KUNGL TEKNISKA HÖGSKOLAN

WATER IN EXPANDING CITIES
-A CASE STUDY OF COIMBATORE, TAMIL NADU, INDIA

Gunilla Bergh
Pia Nordberg

Stockholm 1996

Master of Science Degree Project
Div. of Land and Water Resources
Dept. of Civil and Environmental Engineering
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Supervisors:
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Prof. Jan Lundqvist
Examinator:
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LIST OF ABBREVIATIONS

AEE= Assistant Executive Engineer, Water Supply and Drainage Department, Coimbatore Corporation
bc = bullock cart
DE = Deputy Engineer, Tamil Nadu Institute of Urban Studies
hh = household/s
HO = Health Officer, Health Department, Coimbatore Corporation
lpcd = litres per capita and day
mld = million litres per day
oht = overhead tank
rcc = reinforced concrete house (flat roof)
SE = Superintending Engineer, TWAD board
TN = Tamil Nadu
TNAU = Tamil Nadu Agriculture University
TWAD board = Tamil Nadu Water Supply and Drainage board

Note: At the time of the survey (end 1994) there were approximately Rs. 30 to 1 US$, Rs. 4 to 1 SEK.

TNAU

KUNGL TEKNISKA HÖGSKOLAN
Royal Institute of Technology

CITEC Center for International
Technical and Educational Cooperation

Preface

This study has been carried out within the framework of the Minor Field Studies (MFS) Scholarship Programme, which is funded by the Swedish International Development Authority (SIDA).

The MFS Scholarship Programme offers Swedish university students an opportunity to carry out two months' field work in a Third World country on a basis of a Master's dissertation or a similar in-depth study. These studies are primarily conducted within areas that are important for development and in a country supported by the Swedish programme for development assistance.

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Sigrun Santesson
Programme Officer
MFS Programme

Address
Fiskartorpsvagen 15D
S-100 44 STOCKHOLM
SWEDEN

Telephone
+46 8 790 60 00 operator
+46 8 790 ext

Telex
14637 IUKTHS

Telefax
+46 8 20 37 16

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Stockholm in June 1996

Gunilla Bergh *Pia Nordberg*

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ABSTRACT

As a consequence of economic expansion and rapid urbanisation in India, many urban dwellers live under circumstances characterised by poor access to water, unsanitary conditions, uncollected solid waste and insect infestation. The Master of Science Thesis, ***Water in Expanding Cities - A Case Study of Coimbatore, Tamil Nadu, India***, aims at evaluating the present domestic water situation in an urban area. One focus has also been on the closely related subjects of drainage and sanitation, which very much decide the environmental situation of households. In the study, topics have also been given a gender perspective. The analysis has focused on variations between income groups and areas within Coimbatore. A final objective has been to evaluate if there exists a gap between strategies of the authorities and the view of the public. The study can to some extent help identify appropriate strategy and point to opportunities and obstacles.

The conclusions are:

The household perception is that water supply conditions are rather satisfactory and water charges are low. However, variations between income groups are shown by the facts that high income groups have easy access to water and use greater quantities, while the lowest income group has poor access and pays the highest price for water.

Drainage and sanitation facilities combined with proper maintenance are inadequate.
Households, especially of lower income communities, give high priority to improvements such as water house connections and are willing to contribute with payment. Almost all households finding lack of a toilet a problem are willing to contribute to a "pay-and-use" toilet.

There exists a strong mutual distrust between the public and the authorities (the Coimbatore Corporation), inhibiting improvements.

The study recommendations are that the authorities raise their sensitivity of hearing to the attitudes and priorities of the public and involve the public in the decision-making process Major benefits could be reached if they gave recognition and support to individuals and community groups trying to solve their own problems. Moreover, improved co-operation and insight between the departments of the Coimbatore Corporation will create better strategies, effective utilisation of resources and maybe reduce corruption.

The focus in the present situation must be to consider drainage and sanitation improvements It is realistic to concentrate on simple, low-cost solutions and let improvements be financed to a great extent by the inhabitants themselves. Separation of these costs from tax payments is felt necessary to allow people to see what they are paying for. "Pay-and-use" toilets should be installed and cleaning improved.

Regarding water supply, the discrepancies between high and low income communities should be diminished by allocating more water to poor households Since the set water tariffs are considered low , also compared to other cities in Tamil Nadu, a strategy should be to raise them.

KEY WORDS

Coimbatore, drainage, India, neighbourhood organisations, sanitation, urbanisation, water, water scarcity, willingness to pay

SAMMANFATTNING

I Indien har ekonomisk expansion och snabb urbanisering medfört att många stadsbor lever under sanitärt undermåliga förhållanden. Situationen for dessa hushåll karaktäriseras av brist på färskvatten, ett otillräckligt omhändertagande av avlopp och avfall samt liten tillgång till eller total avsaknad av funktionsdugliga toaletter. Upptornande avfallshögar och stillastående avloppsvatten i människors närmiljö skapar ohälsosamma forhållanden med besvarande lukt och insekter.

Examensarbetet "Water in Expanding Cities - a Case Study of Coimbatore, Tamil Nadu, India", syftar till att utvärdera de aktuella förhållanden for hushåll i en-miljonstaden Coimbatore vad galler vattenförsörjning, vattenhantering, betalning för vatten etc. Studien berör även hushållens sanitära situation, som till stor del bestäms av om det finns ett tillfredsstallande omhändertagande av avlopp och avfall. Ytterligare fokus har lagts på kvinnans roll som huvudansvarig för hushållet, vilket därmed inkluderar bl a vattenhämtning och renhållning. Manniskors varderingar av förbättringar, hur de går till väga rörande vattenrelaterade problem, samt vilken roll lokala organisationer spelar i sammanhanget, har också tagits upp.

Analysen är fokuserad på skillnader i ovan nämnda forhållanden mellan olika inkomstgrupper och stadsdelar inom Coimbatore kommun. Resultaten har indikerat var de mer pressande behoven till förändring ligger, och utifrån detta har utvärderats hur kommunens- och övriga vattenrelaterade myndigheters policies och strategier overensstammer med allmänhetens önskemål och attityder. Studiens resultat kan i viss utsträckning peka på en rådande obalans, samt att strategier och riktlinjer borde, eller kunde, ändras för att tillfredsställa manniskors uttryckta behov Slutsatser rörande passande strategier, mojligheter samt hinder till förbättringar diskuteras i rapporten.

Examensarbetet baseras på en intervjustudie utförd i Coimbatore, Indien i oktober till december 1994. 80 hushåll samt ansvariga personer i kommun och vattenrelaterade myndigheter intervjuades Hushållsintervjuerna var av semistrukturerad konversations-typ.

Följande slutsatser har dragits:

Den allmant rådande uppfattningen bland hushåll i Coimbatore är att vattenförsörjningen ar tillfredsställande och att det av myndigheterna satta vattenpriset är lågt. En jamförelse mellan inkomstgrupperna uppvisar emellertid variationer. Hoginkomsttagarna har tappvatten mer lättillgängligt och de förbrukar större kvantiteter, emedan hushåll i det lägsta inkomstskiktet har mycket svårare att få tag på vatten - dessutom ett vatten de får betala det hogsta faktiska priset på.

Kommunens renhållningsservice och underhåll av avlopps- och dräneringsdiken är överlag otillräcklig och kan på många ställen beskrivas som undermålig eller under all kritik.

Hushåll, speciellt de tillhörande lägre inkomstgrupper, prioriterar de ovan nämnda otillräcklighetema högt och är villiga att bidra ekonomiskt för att uppnå förbättringar.
En övervagande majoritet av hushåll som upplever avsaknad av en toalett som ett problem, ar beredda att betala per toalettbesök om de får tillgång till en funktionsduglig toalett. Detta trots att de uppbringar en mycket låg familjeinkomst.

Det existerar en stark misstro bland allmänheten mot ansvariga inom kommun och myndigheter. Misstron visar sig i ett ifrågasättande av kompetens och vilja till förändring.
I viss mån kan denna diskrepans vara ömsesidig, då myndigheter sällan uppvisar tilltro till innevånarna. Forhållandena försvårar och hindrar en forbättringsprocess.

Rekommenderas vore att myndighetspersoner i väsentlig grad ökar lyhördheten för allmänhetens attityder och önskemål samt att de involverar innevånarna i beslutsprocessen. Avgorande fördelar

skulle kunna uppnås om kommunen gav erkännande och stöd till enskilda människors förbättringsarbete och insatser gjorda av det nätverk av lokala organisationer som finns i Coimbatore. Ett smidigare samarbete mellan innevånarna och myndigheterna och en ökad insyn för allmanheten i kommunens arbete skulle innebära stora vinster. Inte minst troligt ar att en koncentration av ansvaret till en avdelning inom kommunen skulle underlätta strategiarbete, medfora effektivare resursutnyttjande och kanske förhindra korruption. Detta i motsats till de oklara ansvarsförhållanden mellan olika avdelningar och myndigheter som råder idag.

I dagsläget måste fokus ligga på förbättringar i den sanitara situationen i hushållens närmiljö. En förbättrad renhållningsservice måste vara en huvudfråga. Realistiskt vore att koncentrera sig runt enkla billiga lösningar samt att i möjligaste mån låta berorda innevånare själva finansiera forbättringarna. Att separera dessa kostnader från den allmanna fastighetsskatten kanns nödvändigt for att låta människor direkt se vad de betalar för. Bostadsområden bör dessutom förses med ett tillräckligt antal betaltoaletter av god standard och anknytande renhållning måste vara av högsta kvalitet för att säkerhetsstalla att alla anvander toaletterna

Beträffande vattenförsörjningen till hushåll i Coimbatore idag skulle klyftorna mellan hög- och låginkomsttagare kunna utjämnas genom att en större andel vatten fördelas till områden försedda med många kommunala tappställen. Dessa delas idag ofta av många hushåll. Idag får en privat anslutning till det kommunala vattenledningsnätet sig tilldelad samma mangd vatten som en kommunal tapp som delas av ett flertal familjer. En lämplig strategi måste också anses vara att höja de enligt allmänheten lågt satta vattenavgifterna, sarskilt då de också ar låga i jamförelse med avgifter i motsvarande städer i Tamil Nadu.

SUMMARY

The urban population of India has grown dramatically in the last decades as a consequence of the overall population growth in India and migration from rural areas. Today the population of Coimbatore, situated in the state of Tamil Nadu, has reached over a million compared to around 450000 inhabitants in 1961, principally caused by the economic expansion Due to population and industrial growth in combination with a semi-arid climate, scarcity of water is a fact and the water supply is in brief mainly dependent on what the monsoon brings. The seasonal variations are marked. The city has as a solution an interstate-collaboration with the Kerala state and is today supplied with surface water from the Siruvani river and in the near future an additional supply is to be implemented including water from the Bhavani river, the Pillur scheme. Within the city, excess extraction of ground water as well as pollution has made the ground water impotable in many areas due to high saline content. The existing nominal water runoff is not enough to wash out the salt coming from the growing industrial sector and other human activities.

Shortage of water creates a problematic situation with competing demands from the domestic, industrial and agriculture sectors At present, water scarcity actually limits the industrialisation of the city. The allocation policy of the authorities regarding Siruvani water is 90% distributed to the domestic sector and 10% to the industrial sector. Within the city there exist variations in water supply between areas and between income groups. The central parts are favoured compared to suburbs, which have only half their supply, and poor urban households are generally more affected by lack of water than high income groups.

The urbanisation has further lead to the authorities not being able to fulfil demands for new housing, drainage and sanitation facilities to all households due to other priorities and lack of resources. Settlements on unapproved (not structure planned) land constitutes a major problem. For many low income urban dwellers environmental degradation is a fact, with poor access to safe water, unsanitary conditions, uncollected solid waste and insect infestation. Like most environmental problems, these are closely inter-related. There is a great need for strategies and planning for future development of Coimbatore in order to fulfil the demands of the population.

The Master of Science Thesis, ***Water in Expanding Cities - A Case Study of Coimbatore, Tamil Nadu, India***, aims at evaluating the present domestic water situation with regard to water supply and use, sources, handling practices and payment. Closely related to water are the subjects of drainage and sanitation. These conditions very much decide the environmental situation of households and has been studied and discussed as well. A further purpose has been to give a gender perspective, involving effects on women Household valuation of improvements, how households deal with problems related to water and what role neighbourhood associations play have been other topics covered. The analysis has focused on variations in the above mentioned conditions between income groups and areas within Coimbatore city. The results have indicated where the most pressing concerns lie and with the household situation in mind, an evaluation of a possible gap between Corporation policies, strategies and the wishes and attitudes of the public has been made. The study results have shown to some extent if strategies and policies ought to/could be changed in any way to benefit the public. It has been possible to draw some conclusions about appropriate strategy, opportunities and obstacles to improvements.

A questionnaire survey was carried out in Coimbatore, India in October to December 1994. It included 80 household interviews of semi-structured, "focused conversation" type. The households were selected spread over Coimbatore in seven different areas: one located in the city centre, five in the extension areas and one just outside the Corporation border. The families were selected in low to high income neighbourhoods and were post stratified in four income groups, *very low, low middle* and *high*. Information was also collected by interviewing persons from different authorities, principally policy makers and implementors of the Coimbatore Corporation, hospitals and other persons initiated in our topics.

Household Water - Conditions:

It should be pointed out is that a vast majority of the households surveyed experienced the water situation as satisfactory. However, the seasonal variation in water supply is obvious and differences between income groups accentuated.

A dual system of domestic water supply exists in Coimbatore, potable Siruvani water and ground water, of which the latter is not considered drinkable due to high salinity. In times of scarcity Siruvani water is used primarily for drinking and cooking and ground water is to cover additional needs. A majority of the households surveyed consumed 25 to 75 litres per person and day (lpcd) of Siruvani and ground water combined in both seasons. Siruvani water constitutes then the largest part, but the average use of ground water was increased from 9 lpcd in the wet period to 16 lpcd in the dry. When making a comparison between inhabitants of different wealth, the persons of the *high* income group used on average *more than double* the amounts of the rest of the families. In the central areas as well as in Pudur the water consumption was roughly double that of the southern parts, Kurichi and South. Other extension areas used slightly more than the latter. In the southern parts ground water formed around 50% of the water use.

All households interviewed had access to the public supply of Siruvani water, around 25% regularly used a public tap, 40% shared a house connection, 25% were provided with a private house connection and 10% got Siruvani water from neighbours and Corporation lorry tankers One fifth used frequently a public ground water tap and a few bought bullock cart ground water regularly. Bullock cart water and neighbours were sources primarily utilised in times of more severe scarcity, in the dry season especially. Then, ground water was commonly provided or purchased.

A house connection including an indoor piping system was not surprisingly provided to all *high* income households while it gave 70-80 % of the total water consumption in the *middle* income group (often living in compound housing units). Public taps provided 30-40% of the water use in the *low* income group, together with 50-65% from shared house connections. Eventually, 50% of the water consumption of the *very low* income group came from public taps, 30% from house connections, 10-15% from bullock carts, 5-10% from neighbours.

Roughly 40% of the households always used a *combination* of water sources, 30% regularly collected Siruvani water plus ground water and 10 % used two Siruvani sources In the dry period however, 80% of the households had to combine different sources in order to cover daily demands In the *high* income group however no other sources except their house connections were frequented. Neighbours and public taps were most frequently used in Kurichi, South, Singanallur and Ganapathy. Bullock cart water was most commonly purchased in Singanallur and Ganapathy.

The water collection was a duty of the women in the household. A normal time spent was 30 minutes to one hour in the wet season, and one to three hours in the dry season. The women of the lower income groups spent most time collecting water, principally due to the walking distance and a higher number of persons sharing the public tap. Generally, only women of the lower income groups surveyed stated the water fetching procedure as bothersome and time consuming. Households with a private house connection naturally saved time and effort.

In the wet period Siruvani water was supplied daily in central areas, while water supply every second day was most common elsewhere in the Corporation. Outside the Corporation a supply every 4th to 7th day was normal. The supply was normally at the same time on each occasion and continued for three to four hours, but interruptions occurred. As a consequence of no continuous water supply and periodic water shortages, all households had some form of water storage in their homes. The overhead tank was most common in wealthy households with house connections, while smaller containers, vessels and drums were used in lower income groups.

The household perception of the Siruvani water quality was that is was one of the best in the world. According to the survey waterborne diseases were not common, except for occasional colds and diarrhoea. Even so, the practises of boiling and filtration of the drinking water were well-known and practised sometimes in most households, however most often in the *high* income group.

The interviewees expressed no complaints concerning the level of water charges. The official Siruvani water tariff had recently been changed to be progressive, with higher prices to high-

volume consumers, however the "uniform rate system" was still applied on our consumption figures. No major effects on households are actually expected by the authors as the charges are set low. Households sharing connections and thereby increasing the water use per connection might however though be affected.
The *very low* income group had actually the highest water payments per litre Siruvani water in both seasons, households with water free of charge excluded, and highest in the dry season when those were included. The share of the income for water expenses' for this income group was around 5% while in the other income groups it took around half a percent of the family income. The *high* income group had not surprisingly the highest monthly expenditures per month as the consumption was higher but thus paid less per litre In general, extension areas had higher water payments than the central parts as well as larger seasonal difference in payment. Roughly 50% of the *very low* income group was supplied with water free of charge, while 20% of the *low*, 13% of the *middle* and none of the *high* income group.
According to our estimation of the water situation, around 25 % of the households had a very bad or a bad situation, mostly caused by bad access and high water payment, 30 % had an acceptable situation and 45 % a good or very good water situation.

Drainage and Sanitation - Conditions:
People are deeply concerned about the poor drainage and sanitation situation. The circumstances are characterised by unsanitary conditions with open defecation, piles of nauseating garbage on the streets and in drains, and stagnant waste water in the uncovered ditches serving as a breeding ground for various insects. It is a description of urban poverty but obviously common realities also for higher income groups. However, the extent of the problems is much less great in the neighbourhoods dominated by high income groups mainly as these are not congested at all in the same way as areas inhabited by lower income groups. The main reasons for the inferior condition are lack of facilities and proper cleaning. The extremely low status of a cleaning job is a great obstacle to improvements.

The domestic drainage facilities in Central Coimbatore are mainly underground sewers combined with storm water concrete ditches in the central Coimbatore, uncovered concrete ditches in the extension areas combined with septic tanks attached to toilets. Many households are moreover not provided with any drainage facilities; the waste water is simply allowed to percolate into the ground Roughly half of the respondents in each the *high* and *middle* income groups had good standard ditches, while half or more of the *low* and *very low* had only a vegetation plot or a mud ditch to which the drainage water was transported.

A vast majority of the *very low* income group practised open defecation as they were lacking toilet facilities, whereas among the other income groups almost 50% of the *low*, a third of the *middle*, none in *high* defecated in the open. In higher income groups households are generally provided with private pour-flush toilets. Roughly 25% of the households interviewed shared a toilet, either a public toilet or shared by a compound. The main problems constitute the open defecation with the resulting unsanitary situation as well as low hygienic standard of public toilets. Women are those mostly affected from not having access to any toilet as they feel more need of privacy.

According to our estimation of the drainage and sanitation situation, around 40 % of the households live under poor or extremely poor conditions, while 30 % have an acceptable situation and the rest or 30 % a situation characterised by minor or negligible problems. The lower income groups are most affected and the situation is worst among households in the extension areas, in unapproved sites along with congested parts in the centre.

Household values of improvements:
An inferior drainage and sanitation situation was stated by 60 % of the households to be a problem and connected improvements were given high priority. Roughly half of these households were *willing to pay* for an improved drainage and sanitation situation. Lack of toilet facilities was as second mentioned to be a problem and almost all of these respondents were ready to contribute with money to improve the situation. As a solution people wanted "pay and use" toilets, but the

policy of the Corporation though is not to provide these in domestic areas. Notice that water issues were hardly mentioned at all when discussing problems and improvements. A majority considered the Corporation to be responsible for improvements, though many also felt forced to arrange solutions themselves.

Way of dealing with problems:
Informal and formal neighbourhood organisations are involved in solving problems concerning water and other environmental issues. People gather in order to put pressure on the authorities, mainly implementors, or solve the problems among themselves. The organisations vary in importance from neighbourhood to neighbourhood, but tend to be more significant in low-wealth areas. Some have been notably successful in organising improvement efforts such as public taps, roads and scavenging services Their strength lies in their ability to respond directly to local concerns. However, as the overall situation in Coimbatore at present constitutes no *major* threats to most households, the neighbourhood organisations, all multipurpose, often played a somewhat less active role. They obviously stay almost dormant at times of no severe problems but do become activated when a group of households feel it to be necessary. About 50% of the households interviewed were members of an association, while a third had no organisation in the neighbourhood. These figures tell us that many households find no reason for participating in a collaboration with others today, but would certainly join if an urgent problem arose.

Recommendations:
The analysis of our results clearly indicates what the priorities are. Studying household values of improvements (willingness to pay) suggests that people want action, and that their priorities and perceptions of what needs to be done should be taken seriously. Obvious is the existing gap between policies and strategies of the authorities and the view of the public. There are many opportunities and obstacles to improvements necessary at the household level but this study can give some general recommendations. It should not be forgotten that the subjects discussed are closely interrelated and must be dealt with simultaneously.

There are deficiencies in the ***water supply*** system, but according to the public not experienced as very serious. Households in general give priority to other issues. The results however clearly demonstrate that poor households are affected by poor access to water, constituting a rather serious obstacle especially for women spending time and energy on fetching water. Further, the *very low* income group is actually paying the highest price for their water. It deserves special attention by the authorities, whose policy is to provide all inhabitants with water from the public system and those who can not afford a house connection provide it free of charge. However, extending the water supply system and throughput is costly. Given prevailing economic conditions, providing all households with house connections can only be a long-term goal. Meanwhile the results suggest that providing more public standpipes in lower income neighbourhoods and house compounds may bring significant benefits. Increasing the water supply for lower income communities could have the added benefit of decreasing vendor water prices. To address this problem effectively the public must be involved and water charges raised. It is clear that the lower income groups also have the ability to contribute with payment, but if these groups are to be benefited, wealthier households might also have to give up some of their privileges. Considering their much better conditions today, they could afford it.

Overall, solving the ***drainage and sanitation*** problems of Coimbatore is clearly a major priority. It is vitally to involve the target groups and local organisations in the decisions to understand their attitudes towards the problem and to determine which facilities are actually wanted. The authorities should moreover recognise and give more support to individuals and community groups trying to solve their problems; by involving them in improving sanitary conditions great benefits could be reached. The costs for solutions are necessarily not high and the public is willing to contribute. It is, however, important to separate these costs from the property tax payments, to make people see what they are paying for.

One example regards the pressing need to provide all inhabitants with basic toilet facilities and reduce overcrowding at existing toilets. The Corporation firmly dismissed the idea of providing

"pay-and-use" toilets in domestic areas, as the policy of today is to provide these only at public places. The survey shows however that households lacking sufficient toilet facilities were *genuinely positive* towards a pay and use toilet in the neighbourhood. They felt that it would improve hygienic conditions considerably if payment was introduced.

Concerning improvements of the drainage situation, since the implementation of underground drainage or other uncovered ditches lies in the future, smaller local solutions for waste-water handling could be an alternative. The most urgent needs are however to improve the refuse collection, cleaning and road constructions Handier dustbins than the concrete drum of today must also be considered a simple solution.

A major obstacle is moreover the strong perception of cleaning as a low status work, only meant for low caste communities. As a result there are great maintenance problems connected to drains and toilets. Action is needed in order to break down people's resistance to dealing with it. Education is important to increase awareness, and for people to really see the connection between their refuse disposal and the drainage problems, for instance.

INTRODUCTION

Water in Expanding cities

The urban population of India has increased dramatically in the last decades as a consequence of the overall population growth in India and immigration from rural areas. Urbanisation and economic expansion cause obstacles in many ways. The formal planning sector has clearly not been able to fulfil the demands of basic needs to all inhabitants, due to lack of resources and other priorities. Water supply and sanitation are examples of areas where efforts are lacking. It has resulted in creation of differences in water supply and access to facilities between inhabitants of different wealth levels. The high income households normally experience a satisfying situation, but for many low income urban dwellers, the environmental degradation is a fact of life· poor access to safe water, unsanitary conditions and uncollected solid waste, for example The latter issues are closely interrelated.

In India, as in many countries with similar climatic and population conditions, there are competing demands for water. With a wish for economic expansion it is important to supply the industrial sector with sufficient water, but domestic needs are of course to be covered as well. In India the agriculture sector, especially that involved with the water-intensive rice cultivation, also demands major quantities of water. In Tamil Nadu, for instance, 80% of the total water goes to crop cultivation. Priorities need to be set for the allocation: with scarcity of water, who has first priority? Also, the allocation between rich and poor need to be considered.

Over-exploitation of the ground water has lead to lowering of the ground water table, also leading to a shortage of water, especially during dry periods. Water quality problems appear in several places Not only the pollution from industries and agriculture is a danger to the aquifers, but also ground water degradation due to excess extraction.

Today Coimbatore city is supplied with surface water from the Siruvani river which flows from the Nilgiri mountains and passes 50 km west of town and which constitutes the major source of the water supply to households. Shortage of ground water as well as the degradation of its quality has resulted in the surface water being diverted. However, an increasing demand for water prompted the decision by the authorities to add one more source to cover future requirements. The Pillur dam has now been constructed and this scheme will be supplying Coimbatore with water from last year (1995); the supply is thus to increase.

The adding of new water sources such as the Pillur scheme involves great costs and the financing of such schemes must be considered carefully The users will necessarily have to contribute, but with how much? When looking at the water charges of today, are these set high enough or could households contribute more, the authorities must ask themselves As shortage of public water supply has created a private water market in Coimbatore with surroundings, where households have access to buying of potable or impotable water, households are in fact paying a great deal more for the vendor water than the ordinary tariffs would seem to indicate. Since water is indispensable, poor households are also forced to *buy* water as they sometimes lack access to public supply. Is the households' perception that the water charges set by the Corporation are very low? Overall, there are facts pointing to the gap between the strategies by the authorities to improve the situation and the perception of the people of what should be done, by whom and at what price

Objectives of the study

Coimbatore city with surroundings is today supplied with water from the Siruvani River. In the very near future another source will be added in order to cover the demands for water. The project is called the *Pillur scheme.* The overall objective of this *pre Pillur*-study is to evaluate the present domestic

water situation regarding supply, use, sources, handling practices and payment and also subjects closely related to water such as drainage and sanitation. These conditions very much decide the environmental situation of households and will be studied and discussed as well. Moreover, the purpose is to examine the household value of improvements, the way of dealing with problems related to water and what role neighbourhood associations play. The study also includes how the situation affects men and women differently, thus giving a gender perspective.

The analysis focuses on variations between income groups and areas within Coimbatore city and the results can indicate where the most pressing concerns lie. Furthermore, with the household situation in mind, an evaluation will be made of a possible gap between policies, strategies of the authorities and the wishes and attitudes of the public. The study results can then indicate to some extent if strategies and policies ought to/could be changed in any way to benefit the public. It will also be possible to draw some conclusions from our results about appropriate strategy and to help identifying opportunities and obstacles.

Outline of the report

Chapter *two* presents a description of the methodology applied in the study. The validity and accuracy of data collected and of the analysis made are discussed.

Chapter *three* gives the reader the facts of the present situation in Coimbatore area regarding subjects related to our study. The personal impressions from the study's seven interview areas are also briefly described.

Chapter *four* provides social background characteristics of households in Coimbatore, drawn from household survey data.

Chapters *five and six* sum up quantitative and qualitative results of the household survey regarding the topic of water. Included in the subject of water are water sources, handling practices, water supply and use as well as payment. The role of women is also focused on. Further, results from the household survey concerning the drainage and sanitation situation are shown and discussed.

In chapter *seven* the focus is on household value of improvements and the way of dealing with the problems experienced. The role of neighbourhood organisations is discussed.

Finally in chapter *eight*, we take into account all the information gathered and discuss the situation and some possible solutions

Hypotheses

After discussion with persons initiated in the subject of water in India and having studied relevant literature, some hypotheses were formulated as follows:

Water Supply and Water Use

Wealthier households have a more abundant water supply and consequently use more water in comparison with lower income groups.

Households belonging to the lower income groups use more *ground water* as additional source than the higher income groups.

In the central Coimbatore area, the water consumption is higher (water supply is more abundant) than in the suburbs as well as outside the Corporation.

The Role of Women

Water handling is the responsibility of the *home manager*, traditionally a woman It forms an obstacle when the woman wishes to earn an income. Lower income women are more affected by the water collection responsibility as it is more time consuming and energy demanding than the water fetching of a higher income household.

Water Handling

Inhabitants from lower income groups who are less educated are less aware of, or care less about the necessity of good drinking water handling to avoid waterborne diseases. Furthermore, the lower ability to cover the costs for boiling and filtration of the drinking water affects them in a negative way, especially since they already live in more unhealthy conditions.

Water Payment

Higher income households pay less per litre of water compared to lower income groups.

The new progressive water tariffs will affect the lower income households more than the higher, since the former more often *share* house connections.

Drainage and Sanitation

The urban poor are more affected by unsanitary conditions.

Households in general are aware of and are therefore so concerned about their drainage and sanitation situation that they are willing to pay and/or are already paying for improvements.

Dealing with Problems and the Role of Neighbourhood Organisations

Multipurpose neighbourhood associations fulfil a role when influencing the situation concerning water, drainage and sanitation. Especially for the lower income groups, joining the local organisation is an important way to achieve improvements

Facts about India

This part gives readers not familiar with India some basic facts and descriptions of the country. The information in the following is obtained from *INDIEN - historisk oversikt, dagens Indien, kast systemet, livsattityder och etikettsregler* written by the Swedish expert on India, David Ståhl, 1992, if not indicated differently.

Land and Population

India is a country with a size seven times Sweden. It is a subcontinent inhabited by many different ethnic and language groups, speaking more than 200 languages and around 1000 dialects. There are major differences among the different Indian ethnic groups. The religion, traditions and language of an inhabitant in Northern Punjab are quite unlike those of a Tamil in the South. The concept of "India" and "Indians" is rather weak, people rather refer to themselves as say "we Tamils, we Bengalis". Thus, the loyalty is more towards one's own relatives, family and to one's own ethnic and language group.

India is also a diversified country in other ways· there is everything from tribes living in the desert in Rajasthan, poor villages with primitive agricultural methods to the growing middle class in the cities of which many are having refrigerators and televisions and a small but very affluent upper class Along with traditional handicraft making there is high tech industry

The Indian constitutional law gives official status to 15 languages Hindi is the most frequently spoken language in the whole of India, but principally a northern India language, along with Bengali etc. In the southern India states, Telugu and Tamil are the most commonly spoken languages. English has no official status, but is frequently used as such in the administration. English is also the Indians' way to understand each other when coming from different states. In government schools the state language is normally used, but English is common in private schools.

Table 1 · Statistics on India and the state of Tamil Nadu

		INDIA	TAMIL NADU
POPULATION	Millions	843.930.861	56
LITERACY RATE	%, total men women	52,11 63,86 39,42	63,7 74,8 52,2
POPULATION GROWTH PER YEAR	% Number of persons, millions	2,35 16	*2,1* -
NUMBER OF WOMEN PER THOUSAND MEN		929	972
INHABITANTS PER SQUARE KILOMETRE		267	*429*
CHILD MORTALITY	%	9,1	6,8
AVERAGE LIFE EXPECTANCY	Years	58	*57*
INCOME PER CAPITA	Rs.	3.760	2.732
RELIGIONS: HINDUS MUSLIMS CHRISTIANS SIKH OTHER	%:	 83 11 3 2 1	 *88,9* *5,2* *5,8* - *0,1-*
POPULATION OF POOR	%	37,4	39,6
ELECTRICITY, VILLAGES	%	77	100
TELEPHONES	per 1000 inhabitants	6,0	7,9

Source David Ståhl, 1992, in italics K Palanisami, 1991

Political History

On the 15th of August 1947 India (Bharat) became an independent state after having been ruled by the British for many years. At independence it consisted mainly of 362 maharaja principalities. 1956, after a number of reforms India eventually became a federal state much like that of today with a central government in Delhi. At present there are 25 federal states and seven union territories. Every state has a parliament, often with only one chamber, as well as a government with a head called the chief minister.

All Indian citizens have the right according to the constitutional law to settle and take work anywhere in the whole country. The purpose among others is to strengthen the unity of all Indians However, it has also lead to problems due to the immigration in many places. Moreover, the problem of urbanisation, people moving from the rural areas in direction of the cities, cannot be put a stop to.

India is principally a western democracy including a democratically elected parliament, a government selected by and responsible before the parliament, an independent court system as well as a free and very lively press. There are common elections to both central and federal governments every fifth year where the integrity of the voters is guaranteed, at different times though and independent from each other. The participation in elections are around 50-60 % and it seems like the political and economic awareness has been increasing. Also the poor have access to radio and tv today which facilitates the taking part in debates. The development of regional parties is a sign of that as well.

According to our knowledge, elections to Town Panchyats (local governments) have recently been introduced, or rather, the central government has compelled federal authorities not to continue delaying these.

Since 1947, the congress party has been the dominant party in India The opposition has been split and weak The last trend in India is however that the congress party has lost its former strong position, since there is a split between different persons and opinions. Regional parties have gained power in many federal states.

The foreign policy of India is one of freedom of alliance, independence and neutrality. India finds its role in being a spokesman/"spokes nation" for the third world in negotiations with the western powers.

Economy

Since independence India has shown a rather impressing economic development. At the beginning, the industrial sector was very small, only consisting of the textile, mining and jute industries, but today, India is the worlds 12th largest industrial nation. The industry of today includes among other things production of textiles, cars, electronic components, televisions and nuclear power plants. The around 130 million people regarded as the middle class have a considerable purchasing power and it is also increasing for others under that level. Since independence the average life expectancy has increased from 27 to 58 years. Investments have been made in the sectors of education, health care, water and electrification, but not enough. Also in the areas of stopping deforestation, soil erosion etc. as well as the population increase more action is needed.

The population increase by 18 million persons per year is maybe India's most serious individual problem. It has a lot of effects such as unemployment, environmental degradation etc. Hinduism does not forbid the use of contraception, but traditional values prevail saying that many children give parents a secure old age. Also the subordinate position of the women in parts of the country creates obstacles for family-planning.

The Caste system

The word *caste* comes from the Portuguese *castas*, which means clan, group. There is no correspondence in the Indian languages. Sanskrit as well as the modern Indian languages have two word for cast: *varna*, meaning colour, and *jati*, meaning birth. The varnas, a partition of people into four classes, were introduced by Aryans in north India The four varnas were priests (brahmins), warriors (kshatriyas), artisans, shopkeepers (vaishyas) as well as workers and servants (shudras) This partition is also well known in other Indo-European cultures but in India, they became connected to *ritual purity*, with the brahmins having the highest ritual purity. The Hindus believe in reincarnation and the varna to which one is born depends on earlier deeds. A person is born into the varna he or she deserves. Culturally speaking, it is only possible to marry someone from the same varna.

The varna is eventually also parted into *jatis* , sub-varnas, often connected to a certain job and a geographical area. They were created like guilds and constitute the most important part of the caste system of today. Jatis, as well as varnas, constitute different levels of ritual purity.

Persons not belonging to any varna, inferior to the others, are by higher caste Indians, i.e. those having both varna and jati, are traditionally looked upon as *Untouchables*. However, these "untouchables" have a jati

According to Indian law, discrimination due to caste is forbidden. On the other hand "positive discrimination" by quota exists in order to help members from lower castes overcome the social and economical handicaps their caste-membership means and get into education at universities and government positions. It is called reservation and is a hot political subject often leading to major protests and demonstrations by people from higher castes.

A collective way of living

The Indians live more collectively than is usual in the western culture. The social roles ascribed somebody at birth are usually more important than the roles which the individual self gets through work or his or her own decisions The Indian is born into a caste giving him or her a certain position in the society and involving duties to be fulfilled Important decisions such as education and marriage are taken by the family, even though also his or her word is considered. The loyalty to the family is thus very strong and plays a major role. However, in the cities young persons tend to move from their parents when marrying

The role of women

Hinduism has never said that the woman is inferior to the man, as in the case of Christianity, rather the opposite. The status of the woman in India varies to a great extent between different religious and ethnical groups as well as between different families within the groups As a general rule, the women are more free and independent in the south of India compared to the north and among Hindus compared with Muslims. Women are common in posts in the public sector. Women are also found in trade and industry, but to a lesser extent. However, in posts like lawyers, consultants and physicians they are common (around 50%)

Map 1: India

METHODOLOGY

Study design

The field work involved the use of the following instruments:

(a) Information review

In order to understand the existing situation regarding the topics we touched upon in the study, a review of available information was made (including general literature on urban growth, water and sanitation, community participation etc. as well as governmental publications on water data etc.).

(b) Survey

A questionnaire survey of households was made. It was semi-structured with "focused conversation" type of interviews (a spirit of dialogue between us and the informants was the goal). The survey consisted of small-group interviews where the goal was to obtain facts and attitudes from the households

(c) Observations

Direct observations of household conditions regarding housing, water, sanitation and drainage conditions etc., made when walking around in neighbourhoods and when interviewing

(d) Interviews with policy makers and implementors

Semi-structured discussions or interviews with policy makers and implementors in the Coimbatore Corporation (departments of Water and Drainage, Revenue, Health and Town planning), TWAD Board, the Tamil Nadu Institute of Urban Studies Questions were prepared beforehand.

(e) Interviews with administrators at public institutions, private hospitals

Interviews with the Dean at of the Coimbatore Government Hospital, the MAM at the administrative office at Kuppuswamy Naidu Hospital and two small day clinics.

(f) Compilation and analysis of collected information

Qualitative data from the questionnaire, such as attitudes and wishes of respondents, were compiled and explained in writing.

Quantitative information from the questionnaire regarding water quantities and payments etc. were tabulated and explained. Different relationships were tabulated and analysed.

Calculation examples were made of households' water payment.

Compilation, tabulation and explanation of information from authorities.

The household survey

Selection of interview areas

In order to give a fairly representative picture of the situation in the whole of Coimbatore, interview areas were chosen after consultation with Prof K Palanisami in the North, South, West and East as well as in the Central part Also, an area just outside the Coimbatore Corporation border was selected in order to be able to compare the situation outside with the inside See map 5 and table 2 showing the areas selected.

Table 2: Interview areas and number of households interviewed

INTERVIEW AREAS IN COIMBATORE:	NUMBER OF HOUSEHOLDS INTERVIEWED
NSR road	13
Singanallur	17
Ganapathy	15
South	7
East RS Puram	14
Pudur	8
Kurichi (not belonging to Coimbatore Corporation)	6
Totally	80

Sampling procedure

In the survey a total of 80 households were interviewed, comprising 394 persons. See distribution of households by area above

The households were selected randomly while walking around in the interview areas, generally by approaching any person at home at the time who was willing to spend time talking to us. WE were careful however to collect information from all different income levels and as far as possible, to select respondents in such a way that the whole area was covered.

The objective was that the survey should be addressed to the *principal* homemaker of each household, generally a woman, as her knowledge of the subjects touched upon in the study was important. That was to be the case in many interviews but other women present in the households were also interviewed, and we decided to give them all the role of home manager in our study. If a home manager was not available, another person from the household was selected. However, it is important to notice that in general, as neighbours, relatives etc. gathered at the interview spot, information was collected from more persons than those selected

Pilot study

In order to practise interviewing with an interpreter present and also to be able to reveal deficiencies in our questionnaire in Sweden prepared , a pilot study was made. Neighbourhoods in the central (Sukurarwarpet) and west (Vadavalli) Coimbatore were selected where 10 households were interviewed. The questionnaire was adjusted accordingly.

Questionnaire topics

The principal topics covered are summarised below.

Some adjustments of the questionnaire were made after the pilot study as well as during the interview period as new facts appeared. While interviewing, the respondents' interests to some extent decided the focus of the interview, even if all basic facts were also gathered. As a majority were eager to discuss the topic of sanitation, for example, it made us focus more on that subject than was intended from the beginning To see the questionnaire in full, see appendix, page x.

Selected topics covered in the household survey of Coimbatore;

Background data of the household

Water sources
- ***-supply/use***
- ***-payment***
- ***-quality***
- ***-role of women***

Drainage, Sanitation

Problems and Improvements
Willingness to pay for improvements
Dealing with problems
Neighbourhood organisations

Wealth classification

A *post-stratification* of the interviewed households was applied. *Very low, Low, Middle* and *High* wealth households have been grouped according to observation of certain parameters when interviewing, using indicators such as cooking fuel, house type, presence of radio, TV, bicycle, scooter etc. With the assistance of our supervisor Prof. K Palanisami an estimation of the income groups' monthly income was made.

