI, 1993a, *Censos Nacionales 1993, IX de Población y IV de Vivienda*, Lima.

2005 data: INEI, 2005a, *Censos Nacionales 2005, X de Población y V de Vivienda*, Lima.

The public net in the Trujillo Metropolitan area has thus continued to expand after 1993. Coverage increased significantly, but differences at district level are striking (see Table 5.7). The expansion rate was slightly slower than the migration rate, which is very visible in El Porvenir; in this case the migrant area Alto Trujillo was not fully serviced, thereby reducing coverage of the public net in El Porvenir with 5 percent, whilst the absolute number of people without any system stayed the same and the number of people using latrines multiplied by three. Those poor areas that expanded more slowly received better coverage in 2005 compared to 1993; though in La Esperanza the absolute use of latrines stayed the same.

Table 5.7: Types of sanitation used in three districts of Trujillo Province in 1993 and 2005

	1993			2005		
	Trujillo central	La Esperanza	El Porvenir	Trujillo central	La Esperanza	El Porvenir
Public net	83.8	57.4	62.0	88.9	75.4	57.5
Public net outside building	5.7	1.4	1.3	5.8	0.5	0.9
Septic tank ¹	-	-	-	0.6	1.0	1.9
Latrine or cesspit	4.6	29.2	21.4	2.5	18.8	32.8
River, ditch or canal	0.4	0.3	0.5	0.1	0.0	0.2
None	5.4	11.6	14.6	2.2	4.3	6.7
Total percentage	100.0	100.0	100.0	100.0	100.0	100.0

Notes:

1. See previous table, note 1.

Sources:

1993 data: INEI, 1993a, *Censos Nacionales 1993, IX de Población y IV de Vivienda*, Lima.

2005 data: INEI, 2005a, *Censos Nacionales 2005, X de Población y V de Vivienda*, Lima.

The public sewerage net has not significantly expanded from 2002 onwards in the poorer parts of Trujillo. The data on the public net connections shows that the growth of the number of connections from 2002 until 2007 in the metropolitan area of Trujillo is fully accounted for by two old districts including their richer extensions (see table 5.8). The other districts even show a decline in the number of connections, which is mainly due to massive cutting off to those that did not pay their bills for some consecutive months (see Appendix F table 6 and 7). This cutback took place at the end of 2005¹⁵, and was most noticeable in the poorer parts of the city that had expanded rapidly over the last 20 years (La Esperanza, Florencia de Mora, El Porvenir & Alto Trujillo, and El Milagro). It initially affected 6 to 21% of the households; over time many of these households got themselves connected again. Since 2002 to 2007, no large scale connecting of the poorer new settlements has taken place, thus coverage has hardly increased in any of the areas within recent settlements.

Table 5.8: Sources of growth of the number of active sewerage net connections

	Trujillo Metropolitan area	Trujillo Central	VL Herrera	Other districts
January 2002	100,752	45,946	6,680	48,126
January 2007	105,421	49,537	8,243	48,031
Difference	4,669	3,591	1,563	-95

Source:

Sedalib, 2007a, *Maestro de variables comerciales*, Sedalib S.A. Gerente Comercial – catastro de clientes, Trujillo.

These statistics show that sanitation services are especially lacking in those districts that the poorer population inhabits, where migrants have moved to over the last few decades. In the last couple of years, no expansion of the public net has taken place. Therefore, almost all of the recent settlements use either latrines, or just use the open field.

5.3.3 RECENT SETTLEMENTS

There is no public sewerage net available in any of the three selected cases. Also, none has managed to get connected to the sewerage net in the neighbouring areas, nor come up with an alternative interconnected system themselves.

In the recent settlements, the most commonly used option is the open field (see table 5.9 below). This means that often no adjustments have been made to the living environment concerning excrement disposal. This lack of adjustment can partly be explained by the lack of ownership and thereby lack of willingness to invest; squatter settlements with a less clear status are more likely not to have a latrine or cesspit installed. The case of El Milagro shows that this cannot fully be the reason; this whole area is divided into plots, and has reached a higher level of permanency of the houses, yet the lack of latrines and cesspits is still common (37%). In all cases, the proximity to an open area increases the likelihood to this area for sanitation purposes, thus a larger distance from such an area decreases the usage. Finally, there are some people that have shared solutions: some use public toilets, (on a sustainable basis only three households, the rest use toilets that fill up and will be useless afterwards), a couple of households share cesspits.

Table 5.9: Use of different alternatives for sanitation in the three cases.

	Alto Trujillo 2B	El Milagro VII	La Esperanza NJ	Total
Open field	71.7	36.7	56.7	52.9
Latrine	5.0	54.4	18.9	28.8
Cesspit	16.7	6.7	17.8	13.3
Other	6.7	2.2	6.7	5.0
Total %	100.0	100.0	100.0	100.0

Source:

Survey by author.

The latrines that have been built in El Milagro are mainly a result of individual investments made. Such personal investments are much less the norm in La Esperanza and hardly the case in Alto Trujillo. These latrines in El Milagro are often of good quality and with ventilation installed. In both other areas, the open field is the most commonly used option. This option exists in El Milagro as well (a dry river is used by many), but is less popular. The percentage of cesspits used is not very large, even though basic cesspits are easy to make. This indicates that using the open field is considered a better option than using a cesspit, or that building a cesspit is still considered considerable work and investment.

The experienced quality of the sanitation type indicates that the quality of all the types used are poor (4.2 average on a 5-point scale). Of these alternatives, the latrine is considered the best. Those that have built a cesspit find it of better quality compared to those that use the open field. Therefore, the investment or difficulty of building a cesspit is still considerable.

The main problems as they are experienced by the users differ per sanitation type. Those that use the open field consider danger (in the form of other people) the main problem¹⁶. Contamination of the plot and area is most frequently reported by those that use a latrine. Those with a cesspit consider the unhygienic situation the main problem, followed by the work involved in repairs of the cesspit.

The actions taken to improve the situation upon arrival were not many. Some people contacted the local president (13%), or some authority (7%), but most reported not to have taken any action. The public sewerage net is only installed after or together with the public water net, so that it is likely that these services are expected to be installed together. Nevertheless, the amount of people that reported an improvement of the service to NGOs or local municipalities is very low. This is

especially so when considering that Circulo Solidario has been installing latrines in many recent settlements, but hardly in these three cases studied. Where they have been installed (some parts of El Milagro), they are poorly used: the doors and corrugated iron sheets are often removed and used elsewhere, and garbage is thrown in the basin as well. In this way, trust that the situation would improve by contacting others seemed rather low. This situation is different when considering the planned actions. Many are planning to construct something themselves (37%), some will ask their local president (9%) or other authorities (21%) to take action. There seems to be trust in the authorities to be able to take action. This is different in El Milagro, where inhabitants are least likely to take any action or look for help from institutions. Many have built their own latrines here and contact with the authorities is much scarcer here. The trust in improvement with help from others is lower, while self-help is higher.

The above analysis shows that the type of sanitation services used are of poor quality, with many possibilities for improvement. Especially the most recent settlements, where no latrines have been built yet, experience this poor quality and the danger of using the open field. Self-help leads to an improvement of the situation, whilst actions from authorities and NGOs were scarce and without much result in these settlements. Apart from self-help, there are other options that have not been implemented in any of these settlements, such as shared toilets under municipal or NGO supervision. This would require some investment, but technically, creating some alternative system would not be too challenging¹⁷ as conditions (smells, flies, and direct contact with the contaminated area) would improve immensely. Such alternatives can be installed to create a much safer and more hygienic living environment, whilst contamination would be reduced.

5.3.4 ACTOR STRATEGIES

There are not a great many actors active in the provision of sanitation services in Trujillo. In general, there is a large focus on providing final sanitation services, thus getting a neighbourhood connected to the public sewerage net. With regards to intermediary solutions, particularly individual actions as well as the work of Circulo Solidario are important.

