

# **Impacts of increased urban demand for water on livelihood resilience in Chennai's peri-urban areas**

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## **Abstract**

Reliable access to good quality water is crucially important to the livelihoods of people regardless of whether they live in rural, peri-urban and urban areas of India. Water is required for a whole range of domestic, productive, environmental and cultural uses and as such, limited access can have a major negative impact on livelihoods, on the economy of an area and on levels of poverty and indebtedness. Rapid urbanisation in developing countries and associated rapidly increasing demand for water is putting increasing pressures on the areas that supply this water. In the case of Chennai, sources of urban water supply are located both in the peri-urban and more distant rural areas.

Urban demand for water in southern India has been increasing at an alarming rate at exactly the same time that, in peri-urban and rural areas, there has been a rapid increase in the intensification of agricultural water use as a result of increased irrigation and improved rainfed farming. The net result is that water resources are being overexploited throughout the region, but the rate of overexploitation appears to have been accelerated in areas that have also been exporting water to urban areas such as Chennai. Findings presented in this paper indicate clearly that the increases in Chennai's demand for water has contributed to a major reduction in the availability of water for domestic, agricultural and other uses in the two representative peri-urban villages that were the focus of detailed survey work.

Although many other factors came into play, it is clear also that the deteriorating water status of these villages has contributed to major changes in the livelihoods of the different social groups in the villages with some groups emerging as distinct winners and others clear losers. Winners have included farmers with water to sell to Chennai Metro Water Board and social groups that are able to make best use of livelihood opportunities provided by urbanisation. It was found that ease of access to the urban areas and/or the corridors of development leading to the Chennai metropolitan area was an important factor in this regard. Findings from the surveys showed that many social groups achieved higher incomes from non-farm or rather urban employment but they did not enjoy many aspects of non-farm work (e.g. the costs of travel, the longer working hours, the irregularity of the employment).

A premise of the study was that high-levels of water transfer from villages to urban areas would lead to conflict. The findings indicated, however, that initial conflicts or resentment to water transfer was fairly short lived as people in the villages accepted the inevitability of this activity and perhaps their own powerlessness to stop it. Finally, the study indicated clearly that the strategy of buying water from farmers' wells to meet Chennai's water demand is unsustainable and, hence, fundamentally flawed. Chennai's demand for water continues to increase in part because of migration from the urban areas but there is no indication of a long-term sustainable strategy emerging for meeting this demand. Until this happens the outlook is rather bleak for the livelihoods

of poorer and more disadvantaged social groups living in Chennai's urban and peri-urban areas and the ever more distant rural areas that are exporting water to Chennai.

## 1 Introduction

All around the world urban growth and rural-urban migration is a dominant demographic trend. This has led to a rapid increase in the population of urban areas and, to a lesser extent, to rural depopulation. The level of urbanisation in developing countries is fast catching up with the developed world and, by 2015, it is estimated that around 60% of the world's population will be living in urban areas. It is also expected that by 2015 there will be 27 cities with a population greater than 10 million (i.e. mega cities). 23 of these mega cities will be in developing countries. As many of these cities are already experiencing major societal, infrastructural and service delivery problems, the outlook for poorer social groups, in particular, is rather bleak unless drastic measures steps are taken.

It is important that the growth of urban areas is not be seen in isolation from processes and trends in surrounding peri-urban and rural areas. Rapid urbanisation is to a large extent the product of high population growth in rural areas. This provides the 'push' factor for rural poor to leave land holdings that have often become sub-divided to the point of no longer being able to support a decent livelihood. There is also the 'pull' factor that is often linked to a perception of towns and cities as a being the route out of rural poverty (i.e. the perception that: 'the streets are paved with gold'). This perception is almost invariably false as the most likely reality is that rural poverty is simply exchanged for urban poverty and a life of squalor in ever-expanding slums.

### Box 1. Population growth and urbanisation in India

India is one of the most densely populated countries in the world. In 1901, the population was 212 million. This is equivalent to a population density of 66 people per km<sup>2</sup> – or looked at another way, 1.5 ha per person. Population density has risen steadily and remorselessly since 1901 to the 2001 estimate of 1027 millions which is equivalent to 324 people per km<sup>2</sup> or 0.3 ha per person. In 1901, around 11% of India's population lived in urban areas and it is estimated that this figure now exceeds 50%.

Whilst the information presented above suggests a gloomy state of affairs, it must be recognised that the urbanisation process can have both positive and negative impacts on rural and peri-urban areas. Cities often act as engines of growth or development and as places where abundant (and cheap) labour come together with capital flows to produce the goods and services upon which economic growth is built. Depending on political viewpoint, this can be seen as inspiring economic growth and change or dispiriting commodification of people within a sweatshop economy. Either way, the demographic trends and driving forces are such that processes of urbanisation appear to be inevitable and irreversible. In the foreseeable future, most people will live urban lives. Hence, the role of development workers and theoreticians must be to ensure that the transition is a smooth, equitable and empowering as possible.