Table 3: The basis for the post-stratification of households

INCOME GROUP	PROVIDED WITH	COOKING FUEL	ESTIMATED MONTHLY FAMILY INCOME (RS)
Very low	Nothing (often no electricity)	Waste, wood	1000
Low	Bicycle, radio	Wood, kerosene	2000 - 4000
Middle	moped or scooter, TV	Kerosene, gas	4000 - 6.000
High	Rcc house, mc or car, fridge	Gas	around and above 10 000

Households interviewed distributed by income group:

INCOME GROUPS	NUMBER OF HOUSEHOLDS
Very low	15 (14 not including Kurichi)
Low	22 (20 not including Kurichi)
Middle	24 (22 not including Kurichi)
High	19 (18 not including Kurichi)

Note that Kurichi is not located in the Coimbatore Corporation

Validity and Accuracy

Limitations of the household survey

As the household questionnaire comprises results from 80 interviews only (not including the pilot study) a statistically correct picture of the whole of Coimbatore cannot be given, i.e. the sample is not statistically representative That was, however, not the intention as it did not seem necessary in order to draw some major conclusions and moreover due to the fact that time was limited. Instead, a number of households in each area were interviewed until a *feeling* of the area characteristics was achieved. The number of households selected in each interview area varied as a consequence

Furthermore, even if not completely statistically correct, the study reveals facts and opinions worth considering. It should be born in mind however that the survey was in-depth, with many of the questions being structured but open-ended. The focus of the interview thus varied depending on the wishes of the respondents as well as on the fact that the questionnaire was adjusted almost continuously.

Also, complete 80 answers to all questions were not possible to receive due to the fact of the respondent giving no answer, or the topic was to be considered too "sensitive" to bring up

Assumptions in the analysis of data collected

Equivalency of family member

The consumption of *every* member in a family is the same, i.e. equal to *one* (Gunnar Jacks, personal communication), even for children under 15. The reason for this is that even though small children consume less water for drinking, the cleaning, laundry and feeding are more important and frequent. The later issues therefore require more water than for an adult and consequently we assume the consumption as good as even. For adults working outside, the consumption is set at one.

It should not be forgotten that typical Indian families visit each other frequently. Daughters or sons often arrive with their whole family and stay for days or weeks. Others have always company in the daytime from friends or neighbours who might consume a considerable amount of water. However, since the duration and the consumption vary a great deal, and most important, since there is an *exchange* of visits, we set the equivalency of visitors to *zero*. We have thus tried to calculate the water consumption when a family is by themselves, but in some cases it is difficult to say what that actual situation was.

Supply timing equivalents

In calculations, we have multiplied use of water every second day by fifteen, which makes 30 days, to get the *monthly* supply To get a month from a week, we have multiplied by 4,2. It is not by 100% correct, but since it is equal for all and since the amounts are quite approximate, we believe it is good enough for a comparison.

Water containers

Most of the people used vessels, or "kodams" (in Tamil), to carry and store water Even if they bought water from bullock carts for example, they often calculated how many *vessels* they bought, instead of how many litres. That made it better to write the input when calculating in vessels instead of litres. However, the vessels had different volumes and most of the families had some of each size They normally contained between 14 and 18 litres. The most common size was 18 litres, but according to a personal communication with Arunachalam, who had studied the subjects the vessel only contained 17 litres, even if it was marked 18 litres. Some vessels were considered "small vessels", of only 12 litres.

As a kind of standard, we agreed on calculations with *16* litres as an average. If the households said they used mostly 12-litre vessels, or if we saw mostly the small ones in the kitchen, we reckoned upon that.

Seasons
The water consumption in the *wet* and the *dry* period was asked for when interviewing. The wet period, normally when the monsoon arrives, includes according to us the months of October, November and December. The dry period is between March and June. Our calculations only show the *extremes* and are consequently not valid for one whole year. They should be read as the water consumption during a month in the wet period, or "the best" period, and the use during a month in the dry, or "the worst" period. During the rest of the year the use lies somewhere between that of "the best" and "the worst" months

Time spent when fetching water
To be able to compare the difference in time spent in the *wet* period with the time in the *dry* period, we had to make an assumption when only the time spent in wet season was available. The reason for sometimes only having access to wet season data was that we omitted to question the household specifically about the time spent in the dry period. The time spent in dry period was according to the interviewees longer and *when* this data was missing we assumed it to be *50%* longer in the dry period. We have reason to believe this is an understatement.

Easy access to supply of ground water
In apartments where the inhabitants often had an abundant supply of ground water in the indoor tap system, they had little knowledge of how much water they used. In these situations, we calculated with the sum of *15* vessels (240 litres) of ground water used per day in each household. This was slightly more than the average water consumption in our study, but since the water was plentiful we assumed the use to be a bit higher.

Reliability of the answers

The reliability of the results depends on

The number of answers to each question· the higher answering ratio to a question gives a better and more reliable result.

The interpreter: as the person functioning as our interpreter while interviewing was neither an expert on the topics discussed nor in the English language, some misunderstandings arose and were difficult to mitigate. Some information was obviously lost in the interpretation phase, for example the interpreter used the word *expect* when the meaning was *wish*. However, it is important to point out that our interpreter was a local inhabitant of Coimbatore and consequently was well aquatinted with the local accent as well as the inhabitants. It was clearly positive when approaching the households, since the interview person in almost all cases showed a very relaxed and positive attitude and a willingness to express even sensitive opinions, i.e. no suspicion at all.

The interviewee's willingness to answer:
-Our main impression was that the respondents in general were very willing to answer and discuss all the questions presented. However, as the interviews mainly took place outside the building, curiosity made neighbours and passers-by gather. As a result, the respondents might have avoided answering certain questions or given a false answer. It is important to point out though that we normally did *not* suspect it, except in the case of families living in compounds as tenants and when the house owner was then present. Further, a topic such as say open defecation could be regarded as sensitive, and might have influenced the answers to some extent.

-The interviewee's education and knowledge of the subjects discussed. at a few interviews the respondent was not able to count, which naturally influenced the reliability of a few answers. However, since the topics of the survey were rather basic and the questions not very complex we think all respondents were able to follow the conversation.

The role of us as foreigners and outsiders can have influenced the reliability of the data in

quite a few ways. Our knowledge of the Indian culture is limited and we could as a consequence not understand and catch all facts and attitudes of the families It might have limited the value of the information.

Moreover, we suspect some answers were given more importance than was intended by the respondent, whereas some remarks could be under-valued by us (Complete objectivity is impossible to achieve.)

The answers might also have been influenced by the fact that we came from a country giving aid to India. As a result, the respondent might have exaggerated certain problems for example, that of being able to receive money. We tried, however, to mitigate this by asking counter questions and having a somewhat critical approach when felt necessary

Sources of errors

Water supply data

Where possible, the data of water consumption was gathered from meter readings. Then we selected figures from the previous year, and later selected a reading from the dry season and one from the wet Where no meter existed, the respondent had to estimate the water quantities supplied and used as well as the payment.

The answers given by the respondents were of different standard, naturally influencing the accuracy of the results. For example, it was easy to know *when* the water was coming, but it could be more difficult to express in words exactly how much they do *collect*. The consumption might also vary from time to time. Furthermore, since we made the interviews (October 17- December 12) in the wet period when the supply was more abundant, the supply in the dry period was not always easily remembered Anyway, an estimate of the water consumption of the households was made for both the dry and wet season during the year. In order to *increase the credibility* of the mentioned water quantities, control questions were continuously asked. For instance, as a second source to calculate the supply, another question was asked on how many vessels the family *used* every day, i.e in the kitchen, for cleaning, laundry, washing up and for bathroom and toilet use.

Some households which had ***indoor piping*** had little idea of how much water they got or used every day, since they often used it directly from the tap. This was especially the situation for apartments where the inhabitants had an abundant supply of ground water in the taps. See assumptions made above.

Concerning whether the household ***gave or sold water to neighbours,*** we know that they did, but it was difficult to estimate the exact quantities as a lot of families did not give regularly, or did not want to reveal that it was regular. Furthermore, it is unlikely that they would mention if they received payment for it as it is illegal to sell water. Fortunately, the supply from neighbours seemed to be comparatively small, so in the long run it might not came such a great deviation.

Another fact, perhaps influencing the accuracy of the results is the difference in ***units*** used by the households interviewed. The higher income families often gave the presumed storage and tank capacities in *litres* or *meters*, while others stated their storage in how many *vessels* the storage contained.

The quality of the ***meter data*** was obviously not always high according to many respondents. The meter was running even though no water was flowing, i.e. it was activated by air in the pipes. Especially in the summer when there is less water, a lot of air comes through Some people said they paid the same or a higher sum in the dry period as in the wet, even though the supply was approximately half. Moreover, the plumber often made an assumption of supply quantities when the meter had been broken or for some other reason. Thus, some meter cards used in our study did not show quite correct figures It is also astonishing that the plumber very often writes down some kind of standard sum even if the water quantity varies, say the same sum as the last time There exists a minimum charge, but the "standard sum" charged for on the meter card often exceeded that What is the reason? Wrong calculation? Laziness? Bribing? No change(money)?

The ***water tariff*** had been Rs 2 per 1000 litres of Siruvani water, with 100 litres of water free every day. From the first of October the charges became progressive, i e. the more water a person use, the higher the price. This has not affected our study to a great extent since most of the households had the last meter reading before that date However, if the meter was read off later than that, we have not reckoned upon it.

Contradictions

The supply versus the use

When a comparison was made between data given on how much the households *used* for separate needs (kitchen, bathroom etc.) and the figures they had estimated their *water supply to be*, the figures did not coincide Often the families used *more* than they got In those cases, we have calculated with a number somewhere in between.

More supply versus less in dry period

The water supply was assumed to be less in the dry period, but surprisingly enough, when looking at the data from *meter cards*, the figures showed that households in most cases got *more* water in the dry period. We decided finally to use the meter card values of the consumption in the calculations, and not what the families told us, even though we cannot be sure about the correctness. That means some families' water supply figures where augmented in the dry period, while others', without meter cards, show lower figures. This affects the average for almost all households. (The higher figures on water consumption during summer are of course only common for households with house connections (with meters). If the others provided with water from public taps got more water in the summer even though they remember it as less, we have no idea.) (See *Sources of errors* for information on meters)

PRESENTATION OF THE STUDY AREA - COIMBATORE

This chapter displays maps and gives background data on the situation in Coimbatore regarding the topics of our study Facts and opinions are based on publications of the Coimbatore Corporation and interviews made with the heads at the departments of Water and Drainage, Town planning, Revenue and Health. Moreover, information was collected from discussions with persons responsible at the Tamil Nadu Water and Drainage Board, the Tamil Nadu Institute of Urban Studies as well as professors at the Tamil Nadu Agriculture University. Regarding health, general information of conditions in Coimbatore was given by the head at Coimbatore Government Hospital.

The City and its population

A woman selling flowers at Gandhi Puram - the very centre of Coimbatore

Introduction

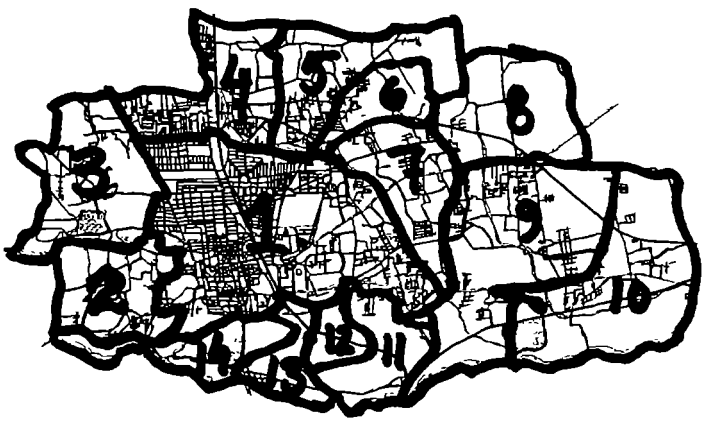
The Coimbatore Urban Agglomeration has nearly 1 2 million inhabitants and is one of the most important commercial and industrial centres of India. The city at the foot of the famous Nilgiri Hills (Ooty) is situated in the state of Tamil Nadu, south India. The climate in Tamil Nadu is semi-arid with a precipitation of about 650 mm/year and a potential evapotranspiration of between 1500 - 2400 mm/year In Coimbatore, the average maximum and minimum temperatures are 35,8°C and 22,4°C, respectively. (M Kalaimani and R. Sathiah, 1994)

Since the Nilgiri mountains unfortunately place Coimbatore in rain shadow, there are shortages in water supply to cover demands of the domestic, industrial as well as the agricultural sector The potable water is today transported from the other side of the mountains, the Siruvani dam with catchment in Kerala. (*KTH, International Unit*, p 20-23, 1989)

Other water sources are ground water, surface water from tanks within the city as well as the Noyyal river flowing through the city. At these sources water is mainly impotable The *ground water* quality varies from well to well but is in principle not accepted for drinking. The *tanks* and the *river* dry up after the months of monsoon and since drainage water is let in, the sources are neither constant, nor potable. (Gunnar Jacks et al, 1994)

Background

Originally Coimbatore city consisted of the Coimbatore municipality, see map 2, excluding the surrounding areas administrated by Town Panchayats. After 1931, when electricity power was included from the Pykara power station and the Madras-Podanur rail link finished, the city started growing and has been growing steadily ever since.



1 Old Municipality
Added areas-Extension areas
2 Kumarapalayam Village
3 Telengupalayam Village
4 Sanganur Village
5 Ganapathy Village
6 Krishnaraya Village
7. Sowripalayam Village
8 VilanKurichi Village
9 Updilipalayam village
10 Singanallur Village
11. Ramanatha Puram
12 Puliakulam Village
13 Annupper Palayam Village
14. Coimbatore Rural

Map 2: The Coimbatore City - Coimbatore Corporation
Source· Coimbatore Corporation ward map and publications

Industrialisation and urbanisation came to characterise the four following decades, when the existing infrastructure such as water supply in the end became heavily overstrained Most of the surrounding Town Panchayats were included in the *Coimbatore Corporation* in 1981, which explains the large population growth between 1971 and 1981 seen in figure 1 and table 4. (M Kalaimani and R Sathiah, 1994)

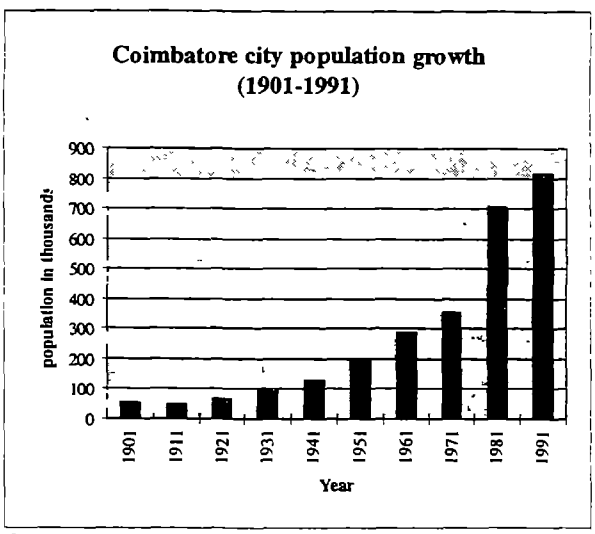


Figure 1: The Coimbatore city population growth between 1901 to 1991

Sources of diagram and table Alagarajan, Manoj, 1993 Urbanisation in Coimbatore District and Growth of Coimbatore City, unpublished M A dissertation, Department of population Studies, Bharathiar University, Coimbatore

	Coimbatore City		Coimbatore Urban Agglomeration	
Year	Population	Percent increase since previous census	Population	Percent increase since previous census
1901	53083	-	-	-
1911	47007	-11,4	-	-
1921	65788	40,0	75491	-
1931	95198	44,8	108023	43,1
1941	130348 (160172)	36,9 (68,3)	189612	75,5
1951	197755 (245501)	51,7 (53,3)	287334	51,5
1961	286305 (430221)	44,8 (75,2)	448201	56,0
1971	356368 (565293)	24,5 (31,4)	736203	64,3
1981	704514	97,7 (24,6)	920355	25,0
1991	816321	15,9	1100746	19,6

Table 4: The Coimbatore population growth between 1901 to 1991

Note Population shown in parentheses is based on partial adjustment of city population between 1941 and 1971 to correspond to 1981 boundaries Percentages computed from the adjusted populations are also shown in parentheses

Present situation

Settlements on unapproved sites - a result of the urbanisation

As the city is growing, people settle in areas not approved of (*unauthorised sites*, without a structure plan). According to *the head of the town planning department*, it constitutes the *primary problem* of the Corporation today. As a result, the planning and construction of infrastructure facilities is made difficult. Regarding water, the regulations of the Corporation allow residents living on unapproved sites to apply for water facilities. Accordingly, the households need to pay a development charge in order to be provided with a house connection and are of course also obliged to pay property taxes As the policy of the Corporation, according to the *Assistant executive engineer (AEE) at the Corporation Water supply and Drainage Department*, is to provide *all* inhabitants with water to cover their daily needs, the households that do not have the possibility to pay development charges are ensured access to a public (Siruvani water) tap in a nearby approved area or by tankers lorries. Drainage facilities are never provided to an unapproved site, though electricity is.(Dr. K. Palanisami 1995, personal communication)

Moreover, due to the still heavy migration from the rural areas into Coimbatore city, so called *slum areas* are created. According to the *Health officer (HO) at the Corporation Health Department* the number of slum areas within the Coimbatore Corporation was 22, all of varying size (October 1994) His opinion was that overall conditions in slum areas in Coimbatore are better compared to those in other cities in India. A *slum upgrading program* sponsored by UNICEF last year led to 20 slum areas being upgraded and moved to better sites, he said. The program, UBSP, Urban Basic Service for Poor, consists of drainage construction, health education, sheltering and low cost toilets. The program started two years ago and concentrates on the women in that one woman per 20 families is selected and becomes an RCV, Residence Community Volunteer. She is offered education and given the possibility to offer loans to residents in the slum area, in the amount of Rs 1000-2000 for self employment. One successful project had been a footwear unit. In the same program, there was a project going on regarding construction of low cost sanitation leach pit latrines, where one third of the costs are subsidised.

Health

The opinion of the Health Officer was that all water-borne diseases were eradicated in Coimbatore. However, he stated that acute diarrhoea is quite common and more so where there is no underground drainage. Coimbatore has an infant mortality rate of 23,7‰ (slightly higher in the slum areas though: 30-33‰) which is the second best in India (Kerala shows a better situation) He explained further that the plague outbreak in Surat the same year raised awareness of the problem and he believed that sanitation would be considered more important after this The HO remarked on the importance of information to the public and the way the Corporation does it· through posters, slides, literacy groups and articles in the newspapers. Education in schools, to teach children to take proper care of the environmental, and district collector centres would lead to a better garbage awareness

The Dean at the Coimbatore Government Hospital, Dr S Marimuthu, mentioned that the overall situation in Coimbatore is satisfactory concerning contagious diseases Cholera, polio and tetanus are all three declared eliminated and the hospital receives around one case of malaria per month (increasing in the wet period though) which is nominal. What affect children today are firstly respiratory diseases and secondly diarrhoea

Water Supply

Background

Before 1931, Coimbatore had no permanent water source and the water supply was dependent on the Northeast monsoon rain only. When the urbanisation started in the thirties, a new water supplying scheme had just been completed. It resulted in bringing 11,3 mld (million litres of water per day) as a diversion of surface water from the Siruvani river The water scheme with water coming from the Siruvani dam with catchment in Kerala leading to Coimbatore with suburbs and surrounding villages, was the beginning of the interstate collaboration between Tamil Nadu and Kerala In 1931, the per capita supply per day was then 126 litres. However, the very rapid population growth due to sudden increased industrialisation reduced the per capita supply to 36 litres per day in 1971 (M Kalaimani and R. Sathiah, 1994) See figure 2

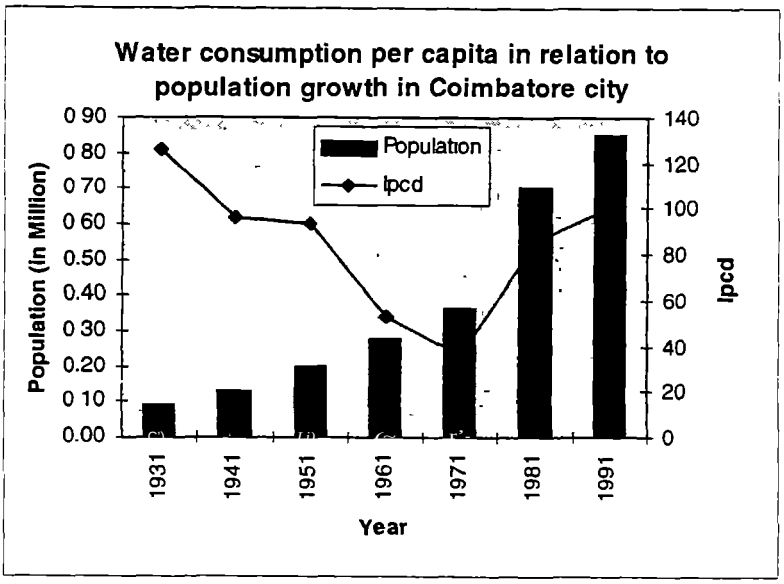


Figure 2: Water consumption per capita in relation to population growth
Source Sharing Common Water Resources

Table 5: Total domestic Siruvani water supply in the Coimbatore area the year from 1931 to 1991

YEAR	(IN MLD)
1931	11,3
1941	12,5
1951	18,6
1961	14,8
1971	13,0
1981	60,0
1991	85,0

It was obvious by the year 1971 that action was needed to something about the decreasing per capita water supply. Consequently, during 1974 a second phase of the Siruvani scheme was initiated It included 33 km of new pipelines from the source to Coimbatore. Meanwhile, the population in several areas governed by Panchayats used only ground water to cover all demands, including drinking (outer circle on map). The water supplying system was a skeleton system with open wells as sources. The ground water was pumped up to overhead tanks and distributed through a number of public taps and house connections. (publication. *Tamil Nadu Water Supply and Sanitation Project with world bank assistance,* Tamil Nadu Water and Drainage Board (TWAD-Board),1993)

In the year 1981, when the extension areas were included into the Corporation, Siruvani water was also made available through a pipeline system. The existing ground water house connections have been, or are said to have been, removed. (interview with K. Palanisami, 1995)

Considering the present ground water situation, the heavy withdrawal of ground water during the last three to four decades has resulted in a gradual lowering of the ground water table with considerable interannual variations Another reason for the lowering of the ground water table is believed to be a change in climate. (P. Appasamy and J Lundqvist, 1993)

Present situation

According to the AEE the major difficulty with water supply to Coimbatore today is that no permanent source exists in the area and they are therefore dependent on other states. In case of a severe multi-state scarcity , the only possible strategy of the Corporation is to drill more wells. Since the conditions are like this, the AEE states, the inhabitants in Coimbatore quite simply must accept seasonal scarcity He also believes that the water scarcity limits further industrial expansion No major industry can be established in Coimbatore today because of the lack of water unless the company installs its own desalination plant. Moreover, according to the head of the town planning department, the heavy industry in Coimbatore today aggravating the water situation.

Ground water is seldom potable within the Coimbatore Corporation due to its high saline content. One of the reasons for this high salinity is the very nominal water runoff (0 4-0 5% of the precipitation) (G Jacks et al, 1994). This is not sufficient to wash out the salt coming from the growing industrial sector and other human activities in the Noyyal River Basin. Thus, domestic use of salt infiltrating into the ground water is one of the main reasons, along with very little runoff to the sub terrain, for impotable ground water. This is particularly the case in urban-suburban areas with high density of population (Prof. G Jacks, 1995 personal communication)

According to the *Superintending Engineer (SE) at the TWAD-Board,* 80% of the Coimbatore population a pipeline Siruvani water supply and 5%, principally slum areas, are supplied by lorry tankers. Furthermore, the allocation policy of the water supply allows 90 % for domestic use and 10% for the industry There are no allocation policies concerning domestic supply to different income groups or areas; the idea is to have an equal supply.

The present population of the city is nearly 1 2 million and the daily withdrawal from Siruvani is 85 Mld. which is equal to a per capita supply of 70 litres per day. It was admitted though by the AEE that households in the *central areas* are supplied with 110 lpcd(litres per capita and day) whereas in the *extensions* of Coimbatore the supply is only normally around 50-55 lpcd Even less water is supplied in the dry season (the months of April, May June and July). It is also admitted that the supply this year is *daily* in the old municipality but on *alternating days* (every second day) in the extension areas.

Waste of water is an important issue The SE stated the losses in the pipeline system are 15-20%, while Dr K Palanisami (referring to official statements by the Corporation) believed it to be more likely that *one third* of the water disappears in losses.

Peoples' opinions concerning water supply, according to the Corporation

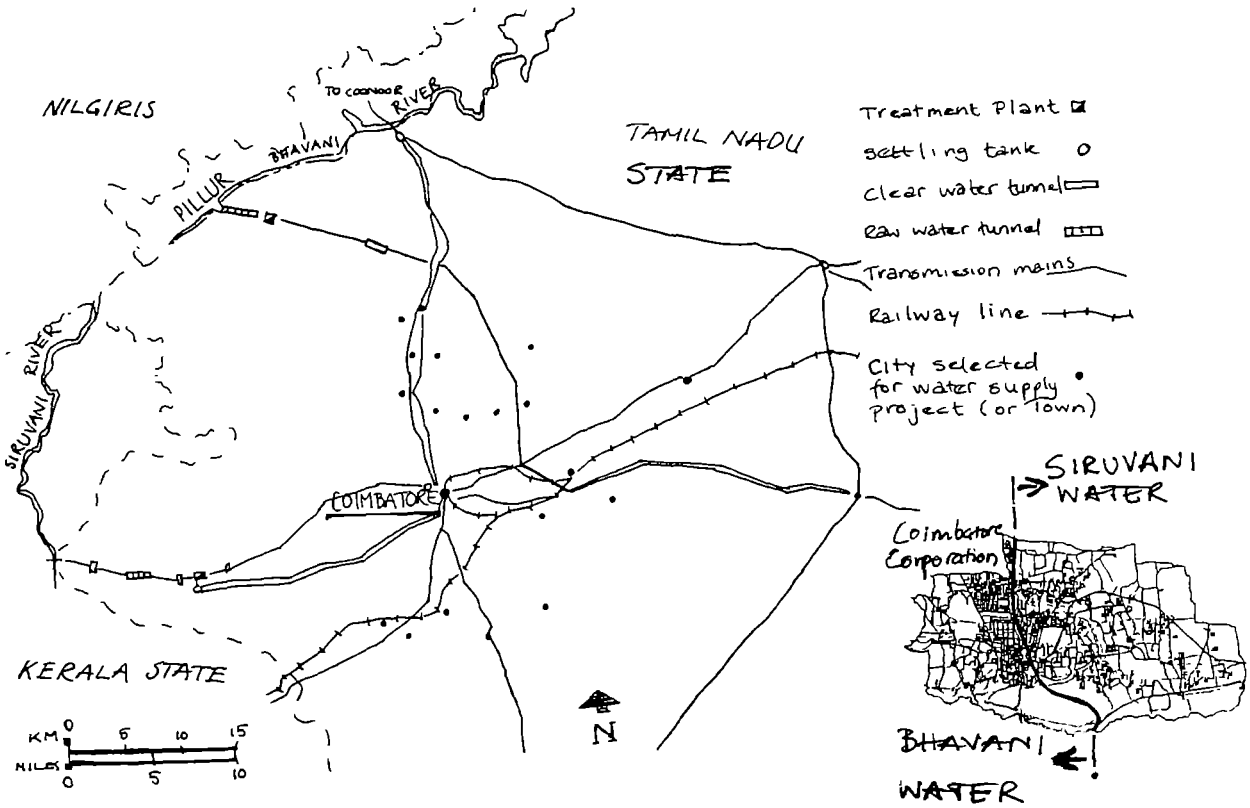
According to the AEE, the Coimbatore inhabitants in general are content with the water supply today, and as a result of the Pillur scheme they will be totally satisfied. He made clear that since the consumer organisations which represent the public have few objections, the situation has to be quite good.

When questioned about the role of women as water collectors, the AEE expressed concerns about the time factor involved in water collection in *slum areas.* He explained that in these neighbourhoods fetching of water takes a great deal of energy and time, although all other households however he told further, are provided with sumps, overhead tanks or servants facilitating the water fetching procedure

Future situation

"In view of the difficulties experienced due to water scarcity in the Coimbatore Local Planning Area, particularly during summer months, this area has been selected for augmentation of water supply." (publication· *Tamil Nadu Water Supply and Sanitation Project with world bank assistance,* Tamil Nadu Water and Drainage Board (TWAD-Board),1993)

The Pillur Diversion Project



Map 3: The Pillur diversion project
Source Coimbatore Corporation ward map and publications

About four thousand million cubic feet will be diverted from the Bhavani River at Pillur in two stages The scheme will provide 125 mld of water in the first stage (1996) and 250 mld in the final stage (2011) for the Coimbatore Local Planning Area, for 20 Town Panchayats and for 523 rural settlements on the way. Moreover, some industrial and commercial users are also included. The domestic share however is said to be 90 % of the supply (J Lundqvist, 1993).

65.97 mld of the water to be drawn from the Pillur scheme has been earmarked for the Corporation (publication *Water Supply and Drainage,* Water Supply and Drainage Board, *Coimbatore Corporation,* 1994) The water supply in the first and second scheme is set to correspond to the future population statistics, and will give a minimum supply of 125 lpcd (1996) up to 200 lpcd (2011). Moreover, regarding the new system, the SE at the TWAD Board mentioned that the new pipelines are of very good standard and the losses in the tunnel pipelines are expected to be only 1-2%.

The new Pillur scheme will divide the city in to two zones, the AEE explained, the east side of the railway track will have a Bhavani supply, while the west part will have Siruvani. (see map). The scheme was supposed to have been finished by March 1995. With the Pillur scheme even the extension areas in the Corporation will have satisfactory water supply

The total cost of the scheme is Rs. 90.00 crores (Rs. 900 000 000), of which the Corporation cost is Rs. 42 crores (Rs. 42 000 000) (publication. *Water Supply and Drainage,* Water Supply and Drainage Board, *Coimbatore Corporation,* 1994) The financing of the Pillur is fully, however, covered by loans from the World Bank according to the SE at the TWAD-Board. He mentioned also that the per capita cost of water supply is around Rs 400-500 for implementation, maintenance and service, while drainage costs are around ten times higher

Water charges and access to water

Eighty percent of the costs for the existing water supply system are covered by collection fees and the remaining 20% comes from taxes according to the AEE. Further, from the property taxes, paid every six months, 30% is earmarked for water supply.

Since the first of October 1994 the Corporation has changed the "uniform rate charge" system to *progressive charges,* (see the table 6 below) According to the AEE at the Corporation, it was a condition set by the World Bank in order to receive loans. The objective is to encourage inhabitants to save water This was also the opinion and wish of the *deputy director (DD) at TN Urban Studies*, who strongly felt the water charges where foolishly low not encouraging people to save water. However, at the same time, the Corporation had changed to progressive tariffs and that was obviously not known at the Tamil Nadu Urban Studies The water charges have in general been raised every three to four years, according to the AEE. The "Uniform Rate Charge" tariff was abandoned in October 1994 and is shown in table 6, to be compared with earlier tariffs drawn up in 1992 and the hike before that, in 1983.

Table 6: Coimbatore Corporation water tariffs

TYPE OF CORPORATION SUPPLY:	CORPORATION WATER CHARGES	TARIFFS FORMED IN		
		1983	1992	1994
Domestic use				
Public Siruvani Water Taps	Water charges	0	0	0
Public Ground Water Taps	Water charges	0	0	0
Siruvani Water Lorry Tanker	Buying for functions / tank of 9000 litres	not known	Rs 200	Rs 200
Siruvani Water House Connections	Meter connection, free allowance per day	270 litres	100 litres	100 litres
	Bi-monthly consumption range,	(Rs /1000 l.)	(Rs /1000 l)	(Rs /1000 l)
	up to 50 000 litres	Rs 1 11	Rs 2 00	Rs 2 50
	from 50 0001 to 100 000 litres	"	"	Rs 3 00
	from 100 001 to 200 000 litre	"	"	Rs 3 50
	above 200 000 litres	"	"	Rs 4 00
	Minimum charge per month	Rs 6 00	Rs 15 00	Rs 25 00
	Monthly tap rate connection	Rs 10 00	Rs 15 00	Rs 25 00
Ground Water House connections	Borewell water monthly tap rate connection	Rs 10 00	Rs 15 00	Rs 25 00
Non-Domestic use of Siruvani water (to hospitals, schools, public institutions)				
Siruvani water Institute Connections	Free allowance per day	0	0	0
	Bi-monthly consumption range,		(Rs /1000l)	(Rs /1000l)
	up to 50 000 litres	not known	Rs 4.00	Rs 5 00
	from 50 0001 to 100 000 litres	"	"	Rs 6 00
	from 100 001 to 200 000 litre	"	"	Rs 7 00
	above 200 000 litres	"	"	Rs 8 00
	Monthly minimum charges	not known	Rs 50 00	Rs 100

NUMBER OF SOURCES	1983	1992	1994
Number of Public Siruvani Tap Connections	1 150	1 200	1 200
Number of Siruvani House Connections	24 000	60 000	61 000
Number of Siruvani Water Lorry Tankers of 9000 litres	not known	12	some 20
Number of Corporation wells	not known	some 190	some 250
Number of Borewell House Connections	not known	6000	6000

Source. Publication Water Supply and Drainage, Water Supply and Drainage Board, Coimbatore Corporation/ 1994, interviews with the Corporation/ personal communication with Prof Dr K Palanisami and two articles in The Hindu, 02 Oct -92 and 29 Sept -92, written by the staff reporter

Note. Water allocated to the industrial and agricultural sectors is not shown

Raises in charges are often met with protests from the public In an article in *The Hindu* (2 Oct. 1992) the Coimbatore Corporation commissioner, Dr. N Mardy, defended the 1992 hike by comparing the charges with Madurai and Madras where there is no free allowance of water per day and the minimum charges per month are Rs. 25.00 and Rs. 12.00, respectively

There were no negotiations with the public when deciding the new tariffs, except "the usual complaints" when hiking tariffs, which means the decision was by the Corporation alone.

According to the Corporation policy, a *meter* must be installed at each Siruvani water house connection. According to the SE at the TWAD board the meter system is better abolished since meters do not function in so many cases. Further more, there exists no system for meter repair and replacement in Tamil Nadu, definitely making the situation worse The DD at the TN Urban studies strongly agreed with the idea of abandoning this system and states that the meters are of poor standard. He further stated that another problem is when the main pipes are opened for throughput of water, air in the pipeline system is forced through ahead of the water, making the meter turn and count, and it turns much faster with air than with water! Also since a meter has a high value to some, some where stolen. Around 10-20% of the meters installed are out of order or stolen.

House connection

A domestic house connection of Siruvani water is provided at a cost of Rs 2000 (1994), according to the AEE The sum consists of a,

- deposit, Rs 100
- non-refundable fee, 10%
- refundable fee, 90%

(Material costs are excluded.)

The Corporation provides no new taps in the dry months, which means all the applicants have to wait until the months of September-October every year. (K Palanisami) The aim of the Corporation is to install meters at every house connection, a project which is as good as complete. The payment thus depends on consumption

An absolute condition for having a house connection is the approval of the house plan. *If* the house plan diverges from the completed house, a "contribution" (bribe) in the form of money to the tax man is a normal way to gain approval. The more the house deviates from the plan, the more is needed for the contribution. The house tax should be paid and the approval should be handed in when applying for the connection, and without the house approval, no connection (K. Palanisami, personal communication 1995)

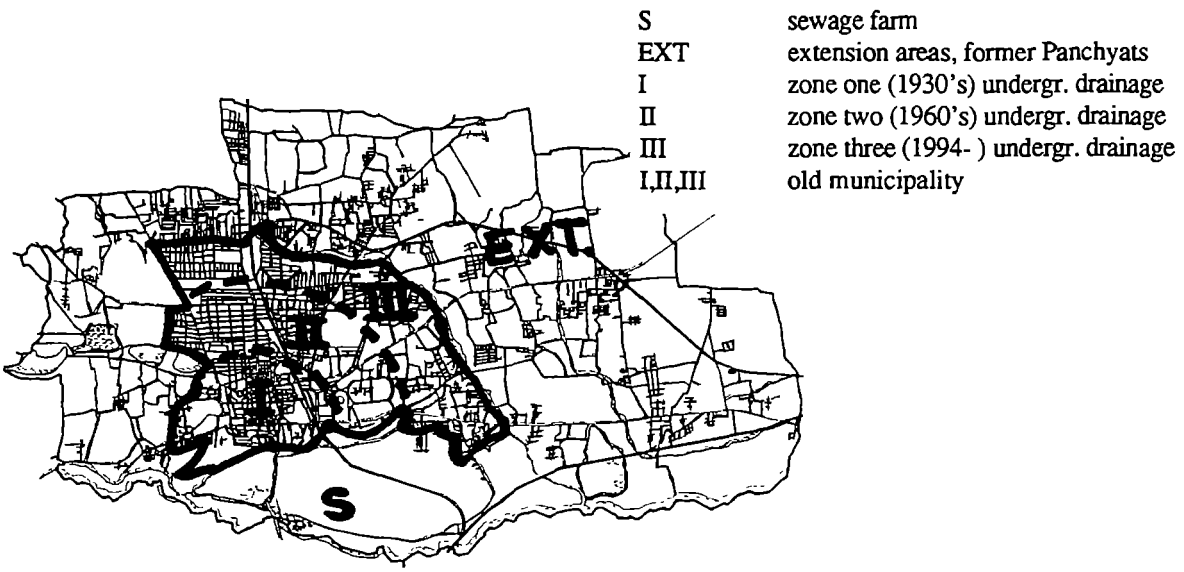
The AEE explained that some house connections still run on *flat rate*. An example is in the Corporation's own staff quarters, which accommodates around 300-350 families A flat rate is based on how many taps a household has. The consumption per tap is statistically calculated at a certain amount, and the charge per tap is based on that. The charge is normally around Rs. 25 per month for the first tap, Rs. 30.00 for the second. In the long run, the flat rate system is to be changed to a meter tariff system even in these quarters.

Drainage and sanitation system

Background

In 1929, a proposal was formulated for an underground sewage system meant to cover the developed part of town It was to be connected to a *sewage farm*, located in Ukkadam (see map 4), and covered in the first stage, one third (zone I in map 4) of the old municipality A second stage covering zone II was completed in the sixties and underground drainage in zone III was completed

1994/1995 (publication. *Water Supply and Drainage,* Water Supply and Drainage Board, *Coimbatore Corporation,* 1994)



Map 4: Drainage zones
Source Coimbatore Corporation ward map and Corporation publication

The sewage and storm water from former Panchayats have been, and are at present, taken care of in septic tanks, percolation pits, natural or uncovered concrete ditches, vegetation areas and also let out in to rivers and tanks (ponds).

Present situation

Drainage costs
From the property taxes, paid every six months, 15-17 % is earmarked for drainage costs A proposal exists according to the AEE, to introduce drainage tax separation to cover drainage of the whole corporation. Individual underground drainage connections cost Rs. 2000 for a domestic and Rs. 5000 for a non-domestic. There is no charge from the households when constructing open cement ditches as storm drains.

Corporation cleaning services and solid waste disposal

According to the HO, the duty of the *street scavenger* is to sweep the streets and place refuse in predetermined places or preferably into dustbins, if provided Another similar form of Corporation service is the *ditch sweeper.* His or her duty is to see that the drains and uncovered ditches along the streets are clean, free from garbage and blockage See table 7 for further information on Corporation cleaning services.

The refuse collected is transported to special sites with the aim of composting it. Unfortunately, according to the HO, few farmers are interested in the composted material even though it is sold to a low price since there is no latrine substance (nitrogen) in the refuse. Artificial fertilisers are instead preferred by the farmers There is however a natural recycling of solid waste by persons collecting useful waste at the dump For example, metal and plastic is sold and bottles recycled. (Prof Sree Ramulu, personal communication, 1994)

Table 7: Cleaning services of the Corporation

CLEANING DOMAIN	FREQUENCY OF CLEANING	CARRIED OUT BY	OTHER COMMENTS
Road sweeper	daily	Corporation scavenger	min salary Rs 2000 per month
Garbage collector	daily	Corporation scavenger	53 lorries + more than 300 Bullock-carts collecting garbage, Concrete dustbins in some places min salary Rs 2000 per month
Public toilet maintainer	daily	SULABH international, non government agency all over India	166 public toilets without fee 26 pay and use toilets, fee 25 paise
Ditch sweeper	every 6th day	Corporation scavenger	min salary Rs 2000 per month
Mosquito sprayer	5-7th day all year round, goes where the mosquito content is high	Corporation Fogging mission	2 big lorries today (1994), 6 small to be purchased

Source the AEE at the Water apply and drainage department, Coimbatore Corporation

According to the AEE, there are *no* problems with maintaining public toilets since the non-governmental agency SULABH has taken over maintenance. However, the HO, described toilets as a nuisance to those responsible as well as users. The major problems according to him is that septic tanks are not functioning properly His opinion was that the Corporation should stop constructing new public pour-flush toilets, because the people using them are not educated enough to use them in a proper way (!). The low cost leach pit latrine was preferred by him, which is also a project in the slum upgrading program.