The company in charge of the sewerage net is Sedalib S.A., the same one responsible for the public water net. Their policy has been to focus on disconnecting those that do not pay their bills and to keep the existing services affordable. They made no investments in the actual tubes and net, but were involved in the expansion of the net as the company responsible for executing the national governmental programmes. Sedalib claimed these to be executable only if an additional connection were made to the sewerage treatment plant in Huanchaco. This has proven to be a strategically successful demand; all areas north of the city centre are or can now easily be connected to this plant. This plant has a large capacity and is not located close to the inhabited areas. Over time, also El Milagro will be connected and their plant will become extinct¹⁸. Therefore, expansion of the sewerage net will remain technically feasible in all the northern districts (Alto Trujillo, El Porvenir, Florencia de Mora, La Esperanza and El Milagro) and Huanchaco¹⁹. These are also the areas where further growth of the city via (squatter) settlements can be expected. This means that if governmental or foreign funding of expansion of the sewerage net is ensured, expansion and almost complete coverage can be established.

The extension of the sewerage net is only relevant on the longer term; on the short term (up to ten years) the inhabitants have to use alternative solutions. In this field, the NGO Circulo Solidario has

been an important player. They have placed a great many latrines of good quality²⁰ in the Trujillo Metropolitan area. For this, they received funding mainly from the Basque Government (Spain). These programmes have ended; settlements established after 2005 no longer received these latrines. These latrines have decreased much of the spread of diseases, since they were installed since 2000, when Alto Trujillo and other parts of the city had to deal with the large influx of migrants²¹. Apart from the advantages of having a latrine, there are some remarks as well. The focus of Circulo Solidario has been almost exclusively on Alto Trujillo²², an area more likely to get connected to the public net than the more separated smaller settlements. Furthermore, in all areas the latrines were often no longer functioning properly, due to a lack of maintenance and demolition for re-use of the materials. Finally, many latrines were placed soon after squatter settlements were established, so that changes in those settlements lead to large scale non-use of placed latrines.

The strategy followed for years by Circulo Solidario was to provide intermediary solutions concerning sanitation, whilst at the same time delivering educational programmes on sanitation and health, as well as the strengthening of the neighbourhood organisation. Officially, Circulo Solidario would negotiate with Sedalib to find longer-term solutions, both direct and via the municipalities (i.e. via the representative in the General Board of Sedalib). Despite good intentions and a clearly defined NGO policy, in practice only little resources and time were spent on these negotiations. This changed in 2007, when the focus shifted towards longer-term diplomacy, and the organisational aspects of infrastructure services. As a result, Circulo Solidario has become less active in the field of sanitation in general, as well as in the recent settlements²³. Furthermore, the lack of openness of the NGO in general²⁴ makes it unclear for both the local presidents and inhabitants what their prospects for receiving any service from Circulo Solidario are.

The municipalities and the provincial government have not taken any actions to provide solutions preceding the installation of the final public net. The health centres, which are run by the national government, provide information on hygiene, but do not provide practical solutions for excrement disposal in the form of information or hardware. Thereby, the government at all levels has very little involvement in the temporary solutions, whilst hygiene and disease control is one of their priorities in poor urban areas.

5.3.5 PRELIMINARY CONCLUSIONS

The lack of alternatives in the recent settlements lead to massive implementation of own-built cesspits. These are often of inferior quality, leading to discomfort and the need for regular reconstruction. Over time, latrines of reasonable quality were built by the inhabitants. The influx of new settlers did not lead to a type of neighbourhood organisation that builds temporary collective solutions concerning sanitation, nor did other actors provide intermediary solutions. Migration has thus had negative effects on the average level of sanitation provided. Thereby, the current situation in the recent settlements is rather poor where it concerns sanitation.

The strategies of Sedalib basically consist of two aspects: to demand structural improvement of the network before connecting large amounts of households, and to increase efficiency by disconnecting offenders. Up until the time of writing, this has lead to a stop in the growth of the coverage over the last couple of years, with particularly negative effects in the more recent districts. More positively; this will allow for long-term growth and large expansion of the network in those

areas where squatters have settled and formal expansions have taken place, also when these areas continue to grow.

Opportunities for involvement of NGOs or local governments exist. The setting up of shared units for sanitation for a block or several blocks seems the most promising alternative. Actors could negotiate delivering services. Investments could be made with a reasonable one-time charge whilst a monthly payment could be set up via local representatives. Though solutions are not easy to provide, they can lead to well-functioning alternatives for the currently poor situation.

5.4 ELECTRICITY

5.4.1 INTRODUCTION

The electricity networks in Trujillo cover most of the city. The technological advances and the drive to serve new areas are the main reasons for ongoing expansions. However, the coverage in the recent settlements is poor; large parts are not connected, and those areas that are connected show low coverage.

The data used for the description of the metropolitan wide coverage of the electricity net are deduced from the Environmental Atlas of Trujillo and the national census. Furthermore, strategies and developments concerning the actors involved are derived from personal interviews with employees of Hidrandina and OSINERGMIN. The data collected via questionnaires as well as observations are used for the analysis of the use of electricity in the recent settlements.

5.4.2 CURRENT SITUATION AND DEVELOPMENTS

The system of electricity supply has expanded considerably over the last decade. Thereby the coverage of the metropolitan area as a whole is good. This delivery of electricity to the households goes via different sub-networks, which can continue to expand. The households have three different ways of getting connected to the electricity grid in Trujillo. These are:

Definitive: a household gets connected to the three phase electricity grid. Per connection a transformer is installed to synchronize the phases, so that they become usable for household use. The connection from the house goes via a meter, so that the individual use is registered.

Provisional/collective: a group of houses gets connected to low current electricity net. The posts and wires as well as the installation are taken care of by the users themselves, under supervision of Hidrandina. Payment is done via a committee. The network serves delivers either tri-phased or mono-phased connections.

Clandestine: these consist of either extensions of the provisional network by those not registered, or as illegal connections/tapping from someone who has a definitive connection. In the latter case, wires are most often buried in the sand.

There is not much data on the occurrence of these different options; the census' of 2005 takes into account the possibilities and alternatives for cooking, as do the different ENAHOs, but they do not differ between these various options of electricity supply. This is a pity, because it would have allowed for a comparison over time, which could show the immense improvement of the quality of the system used for delivery of the electricity to the households.

The coverage of the system in Trujillo Province is impressive; it improved from 81% in 1993 to 92% in 2005. This means that despite the large influx of new migrants into the city of Trujillo, Hidrandina has managed to increase coverage further (see Table 5.10). Compared with the national and departmental coverage, the coverage in Trujillo Province is high.

Table 5.10: Use of electricity in 1993 and 2005 for Peru, the department La Libertad and Trujillo Province.

	Peru		Dep: La Libertad		Prov: Trujillo	
	number	%	number	%	number	%
¹ 1993	2,430,666	54.9	135,827	54.8	95,225	81.2
² 2005	4,228,934	72.2	232,552	69.7	149,853	91.7

Notes:

1. The data for 1993 is obtained via the question “Do you have electricity in your house?”.
2. The data for 2005 is obtained via the question “what type of lighting do you use?”

Sources:

1993 data: INEI, 1993a, *Censos Nacionales 1993, IX de Población y IV de Vivienda*, Lima.

2005 data: INEI, 2005a, *Censos Nacionales 2005, X de Población y V de Vivienda*, Lima.

The areas where the coverage of the grid is far from perfect are the zones at the city’s edges, as well as the less metropolitan districts of Huanchaco, Moche and Laredo (see Appendix H). These latter parts that are farther away from the city are getting more easily connected nowadays, as investments in the high voltage lines have followed the trend of the metropolitan area to become more interconnected²⁵. The older and more central districts show almost complete coverage, with only smaller neighbourhoods not being connected. This is different in Alto Trujillo and El Milagro (part of Huanchaco), where large new settlements are not served for years despite the increased coverage for the area as a whole. In the case of El Milagro provisional connections have been installed since 2005, so that the coverage is better now. Nonetheless, as is described in the next section, coverage is still far from complete. In El Porvenir (including Alto Trujillo), the coverage has increased only slight, to 87%. This is due to the continuous expansion in this region, where the more recent settlements are slowly and impartially connected to the grid.

Table 5.11: Use of electricity for several districts of Trujillo Province in 1993 and 2005

	Trujillo Central	La Esperanza	El Porvenir	Huanchaco
1993	93.9	75.2	82.6	61.1
2005	97.4	90.2	86.7	82.4

Sources:

1993 data: INEI, 1993a, *Censos Nacionales 1993, IX de Población y IV de Vivienda*, Lima.