As discussed above, the growth of urban areas is not something that happens in isolation from the rural world. Cities act as huge demand centres for rural and ecological goods and services. The population density of cities means, almost by definition, that a city cannot be self-sufficient within its own space in terms of sourcing food, water, power and even air (as anyone who has spent time in a large city during a period when the wind doesn't blow will know). Cities can be seen as organisms sucking in nutrients from the surrounding rural hinterland and giving back excreta of all kinds. The ecological footprint of cities as they seek to quench their voracious appetite for resources of all kinds is

huge and many times greater than the area of the city itself. This has always been the way with cities and there is growing evidence that the collapse of many early city-based civilizations can be directly linked to growth that led to the collapse of the resource base and ecology in areas surrounding the city.

There are two extreme views exist of urban-rural dynamics in relation to livelihoods. In one, the cities are seen as engines of growth and places in which rural youth can throw off the restrictions and poverty of rural existence. Thereby, achieving lives that their parents could only have dreamt of. In the converse view, cities are seen as being demonic, sitting like a malign and cancerous growth in the middle of a previously health rural ecology. Sucking in resources and spewing out waste products and broken lives. Of course the reality lies somewhere in between these two extremes. The main issue is how to maximize the benefits and reduce the negative consequences of urbanisation. As such, the big challenge facing society as a whole is to find ways by which the city can live in balance and harmony with its rural hinterland.

**Box 2. Population growth in Tamil Nadu since independence**

Similar to the rest of India, Tamil Nadu has seen huge population growth over the past century. In 1901 the state had a total population of 19 million people. By 2001, the population had risen to 62 million, of whom 44% were urban dwellers. In terms of population density, this gives Tamil Nadu an average of 478 people km<sup>2</sup>, or 0.2 ha per person.

Un-planned growth in cities leads to severe stresses on both the cities themselves and on the rural hinterland that supports them. People living in cities experience severe stress due to the increasing problem of meeting demand for limited resources and services such as land, water, transportation, power and sanitation. This is reflected in the: mushrooming of slums; transport congestion; sickness due to unhygienic sanitation, irregular access to safe water supplies; rising crime rates; and, above all, rising levels of air, water and soil pollution.

The effect of globalization and market liberalization, coupled with deliberate efforts of governments (both Central and State governments) in South Asia to attract foreign investment, have had major impacts on the ecology and environment of peri-urban areas of major cities. The spread of industries, housing colonies, transfer of water from peri-urban villages to cities have had negative impacts on the livelihoods of peri-urban populations. Understanding the impact of urban growth on surrounding peri-urban and rural areas is crucial to identifying policies that can mitigate the negative effects of urbanisation. Key questions include: How does urbanisation impact on rural, peri-urban and urban livelihoods? To what extent are the net effects positive or negative? What is the scope for mitigating the negative impacts of urbanisation on, in particular, the livelihoods of poorer social groups in rural, peri-urban and urban areas?

**Box 3. Chennai's demand for water**

Chennai has seen the same growth dynamics as the rest of the country with population growth averaging an amazing 24% per decade since 1901 and peaking at 65% in the 1940s. This has seen Chennai (then Madras) grow from a town of 230 thousand people in 1901 to one of over 7 million today. Taking an average per-capita demand of 150l per person per day (which means actual access to less than 100 when leaks etc. are taken into account) this implies a domestic demand for water in the city of around 400 Mcum per year.

This paper seeks to answer these questions within the specific context of Chennai city, and with a particular focus on the transfer of water from the rural hinterland into the city. We do this by looking in

detail at the impacts of transport of water from rural villages into the city, and considering the extent to which these villages are affected socially, economically and environmentally. The basic premise of this study is that the water transport from peri-urban area to cities has affected rural livelihoods, in part by shifting water use out of agriculture and into municipal water supply. Although selling water provided a source of income for many farmers, the question remains as to whether this provides adequate compensation for the change in livelihoods that has been experienced by the wider population.

## **2 Methodology**

### **2.1 Study area**

Given that the natural resource being studied was water, it made sense to use hydrological boundaries as the largest scale boundaries for this study. Therefore, the two basins which supply Chennai with most of its water, namely the A-K basin and Palar basin, were taken as the meta-level for analysis (see Figure 1). In 2004, a meso-level survey was conducted in 23 villages and 41 villages in the Palar and A-K river basins respectively. In the meso-level survey, the study team tried to capture general information through group interviews. A third level of analysis was a micro-level survey in one village from each basin, during which a detailed study of poverty and livelihoods was carried out. The two selected villages were Palayaseevaram and Magaral villages from Palar and A-K basins respectively (See Figure 1). In these two villages, a detailed household survey was conducted during the period 2004-05. The findings presented in this paper are primarily from the micro-level surveys.