Further on the subject of cleaning, the HO told us that they at the Corporation fulfil their duties: if a scavenger is absent one day, a stand-in always replaces him or her That seems to us unrealistic, however, as we heard about so many streets and areas where there was no scavenging for days or weeks. At some places there was even no cleaning at all. The Officer explained further that the Corporation takes very good care of their scavengers, providing them with dwellings in Corporation quarters, giving them a monthly salary of Rs 2000 and providing them with a uniform (there is always a problem with supervision however, but the key to good supervision is to make the employees feel responsible, he said.) The disposal problem is according to the authorities instead a problem caused by the people lacking awareness and throwing garbage everywhere as long as it is outside the boundary of their own building site.

Peoples' opinions concerning drainage and sanitation, according to the Corporation

Solely where no underground drainage is provided are people dissatisfied with the situation, the AEE explained. However, due to the dry climate of Coimbatore with little rain, people are in general very satisfied with the existing drainage capacity according to him. In the monsoon period, the drainage conditions are slightly worse.

According to the HO, on the other hand, there *are* problems with the existing or non-existing slopes of the drains. He told us that *most* incoming complaints to the Corporation from the public are about blockage and stagnant water in the drains and also overflow of drainage water

Future Situation

In addition to the existing Ukkadam sewage farm, there is another under construction in the Vellalore area, 8 km Southeast of town From 1995, the waste water from zone three in the central Coimbatore will be treated there The old sewers from zone II will be moved from the old to the new sewage farm, since there are better possibilities for treatment there. Moreover, the old sewage farm is nowadays surrounded by the expanding city and cannot be wider enlarged. (publication *Water Supply and Drainage,* Water Supply and Drainage Board, *Coimbatore Corporation,* 1994) There are no plans so

far for providing the extension areas (see map 2) with *underground* drainage. However, uncovered concrete drains for households in the whole Corporation are already on the blueprints and are about to be constructed in the near future according to the DE at TN Urban Studies.

When asked if *privatisation* of cleaning services etc. was a goal, different opinions were heard. Better supervision and solid waste collection is achieved by privatisation of scavenging as in Bombay was the HO's personal opinion. He is of the opinion that only privatisation by contract would make it possible to collect separate taxes for drainage and scavenging purposes At the Water and Drainage Board, the AEE expressed no plans or wish for privatisation.

Presentation of the interview areas

The following presentation is foremost a short and general description of how *we,* the interviewers, experienced the different interview areas. Taken into consideration is also the general apprehension among Coimbatore's citizens, which during our two months in the city partly and slowly influenced us too. Below is a Coimbatore Corporation map where the different parts and other relevant data are shown.

The areas:

EAST RS. PURAM One of the three centres in town, partly consisting of the old Coimbatore (more than 100-year-old built-up neighbourhoods with low or medium standard tile houses), partly of wealthy blocks of rcc houses with nice gardens The flower market (Poo market) in the middle of the area is frequented by huge crowds every day, leading to waste problems around and in it. Moreover, the area consists of tar roads with cement storm ditches and is partly covered by underground drainage, the water supply is daily in the wet season and otherwise on alternate days. East RS Puram is generally said to be one of the wealthier parts of Coimbatore with its street lamps, concrete dustbins and several shops, hotels and cafés.

NSR-ROAD Generally described as a middle-class area with a nice "country suburban" atmosphere with lots of sparsely built rcc (reinforced concrete) or good standard tile houses with gardens. However, some groups of very low standard houses are incorporated between the large rcc houses NSR is close to the city and has a main road with never-ending shops on both sides, The water supply seems to be more abundant here than in other areas, due to, among other things, the high frequency of house connections

PUDUR Pudur, just on the west border of the Corporation, was a farming area not long ago and still has the character of the countryside. Some wealthier rcc houses with big gardens are situated in areas apart from the tile houses otherwise representing the area. A smaller centre with a few shops edge the main road. Pudur has apparently a very good water supply in both seasons due to the location of a Siruvani tank in the area. The drainage facilities, however, are somehow poor, among other things due to a high proportion of mud roads.

GANAPATHY A suburban area close to the town with a city atmosphere, congested and built up with few green spots, cement ditches, tar roads and small tile houses along with some shops at the north main road leading out from the city. In the vicinity though, some large Rcc houses with big gardens are situated

SINGANALLUR A large area Southeast of town, quite far away, creating its own satellite town Gives an impression of a rather poor area with a lot of low standard tile houses, mud roads, inferior drainage facilities and a very small centre The water supply is on alternate days, with great seasonal deviation, where the lesser quantities of Siruvani water need the addition of ground water

SOUTH A very inhomogenous area located very near the south city centre (Ukkadam) and the market area. Partly congested and built up, partly consisting of farmhouses, huge rcc houses or just empty fields, of which one functioned as a cemetery. Situated on both sides of the south main road leading out of town is a large neighbourhood inhabited by Muslim families (the only homogenous Muslim area encountered when interviewing) There is a city centre along the main road The area is said to have been incorporated in the Coimbatore Corporation only two years ago and therefore the water supply and public taps are still inadequate.

KURICHI Located *outside* the Corporation border, just after "the South" on the same main road. A satellite town with a small centre, all in all quite similar to Singanallur with low standard tile houses and mud roads giving a village impression, and more attractive rcc houses on the outskirts, as in all areas. The water is supplied only every seven days and the sources to a great extent are public taps and own bore wells

Gunilla and the interpreter, Rajendran on their way out interviewing

Map 5: The interview areas

Presentation of the study area - Coimbatore

Study population structure

The average household consisted of five persons according to our survey, four adults and one child. Six of the 80 households consisted of 10 or more members and 18 of the households consisted of three or fewer persons. The majority of the households (50) were nuclear families with wife, husband and children. There is a resemblance between the income groups regarding household size. However, the children in the *high* income group were less numerous. The number of children was not as may be suggested markedly higher in lower income communities. Five out of the 80 households were headed by a woman Traditionally and still prevailing, though, is that the ***household head*** is the oldest man. By ***home manager*** we mean the person responsible for running the household, for example collecting water, cooking etc. In our study 79 out of 80 households had a female home manager.

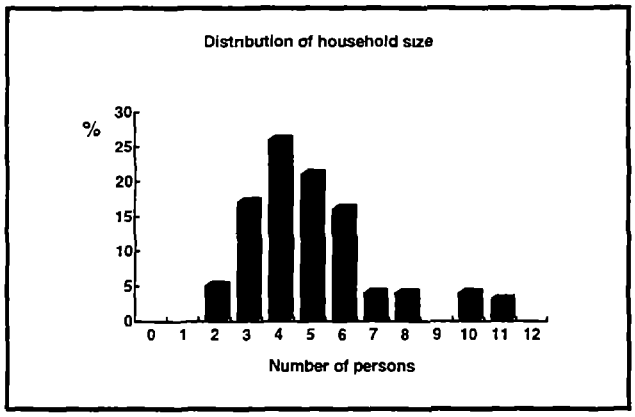


Figure 3: Distribution of household size

A household usually consisted of more than one home manager, i e. apart from the wife or mother, also unmarried daughters and daughters-in-law. Below is data concerning the respondents in our study presented. The majority of ***interview persons*** were women, regarded as home managers.

Education

The answers in our study concerning education varied from no years to a completed *university degree*. However, an average education level between five to ten years for both genders prevailed. The persons belonging to the high income group showed a fairly higher average education however. Moreover, in all income groups the education differences between the home manager and the household head were rather small.

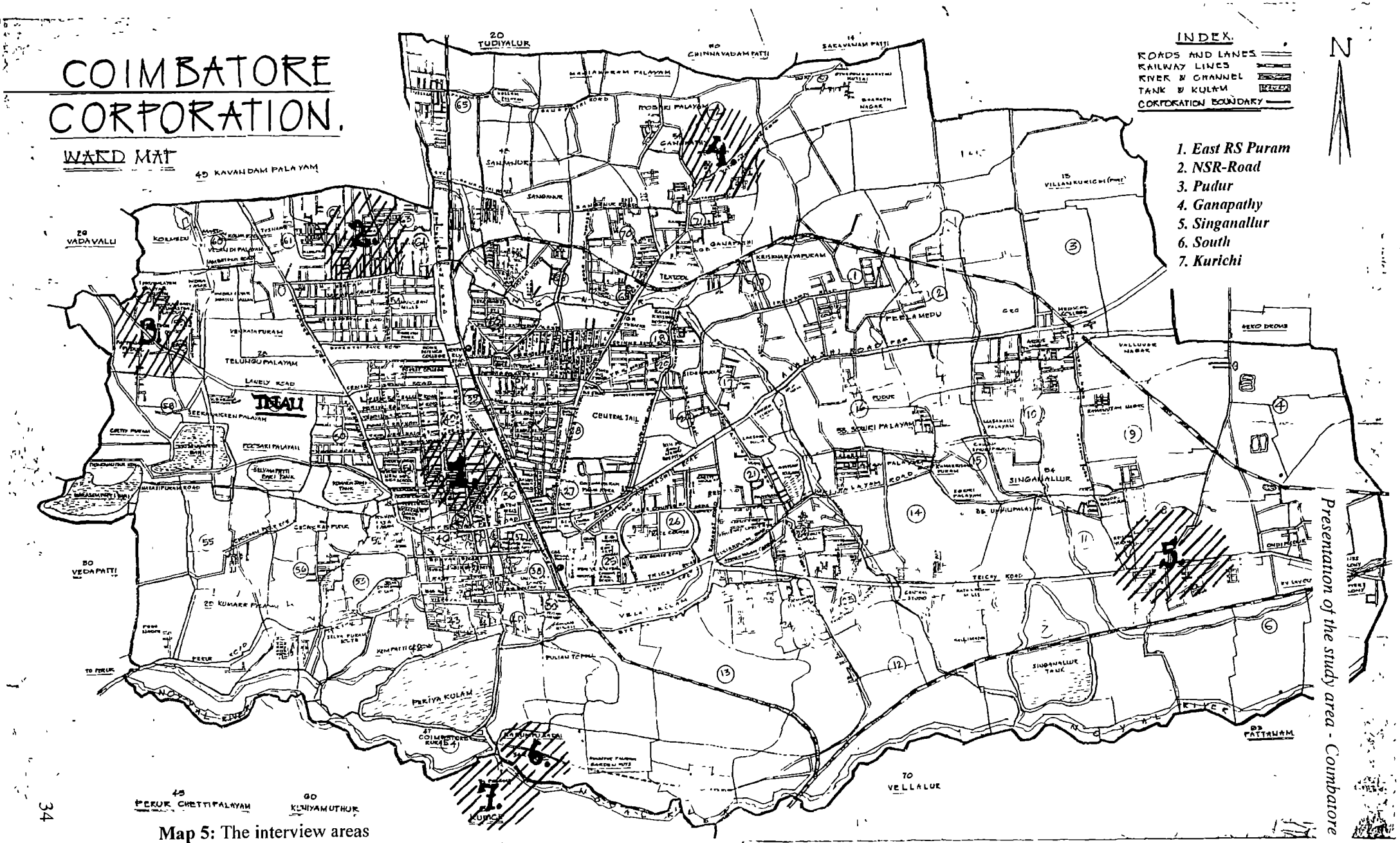
With respect to the number of years spend in school by the interview persons, we see that most women had an education lasting between five to 11 years. However, 9 women had never attended school. One sign of education of a respondent was the possibility of holding the conversation in English. Mainly people from the higher income groups had attended English-speaking schools

Employment status

In our study, persons with ***daily wages*** existed in 26 households, while 51 families had members with regular ***employment***. A combination existed in three of those. The daily wages mainly included selling of varying articles or engagement in construction work. One's own business seemed to be a common occupation; especially people who became unemployed turned to that.

Generally, the men in the household left the home for work, while the women were responsible for the household duties. However, women of the very low income group were usually forced to heavy labour also outside home in order to earn a wage high enough to cover the family expenditures Construction work, cleaning service to others etc were common tasks mentioned. Also well educated women in the high income groups left home for work to a higher extent.

A majority of the respondents stayed at home the whole day, not leaving home for work in other places. The women partly working outside normally returned to the house to do household tasks during the day.



Map 5: The interview areas

HOUSEHOLD SOCIAL BACKGROUND CHARACTERISTICS

To develop an understanding of the characteristics and living conditions of the households interviewed, we present in this chapter background statistics and further observations from the interviews. This information forms an instrument for understanding the water and sanitation questions later dealt with.

The interview procedure:

An interview commonly started with the woman living in the house and a neighbour or a relative visiting, and the interviews ended with the whole street!
During the interview of our visit spread in the area and especially in the very low to middle income group areas, the interviews ended with many curios people wanting to express their opinions. At the end of the interview the husband of the woman we spoke with had often appeared, he just came "strolling by" and was able to give us some final opinions. The families spoken to were very friendly and also very curious about us and our country; they always offered us tea or coffee and many invited us for lunch or dinner. When walking around asking for an interview, almost all ladies showed a very positive attitude to being interviewed. While 80 respondents agreed to an interview, around 20 declined, stating they were busy or had a contagious illness (like Madras Eye). Some of the women were actually suspicious, thinking we were sent by the Corporation to do some check up and others were suspicious because we were "highly educated" Europeans. In a neighbourhood dominated by Muslim dwellings, we were sometimes not allowed to interview the home managers, but the man instead. Many of the Muslim families approached did not agree to an interview, stating there were no one at home able to answer their questions. One other reason for these Muslim families not letting us in was according to the respondents ongoing conflicts between Muslims and surroundings Hindus.

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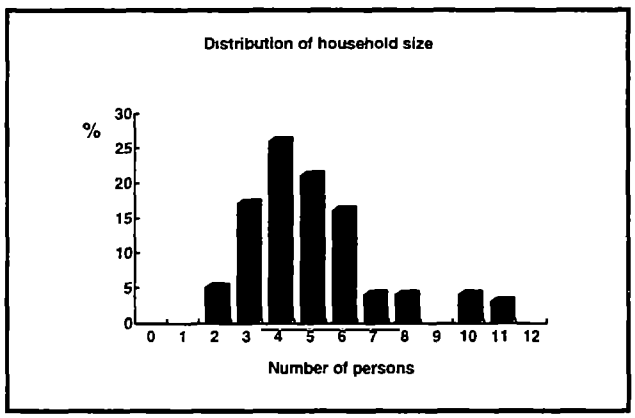

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Regarding the salary, construction work means a payment of around Rs 30-40 per day (Rs 1000 per month), while a reasonable salary for a government-employed teacher could be Rs 2000 per month (See our classification of income groups for further information on approximate salaries). Regarding "working women", three women were found to have *full-time* jobs, two in the very low and one in the high income group. Sixteen of the women were working part time, mainly with a job with their own home as a base, returning there between the duties or doing some type of crafts work at home. The income distribution by income group was six in the *very low*, one in the *low*, six in the *middle* and three in the *high*.

Dwellings

A range of different house types could be seen in Coimbatore. The majority of houses were *tiled*, but an increasing number of *reinforced concrete* (rcc) houses were being constructed in many areas. With the house type in mind, the income standard of the family living in it can be decided with great certainty. Usual in Coimbatore it was that the same community of families populated one neighbourhood, consisting of say 50 to 500 households depending on housing density The typical neighbourhood seemed like an isolated "island" among others, as all neighbourhoods showed different characters, i.e. wealthy households living in large rcc houses were located separately from poor communities in huts. In the following, a description of house types and connected characteristic is given.

Huts were typical of areas in all parts of Coimbatore populated by dwellers belonging to the lower caste and income groups. They were typical signs of the urbanisation going on. The dwellers have often occupied an empty piece of unapproved land by a street, river or a field. This was a temporary solution in many cases and the inhabitants often lived under the threat of being removed by the authorities at any time. The number of families varied but the huts always seemed to exist in groups. One small size room was normal and mud or plaited reed constituted the construction, naturally leading to a comparatively short durability. Also the fact that the huts were usually located on low-lying land, easily affected by flooding water, constituted a great problem. Facilities like water supply and drainage were always in short supply it seemed, but housing was the main problem according to the respondents

Tiled roof houses were typical Indian houses frequently found in Coimbatore. Characteristics of these often rather built-up neighbourhoods were narrow winding streets with no space for gardens However, in outlying areas, not yet so densely populated, gardens existed. Fifteen households out of 53 living in tile house had a garden The number of rooms was typically one or three, of small size The standard of the building differed to a great extent depending on to which income group the family belonged. In the middle income communities the quality of the house was high, while lower income groups were seen living in tile houses almost breaking apart, as in centrally situated slum areas. In one neighbourhood the long-established population belonged to a *Brahmin* community. The tile houses had the typical pillars in front and were decorated in a traditional style. Modern tile houses on the other hand show a more simple design.

A ***reinforced concrete house*** (rcc) house was generally large and was moreover the only house type with a flat roof. The flat roof was a prerequisite for having an indoor water piping system, since an over head-water tank must be placed on the roof. With an improved economic situation, a household occupying their site for generations back often restored their old tile house with an rcc part, to be able to implement indoor piping as well as of course increasing the space.
Neighbourhoods with rcc houses were inhabited by higher income communities. The population was comparatively sparse and gardens (and many satellite dishes!) were usually attached to the houses. All households with rcc houses in our survey had a garden. It created nice fashionable neighbourhoods.

Apartment buildings were rather rare and were generally located among individual houses. A house board was responsible for the management of the house. The dominant income group living in apartment buildings varied from house to house. *High* as well as *low* income communities were in flats.

The households in the survey were distributed almost equally regarding how many years they had lived in their houses or on the lot. An old style tile house located in long-established residential quarters was the most prevailing house type of those who have lived for generations in the same house.

Cooking fuel

The cooking fuels varied greatly from just cotton waste in areas near the textile mills to gas stoves, less wealthy households using the former and wealthy the latter With kerosene as a cooking fuel it could be either a pumpstove or a thread stove, where thread stoves were more common when wood was also to be used. The reason for using both was that these families were not always able to afford kerosene

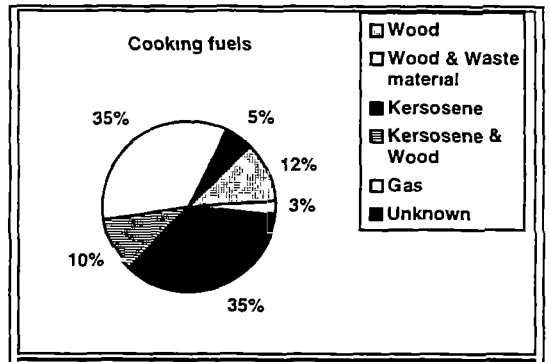


Figure 4: Prevalent cooking fuels among the households interviewed

Animals

Seven families had cattle, most often bullocks and goats. (A dog or just a few hens are not included as these did not influence the water consumption to a major extent.) The distribution of cattle by income group was as follows: three in the *very low*, two in the *low* and two in the *middle*

Gardens

Twenty-eight families, or 35% of the households in our study, were living in houses with garden, three from the very low, three from low, ten from middle and twelve from high The housetypes represented were, except in the very low income group, good standard tile- and rcc houses. The areas were equally represented except Pudur, overrepresented, and East RS Puram and Kurichi, underrepresented. we considered it a garden if the plot consisted of at least three-four trees and some plants. (Common trees were banana and neem trees.)

Approved vs unapproved sites

Approved site mean one that it had been planned by the authorities for the purpose of house construction and connected infrastructure. The owners of the houses paid property taxes accordingly.

The rapid immigration to Coimbatore due to industrialisation, however, have forced people from all income levels to construct dwellings on *unapproved* areas. The households simply buy a vacant site which is unapproved. The price of the lot is naturally lower when no approval has been given. This is all done in the knowledge that lots which have been unapproved for a long time often become approved after a while. This practise was mainly going on in the outskirts of Coimbatore city, but there have long been unapproved areas more centrally located. This issue constituted a *major* problem according to both interviews with the Corporation town planning head as well as families living under such circumstances. Facilities such as roads, water supply and drainage were not planned for and would not be provided until the areas gained approval by the Corporation. It is important to point out though that in some neighbourhoods a single house could become approved. As the rest were unapproved no facilities were provided. Regarding water supply however, the authorities have enabled affected households to pay a *development charge,* which makes it possible to receive water. Naturally, only those who have the financial means to pay this charge will get water.

According to our observations, there were great differences in standard between neighbourhoods populated by higher income groups and those where lower income communities live. Households from the higher income groups usually constructed a house, of rcc type with a garden attached, in the outskirts of Coimbatore. Even though unapproved, the neighbourhoods looked much like an ordinary area inhabited by the same income group, i.e nice and fashionable. The lack of a tar road and drainage facilities caused complaints though. Low income groups populating unapproved areas on the other hand suffered a great deal more. The basic need of water was according to the interviews not provided for.

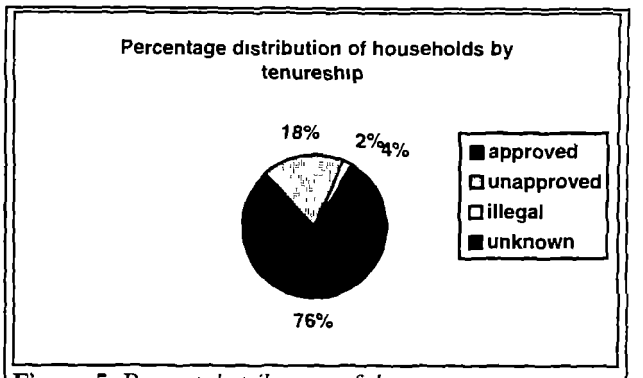


Figure 5: Percent distribution of the study population between approved and unapproved sites

Of the 80 households interviewed were;
63 approved.
14 unapproved
3 unknown

Tenureship

Ownership of the residence was encountered in 44 households out of 80 in the survey. The distribution between the income groups was as follows, six of 15 households in the very low income group were owners of their dwellings, while 12 out of 22 in the low, 13 out of 24 in the middle and also 13 households out of 19 in the high, respectively. Consequently, around half of the households in the very low, low and middle income groups owned their dwellings, while a majority in the high income group did.

33 households in our study were ***tenants***. The average monthly rent among 30 of them (as three have a rent unknown to us) was Rs 323. The monthly rent as an average in the different income groups was: 152 in very low(7 households), 310 in the low(10 households), 374 in middle(11 households), 533 in high (5 households). Examples of monthly rents are, Rs 50 for a piece of land with no house in Kurichi, Rs 150 for a one-room-tile-house in Singanallur and Rs 3000 paid for a rcc house with 12 large rooms in East RS Puram.

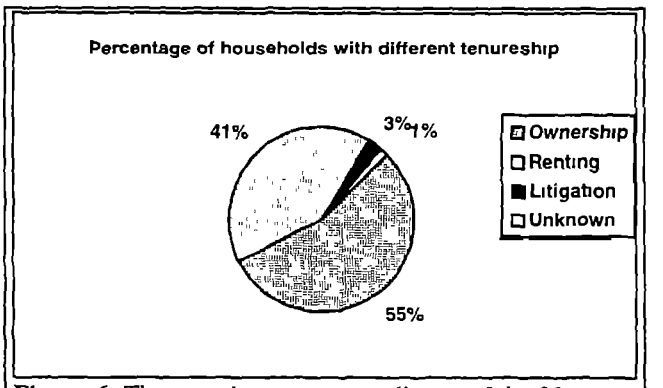


Figure 6: The prevalent tenure conditions of the 80 interviewed households

Of the 80 households interviewed were:
44 owning their dwelling
33 tenants
2 under litigation
1 unknown

Of the 33 tenants in our study, 20 lived in a *compound* of families. (Of all 80 interviewed 32 households lived in a compound.) A family sharing a lot or dwelling with other households was a form of living frequently encountered when interviewing, especially common in the *middle* income group. The normal number of families sharing a compound seemed to be from two to around ten. The owner was usually either living in the same compound or situated at a distance away. If living there, she/he took the responsibility for problems and improvements. If the owner lived in the house, his/her duty was to collect fees from the tenants and pay the plumber and sweeper etc. Renting a house, many tenants mentioned, often meant considerable problems if the owner was reluctant or refused to arrange for facilities like a house connection for water. According to Indian law the owner is the only person allowed to act in order to influence the Corporation for example when applying for a tap or drainage facility. The tenants had hence no

possibilities to make any improvements. This situation is especially prevalent when the house owner is situated far away and never intends to move back to the dwelling. (The consequences are further discussed in the chapter *Improvements desired and Discussion*)

Colonies, where the tenants shared the same employer, for example the Corporation or a private company, also existed all over Coimbatore. Households in a police colony as well as a colony with scavengers were interviewed.

A situation quite common in Coimbatore it seemed was conflicts over land. (We have no information on *how* common though) *Two* households which were in our survey, were situated on land where the ownership was ***under litigation***. The households had obviously a heavy burden to carry living with the uncertainty as well as, not least the fact of large expenditures to the lawyer. One family had had their lot under litigation for the last 20 years and so far had seen no improvements while their money was running out. The land disputes were mainly over land inhabited by low income communities. In our survey the two households belonged to the *very low* income group.

Moreover, ***illegal occupation of land*** was the only solution for some households it seemed. Two families encountered lived in such so called neighbourhoods. The dwellings were placed on a piece of land previously vacant at a road in Ganapathy and the others in the central Coimbatore As mentioned before, they were living with the threat of being evicted by the Corporation at any time. Overall, this was a burdensome situation, also since no facilities existed.

Home managers interviewed, here posing together with their children
The women are from different families but live in the same compound.

WATER

Water in India is a central issue since the inhabitants in most parts of the country have difficulties getting sufficient water supply. Except being important for the every day survival, as for all human beings, the handling of water often takes a great part of the daily duties. planning, collecting and discussing water matters The importance is not less seen when considering politics and media news For example politicians are collecting votes by promising to provide voters with a tap. Water is hence connected to power in many ways.

A woman fetching water in the typical Indian water vessel "kodam"

In this chapter, the results from our interviews regarding the water situation of households in Coimbatore are presented. The four parts are,

WATER SOURCES
-presentation and description of different water sources encountered
WATER HANDLING PRACTISES
-description of water collection, storage, boiling and filtration practises
WATER SUPPLY AND USE
-presentation of water quantities and other matters concerning the supply system
WATER PAYMENT
-presentation of both consumption costs and other costs related to the water system

Last follows CONCLUSIONS drawn and, in the appendix, a table showing SUMMARY OF THE HOUSEHOLD WATER SITUATION

WATER SOURCES

While walking around interviewing households, we were told about the water supply sources as well as had them shown and explained to us. As we were unfamiliar with Indian houses, water systems and utensils, women and men willingly lead us into the kitchen and the back yard to show different kinds of vessels, storage facilities and indoor piping systems. They showed us their tap and where the water meter was installed, discussed the problems with their meters or what ever they found good or bad about water

Introduction

It became clear after the 80 household interviews that all had access to both ground water and Siruvani water. Ground water was not considered potable due to high salinity, but used in addition to potable Siruvani water. The domestic *potable* water supply was totally covered by the Corporation *public system*, i.e. *all* inhabitants in our survey were supplied with Siruvani water, however in different ways.

The following types of water sources were found:

SIRUVANI WATER SOURCES:	
Public tap (fountain)	***Public supply***
Shared house connection (often in compounds)	"
Private house connection	"
Neighbours' house connection	"
Corporation lorry tanker	"
Bullock cart vendor	
GROUND WATER SOURCES:	
Public tap	***Public supply***
Private house connection	"
Bullock cart vendor	
Own bore/dug well	
Neighbours' bore/dug well	

In several cases the respondents explained that they had to augment their water supply by water from additional sources, since water was not adequate to cover all needs. Thus, the families used either a *single* source of water or a *combination* of sources, either in both wet and dry season or only during the dry period. The types of sources frequented varied according to which area the household was situated in and to which income group it belonged. Lower income groups normally used a higher number of different sources during the year than households from the higher income groups, which often found one permanent source sufficient.

Totally 27 or 34% households in the survey were *always* forced to utilise more than one source of water.

24 of the 80 households interviewed *regularly* combined Siruvani and ground water sources. The households of the very low income group formed a majority of households needing additional ground water in all seasons. 40% of the households in the very low income group had to use a combination, while the other income groups in an ascending scale were represented by 32, 21 and 21 percentage respectively. While 27 households interviewed had to increase their water supply with additional water during the *whole* year, further 35 households (a 44% increase) had to utilise a combination

merely in the *dry* season. Thus, in the dry period totally 62 households had to add a ground water source to the source of Siruvani water

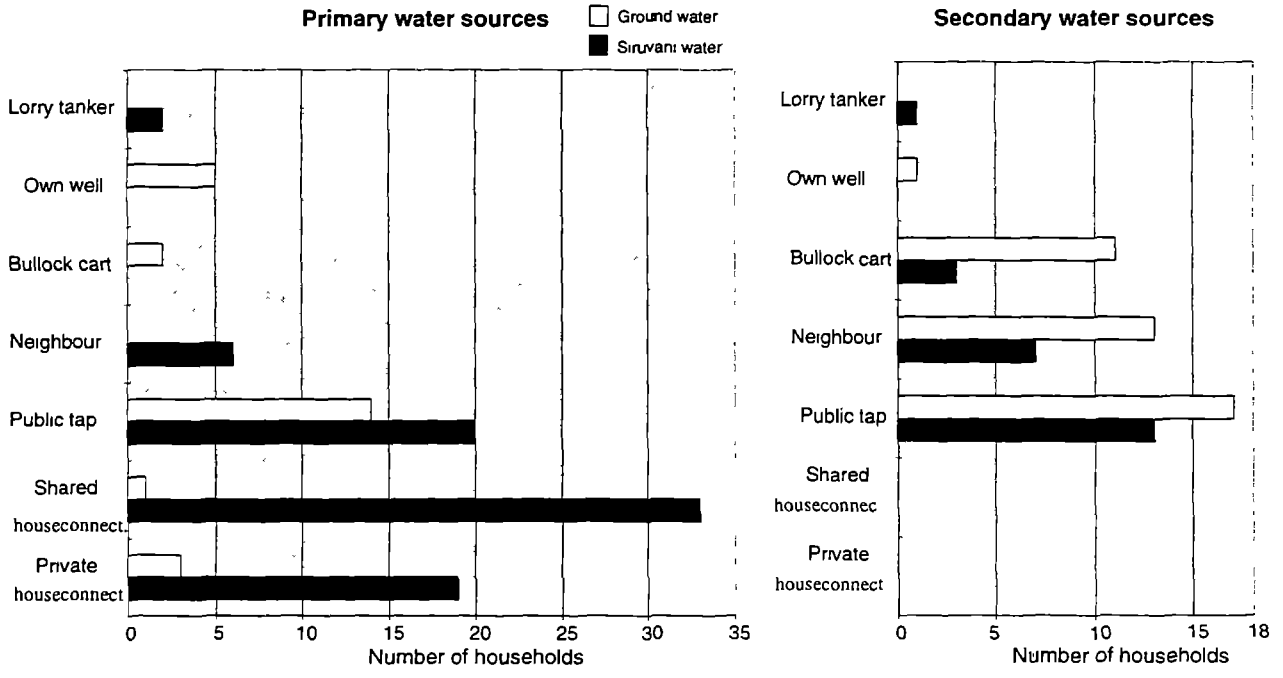
Of the 27, 4 families stated *frequent* use of two Siruvani water sources and 1 household used three Siruvani sources in order to cover the daily needs. Of those four, 2 were households of the very low income group and 3 of the low respectively. 2 of the four households also utilised ground water sources (included above). In the dry season 5 more households are to be added to the four using two or more Siruvani water sources.

The rest, or 18 out of 80 respondents experienced a sufficient water supply during the whole year and showed *no* need for utilising other sources. The latter belonged foremost to the higher income group and were provided with private house connections.

In figure 7, the two diagrams show number of households using the different types of sources The *left* diagram shows the sources frequented when the water supply was found more adequate, i e. sources used regularly, while the *right* diagram presents sources requested in times of shortage of water, for instance in the dry season or for the purpose of functions (family celebrations). (Notice in the right diagram that *house connections* are not represented. The reason is of course that this source was a primary source and as a consequence already had been "emptied") Noticed is that house connections, either shared or private, constituted a regular source of Siruvani water for a majority of the households interviewed Public Siruvani taps were utilised by 20 households, neighbours' house connection by little more than 5 households and Corporation tanker lorries were sources of less than five households. Bullock cart water was mainly only purchased in times of scarcity and then usually ground water. Overall, people primarily chose ground water when additional sources were needed

Definitions:

With **primary sources** are meant sources used always, or regularly
With **secondary sources** are meant sources used when necessary, at times of water shortage



Figures 7: Number of households distributed by type of source they utilised

Description of the water sources

House connections

Private house connections were most common in higher income communities where all households owned a residence. However, these existed also in compounds where up to eleven families could share the tap. (Here we define it as a *shared* house connection.) Of the 80 households in our survey 52, or 65%, used either a shared or private house connection.

A house connection connected to the ***Siruvani water*** public system was provided at the residence by the Corporation. The objective of the Corporation was that it should include a meter to indicate the amount water used at each tap. In all cases encountered within the Corporation, a meter had been installed. (Although, in compounds all households did not pay according to the meter, but instead a fixed charge to the owner.) Quite a few households pointed out problems connected to the meter system For example, respondents mentioned that air running in the meter made it turn and count even though no water was coming. The figures shown on the meter were hence not always correct. Also the fact that a meter is valuable created difficulties, especially to households in the centre of Coimbatore where the meters were continuously stolen and they were forced to buy new ones to a high cost (Rs. 450, 1994).

The house connection consisted of a tap placed on the court yard. Several families however connected the tap to an individual system of indoor piping in order to make the access to water more convenient. See description of indoor piping below.

Indoor piping

The pressure in the public water system is not high enough to automatically make indoor piping possible As a result, households with the possibility construct an individual system with a ground level tank (sump) and an overhead tank on the roof A motor driven pump pumps water from the sump to the overhead tank and after that water is lead in pipes into the house. For this system a reinforced concrete (rcc) house is a condition since it has a flat roof which allows an overhead tank to be placed there. Since construction of a rcc house (with overhead tank) requires comparatively extensive financing, it is mostly households belonging to higher income groups which have this convenient form of indoor piping

Even if indoor piping was provided, water meant for drinking and cooking was normally carried in vessels into the kitchen. One reason mentioned was that the households sometimes added ground water into the Siruvani water in order to extend the supply Other causes were that water stayed in the tanks for a long time, degrading the quality of the water, and further because the indoor piping system (tank, pipes) were not kept clean enough.

Ground water house connections were encountered in three households only, two in Pudur, one in Singanallur. Pudur and Singanallur are located in the periphery of Coimbatore Corporation and did formerly, before the year of 1981, belong to Town Panchayats which had arranged with a public supply of ground water. The pipe system includes both public taps and house connections. The house connections are now run by the Corporation and are under hand removed when the Siruvani water public system is provided.

Public taps

The following types of public taps were encountered:

Siruvani water taps from the public system existing in residential areas and at public places
Ground water taps from the public system located in residential areas
Ground water taps connected to local bore wells

Siruvani water public taps have been and were being provided by the Corporation to households in areas with few or no house connections. The water supplied from public taps was free of charge Out of 80 households in the survey, 21 or 26% used public Siruvani taps as their primary source. The public taps were according to respondents often installed around ten years ago after major protests of water shortage by the inhabitants and strikes by the persons collecting water.

All lower income group settlements which are approved were according to the Corporation provided with public taps, but we encountered some households who had no access to a public tap. Illegal settlements are also included in the Corporation policy of providing water to all and are consequently supposed to get sufficient Siruvani water supply, either from public taps or tanker lorries.

Especially in neighbourhoods where dwellings lacking house connections were numerous and had been located there for long, a public tap existed. When households provided with house connections started to dominate a neighbourhood, the existing public tap (Siruvani and/or ground water) was taken away.

A public ***ground water*** tap was used as a primary source by 13 or 16% of the households in the survey. (See system description in *Ground water house connections* above)

At the public stand pipe (Siruvani water tap)

Neighbours' house connection or well

Neighbours served as a source for water when either an occasional lack of water arouse, say when the usual source was out of order, or when neither a public tap nor a house connection was provided. In the latter cases the neighbours served as continuos water suppliers. A neighbour could be the neighbour next door or located at a distance away, either provided with a house connection or having a well. Farmers and factories were often supplying water from their bore wells. Normally a person belonging to the lower income level approached a household from the high income group, as these were seldom experiencing scarcity of water.

Table 8: Number of households giving or selling water to neighbours

FREQUENCY	NUMBER OF HOUSEHOLDS
Always	4
Occasionally or during dry season	28
Never	39
Not known	3

Out of 80 households interviewed 5, or 7%, used neighbours' Siruvani house connections as their primary source. None used a neighbours' ground water as a primary source. 12 families or 15% said during the interviews that they in need of a secondary water source left their neighbourhood for a farmers' well in the outskirts. Often they did the laundry there.

Although it was illegal to sell Siruvani water, some households mentioned they bought it from neighbours. Others got it free of charge. Respondents in our study rarely said they *sold* water, yet gave it away. (Of course some families probably sold Siruvani water without wanting to tell us.) As a kind of rule we noticed that families started to sell water when the "customers" came regularly or if they more or less shared their house connection with them. It was, however, obvious that most families willingly gave water occasionally to thirsty passers-by or other people in need of water.

Bullock cart vendors

Vendors with bullock carts offered for a set price both Siruvani water and ground water to households. The cart water sold was according to the interviews in most cases ground water though. The vendor then got it from a borewell belonging to a farmer or anybody else in the outskirts of the Corporation. They might even have travelled outside the border for collection of water.

When *Siruvani* water was sold the vendor had either got the water in a legal or illegal way. Legal was to get a supply of Siruvani water from a Corporation tank and sell it to households for the purposes of construction or functions. We were however told about vendors getting this supply, with the usual receipts allowing purchase of Siruvani water, but he then sold it illegally for a price 50% higher than the original price. Moreover with no right, some vendors were observed taking water from taps at the public system.

Within the Corporation the interviews showed that only very few families depended on bullock cart vendors for their *continuos* water supply during the year. One out of 80 households used at the time for the interviews bullock cart *Siruvani* water as a primary source (The family belonged to the higher income group and was living in a new apartment where the water connections had not been arranged yet. Also in cases where the house had no official approval of the house plan, water connections were delayed and bullock cart water a solution). Two households belonging to the very low income group used bullock cart *ground water* along with other primary sources.

The few number of households using bullock cart water was mainly due to two reasons; water from other sources was abundant enough and/or the fact that carts could not enter the narrow streets in congested areas It was mentioned that in central Coimbatore there was little access to bullock carts for the latter reason Thus, bullock cart water was mainly needed *occasionally,* for house construction and at functions at which many people gather.

Moreover, in the months of the dry season, need of additional sources might arise Households then usually jointly called a bullock cart vendor that was well known or connected to the area, and shared

the costs. As a *secondary* source, 3 households out of 80 utilised bullock cart Siruvani water. The households belonged to the middle (two) and high (one) income groups. Bullock cart ground water was on the other hand used by more households, 11 families bought this water None of the *low* income group needed to buy ground water from bullock carts, while 4 households of the *very low*, 4 of the *middle* and 3 of the *high* income group did so

Corporation tanker lorries

The Corporation provided tanker lorries containing *Siruvani water* to neighbourhoods inhabited by households suffering from more or less acute shortage of water. The cause for the shortage was technical problems of providing water, e.g. the pressure needed was impossible to achieve. Moreover, it was supplied to households waiting for new connections, after having paid all the necessary fees, as well as to lower income groups with no access to other sources According to the Corporation, 5% of the Coimbatore population was regularly supplied with water from tanker lorries. The water was provided free of charge, but the Corporation also sold Siruvani water for occasional use, as for weddings and functions.

One household in our study used Siruvani tanker lorries as a primary source. This family belonged to the middle income group and lived in the South. In this neighbourhood the respondents told, several households had fought for the purpose of getting water supplied from regular tanker lorries since the pipes leaned upwards and had too low capacity to ensure a satisfactory supply The tankers now appeared once a week and would continue to do so until a new pipeline, which now was under construction, was finished.

As a Siruvani source in the dry season, one family in our study got water from the Corporation tankers. The family belonged to the *middle* income group and was situated in the NSR-road area In the summer period, the pressure was so low that it was not possible to extract enough water to cover demands from the people living in the area.