2005 data: INEI, 2005a, *Censos Nacionales 2005, X de Población y V de Vivienda*, Lima.

The coverage as described above consists mainly of definite connections to the grid. The provisional projects are of a temporary nature, and are mainly used to serve the poorest areas of the city. The reasons these projects exist is because either the settlement is not structured enough to install definite post yet, or the costs of installation are too high for the inhabitants, or the area fails to apply properly for projects at the beginning of the year²⁶. The different parts of the provisional net serve large parts of the districts of Huanchaco and Laredo. Furthermore, provisional has been installed in many of the recent settlements of Alto Trujillo and El Milagro. In La Esperanza, provisional connections hardly occur (see table 3 below and Appendix H Table 3) One reason for this is that many of the previous projects of provisional electricity have now been replaced by the definitive net. Furthermore, Hidrandina prefers to install definitive connections immediately here (see section 5.4.4).

Table 5.12: Provisional electricity connections present in Trujillo Province - summarized

District	Subscribed number of users / households
Huanchaco	485
Trujillo	465
Laredo	299
El Milagro	349
Alto Trujillo	221
El Porvenir	210
La Esperanza	42
Moche	32
VL Herrera	16
Total	2119

Source:

E. Ríos, 2007, Convenios Provisionales Hidrandina, Hidrandina

As can be seen from the data, the provisional net serves only a limited amount of households. The actual number of households served can be somewhat higher; since these only concern the registered users, and not the clandestine connections. Nonetheless, the several thousand households served by the provisional net might seem negligible compared to the 150 thousand connections in the total metropolitan area. The cases presented in the next section show that the provisional net is still important in the recent settlements, where the coverage of the definitive net is imperfect.

5.4.3 RECENT SETTLEMENTS

Coverage of the public net in the recent settlements is partial; some parts of the recent settlements do not have any form of electricity available. Where the public net has been installed, this is done rather quickly after settlement. All the different types for getting electricity are used, and diversity is large also within neighbourhoods.

The three cases of recent settlements are characterized by different coverage of the various services; diversity is largest in Nueva Jerusalén; half of the households have definitive connections, some provisional and some clandestine connections. In El Milagro, the coverage is slightly lower, and provisional connections are more common whilst none is connected in a clandestine way. In Alto Trujillo 2B, coverage is low and clandestine connections are most common amongst those that have electricity (see Appendix C-7 for the cases' details and statistics on electricity).

The electricity connections have been established only shortly ago; almost all that have been connected either formally or informally did so over the last year. This is remarkable, since many of the migrants that came to the recent settlements have done so more than three years ago, up to nine years. All but one of the clandestine connections is established within the last six months, as have two-third of the provisional connections. This shows that as soon as the network and number of connections start to expand, than this includes a considerable amount of people. This does not mean that the sporadic connections lead to getting everyone connected; some take-off exists after which many more get a connection. Furthermore, there have always been some clandestine connections in Nueva Jerusalén, but they do not last long. They are either replaced by a formal connection or simply removed.

The costs for the users vary considerably among the different types of connection. The most expensive type of connection is the definitive net (24 Soles/month), followed by the provisional connection (18 Soles/month) and the clandestine connection (10 Soles/month). The share of the income spend on electricity varies little for the different used types of electricity supply. Those with a definitive connection spend 6% of their household income in electricity, those with a provisional connection 4% and those with a clandestine connection 3%. The differences are not large, and all three services are considered affordable. Differences between the costs of electricity are thereby relatively small.

The differences in price are relatively small. This is remarkable, as there are differences in the investment costs included in the monthly bill. The monthly payment for the definitive includes the costs of installation and hardware over the first 18 months, which is more than half of the total monthly payment. These costs for poles and wires are often not included in the other two types and go up to a one-time payment of 150 soles per connection. In addition to this, Hidrandina pays part of the costs and installs public lighting (increased safety). Those paying for provisional service are sometimes paying for a buffer that is created as insurance against theft (to have money available when wires get stolen). The usage can be expected not to differ too much amongst those that have provisional and those that have a definitive connection; both are in a similar stage of settlement. This is different for those that have clandestine connections; these often consist of one wire only, so that often only one light bulb can be connected (due to low amperage).

The prices for the provision of electricity are generally appreciated to be normal to expensive (average 3.6 on a 5-point scale). The definitive connection is appreciated normal to expensive (3.4), the provisional connections are considered expensive (4.0). The clandestine connections are appreciated as expensive, at a less significant level. These data show that those that have a provisional connection (significantly lower monthly payment) find their service to be significantly more expensive than those with a definitive connection. Finally, there is no correlation between the actual price paid per month and the experienced price; the experienced price varies very much independent of the actual price paid.

Payments are made remarkably regularly; most respondents pay every month, some pay with slightly less regularity, but none of the respondents that currently receive some form of electricity pays only sometimes or never. The regularity of the payment is highest when the connection is clandestine, slightly lower when provisional and lowest when the connection is of the definitive type. When a household with a clandestine connection fails to pay, he is likely to be disconnected. Those with provisional connections have a system of collective payments, where social pressure is the key element to induce payment. Those with definitive connections do not experience immediate sanctions from Hidrandina when they do not pay; a notification is sent to the household as soon as they fail to pay within notice, and only after two months is the connection disabled. All respondents that receive electricity have always paid before that happened. Once disconnected, a new connected is cheaper to establish than getting a new one; these costs are nonetheless prevented to make by the respondents. From the above it can be concluded that the system of payment functions well in all cases; the respondents manage to pay regularly despite the high prices.

The different types of electricity services all have 24 hour coverage per day. Nonetheless, there seems to be a difference amongst the quality of this delivery when considering the amount of failures per year. They are low amongst those with a definitive connection (55% has a lack of

delivery twice a year or less, 75% four times per year or less). These data are similar to the data in the rest of the city metropolitan area of Trujillo²⁷, showing that the definitive net is of a similar quality in the recent settlements as it is in other areas. The power cuts are more often for both those with a provisional and clandestine connection; differences within these groups are large, and reported failure of service ranges from once a year to once every two days.

Upon arrival, different actions have been taken by the migrants to get electricity. Most common is contacting the local president (24%). He often went to visit the office of Hidrandina, to explain and discuss the current situation. Many others reported to have visited Hidrandina as well (18%). About one third (33%) did not take any actions at all. Furthermore; some people in Nueva Jerusalén mentioned that they stole electricity for some time, before getting connected legally. Theft was not reported in the other cases. Some statistical relations can be found; those that did visit Hidrandina are more likely to have a definite connection, and those that do not have any connection are more likely not to have gone to Hidrandina. Also, those that did not take any action are more likely to have no service at all and less likely to have provisional electricity. Finally, those that went to see the local president are more likely not to have a clandestine or definitive connection, and more likely to have a provisional connection (less significant relation). These relations show that once actions are taken by the inhabitants of a neighbourhood, for whatever reason, they are more likely to receive some service. Especially visiting Hidrandina and having the president visit the office seem to be good strategies to get formally connected to the electricity net. This can further be explained by the status of the migrants; if they are living in one of the less settled parts (*invasions*), then they are more likely not to have visited Hidrandina and vice versa. It takes some time for the squatters to settle down before they visit the office, they are more likely to do so after two years, and much less likely in the first year.

Actions by citizens to establish or improve the delivery of electricity services differ between Alto Trujillo and the other two cases; in Alto Trujillo 2B the citizens have fewer plans for actions to take. Of the actions that are planned to be taken in the three areas, saving and/or paying is most common. Furthermore, visiting the office of Hidrandina, talking with the local president, as well as getting a clandestine connection are reported. Those reporting a planned action seem to target decent means; all have proven to be successful for getting electricity.

From the above analysis, some conclusions are drawn. The recent settlements have a decent coverage of electricity, a service that is often established rather recently. The prices do not differ greatly amongst provisional and definitive, especially when the costs of installation are taken into account. This explains why those with a definite connection experience the price to be less expensive. Stealing of electricity does not often take place, it has been a strategy of only a few households, and is reported as a strategy by some. The actions of the presidents as well as visiting the office of Hidrandina seem to bear fruits; those that take these actions are more likely to respectively get provisional and definitive connections.