**Figure 1. Map of Chennai showing AK and Palar basins and location of study villages**

### 2.1.1 Magaral village

Magaral is located beside the Kosathalaiyar river at a distance of 43 km from Chennai city. People commonly refer to the village as *Metro Water Magaral* as a consequence the large number of wells in the village area that are used as a source of water supply for Chennai. Based on a 2002 survey, the total population of the village is 1637 and there are 458 households. Demographic information relating to this village is presented in Table 1.

Caste groups	Magaral Village		
	Male	Female	Total
SC	399	372	771
ST	101	99	200
BC	343	315	658
OC	5	3	8
Total	848	789	1637

**Table 1. 2002 population and caste statistics for Magaral village**

Land value on the roadside is relatively high compared to interior lands and the value of this land has been increasing rapidly in recent years. Roadside land sold at Rs.75,000 per ha in 1990 and can now be sold for Rs.500,000 per ha.

The official total irrigable land is 145 hectares, dry land is 205 hectares, and poromboke (common land or government land) is 203 hectares. Traditionally the irrigated area in this village was triple cropped with paddy rice being the most important crop followed by groundnuts. However, the irrigated cropped area has been declining for some time as a result of water scarcity. In 1999-2000 season, the area under a the first paddy crop was 98 ha, followed by 105 ha and 54 ha in the second and third seasons. But by 2003-2004 the totals in the first and second season had fallen to 45 ha and 32 ha respectively, and there was no third cultivation. Total gross irrigated area in 1999-2000 was 459 hectares but in 2003-2004 it had dropped drastically to 185 hectares.

The village has a number of tanks, but these have not been used for many years, and wells have emerged as the most important source of irrigation water. Initially open wells were constructed but as groundwater levels have fallen only borewells are being constructed. In 1980, there were 110 wells of which 50 were open wells in the depth range of 6-10 m and 60 bore wells in the depth range of 20-24 m. At present there are no functioning open wells but there are 127 bore wells in the depth range of 37-41 m most of which have been sunk during the last few years. However, of these 127 bore wells, approximately half yield either no water or a very limited supply.

### 2.1.2 Palayaseevaram village

Palayaseevaram village is located on the side of the Palar river at a distance of 50 km from Chennai city on the Chengalpattu – Kancheepuram road. The total population of the village is 2447 (as per 2001 census) and there are 1174 households. The split between men, women and caste groups is shown in Table 2.

<b>Palayaseevaram village</b>			
<b>Caste</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>
SC	837	828	1665
ST	4	2	6
BC	354	407	761
OC	9	6	15
<b>Total</b>	<b>1204</b>	<b>1243</b>	<b>2447</b>

**Table 2. 2001 population and caste statistics for Palayaseevaram village**

The village has 482 ha of irrigable land, 585 ha of dry land; and 432 ha of poromboke land. Land value on the roadside in this village also is disproportionately high compared to value of interior lands. Roadside land that was worth for around Rs125,000 per ha two decades ago, now sells for around Rs1,250,000 per ha.

There is a sugar factory in the village which has occupied 28 ha of prime irrigated land which historically had been irrigated using water from a spring. Since the sugar factory started operating, water flow from the spring has ceased and a total command area of 56 ha is no longer irrigated.

In 1980, there were 71 wells (24 wells in wet lands and 47 in dry lands) and depths were in the range 7-8 m. Now there are 150 wells with depths in the range 18-30 m. Out of these, 50 are borewells and the rest are open wells. But most of these wells and bore wells are either dry or supply only limited volumes of water. At present only 20 only wells are in use.

### **3 Status of water supplies in the study villages**

#### **3.1 Tanks and other water bodies**

There are three large tanks in the Magaral village area and 14 small tanks or ponds that were used by villagers for non-irrigation purposes such as washing. At present, the three large tanks are in a poor state of repair. Weirs and sluices are damaged and the tank beds and foreshore areas have been encroached and/or are being used as locations for digging brick pits. None of the tanks are being used as a source of irrigation water.

Palayaseevaram has seven tanks of various sizes, one spring channel that is defunct and nine small tanks or ponds that have never been used as a source of water for irrigation. Similar to Magaral, all the tanks and water bodies have fallen into a state of disrepair and, in the case of Palayaseevaram, inflows to the tanks and water bodies have also reduced in recent years.