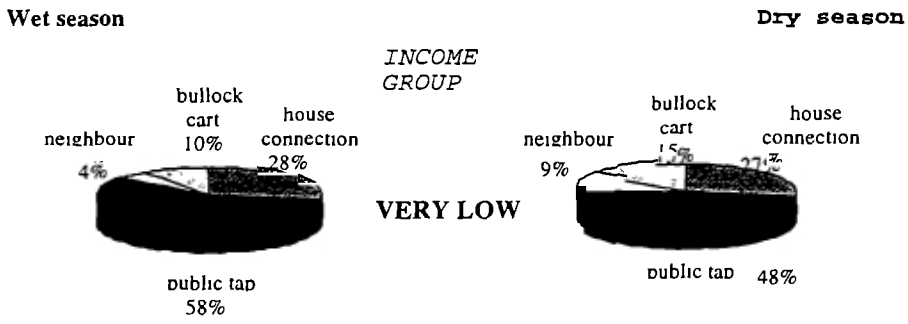
Own bore- or dug well

The survey revealed that own wells attached to the dwellings existed only rarely in Coimbatore. The existence of wells did not seem to be area oriented, but rather a construction made in former days and today found on old lots with old houses. The households who actually were provided with a well further frequently stated that they only rarely or never used it as it was polluted. At least two respondents stated no use of their well due to the mentioned reason. (one in Singanallur, one in East RS Puram)

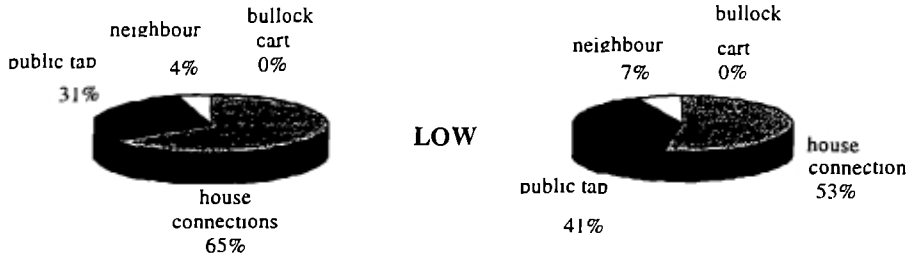
Totally 5 households in the study had a private well on their lot which they used regularly. 3 of the five lived in apartments (situated in NSR-road and Singanallur) provided with a well shared by all residents. The ground water was pumped up to an overhead tank and indoor piping existed consequently. The system was probably common for all blocks of flats in Coimbatore as all we encountered showed a similar system. The other 2 households were situated in the South and belonged to the very low and high income group respectively. Two families utilised their own well merely in the dry season, as a secondary source. One household was situated in Singanallur and the other in Ganapathy.

A comparison between the income groups

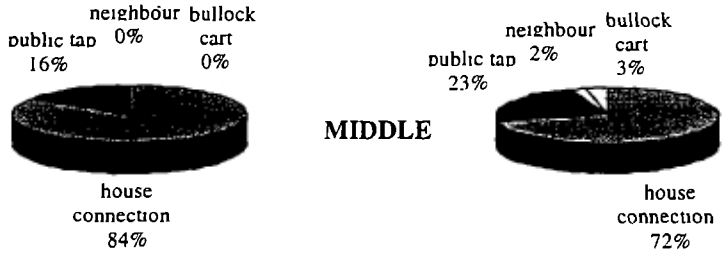
The following diagrams, figure 8, are showing the sources' share of the total water consumption, while number and percentage of households using each water source are given in appendix 2.



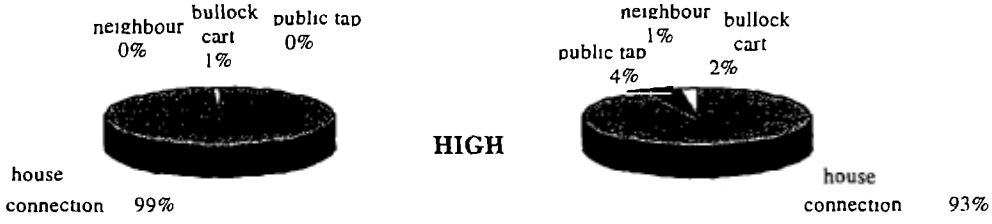
In the very low income group around 50-60% of the supply was from public taps and roughly 30% from shared house connections in both seasons The rest of the consumption was taken from neigh bours and bullock carts, both sources used to a higher extent in the dry period



In the low income group 50- 60% of the water consumed was taken from shared house connections, 30-40% from public taps and between 5-10% from neighbours Important to notice is that no bullock carts were used, not even in the dry period, when instead public taps and neighbours were used to a higher extent



In the middle income group around 70-80% of the supply was from house connections, wheras the rest was mainly from public taps In the dry period, however, bullock carts and neighbours were frequented

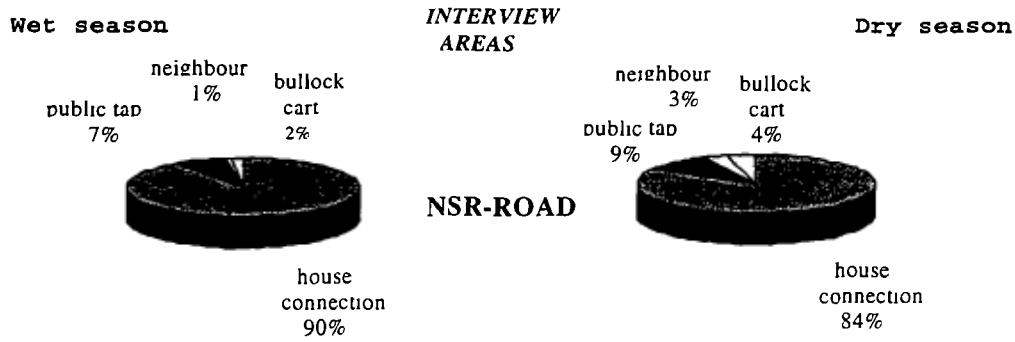


As seen in the diagrams, almost exclusively house connections served as sources of water supply in the high income group 1% of the consumption was though covered of bullock carts, which was increased to 2% in the dry season Neighbours and public taps were sources also used to a slight extent in the dry period

Figure.8: Seasonal differences in percent distribution of the water consumption by source
Note. In the diagrams Siruvani as well as ground water is included

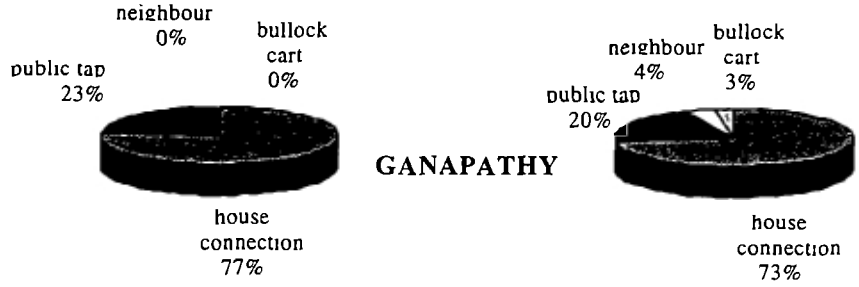
A comparison between the interview areas

The diagrams in figure 9, are showing the sources' share of the total water consumption.

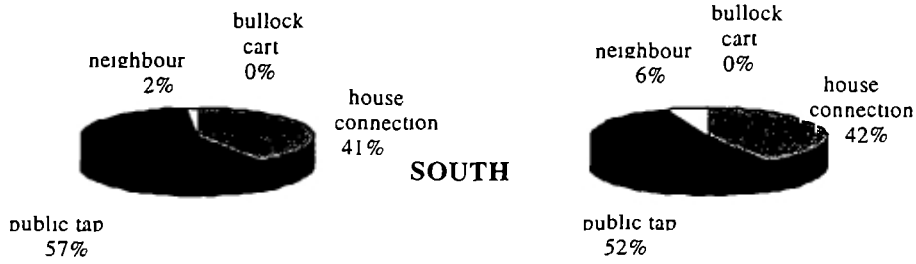


In NSR-Road, the house connections dominated fully, in fact, no other area studied had such high number house connections In the dry period use of sources such as public taps, bullock carts and neighbours increased

In Singanallur, there was a more frequent use of public taps together with neighbours and bullock carts Notice the decreased share of the house connections in the dry season

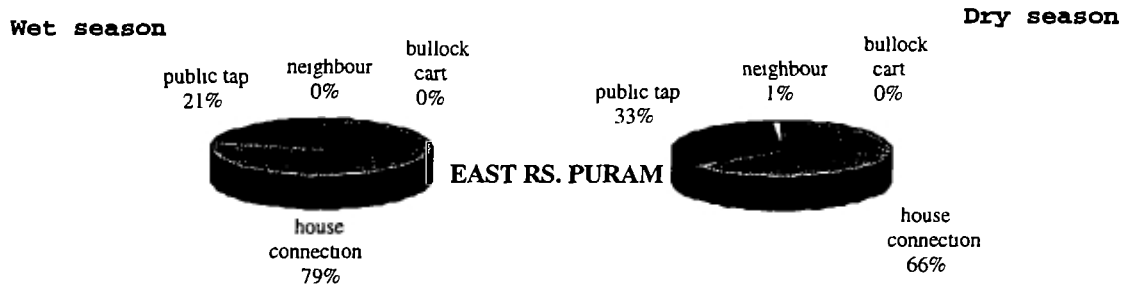


In Ganapathy, the water consumption was only from house connections and public taps in the wet season. In the dry period use of additional sources such as neighbours and bullock carts were a must.

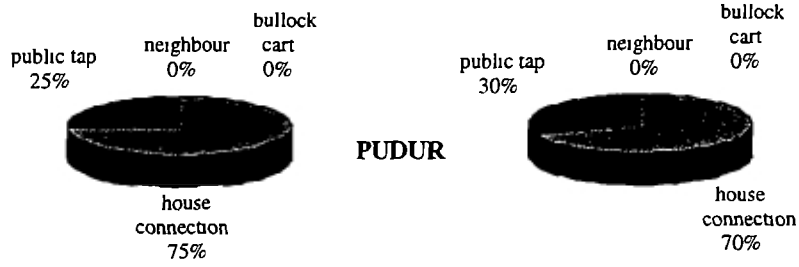


No other area had such high water quantities taken from the public taps There was no use of bullock cart water. In fact, no other interview area within the Corporation used public taps more than house connections.

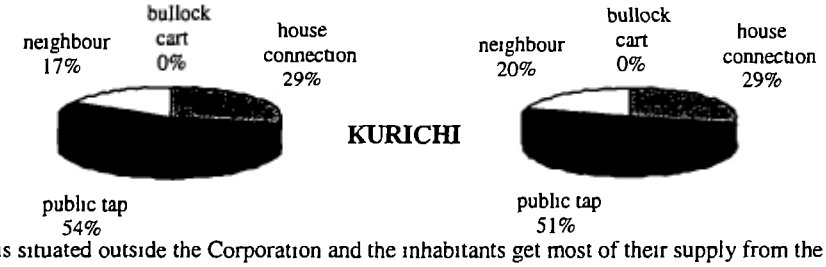
Diagrams continues on next page.



The households located in East RS Puram has a comparatively a high use of public taps, but house connetions supplied most of the water. Bullock carts were not used



In Pudur the households utilised house connections together with public taps There was no use of either bullock carts or neighbours



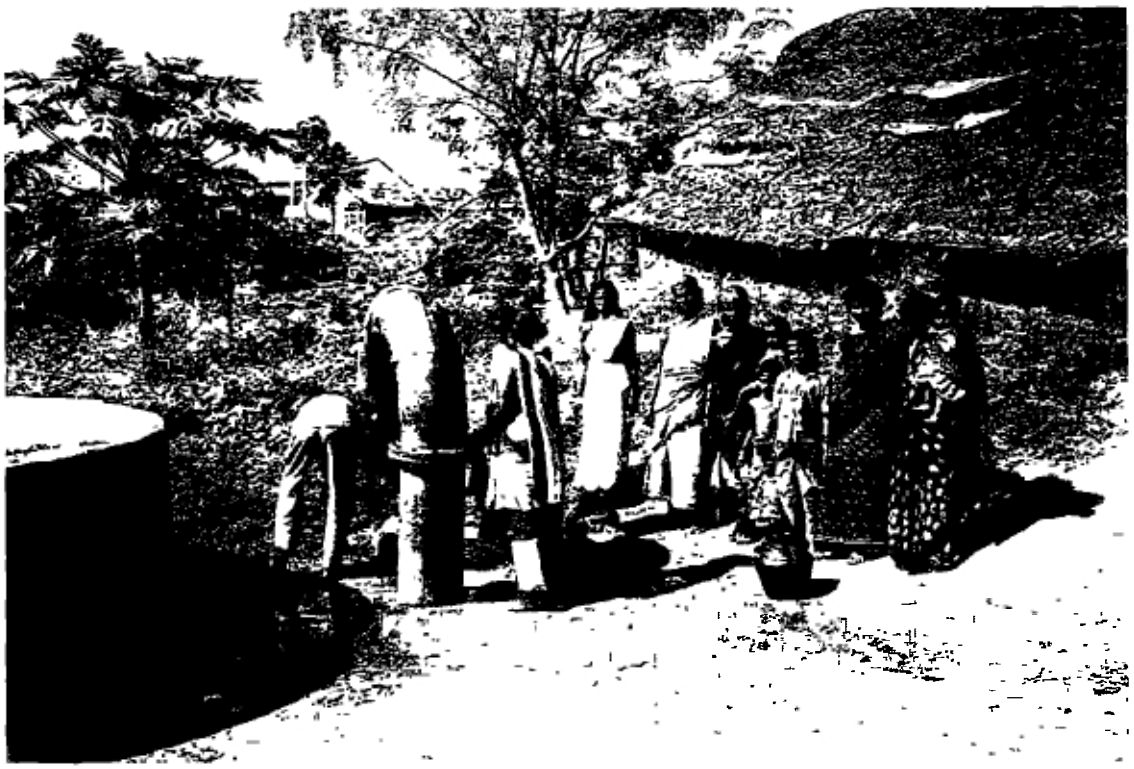
Kurichi is situated outside the Corporation and the inhabitants get most of their supply from the public taps They depended also very much on neighbours for their water supply, while bullock carts were not used.

Figure 9: Seasonal differences in percentage distribution of the water consumption by source
Note: In the diagrams Siruvani as well as ground water is included.

WATER HANDLING PRACTISES

The chapter Water Handling Practises provides our results and observations regarding water collection, storage of water and household practises of filtering and boiling. The household views regarding the water quality and waterborne diseases are also presented. Concerning the water collection, central issues discussed are the role of women and the effects on them due to varying convenience of access to water. The time spent for collection of water, distance to the sources and number of persons sharing the sources are topics discussed.

Water Collection



Water containers

By all households interviewed water was collected in *kodams*, vessels especially designed for collection and storage of water. The material was either plastic, brass or stainless steel and the weight including water was approximately 17 kilograms. The kodams were carried on the hip and/or on the head.

The role of women

In the typical Indian household a woman is the principle home manager and to her daily duties belongs the collection of water. She is the first to be affected by inconvenient access to and scarcity of water. Our experience from the survey says that her situation concerning the collection of water was decided by the *time spent* for fetching water, the usual *distance to walk* and *the weight* she had to carry. Also at what *point of time* water was supplied was of importance. Large time fluctuations for example meant inconveniences to the women fetching.

In 72 out of 80 interviewed households the home manager, a woman, was the person responsible for the collection of water. The duty consisted say either of carrying vessels from a tap located at a distance away or just opening a tap at the residence. In 26 of the 72 households she was not the alone responsible, but accompanied by another woman, other women or a servant. In 4 households the male household head had the duty of fetching water, while in 2 households other females (friends, relatives) were the responsible and in one the servant alone. A servant existed in two households visited.

Time spent and convenience of access

Notice in table 9 that a majority of the households interviewed spent between *30 minutes up to an hour* in the wet season fetching water and around *one hour to three hours* in the dry season Perhaps it can not be considered a very long time, but important to point out is that women had to break their work and other daily duties in order to collect water, of course depending on point of time of the supply. Moreover, often the water had to be fetched on and off as the households took turns. Some women stated difficulties with matching the time for fetching water with their working hours. One solution was to employ servants If the economical circumstances did not allow a servant they had to work part time or solve it with neighbours, which was found problematic. However, as not so many protests were heard about these facts, some women might have found it a pleasant break in the household work meeting other neighbouring women

Table 9: Time spent collecting water, distributed by household wealth
Note: Time spent is at each occasion water was supplied, in general every second day

	TIME SPENT												
INCOME GROUP	**-5 min.**		**5-30 min.**		**0,5-1 hrs**		**1-2 hrs**		**2-3 hrs**		**3-6 hrs**		Number of households answering
	wet	dry	wet	dry	wet	dry	wet	dry	wet	dry	wet	dry	wet/dry of all
Very low	0	0	6	3	4	3	4	4	1	2	0	2	14/15 of 15
Low	0	0	6	3	8	2	1	6	1	4	3	5	19/20 of 22
Middle	1	1	4	1	9	3	3	11	1	2	1	2	19/20 of 24
High	4	4	8	2	3	7	2	2	0	2	0	1	17/18 of 19
Number of households	5	5	24	9	24	15	10	23	3	10	4	8	69/73 of 80

In table 10 is seen that the *low* income group spent most time fetching water Basically since they to a higher extent used public taps (Siruvani and ground water public taps) and at them there was in general always a queue. In the *very low* on the other hand, neighbours and bullock carts were more common sources, leading to less times spent (the neighbours were most often located in the vicinity), but increased payment. As this group was often situated in areas with no or too few public taps, people had to chose alternative sources. The seasonal differences in times spent were however highest in the *very low* and *high* income groups. Principal reasons are that the very low income group had to use a higher number of additional sources and consequently walk farther and in the high income group the lower water pressure in the dry season lead to a longer waiting time. (Naturally, the very low income group was also affected by the lower water pressure)

Table 10: Seasonal differences in time spent for water collection, distributed by household wealth.

INCOME GROUP	AVERAGE TIME SPENT (minutes)		SEASONAL TIME DIFFERENCE
	wet season	**dry season**	
Very low	64	112	+75% in the dry
Low	118	143	+20% in the dry
Middle	89	115	+30% in the dry
High	36	65	+80% in the dry

Most important factors influencing the time spent when collecting water were according to the interviews the *distance* to the sources as well as *number of households sharing* the tap. Naturally, the higher number of sources a household was forced to utilise definitely meant a longer the time spent. Notice that in tables 11 and 12 the distances *to* the sources are given, however *not* the total distance to walk which could be many times to and from the source.

Table 11: Number of households sharing the primary sources

PRIMARY SOURCE	*Type of water*	NUMBER OF FAMILIES SHARING		
		Min.	*Aver.*	*Max.*
private house connection	Siruvani		1	
	Ground		1	
shared house connection	Siruvani	2	5	12
	Ground	4		
public tap	Siruvani	7	80	500
	Ground	7	140	500
neighbour connection/ well	Siruvani	not known		
	Ground	not existing		
bullock cart	Siruvani	not existing		
	Ground		1	
own well	Ground	1	4	12
lorry tanker	Siruvani		300	

Note, when families share an own well, some belong to an apartment building or to a compound

Table 12: Distances to primary sources

PRIMARY SOURCES	*Type of water*	DISTANCE TO SOURCE (meter)		
		Min.	*Aver.*	*Max.*
private house connection	Siruvani	at the house		
	Ground	at the house		
shared house connection	Siruvani	1	6	50
	Ground		3	
public tap	Siruvani	5	60	200
	Ground	2	100	500
neighbour connection/well	Siruvani	1	100	500
	Ground	not existing		
bullock cart	Siruvani	not existing		
	Ground	at house yard		
own well	Ground	at house yard		
lorry tanker	Siruvani		30	

As seen in tables 13 and 14, the convenience of sources *regularly* frequented (*primary* sources) was of course higher, with less a number of persons sharing the sources as well as shorter distances. At shortage of water the women responsible were often forced to walk farther away, to neighbours, farmers and public taps where sometimes a crowd of people had to fight for water

Table 13: Number of households sharing the secondary sources

SECONDARY SOURCES		NUMBER OF FAMILIES SHARING THE SOURCE		
	Type of water	*Min.*	*Aver.*	*Max.*
public tap	Siruvani Ground	12 3	200 80	500 300
neighbour connection/ well	Siruvani Ground	not known not existing		
bullock cart	Siruvani Ground	not existing 1	7	36
own well	Ground	1		
lorry tanker	Siruvani	50		

Table 14: Distances to secondary sources

SECONDARY SOURCES		DISTANCE TO SOURCE (metre)		
	Type of water	*Min.*	*Aver.*	*Max.*
public tap	Siruvani Ground	12 5	200 120	600 500
neighbour connection/well	Siruvani Ground	5 1	230 700	800 4000
bullock cart	Siruvani Ground	not existing at the house		
own well	Ground	at the house yard		
lorry tanker	Siruvani	at the house		

The water collection could take a large part of the day for women, queuing and walking to and from the tap, carrying one or two vessels at the time. The distance they were forced to walk in order to get access to water varied, up to 4 kilometres one way from the dwelling to the source was mentioned. The woman stating this long distance said they were not able to pay for water and wanted it free of charge, consequently, she was forced to walk far. However, it is important to point out that it was mainly in the *dry* season some were forced to travel by foot long distances and the people affected by low access to water sources were mainly from the lower income levels. The households of the *high* income group, all provided with house connections, mainly stated the frequency of broken pipes as problematic, if they mentioned anything about problems in the water supply.

Especially in the areas *Kurichi* and *South* the time spent and distance to walk in order to get access to a water supply seemed to be problematic. The few public taps lead to extensive queuing and many frequently went around to several neighbours asking for water Thus, also when neighbours were the source of water, the distance to walk could be long and bothersome. In the central areas on the contrary, several public taps were provided according to respondents. Some contradictory answers were heard though. One household situated in the *East RS. Puram* for example, stated that one more public tap was certainly needed in the dry season to cover the demands of water and diminish queues. However, it seemed as bullock carts and neighbours were sources mainly used in former days in the Centre and not to the same extent nowadays according to the interviews In the extension areas these were more customary utilised sources.

Respondents of the lower income groups clearly found the water fetching procedure more bothersome than persons from higher income group. If water was supplied *daily*, two respondents mentioned it would only be an obstacle (!) in the every day life and as a result daily supply was certainly nothing they strived for. The gap day was felt necessary for catching up with other household

duties they told. To ease the procedure they instead wanted a larger number of public taps to reduce the crowding of people and consequently reduce the time spent. Another female respondent mentioned her limited storage facilities as a reason for being very occupied with the water fetching With larger storage facilities she would not have being forced to fetch so often.

One more example from a household: the woman spent 3 hours collecting water even though the tap in this case was located rather close to the house 20 persons she said were fighting at all times for the water. She had to walk 10 times to and from the tap carrying one vessel at the time Anyhow, our impression is that she considered it as rather normal and as a result did not mention it to be a major problem. Her water fetching procedure was perhaps less problematic compared to other problems.

Low pressure was also causing a long waiting time when fetching water. A woman from the middle income group in *NSR-Road* expressed great dissatisfaction because she was forced to spend 2 hours every day in front of the tap when water was slowly filling the vessels. It was even worse in summer she said. One hour she thought was a reasonable time when fetching water.

When a hand pump were a must due to the low water pressure the women usually needed help from men to pump as it was very hard work. The use of a hand pump was most commonly mentioned in *East RS Puram* and the *South*. A whole day was wasted pumping for water in the dry period according to one respondent.

For households with a house connection the use of a hose pipe facilitated the fetching procedure to a great extent Other duties could then be carried out simultaneously. However, in our survey only four used a hose pipe.(With certainty four, but perhaps some more households without our knowledge)

Time influencing factors in order of significance:

- *Number of persons sharing the water source*
- *Distance to the water source*
- *Type and characteristics of the source*
  Households provided with *house connections* spent naturally less time collecting water than others They just had to open the tap and carry a few vessels of water into the kitchen for drinking and cooking (since they usually did not drink the water stored in the tanks). Although a house connection was time saving compared to other sources, one person in the household always had to be at home for the purpose of opening the tap at the point of time water was supplied and to carry some vessels into the kitchen. Moreover, to fill an overhead tank took time, 3-4 hrs. In the case of buying water from a *bullock cart*, the vendor was either arriving at the doorstep or at a distance away which influenced the convenience to some extent. Households using *public taps* often had to queue In general, these families had to spend at least one hour collecting water. In summer the time was often the double, even if what they got was less.
- *Water pressure*
  According to many respondents the water pressure was normally low, but distinctly lower in the dry season The respondents usually indicated the with their hands how small size the water spray really was. "The spray comes 1 centimetre out from the tap in the dry season and 10 centimetres in the wet" a respondent said.
- *Queuing systems*
  An arranged queue system followed by all persons sharing the water source was apparently a way of saving time in many neighbourhoods. See further *Sharing arrangements*
- *Number of sources*
  The larger number of sources frequented, the more time was of course spent. As many households used a combination of Siruvani and ground water, at least two taps had to be frequented Moreover, in some cases many neighbours had to be visited in order to get sufficient amounts of water.

- *Household characteristics*
  The size of the household decide the water quantities in need of The more members the more water must be collected and more time is spent. Moreover, households with economical possibilities could employ a servant to fetch water or in other ways facilitate the situation concerning time spending.
- *Number of persons responsible for water collection*
  The more persons sharing the duty of the water collection the easier the burden and time is saved. In reality it seemed though that one person alone was the responsible.
- *Timing of water supply*
  The point of time at which water was supplied *varied* according to some respondents and this was felt very inconvenient. The person fetching water was occupied with it for a longer time and as a consequence also had difficulties to plan the daily activities. Moreover, when the water came during night the persons responsible had to stay awake and felt tired the next day.
- *Measures to reduce time and effort*
  Two methods to facilitate the water collection procedure were hose pipes and hand pumps

Water sharing arrangements

At a tap shared by a number of persons all gathering to collect their daily needs of water, different forms of water sharing arrangements arouse in order to facilitate the procedure. According to the interviews, sharing arrangements existed in form of:

- *queue order*
  The persons waited in queue, the first arrived the first to get water. The kodams could also be placed in queue order, making time available for the persons fetching.
- *turn order*
  The persons took an agreed amount of water each turn, normally 2 kodams Number of turns depended on available amounts of water. Usually existing when there was scarcity of water and where the persons were familiar to each other.
- *house order*
  The households fetched water according to agreed house number order. If a turn system was felt a necessity the households took turns accordingly. According to respondents, it was experienced to be very positive and time saving. It was prevailing in neighbourhoods where everyone knew and could trust each other.
- *time order*
  Each household had a certain time available for fetching water (usually half an hour) and turns were taken

Table 15: Water sharing arrangements

TYPE OF WATER SHARING ARRANGEMENTS	NUMBER OF HOUSEHOLDS
Turn order	12
Queue order	8
House order	6
Time order	4
No order	14
In total of 63 sharing a tap	44

Not known: 19 households (all sharing taps)

As mentioned, a system for sharing the water was mostly formed and worked fine at taps where the persons fetching knew each other. Households in the survey experienced the collection of water very bothersome when a crowd of unfamiliar people gathered at the tap and chaos was a consequence. Fighting and oral disagreements were common then. That was especially in times of worse water scarcity, as in the dry season. The households in Kurichi were more often and worse affected, also since women came from areas far away to collect water at their taps. When people came from other areas first priority was usually given to the regular collectors connected to the particular tap. The persons from outside had to wait to see if water was enough for all.

63 households in the survey shared a tap, at least some times in a year. 30 of these mentioned one form of sharing arrangement described above. Of the 30 households seen in table 15, 18 used a public tap on a more or less regular basis, 4 shared a house connection, while 7 used a combination of these sources. One family fetched water at a Corporation tanker.

Water storage

All households visited had some forms of water storage containers. The ground water was generally stored separately from the Siruvani water, except in times of water scarcity when they could be mixed. The storage facilities depended mainly on what water sources were normally frequented. As mentioned earlier, if a house connection was provided, a *sump* often in combination with an *overhead* tank served as storage for water. These were usually covered. The volumes varied between 300 - 1500 litres of the overhead tank and 600 - 4000 litres of the sump. (Well worth to notice is, as said before, the water for drinking and cooking was stored separately in the kitchen.)

Households fetching water from public taps, neighbours etc. generally kept the water in kodams, *tavalais*, *andas* placed in the kitchen. A tavalai and an anda contained between 25 to 65 litres (2-4 kodams). The containers were covered with lids. Water for the purpose of bathroom and toilet use was kept in cement (concrete) *drums* (150 - 200 litres) or *tanks* (500-1500 litres) located outside on the court yard. Another form of storage encountered was barrels which contained normally around 200 - 300 litres.

Depending on the economical ability, the more storage capacity was available it seemed. Some families visited in the very low income group had no or very limited storage facilities, say only two vessels for keeping the water in which case they found really.unsatisfying.

Table 16: Relationship between type of storage container used and household wealth

	CONTAINERS				
INCOME GROUP	Kodams, Anda	kodams, anda barrel, drums	kodams, anda cement tank	kodams, and sump	kodams anda sump+ overhead tank
Very low	2	11	2		
Low	1	16	3	1	1
Middle		13	5	4	2
High			4	2	13
Number of households	3	40	14	7	16

Household perception of water quality

All answers related to the ***Siruvani water*** taste pointed in one direction The taste was "*one of the best in the world*" a great majority of the respondents mentioned. However, often the persons later specified that the Siruvani water was the *second* best in the world. (People showed hesitation concerning which water had the best quality, but several mentioned the Niagara Falls!) With certainty, the coming Pillur scheme water will have difficulties living up to the reputation of the Siruvani water. We heard people stating that they "did not want" Pillur scheme water since it never would taste like the Siruvani water!

The ground water in Coimbatore is not potable since the salt (NaCl and Cl) concentration is too high. One of the reasons for this is the very nominal water runoff (0.4-0.5% of the precipitation). This is not enough to wash out the salt from the growing industrial or human activities in the Noyyal River Basin. Thus, domestic use of salt infiltrating to the ground water is one of the main reasons along with the very little runoff to the sub terrain for an impotable ground water, especially so in urban-suburban areas with high density of population according to *(Jacks et al, 1994)*

However, some elderly people visited pointed out that the taste was better before, around 20 years ago, essentially because today saline ground water was experienced to be mixed into the Siruvani water. The mixing was principally a fact during the dry season they mentioned. Taste of chlorine was also a source for unsatisfaction of a few households. During wet season though the taste was said to be excellent. (Also according to us, who were encourage to taste, the Siruvani water was found rich in taste compared to Swedish water!)

Regarding colour of the Siruvani water, almost all households stated that the Siruvani water supplied contained sand and mud during the wet season, which made it appear reddish. During dry season though, the water was mentioned to be transparent.

In a couple of interviews respondents expressed worries concerning leakage of waste water into the drinking water due to technical problems with pipes. They were sure it happened occasionally. One respondent for instance said the waste water pipes were wrongly placed on top of Siruvani water pipes, enabling leakage. (Leakage of waste water into drinking water is likely to be a problem since pipes are not always under pressure (G. Jacks))

No households interviewed ever drank ***ground water*** at present time as it was too saline, not even in times of shortage. However, two households hesitatingly said that if there was no other possibility of getting other water, ground water would do.

Boiling and filtering of drinking water

Filtering and boiling of drinking water were well known practises applied in several households interviewed. If not boiling always, boiling usually was most frequent of water given to small children, old and ill persons. If not filtering always, filtering was usually more common in the wet season as the water appeared red and muddy. Also when the media announced warnings of poor water quality, people especially took up the practises.

Facilities for the filtering of Siruvani water encountered when interviewing.

- Sedimentation of the water in the storage containers.
- Simple cloth or tap filter
- Steel filter container
- Electrical filter

The type of filtering chosen, if any, depended on the economical situation of the household. Sedimentation in the storage vessels, cloth and tap filtering were cheap methods and consequently more common in the lowest income groups An electrical filter on the contrary had a price of around

Rs. 3500 (1994) and were only encountered in families belonging to the high income group. Steel filters were common in the middle income group.

Table 17: Practise of water boiling and filtering before drinking by households together with the average education of the home manager.

	PERCENTAGE OF HOUSEHOLDS FILTERING AND BOILING IN THE INCOME GROUPS											
	Very low			**Low**			**Middle**			**High**		
	never	**some-times**	**always**	**never**	**some-times**	**always**	**never**	**some-times**	**always**	**never**	**some-times**	**always**
BOILING	57 %	29 %	14 %	35 %	61 %	4 %	29 %	38 %	29 %	26 %	37 %	37 %
Average years of education of the home managers	4	4	10	6	7	8	8	5	9	8	10	10
FILTERING	86 %		14 %	57 %	13 %	30 %	50 %	17 %	33 %	21 %	16 %	63 %
Average years of education of the home managers	4		10	6	11	8	8	5	8	6	10	10
Average income group education		5			7			7			9	

Notice in table 17 that in the *very low* income group a majority never boiled or filtered the drinking water. One significant reason for not boiling was lack of cooking fuel, but also lower awareness of the importance of boiling and filtering influenced, we assume. In the low and middle income groups a majority never filtered the drinking water, but many boiled sometimes. Eventually, the high income group showed a higher frequency of boiling and filtering than the rest, probably due to both a better economical situation and longer education of the women.

Notice further in table 17 that the households always practising filtering and boiling have generally a slightly higher education than the others. However, the difference in years of education was most marked in the very low income group where it differed six years of average education between those always boiling and filtering and those who never practised it. Naturally, an education is influential for increasing the awareness of water borne diseases etc. but as there were no major variations in years of education of the home managers it is difficult to draw any principal conclusions.

No analysis of the drinking water was made by us, but some information about the chemical- and biological quality was given by Dr. Ganambal, Avinashilingam Home Science University Her analysis showed that all bacteria contents in the Siruvani water were low or acceptable, except for a raised content of coli bacteria

Household awareness of water borne diseases

Diseases related to the handling and drinking of water were generally not familiar to the persons interviewed. Several households said they found it difficult or impossible to know whether a disease caught was due to the water specifically or not. Thus, the answers to whether if they had ever had any water born diseases were generally *no*. Also when we asked specifically about *malaria, typhoid, dysentery, diarrhoea, cholera etc.*, the same negative answer was given. Only in one household the man had recovered from both malaria and typhoid. In another household they had heard about others who had caught typhoid. Our impression from some households was though that *diarrhoea* occurred frequently but was found "normal". A nurse encountered told us that children's diarrhoea was common, but as it was a too sensitive subject very few persons would bring it up for discussion she said. *Cough and cold* were though mentioned to be very common, especially in the wet season. Cold drinking water was thought to be the cause. Some households did not want to store drinking water in the refrigerator in the wet season for that cause.

WATER SUPPLY AND USE

In this chapter follows a summery of facts and household attitudes concerning water supply and consumption. The interviews revealed the *used* quantities of water, while the actual water quantities supplied to the households could not be assessed. A general idea of the water supply can though be given when looking at comments from respondents and the consumption diagrams.

Introduction

The interviews revealed that most households within the Corporation found the actual water supply situation satisfying. Many households of higher as well as lower income groups made comparisons with the countryside outside the Corporation where the water scarcity was known to be much more severe. Also the water situation in Madras was rather well known and considered as much worse

Among the residents within Coimbatore Corporation, the awareness of the water conditions other inhabitants lived under seemed to be rather high. Strongly pointed out by respondents of lower income groups was the much better water situation of higher income groups, politicians and other influential persons. Also when their own community was believed to be benefited, households did point out their favourable situation compared to others.

To what degree people were aware of the *overall* water supply situation in Tamale Nadu or Coimbatore, for example the Pillur scheme, competing demands of industrial and domestic sectors, progressive water charges etc. is hard to tell. The Pillur scheme seemed rather familiar even though not particularly often brought up to discussion in the interviews. Where the inhabitants read newspapers, had an education or were organised in some way, it naturally lead to higher awareness.

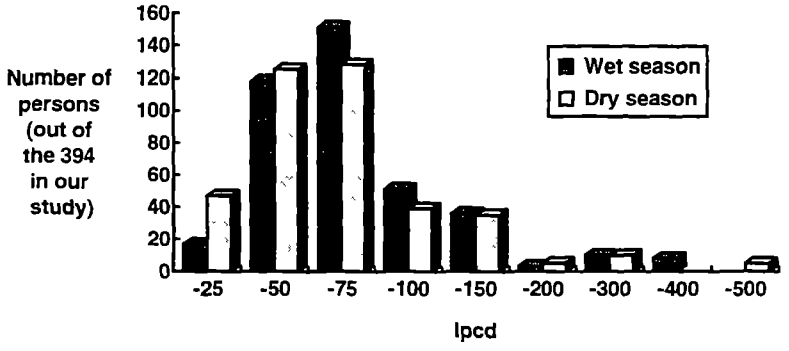


Figure 10 :Distribution of water consumption in wet and dry season. Siruvani as well as ground water is included.

The diagram in figure 10 presents water consumption in dry and wet season with number of persons in the survey distributed by set consumption intervals. The majority of people used between 25 to 75 litres per capita and day in both seasons, Siruvani and ground water included. Notice that the bars advance more to the left in the dry season, which marks a higher number of persons with less consumption.

Siruvani water supply

As already emphasised, our study showed that water today was not experienced to be a great problem for the population. Although, lack of water was a fact during dry season many respondents told. Concerning water supply outside the Corporation, the Town Panchayats are the responsible authorities Six interviews made outside the Corporation indicated that Siruvani water was supplied in less quantities there than within Coimbatore Seen in figure 11 is that a majority of people consumed roughly 25 to 75 litres of Siruvani water per capita and day in the wet season, decreasing to around 25 to 50 litres in the dry season

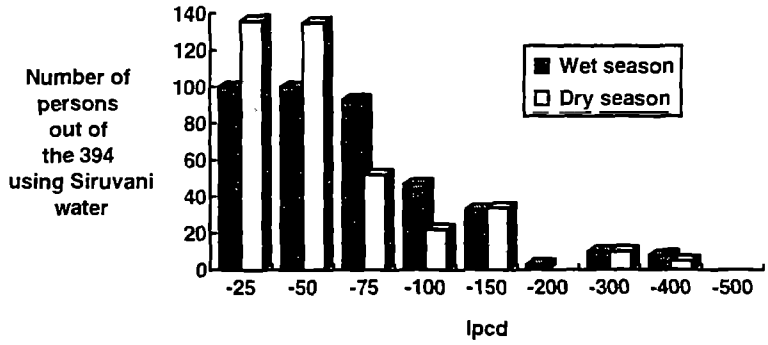


Figure 11 · Distribution of water consumption in wet and dry season Only Siruvani water is included.

The Siruvani water from the public system is generally supplied *every second day* within the Corporation. In inner Coimbatore (former municipality) though, the interview replies showed that Siruvani water supply at the time for the interviews was often *daily* in the wet season The suburbs got water every second day. Out of the 74 households interviewed within the Corporation, only *one* family, living in Singanallur, mentioned that their water supply was *not* every second day, but every 7th (seems unlikely though).

As soon as the Corporation border is crossed, our interviews showed that the Siruvani water supply was *every fourth to seventh day*. It was thus the situation in Kurichi (every seventh day)and also where we made our pilot study, in Vadavalli (every fourth day).

Table 18: Timings of public Siruvani water supply, distributed by interview area

	SUPPLY						
	DAILY		2ND DAY		7TH DAY		NUMBER OF HOUSEHOLDS WITH PUBLIC SUPPLY
AREA	wet	dry	wet	dry	wet	dry	
NSR-road			12	12			12 out of 13
Singanallur	1	1	15	15	1	1	17 out of 17
Ganapathy			15	15			15 out of 15
South	3		2	4		1	5 out of 7
East RS Puram	10	2	4	12			14 out of 14
Pudur	1	1	7	7			8 out of 8
Kurichi					6	6	6 out of 6
Totally	15	4	55	65	7	8	77 out of 80

The Siruvani water supply is switched on by the Corporation plumbers to the different pipes and taps. A timing schedule is decided for all different areas, but as a rule, the supply is normally about the same time each occasion and continues for three to four hours at the current place.

Inner town households were shown to have a longer supply time. Some residents located there had at the time of the interviews more or less a 24 hours supply every second day.

The supply timing could be experienced as a problem when households had their normal water supply only during the night. The person responsible for fetching water had in that case to be awake every second night which naturally caused inconvenience. On the other hand, one lady told us that she did not want to have water coming in the daytime since it disturbed the cooking activities.