5.4.4 ACTOR STRATEGIES

There are only a few actors active in the expansion and improvement of the electricity network in the recent settlements. The main actor is Hidrandina, which has direct contact with the population of the settlements as well as with the local presidents and Plandemtru. Other actors play a far less significant role in the process.

The projections and plans of the planning office of the Province of Trujillo, Plandemetru, are forwarded to Hidrandina. Hereby, Hidrandina has up-to-date information about the zones that will expand as well as information of the people that have settled²⁸. Hidrandina reported that this has a positive impact on the speed with which provisional projects are carried out, though it is finally the local president and the electrification committee that applies for a project. This shows the importance of these presidents; the president and committee are elected, and do report regularly (often weekly) to the rest of the neighbourhood. However, where it concerns the provisional net, the agreements with Hidrandina do not reflect appointments made at those meetings; i.e. a single block within a neighbourhood gets connected whilst the other parts stay without connection. Furthermore, in the case of El Milagro sector Las Molinas the progress of and payments for the projects are unclear²⁹. Here, the legal status is unclear (part of Parque Industrial) and the committees and contacts much more informal. The project could turn out to be a huge success, where the whole area gets connected at once to the provisional net; but could just as well turn out a flop, with the president and money disappearing.

The expansion of the definitive net is most promising in La Esperanza, the projects to be carried out will be mainly for the definitive net; the expansion here can be done easily and rapidly; both the population density, the level of permanence of the neighbourhoods and the costs for installation are limited. No special relation exists between Hidrandina and either the municipality of La Esperanza or any NGOs, so that the incentives to install the provisional net rapidly in the expanding areas are limited. In Alto Trujillo, the NGOs and municipality have pleaded and agreed with Hidrandina to expand the provisional net rapidly, so that coverage is established quickly in all neighbourhoods³⁰. Furthermore, the policy of the company is to get the provisional net into the recent settlements for one year and possibly two years before installing the definitive net². If projects are applied for directly at the beginning of the year, they will be considered by the project division. This division is in support of installing definitive connections rather than provisional ones. The strategy of having the provisional net installed for two years before being able to apply for the definitive net is only partly followed; the projects that show partial provisional connections (e.g. two blocks in a neighbourhood with 10 blocks) can be approved. This difference between company policy on the one hand and possible different paths in practice is confusing, and can result in formal help from NGOs and Plandemetru being more expensive and slower than connecting small parts of the area provisionally whilst directly applying to the department of projects for total definitive connection.

Hidrandina has had severe problems with the recovery of the cost after installation of a new network. This was mainly due to illegal tapping directly from the electricity lines. Since the gradual introduction of insulated wires and a tri-phased system over the last 15 years, this tapping has become impossible. Thereby, individual's theft is reduced especially in the poorer parts of the city. Other measures that are implemented are meters with extra protection to prevent fraud (installed into a brick wall, also when the houses don't have such walls) and more frequent checking of the meters³¹. As illegal tapping has become impossible, the main form of clandestine connection is via re-selling or illegally connecting more than are subscribed. This does not have consequences for the recovery of costs, since the person illegally selling to others pays for the quantity used. Thereby, theft and clandestine connections are no longer an issue for the return on investment.

Recovery of investment costs and good payment are prerequisites for further expansion into the recent settlements. Hidrandina wants to keep everyone connected rather than gain by receiving

money from re-connecting. The policy of the Hidrandina is influenced by governmental policy (they have a 30% stake, and no other direct involvement with the management (Hidrandina, 2007)) that also wants continuous expansion. Furthermore, the supervising office OSINERGMIN aims to establish competitive tariffs in Peru and to support further expansion of the coverage. (OSINERGMIN, 2007). National legislation has passed on tariffs, making prices competitive. Their office at Trujillo, however, is focussing more on the mining industry than the electricity supply within the city, and does not take action to support further expansion.³² These various elements have led to a policy of Hidrandina aimed at expansion where possible. This is indeed what is happening, even in the areas where income is extremely low (the three studied cases) most customers pay regularly. The system of quick notification and reminders keeps the rate of return high, so that the main prerequisite becomes the neighbourhoods not being too far away from other parts of the net or to have a sufficiently large population if not close by. This means that all areas where the metropolitan area of Trujillo is expanding qualify. Complete coverage of the areas not yet covered can be expected to be achieved soon.

There are no NGOs active in the field of expansion of the electricity net. The NGO Solaris Peru is recently working on the improvement of the relations between the different local presidents as well as between them and the municipality. This neighbourhood organisation could easily be expanded with provision of standardized forms and possibly even more active involvement of the NGO where it concerns the contact between the neighbourhood and Hidrandina. Improving the ease of access to and spread of information between the different parties can help the recent settlements to get connected faster. This could be especially helpful for those areas that experience a less clear legal status, or where the contact with Plandemetru is only recent.

Summarizing the above shows a positive picture: the main actor Hidrandina has a positive attitude towards expansion of the net, and helps neighbourhoods to get connected via either the provisional or the definitive net. Their strategy has led to fast expansion of the network, and can continue to do so. The involvement of Plandemetru has a positive but limited impact for the settlements; the involvement of Plandemetru does not remove the risk that come after a president and committee have been established. Smoothing these processes can be done by NGOs that work in the field of neighbourhood organisation, and also since Hidrandina is willing to expand, this can bear quick results.

5.4.5 PRELIMINARY CONCLUSIONS

The expansion of the public electricity net of Trujillo has been impressive. The coverage is much higher, and has increased considerably into the recent settlements. These settlements are mainly served by the provisional net, and both the provisional and definitive net have expanded here over the last two years. The costs for the provisional net are mainly for the neighbourhood's inhabitants; which allows the company to expand rapidly. The costs for the definitive net are partly paid for by the company, which makes this a much more attractive alternative for those living in the recent settlements. Since the system is improving, the focus of both NGOs and Hidrandina can shift towards the faster establishment of the definitive net.

The influence of migration has been a positive one; services are expanding rapidly in new areas. The recent settlements do often not receive full coverage, small parts get connected first. Still, the impact of the expansion of the net is apparent even when it is formally not installed. Public

telephones and lighting become available in the nearby areas. Thus, even the imperfect coverage of the system of electricity supply leads to improvement in the situation in the recent settlements.

The promising results with this network show that despite the risks involved for all parties, a rapid expansion of the net can be established. This can continue to serve the new expanding areas; with NGO involvement the coverage of the settlements as a whole rather than only isolated islands that have provisional, can be established. This can be done by explicitly connecting only small parts whilst applying for larger projects in the meantime, so that costs for installing provisional stay limited. Speeding up the process of getting definitive connections is beneficial for all parties.

5.5 TELECOMMUNICATIONS

5.5.1 INTRODUCTION

The telecommunication networks³³ in Peru have been expanding rapidly over the last fifteen years. New technologies as well as a continuously changing field of actors create new opportunities and challenges. These opportunities and challenges also include access to these networks by the poor population.

The data used for the description of the general developments of the expanding telecommunication sector are deduced from the various OSIPTEL documents and web pages. Furthermore, strategies and developments concerning the actors involved are derived from personal interviews. The data collected via questionnaires is used for the analysis of the use of telecom in the recent settlements. On the level of the districts within Trujillo, the information used is entirely based on the data from the questionnaires and personal observations. Official data on coverage and use of telephone and internet at district-level from the *Ministerio de Transport y Comunicaciones* and/or the operating companies was considered confidential and strategically important.

5.5.2 CURRENT SITUATION AND DEVELOPMENTS

The telecommunication services are diverse, and include television, telegram and fax services. In this research, the telecommunication services studied are limited to telephone and internet services. The use of these telephone and internet services has increased rapidly over the last fifteen years. Important differences in the type of service used, as well as between various regions and groups, exist.

The telephone calls in Peru are made via the following services:

Landline connection: A telephone is connected to the electricity net, and uses either a landline wired connection or (more recently via Telefónica) a wireless device.

Mobile phone: Mobile phones with either pre-paid or monthly contracts are sold commercially. Limited-user networks are offered as well (Nextel) for business. Charging can be done on any socket via an adaptor.