#### **3.2 Domestic water in Magaral and Palayaseevaram**

Table 3 presents the findings of a survey of use of domestic water sources in the study villages that was carried out in 2005. This survey showed tremendous improvements in the water supply infrastructure over the period 1985 to 2005 as the majority of households switched from accessing water from village wells to street taps. However, these figures mask the fact that there has been a dramatic deterioration in access to adequate quantities of safe water. In 2000, Magaral's water supply was continuous whereas Palayaseevaram's supply was for five hours per day. By 2004 the situation

was completely different. Magaral's supply was for two hours per day and Palayaseevaram's supply is for only an hour per day. The result in the case of Magaral was that villagers were compelled to illegally tap water from the Chennai Metro Boards's pipeline to the Tamaraiakkam and Poondi well fields.

	Magaral		Palayaseevaram	
	1985	2005	1985	2005
Street taps	0	311	16	445
House tap connection	0	70	0	99
Hand pumps	2	0	13	0
Common well and other wells	378	0	491	0
Other sources	0	0	9	1
Not applicable	1	0	16	0
Total	381	381	545	545

**Table 3. No. of households accessing domestic water from different water sources**

### 3.3 Status of groundwater in the study villages

In recent years, there has been a continuous decline of groundwater table in the study villages. Round-the-clock pumping of groundwater, primarily to supply water to Chennai, has contributed to a growing gap between extraction and recharge. Table 4 gives an indication of the extent groundwater table decline over time in the study villages. A total of 90 bore wells and open wells have been constructed in Magaral village since 1985. Of these, 64 were constructed to a depth greater than 25 m. More worrying is that during the same period 69 wells have been reported to have failed. The pattern of groundwater depletion in Palayaseevaram is somewhat different as a result of geological formations that act as a major constraint on groundwater development. In Palayaseevaram, successful construction of deep wells is more difficult than in Magaral. The stunning fact is, however, that 21 of the 23 wells constructed in Palayaseevaram during the period 1985 – 2004 have failed.

Table 5 presents information on all the wells in Magaral and Palayaseevaram. This table shows that there are fewer wells in use in Palayaseevaram as compared to Magaral and that, in both villages, the tendency is for shallower wells to have failed.

Depth range (m)	Magaral village		Palayaseevaram	
	Wells and bores installed since 1985	Wells and bores failed since 1985	Wells and bores installed since 1985	Wells and bores failed since 1985
<10	0	4	17	18
10-15	4	10	4	2
15-25	22	20	1	0
>25	64	35	1	1
Total	90	69	23	21

**Table 4. Depth and status of wells constructed during period 1985-2004**

Depth range (m)	Magaral			Palayaseevaram		
	Total no. of wells and bores	Total no. of wells and bores in-use	No. of wells and bores not-in use	Total no. of wells and bores	Total no. of wells and bores in-use	No. of wells and bores non-in-use
<10	7	0	7	37	14	23
10-15	12	0	12	4	2	2
15-25	27	7	20	1	1	0
>25	71	34	37	1	0	1
Total	117	41	76	43	17	26

**Table 5. Depth and status of all the well in the study villages**

### 3.4 Cultivation status

In both villages, agricultural activities have declined quite drastically in the past couple of decades. FAs mentioned earlier, Magaral was well known for being able to produce three paddy crops per year and for paddy yields that used to be amongst the highest in the State at around 6.5 tonne per ha. In 1980, gross cropped area under paddy, groundnut and pulses were 350 ha. But in the year 2004, only in 12 ha of land paddy and in 40 ha groundnut, pulses and vegetables were cultivated. Palayaseevaram on the other hand was well known for sugarcane cultivation which was grown in addition to paddy. In both villages, these water intensive crops were cultivated throughout the year. The present status, however is pathetic. In Palayaseevaram, the 2004 village agricultural records are blank with no entry. As per 2002 records, area under paddy was 6 ha and area under sugarcane was 4 ha. The rest of the lands were left fallow because of water scarcity.



## **4 History of water transport from study villages**

### **4.1 Magaral village**

In 1969, 10 borewells were constructed by the Chennai Metro Water Board on common land near to roadside to provide a source of water supply for Chennai city and the nearby industries. By the year 2000, nine out of ten bore wells had failed and purchase of water from farmers became an important alternative source of supply. However, of the many farmers' borewells that were used to supply Chennai in 2000, only 10 were supplying water in 2005. All the others had ceased supply due to decline in the water table. In addition to farmers' wells, 4 borewells were constructed in 2000 by the Tamil Nadu Water Supply and Drainage Board (TWAD) to supply water to Tiruninravur town. By 2005, two of the TWAD borewells had failed. One borewell was constructed in 2001 to supply water to Nadugudhu Panchayat. The Magaral Village Panchayat has been asking the Tiruninravur town Panchayat to share the water tax collected with Magaral Panchayat since 2002-03 but Tiruninravur Town Panchayat has rejected the proposal.