Table 19: Hours of supply for households with public Siruvani water, distributed by area

	SUPPLY							
INTERVIEW AREA	**morning**	**daytime**	**evening**	**night-time**	**non-stop**	**varying**	**anytime -to neighbours**	**number of house-holds with public supply**
NSR-road	2	7		3				12
Singanallur	2	6		8	1			17
Ganapathy	5	2		3	3	1		14
South		1	1	1			1	4
East RS Puram	7	4	1			1		13
Pudur		2	5		1			8
Kurichi				1		4	1	6
Totally	16	22	7	16	5	6	2	77

Not known 3 households (Ganapathy, South, East RS Puram)

During *wet* season, at the time for our interviews, the majority of the households within the Corporation expressed that the Siruvani supply was abundant and enough to cover their daily needs, while in the *dry* period, April to July, many of the households had difficulties getting sufficient water quantities from their sources normally used. The supply and pressure were then generally lower and the demand from the households higher compared to in the cooler, wet season Only in Pudur though, the households could collect comparatively *higher* quantities of water in the dry period.

In the *extension* areas, the replies were often that the supply from the taps was half or even less than half in the dry season, naturally leading to need of water adjustments. In the *centre* though, it seemed according to the respondents that the supply was sufficient to cover the daily needs, even in those cases where the water came every second day instead of daily.

Timings of water supply varied with season At some places families mentioned that the point of time varied, as well as the hours of supply, especially with the season. In the dry season, the duration was usually shorter and it was even possible that the water could cease to come.

Ground water supply

The quantity of ground water available for the households depended on the ground water table, which was at the time of the survey low, however, even lower in the dry season. The interviews indicate that the supply was less in the dry period, although to what extent was difficult to assess since all respondents stated different reductions of timings and quantities. In the study, there were only 24 households or 109 persons using ground water in *both* seasons, the consumption of these is seen on next page.

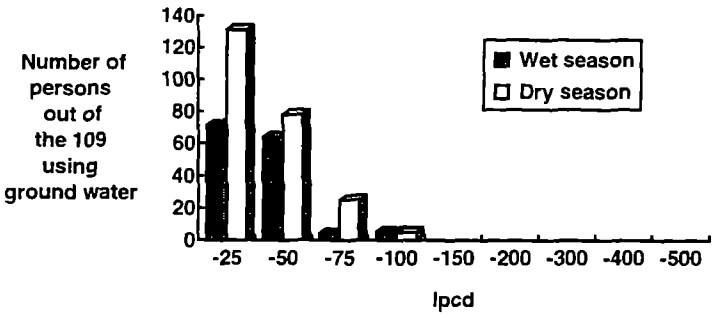


Figure 12: Number of persons distributed by ground water consumption intervals

The ground water from public taps was according to the interviews primarily supplied daily or every second day in both wet and dry season. The ground water supply was often continuos (like 8-12 hours) during a whole day, with one gap day.

Water use

In our study, one major focus was on domestic water use, the quantity of water collected by the households and for what purposes it was normally used. According to the survey, the water consumption included water for.

- drinking
- kitchen use (cooking, rice rinsing and utensils cleaning)
- laundry
- cleaning
- toilet
- bathroom
- garden irrigation
- watering of animals

Our study shows an average Siruvani water consumption of 71,5 lpcd in the wet season and 58 lpcd in the dry The ground water consumption was 9,25 and 16, 25 lpcd respectively, thus, 76% higher in the dry period The total water consumption varied from 82 lpcd in the wet season to 75 lpcd in the dry

Siruvani water was in principle the only potable water and was as a consequence of scarcity primarily used in the kitchen for cooking and drinking, but moreover, also wanted when soaping laundry, utensils and body Remaining demands were then covered by ground water However, 18 households out of 80 stated that they had sufficient Siruvani water to cover *all* the above mentioned needs

Ground water was foremost used for toilet and cleaning purposes and if necessary for rinsing laundry, utensils and body. All households stated that *only* Siruvani water was used for drinking, never ground water. (Two families from the very low income group though indicated that they could drink ground water when absolutely necessary). Ten to twenty years ago on the other hand the ground water quality was satisfying and consequently used for drinking.

Cattle, encountered rarely, was watered with ground water primarily and type of water used for garden irrigation seemed to vary between the families. Some with abundant supply used Siruvani water while others irrigated with ground water. Not to forget is, that quite a few respondents showed us a system for irrigation with grey water.

Use of Siruvani water for construction purposes is prohibited by law, but we met at least one family which had constructed their house using it. The reason stated was that "the concrete should not be mixed with salty water". When constructing, ground water should be purchased from bullock carts, and we met one family who said they were to use it for construction of a toilet.

Clear is that with increased supply higher quantities are used With a house connection recently provided, a household told us that they had increased their water consumption with around 10 vessels per day (around 160 litres).

Seasonal variations

Naturally, respondents pointed out increasing demand of water for drinking in the hotter, dry period when the supply at the same time was less. Also increased water was used for bathing. As Siruvani water quantities in the dry period were sufficient only to cover drinking and cooking needs in quite a few households, ground water was used to a higher extent to cover remaining needs. Pronounced variations in water use in the different seasons existed between the income groups and areas within and outside Coimbatore Corporation. For further information, see *comparison between the income groups and areas.*

Water shortage

Although a continuos situation of water scarcity existed in Coimbatore, *occasionally more severe deficiency* of water occurred. In Coimbatore, domestic Siruvani water shortage is due to both climate factors, e.g not sufficient rain during monsoon to fulfil the requirements over the year, and because of breakage and leakage in the water supply system Regarding ground water, there are naturally less variations in supply over the year, but availability varies however. Not to forget is when there is a cut in the electricity, which often occurs in the dry season and due to heavy monsoon rains, the water pumps stop working, leading to a temporary shortage.

Minimum need of water

With *minimum need* is meant the minimum quantities of Siruvani water and ground water the respondents and their families could cope with during a time of shortage. When asked for the *minimum need,* the requirements for drinking and cooking were naturally given priority to. Normal quantities were 1 kodam (16 litres) per day for cooking and drinking respectively. Sometimes the daily bath was considered a necessity included in the minimum need and then people usually managed with one or two vessels each

However, according to the interviews, the households of *higher* income groups not surprisingly generally stated a much higher minimum need than the lower income group households. Respondents of lower income groups often said that they already used what they felt was a very minimum amount. No possible ways to reduce the water use could be found they told. At a time of more scarcity, they would have to buy water from vendors, from neighbours or other secondary sources. They always seemed to know where to turn and no household stated they did not know where to go in an urgent situation.

Since families belonging to higher income groups had a more abundant water supply than lower income groups, they should obviously have a higher ability to reduce their consumption. Reduction was apparently though often never required as "plenty of water" seemed to be a standard answer from people in the high income group. Only very few high income group households had ever experienced scarcity the last ten years. Besides, in case of lack of water, respondents tell that higher income groups had the financial possibilities and personal connections necessary to improve the situation.

Table 20: Average minimum need of water compared to average normal use of water, distributed by household wealth

INCOME GROUP	AVERAGE *MINIMUM* NEED OF WATER (LPCD)	AVERAGE *NORMAL* USE OF WATER (LPCD)	DIFFERENCE (%)
Very low	35	49	40%
Low	41	63	54%
Middle	44	69	57%
High	64	141	120%

Not known minimum need: 7 households (3 in the low, 4 in the high)

Management or Adjustments

To be able to handle a water deficiency situation, different measures were taken by the households. The way they managed the situation, and what forms of adjustments were taken, depended very much on income group and area. Moreover, the severity of the situation, how long time the shortage lasted and to what extent the water amounts were reduced, naturally influenced what measures a household had to take.

Typical ways of managing the shortage were:

- reduction in washing of clothes and changes in washing procedures
- soaping with Siruvani, rinsing with ground water
- reduction in water quantities used for cleaning the home, garden and vehicles
- start of using the Siruvani water *only* for drinking and cooking
- bathroom and toilet use of ground water

The *managing* of water scarcity includes to change habits and cope with the less water given. *Adjustments* means to arrange with supplementary water, which was also common. Natural was of course to change the habits first in order to reduce water consumption, then later if necessary to buy water.

Reasons for respondents saying that they would *not* change habits in order to manage a situation of water scarcity were that it was not felt required in reality or that the households did not feel they had a possibility to reduce the water consumption. Households of the *very low* income group to a less extent stated any management of water. According to these respondents they could not reduce their consumption any further, so therefore they had to locate water in other ways. Around 70-80% of the respondents in each of the *very low, low* and *middle* income groups would or actually did adjust with additional water when a water shortage occurs A majority of the *high* income group on the other hand told they would or did manage in different ways if shortage of water occurred, but around 50% of the high income group would or did also adjust by additional water. However, as mentioned, they had normally plenty of water so they did not need to change their habits. Not to forget is that the high income households often had huge storage facilities, making them able to save water for a couple of days if a temporary shortage occurred.

Rain water collection

26 households of the 80 interviewed mentioned they collected rain water as an additional source The use was mainly for toilet and bathroom purposes, washing of kitchen utensils as well as for gardens. The distribution between the income groups was as follows, 8 from the *very low* income group collected rain water while 7 from the *low*, 9 from the *middle* and 2 households belonging to the *high* collect rainwater

The low number in the high income group is naturally because they were in less need of adding water. However, as gardens required relatively much water, rain water was naturally used by these families

As the house type very much decided the possibility for rain water collection, the families living in huts or tiled houses of less a quality explained to us that they could not collect water from their roofs and further lack of containers set a limit to the rain water collection.

A comparison between the income groups

While interviewing, it became clear that variations existed between the income groups regarding how much water a household could get and did consume Differences stated in the succeeding section were explained by households interviewed as well as noticed by us.

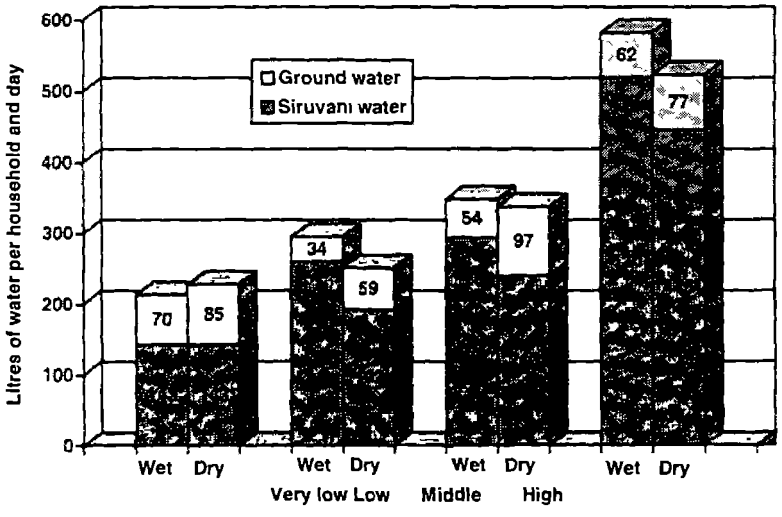


Figure 13: Household water consumption in the wet and dry season

As expected, the water consumption was peaking in the *high* income group, greatly exceeding the others' use. The differences between the other income groups in total consumption were not so large, even though it is clear that the *very low* income group had the lowest use of water. Notice the highest ground water consumption during both seasons in the *very low* income group, and moreover that the *low* income group used less ground water than any of the others.

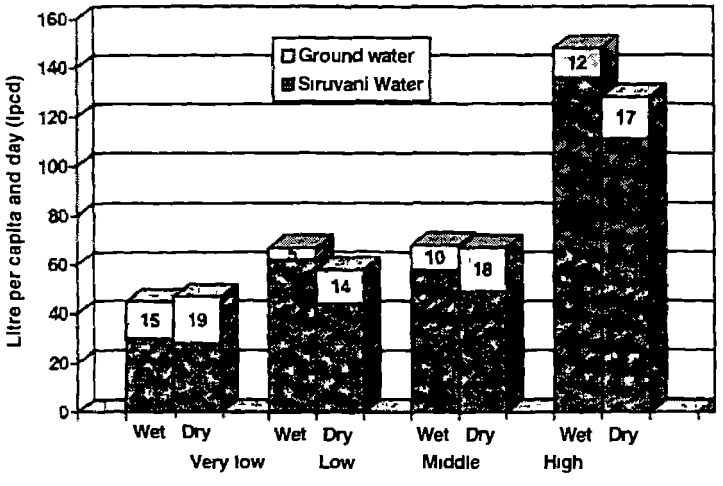


Figure 14: Water consumption per capita and day

When the *per capita* consumption is looked at in figure 14, the difference between the high income group and the rest it is even more striking. A reason to consider is that the families of the *high* income

groups consisted of less members than those of other income groups. Households of the *low* income group had a lower number of members (in average 5,0) than families from the Middle income group (in average 5,6), which affects the lpcd.

Available quantities of water varies much depending on source utilised. Since water is obtainable only during a certain time equal to all, the wealthier household having a private house connection is able to get more than for example the compound next door where several families shared the tap and also compared to families sharing a public tap.

Furthermore, in some neighbourhoods visited the public tap had been removed since most of the houses had been able to afford and arrange with house connections. It greatly affected households belonging to the lower income groups situated adjacent to the wealthier households In our survey 3 households, all of the *very low* income group, were located in such neighbourhoods and as a result the only possible water supply was from neighbours' house connections or bullock cart vendors, both selling water.

Some people pointed out that when they got a public Siruvani tap in the area, the ground water tap was removed. This was not adequate, since the Siruvani water was still not enough and they now had to find other and often more expensive sources for water.

A comparisons between the interview areas

When comparing data from different areas in figure 15, notice the lower total as well as Siruvani water consumption in all suburbs in comparison with the centrally located East RS Puram. Pudur constitute an exception though with over 100 litre Siruvani water per capita and day in both seasons. The much better situation, with even higher Siruvani use in the dry period, is explained by the close distance to the Corporation water tank allowing a very high pressure according to the interviews.

Reasons for the better water conditions in East RS Puram are for example that the actual water supply was higher in the central parts. Moreover the fact that house connections were in majority naturally contributed to a higher water supply. The comparatively large seasonal variation depends on the low water pressure in the summer season, also frequently mentioned in NSR Road.

To be pointed out is that in the South together with in Kurichi the households experienced the worst water conditions, with a Siruvani consumption below 30 litres per person and day. In both South and Kurichi, the ground water made up a larger or equal part of the total consumption compared to Siruvani water. Higher ground water use during the dry period in the South in order to mitigate scarcity made the total consumption higher than in the wet part of the year. The location of Kurichi outside the Corporation influenced the water supply to a great extent by a higher degree of scarcity, but people in the South pointed out that they recently (two years ago) had been incorporated in the Corporation so they were very much expecting better conditions The inhabitants interviewed in Kurichi further wished they instead belonged to the Corporation for the reason of a more frequent public supply inside.

Moreover concerning ground water consumption, in *Singanallur* it was much accentuated in the dry season. The supply of Siruvani water was then mentioned to be very low and the water pressure almost non-existing. In Singanallur, several respondents were aware of and pointed out the pronounced differences in water supply between suburbs and the centre.

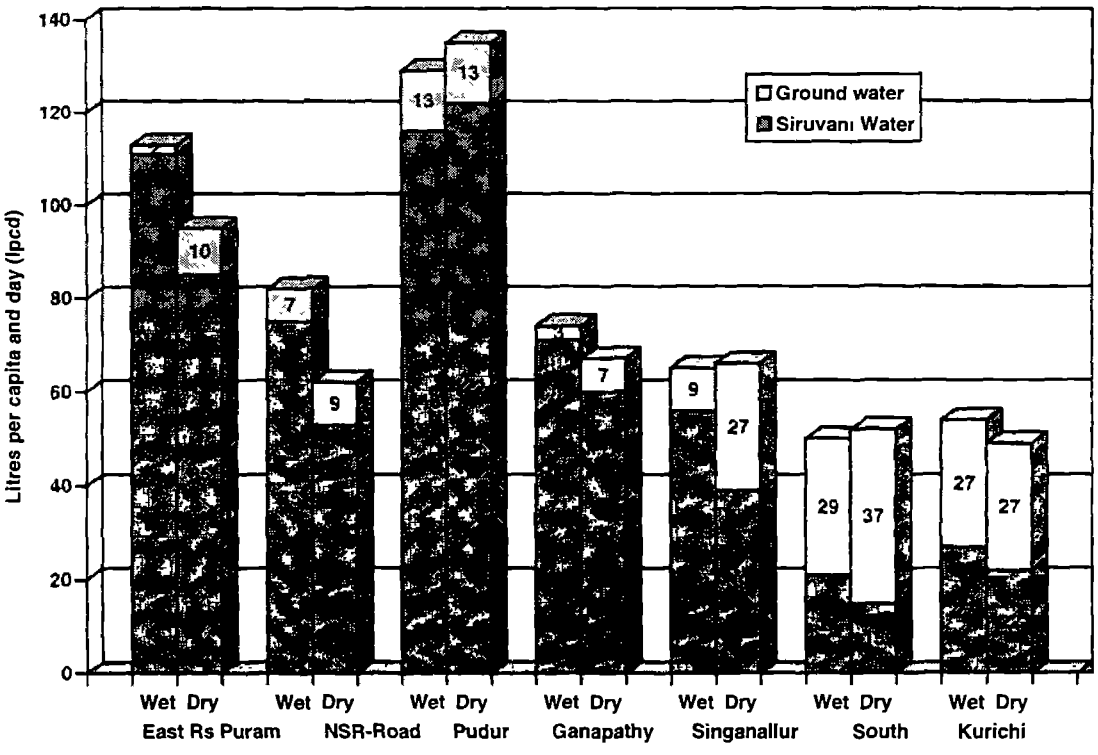


Figure 15: Average water consumption per capita distributed by area

Households in the *extension* areas had a closer distance to the farmers with borewells, which facilitated the water collection and in times of scarcity they utilised these sources for fetching ground water as well as doing the laundry. Further, the interviews revealed that it was often easier for households in these areas to buy water from bullock carts since they seemed to be more frequently visiting. Reasons mentioned were that the roads were easily accessible, not so narrow as in the town centre, and borewells (where the vendor fill up the tank) located at a closer distance However, also due to the fact that in these areas demand of bullock cart water was higher as the Siruvani water supply actually was less

Thus, variations in supply and consumption were mainly depending on,

- Location of the area and year of entrance into the Corporation: the more centrally located generally the better water supply.
- Location of a Corporation water tank in the vicinity: it made water supply conditions all year around better, and in direct relation is *where* on the main pipe the connection is situated. The tails of the pipeline system as in suburbs give low water pressure and supply. A hand pump might be a necessary complement
- Dominant income groups settled in the area: more house connections mean less families sharing the quantities given

Water in areas not approved

The water situation in different unapproved areas visited varied. Variations were mainly depending on how recently the dwellings settled there, as well as what income group was dominating the neighbourhood If the dwellings had been located there for a longer time, like 10-20 years. the chance that water was supplied is naturally higher. The location within Coimbatore also decided the access to water.

The most striking differences were between unapproved areas inhabited with higher income group residents and those where lower income groups had settled. The water situation among the lower income groups was according to the Corporation satisfying as all were provided with Siruvani water. Our interviews however, showed great resentment among the inhabitants as the number of Siruvani taps were not sufficient. People gathered from all directions, often from not intended neighbourhoods, and the number of families sharing the tap seemed to increase with time Respondents said that they had almost lost hope to get the additional taps so much demanded for.

Furthermore, some households pointed out that when the Corporation evacuated slum areas from central areas to the outskirts, no additional taps were provided even though the number of inhabitants using public taps had increased. Thus, slum upgrading programs did in fact make the situation worse for the first settlers.

In neighbourhoods with higher income communities, the inhabitants had normally applied for a water connection and paid development charges which had enabled them to get Siruvani water house connections. The water situation was hence similar to in an *approved* high income area. Otherwise, if no tap was provided, they usually bought bullock cart water. The time between application of a house connection and installation could be very long, more than a year many said. The interviews revealed no complaints about water in these neighbourhood since all but one interviewee of the high income group had a private house connection.

Households under litigation

A dispute over land ownership means that the household can not influence the present water situation until the court has reached a verdict. As mentioned above, also these households are entitled to fresh water according to the Corporation The time waiting until the litigation is over can be very long, like decades, the interviews revealed The two households under litigation in our study turned to neighbours and public taps for water. The conditions concerning water supply were obviously poor and the situation for these people was almost to compare with families living in illegal settlements, see below. It could be even worse though since the litigation procedure could affect only *one* family in a neighbourhood where others were provided with taps. The one family was as a result even more neglected by the Corporation

Illegal settlements

Usually the households were forced to fetch water at crowded public taps. In our survey we encountered two families living in illegal settlements, both belonging to the *very low* income group. One family told us they used public taps and the other, where no public taps existed in the neighbourhood, turned to neighbours and bullock carts for water

WATER PAYMENT

In this chapter, results and opinions from the interviewees regarding payment for domestic water in Coimbatore are brought up and explained.

Introduction

Types of costs related to water

Providing of house connections
- Investments when providing of taps and pipes, consisting of three different posts;
  -connection materials, (around Rs 1000 depending on distance)
  -connection fees to the Corporation (Rs 2000,1994)
  -"bribing fees" to the Corporation employees in order to be granted permission to a connection etc. (Rs 2 000-15 000,1994)

Water consumption
- Charges set by the Corporation related to water consumption (water tariffs, flat rates)
- Payment to neighbours or water vendors according to consumption

Repair and Maintenance
- Varying costs related to repair and maintenance of taps and pipes

Plumber
- Festival donations and gifts
- Varying costs related to the consumption of water, for example, according to some
- households payment (bribes) to the plumber in order to get water from the tap.

The above stated costs are explained in the following.

Costs related to providing of *house connections*

A private house connection of Siruvani water is provided to a cost of Rs. 2000 (1994), according to the *Account officer at the Water Supply and Drainage Department, Coimbatore Corporation*. The sum is a connection fee, consisting of a deposit of Rs. 100 and a 90 % refundable fee. Combined with this fee, the interviews revealed that bribes were also needed to be paid in order to get the connection The "bribing fees" are estimated to rise to 5-7 times the connection fee.

The total cost of a house connection varied remarkably many respondents told, from around Rs. 3000 if there was no violation of the house plan and the right personal contacts exited, to Rs 15 000-20 000 in other cases. Many households expressed despair over the difficulties and the high costs related to the providing of a private house connection We met several persons who had in vain fought for such a tap for years. We can not be truly sure about what the additional obstacles actually are, but the procedure was long and without the right contacts it seemed to be much worse.

The *ground water house connection* is a remnant in the extension areas from the time when these areas were not belonging to Coimbatore Corporation. The households in the Centre of Coimbatore have no ground water house connections since they had Siruvani water implemented from the beginning. No new ground water connections to the public system are provided.

Costs related to *water consumption*

Siruvani water charges

Persons having *private house connections* paid water charges in form of flat rates or according to the consumption stated on the meter card. The policy of the Corporation is that each private tap should be provided with a meter and installation of meters had been accomplished, the Corporation declared In all households with house connections we encountered there was a meter, if not in use, it was broken or stolen.

The meter charges were until the first of October 1994 fixed to Rs. 2 per 1000 litres, with 100 litres of water for free per day. After that date, the Corporation introduced a progressive charge system See table showing revised tariffs in the chapter *Presentation of the study area -Coimbatore.*

Flat rates (fixed rates) exist only in *rare* cases, foremost in Corporation staff colonies. A flat rate is based on number of taps a household are provided with The charge is normally around Rs 25 per month for the first tap. Another form of flat rate is when a tenant pays a fixed amount to the house owner each set time period.

Regarding *shared* house connections, households living in compounds did either share the meter charges among the families living there, or water charges were included in the rent. Thus, in many cases the tenant had no idea of how much he or she paid for the water, and they did not really seem to bother about it either. In the cases of sharing the water charges, we both found families who paid a share in relation to their consumption, and those who paid a fixed share even if the consumption could then vary between the households in the compound. No respondent ever complained to us about injustices in water consumption and charges

Siruvani water supply from a *public tap* was normally free of charge. 3 households in our study however were forced to pay a small amount, considered as bribes, to the plumber See *Plumber* below.

Concerning *neighbours'* house connection, our study revealed that the average price per vessel when buying from neighbours was 21 paise in the wet period compared to 23 paise in the dry. (Rs. 1=100 paise)

Ground water charges

As mentioned before, a *private ground water tap* connected to the public system was not commonly encountered when interviewing. Only three taps were found, two located in Pudur and one in Singanallur. The payment of these connections were of the households stated to be of a flat rate of around Rs. 20 per month. (However, *the Corporation Water Supply and Drainage Department* mentioned the monthly charge to be Rs. 15.)

In the areas visited, *ground water public taps* were almost as common as Siruvani public taps. The supply was normally free of charge (except when paying a monthly bribe to the plumber).

The average price for ground water from a *neighbours' (factories, farmers) borewell* was 51 paise per vessel in the dry period, whilst no respondent bought borewell water in the wet season. The average price is not particularly reliable since only three families bought ground water. The prices they stated where 25 and 28 paise and Rs. 1 per vessel, the latter from a household from the high income group Two families got a regular supply of ground water free of charge from neighbours in the both seasons and 7 in the dry. Some other families in our study though regularly went to a neighbour farm to do their laundry, the water taken from there free of charge.

Bullock cart vendors

Bullock cart vendors sold both Siruvani and ground water. The price for bullock cart water was, the interviews revealed, *much* higher compared to the other water charges One cart contained 900 litres or around 56 vessels and was often shared between families. Only one family in our study used Siruvani bullock cart water in the wet season and paid then Rs. 56 rupees per tank or Rs. 1 per vessel. A normal price for a Siruvani water bullock cart though seemed to be Rs. 75 in the dry season and that makes around Rs. 1.30 per vessel, which also was what another respondent mentioned they paid in this season During wet season, *Rs. 25* per tank was a normal price for ground water. Usually the charges were slightly increased in the dry season as the demand was higher and supply less, around *Rs 30* for a cart

of ground water. The average price in our study per vessel of ground water bought from bullock carts turned out to be 38 paise in the wet and 59 paise in the dry season.

Striking was that lower income groups were those who used this source more than other income groups, and also most increased their supply of bullock cart water in the summer. No remarks or complaints from households regarding the payment were heard.

It was in principle not possible to receive a credit or get a loan from the vendor. Only one family in our study were allowed to pay later, in that case at the end of the month. The reason stated by them was that they had a regular supply during the whole year, the payment seemed to be so familiar, accepted and equal in all areas that no one questioned upon it.

No vendor sold or dealt with other things than water according to the interviews.

Costs related to *plumbers, repair and maintenance*

A plumber giving service to residents could either be employed by the Corporation or be on private duty. Nevertheless, the combination, when the Corporation plumber provided private services was also encountered when interviewing

The role of the *Corporation plumber* was to control the Corporation pipeline system and turn on the water supply at times set to different branches in the main pipeline system. Moreover, his duty was to maintain and mend the pipelines and taps belonging to the Corporation. With that outstanding role, some plumbers apparently upgraded their own living conditions in some debatable way as they obtained bribes in order to extend the water supply by prolonging the supply time. Other plumbers extended the water supply free of charge the respondents mentioned, while still others would under no circumstances prolong the supply even if they were offered payment. However, the interviews gave us the impression that *in general* the plumbers did *not* supply extra water to the consumers.

Moreover, according to the interviews some plumbers demanded a monthly payment from the users who collected water from public taps, as well as those with supply from house connections. Examples of the households interviewed were charges like Rs. 1-2 per month and household for a family from the lower income group, Rs. 5-10 per month from a middle income family. Even though no extra supply was given they were forced to pay. The plumber threatened to cut the water supply if they did not pay the respondents told In some cases the families had to see to that *all* households in the area were able to contribute, since the plumber would cut the water for all if one did not pay (as the public tap supply affects all), leading to that families had to lend money to others along the street if they could not pay.

Among middle to higher income groups, a *private plumber* was according to the interviews engaged by the households to maintain private pipes and taps (normally not the public system) When interviewing, households often mentioned that if the problem with water was very urgent, a *private* plumber was called for and if not, they waited for the Corporation plumber. The waiting time for the later to correct the fault can be very long though. A private plumber was either on contract and got a monthly payment (one family gave Rs. 30-40), or called for when needed (one family paid Rs. 10-15 for each repair occasion).

For festivals, small *donations and gifts* were given to the plumbers by almost all households. It seemed to be a common practise in India to give the people serving you during the year a small gift, preferably money. Thus, it was in general voluntarily, but expected. On the other hand, some families encountered explained that the donation was a prerequisite for getting water, as in the case of monthly contributions mentioned above The economical situation of the household decides the amount given by them and in our study, variations between sweets only and Rs. 55 existed. Families from the *very low* income group usually paid Rs. 2-5, *low* Rs. 2-10, *middle* Rs. 10-25 and *high* Rs. 10-50, respectively

Household perception of water payments

Only *one* respondent out of 80 interviewed complained about the Siruvani water charges set by the Corporation. The household belonged to the high income group and the criticism was regarding the charges to be too high. All other families interviewed seemed to accept the prices they paid. Occasionally protests regarding the role of the plumber were heard, usually regarding corruption in general though.

Important to notice is that several households in the lower income groups got water free of charge (see figures mentioned above). That is of course a reason for not rising complaints about prices. However, as a fact they were also in need of buying water from expensive sources from time to time.

According to our interviews, the new *progressive* water charges seemed to be unknown to a majority of the households and consequently no opinions were heard. A reason can be that these had just recently come in force at the time of interviewing.

A comparison between the income groups

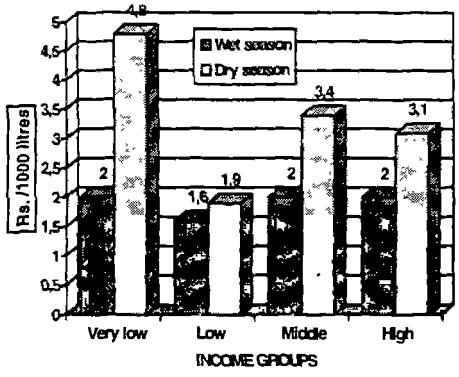
In this section, Siruvani water payment and ground water payment are treated in combination at first, then presented separately.

As seen in figure 16, payment for water is overall higher in the dry period when there is an overall higher scarcity of water. When all households in the very low income group are included, the *very low* income group paid in average most per 1000 litres water supply in the dry season, while roughly the same as the other income groups in the wet season Excluding the 53% of the households having water free of charge in the very low income group, lead to that the households of the very low pay the highest price for water in both seasons. The seasonal difference in payment is emphasised and highest among the income groups. Reasons for the highest payment are that more expensive water sources, as bullock carts or neighbours' house connection or well, were used to a higher extent as these households often were situated in areas with insufficient number of public taps or no public taps at all.

Surprising is that the *low* income group had the lowest water expenses per 1000 litres, both in wet as well as in dry season and also when the households (23%) having water free of charge are excluded. The seasonal difference in payment is further almost nil. The cause for the lowest payment is that a relatively high share (36%) was supplied with water by public taps and at times of scarcity, they sought more water form other public taps. Most important is though that *no bullock carts were used*, the source which makes the litre price raise astronomically.

The *middle* and *high* income groups show similar payments for water and the seasonal variations were slightly more pronounced than in the low income group The cost varied between Rs 2 to 3 per 1000 litres in both diagrams. 13% of the middle income households were supplied with water free of charge, while none of the high. When scarcity the households of the middle and high income groups to higher extent *bought* water and did then not use public taps, therefore the higher payment in the dry period in comparison with the low income group. Moreover, when these households, especially those of the high income group, bought water the interviews revealed that they paid a higher price for the additional water than the other households. One respondent belonging to the high income group said he paid around Rs. 1 per vessel ground water from a bullock cart, while the average in our study was Rs. 0.55. The convenience of the source seemed to play an important role, and the price somewhat less.

Households with water free of charge included



Households with water free of charge excluded

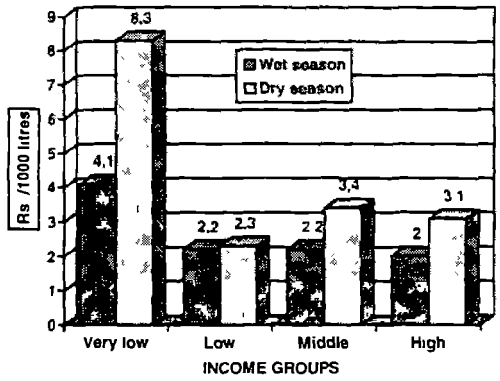
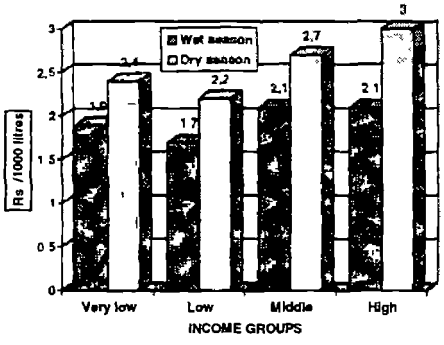


Figure 16: Average water payment, Siruvani and ground water included, distributed by household wealth. *Note: 3 households with extreme payment figures which affected the average with more than 100% have been removed One belonged to the Very Low income group and two to the High*

When looking at payment for *Siruvani water* only in figure 17, we also see here that payment is higher in the dry period and further that the seasonal variations are rather similar when comparing income groups. Including all households, figure 17, variations in payment are not emphasised but noticed is that the high income group pays in average the highest price per 1000 litre and the low pays the lowest. However, when excluding the households supplied with water free of charge, obvious is that those households buying water in the very low income group have the highest prices, while the other show similar figures. The reasons are the same as mentioned above The overall Siruvani water costs varies though less in seasons since it its the ground water bought which affects the litre price the most (which is to look at in the following diagram).
The figures per 1000 litre can furthermore be compared with the Siruvani water tariffs Rs 2/1000 litres.

Households with water free of charge included



Households with water free of charge excluded

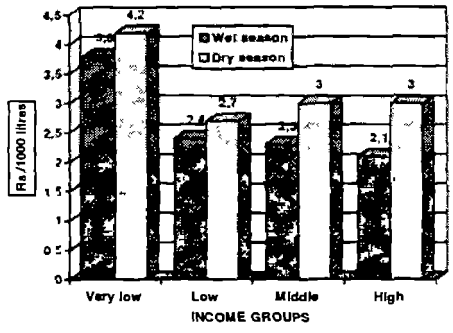


Figure 17: Average Siruvani water payment, distributed by household wealth.
Note 3 households with extreme payment figures which affected the average with more than 100% have been removed One belonged to the Very Low income group, two to the High

When concentrating on *ground water*, figure 18, it is noticed that all income groups except the *very low* mainly used ground water only in the dry period. Then the payment was around Rs. 20 per 1000 litres, ten times higher than the Siruvani water payment! The very low income group hence consumed and paid often for ground water also in the wet season and then to a price of around Rs. 15 per 1000 litre It is also seen here that the low income group pay less than the very low and there were further less number of households using ground water in the low income group As mentioned, the low income group used water free of charge supplied from the public taps and there was little need for other costly

sources as bullock carts etc The high income group pay the highest price and the *very low* and *middle* income groups paid in average almost the same in the dry season. The latter groups seemed to use and buy ground water on a more regular basis, while only *occasionally* ground water was bought in the high income group. Consequently, it made high income group households less affected by the high litre price they paid.

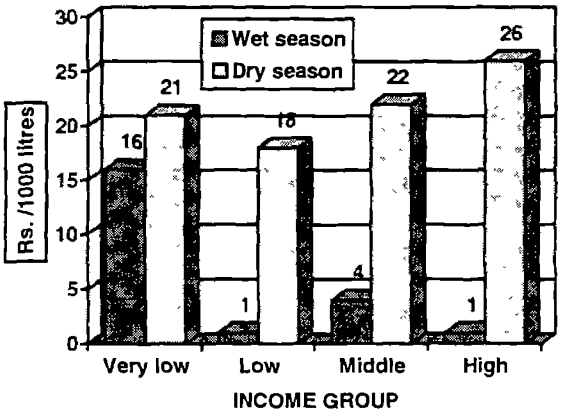


Figure 18: Average ground water payment, distributed by wealth
Note: 3 households with extreme payment which affected the average with more than 100 % have been removed One belonged to the Very Low income group, two to the High.

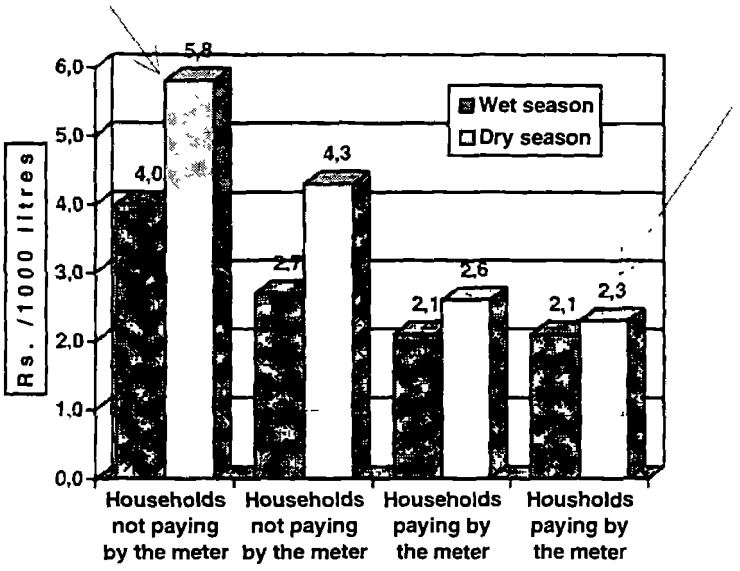
All households did not use ground water, and of those who used it many could get it free of charge from public taps. In figure 18, only 8 households are included in the wet season and 16 in the dry.

Table 21: Ground water payment

INCOME GROUP	NUMBER OF HOUSEHOLDS			
	PAY	USE IT FREE OF CHARGE	PAY	USE IT FREE OF CHARGE
	Wet	Wet	Dry	Dry
Very low	3	4	4	4
Low	1	5	1	12
Middle	2	5	6	11
High	2	2	5	4
Totally	8	16	16	31

Figure 19 indicates the advantage of a *house connection with meter* compared to other Siruvani as well as ground water sources The households paying according to meter readings pay less per 1000 litres than households seeking other sources or paying a flat rate, especially when those having water free of charge are excluded Not unexpectedly, the *high* and *middle* income groups were overrepresented in the group paying according to the meter as they were usually provided with house connections.

Households with free supply excluded



The last bar in this diagram show the *Siruvani water meter payment only.* The minor seasonal payment increase in the dry season is probably because that air is making the meter turn and count, and the air makes the sensor to turn faster compared with when water flows in the pipes. That is also a reason for the meter cards showing more quantities and higher payment in the dry period compared with the wet, even though families stated the supply was less, a contradiction which really frustrated them a lot. When calculating the supply, we have considered the quantities stated or used, not only what the meter card said which then made the seasonal difference in the price per 1000 l visible.

Figure 19: Water payment per 1000 litres, distributed by households paying by meter and those not paying by meter Ground water and Siruvani water use are included
Note 3 households with extreme payment have been removed, one from the group without meter, two from the group paying according to the meter. Note: Households sharing a house connection were placed either in the group paying according to the meter or in the group without meter. The reason is that some of them were registered under the group not having a house connection with meter because they were not familiar with their actual share in the meter payment. Also if they did not have any meter card available to show us or they just paid a flat rate to the house owner. Thus, we had to consider them as not paying by the meter.

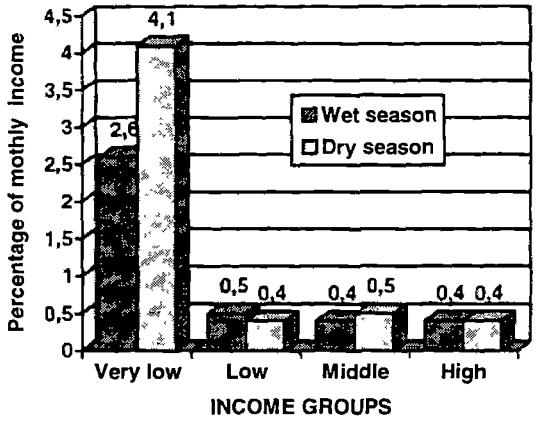
Water expenses' share of income

Households of the *high* income group had naturally the highest water expenses per month as their consumption was peaking among the income groups. However, when looking at the water expenses' share of income, figure 20 , the *high* has less a share than all other income groups when households having water free of charge are excluded. The *high, middle* and *low* income groups though all show similar shares in both diagrams, with around 0,5 % of their income spent on water. The very low income group on the other hand spent most of all with roughly 5% of their income on water. The seasonal difference of the very low is further more marked compared to that of the others. The higher share is as mentioned earlier depending on the more costly sources used. Overall it is important to point out that water payment did not constitute a large share of the income, and consequently a cause for the non-existing complaints about water charges.