Public phone: public phones come in three varieties; on the street, via per-minute renting out of a mobile/landline connection, and via cabins on landline connections with an attached timer.

Internet calls: Phone calls via internet in public cabins or a domestic connection are not registered. They are not included in the below analysis. (The use of internet is treated separately below.)

The use of these telephone services has been tremendous, especially since its privatization in 1994. In the whole of Peru, the use of landlines has increased from less than a million in 1994 to 2.5 million in 2007. Much more spectacular is the growth of the number of mobile connections;

growing from one-twentieth of a million in 1994 to 12 million in 2007. (See Appendix I Tables 1 to 3 for exact figures) The coverage show that the number of mobile phones in Peru is much higher than number of landline connections in 2007, as is shown in table 5.13 below. Furthermore, the number of public phone connections has increased to more than double the number of 1999. The number of landline connections is now more than one and a halve times as large as 1999. (OSIPTTEL, 2007) These data indicate that the sector has been growing tremendously, and though the number of all type of phones is increasing, growth can be expected mainly in the use of mobile phones. There are important differences between the different regions of Peru. As can be seen in table 1, the density (number of connections per 100 inhabitants) of La Libertad is slightly lower than Peru, whilst the density in Lima in 2007 is about twice as high as that of La Libertad. Even if the phone use in La Libertad is concentrated in Trujillo, the number of phones as part of the population is still lower compared to Lima. Trends are very similar, with the mobile phones appearing rapidly over the period last few years.

Table 5.13: Density of different telephone services per 100 inhabitants for Peru, Lima and La Libertad

	Landline			Mobile			Public		
	Peru	Lima	La Lib.	Peru	Lima	La Lib.	Peru	Lima	La Lib.
1995	4.5			0.3					
1999	6.3	13.2	5.2	4.1			0.3	0.4	0.2
2003	6.7	13.8	5.9	10.7	23.3	9.5	0.5	0.8	0.5
2007	9.0	17.5	8.6	43.7	74.1	39.6	0.6	1.1	0.5

Source:

OSIPTTEL, 2007, *Indicadores Estadísticos*, accessed from website, Lima.

Since landline connections and public phones are often used by more than one person, their number is not a sufficient indicator. Therefore, the access of households to different telephone services is considered, and is displayed in table 5.14 and Appendix I). The differences are best described by looking at the coverage of those that have either a landline or a mobile phone available. Again, Lima has a better coverage than Peru's average, as well as the other urban areas. Furthermore, the coverage in the other urban areas and that of Peru was at the same level in 2001, but since 2001 the coverage in the group other urban areas has improved more. Finally, landline or mobile phone access was hardly existent in the rural areas, a situation that has changed since 2007. Still, the difference between urban and rural areas is striking; the urban areas (both Lima and the rest of the urban areas) have a far better coverage and continue grow faster in absolute terms. The cities outside Lima have shown a tremendous growth over the last year, more than half of the households has a phone available now.

The growth of access to telephone services is influenced most by the increase in mobile use. Also, the number of households that only have access to a landline connection has been slightly declining in all urban areas. Therefore, the challenge for those companies offering landlines in improving or maintaining their share is obvious. (Gallardo, López and Gonzales, 2007) Possibly, the difference between Lima and other urban areas can be explained by better coverage of the provider in Lima. Over the last three years, the two main providers of mobile telephone services in Trujillo (Claro and Telefónica, see next section) have covered the entire city and all its districts, and coverage has thereby improved significantly. This result has been most significant in the northern part of

Trujillo, and especially there where recent settlements are (Alto Trujillo, El Milagro, parts of La Esperanza)³⁴.

Table 5.14: Household access to either landline or mobile phone in Peru, Lima, other urban, and rural areas

	Peru	Lima	Rest Urban	Rural
2001	24.4	52.6	24.4	1.0
2002	25.4	52.2	27.1	1.0
2003	26.1	53.3	28.7	0.7
2004	31.7	66.1	35.4	1.7
2005	35.7	74.0	39.8	1.6
2006	41.9	76.4	50.6	4.5

Source:

Gallardo, J., K. López and C. Gonzales, 2007, *Perú: Evolución del acceso, la cobertura y la penetración en los servicios de telefonía*, OSIPTEL, Lima.

There is a statistical link between the income and the use of telephone services. For 2004, the density is about 8 percent at an annual income of S/.2,000 (corrected for PPP) for landlines and about 10 percent for mobile phones, whereas for an income of S/.12,000 this is about 37 percent and 18 percent respectively for an income of S/.12,000. The relation between income and density is strongest with mobile phones. Compared to other Latin American countries, the density of phones in Peru is lower than can be expected at these prices. Those with a higher income only show a marginally higher density of phone connections in Peru, whereas in the rest Latin America this difference is large³⁵. (Gallardo, López and Gonzales, 2007) This shows how much the Peruvian telephone market and its networks are functioning at a suboptimal level; partly due to the fact that developments in Peru are more recent, so that the network is still maturing. In the section on the strategies of the actors, an overview of the investments made in the Peruvian telephone sector and the basic problems related to this are discussed.

Internet services in Peru have also developed tremendously over the last decade. Internet services are available in Peru since 1991. Until 1998, dial-up (commercial and personal use) and ISDN (commercial use) were the only modes of access. The number of companies that offered these internet services was limited, and only two of them possessed an international backbone connection. Since 1998, other providers were able to enter the market, and new technologies were introduced. (OSIPTEL, 2003b, p. 43-54) Until 1999, almost all connections were made via dial-up modems. Since then, other technologies have become more important. The use of dial-up connections increased until 2003, and has been declining since then. Nowadays, the most common connection types used to access the internet are ADSL³⁶, WAP³⁷ and still dial-up. The total number of connections has increased to one million. Furthermore, a large part of the population has access via public cabins³⁸, which are registered as one connection only. (OSIPTEL, 2007a; see also Appendix I Table 4).

An interesting article by Fernández-Maldonado on the telecom network in Lima discusses how developments affect the situation of the poor in Peru. As she reports on the case of Lima, the costs of having a personal connection are significant. The poor do not consider the possibility of getting a telephone or internet connection; this is due to the high monthly billing. Therefore, they use out-of-the-home facilities; an extensive system of public phones and internet cabins has created barriers

for those that want an in-house connection in these poorer parts of the city. She claims that this has led to large parts of the poor population being highly unsatisfied about the telecom services offered; especially since the tariff structure (high monthly payment, low price per usage) favours those calling more. Furthermore, developments in the telecom market have led to urban splintering, with parts of the city of Lima becoming fragmented and more isolated. (Fernández-Maldonado, 2005) The situation concerning the use of telephone services is similar in Trujillo, but the availability is high and the splintering does not at all take place. This will be shown in the next section. Where it concerns the use of internet, the splintering does take place.

In the case of Trujillo, the number of internet cabins has been increasing over the last couple of years. Most are located in and around the central part of the city and close to the mayor educational institutes³⁹. In the other districts of the metropolitan area of Trujillo, internet is less common, and often close to either the central square (*Plaza de Armas*) or to other business. Internet cabins exist in the central areas of La Esperanza, El Porvenir and Florencia de Mora. In the coastal district of Huanchaco, tourism has boosted the presence of public internet cabins. In all other districts, the appearance of internet cabins is scarce and prices are higher⁴⁰. There have not been any studies on the use of internet in Trujillo; this makes it hard to quantify the use of the internet cabins. Nonetheless it is safe to say that an increased number of people access the internet via public cabins. Despite this general trend, isolation from internet services takes place; parts of the city are not able to access the internet. On the other hand, many secondary schools have in-house internet connections, which create possibilities for future growth in all areas.

The nation-trend of a rapid increased in the use and coverage of telecommunications is taking place in La Libertad and Trujillo as well. Nonetheless, the use of phones is still behind the use in Lima, and the net is has only recently been extended so that the whole city is covered. Further growth can be expected in the use of all types of connections, toward a majority of the people having a phone available. Where it concerns internet, the availability is highest in the more central, richer or touristy parts of the town; internet is only scarcely available in many of the poorer and faster developing areas.