Sources of conflict can be summarised as follows:

- Continuous pumping of groundwater to supply Chennai for more than 35 years has reduced the groundwater availability considerably in the village even for drinking. Agriculture has also been badly hit due to water scarcity;
- Decline in agriculture has resulted in agricultural labourers having to migrate in search of alternative sources of income.

The construction borewells in Magaral and pipelines to supply Chennai was carried out under a UNDP programme. At the time, the Chennai Metro Water officials said that the purchased water was used only for drinking purposes in Chennai but, in reality, it was used mainly for industries located in the northern part of Chennai. Since the water supply in the village was abundant, farmers did not object to transfer of water to Chennai. But the severe drought in 1983 changed farmers' calculations and views. Water in all the village's irrigation tanks and openwells dried up. This prompted farmers to install borewells with a view to saving the standing paddy crops. But the government thought that if farmers used groundwater for irrigation by digging borewells, it would reduce the yields of 10 government borewells which were supplying drinking water to Chennai. Therefore, the then ruling government in the State (AIADMK) issued Ordinance 5 of 1983, Madras and Chengalpattu Groundwater (Regulation). The ordinance had the following components: (i) it prohibited use of groundwater for irrigation and other agricultural and horticultural operations and, (ii) it introduced a licencing system that required water users to apply and pay for licence that would only be valid for a maximum of 60 days.

The Farmers' Association took up this issue to the court immediately. The judge stayed the ordinance and said that, without any fee and without any time limit farmers could be permitted extract groundwater but only for agriculture. The judge stated also that selling water to tanker-trucks was prohibited. Therefore, after the court order, the Magaral farmers started digging borewells and extracting groundwater in a massive way. Thirty-three farmers were selling water to Chennai Metro Water Board in 2000, but by June 2004 only 19 farmers were able to sell water. This number was reduced to only 10 farmers in 2005. Interestingly, although the Court Order prohibits sale of groundwater, the Metro Water officials are compelling farmers to sell water, which is in complete violation of the Court ruling. Indeed, the Tamil Nadu Groundwater Regulation Act 1987 bans extraction and sale of water from 300 notified villages but this Act is violated by the Metro Water Board officials. At present, there is mixed response to selling water to Metro Water among farmers. Though the agricultural activities have declined there is not much conflict on this issue in this village

because people have been engaging in alternate livelihood activities such as cattle rearing and urban employment. On the whole, it appears that people are still better-off despite the damage to agriculture and local ecology. We shall discuss this issue in more detail in later sections.

#### **4.2 Palayaseevaram village**

Originally, it was planned that water would be pumped from the Palar riverbed to supply water to adjoining areas of the Chennai city such as Alandur, Pallavaram, Chrompet, Tambaram, Anakaputhur, Pammal, Chithilapakkam and Vandalur Zoo. The people of Palayaseevaram opposed this move on the grounds that it would affect the groundwater availability in the region. A memorandum was submitted to the District Collector and the matter was taken up with the then Chief Minister, Mr. Karunanidhi. He took a decision which was in favour of Chennai city and he sought the support of the village who eventually gave their consent for the extraction to take place. Work started in 1972 with the TWAD constructing 11 wells in the Palar riverbed that were designed to extract water from the riverbed aquifer. The estimated water yield at the headworks was 4.9 mld but actual water availability was much less than this figure. For the past 5 years, supply of water from these wells has reduced drastically. Six additional wells were constructed in the year 2004 on the other side of the river, which is part of the village called Pullambakkam / Thirumukkodal. Substantial illegal sand mining in the riverbed much beyond permissible limits has been reported to be the main reason for the steady reduction of water supply in wells.

It should be noted that the Chennai Metro Water Board wanted to buy water from the farmers of Palayaseevaram but the TWAD Board objected to this proposal. Their argument was they already had a substantial stake in the village as early-comers who had already constructed 11 wells. Therefore, the farmers of this village were requested not to sell water.

Sources of conflict can be summarised as follows:

- Continuous pumping of groundwater from the river bed has reduced groundwater availability in the village even for drinking. Agriculture has been badly hit due to water scarcity
- Illegal sand mining has exacerbated the problem of over-extraction by reducing the potential yield of the riverbed aquifer
- During 2003-04 large volumes of water were purchased from the village and transported to Chennai in tankers.
- The sugar mill constructed in the village is both a major user of water and source of effluents. It is believed that the factory is the primary cause of the drying up of a spring.