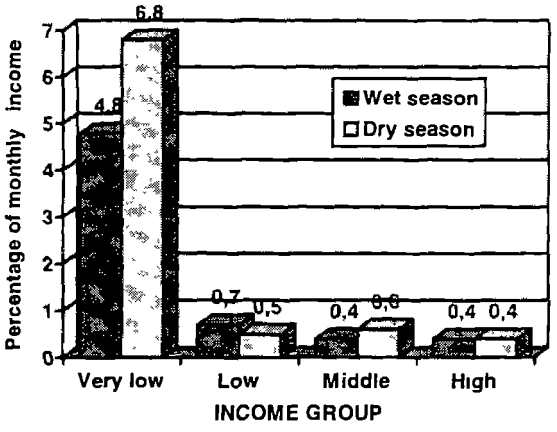
As a base the following estimated incomes have been used (see further *Methods*)

INCOME GROUP	AVERAGE MONTHLY SALARY
Very low	Rs. 1000
Low	Rs. 3000
Middle	Rs. 5000
High	Rs. 10000

Households with water free of charge included



Households with water free of charge excluded



Figures 20: Water expenses' share of monthly income in the income groups
Note: 3 households with extreme payment which affected the average with more than 100% have been removed. One belonged to the Very Low income group, two to the High

A comparison between the interview areas

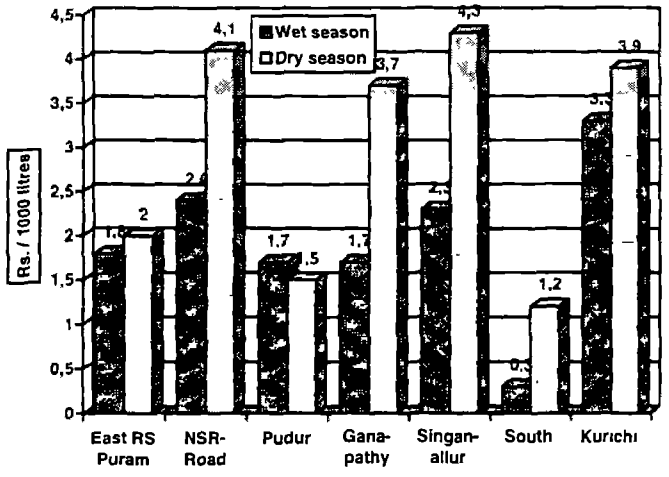
In this part, household water expenses for both Siruvani and ground water are brought up in figure 21, and then Siruvani water is considered alone in figure 22. In general, as mentioned before, increased water expenses are due to use of more costly sources as neighbours' house connections or wells and in particular bullock cart water. Use of a house connection decrease water payment

In ***South*** a vast majority or 71% of the households used water which was free of charge. The payment figures shown in the diagrams are accordingly the lowest among the income groups', extremely low in the wet season That is because of the fact that the majority of the households used public taps and *none* used bullock cart water. Notice that the seasonal variation was rather outstanding with the relatively higher payment in the dry season.

In ***Kurichi***, located outside the Corporation, the water supply was mentioned to be less than in other areas and as a result the price of water was peaking. Important to point out is that households located in Kurichi, surprisingly enough, had higher water payments in the *wet* season, but considering that they mainly used ground water got for free as an additional source it explains the low figures in the dry period. Borewells were more frequently existing and there was hence no consumption of expensive water, no households bought bullock cart water. 33% of the households visited in Kurichi used water for free.

The areas ***NSR Road, Ganapathy and Singanallur*** have the largest seasonal difference in payment. The particular high price in the dry season in the suburbs can be explained by the more severe Siruvani water scarcity. Secondary sources, and consequently water supplied to a higher price, were thus needed in order to increase the supply during the dry season. Furthermore, the water pressure in Singanallur and NSR Road was mentioned by respondents to be extremely low, especially in the dry season. Low pressure is contributing to creation of seasonal variations in payment by the fact that air in pipes makes meters count, in spite of the decreased water consumption. Since most households, more than in any area, in NSR Road were provided with house connections, air in the meters influence to a great extent. Also air in the meters give higher payment figures in the dry season in Ganapathy. In Singanallur, 18% of the households interviewed had water free of charge, while 13% in Ganapathy None used water free of charge in NSR Road and bullock carts as sources were used by very few.

Households with water supply free of charge included



Households with water free of charge excluded

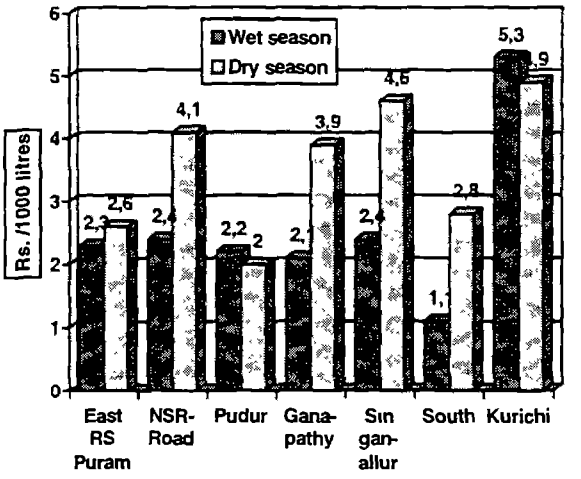
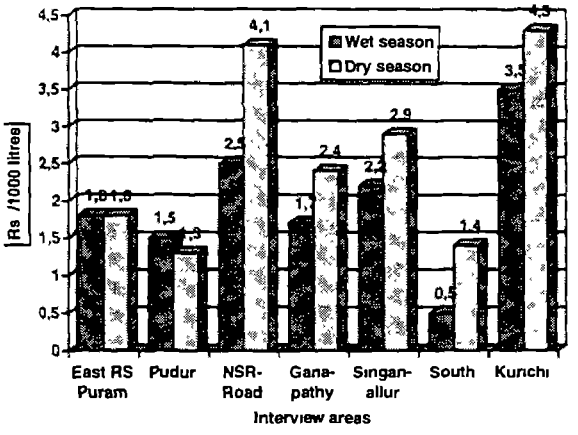


Figure 21: Average water payment, Siruvani and ground water combined, distributed by area
Note. 3 households with extreme payment which affected the average with more than 100% have been removed. They were situated in NSR-road, Ganapathy and Kurichi

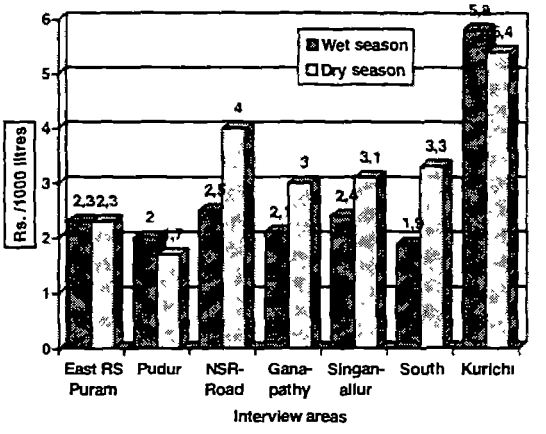
In ***East Rs Puram*** the average payment of water is similar when comparing the seasons. Many households were provided with a house connection, meaning comparatively slightly lower payment figures. The higher pressure was usually leading to abundant water supply and less air in the meters, however, a few households situated in the congested parts west of the flower market stated that a hand pump was necessary. The households further used neighbours' house connections or wells only to a slight degree and never bullock carts, but instead public taps were used as additional source in the dry period, consequently decreasing costs. 21% of the households in East Rs Puram were supplied with water for free.

In ***Pudur***, with it's close distance to the Corporation tank, households were provided with ample water supply and a high water pressure. The high water pressure created more reliable meter data as less air influenced the meters. Further, in Pudur neither bullock carts nor neighbours were utilised to mitigate the dry season scarcity, solely public taps where water was supplied for free. Most households used house connections and in the dry season they turned to public taps to get a small additional supply, which means they got the same or more amounts of water but paid for less water at their own connections, i.e. the litre price sunk. The study shows that of the total supply, the public tap supply did increase with 5% at the expense of the house connection supply. 25 % of the households had water supply free of charge.

Households with water free of charge included



Households with water free of charge excluded



Figures 22: Average Siruvani water payment distributed by area
Note: 3 households with extreme payment which affected the average with more than 100% have been removed. They were situated in NSR-road, Ganapathy and Kurichi

Will the progressive water charges affect households *sharing* a connection more than households with a *private* connection?

When we heard about the recently introduced *progressive* water charges set to encourage water savings, our thoughts went to households *sharing* house connections, both to the families sharing it legally as in compounds and to the families with illegal joint-connections to the neighbours. How will the new tariffs affect the families sharing, compared to families having private house connections? And are the progressive charges likely to result in water savings?

It seems unfair that people from the lower-middle income groups, often sharing taps, should pay more per 1000 litres of water than households with *private* connections, the latter mainly from the high income group. The one-connection family do not even need to save if they do not reach the level (50 000 litres per two months + 100 litres of free per day) where the progressive charge starts. Also the 100 litres free of charge per day gives the private households a huge respite before starting paying, while compound households quickly consume the daily 100 litres free of charge they got for the whole compound (as they have *one* connection).

To find out how the new tariffs affect the households having meters, we have calculated how much the households living in a compound compared to the single households would have paid with progressive water charges according to the normal water quantities taken of today. Please, *follow the calculation example starting on next page:*

Number of households taken into account with shared house connection 34
Number of households taken into account with private house connection 19

	Number of households		Price
	Wet season	Dry season	(Rs./ 1000 litres or part there of)
Shared connection			
up to 50 000 litres per two months (which means not affected by the progressive charges)	**12**	**18**	Rs 2 50
>*50 000* litres (first limit) per two months	22	16	Rs 3 00
>*100 000* litres (second limit) per two months	7	4	Rs. 3 50
>*200 000* litres (third limit) per two months	2	-	Rs 4 00
Private connection			
up to 50 000 litres per two months (which means not affected by the progressive charges)	**16**	**18**	Rs 2.50
>*50 000* litres (first limit) per two months	3	1	Rs. 3.00
>*100 000* litres (second limit) per two months	-	1	Rs. 3.50
>*200 000* litres (third limit) per two months	-	-	Rs 4 00

Note. the payment figures on the meter cards did not correspond with the set water charges, see a) meter card and b).water charges	Shared connection		Private connection	
	Wet season	Dry season	Wet season	Dry season
Average Siruvani water consumption today (litres/hh/month)	9 360	7 160	15 280	14 170
a). actual payment today *according to the meter cards* (Rs. /month)	20.8	17.1	32.8	33.5
b). calculated payment today, *according to the water charges* (Rs. /month)	17.1	12.6	24.6	22.5
c)The difference between the actual and calculated payment, *a). and b)*,	+22%*	+36%*	+33%*	+49%*
d). Average calculated payment if progressive water charges, *according to the meter card consumption and the progressive water tax charges* (Rs. /month)	23.3	16.7	31 3	39 1
Percentage increase/decrease, *The difference between a). and d).*	**+12%**	**-2%!**	**-4%!**	**+17%**
Average payment per 1000 litres with progressive charges	2.49	2.33	2.05	2 76

* The actual price is this much higher than what the price should have been according to the water tariffs. Reasons can be that a families' consumption do not reach over the minimum charges, at the time for the interviews Rs. 20 and that consuming only *a part* of 1000 litres gives anyway *a full* 1000-litre payment.

Three answers to the question:

- Yes, the compound families will have to pay slightly more for the same quantities of water in the future, and the family with a private connection will hardly be affected at all. Why this, see how many households in each group respectively who will exceed the different tariff limits.

- No, in absolute numbers, the payment increase will not according to the table above be remarkably higher among the compound families, because they already pay on an average 30% more than what the water tariffs say, so the progressive tax is eaten up in the higher payment of today. This is because many compound households pay a set flat rate to the house owner, or might not get to know what the meter cards actually say. The house owner could for instance see that the tenants cover the payment for his/her water consumption as well. The high income group pay on an average 40% more than what the set water charges are!!

- No major water savings will according to the authors be made as a result of the progressive water charges. Primarily since the high income groups, all having a private connection, will hardly ever reach the consumption of 56 000 (including the free litres) litres per two months (233 lpcd if the family consist of four!) where the increasing charges are introduced. In compounds with families sharing a tap almost all will reach the progressive level Probably the house owner will just raise the flat rate or the house rent slightly No savings worth the efforts will likely be made in compounds with shared connections, since it is more tedious or more expensive to seek water from outside than to take it from the own tap, even though some extra rupees per month will be paid By the way, the compound *and* the single households did not anyway seem aware of exactly how much money they spent on water For tenants the water charges were often included in the rent for instance, so some rupees more or less will we assume not be noticed.

Conclusions

According to the authorities, the water supply situation in Coimbatore is much dependent on the monsoon rains. A heavy monsoon fills the reservoirs with water, assuring a sufficient supply to cover the demands of the domestic-, industrial- as well as the agricultural sector. Years with little rain mean that the inhabitants of Coimbatore must adjust with existing water supply according to the Corporation. However, the overall scarcity of water does not effect all people similarly, clear is that the higher income groups are favoured and the low income communities suffer more, both from little water availability and higher payment of water. According to our survey, the higher income groups have in general not experienced any scarcity in the past ten years and have only on few occasions been forced to adjust their water use in any way

To be pointed out again, our impression is though that households did *not* consider neither the scarce water nor the water charges as great problems, instead rather satisfying The shortage of water though was more severe in the extension areas and especially outside the Corporation compared to in the city Both some of the respondents as well as the Corporation believed further that the general water shortage would be overcome after the implementation of the Pillur scheme. As a fact, the expectancy among the households of supply by Pillur scheme water in the near future could be a reason for so few complaints about the water situation. Respondents were not fully aware of the partition deciding who are getting Pillur water and who are getting Siruvani water

Considering the individual water conditions of households we would say that an existing *house connection* very much influence in a positive way. A house connection gives advantages as·

- Better convenience· a closer distance to carry water vessels (even making indoor piping possible) and less number of persons sharing the tap leads to time and energy savings of persons collecting water.

- Benefit from the water supply duration. as the water supply duration for households with a house connection is equal to the duration at taps shared by a number of persons, those provided with a house connection consequently can get higher quantities of water each time

A house connection is today met wiht mostly in wealthier families In the survey all households of the *high* income group were provided with a house connection, in the *middle* income group 80% had a house connection, usually shared by the compound, 60% of the *low* and 20% of the *very low* income group also had house connections, usually shared by compounds. To be added to these differences of the income groups is that households of the *very low* income group are forced to settle in areas not approved, where there is insufficient public supply of water. This force them to purchase water from neighbours' house connections as well as bullock cart vendors and that explains why these households had the highest water payments of all income groups. Households of the *low* income group used to a high extent shared Siruvani house connection but also to a rather high extent a public supply of water, either a couple of Siruvani sources or a Siruvani source combined with a ground water source That is a reason for their comparatively low water payments, but because of the use of public taps they spent a longer time fetching water The majority of households belonging to the *middle* income group were as mentioned provided with *shared* house connections. The supply is then assured, however quantities not at all as high as those in the high income group. In general they paid water fees which correspond to the set tariffs.

While bringing up the subject of house connections and their meters, a matter which often came up when interviewing was the running of air in the pipes before the water was coming. As said in the result chapters, the families had to pay more in the summer for the running air than in the winter when they got water, i.e. the supply was less in the dry period though they had to pay more. This was especially noticed and complained about in NSR-Road and Singanallur and even to some extent in Ganapathy. Common for those areas we realised, was that the pressure in the water pipes is very low. The situation in Pudur was the reverse, families living north of Lawley Road explained that no hand pumps were used, the supply was abundant in both seasons and the pressure was very good since a Corporation Siruvani water tank was located just nearby. No complaints about paying for air in the pipes were heard there. A conclusions drawn is then naturally that if houses are situated very close to a fresh water tank, less air will come ahead in the pipes and that makes the meter cards show more realistic consumption and payment figures. The distance to the tank must though be very close, say not more than two-three kilometres, since the households living South of Lawley Road complained about low water pressure in the dry period.

When applying to the Corporation for a house connection, there were strict rules for the application The connection fee of Rs 2000 to the Corporation was to be paid along with a corresponding "bribing" fee to the tax man, *if* the house diverges from the house plan. Our interviews on the other hand gave us the impression that people felt totally neglected by the Corporation and further felt it was no use to apply for a house connection unless they were able to pay Rs. 10 000 - 15 000 (If all of these families lived in housed diverging from the house plan, we do not know) Anyway, some were tenants, and because of that had no chance of getting a house connection unless the *owner* approved of it. When visiting neighbourhoods and speaking with families, imbibing the street life and looking at varying water collection methods, it seemed to us that many women had a part- or fulltime work related to water, not only among the urban poor but also up in the middle income communities. Women in the high income groups on the other hand seemed to have a relatively relaxed situation. The water collection for all except wealthier women, included queuing in the hot sun or in the middle of the night, carrying heavy water vessels, possibly hand pumping and of course walking the distance to and from the sources several times. Some women further had to adjust to variations in water supply timings and therefore were forced also to spend time waiting and listening for water in the pipes. However, even households provided with house connections were affected from time to time If the low water pressure demanded use of a hand pump for example or if they had to carry several vessels into the kitchen the fetching procedure could be tiresome (Most of the families with house connections used hose pipes or overhead tanks, though)

Moreover, not to forget is that 34% of the households interviewed utilised a combination of sources *in all seasons*, whereas 43% in the dry season. Different Siruvani sources or a combination of a Siruvani and a ground water source was used to cover daily demands. This naturally made the collection of water even more time consuming.

According to interviews with the Corporation on the other hand, they did not seem aware of or did not like to admit that the water collection today often constitute a tedious work for many women. When discussing with the Assistant Executive Engineer at the Water Supply and Drainage Department, we got the impression that almost all households within the Corporation were provided with house connections, indoor piping or servants and consequently spent almost no time on collecting water No strategies, except the slum improvement program, was heard of for the purpose of facilitating the water collection procedure for women without a house connection

Considering household *water payment*, it might be of value for the Corporation to look over the set charges, even the new progressive tariffs, since these are obviously not at all considered a burden to households today. 79 of 80 households in the survey did not even comment on the water charges, even though discussing the topic of water and noting their payment. The household awareness of the new progressive water charges was moreover extremely low, no one had heard of them. If the purpose is to make households save water by these progressive water charges, we doubt it will work. Thus, considering the household payment of today as well as the attitudes, it is very likely that the domestic sector has ability to contribute with more money for the purpose of water.

An example regarding water costs. the households of the *very low* income group, which is expected to get a water supply free of charge from the public taps showed in fact to have the highest payment per 1000 litres (Siruvani and ground water combined). At the time for interviewing they actually spend on an average Rs. 8 monthly in the wet season and Rs. 17 in the dry. These figures correspond to 11 500 *Siruvani* water litres per month and 17 500 litres respectively, calculated according to the Corporation Siruvani water tariffs. These families however used on an average only 4300 litres of Siruvani in the wet and 4100 litres in the dry season. (plus 2300 litres of ground water in the wet season and 2800 in the dry) and would surely accept to pay according to the Corporation tariffs (even wiht a future hike) if they get an assured supply

DRAINAGE AND SANITATION

In this chapter we discuss what we find closely related to water issues, namely where the waste water goes and what the resulting effects are in a neighbourhood. Our interviews have also shown the households' great concern for sanitation questions. Therefore, we also present facts and attitudes about that subject. In the end of this chapter we give our evaluation of the total drainage and sanitation situation of the households interviewed, as well as conclusions we have drawn
(See the following chapter *Improvements desired* for detailed descriptions of what the households regarded as problems and which improvements were wanted.)

A woman washing clothes close to the storm water drains

DRAINAGE

In the following, our results from the interviews regarding the household drainage situation will be presented With drainage we here mean sewage as well as storm water. We find it natural *not* to discuss sewage and stormwater separately as handling of sewage (then grey water) in most places visited in Coimbatore is combined with stormwater, i.e. the same ditch is used for collection as well as transportation of the water. (At some places defecation in the ditches occurs, therefore they contain both storm-, grey- and black water) The most significant reason, however, for not separately discussing different kinds of waste water is that regardless of what drainage system a household is connected to, the attitudes and problems mentioned by the respondents are about the same.

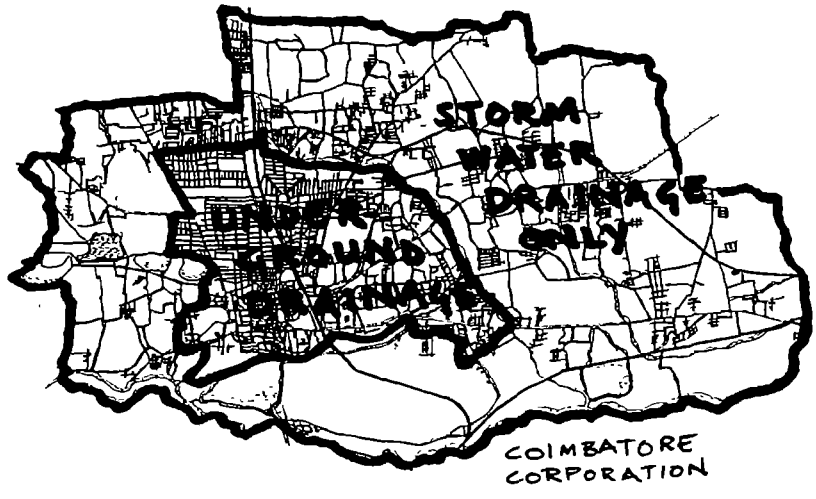
Introduction

The household waste water consists of *grey water* (sullage) from kitchen (cooking, utensils cleaning etc.), bathroom, laundry, cleaning as well as *black water* from possible toilet/latrine.

Where *underground drainage* house connections are provided (in the town centres), the sewage is separated from the storm water. The sewage from the underground drainage is lead to the Ukkadam sewage farm and storm water is transported in uncovered cement ditches, leading the water to either fields or reservoirs Fields and reservoirs seem to be the end-destination for all kinds of water transported in uncovered cement ditches. Where no underground drainage is provided, the black water is usually taken care of in septic tanks. The grey water makes it's way through the same conduits as described above, in cement ditches leading to fields or tanks.

Domestic drainage facilities existing in Coimbatore:

- underground drainage
- uncovered or partly covered cement (concrete) ditch for storm water
- uncovered or partly covered cement (concrete) ditch for storm water in combination with greywater
- septic tanks (see, *Sanitation*)
- percolation pit
- natural or dug mud ditch
- vegetation



Map 6: Drainage zones and drainage facilities

Important to point out is that a majority of the households in the survey expressed great concern about the drainage situation, not only their own but also as a whole in Coimbatore. Often, type of drainage facility provided at the residence did not influence much on how the household experienced the situation. In many cases the respondent vigorously described the circumstances as far-from-acceptable, even disastrous When visiting the households we felt it was easy to agree. The unsatisfactory drainage situation was sometimes also even a reason for moving or wishing to move to another site In the central area underground sewers in combination with storm water ditches were most common, whereas in the outlying areas uncovered ditches for transportation of storm water as well as grey water were in prevalence. See map 6.

The main problems related to drainage:

1. Flooding and stagnant water due to not functioning drainage facilities, which creates
   - problems with complicated access to the dwellings and to the road
   - mosquitoes, flies, other insects (the stagnant water is a breeding ground)
   - health worries concerning children in particular
   - odour
   - different kinds of worms in the drains
2. Health effects as diarrhoea, malaria, worms etc.

The reasons for not functioning drainage facilities were mainly:

- refuse material creating blockage
- wrongly constructed ditches, with no sloping etc.
- the capacity of ditches is too small, especially in the wet period of the year
- the waste water is not taken care of, not transported to a tank or similar site
- poor road construction (mud road)

A comparison between the income groups

The areas inhabited mainly by higher income groups were usually sparsely populated and had the best drainage conditions in Coimbatore according to our interviews No variations between these kinds of neighbourhoods due to the location within Coimbatore were discovered as the characteristics of the areas were much the same. As the higher income groups mainly lived in rcc houses with gardens attached, it improved the drainage situation considerably. The grey water was often used for irrigating the garden or only let percolating into the ground. Also as seen in table 23, the majority of these households were provided with either uncovered ditches or underground sewerage. These facilities contributed to the better situation, but the characteristics of the neighbourhoods and moreover, their higher ability to pay for cleaning services as well as important personal connections in the Corporation etc. influenced the situation to a higher degree. Even though a markedly or at least somewhat better situation compared to the lower income households, also families from the high as well as many from the middle income groups felt that the drainage problems were great They are affected by standing, smelling water in the ditches and react to it even though they are not "living in it" as many from the lower income groups actually do.

Table 23: Distribution of drainage facilities (excluding toilet) by household wealth

INCOME GROUP	NUMBER OF HOUSEHOLDS WITH ATTACHED DRAINAGE FACILITY					Number of households
	None	Vegeta-tion pit	Mud ditch or poor standard cement ditch	Good standard cement ditch	Under-ground drainage	
Very low		7	3	5		15
Low		2	9	9	2	22
Middle	3	2	2	13	4	24
High		4	1	10	4	19
Total number of households	3	15	15	37	10	80

Lower income groups on the other hand, which were often living in more congested areas without sufficient well functioning drainage facilities experienced the worst drainage conditions. All the main problems mentioned above affected them. Flies were everywhere, children were close to falling into the wide ditches with smelling waste water when playing outside the house etc. Sufficient facilities as well as related cleaning services were needs very much wanted and fought for, according to the interviews.

Many of the respondents with less wealth were not provided with any drainage facility at all by the Corporation. A mud ditch, vegetation plot, a pit or just nothing, were the alternatives to where the waste water was transported, see table 23 An example is those living in huts on unauthorised plots. The waste water was simply let out on the backside of their house to a low lying area or a similar site. Surroundings with vegetation could solve the problems and lead to a better drainage situation, but in many cases flooding and stagnant water were common sights, all depending on the natural conditions and the amounts of water. To improve the situation, some people, mainly those directly affected, dug a ditch or a pit to lead the waste- and storm water away from their lot.

Compared to *no* facilities (the waste water is transported to a field or the backside of the dwelling for example) as well as only a self-made percolation pit or ditch, a newly constructed uncovered drain ditch was experienced to be much better, according to discussions with some households Their deficient drainage situation was, or would be, solved when the Corporation had decided to construct a ditch outside their lot.

At some occasions, at lower income dwellings visited, there existed a drainage ditch, self-made or a low standard cement type, located at *a distance* from the dwelling. Usually, the road was muddy and access low, especially in the wet season Where encountered, the need of carrying a container with the waste water and then emptying it into the ditch was experienced to be very inconvenient.

The inhabitants from low income groups pointed out that they usually had little influence on the politicians or Corporation cleaning staff to improve the circumstances. Many had put complaints to the Corporation, without result.

Our impression as well as the respondents' was that wealthy households with good sanitary and sewage conditions improved the situation for a household belonging to a lower income group living in the vicinity. As mentioned, the neighbourhoods with higher income families were scattered among neighbourhoods mainly inhabited by lower income groups. For instance, some cases were found where households belonging to the very low income group, all living in huts in a field close to more wealthy households, where helped by the fact that the wealthier families had hired private sweepers to clean the surroundings. As the low income communities also used a comparatively very small amount of water and some plants surrounded the area to where the waste water could go, the drainage conditions were quite good.

We found various income groups living in apartments. They naturally found the drainage conditions better as drainage facilities naturally were provided to each apartment with indoor water connections. Households claim often though that the lower situated apartments experienced bad smell and mosquitoes from the ditches just outside

A comparison between the interview areas

Central Coimbatore (old municipality)

In central Coimbatore, East RS Puram, the houses were generally provided with underground drainage connections. Our visits showed that underground sewer pipes could be provided either at the sources of waste water or as in many cases, a small uncovered concrete channel lead from the sources out to an underground pipe connection in the street. Thanks to the underground sewers, the overall situation in all seasons, was generally experienced to be rather satisfying. Especially where rcc houses, gardens and broad streets dominated the neighbourhood, households expressed no disapproval of their situation. (unapproved areas and illegal settlements are considered below)

Table 24: Distribution of drainage facilities (excluding toilet) by interview area

AREA	NUMBER OF HOUSEHOLDS WITH ATTACHED DRAINAGE FACILITY					Number of house-holds
	None	Vegetation, pit	Natural- or poor standard cement ditch	Good standard Cement ditch	Underground drainage	
NSR road	1	1	1	10		13
Singanallur		2	9	6		17
Ganapathy		4	2	9		15
South	1	3	1	2		7
East RS Puram			1	3	10	14
Pudur		4	1	3		8
Kurichi	1	1		4		6
Total number of households	3	15	15	37	10	80

Exceptions were though where respondents expressed worries about stagnant water in the *storm water* ditches. That was a fact all year around due to blockage created by refuse material thrown into the ditches, or not collected waste It was especially in the more congested areas around the Flower market, which is frequently visited by many people. The area is old, densely built-up and with narrow streets The Corporation scavenging services were expressed to be non-existing and the waste problems disastrous. Reasons were said by the Corporation to be lack of staff and vehicles. Some temporary improvement occurred though when a newspaper published a picture showing the big and growing garbage dump.

Except for the poor refuse collection, wrongly constructed ditches were mentioned to be a reason for problems. Moreover, open defecation in and around the storm ditches by by-passers and others with no toilet facilities, caused complaints from nearby living inhabitants They mentioned the odour created and unhealthy conditions overall to be annoying. Some inhabitants, in order to improve the situation, filled up the storm ditches outside their lots with sand to get cleaner conditions. It naturally created problem with stagnant water at the other sites along the drain.

All neighbourhoods in East RS Puram were not provided with underground sewers, see table 24 A slum area visited had one of the worst drainage and sewage conditions we experienced. Refuse material was piling up in the uncovered ditches, all of inferior standard, creating blockage leading to flooding and stagnant waste water. Close by the inhabitants' ordinary life went on, near the filthy water children were playing and women were doing the laundry The Corporation refuse collectors were mentioned not to come to the slum area since these inhabitants were from the same low caste community, or were themselves employed as scavengers. The meaning was obviously that they should take care of their garbage themselves. Discussions with respondents revealed their disgust and resentments towards the Corporation and false-promising politicians coming in election times.

The extension areas

In the extension areas NSR road, Singanallur, Ganapathy, South, Pudur and Kurichi, it is clear that the majority of households find the drainage situation more than inadequate They pointed out that there were no considerable differences with seasons, the conditions were not satisfying *at any time*. This was especially accentuated in the lower income groups according to the interviews, and especially in slum areas, but also common realities among middle and higher income communities.

The majority of households were provided with uncovered ditches of poor or good standard type, stretching along the street outside their lots. A combination of grey- and storm water was transported in these. The connection between the waste water sources *in* the house (or on the court yard) and the ditch along the street was either non-existent or poorly constructed and typical problems mentioned above, as stagnant grey as well as sometimes black water, mosquitoes, odour, diarrhoea etc , were common and people were indeed worried. As the Corporation scavenger *never* seemed to appear when she/he was supposed, *every* day according to the Corporation, solid waste was gathering in the ditches creating obstacles for the water to flow properly and for people to pass. With ditches so close to the dwellings, all stretching along the sides of the narrow streets, people were "in contact" with it all the time since the every day life is much lived in the streets. At many interviews we sat outside the house on a bench over or beside the ditch with the bad odour, flies and other insects annoying us all.

In ***Singanallur***, most visited households had no better drainage than a natural or low standard cement ditch, see table 24. The area has a character more village-like than the central city, Ganapathy and Pudur, and all kinds of services and facilities are less developed respondents mentioned Stagnant waste water and refuse piling up were common sights in the narrow streets.

Pudur is also rather village-like but with wider streets and gardens more often attached to the dwellings. Due to these characteristics the drainage conditions appeared as somewhat less problematic. When visiting during the monsoon however there was flooding, waste water mixing with rain water.

Ganapathy, on the other hand has more of a city-character with constructed cement ditches and tar roads. The area is consequently more congested and several households complained about the drainage situation. However, a ruling party man was situated in a neighbourhood visited, which according to the respondents was the simple reason for why the Corporation maintained a neat and clean situation along their street. Also in *RS Puram* a politician had arranged with special services as street lamps and proper cleansing for "his" neighbourhood.

Our impression from ***NSR Road*** is that a majority were living in nice tile and rcc houses with gardens attached and were as a result content with their drainage situation However, low income communities located in the outskirts were very upset with their drainage situation. One of the roads we passed was so muddy that we had difficulties reaching the houses. Moreover according to the respondents, the fields close by were smelling of excreta of persons defecating in the open.

Some households living in slum-like quarters had due to their continuos pressure on the Corporation made them construct a tar road It improved the drainage situation a great deal even though stagnant waste water and hordes of flies were seen when visiting A tar road also enables construction of cement ditches for waste- and storm water and facilitated the access to and from the neighbourhoods.

As seen in the table 24, a vegetation plot or a dug pit were the only drainage solutions in some places, especially in neighbourhoods of lower income communities with low standard dwellings The waste water was moreover often just let out on the backside of the house. This kind of waste water handling have clearly negative health affects, which also most respondents seemed to be aware of

Seasonal variations

Naturally, the drainage situation varied with season depending on if the monsoon was causing flooding or if all waste water evaporated in the hot period. According to most respondents, however, *not* to a major extent since problems existed and were more or less of the same type in both the dry and wet season.

In the *monsoon period (wet season)* especially low lying areas and roads get flooded and muddy due to underdimensioned and not well functioning drainage facilities. As the drainage system is out of order, sewage mixes with storm water and people get exposed to it when being forced to wade in it. At the time for our interviews, especially the slum dwellers living in huts and badly constructed houses suffered a great deal. Their houses often cracked and got destroyed due to the abundance of water. The poor population is usually forced to settle on inferior ground as the better land already is occupied or simply too expensive. Consequently, low lying areas and river sides, sensitive to flooding, are typical sites for slum settlements. Mosquitoes and other insects were also mentioned to be more common in the wet season due to the water gathering everywhere.

Some households, however, stated that in the wet season the abundant storm water flushed garbage gathered in the uncovered ditches away, which improved the situation and made it better in comparison with the dry season. In the *dry periods* on the other hand, the same persons mentioned, the waste water was stagnant in the ditches and the usual problems connected to that occurred. Worms appeared, a household from a very low income community told for example. Others pointed out that ditches were dry and clean in the dry period of the year, no disadvantages at all. The cause for that could be less water consumption due to water scarcity, increased evaporation as well as of course less precipitation. The reasons for the different opinions of the households naturally depend on the specific conditions of that particular household and type of drainage system connected For example the technical condition of the drains, the elevation of the dwelling, presence of vegetation in the surroundings or not, frequent cleaning of the streets or not etc. had impacts on the conditions over the year.

Refuse disposal and scavenging - a major obstacle to a better drainage situation

As pointed out earlier, stoppage and stagnating water in the uncovered ditches were much depending on the cleanliness of streets and disposal of solid waste. The refuse collection as well as cleaning of roads and ditches are duties belonging to the Corporation. The service is supposed to be regular with scavengers appearing *once a day* in the neighbourhoods, and ditch cleaners *once every sixth day*. The refuse is collected from piles on the streets or dustbins placed in the vicinity of residential quarters The majority of the respondents showed great dissatisfaction with these services.

Table 25: Distribution of households by existing cleaning services

Type of cleaning	Number of households
Corporation scavenger	32
Hired scavenger	7
Corporation + private	6
Corporation + themselves	4
Private + themselves	0
Themselves	10
None	7

Note: no answers were received from 14 households

There is no regularity in the services and the quality of the cleaning is poor was a common statement heard from people. Furthermore, households mentioned that dustbins provided were too few and almost always overloaded At many places garbage is piling up. Households in all parts of Coimbatore and belonging to all income groups seemed to regularly put complaints to the Corporation, but the outcome was very unsure. Clear is that the lower income groups were those suffering most from the unhealthy conditions. In the heart of the city, the interviews showed that the service was superior compared to the outlying areas, but it varied in between the neighbourhoods. Anyway, the sweepers working in the centre of Coimbatore seemed to appear *almost* every day, but in the outlying parts of

Coimbatore Corporation our survey showed that the sweeper appeared anything from once/twice a week to never.

In some cases the scavengers and other types of cleaners demanded payment in order to carry out the services 8 households out of the 80 in the survey paid the *Corporation cleaners* either per time he appeared or per month. Some households felt that they were obliged to pay extra for the cleaner *to come at all*, while others paid extra for him to carry out the task *properly*. According to many, the result was definitely better if the cleaner was paid a certain amount of money.

The Corporation on the other hand, complained about negligible from the inhabitants' side. For example that people did not throw the refuse into the arranged dustbins, but instead into the ditches The awareness of how to handle the solid waste among the inhabitants was stated by the implementors as extremely low. That was also the opinion of some respondents, mentioning the importance of people taking responsibility for their actions. One man told that families did not care about what happened outside the boundary of their site, they threw garbage everywhere without concern. He stated, "My neighbours do not care about the situation Even though a big dustbin is placed in the area no one is using it".

Obvious is though that a majority of the respondents minded about the cleaning standard of their residential quarters. Some households solved their refuse problems collectively among themselves, for example by collecting and burning the garbage. Many families pointed out that if there was a blockage in the drains, the *only* solution was to cleanse the area themselves or rent a private ditch sweeper to do it. Of the 80 visited households, 14 cleaned their surroundings themselves on a regular basis. Another common solution was that households along the street together rented a private scavenger for the purpose of ditch- and street cleaning. 13 of the 80 interviewed households rented a private scavenger regularly. In the middle and higher income groups, the hiring of *low cast* people for cleaning (and laundry etc.) purposes both inside and outside their property was a usual practise. Also other lower income groups turned to lower cast communities when cleaning was the current need.

The drainage situation is thus mainly depending on the following factors:

- characteristics of the area:
  - population density
  - dominating house type
  - existence of gardens
  - road type and present condition
  - structure planned area or not (Unapproved-approved)
  - scavenging and solid waste disposal
- the technical standard (slope, leakage) of ditches and gutters
- income group dominating the neighbourhood - ability to pay for services, say private scavenger
- location of household in Coimbatore
- soil conditions and elevation of the dwelling

SANITATION

Although sanitation was not meant to be a major topic in our study we found when interviewing that many households found their personal sanitation situation as well as that of others' very problematic. It was found too closely related to water and drainage issues to be left out. Therefore, a summation of facts and impressions regarding sanitation is given in the below chapter.

Introduction

Types of toilet facilities existing in Coimbatore:

- Pour-flush toilet, combined with septic tank or underground drainage
- Bucket latrine

Where lack of toilet facility, open defecation was practised.

Toilet ownership and sharing conditions existing:

- Private toilet, shared by one or a couple of households
- Private toilet, shared by a compound of households
- Public toilet, shared by a few number of households or by a whole neighbourhood
- Public toilet, located at a public place

The public toilet can be either for free as for domestic use, or of "pay and use" type located in public/commercial places.

Reasons for *lack of* sanitation facilities in a neighbourhood:

- No ability of a household to cover the costs for construction of a toilet
- Lack of strategies and planning by the Corporation in order to provide public toilets
- In "old" areas toilets were not provided when dwellings were erected and moreover, these are often densely built-up, which creates obstacles to installation of toilet facilities.
- The Corporation "found no space" for a public toilet, i.e. according to the respondents unwillingness to deal with the toilet problems.
- Conflicting interests between political parties representing different income groups, for example, construction of public toilets in a neighbourhood may create nuisance for higher income inhabitants who themselves already have private toilets
- Lack of water for the purpose of using as well as maintaining a pour-flush toilet

A pour-flush toilet is, if not connected to sewerage, connected to a *septic tank*. The tank is placed a couple of feet under the ground on every lot allowing the human faeces along with the toilet water to be stored until it once or twice per year is collected. There are though often problems with the septic tanks consisting of among other things leakage, filter cleaning and collection .

A comparison between the income groups

Important to notice, see table 26, is that almost 30 out of 80 respondents practised open defecation, of them most belong to the lower income groups. The main reason, except the hindrance their low income constitutes, may be the fact that they lived in low standard dwellings like huts or in old tile

houses, all with too little room for a toilet Furthermore, that they often lived in areas never planned for toilet facilities, not necessarily only congested slum areas but also quite ordinary neighbourhoods.

Today, use of public toilets seemed to exist in all income groups but the highest The fact that a public toilet was constructed in an area however, seemed not to be sufficient in order to remove the practise of open defecation. The inferior hygienic standard of the public toilets made people rather defecate in the open than visit such a toilet, see part below discussing *Two major problems.*

Slightly more than 30 households had a private toilet, the majority belonging to the *high* income group. Wealthier households had in principle always a private pour-flush toilet in close connection with their residence and that is indicated by the fact that all 19 households from the *High* stated use of a private toilet. With their better economical conditions they are able to construct a toilet themselves, preferable a pour-flushable A septic tank was provided in case the toilet was not connected to underground sewers. Their sanitation situation was satisfactory according to the respondents, but some were affected by others practising open defecation outside their residence.