5.5.3 RECENT SETTLEMENTS

The situation in the recent settlements is best understood by considering the three case studies. These show that the use of landlines and mobile phones is behind the city's average, and that internet is used by only a small part of the population in the recent settlements. Despite this, almost every inhabitant uses the telephone regularly as a means of communication. The attitude towards obtaining a phone, as well as the high appreciation of the telecommunication services shows that they are part of increasing the quality of life of most of the inhabitants of the recent settlements.

Most of the households living in the recent settlements do not have their own telephone connection. About 60% does not own any phone, 36% owns a mobile phone and only 3% has an in-house landline phone. (For an overview of the statistics used in this chapter, see appendix C part 8.) It is required to be connected to the electrical grid before a landline can be installed, which is the main cause for the small amount of landlines installed. Those that are not connected to the electricity grid (in any form) are more likely not to own a telephone. On the other hand, the ownership of mobile phones cannot be explained by having electricity or the lack thereof. Also, there is no significant link between age and phone ownership. Income has a clear link with

ownership of telephones; those that have a monthly household income of S/.500 or higher are more likely to have a phone (especially strong link with landline). There are differences between the three cases studies; those that settled in Alto Trujillo are more likely not to own a phone; those in El Milagro are more likely to do so; most likely a cell phone. This difference cannot be explained by the time that people have been settled, neither by their former locations. It might be understood by the vicinity of relatives and work, which could explain why the ownership of telephones is higher in El Milagro. The above indicates that ownership can best be explained by income and the availability of electricity, far less by other variables. Furthermore, the use of landlines is very uncommon in these settlements; their appearance is very low compared to the rest of the city.

As seen before, coverage of telephone services is much higher than ownership, as public phones are available. Most of the people living in the recent settlements make telephone calls; about 93% uses it regularly. The most popular way of making phone calls is via public phones (44%) or cell phones (40%), much less common is the use of a family member or friends phones (8%). This indicates that those owning a mobile phone use it, and that these are not shared beyond the household.

There is a small group of people that do not make phone calls⁴¹, about 8% of the total number of respondents. They do not own phones because they considered them to be too expensive⁴². Characterizing the ones that did not make any phone calls is hard; the main characteristic that they share is that they seem more likely to be found in the squatter settlements, thus where the use of land is informal and its status often unclear. Nonetheless, they do not typically show a link with any one of the other characteristics as identified in the questionnaire. Thus; neither their origin, former locations, moments of migration or district of settlement, nor their age, income, household size, connectivity to electricity or any single other characteristic shows to be significantly more appearing amongst those that do not make phone calls⁴³.

The quality of the services offered is considered reasonably well. Overall, the telephone services are appreciated good, with 82% of the respondents qualifying the service as very good or good. Most of the people that have a cell phone consider the quality to be very good (43%) or good (42%) too, hereby significantly more people consider the quality of the cell phone service very good compared to the total average. The other options that are used (public phone, family, friends) are appreciated less, they are considered good to normal. It is very likely that if the network, the payment facilities, topping-up or other services were of poor quality, then these responses would have been different. The operating companies thus provide a decent service to those living in the recent settlements.

The appreciation of the price for making phone calls varies widely. On a five-point scale, very few people consider the price to be very cheap all (2%), all other groups are mentioned often (cheap 33%, normal 18%, expensive 21%, and very expensive 26%). More details are found when the appreciation of the price and type of phone are considered; those with a cell phone are very unlikely to find it very expensive, yet more likely to find it expensive. Those that use the public phone are very likely to find it very expensive. No link was found between income and appreciation of the price. An interesting detail in the responses is that many reported that they always paid the same price, namely a fixed S/.10, S/.20 or S/.50 every time, and that this hadn't changed. This and follow up questions show a clear lack of knowledge about the actual prices per minute per region. The fixed amount is the price paid for topping up one's account, for which the number of available minutes has increased with all providers over the last three years. This can indicate a lack of awareness, which in turn might hamper proper functioning of the market in the

recent settlements. Overcharging or more competitive deals might go unnoticed by these consumers. On the other hand, few users of mobile phones respond to have experienced an increase in the price, and many reported a decrease; this shows that they are aware of the changes in prices. This response is different from those that use a landline or public phone; they do not respond such a lowering of price. This can indicate that the prices of use of the public phones have gone up in these recent settlements. With more than half of the population using these phones this is a relevant element for further research.

The changes that people have planned to make are mainly related to getting or adding a connection (67%). Those that have a mobile phone are not likely to add another one for the household, and are very likely to get a landline. Those that do not own a phone now are likely to get a cell phone, and unlikely to get a landline. This shows that there is still great potential for landline connections, as people with a mobile phone are willing to get a landline next to it. This is also driven by recent offerings of landlines by Telefónica (see next section).

Internet services are used much less in the recent settlement; most inhabitants of the recent settlements do not use the internet (76%). Those that use it mainly use it in public cabins (93%) and some at a family members place (7%). They value the quality as good to very good (overall average 1.7 on 5-point scale). Only one person qualifies the service as of poor quality, and four as normal; the rest (91%) values it as good or very good. The price is considered cheap to normal, with very few finding it very expensive (4% only). There is a link with income and internet use; those that have a higher than average income (S/.500 and higher) are more likely to use the internet, whilst those that have the average income (S/.250 – S/.500) are less likely to use it (for the lowest income group, less than S/.250, there is no correlation). These above described figures show that the services are of good quality, offered at a decent price. Nonetheless, the service is not often offered in the recent settlements. This might have to do with the investment costs, which can be large for those living in the recent settlements. Nonetheless, given the usage (about one quarter of all people), appreciation, expected growing usage and increasing neighbourhood size (both migration and births), the return on investment can be expected to be good especially on the longer term. Providing small loans (micro credit) or letting computers can be both profitable and useful in the recent settlements.

These statistics on the use of telecom in the recent settlements shows that despite the limited infrastructure, most people use phones. Also, the lack of full coverage of the electricity net is one of the reasons why landline connections are not common. It does not significantly influence the ownership of mobile telephones, and does not influence the use of internet. There are possibilities for expansion of the mobile phone coverage, number of landline connections, and internet services offered.

5.5.4 ACTORS STRATEGIES

The privatization has had tremendous impact on the Peruvian telecommunication sector. Therefore the most important developments in the Peruvian telecom sector concerning the actors are described here. Attention is paid to the strategies of the actors involved as well.

The privatization process in Peru shows many similarities compared to other countries in Latin America. The process of privatization contains two main elements; the opening up of the market,

and the privatization of former state monopolies. In Peru, the privatization of the state monopoly happened in 1994, four years later than Mexico and Argentina but four years before Brazil and Panama⁴⁴. It was not until 1999 that the market for other providers was opened up; most other Latin American countries maintained a longer exclusive period. (OSIPTTEL, 2003a) Since the opening up of the market, the number of service providers that have entered the market via concessions is limited. Concerning landline connections, the privatized Telefónica is still by far the largest operator, and in most parts of Peru the only operator. This is also the case in Trujillo, where only in June 2007 some competition had started. (OSIPTTEL, 2007b) The mobile phone market has been extended with the introduction of Nextel in 1998 and Claro/TIM in 2001, operating next to Telefónica. The total number of connections of Claro/TIM has been increasing rapidly since their introduction. Nextel is only marginal competition for these other providers (see Appendix I Table 6) and is operating in niche markets such as their Direct Connect network⁴⁵.

The governmental policy towards telecommunication is based on two pillars; getting the telecom market function properly, and invest in the rural areas which will otherwise not be connected. These investments in the rural areas are the only large investments made by the government, and all fall under the subsidiary programme FITEL (OSIPTTEL, 2005). This policy towards rural areas is not about to change, as political support for the programme FITEL is very high and private investments in the rural areas still very limited⁴⁶. The functioning of the market in the urban areas is supervised by the supervising agency OSIPTTEL (*Organismo Supervisor de Inversión Privada en Telecomunicaciones*). Their main means of intervention is via the creation of maximum prices. These are set regularly, and have a binding impact for the operating companies (OSIPTTEL, 2004b).