As a result of water shortages, several petitions and memorandums were sent to the government. And a group of NGOs organized a series of demonstrations. The NGOs also organized a public hearing on the issue of illegal sand mining in Chennai which attracted considerable attention from civil society and the media. The jurists, which included some judges such as Justice V.R. Krishna Iyer condemned severely the illegal sand mining and suggested that the Government appoint a committee to look into the details of damage done to the riverbed and to suggest ways to protect it. Despite these moves, the current situation is one of passive struggle. People of the village are absorbing the shocks to their livelihoods that have resulted from water depletion. Many have left the village for urban employment, others have sold their lands and many more are planning to sell their lands. If there are no open or active conflict, it is because:

- The village is located on the main corridor linked to Chennai and, hence, there is easy access to the metropolis;

- The very powerful sugar mill lobby having high political connections and, as a result, are able to threaten people;
- There has been a rapid growth of non-farm employment in activities such as: construction, garment manufacture, petty business, illegal sand mining and transport;
- The non-availability of farm labourers who find more gainful employment in non-farm activities.

## 5 Changing occupational characteristics

Table 6 compares the number of people in various types of employment in 2005 with the situation in 1985. It can be seen that, although the absolute number of people involved in agriculture in Magaral has increased, the overall importance of agriculture as a source of income has declined as the growing population has become increasingly involved in non-agricultural activities. Interesting additional observations, that can be made with regard to the findings in this table, include:

Type of occupation	Magaral			Palayaseevaram		
	Past	Present	Present/ Past (%)	Past	Present	Present/ Past (%)
Cultivators	71	70	98	87	39	45
Landless agricultural labourers	442	510	115	445	324	73
Total Agricultural	443	580	131	532	363	68
Govt. employees	14	20	143	52	62	119
Business	5	25	500	21	81	386
Industries and transport	7	39	557	7	132	1886
Other workers*	14	61	436	115	338	294
Livestock	2	11	550	4	23	575
Total non-agricultural	42	156	371	199	636	320
Studying	162	382	236	240	598	249
Children below 3 years	182	166	91	351	200	57
House work	76	181	238	65	233	358
Unemployed	Not available	71	---	2	284	14200
Sick, retired and old age	Not available	95	----	Not available	133	---

**Table 6. Changing occupational characteristics of population in the study villages**

- Both villages are severely affected due to over-exploitation of water resources but there is a major difference in occupational characteristics between Palayaseevaram and Magaral villages. In Magaral agriculture continues to be the major occupation whereas in Palayaseevaram agriculture as an occupation has reduced in importance. The main reasons for this difference are the location of the villages and the different hydrogeological conditions. Palayaseevaram is located close to the national highway and is well connected by road and train. Since there are major towns on both sides of the village and since the Chennai city is also easily accessible, people find it easy to commute and seek employment elsewhere. In contrast, Magaral is not well connected by road, which makes it difficult for people to commute.

\* Other workers include urban casual labourers, brick workers, artisans, construction workers, weavers, stone workers, sand mining and all other forms of non-farm casual work

- Another notable feature, which indicates decline in the importance of agricultural employment, is the increasing number of women reporting housework as their major occupation at present as compared two decades ago. For instance in Palayaseevaram, 65 women reported housework as their major occupation in 1985 and this number has gone up to 233 in 2005. In Magaral, this figure has gone up from 76 to 181.
- Similarly, there is a large increase in the number of people reporting to be unemployed in both villages. Unemployment did not exist in either village two decades ago.

## 6 Earnings from agricultural and non-agricultural employment

Table 7 shows that, in general in the study villages, people earn more from non-agricultural occupations than agricultural occupations. The exceptions are the cases of scheduled castes and scheduled tribes who appear to earn less from non-agricultural occupations. As might be expected, regardless of occupation, scheduled caste and scheduled tribes earn much less than other castes.

Caste Particulars	Magaral			Palayaseevaram		
	No. of households	Av. agricultural income (Rs)	Av. non-agricultural income (Rs)	No. of households	Av. agricultural income (Rs)	Av. non-agricultural income (Rs)
Scheduled Caste	181	9,250	10,709	352	3,069	20,467
Scheduled Tribe	52	12,631	2,515	1	0	18,000
Backward Castes	146	10,547	20,692	187	4,101	24,530
Other Castes	2	3,700	52,500	5	0	52,104
All Castes	381	10,180	13,636	545	3,389	22,147

**Table 7. Average agricultural and non-agricultural annual income in the study villages**

## 7 Peoples' perception about livelihood status

A series of subjective questions were asked with a view to obtaining information on perceptions of economic status, educational status, health conditions and access to basic infrastructure such as housing, electricity and telephones. The results of this survey are summarised in Table 8. Observations that can be drawn from this survey include:

- There is a big difference in perceptions of economic status in the two villages. While nearly one-fourth of the people of Magaral confirm that their families are better-off, over 45% of respondents reported that their caste groups and village (as a whole) are worse-off compared to 20 years ago. In fact, only 11% of the people reported that the village as a whole is better off compared to 20 years ago. In contrast in Palayaseevaram, while one-fourth of the population feel that the economic status of their families are worse-off, a good number of them feel that various caste groups and village as a whole have done better economically.