Table 26: Distribution of toilet facilities by household wealth

	NUMBER OF HOUSEHOLDS WITH ATTACHED TOILET FACILITY				
INCOME GROUP	**No toilet (open)**	**Bucket latrine**	**Pour-flush Toilet (septic tank)**	**Pour-flush (underground sewerage)**	**Number of households**
Very low	11		3		15
Low	9	3	6	3	22
Middle	7	1	11	4	24
High			18	1	19
Total number of households	27	4	38	8	77
Unknown 3					

In the *middle* income group the use of a private toilet as well as one shared by a compound was most prevalent. No major complaints were heard and the situation seemed satisfying. However, seven out of the 24 middle income respondents stated that they practised open defecation even though their economical situation could be described as acceptable. The reasons were those mentioned above. See also part discussing *open defecation* below

Table 27: Relationship between number of households sharing the toilet facility, and household wealth

	NUMBER OF HOUSEHOLDS SHARING					
INCOME GROUP	**No Sharing (open toilet)**	**One, with private toilet**	**2- 10 (Compound)**	**Few households sharing a public toilet**	**Whole neighbourhood sharing public toilet**	**Number of households**
Very low	11		3		1	15
Low	9	6	6		1	22
Middle	7	9	6	1	1	24
High		19				19
Total number of households	27	34	15	1	3	80

A comparison between the interview areas

Central areas

As seen in table 28, in East RS Puram, *central Coimbatore*, the majority of households were either using a private toilet or one shared by the compound to which they belonged. The pour-flush toilet was common, either connected to the underground drainage or a septic tank In these neighbourhoods, typically characterised by rcc- or good standard tile houses, a satisfying sanitation situation was prevailing. The inhabitants seemed to be content with their situation as a whole.
However, in old parts of central Coimbatore the conditions experienced were different. In these dense, congested areas, both regarding population and dwellings, with narrow winding streets there has been no planning for or installation of sanitation facilities and/or underground sewers. The possibilities to improve the situation are small due to the actual physical conditions. Of great significance, according to respondents, would be increased tidying up though, as well as installation of public toilets to a larger extent. Public toilets *do* exist, shared by large numbers of people, but due to different problems connected to their maintenance, open defecation is practised instead. This is naturally leading to very unhealthy conditions and great resentment among the inhabitants was common. In one household we were told that 12 families in the neighbourhood lacked toilet facilities. Previously a public toilet existed but was closed due to the low hygienic standard. The Corporation had a while ago collected money from the households in order to construct a new toilet, but no result had been seen so far.

Located in the centre is also a large slum area where 500 families share two public toilets (one ladies', one gents'). The respondent stated that the cleaning was done properly by the Corporation every day, but our impression is that open defecation was very common.

Table 28: Relationship between number of households sharing the toilet facility, and area

AREA	NUMBER OF HOUSEHOLDS SHARING					
	No Sharing (open toilet)	**1 with private toilet**	**2 - 10 (Compound)**	**Few households sharing a public toilet**	**Whole neighbourhood sharing public toilet**	**Number of house-holds**
NSR road	1	7	5	0	0	13
Singanallur	8	8	1	0	0	17
Ganapathy	4	6	4	1	0	15
South	4	2	1	0	0	7
East RS Puram	1	7	4	0	2	14
Pudur	5	3	0	0	0	8
Kurichi	4	1	0	0	1	6
Total number of households	27	34	15	1	3	80

Extension areas

In the *extension areas* of Coimbatore, private sanitation facilities were not as common as in the central parts. Public toilets were according to respondents very few in number and open defecation was by many a normal practise. The NSR Road area was an exception though, where almost all households had a private toilet. Households located in the outskirts of the NSR area however vividly described conflicts with people defecating in the open just outside their houses.

In ***Pudur***, not long ago an agricultural area, many households tended to use the fields for carrying out their needs, even though a few public toilets existed.
In ***Kurichi***, outside the Corporation, the majority of the population practised open defecation. A couple of public toilets existed people told, but many felt disgust for visiting them. (see further under *Major problems* .) The area is typically less developed than areas within the Corporation, even though South, which is included in the Corporation, showed pretty much the same conditions

The two *major* problems connected to toilets

While surveying we realised the two major issues people were very concerned with, namely the problems of defecation in the open as well as the consequences of people sharing a public toilet .

Open defecation

According to the interviews, sanitation improvement was a primary basic need of the households located where no facilities existed and open defecation was a consequence and especially urgent is that actions are taken in the central densely populated areas People in the outlying areas have more access to fields/farmlands and bush, of course leading to unhygenic conditions but they themselves found the situation slightly more acceptable than households in the centre. As the conditions in the more congested areas did not allow the same privacy as defecation in fields, the problems were even greater for the people concerned and neighbours affected. Unease was expressed concerning the humiliating conditions squatting on the street and unhealthy conditions connected.

Male as well as female respondents pointed out that women are especially affected as they need more privacy and can not be seen defecating in public to the same extent as men *Night defecation* is especially common for women Since it is difficult to find a hidden spot to defecate during daylight, women often wait until after the sunset or early mornings, then probably visiting areas agreed upon for women only. That is naturally leading to problems of convenience, especially with stomach upsets and pregnancy.

Concerning the fact that surrounding households also got affected by the open defecation, in Singanallur for example, households expressed great relief as the Corporation recently had demolished 63 slum dwellings. The slum inhabitants had used the drainage ditches for open defecation. Many other voices were heard, in all areas and income groups visited, about odour from fields as well as from streets and ditches used for open defecation. That was obviously a great nuisance.

Public toilets

In neighbourhoods lacking private sanitation facilities the policy of the Corporation according to the Health Officer, is to provide public toilets. Our impression is that where they *do* exist the number is too low, the maintenance poor and the location debatable.

When provided, the Corporation is responsible for keeping a reasonable hygienic standard by cleaning the public toilet regularly. Some households stated that it is done properly, while others described a situation far-from-acceptable. In the later case, the Corporation cleaning function was non-existent, according to respondents.

No matter if a large or a small number of households were sharing the public toilet, problems of maintenance and cleaning arose. Persons interviewed often stated that they did not use the toilet because of the low hygienic standard and instead they returned to open defecation practises.

Naturally, the higher the number of persons sharing the common toilet, the less personal responsibility is felt by the users for keeping it clean and the problems increase. However, even in a compound consisting of a few households the responsibility of cleaning the toilet seemed always to be a difficult question. The very low status of the toilet cleanser influences a great deal, hence even where the toilet is more or less private.

In one neighbourhood conflicts between young and elderly people occurred frequently. The elders did not allow the young people to clean the toilets as toilet cleaning was said to be the duty of the elders The elders though did not clean as they were supposed to according to the young The actual problem is not quite clear to us, but important is that the subject was brought up for discussion on a regular basis.

The hiring of someone from outside, preferably a *woman from a lower caste*, was a common solution to the cleansing problems. Toilet cleansers were according to respondents, normally all from the same low cast community. The costs were normally shared by many households, as in the case of hired scavengers. Even though paid, the person hired was seldom appearing regularly, families pointed out.

Another constraint for achieving a better standard was according to some respondents, scarcity of water for both use after toilet visits and cleaning of the toilet. One respondent mentioned that since there always were problems with the septic tanks, she wanted underground drainage for the public toilet.

Important to notice is that women were more reluctant than men of using a toilet that was not clean. Also the fact that they were forced to share it with men seemed to be very unsatisfactory or even impossible. Interviews in Kurichi and South showed that where there only existed one common toilet for men and women, the women got first priority and were able to use it alone. The men went to an area near the pond. Some men pointed out that especially for the sake of women, more public toilets were required.

The *distance* to the public toilet plays an important role when aiming at decreasing the defecation in the open. In case the toilet is located far away, a field is rather frequented, as in the extension areas in the vicinity of farmlands In the central city, the street or a drainage ditch created suitable places for carrying out the needs when the distance to the public toilet was felt too long

Hence, the main problems mentioned connected to a public toilet are:

- Low sanitary standard due to
  low cultural status of toilet cleaners, leading to that people dislike cleaning toilets themselves
  no regular cleaning of the toilet by the Corporation
  lack of water and problems with the septic tanks
  too high number of households sharing the toilet
- The location of the toilet is considered too far away

These facts make inhabitants avoid using the public toilet, and consequently prefer open defecation.

Evaluation of the drainage and sanitation situation

Considering our observations, facts and discussions with the families, we have given an estimation of the overall drainage and sanitation situation of each household. The classification is seen in the diagrams below. Rough classification

Negligible problems	no real problems mentioned, except mosquitoes occasionally
Minor problems.	few problems, e g. flies, mosquitoes
Acceptable situation	no major complaints, the respondent mentioned the situation to be OK, but often later mentioned inconveniences experienced
Poor situation·	complaints regarding e g. open defecation, stagnant waste water, the respondent concerned and demands that action mistaken immediately
Extremely poor situation:	major complaints; greatly affected in the everyday life by lack of drainage facilities and toilet facilities, the problems were usually to a great extent visible when visiting

Notice in figure 23 the obvious relationship between household wealth and the drainage situation described.

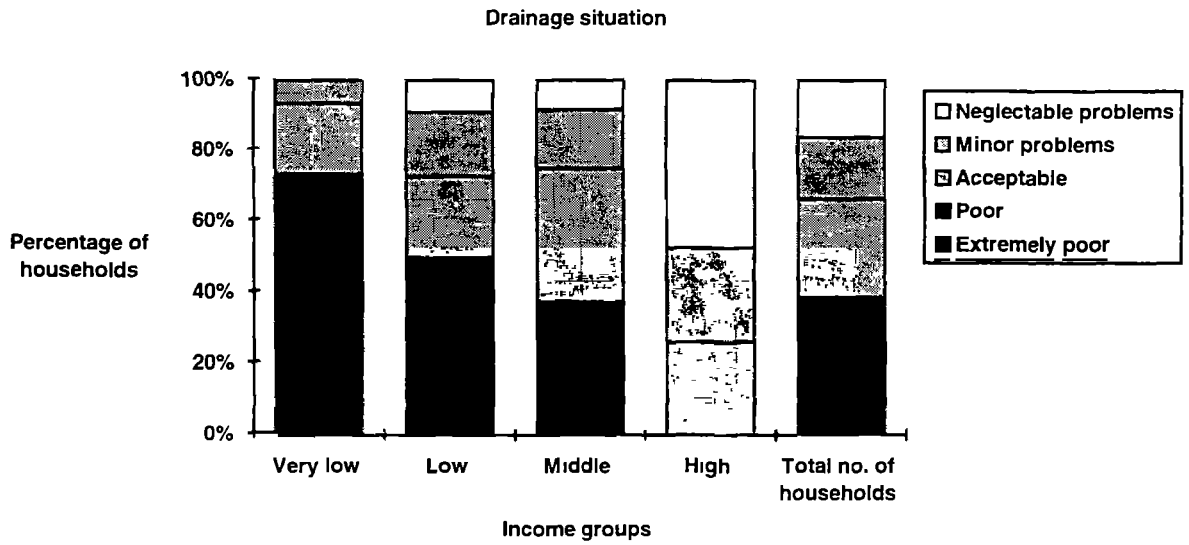


Figure 23: The evaluated drainage and sanitation situation, distributed by household wealth

28 households of 80 interviewed had a ***garden*** attatched to their house. Since a garden includes the possibility of irrigating with the grey water from the household it improved the situation concerning stagnant water in the drainage ditches along the street considerable. If a garden existed it of course also means that the area was less congested, which was a major cause for better drainage and sanitation conditions. 16 out of the 28 households with garden consequently had a situation with *minor or negligible problems*, four show an *acceptable situation*, while five a *poor* and three an *extremely poor* situation.

In the figure 24 can be seen that the extension areas, Singanallur, Ganapathy, South and Kurichi all have a situation described as bad or worse, while the more central parts have better conditions

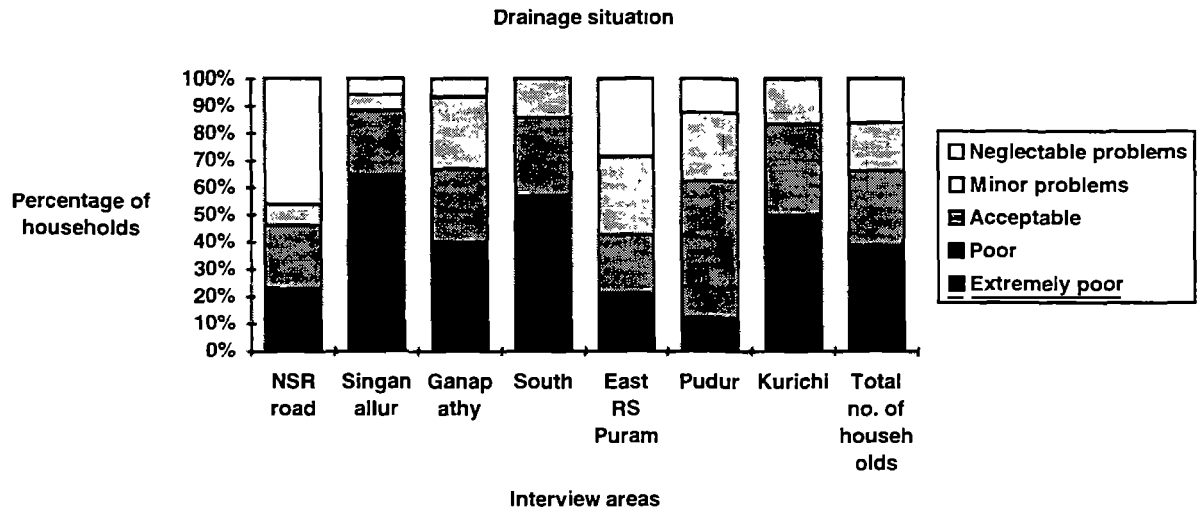


Figure 24: The evaluated drainage and sanitation situation, distributed by interview areas

The existing scavenging service naturally influences the drainage and sanitation conditions, certainly if it is non-existing as in quite a few cases. Moreover, even in case the Corporation scavenger appears almost everywhere day , the quality of the Corporation service varies considerably The households with negligible or minor problems, see figure 25, *had* a better service, but it is also influenced by the characteristics of the area etc. What can be seen in the diagram is that households with a poor or acceptable situation arranged with private scavengers. Those with a extremely poor situation probably could not afford it as they foremost belonged to the very low income level. Moreover, in all groups

except where households showed negligible problems, people cleaned their surrounding themselves. Where there were only negligible problems, a Party man, a Corporation Official or an other somewhat important person were often living in the area which made the Corporation scavengers to do a proper job.

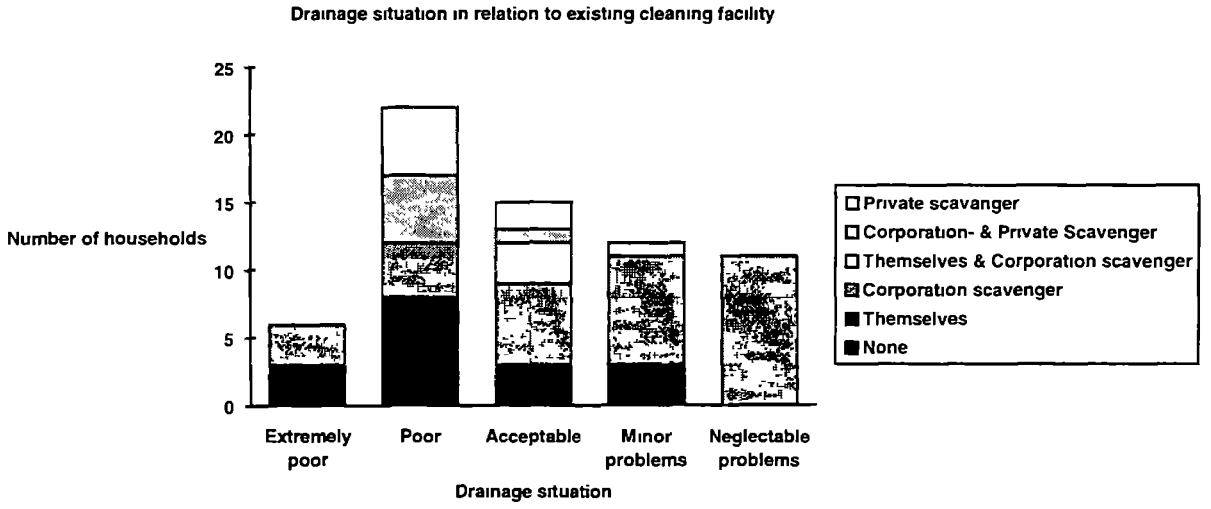


Figure 25: Estimated drainage and sanitation situation in relation to existing scavenging service
Note. From 13 households of the 80 interviewed we did not receive an answer to the question of cleaning 1 with extremely poor, 2 with poor, 7 with acceptable situation, 2 with minor problems and 1 with negligible problems

Unapproved areas and areas under litigation

The general opinion of respondents living in *not* approved areas or on sites *under litigation* was that drainage and sanitation conditions were very poor Unapproved neighbourhoods were encountered in all areas visited, populated with families from all income groups. According to our survey, the areas were not provided with sufficient infrastructure and services for drainage and sanitation, as the inhabitants were to invest personal money in order to arrange facilities. Thus, an tar road was normally not provided, leaving a dirt road with no drainage facilities like cement ditches. The conditions varied, however, to a great extent with neighbourhood and income group. The residential quarters of high income households for example displayed a rather satisfying situation due to the sparsely population and the houses with gardens attached. These inhabitants had also often arranged with a solution themselves, for example financed a drainage system or transported grey water to their gardens.

A Muslim dominated neighbourhood in the south Corporation (Medina Nagar) was unapproved The discontent respondents wished to have underground drainage facilities. One household had arranged with a percolation pit to which the kitchen and bathroom waste water was connected.

Illegal settlements by lower income and caste communities located in the central Coimbatore experienced major problems with drainage and sanitation. They took part in the Corporation slum improvement program. The solid waste collection was obviously neglected as garbage was piling up in and beside the drainage ditches Stagnant waste water could be seen everywhere in the open ditches. The persons interviewed pointed out worries concerning the risks of exposing children to the waste water and dirt.

Our evaluation shows that the 17 unapproved households interviewed belonged to the classified groups accordingly: *Negligible problems*-1, *Minor problems*-2, *Acceptable* -4, *Poor* -6, *Extremely poor* -4

Of the two households encountered under litigation, one had a drainage and sanitation situation described as *extremely poor*, while the other had a *poor* situation. Both belonged to the very low income group

Conclusions

The main conclusion drawn from visits and discussions with households is that the inhabitants of Coimbatore to a great extent want improvements foremost in the drainage and sanitation sector The circumstances are characterised by unsanitary conditions with open defecation, piles of nauseating garbage in the streets and in drains, and stagnant waste water in the uncovered ditches serving as breeding ground for various insects, constituting great environmental problems. It is a description of urban poverty but obviously common realities also for higher income groups. However, the extent of the problems is much less severe in the neighbourhoods dominated by high income groups mainly as these are not congested in the same way as areas inhabited by lower income groups. Also their higher status due to a better economical position of the high income groups naturally influences a great deal the better circumstances.

Moreover, when discussing the open defecation existing everywhere, the role of women must be considered. They are clearly feeling more affected by not having access to a well maintained toilet Construction of public toilets is very important especially for the sake of women.

The reasons for the poor situation are clearly: lack of drainage and toilet facilities, wrongly constructed ditches, an inferior road construction and not the least, the very low status a cleaning job has, leading to deficient refuse collection and scavenging. Most of these issues are consequences of the urbanisation going on and the lack of policies, strategies, co-operation and lack of action by the Coimbatore Corporation. Uncontrolled growth of the city, makes planning for new facilities difficult. However, also the Indian culture with it's perception of cleanness as being connected to Hinduism also set some limits. The view of public is that a cleaning job is better done by a person of low cast.

Several persons pointed out that the Corporation, whose responsibility it is to provide the basic urban services, has failed in respect of living up to the needs of all inhabitants. The Corporation though stated the ignorance and unawareness of households as the main hindrances in the process of making improvements However, too few and inadequate strategies for providing of education and information in order to increase the awareness seem to be available to the public, often the problems also seem more basic than that: if the few dustbins are overloaded what should a household do but putting the garbage on the side or into the ditches?

Initiatives from the households are also, it seems, not much supported by the authorities. Many families show an attitude of hopelessness after having tried to pursued for action for years with no response from the authorities. Others are however trying to deal with the problems themselves (or in neighbourhood organisations) in a concrete way by hiring a private scavenger, construction of own percolation pits, drainage ditches etc. The *unity* among inhabitants in an area very much set the present conditions.

Our feeling is that the awareness among the public of the importance of a satisfactory solid waste disposal is increasing as the problem grows People are genuinely feeling it is a great problem with the waste piling up, attracting rats etc., especially in more congested areas. At the time for the interviews, the plague incident in Surat, Gujarat earlier the same autumn had also created incredibly high attention and the media had written many articles about India's problematic waste situation. Naturally the public became more aware and will become more aware in the future, demanding action even more.

IMPROVE-MENTS DESIRED

Essential for creation of future strategies is to decide the inhabitants' own priorities of issues regarding water and related subjects, i.e. these which they find problematic and wish to improve. The information from our survey indicates where the most pressing concerns lie and can to some extent help to identify opportunities and obstacles for a strategy of action In this chapter we first present the existing problems, mentioned by the respondents, further discuss household value of improvements and last describe how households deal with problems.

A cow searching for delicious pieces!

EXISTING PROBLEMS

When interviewing, the households were asked if they found anything related to our topics problematic. In case of a positive answer, the household was to state which the problems were and moreover, to simplify, evaluate which problem was the most urgent to be solved, the *primary* problem, and also the issue weighted as a *secondary* problem. In reality however, the discussion was often vivid and with the help of memories of for example face-mimic and gestures we afterwards estimated the strength of the problems, i.e. what was a primary as well as a secondary problem. The secondary problem told was sometimes as important as the primary to the household, but anyway we parted between them. Often, it was very clear what the household found as a problem, as it was easily observed around the house, but in other cases not. In the following chapter the results are given. Some important relationships are also presented and discussed.

Presentation of the problems

The problems are *presented in order decided by the frequency of complaints*, the most commonly mentioned first The context of area and income group must be considered when looking at the subjects mentioned as problems. Depending on the conditions experienced, problems are varying and of different weight. Moreover, the different income groups have varying frames of references. As the topics mentioned below have been presented and discussed in earlier chapters, please turn to them for more information.

Problems mentioned, in order decided by the frequency of complaints:

1. Poor Drainage and sanitation situation
2. Lack of toilet facilities
3. Inadequate housing
4. Lack of daily water supply
   Inadequate number of public taps
5. Poor road construction
6. Inferior Siruvani water quality
   Lack of a Siruvani house connection
   Lack of a Siruvani public tap
7. Inconvenient Siruvani water timings
   Occasional lack of water
8. Low water pressure
   Poor sanitary standard of toilet (unsatisfactory cleaning service)
9. Too high water charges
   Lack of a pour-flush toilet

1. *Poor Drainage and Sanitation situation*

A poor drainage and sanitation situation was the most common problem mentioned and it implied *major* difficulties according to the interviews. 35 households described it to be a primary problem, 12 a secondary. That means, 59 % of the households found the situation dissatisfying. Main examples of the conditions were solid waste gathering in drains, creating stagnant waste water, as well as the low sanitary standard open defecation creates.

Table 29: Households stating a "poor drainage and sanitation" as a problem, distributed by wealth

	Number of households				
DRAINAGE AND SANITATION	**Very low**	**Low**	**Middle**	**High**	**In Total**
Primary problem	7	9	12	7	35
Secondary problem	4	2	5	1	12
Not mentioned to be a problem	4	11	7	11	33

Note. All 14 households located in unapproved houses were stating drainage and sanitation as a problem 13 families of the 47 complaining were tenants

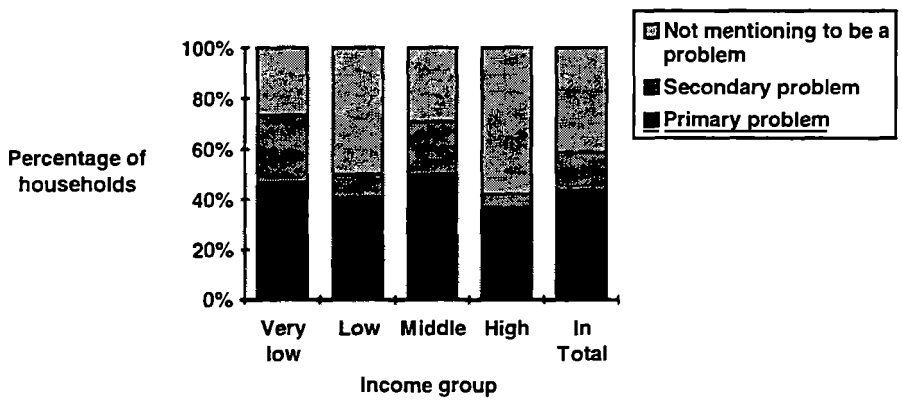


Figure 26: Percent distribution by wealth of households stating "poor drainage and sanitation" as a problem

As seen in table 29 and figure 26, about the same percentage of households from each income group found the drainage and sanitation conditions to be a problem, even though they live under different circumstances. However, the families of the high income level were slightly less represented. Since house type is strongly related to income group, the similarity in opinions could also be noticed when looking at the prevailing housetypes of those complaining, see table 30. Moreover, obvious, in table 31, is that almost unregarding of what type of drainage facility is provided, households experienced the drainage situation as a problem. At least 50% of those grouped according to drainage type, table 31, raise complaints against the inferior conditions.

Table 30: Prevailing House types of the households making complaints about a "poor drainage and sanitation situation"

HOUSE TYPE	NUMBER OF HOUSEHOLDS COMPLAING	PERCENTAGE OF TOTAL NUMBER OF HOUSEHOLDS IN EACH HOUSE TYPE (%)
Hut	3	60
Low standard tile house	11	73
High standard tile house	24	63
Rcc	8	44
Appartments	1	25

Table 31: Prevailing Drainage types of the households making complaints about a "poor drainage and sanitation situation"

DRAINAGE TYPE	NUMBER OF HOUSEHOLDS COMPLAINING	PERCENTAGE OF TOTAL NUMBER OF HOUSEHOLDS IN EACH DRAINAGE TYPE (%)
None	3	100
Vegetation, pit	8	53
Mud- or low standard cement ditch	11	73
Good standard cement ditch	20	54
Underground sewerage	5	50

The type and standard of scavenging and refuse collection in the neighbourhood influenced to what extent the inhabitants found conditions tolerable or not. According to table 32, more complaints were naturally raised when lack of cleaning service, as well as when only a hired scavenger came.

Table 32: Prevailing cleaning services of households making complaints about a "poor drainage and sanitation situation"

TYPE OF CLEANING SERVICE	NUMBER OF HOUSEHOLDS	PERCENTAGE OF TOTAL NUMBER IN EACH CLEANING TYPE (%)
Corporation scavenger	13	41
Hired scavenger	6	86
Themselves	7	70
Corporation + themselves	2	50
Hired scavenger + themselves	-	-
Corporation + hired scavenger	6	86
None	6	86
Not known	7	

Table 33: Our estimated drainage situation of the households making complaints about a "poor drainage and sanitation situation"

DRAINAGE SITUATION	NUMBER OF HOUSEHOLDS	PERCENTAGE OF TOTAL NUMBER OF HOUSEHOLDS IN EACH DRAINAGE SITUATION (%)
Extremely poor	5	71
Poor	21	88
Acceptable	16	73
Minor problems	4	29
Neglectable problems	1	8

A hired sweeper was though of course a solution for clearing away of inferior circumstances, but the situation would according to respondents of course be worse without.

The data in table 33 is only to emphasise the connection between complaints and the reality, i.e. the drainage and sanitation situation according to our evaluation.

2. *Lack of Toilet facilities*

The absence of toilet facilities was the second most common problem stated. It was mentioned by 13 households out of the 80 in the survey. Information in table 34. shows that no complaints were raised in the high income group, whereas most complaints, in number and percentage, were made in the middle income group. 12 of all households stating that lack of toilet is a problem practised open defecation. One family shared a public toilet with a large number of others, also a typical condition experienced to be problematic, the interviews revealed.

Table 34: Number of Households stating "lack of toilet" as a problem, distributed by wealth

	Number of households				
Lack of toilet	Very low	Low	Middle	High	In Total
Primary problem	1	4	5		10
Secondary problem	1	1	1		3
Number of households lacking toilet	11	9	7	-	27

(Six of the 13 households stating lack of toilet as a problem were situated in *unapproved* houses. Three families were tenants)

3. *Inadequate Housing*

The housing conditions influence the water, drainage and sanitation situation to a great extent. 7 households out of the 80 interviewed stated inadequate housing as a problem. Main characteristics of those households was that 6 out of the 7 were *unapproved* ,and 2 were *under litigation (*one household had a combination). By stating housing as a problem, the respondents often meant living with the threat that the Corporation any day would come with a bulldozer and tear the house down, evacuating the people. Concerning those under litigation, they were much afraid that the court would not decide in the favour of them. Naturally, for those families no other issue had a higher priority than the secure access to a house. Other examples of housing problems were the poor quality of the dwelling, it was simply falling into pieces, and also living without electricity.

Table 35: Households stating "housing" as a problem, distributed by wealth

INADEQUATE HOUSING	Number of households				
	Very low	Low	Middle	High	Total no. of households
Primary problem	4			1	5
Secondary problem	2				2
Number of households living low standard dwellings	15	5	0	0	20

Notice in tables 35 and 36 that inadequate housing was most prevailing in the very low income group. They were mainly situated in huts and low standard tile houses.

Table 36: Households mentioning "inadequate housing" as a problem, distributed by house type

HOUSE TYPE	No of house holds	Percentage of total number of households with the house type (%)
Hut	2	40
Low standard tile house	4	27
High standard tile house	0	0
Rcc	1	6
Apartments	0	0

However, one respondent from the high income group was very concerned about his housing conditions. The family was living in an unapproved neighbourhood which would not get approved by the Corporation until enough land was let for public use. The inhabitants were strongly objecting to that.

4. *Lack of daily water supply*

Table 37: Households stating "lack of daily water supply" as a problem, distributed by wealth

LACK OF *DAILY* WATER SUPPLY	Number of households				
	Very low	Low	Middle	High	Total no. of households
Primary problem		1		2	3
Secondary problem	1	1		1	3
Number of households never having daily water	11	19	20	14	64

Six households thought that a water supply of every *second* day only (or every 7th day in Kurichi) was not sufficient and consequently a problem. Naturally, especially where the water supply was only every 7th day, an increased frequency of supply was of a very high priority to the respondents.

Inadequate number of public taps

The same number of households, or six, mentioned the few public taps as an obstacle to them in their daily life, although only one gave it highest priority. The difficulties were mainly crowding at the existing taps or the long distance to carry the water. However, it constitutes according to table 38 mainly a secondary problem to the lower income groups.

Table 38: Households stating "inadequate number of public taps" as a problem distributed by wealth

INADEQUATE NO. OF PUBLIC TAPS	Number of households				
	Very low	Low	Middle	High	Total no. of households
Primary problem			1		1
Secondary problem	2	2	1		5
Number of households supplied by public taps	8	8	4		20

(Two of the six households were *unapproved* and four families were *tenants* The households are distributed in all areas but Pudur and Kurichi)

5. *Poor road construction*

A sufficient drainage situation can only be achieved with a proper road construction many respondents stated. A poor road was often existing in unapproved areas according to the interviews. Of the households mentioning this problem, three belonged to the high income group and one to the very low. The majority, or three, were however situated in approved houses. A reason for the poor road can be that these households have paid development charges to get *their* sites approved, but they might be surrounded by a majority of unapproved houses, making it impossible for the Corporation to improve the road construction.

6. *Inferior Siruvani water quality*

By inferior water quality, three households meant taste of chlorinating or the mixing of saline ground water into the Siruvani water. Two belonged to the *high* income group and one to the *middle*, all pointing out that is was not so serious a problem.

Lack of a Siruvani house connection

Three out of 80 households interviewed said there were difficulties with not having a Siruvani house connection Two were tenants which might have influenced why they were not provided with a tap. Mainly since the owner, who is responsible for application of a house connection, showed no interest in providing of a tap.

Table 39: Households stating "lack of a Siruvani house connection" as a problem distributed by wealth

LACK OF A SIRUVANI HOUSE CONNECTION	Number of households				
	Very low	Low	Middle	High	In Total
Primary problem			2		2
Secondary problem		1			1
Number of households lacking house connection	12	9	4	0	25

Lack of a Siruvani public tap

In case there was no access to a public tap, the sources available were neighbours and bullock carts Both sources including payment for water, and with neighbours as the only source the distance to carry the water might be long. 3 households belonging to the very low income group found lack of a public tap problematic. Thus, providing of a public tap can be seen as a very high priority of the households lacking it.

Table 40: Households stating "lack of a public tap" as a problem, distributed by wealth

LACK OF A PUBLIC TAP	Number of households				
	Very low	Low	Middle	High	Total no. of households
Primary problem	2				2
Secondary problem	1				1
Number of households without public tap or house connection	4	1			5

(Two lived on an *unapproved* site and the other was under *litigation*
The families are located in the outlying areas of South, Singanallur and Kurichi)

7. *Inconvenient Siruvani water timings*

Especially when the Siruvani water was due in the middle of the night or when the point of time varied it was experienced to be bothersome for the persons responsible for fetching water. Two households, one of the low income group and the other from the high, found it to be a *primary* problem. These respondents were situated in Singanallur and Kurichi. 17 of the 80 households in our study had their water supplied during the night time, where the area Singanallur dominated 6 of the 80 households stated varied point of timings for the water supply, among which the Kurichi area dominated.

Occasional shortage of water

2 households from the high income group mentioned that they needed more water at times. Principally there was lack of water in the dry period but also when relatives were visiting. It constituted the *primary* problem of the respondents.

8. *Low water pressure*

Several households mentioned that especially in the dry season the low water pressure implied a longer fetching time in order to collect as much water as possible. Also the use of a hand pump was an absolute must in many cases, especially tiring for the women who fetched the water It was pointed out to be very problematic. Depending on the location of the tap the pressure could also be low throughout the *whole* year, meaning even greater problems One household of the middle income group mentioned the low water pressure to be a *primary* problem and another from the same income group a *secondary* problem respectively The households were situated in the areas NSR-road and East RS Puram. Notice that East RS Puram is located in the central city where the water supply conditions were expected to be satisfactory.

Poor sanitary standard of toilet (unsatisfactory cleaning service)

One family of the low income group found the hygienic standard of their toilet to be their most significant problem (the *primary* problem). The toilet considered was of a pour flush type and it was shared by a compound. A lady was hired to do the cleaning but did not carry out her task properly

9. *Too high water charges*

According to the survey, *no* household experienced the set water tariffs as being a primary problem. Usually no respondent even touched upon the subject. However, one household from the *high* income group thought that the raises in water charges were too high each time, since the water supply was not increased accordingly.

Lack of a pour-flush toilet

The family wishing a pour-flush toilet was provided with a private bucket-latrine. It constituted a problem (of *secondary* priority) of theirs as they lived in a colony of police employee-families and the standard according to the respondent were that a pour-flush toilet was installed. Such were the case in the centre of Coimbatore, she said. No other complaints concerning specifically the bucket-latrine was heard of.

HOUSEHOLD VALUES OF IMPROVEMENTS (WILLINGNESS TO PAY)

A way to evaluate how much the respondents value a problem is to decide the willingness to pay for the improvement in order to get it realised. All households stating the problems described above wanted improvements, but were they able and willing to spend money in order to get the problems solved? And who was going to act?

In many cases, the households were already paying, for example in order to get a regular cleaning service or an *increased* water supply. These figures of costs are also evidence of the importance felt of improvements achieved. Often the household told that they could increase their present payment by an amount in order to get the improvement. In other cases the household told what they had heard from others the cost would be. In general, it seemed hard for the respondents to evaluate in terms of money what an improvement would be worth when they knew the actual price in reality.

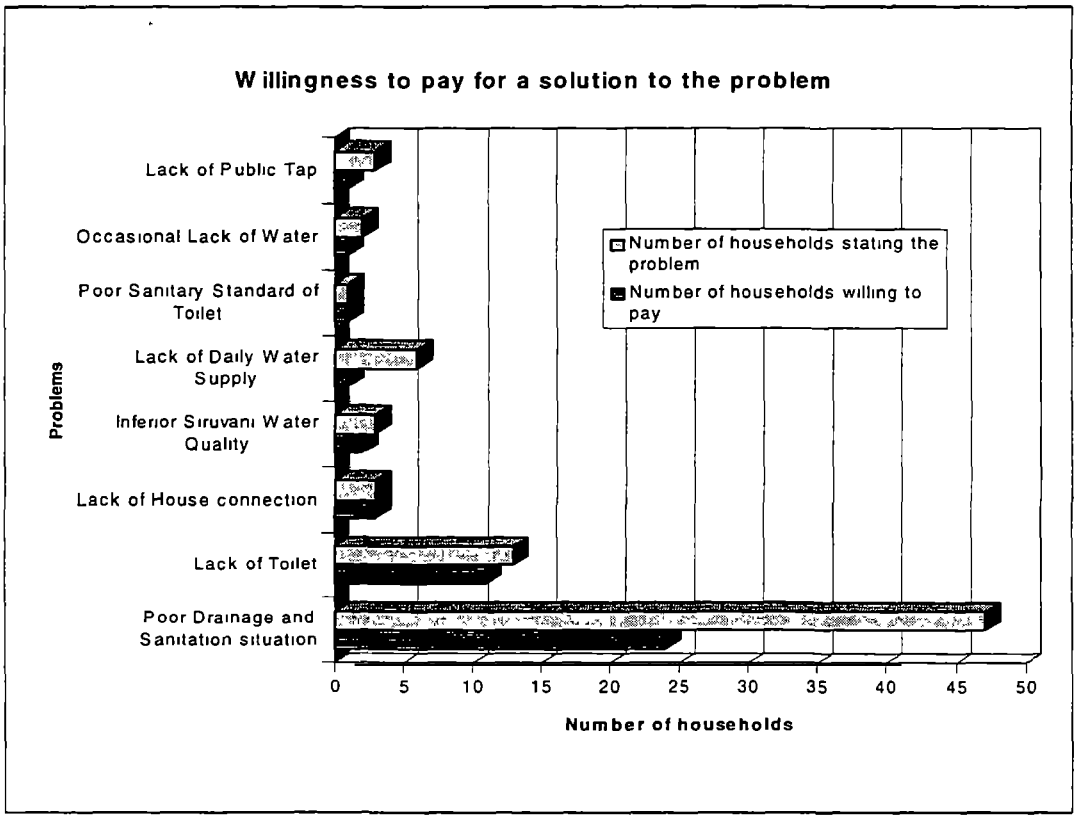


Figure 27: Number of households willing to pay for an improvement in relation to number of households stating the problem

There is no doubt regarding what problems were evaluated highest by the households, see figure 27. An improved drainage and sanitation situation was of highest priority and is followed by the need of toilet facilities. Of those stating lack of toilet as a problem, almost all were ready to contribute with money. A pay-and-use toilet was wanted.

In the table 41 below, the willingness to pay is expressed in Rupees For a *pay-and-use* public toilet the figures are presented in paise *per visit* as it was the common practise according to respondents. A scavenger or other cleaner on the other hand was normally either paid *per month* or per *time*

(appearence). Regarding providing of toilet facilities or an underground drainage it was prefered to be paid on the *occasion* when it would be provided.

The respondents generally pointed out that the Corporation was the *only responsible* for providing the improvements. Very few households stated that they wanted to solve infrastructural improvements, like roads, ditches and toilet facilities, themselves. However, some who felt desperate had actually improved the road and drainage themselves. Some respondents were more positive to clean themselves, while others showed reluctance. The domestic services of the Corporation were regarded as inferior, but most households were, it seemed, rather hiring a cleaner than cleaning themselves.

Table 41: Willingness to pay in, Rs. or paise. (household = hh)

	PAYMENT										
IMPROVEMENT	**Per time**			**Per month**			**Per one occasion**			**Dominating income-group**	**Dominating area**
	min	aver	max	min	aver	max	min	aver	max		
Improved drainage & sanitation situation	Rs 5	Rs. 10 (5 hh)	Rs 15	Rs. 1	Rs 27 (13 hh)	Rs 200	Rs 5 ditch-blockage	- (7 hh)	Rs 2500 sewer-age	Very low	Singanallur
Toilet (*pay & use*)	10 p	27 p. (10hh)	60 p							Middle, Low	Kunchi, South
House connection	*Unknown (1 hh)*			Rs 1 (1 hh)			Rs 70 (1 hh)			Middle	East RS Puram
Improved water quality	Rs. 10 (1 hh) to mend pipe when leakage into Siruvani water						Rs. 200 (1 hh) apartment want Siruvani water overhead tank			Middle, High	NSR, Pudur
Daily water supply	*Not known (1 hh)*			Rs.30 (1 hh)						Low, High	NSR-road
Toilet cleaning				Rs. 10 (1 hh)						Low	Ganapathy
More water occasionally	*Not known (1 hh)*									High	Ganapathy
Public tap							Rs 10 (1 hh) contribution to a tap in the neighbourhood			Very low	Kunchi

Of the households declaring a problem, but were *not willing to pay* for an improvement, the following reasons were mentioned:

- The household had no economic ability to pay for anything above usual expenditures.
- The improvement was concidered a duty of the Corporation and the authorities should pay accordingly.
- The household already paid for the service, through for instance the property tax. They refused to spend *more* money on the service, even though it was not carried out properly.
- The household had no belief in seeing a solution to the problem in the foreseeable future and consequently thought there was no point in paying.