Most of the work of the supervising agency OSIPTTEL is dedicated towards problem solving for existing customers, like the other supervising agencies. Here however, the customer base is much more diverse in the sense that people with any income level or location can be customers. Furthermore, the policy of OSIPTTEL is to keep the prices low; this is in line with the demand of the poorer population. Thereby, there is no need to focus more on new customers; this is done sufficiently. There are possibilities for interaction with OSIPTTEL; before important decisions are made, public debates are held on the topic. These are typically busy, but not visited by the local president of the recent settlements, neither by the authorities of the various municipalities. This can be because these decisions that are made for the functioning of the market in the city are discussed at a more general level; it does influence the inhabitants in a particular neighbourhood the same as it does most others. This sets it apart from the public meetings of the other supervising organisms (Osinergmin, SUNASS) where lively debates on the lack of services were held. This illustrates that those living in the recent settlements do not feel excluded or forgotten where it concerns telecom services.

One of the main concerns in the telecommunication sector in Peru is the low level of investment. Shortly after the privatization, these investments have dropped and steadily declined (see Figure 1 of Appendix I). (OSIPTTEL, 2004a, p. 11) According to the telecom companies, these low levels of investment are a result of the maximum tariffs, so that profit margins are too small and leave little room for investment where the need is not high. In the urban areas, coverage is high so that investments can remain small. In the rural areas, subsidiary programmes exist, so that it is not worth investing privately. On the long term, investments of maintenance will rise for especially the landline network. Especially the company Telefónica will have to deal with this⁴⁷.

Landline connections are more common now than five years ago, but the share of landline connections is declining rapidly over the last few years, as is explained in section 5.5.2. Apart from the earlier mentioned maintenance costs, this is another reason why the companies offering these services are challenged to come up with technical innovations. In the case of Telefónica, the introduction of a new type of landline connection has led to new possibilities. This 'radio'-connection works without a telephone grid, and can thus be installed much easier in recent settlements. Salesmen go door-to-door as a neighbourhood or block has been connected to the power grid, offering these phones with pre-paid cards⁴⁸ or contracts at rates below pre-paid mobile phone rates. The number of these phones sold in Trujillo in 2007 was around 200 per week over the period January 2007 – April 2007, the largest growth in a single city outside Lima⁴⁹. This will allow further growth of the landlines without creating future maintenance costs. Thereby, an additional service can be offered, which seems in demand also by those living in the recent settlements (see previous section). Furthermore, these are the only service offered at home in recent settlements; mobile phones or mobile phone contracts are not advertised or sold there. This aggressive strategy of going door-to-door is likely to continue to yield good sale results for Telefónica.

The telecommunication sector is functioning well, with prices being lowered by OSIPTEL and competition starting to appear more. Though the amount of companies is still limited, there seems to be sufficient competition; this is illustrated by the introduction of the telephone by Telefónica; this is done at a low price to expand their market. The low level of investment does not seem an immediate problem for Trujillo, coverage is good and competitors are operating in all areas. Thereby, the task of OSIPTEL should be here to keep the market functioning, and to facilitate the introduction of new approaches and products. This could lead to very high coverage and quality in the case of Trujillo, where many households are still willing to change their current telecom situation.

5.5.5 PRELIMINARY CONCLUSIONS

Telephone calls are common way of communicating; almost everyone uses either via mobile or public phones. The opposite is true for internet use; only a small group of people uses the public cabins where internet is offered. These different telecom services are decent; there seem to be few problems with these in the recent settlements. Privatization has made it possible for many Peruvians to get a phone, and more continue to do so. Public phones become quickly available as the expansion of the electricity net continues, and many whom don't have electricity use mobile phones. The impact of migration is visible with the introduction of the new phone by Telefónica, which aims at those living in recent settlements: it does not require the installation of a landline, and is cheaper. Overall, the telecommunication services offered are of good quality, and coverage of various networks increases rapidly.

The actors involved should continue to focus on the introduction of new technologies and the lowering of the prices of the existing services. The telephone recently introduced by Telefónica can continue to gain importance, and can be a valuable addition for those that already have a mobile phone. Responses from other providers are likely to follow, and can lead to a wider variety of services offered. With this, possibilities for the poor are likely to increase and improve as well. NGOs could get into the field of micro credit to facilitate the developments in the recent settlements, where possibilities for small scale internet business or phone services are there. Overall

the prospects for the quality of the telecom in Trujillo are bright, and the current situation for those living in the recent settlement at least decent.

5.6 HOUSEHOLD WASTE

5.6.1 INTRODUCTION

The proper collection and/or disposal of household waste is an important element in the creation of a healthy living environment. In many neighbourhoods in Trujillo, the system of collection is inadequate, leading to a situation where garbage is lying on the streets, burnt by individuals or buried in public areas. This is especially the case in the more recent settlements.

The collection of waste is a subject little studied in Peru. The main source for the recent settlements in this chapter is the data collected by the author. For the other parts, the information is derived from observations and interviews with the various municipalities and other actors, as well as from the Environmental Atlas of Trujillo (MPT, 2003). There are questions concerning waste included in the ENAHO or census of 1993 and 2005, and barely any (scientific) writings on the waste disposal in Trujillo.

5.6.2 CURRENT SITUATION AND DEVELOPMENTS

The system of the collection of household waste in Trujillo consists of sub-systems, every district (i.e. municipality and 'populated centre') has its own collection system. The main connection between all these collection systems is their shared recycling and dumping places.

In the metropolitan area of Trujillo, there are various ways in which waste collection is dealt with in households;

Garbage truck: a truck drives a fixed route at a regular interval (most places weekly, some daily). The garbage is put along the roadside and thrown in by the workers. The trucks have a compression device. Furthermore, trucks visit the containers (3 m³) that have been placed throughout the city, mainly close to markets.

Formal cleaners: municipal public servants and private workers visit public areas daily, mainly the city centre and central parts of the districts (central squares). These workers are paid by the hours worked.

Informal collectors: roaming the streets with tricycles and carts, they sort out the valuable bits of the garbage that will be collected later by trucks. Furthermore, metals (tins, wires, batteries, etc.) are collected during daytime at the house. These collectors are paid for the amount of garbage per type brought in.

Individual solutions: garbage is thrown in open places close to the living space and on the streets. Furthermore, on-site burning and burying of the garbage is also common in the poorer parts of the city. These individual solutions are especially used in the recent settlements, as well as the more rural areas of the province of Trujillo.

Most of the waste produced in the province of Trujillo derives from the central district Trujillo (about 65%). Also, most of the approximately 100 containers used at strategic places are in the

district of Trujillo. The same accounts for most of the 166 (year 2000 approximation) workers, that clean public areas daily. The number of formal workers increased further in 2007 when special cleaning teams started to operate in the city centre of Trujillo. (MPT, 2003)

As mentioned, these different systems are connected via the central recycling and dumping places. The waste collected by the garbage formally (mainly by trucks) is brought to the garbage dump (outside the urban area) in the district El Milagro. The waste collected by informal collectors is brought to one of the many recycling centres in El Milagro (within the urban area) from where the enterprise takes over and either recycles the materials or sells them to others. El Milagro therefore has a central function as a collection and distribution centre.

The garbage dump has been in existence since 1989, and since then the amount of garbage processed has doubled. The garbage comes mainly from Trujillo (73%) and Victor Larco Herrera (9%), La Esperanza (11%) and Florencia de Mora (6%). (MPT, 2003) This shows that in the areas outside the oldest and richer parts of the city, the municipalities and appointed private companies collect considerably less garbage. This is due to the fact that most services and shops are located in the city centre; that well-off people produce more waste, and because of the inadequacies of the collection system in the poorer areas.

From the above, it is clear that the system of collection as it is currently operating is not very diverse, especially not in the more recent settlements. Information on changes in this system have not been published nor investigated properly.

5.6.3 RECENT SETTLEMENTS

The situation in the most recent settlements of Trujillo is characterised by a sub-optimal functioning collection system, which is operating in most of these settlements. The existence of decent roads is the most important prerequisite for the municipal trucks to operate in a settlement. This is especially important since these settlements are located at the edges of the city, where the sandy soil and slopes of the hills make visiting hard.