- There is a significant difference in SC perceptions between the two villages. A vast majority in Magaral feel that the economic condition of their families, caste groups and village as a whole has worsened. However, in Palayaseevaram, at least one-fourth of the families feel that they are better off.
- Interestingly, among the BC community (i.e. the land owning community) one gets the opposite view. In Magaral more people feel better off compared to Palayaseevaram. Perhaps this is because of the better water availability in Magaral for agriculture at least until recent times.
- While many people feel that their families' economic status has worsened, they feel that the economic status of their caste group and village as a whole have done much better.

Village/ Caste groups	Family			Caste			Village			Total
	Better	Same	Worse	Better	Same	Worse	Better	Same	Worse	
<b>SC</b>										
Magaral	19	62	100	3	78	100	5	73	103	181
Palayaseevaram	83	120	149	63	194	95	161	134	57	352
<b>ST</b>										
Magaral	8	10	34	0	18	34	0	18	34	52
Palayaseevaram	1	0	0	1	0	0	1	0	0	1
<b>BC</b>										
Magaral	71	34	41	35	31	80	38	72	36	146
Palayaseevaram	52	60	75	71	35	81	71	79	37	187
<b>OC</b>										
Magaral	1	1	0	1	1	0	0	2	0	2
Palayaseevaram	3	1	1	1	2	2	2	0	3	5
<b>Total</b>										
Magaral	99	107	175	39	177	165	43	165	173	381
	26%	28%	46%	10%	47%	43%	11%	43%	45%	100%
Palayaseevaram	139	181	225	136	277	132	235	213	97	545
	25%	33%	41%	25%	51%	24%	43%	39%	18%	100%

**Table 8. Peoples' perception about economic status of family, their caste and village compared to what existed 20 years ago**

When asked about the status of family health and education compared to 20 years ago, some categorical answers were given. By and large the general perception of the people of all castes is that educational status of the family has improved, while family health condition have deteriorated (see Table 9). When people were asked to give their perceptions with regard to the environmental status of the village as a whole, a vast majority in both villages reported that it has worsened compared to 20 years ago.

Village/Caste groups	Health status of the family			Educational status of the family			Environmental status of the Village			Total
	Better	Same	Worse	Better	Same	Worse	Better	Same	Worse	
<b>SC</b>										
Magaral	103	72	6	115	61	5	15	52	114	181
Palayaseevaram	148	119	85	272	62	18	7	34	311	352
<b>ST</b>										
Magaral	32	18	2	41	7	4	1	20	31	52
Palayaseevaram	0	1	0	1	0	0	0	1	0	1
<b>BC</b>										
Magaral	52	83	11	116	29	1	5	51	90	146
Palayaseevaram	52	82	53	122	55	10	2	6	179	187
<b>OC</b>										
Magaral	1	1	0	1	1	0	0	1	1	2
Palayaseevaram	3	2	0	3	1	1	0	0	5	5
<b>Total</b>										
Magaral	188	174	19	273	98	10	21	124	236	381
	49%	46%	5%	72%	26%	3%	6%	33%	62%	100%
Palayaseevaram	203	204	138	398	118	29	9	41	495	545
	37%	37%	25%	73%	22%	5%	2%	8%	91%	100%

**Table. 9 Peoples' perception about family health, educational status and environmental status compared what existed 20 years ago**

A general perception of the people in both villages is that alcohol consumption either remains same or has worsened compared to 20 years ago (see Table 10). But among the SC population the feeling is that the alcohol consumption has reduced in the last 20 years ago.

Village/Caste groups	Alcohol consumption in the family			Alcohol consumption in the Village			Total
	Better	Same	Worse	Better	Same	Worse	
<b>SC</b>							
Magaral	65	96	20	11	132	38	181
Palayaseevaram	149	140	63	51	84	217	352
<b>ST</b>							
Magaral	14	32	6	0	39	13	52
Palayaseevaram	1	0	0	0	0	1	1
<b>BC</b>							
Magaral	58	77	11	6	126	14	146
Palayaseevaram	83	74	30	32	52	103	187
<b>OC</b>							
Magaral	1	1	0	0	2	0	2
Palayaseevaram	1	3	1	0	1	4	5
<b>Total</b>							
Magaral	138	206	37	17	299	65	381
	39%	54%	10%	4%	78%	17%	100%
Palayaseevaram	234	217	94	83	137	325	545
	43%	40%	17%	15%	25%	60%	100%