DEALING WITH PROBLEMS AND THE ROLE OF NEIGHBOURHOOD ORGANISATIONS

The main impression is that households almost always *jointly* try to find solutions to problems common for them all, say the water supply. That is either done by a spontaneous gathering of families or in an existing neighbourhood organisation that could either be formal or informal. The purpose was principally to put pressure on the authorities in order to make them act.

Introduction

Of the 80 interviewed households (one not known) were·

62 households protesting to the Corporation *collectively*.
(22 could *not* turn to any organisation in the neighbourhood, while 40 households were able to)

17 households logdging complaints against the Corporation *individually*.
(11 of the 17 households could *not* turn to any organisation in the neighbourhood. 63% of the 17 complaining individually belonged to the high income group, 8% to the middle, 14% to the low and none was of the very low)

Water in India is a burning issue for households and always of current political interest. The existence of different types of associations in the Indian multi cultural society plays a crucial role when influencing the politicians and the decision making process. The issues commonly dealt with in neighbourhood organisations we encountered were religious activities, the situation of women, welfare, charity, water supply, sanitation and road improvements.

According to our interviews, it was normal in Coimbatore to have some form of co-operation among inhabitants from the same community and consequently the same neighbourhood as they tended to live more or less together. Thus, in the same association usually only people with the same cultural background, religion, traditions etc., took part and it obviously facilitated the communication between the members. In rare cases when there were members from different communities and casts, difficulties to cooperate was mentioned to arise. Difficulties to unite between richer and poorer households also existed, according to the interviews, especially when payment for improvements were to be shared equally.

In general, there seemed to be only *one* organisation (if any) represented in a neighbourhood or layout. It was either a formal (registered) or an informal association. The particular organisation dealt with common questions, no matter what topics were of current interest or the type of co-operation it was. Hence, the organisations were *multipurpose*. Informal associations dealing *only* with water and sanitation questions did not seem to exist. The Corporation implementors though mentioned contacts with *water consumer* organisations, as they probably were called when dealing with water issues. Contacts between associations in different neighbourhoods seemed not to be prevailing

Table 42: Distribution of neighbourhood organisations by household wealth
Note. Some households mentioned more than one organisation in the neighbourhood

	Number of neighbourhood organisations				
ORGANISATIONS	**Very low**	**Low**	**Middle**	**High**	**In total**
Political	3	6	1	2	12
Union of neighbours	1	6	3	1	11
Community	3	3	2	1	9
Ladies	1	2	3	1	7
Compound housing unit		2	2		4
Religious		1	2	1	4
Welfare		1	1	2	4
House board		1	1	1	3
Lions, Rotary				1	1
Literacy Movement		1			1
Number of organisations encountered	8	23	15	10	56
Number of households living where *no* org. existed	7 (out of 15)	6 (out of 22)	11 (out of 24)	10 (out of 19)	34 (out of 80)

The water and sanitation questions are, among other things, dealt with in the following types of neighbourhood associations (see table 42), all encountered when interviewing,

- community/caste based association
- compound housing unit
- ladies' associations
- political party organisation
- religious based association
- housing board, connected to apartments
- union of neighbours

Some of associations mentioned might overlap, for example all can be community/caste based. A ladies' association can moreover be political. Moreover, another form of co-operation among households dealing with water and sanitation etc. was

- the literacy movement, as we understood initiated by the authorities, but seemed to be well known in the areas visited

Duties of the association, and participation

The duties of the neighbourhood organisations were to present the opinions of the members to decision makers in the Corporation, or to solve problems in other ways. By decision makers were usually meant by all income groups the implementors belonging to different departments of the Corporation. When called for, the organisation approached them with a *petition*, stating their wishes regarding an issue. The members' signatures were submitted The approach was made directly by themselves or in many cases via a local party representative. Another possibility was through a friend with valuable contacts. The role of a party man/woman, especially if he/she belongs to the ruling party, was to speed up the process by having the right connections. If there was no response by the authorities repeated complaints are made, often during a long time. However, since that way was experienced by many as *very* time consuming and *not* very successful, the organisation often instead contacted a Corporation employee directly and paid for certain favours wanted. For example regarding the scavenging service or a drainage ditch. Money

seemed always involved in some way. All households were to contribute, sometimes equally sharing or otherwise according to ability. The neighbourhood organisation played an important role when collecting all kinds of fees from the households The purposes varied In one layout visited only inhabitants willing to contribute with money were allowed to participate. The money collected was invested and the interest used for construction purposes Other common ways to deal with issues and problems were to share tasks among the members, say cleaning of the streets.

Meetings were usually held where one representative from each household was present. All the neighbours in the area discussed which improvements or actions were needed. The representative could either be the household head, the home manager or son, depending on which type of association it was. Elders and daughters were also mentioned to be representatives on some occasions. In one neighbourhood the elders frequently went to the Corporation when a complaint was to be made, which always turned out to be successful. Most common is though that the male household head attends the gatherings.

The interviews showed that associations played different roles in different income groups and communities. The *higher* income groups with the better financial conditions and personal contacts in the Corporation, were often less dependent on the neighbourhood organisations. Their co-operation clearly had other objectives, like welfare, charity and security of the neighbourhood. The association hence usually played a minor role for the purpose of improving their own situation by complaining to the Corporation. They mainly approached the Corporation implementors individually when they wish to solve a problem. The households in the *lower* income groups depended much more on co-operation within the neighbourhood, and were more sensitive to disturbance in the relationships to neighbours.

Participation by the interviewed households:

46 out of the 80 households interviewed stated that they were not members in any organisation. (12 out of the 46 households mentioned that there does exist an organisation in the neighbourhood)

17 households, all situated in neighbourhoods where organisations existed, were passive members or turn to the organisation only if a problem arises.
(27% of the Very low, 36% of the Low, 12% of the Middle, 21% of the High)

17 households said they were active members in a neighbourhood organisation.
(7% of the Very low, 23% of the Low, 29% of the Middle, 21% of the High)

Important to point out is that a majority, or 46 of the 80 households interviewed, did *not* take part in any neighbourhood organisation. Very often the reason was mentioned to be the lack of an association in the vicinity. The respondents was often interested in taking part if "someone came and asked for it". Obviously, no major difficulties were experienced, even though lack of time and distrust in organisations also were causes for no participation. 17 respondents said they were active members in an organisation, regularly attending meetings etc. Of those many said that the organisation was the only driving force for solving problems in the neighbourhood.

Common tasks relevant to our focus, according to the interviews:

- -arrange a public tap, public toilet or drainage ditches
- -rent a sweeper/scavenger in order to clean common areas
- -construction of road and drainage
- -invest money collected from the members for future needs
- -providing loans to member households
- -financial support, charity to lower income group households in need
- -improve housing conditions

A great number of households told that the political situation was extremely unsatisfactory since there had been *no* elections of candidates to the Corporation or the Town Panchayats in the last 20 years. Respondents stated that they were expecting elections and believed that improvements in the every-day-life were only possible then.

Two strong opposing opinions were heard when discussing *political party organisations*,

- Respondents stating that political parties' only purpose is to win votes Moreover, the members are corrupt and consequently, these organisations are of no use whatsoever.
- Respondents who felt the party was reliable and turned to it in need of support

Almost all households agreed with the first opinion, the confidence in politicians as such is extremely low. The politicians kept coming during election times promising for example a public water tap, which never turned up afterwards However, the *local* party organisation seemed to have a better reputation. Inhabitants generally found the leaders less corrupt and as mentioned before turned to the local party representative when a problem arouse and they were in need of support. Though, some said they had no alternative but turning to the party organisation and bribes were common then as well.

In all areas and neighbourhoods party symbols were seen. We encountered ruling party (The Dravidian party, AIDMK) followers as well as followers of the opposition, among which the Communist party dominated among our households interviewed. To what particular party someone was connected to was however not asked for. The issue seemed sensitive as the families made sure we did not write down any party names or opinions that could be connected to their family It could lead to unwanted consequences they said. Voluntarily though, in two places (Singanallur and Pudur) households explained about their involvement in the Communist Party. They described the at least partly successful struggle with the Corporation to get better roads and drainage. They advocated collective action and common fight to a great extent.

The opposing parties fighting for votes in one area visited lead to that a public toilet built by one party representative was later demolished by the representative from the opposition party.

Regarding water, a public tap was supplied to all ***temples*** (regarded as public places) to serve visitors. However, households in the vicinity who were suffering from scarcity of water often took water there as well.

In the Muslim dominated area Medina Nagar in southern Coimbatore the ***mosque administration*** played a central role as owner of the land and dwellings. The unity among the Muslim inhabitants was strong, probably due to the fact that the Muslims formed a minority group and once in a while conflicts were appearing with surrounding Hindu families. The household representative, the male household head, took part in meetings once a month. At the time of interviewing, the mosque association dealt with the question of arranging a public toilet.

Smaller groups of women, the interviews indicated, gathered all over Coimbatore. The women in one neighbourhood and possibly its' vicinity, formed a ***ladies' association*** which could be independent or connected to a political party and/or a larger women's network. Except dealing with special issues regarding women, say police violence against women, they also considered water problems and sanitary arrangements A natural consequence since the woman is responsible for the household, i.e. the home manager, and therefore has to deal with questions of water scarcity, cleaning and unsatisfactory sanitary conditions etc.

Regarding scarcity of water, the women in many areas united in *sitstrikes* five to ten years ago, all sitting on the road blocking it with their "kodams" (water vessels). The purpose was to influence the authorities in order to increase water supply and provide public taps. The strike proved to be a very successful method to influence the decision makers and often mentioned as a reason for the sufficient water supply today. The current problems with drainage and sanitation was mentioned not to be so easily solved by strike. When asked why not, some households said the reasons were that there was neither any person responsible for it, as water, nor can the situation threaten life in such a way as water scarcity. Moreover, the Corporation has convinced some that the lack of labour to arrange better sanitation,

drainage etc. was a too great an obstacle for action. Thus, at present time none of the major domestic problems seem to be suitably solved by striking according to the interviews.

In the NSR road area a ladies' association was encountered which had the purpose to make the Corporation clean the streets and further present the members' opinions regarding water to the authorities All households in the area participated. The elder women approached the Corporation or when needed increased the payment to the plumber. Furthermore, it allowed men to participate, but usually the women stated that the men has no time as they are employed.

A ladies' association could be unsuitable in some cases by some. In a police colony in Singanallur the women stated that they were interested in starting a ladies' association, mainly only for marriage arrangements, and had already tried but were stopped. According to them the police authorities did not find it suitable for wives of policemen to form an association. The similarity to a trade union made the authorities suspicious since those are not allowed for policemen in India. The punishment was to send the husband (police) of the woman leader to prison

At the time for the interviews some people were involved in a ***literacy movement***. It seemed to be well known among all income groups and was to cover all parts in Coimbatore The purpose we assume was to increase the literacy rate, of course, but also to increase overall awareness concerning water, sanitation and health. One woman mentioned that the youth organisations were involved in this literacy movement and the boys were to clean the roads. (The girls though had housework to attend to, she further said, so they were not able not join.) In a very low income household interviewed, the women were much disappointed that no representative from the movement had arrived so far. The reason was that they were not able to read or write.

Lack of an association

According to a majority of the respondents, associations were something important and wanted, even though not existing at many places. As mentioned earlier, most respondents stated that the best way to solve a problem is jointly with others. However, some households also pointed out the existing lack of collaboration.

When no co-operation among the households in a neighbourhood or association was present, the main reasons mentioned were:

- lack of a person taking on the leadership
- "selfishness" among the inhabitants
- lack of time and interest among the inhabitants
- no solution to their problems can be seen realised/ no hope/ lost faith in politicians etc.

The major reason is though probably that

- *-no acute problems* were present

An organisation, or another form of co-operation, became more activated when a common problem arouse, say scarcity of water. In the meantime the association stayed dormant. That is in times of no or less severe problems. A possibility is also that it ceases to exist because the inhabitants have given up the hope for solutions.

In lower income groups a feeling of lack of power and influence sometimes made people reluctant to turn to an association ,or form an own organisation. Statements as "we have no education" as well as "organisations are only money minded" and "only for rich people", were heard.

Moreover, quite a few households made complaints about "selfishness" among their neighbours, or, as one elderly person said; "youngsters are not interested in sanitary agreements, they just solve *their* situation and don't care about the rest", i.e. they had too little "collective mentality".

Major obstacles to improvements

Our impression of which obstacles were most influential is,

No elections to the Town Panchyats and the Corporation for the last 20 years. Respondents felt it greatly influenced their unsatisfactory situation with both corruption and little power to do something.

Unapproved areas constituted an obstacle. One hindrance for improvements was the delay until facilities could be provided by the Corporation to an area where the majority of houses were unapproved.

Illegal settlements and **households under litigation**

Renting of houses is problematic. Tenants were frequently met with all over Coimbatore. As the house owner is the single person who can influence the circumstances of the house and lot, many tenants told that neglectance often leads to a problematic situation. The consequences of renting was a sincere problem since lots of house owners were living far away and were actually not interested in their houses, except for collecting rent The tenants could by no means improve their situation by for example a house connection or a toilet, which many felt upset about. Moreover, with the knowledge of the little power they had, combined with maybe a limited stay in the house, the responsibility of keeping say the surroundings clean was not felt so important. The lack of motivation of tenants influenced the whole co-operation between households in a neighbourhood.

Conclusions

Problems and Improvements

Our impression is that people place a high value on improvements despite severe economic constraints, but the common opinion is that the government should take the lead in introducing major improvements.

An obvious conclusion drawn from the results in this chapter is that the major domestic problem of today is the inferior drainage and sanitation conditions in the neighbourhoods. The households expressed genuine concern for their poor situation and wanted immediate action in order to improve the situation. Sufficient toilet facilities and properly maintained drainage ditches were on top of the list. These attitudes were often met with when interviewing. However, important to emphasise is that households mentioning an improved drainage and sanitation situation as the highest priority already had other basic needs as housing and sufficient water supply fulfilled. A proper shelter and water to cover the daily needs were naturally more urgent needs than a proper drainage situation and considered so by affected households encountered. A poor sanitary standard could never be life-threatening in the same obvious way as lack of water or lack of a house.

No major variations in what the households consider to be a problem existed between the income groups. In all groups an improved drainage and sanitation situation was most urgent. However, the families of the lower income groups were generally much more affected and concerned. Our impression is that *no* exaggerations of the problems were heard among them.

Perhaps as a surprise, the scarcity of water was not frequently considered a problem. However, the answers would perhaps have been slightly different if we had paid a visit in the dry season when the scarcity of water is mentioned to be severe. Even in the wet season though, several lower income group women were queuing at the public taps at an inconvenient point of time and were carrying heavy vessels of water. They did not mention this as some of the higher priorities to be solved, even though they experienced the water collection to be hard work. Reasons could be that their perception of the water

supply situation of today is that it is much better than some years ago and moreover that the procedure of water fetching is seen as a normal and unavoidable duty in the everyday life. The gathering of women at the tap also admit a social break among the ordinary duties which might be nice.

Further, concerning water many households from the *high* income group gave high priority to problems with lack of daily water supply, inferior water quality, occasional shortage of water as well as too high water tariffs. Our impression is that even though the high income families mentioned these issues to be problematic, they constitute certainly no threat to the family. Sooner they were mentioned for the sake of saying *something*.

When discussing the solution to the problems mentioned, there was an interest of many households in contributing with money Mainly for a getting improved scavenging and refuse collection service as well as for a public toilet. Clearly, there is ability to pay when necessary. The answers we consider very truthful as the households were so affected by the problems and moreover especially since they were already paying. Our impression is that even more people would be willing to pay for an improvement, but the difficulties of *imagining* a value of an improvement influenced the answers slightly.

Dealing with problems

The way households deal with problems is mainly *jointly with others* as this is felt more powerful The most common way was by sending petitions to the Corporation implementors. However, as the overall situation in Coimbatore at present constitutes no *major* threats to most households, the neighbourhood organisations, all multipurpose, often played a somewhat less active role. Of course, there were variations between the areas As mentioned, they obviously stay almost dormant at times of no severe problems but do become activated when a group of households feel it to be necessary. About 50% of the households interviewed were members of an association, while a third had no organisation in the neighbourhood. These figures tell us that many households found no reason for participating in a collaboration with others today, but would certainly join if an urgent problem arise. Today the organisations though play an important role for arranging say scavenging service as well as collection of fees

To be pointed out is moreover that several women in the survey stated that they were interested in taking part in organisations *if* there existed one in the vicinity or if they were contacted. They felt hesitating to initiate the formation of an association themselves and often said that a suitable leader was missing. With certainty, they would of course as is common in India form an organisation if a life-threatening problem would appear, but also their problems of today are worthwhile to consider. Our impression is that the women most in need of co-operation to achieve improvements were working very hard and had limited time available for meetings etc. Moreover, men were more commonly representatives in neighbourhood association and as spokesmen in the relation to the Corporation. Problems experienced solely by women might be neglected, but with some form of support they could give valuable information to the authorities in the decision-making process and they ought to be involved on the neighbourhood level in improvements.

Not to forget is though the major distrust in the politicians and implemetors, which naturally also is making people more passive when seeing no responses to their actions. People are used to not expect much from the Corporation even though paying bribes and long waiting times. That elections to the Town Panchyats and the Corporation play an tremendously important role is a common perception among people.

Furthermore, a fundamental obstacle to improvements is the many tenants, all with no possibility of influencing their circumstances, a fact of great importance felt when discussing with respondents.

DISCUSSION

The City

The result of urbanisation is that planners of infrastructure have trouble keeping up with the fast growing population and the land expansion. The growth demands housing and land for the new settlements, and especially the poor families located on land rejected by others or on unauthorised sites must then be considered.

The city is like an ever-changing amoeba: settlements pop up everywhere on unapproved sites, people move or are moved, some people come back and some go away. The employment transfer system in India, used by public institutions such as schools, universities and governmental offices, stationing the staff for two years at each place, adds to the inhabitants' move-around behaviour. The "status quo" of not settling down or always *renting* a dwelling, is a direct problem influencing a household's situation, a fact expressed by respondents through the whole survey.

Focusing on *renting*, the missing link is of course not the tenants, but instead the house owner letting it for rent. Instead of selling a house, it could now be let out for rent for decades, with the house owners not caring about it at all since they never intend to move back. The tenants are denied any improvements in their water and drainage situation and look upon the conditions as hopeless which also constitutes an obstacle for common improvements along the street. It is maybe possible to draw a parallel with an agricultural land-law, where land not used by the actual owner falls to the current cultivator after five years. A similar law could be applicable even in a city to mitigate the problems renting involves. In any case, with the current situation in mind, houseowners must be prevented from letting their houses for rent for more than a given number of years and the position of tenants must be improved. By restricting the time and strengthening the role of the tenants, it would encourage improvements and would consequently be very beneficial for the population and the overall environmental situation. In reality of course there exist bureaucratic barriers; a new system is bound to create far more disputes over land and a huge administrative control system.

Water

There exist deficiencies in the water supply system of Coimbatore, but according to the survey these are not regarded with any major concern. Households have other priorities at present, like an improved drainage and sanitation situation, since the minimum need of water is fulfilled.

Access to water by the *very low* income communities, however, is currently a rather serious shortcoming, especially compared to the other income groups. They were to a greater extent forced to use the sources of bullock carts and neighbours regularly, considered to be only temporary solutions by others. The families of the *low* income group, together with many from the *very low*, were in principle supplied with water from public taps, free of charge, though the fetching procedure was often long and bothersome due to waiting at the tap and carrying of vessels. There are obvious variations in water supply between these groups and households provided with a house connection. How can for instance a woman using a public tap get the same supply as a family with a private house connection when she has to compete with 50 other women for the same quantities of water? Today, the water supply time is *equal* for all taps (around three to four hours), but it would be more fair to set the timings according to number of households sharing the tap/connection. At least it would be beneficial to set different timings for two groups, *timings for households with house connections* which should be less than *timings for a public tap*. The division is, we suppose, not impossible but it involves further construction of pipes and increased costs. To create a fair situation, other solutions would perhaps be simple, moreover, the policy of the Corporation is to provide lower income people with water free of charge; these people can perhaps then not expect to have the same amount of water as those being charged for it.

Extending the water supply system and throughput is costly. Given prevailing economic conditions, providing all households with house connections must remain a long-term goal. In the medium term,

the results suggest that providing public standpipes in neighbourhoods and house compounds may bring significant benefits It should not be forgotten that increasing the water supply for lower income communities could have the added benefit of decreasing vendor water prices.

The fear of the Corporation of raising water charges is probably mainly a fear of the reaction from wealthier households. These are the only households whose entire water supply is provided from private house connection and consequently they pay charges according to meters. Thus, they are the only ones to be really affected by raised water charges and it is they who complain when charges are about to be hiked. (The households sharing a house connection are usually tenants and water charges are included in the rent, therefore they would complain less.)

Thus, the Corporation ought to seriously consider raising water charges to cover costs for the new Pillur scheme and introducing a water supply equal and available to all through an increasing number of house connections and public taps. If the lower income families could get easier access to the water, even if charged, they would probably not pay more than they do today, though the supply might be greater.

Drainage, sanitation and solid waste

It was not water but instead the drainage and sanitation situation that received most attention in the survey.

As the implementation of underground drainage or uncovered ditches obviously lies in the future in many areas in Coimbatore, smaller local solutions for waste water handling could be an alternative. The most urgent needs are however to improve the refuse collection, ditch cleaning and road construction in order to avoid the stagnant waste water in the ditches and other low lying areas, and also to increase the few toilet facilities. There is a pressing need to reach all inhabitants with basic toilet facilities, in the centre as well as in the outskirts, but these must be properly maintained for people to use them. To involve the target groups in the process of improvements must be absolutely essential to understanding their attitudes and wishes, and also in order to break down peoples resistance to dealing with the cleaning. Who is in fact supposed to clean?

Due to cultural and religious beliefs there is, especially in a Hindu tradition, a very strong perception of cleaning as a low status job It is expressed in the fact that people of higher caste or status are not willing to concern themselves with unclean things. We feel that this perception is very much alive today when people from *all* income groups hire people from lower cast to do the cleaning jobs. But when not even the lowest cast want to deal with the cleaning as in many cases today, who is then supposed to? The Corporation is in vain giving out nice uniforms to increase the status of the scavengers. This is a major obstacle that has to be broken down if improvements are to be fulfilled, and as the problems increase which they certainly will, sooner or later someone must deal with it.

Education is important for people to really see the connection between their solid waste disposal and the drainage problems, and as a whole make people aware of the "think global, act local" - concept. According to one respondent; "people do not care about the sewage situation, they only go to the doctor when they get ill". Lack of education as well as knowledge of how to handle the situation seem to inhibit improvements among lower income households. Especially since India now is in the beginning of the "buy and throw" era, where garbage more and more consists of plastic and metallic instead of organic material, increased awareness is essential. It is important not to adapt the habit of the western world, first to be threatened by the "garbage monster" and *then* face the reality and start to sort garbage according to type, compost and cut down on plastic wrappings. By concentrated educational efforts and by forcing the population to face the seriousness of the problem, the City Corporations might be able to avoid a few of the Western World's mistakes and errors.

One simple way to improve the refuse handling and collection is to construct a more practical dustbin than the concrete drum of today. It might be an idea to cover the bins since animals eat and drag the waste around, the hot sun makes the garbage smell and full of flies, and the monsoon rain fills the concrete drums with a garbage-mixed sludge. It is also very inconvenient for the scavengers to *pick* the waste up instead of having a system where the bin could be turned over and emptied.

Concerning toilet problems, "pay-and-use" toilets might be a solution. The policy and strategy of the Corporation, as stated by the Health Officer, is to provide public toilets where there is a need These are to be free of charge for domestic use, while "pay and use" toilets are provided at public places. However, the attitude of the households interviewed towards also having a "pay-and-use" public toilet in the neighbourhood was often *genuinely positive*. People who either expressed need the of a toilet or were discontent with the present arrangements, were generally willing to pay for each toilet visit. Their opinion was that it would improve hygienic conditions very much if payment was introduced. They all seemed to know the existing usual fees for one visit to a public toilet.

The role of women

Many women responsible for the water collection explained how much work it involved, carrying the vessels, using a hand pump and waiting at the tap. Even though much time of the day was occupied with water handling, a majority did not raise major complaints about it. It seemed as if many women thought about the water handling procedure as so natural and unavoidable that the possibility of reducing did not strike them, either because they knew they could never be provided with a house connection or the general fact that they were living in a country with water scarcity. It should be pointed out that compared with former days, say ten years ago, when many women had no access to public water and sit strikes to get a public tap in the neighbourhood were common, the water situation today is seen as a vast improvement. We felt anyway that the Corporation could help in many ways by providing more taps, set the timings better and reduce variations and interruptions.
One hypothesis of ours was that the water handling is an obstacle to women in their daily life and that this prevents them from seeking employment. Some women in the study explained that they had difficulties working since their duty was to collect water but these women were only represented in the *very low* and the *high* income groups. The normal way though, incorporated in the culture and society, was that women took care of the household, children and water handling, a situation which they seemed to accept and find natural and pleasant. Anyhow, we did not feel while discussing and chatting with the women that it was the water responsibility *only* which prevented them from working Other tasks were also unavoidable, such as cooking (food is normally bought and cooked several times per day due to lack of storage facilities such as refrigerators) and child care. Day-care centres were unheard of The most favoured situation according to both men and women seemed to be when the family budget allowed the woman (or the women in a joint family) to stay at home and work with the household duties. In other words, even if the water handling were eased to say some 10 minutes a day, we felt in principle that no more women would go outside for work than already worked today, mainly because the rest of the household duties would fill up the day

The Corporation and the public

As an overall description of the co-operation between the Corporation and the inhabitants, it is disheartening to hear that so many people in our interview study express despair when the authorities are involved, for instance when applying for a house connection It is evident that the reliance on or trust in the Corporation is since long gone. The despair is connected both to difficulties getting the Corporation to *pay attention* to them and to the *bribing system* practised by the employees such as plumbers and tax men (they in return have to contribute with money to their superiors for having or keeping their job, we heard from an unconfirmed source).
However, people in Coimbatore seemed very business minded and active, not waiting for what the authorities might do. In discussion with Dr. P. Appasamy, resident in Madras, we noticed differences among the inhabitants in the two cities, the Coimbatore population writing petitions and to a higher extent trying to solve problems themselves. Anyhow, the vacuum appearing when the Corporation neglects its duties is problematic, so who is to fill the gap? Neighbourhood organisation plays an important role since it constitutes an existing network and could be a forum for unfulfilled duties to be brought up and carried out. It would be very beneficial if citizens are involved in their local problem

solving, including their more low-status duties, as some others actually already are working with today. Support and "compensations" from the local authorities are justified since some of the tasks then will be facilitated and removed from their schedule. It is thus important to support women from *all* income groups that are interested, as some women today are supported in slum improvement projects, not only with money but by taking them into consideration in the decision-making process. Today it is felt that the Corporation do not support these initiatives, but rather place obstacles in their path

The communication between the *public and the authorities* on the one hand and *the different institutions* on the other must improve. As it was now the Deans, Superintending Engineers, Deputy Directors and Executives were contradicting one another! One complained about one thing, such as the "uniform rate charge" system, without knowing a change had already been implemented, and while another explained that the public was satisfied with the drainage system, someone else admitted that the most numerous complaints to the Corporation concerned the bad drainage system, no slopes or slopes in the wrong directions or waste filling up the drains! To be sensitive to the public by paying attention to their attitudes and wishes is very important for the future. This will, of course, depend on the goodwill of both the authorities and the public, and whether they are able to admit errors, lack of awareness and lack of -or wrongly carried out- duties.

A basic obstacle for the communication between authorities and the public is that democracy has not been working adequately in the past 20 years, when not a single Panchayat election has been held at the Corporation. Of course people were angry or disappointed that the elections had been postponed again and again. Who are now the men in power at the Corporation? People who had bought themselves high positions? Individuals with more concern for their own residence than for the public welfare?, Men aiming for power? Relatives and more relatives seeing to the families' and other relatives' benefit? The answer is, we assume, unfortunately *yes*, and that means of course that the great obstacle -corruption- is growing worse and worse. However, it has recently been decided that elections are to be hold, which according to many respondents will definitely make the situation better, giving people hope and expectations for great changes as well as a renewed inclination to contend with difficulties.

QUESTIONNAIRE SURVEY TO HOUSEHOLDS

DATE: **INTERVIEW DURATION:** **AREA:**

BACKGROUND DATA

Age
Sex
Familyrole.
- husband
- wife
- child
- grandparent
- other

How long have you lived here?
How many persons are living in this household?
Do you have any cattle or pets?
If yes, what kind? How many?
Do you cultivate anything outside the house?
If yes,what do you cultivate?
What size is the lot?
Who is the household head?

Education of principal male?
Education of principal female?
How many in the family are employed?
Time interviewperson spend at home per day?

Does your family rent/own/other your dwelling?
Other properties?
How many rooms do you have?
Do you have a bathroom?
Do you have a toilet?
Do you have a kitchen with
- gas
- electricity
- paraffine(oil)

Do you have
- radio
- tv
- car
- bicycle

PAYMENT AND ACCESS TO WATER

What type of watersupply source/sources do you use
public standpipe/tap/well
- indoor piping
- tanker

private. vendors
- well/standpipe
- indoor piping

How many families are sharing the source?
How many persons are sharing the source?
How long distance is it to walk to the water sources?

- - - - - - - - - - - - - - - - - - -

How much money does your family spend on water per week approx.?
Have you got informal rules in your neighbourhood area? How do you for instance distribute water among yourselves?
If you want to improve the situation concerning access to water what would that be?
How would you suggest that improvements should be made?By whom?Who should pay for the improvements?

Who is the the best to act to get fast improvements?
If you want to improve the situation concerning payment of water what would that be?
Who are responsible for the water price?
Who are responsible for the whole water system?
How can you contribute in order to make improvements?
If you compare the sewagewater situation with _____ what is the difference, if any?

QUESTIONNAIRE SURVEY TO HOUSEHOLDS

indoor piping
How much of your total water consumption do you get from indoor piping?(%)
How many litres does your family use per week during normal season?
How many litres does your family approx use per week during dry season?
How do you pay for the water?
meter
fixed rate
What is the min. tariff?
What is the maximum tariff?
How many hours per day do you normally get water?
Is it sometimes water shortage?
If yes, when? (daily, seasonally)

standpipe/well/tap.
How much of your total water consumption is from the standpipe? (%)
How many litres per week does your family use during normal season?
How many litres per week does your family use during dry season?
How do you pay for the water?
meter
per bucket
other
What is the minimum tariff?
What is the maximum tariff?
How many hours do you normally get water per day?
Is it sometimes watershortage?
If yes, when?
daily
seasonally
What do you fetch your water in?
How many litres does it contain?
How many containers per week do you approxbuy?

vendors
How much of your total water consumption is from the vendor?(%)
How many litres per week does your family use during normal season?
How many litres per week does your family use during dry season?
How do you pay for the water?
meter
per bucket
other
Is it possible to get a credit?
What is the minimum price?
What is the maximum price?
What do you fetch the water in?
How many litres does it contain?
How many containers per week do you approx buy?
Do the vendors only sell water?
If no, what else?
Is it possible to get a loan from the vendor?

Public tankers (for free).
How much of your total water consumption is from the tank?(%)
How many litres per week does your family get during normal season?
How many litres per week does your family get during dry season?
How often do they come during normal season?
How often do they come during dry season?
Where do the tankers come from?

WATER QUALITY

How do you find your water quality from your different sources?
good satisfying bad
Do you boil and/or filtrate the water before drinking?
Do you know what diseases could be caused by water?
Have you got/had any of those diseases?
Which?
Do you buy/use any non drinkable water?
If yes, for what use?
washing lavatory construction
animals irrigation other

If you want to improve the situation concerning water quality what would that be?
How would you suggest that improvements should be made?
By whom?
Who should pay for the improvements?
Who is the the best to act to get fast improvements?
How can you contribute in order to make improvements?

QUESTIONNAIRE SURVEY TO HOUSEHOLDS

SEWAGE AND WASTE WATER

Is your household connected to the public sewage system?
If no, what happens to the
kitchen water?
toilet water?
washing water?
If yes, is all your waste water going to the sewage system?
If no, to where else?
Do you have a septic tank?
Does your neighbourhood have any rules concerning the waste water?
If yes, what kind of rules?
As far as you know, are there any rules from the government which you don't follow?
If, yes, why? Too stupid, too expensive..
How do you find the sewage situation in your neighbourhood?
How do you find the sewage situation in your household?
Are there seasonal variations?
Is there anything which causes you trouble with the sewage water?
(flood, smell, mud, toxic, diseases, seasonal variations, othe
If you want to improve the situation concerning sewage and waste water treatment what would that be?
How would you suggest that improvements should be made?
By whom?
Who should pay for the improvements?
Who is the the best to act to get fast improvements?
How can you contribute in order to make improvements?
Who helps you if problems arise?
If you compare the sewagewater situation with _____ what is the difference, if any?

INSTITUTIONS AND ORGANISATIONS

Is there any organisation in your neighbourhood?
dealing with water
If yes,what kind of organisation?
If someone recently moved to your area, where does that person turn to get to know the water system?
If someone has a problem with water,what is the best to do?
Do you take part in any organisation dealing with water questions?
If yes, which?
How do you participate?
Why do you participate?
How much time do you spend working with the ctivities?
How often do you meet?
How many people participate in your neighbourhood?
a few
50%
75%
almost everyone
Do you think it is important with neighbourhood organisations?
Why?
Why not?
What organisations and groups take care of water questions in Coimbatore?

Table 22a: number of households and percent using each water source, distributed by household wealth

PRIMARY WATER SOURCES

Public supply:

Siruvani private house connection

Income group	Number of households	Percent
Very low	0 out of 15	0%
Low	4 out of 22	18%
Middle	4 out of 24	17%
High	11 out of 19	58%

Siruvani shared house connection

Income group	Number of households	Percent
Very low	3 out of 15	20%
Low	9 out of 22	41%
Middle	15 out of 24	63%
High	6 out of 19	32%

Neighbours' Siruvani house connection

Income group	Number of households	Percent
Very low	4 out of 15	27%
Low	1 out of 22	5%
Middle	0 out of 24	0%
High	0 out of 19	0%

Siruvani public tap

Income group	Number of households	Percent
Very low	8 out of 15	53%
Low	8 out of 22	36%
Middle	4 out of 24	17%
High	0 out of 19	0%

Ground water private house connection

Income group	Number of households	Percent
Very low	0 out of 15	0%
Low	1 out of 22	5%
Middle	1 out of 24	4%
High	1 out of 19	5%

Ground water public tap

Income group	Number of households	Percent
Very low	3 out of 15	20%
Low	4 out of 22	18%
Middle	6 out of 24	25%
High	0 out of 19	0%

Private supply:

Siruvani Bullock cart

Income group	Number of households	Percent
Very low	0 out of 15	0%
Low	0 out of 22	0%
Middle	0 out of 24	0%
High	1 out of 19	5%

Own well

Income group	Number of households	Percent
Very low	1 out of 15	5%
Low	0 out of 22	0%
Middle	1 out of 24	4%
High	3 out of 19	16%

Ground water Bullock cart

Income group	Number of households	Percent
Very low	2 out of 15	13%
Low	0 out of 22	0%
Middle	0 out of 24	0%
High	0 out of 19	0%

SECONDARY WATERSOURCES

Public supply:

Neighbours' Siruvani house connection

Income group	Number of households	Percent
Very low	3 out of 15	20%
Low	3 out of 22	14%
Middle	0 out of 24	0%
High	1 out of 19	5%

Siruvani public tap

Income group	Number of households	Percent
Very low	2 out of 15	13%
Low	5 out of 22	36%
Middle	5 out of 24	21%
High	0 out of 19	0%

Ground water public tap

Income group	Number of households	Percent
Very low	1 out of 15	7%
Low	6 out of 22	27%
Middle	8 out of 24	33%
High	2 out of 19	11%

Private supply:

Siruvani bullock cart

Income group	Number of households	Percent
Very low	0 out of 15	0%
Low	0 out of 22	0%
Middle	3 out of 24	12%
High	1 out of 19	5%

Own well

Income group	Number of households	Percent
Very low	0 out of 15	0%
Low	1 out of 22	5%
Middle	0 out of 24	0%
High	0 out of 19	0%

Neighbours' or farmers' well

Income group	Number of households	Percent
Very low	1 out of 15	7%
Low	6 out of 22	27%
Middle	4 out of 24	17%
High	1 out of 19	5%

Ground water bullock cart

Income group	Number of households	Percent
Very low	4 out of 15	27%
Low	0 out of 22	0%
Middle	4 out of 24	17%
High	3 out of 19	16%

Table 22b· Summary of the households' water situation

		DOMINATING:				DOMINATION OF			AVERAGE							
									NO. OF FAM SHARING		DISTANCE (m)		LPCD		MONTHLY PAYMENT	
WATER SITUATION	**No. of hh**	**Area**	**Income group**	**House type**	**Water source(s)**	**Approved sites?**	**Tenants/ Owners ?**	**Indoor piping ?**	**Sir. source**	**Gw source**	**Sir. source**	**Gw source**	**Wet**	**Dry**	**Wet**	**Dry**
Very bad	3	Singanallur/ Kurichi	Very low	low standard tile house	neighbours' houseconnection+ bullock cart	No	Litigation tenant/ owner	No	35	1 (Bullock cart)	200	-	38	37	85/ 85	103/ 103
Bad	17	South/ Kurichi	Very low	low st. tile-house	public Siruvani tap+ public groundw. tap	No	Equal	No	85	140	60	70	52	49	6/ 14	18/ 28
Acceptable	22	South/ East RS Puram	Middle	good standard tile house	shared houseconn + public groundw. tap	Equal	Equal	No	26	63	55	55	70	62	20/ 29	25/ 27
Good	23	Ganapathy	Low/ Middle/ High	good st. tile house/ rcc	shared house connection	Yes	Equal	No	3	-	3		80	77	20/ 20	22/ 22
Very good	14	East Rs Puram	High	rcc/ apartment	private house connection	Yes	Owners	Yes	1	-	-		154	134	44/ 44	44/ 44
INCOME GROUP	**No. of hh**	**Area**	**Water situation**	**House type**	**Water source(s)**	**Approved sites?**	**Tenants/ Owners ?**	**Indoor pipings ?**	**Sir. source**	**Gw source**	**Sir. source**	**Gw source**	**Wet**	**Dry**	**Wet**	**Dry**
Very low	15	All except NSR and East RS	Very bad/ Bad	Hut/ Low st. tile house	neighb ' conn + public Siruvani and groundw tap + bullock cart	No	Tenants	No	60	50	70	40	45	46	25/ 48	41/ 68
Low	22	Singanallur	Bad/Accept /Good	Low/ Good st tile house	public Sir. tap	Yes	Equal	No	17	-	15	-	67	58	15/ 20	13/16
Middle	24	All except Singanallur	Accept / Good	Good st tile house	shared house conn + public groundw tap	Yes	Equal	No	35	20	23	15	68	66	19/ 22	27/ 29
High	19	NSR and East RS	Good/ Very good	Rcc	private house connection	Yes	Owners	Yes	2	-	0	-	149	128	42/ 42	44/ 44
Total no. of households	***80***	***Singanallur***	***Middle***	***Good st. tile house***	***Shared house connection***	***Yes***	***Owners***	***No***	***27***	***73***	***19***	***141***	***82***	***75***	***25/ 31***	***30/ 35***

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Personal Communication

Assistant Executive Engineer at the Water Supply and Drainage Department, Coimbatore Corporation

Health Officer at the Health Department, Coimbatore Corporation

Superintending Engineer at the Tamil Nadu Water and Drainage Board

Deputy Engineer at the TN (Tamil Nadu) Institute of Urban Studies

Rajammal Devadas, Chancellor, at the Avinashilingam Home Science University

Dr R Gnamabal at the Avinashilingam Home Science University

Head of the Kupaswamy Naidu Memorial Hospital

Tryck KTH, TS- Tryck & Kopiering
Tel. 08- 790 7633

ANLÄGGNING OCH MILJÖ