In the cases studied, the garbage is collected by the municipal trucks in most of the settlements. Coverage is partial only in the squatter settlements where settlers arrived less than a year ago, and even there about half of the households have their garbage collected. This does not mean that the coverage is perfect, as the trucks only visit the main road and do not pass along all the houses. Nonetheless, those that receive this service perceive the quality as good to normal (2.4 on a 5-point scale). Between the three cases, there is a difference in the interval of collection; in Alto Trujillo 2B the truck visits once a week, whilst in Nueva Jerusalén (La Esperanza) and in El Milagro the truck visits about twice a week. In these latter two areas, the intervals are irregular and respondents found it hard to give exact times of visit of the truck. Nonetheless, this irregularity had no significant impact on their experienced quality. This data on visits shows that when the truck starts operating in an area, there is no difference between the more recent settlements and the older ones (i.e. between the cases and the other parts of these districts). (For an overview of the statistics of the three cases, see Appendix C section 9)

The small amounts of waste per inhabitant and its type (mainly organic), are not a sufficient incentive for informal collectors to pass through the streets. They do sporadically roam through the

garbage that is thrown away on the hillsides (various settlements in La Esperanza) or in dry rivers (El Milagro). This is by far not enough to prevent contamination, flies, and metals from oxidising. This pollution is mainly but not exclusively caused by those that are not serviced by municipal trucks; about half of them throw their garbage away in the field, and one quarter uses some type of dump where the garbage is burnt or covered with sand at times. Some others throw it either on the street or burn it on their own plot. This dumping and use of the open field is very visible, and is done at places right at the borders of the neighbourhoods (Nueva Jerusalén and Alto Trujillo), at open places within the neighbourhoods (Nueva Jerusalén and El Milagro), or at the dry river and open areas slightly farther away from the houses (El Milagro). Furthermore, the garbage is not piled neatly, nor are any measures taken to keep it in place (such a holes, walls, or similar); thus the garbage spreads over a relatively large area. This same area is used by those that have no sanitary facilities at their disposal, and is often inhabited some weeks or months later by new migrants; thereby exposing themselves and future inhabitants to disease.

There is a high level of awareness of the problems caused by throwing away garbage at those areas; the inhabitants that do not have municipal collection services are generally unsatisfied with their way of disposing garbage (4.1 on 1-5 scale). The main problems that they mention are almost all related to the unhygienic situation; contamination (58%), spread of diseases (12%), smell (12%), flies (7%), and the dirty situation in general (4%). The other problems reported are the distance and danger (combined 7%). This notion is especially interesting, since preventing the worst effects of the contamination can be done by taking some simple measures.

Despite the unsatisfactory situation, the actions taken shortly after arrival of the inhabitants of the recent settlements are limited. Most people did not contact anyone, nor did they arrange anything themselves to dispose their garbage properly. Of those that took action, most went to talk with the mayor, the municipality or the local president. Of the actions taken to get rid of the garbage by own initiatives, burning the garbage on a regular basis was the main solution. This is generally done by small groups of some families within the neighbourhoods; actions were not taken by a whole block together, nor was there presidential interference. In general, support and participation in neighbourhood cleaning events organised by NGOs was limited.

The planned actions on what to do to change the current situation consists mainly of getting the municipal truck to visit; either by visiting the mayor (42%) or by consulting the local president (8%). Most people, however, are not planning to take any actions to change the current situation. This is slightly more the case for those whose waste is collected and less the case for those whose waste is not. Hardly any planned actions for setting up a more durable system were mentioned. The presidents of the various neighbourhoods of the cases said that the garbage was not their main priority, mainly because they considered themselves unable to change the behaviour of those throwing away garbage.

These above characteristics of the behaviour and attitude of the people living in the recent settlements show that when the municipal waste collection trucks visit an area, the service is perceived much better than before. When these trucks do not visit, the neighbourhood actions taken are very limited, though awareness of the severity of the problems is high. Individual actions (taken or planned) are limited, as are expectations from and of the local presidents. The municipality is therefore the most active participant in improving the system, of which the most is expected.

5.6.4 ACTOR STRATEGIES

The main actors in the systems of waste collection and disposal are the municipal governments; they work on a permanent base in neighbourhoods on this topic. The sharing of information is limited, and contact with neighbourhoods' citizens and their local presidents far from adequate.

The municipalities of the central district of Trujillo, as well as in Florencia de Mora have appointed a company to take care of the household and public waste. These contracts have been appointed via concessions; in both places a Brazilian company operates under a 15 year contract. In the city centre, the company started operating in 2007; those defending the stakes of the informal workers claimed that no action was taken to transit these workers to different jobs, or provide any alternative. The experience in Florencia de Mora is promising; the collection system and the punctuality of the garbage trucks' visits have improved.⁵⁰

In all the other districts, a different approach is taken. The municipalities do not want private sector involvement, and keep the system operating under municipal flag. The topic of waste collection has high priority for most municipalities, also because of the possibilities for additional taxation⁵¹. In La Esperanza, two high-quality trucks were operating within 8 months of the appointment of the new municipal government, and the garbage collection is done without an additional direct tax for the citizens. In Alto Trujillo, the collection is arranged as soon as the roads are of sufficient quality and contact with NGOs (Solaris Peru and Circulo Solidario) is intimate. The growing pile of garbage that had been there for years at a large uninhabited space, was removed shortly after the 'populated centre' gained a status independent of El Porvenir.⁵²

The dedication of the municipalities does not directly translate to their contact with the recent settlements. Though migrants plan to contact the municipality (see previous section), the municipality rarely communicates with them. The municipalities do not deal with personal quests concerning waste collection⁵³; this contact is supposed to go via the local presidents. The various local presidents have no idea how the municipal decision making process takes place, nor how long it would take before the collection trucks would come to visit the areas. Furthermore, the municipalities do not provide any incentive for inhabitants of the recent areas to prevent pollution, though both parties consider this pollution to be a serious problem.

The NGOs that are active in the field of waste disposal are Solaris Peru, Circulo Solidario and DEECO. Solaris Peru focuses on the contact between local presidents, and the exchange of information, by way of meetings where the municipality is present as well. They have started these meeting too recently to draw conclusions, and operate only in Alto Trujillo. The actions of Circulo Solidario consist of cleaning days, where it desires neighbourhood organisation and participation to increase. These days are organised in a top-down manner where the NGO announces a time and date of the event. The inhabitants of the recent settlements seldom participate, and do not see this as a solution to preventing pollution from getting out of control, as the meetings seem too infrequent for that. If the NGO wants to ensure the success of the system then either more frequent involvement or an organisation of these days where the NGO has a less active role, is required. DEECO uses a more responsive approach, with public campaigns in favour or against policy measures concerning ecological issues. Their role is still limited. The impact of these NGOs is still rather limited, and can increase when cooperation with settlements improves.

The central function of El Milagro in the system of waste disposal and recycling does not translate to a more important role of this municipality in these processes. The companies operate mainly without municipal involvement, and no special arrangements are made to facilitate the involvement of other companies. Its central function is mainly a result of the accessibility (along Pan American Highway) and the available space and plots in what later became an urban area. This could be further exploited; the municipality of the populated centre of El Milagro or any NGO could take initiatives to expand and improve the recycling facilities in the growing market of waste recycling. This could provide additional income for the municipality and help prevent pollution in other areas.

5.6.5 PRELIMINARY CONCLUSIONS

The system of collection of solid household waste is lacking in some parts of the recent settlements. Problems with contamination occur in these areas, and very few actions are taken to provide intermediary solutions. Here, the work of NGOs is not adequate, and neighbourhood organisation non-existent. The municipalities dedicate serious resources and time to improve the system of household waste collection, via the expansion of the area where trucks collect this waste. Migration has neither lead to massive implementation of alternatives, nor to rapid expansion of the existing infrastructure. Thereby, the current situation in many of the recent settlements is poor and collection inadequate.

A further expansion of the role of the municipalities is possible, better communication with the representatives of the recent settlements and intermediary solutions could be provided. The building of roads plays a vital role in the collection system; both NGOs and local governments could take a more active role in the construction of these roads. Planning is a vital element in the quick implementation of neighbourhoods in the collection scheme; communication with Plandemetru is vital here. Both NGOs and municipalities should get involved in organising the implementation of intermediary solutions.