**Table 10. Peoples' perception about alcohol consumption in the family and in the village compared what existed 20 years ago**

Table 11 presents the findings from a survey based on another set of indicators that considered changing housing conditions and access to electricity and telephones. An obvious improvement in all of these indicators can be seen across all caste groups. For instance, among the SC population, the number of thatched house roofs has reduced from 475 to 261 and the number of tiled houses and concrete roofed houses has increased. The number of SC households having access to electricity has gone up from 51 to 458. While none among the SC had access to a telephone 20 years ago, 6 families had had telephones installed by 2005.

Facilities	Scheduled caste		Scheduled Tribe		Backward Castes		Other Castes		Total	
	Past	Present	Past	Present	Past	Present	Past	Present	Past	Present
Thatched roof	475	261	52	42	180	92	1	1	708	396
Tiled roof	30	63	1	4	100	93	2	1	133	161
Concrete roof	8	73	0	6	31	124	2	5	41	208
Group houses	19	129	0	0	1	5	0	0	20	134
Electricity	51	458	7	52	145	305	1	7	204	822
Telephone	0	6	0	0	1	28	0	2	1	36

**Table 11. Access to better housing, electricity and telephone compared to 20 years ago (total for both the study villages)**

Caste group	Magaral			Palayaseevaram			NA	Total
	Yes	No	Total	Yes	No	Total		
SC	81	100	181	153	198		1	352
ST	18	34	52	1	0	0	0	1
Backward Caste	97	49	146	78	101	6	1	186
Others	1	1	2	3	3	0	0	6
<b>Total</b>	197	184	381	235	298	10	2	545

Note: NA – Not Available

**Table 12. Overall living conditions: Are you better off compared to your father's time?**

Respondents were also asked whether they were feeling better-off compared to their fathers' time. This question was asked with the objective of obtaining peoples' perception whether overall living conditions in the village had declined or improved over time. In Magaral village, there was an even split in the response (see Table 12). Whereas in Palayaseevaram, a majority responded in the negative saying that they were worse-off compared to their fathers' time. In both villages, a majority of SC people expressed the opinion that they were currently worse-off compared to their fathers' time. It should be noted that this social group have a high-level of dependency on wage employment in urban areas. Interestingly, the general perception of landless labourers was that agricultural wage employment was much better compared to non-farm work. The reason given was that, despite the wages in non-farm activities being slightly better, working hours in agricultural work are relatively low and there is no need to travel long distances to and from work. Also in agricultural work, food is often provided along with the cash wage and, after the agricultural work is finished, labourers are able to look after their domestic chores and take care of their children and livestock. Labourers in non-agricultural employment often have to leave their village early in the morning and return late in the evening. Many others have to stay in the urban areas and only return home once a week. In either

case, they have to spend a substantial amount of money on transport and food. Furthermore, non-farm employment is quite irregular.

Caste Particulars	Magaral			Palayaseevaram		
	No. of households	Av. agricultural assets	Av. non-agricultural assets	No. of households	Av. agricultural assets	Av. non-agricultural assets
Scheduled Caste	181	814	25,829	352	32,321	32,971
Scheduled Tribe	52	962	28,744	1	0	5,000
Backward Castes	146	3,42,186	1,46,106	187	46,120	1,14,796
Other Castes	2	595,250	68,000	5	0	95,400
<b>All people</b>	<b>381</b>	<b>134,769</b>	<b>72,539</b>	<b>545</b>	<b>36,837</b>	<b>61,569</b>

**Table. 13 Caste-wise agricultural and non-agricultural assets (Rs)**

Yet another set of indicators were used to assess levels of agricultural and non-agricultural assets. As might be expected in a typical peri-urban village, the average value of non-agricultural assets owned per household is higher than the value of agricultural assets (see Table 13). However, differences were observed across various caste groups. In Magaral for instance, the average value of the non-agricultural assets of SC and ST households was much higher than agricultural assets. Whereas, in Palayaseevaram, there was hardly any difference between the average value of agricultural and non-agricultural assets owned by SC respondents. Among the land owning communities (BC) in Magaral, the value of agricultural assets was much higher compared to non-agricultural assets. This indicated that agriculture has remained as the major occupation of this group. Whereas in Palayaseevaram, the indications were that agriculture is an occupation in steep decline.

Caste Particulars	Magaral			Palayaseevaram		
	No. of households	Av. liability	Av. net asset	No. of households	Av. liability	Av. net asset
Scheduled Caste	181	12,175	14,469	352	10,403	54,890
Scheduled Tribe	52	9,552	20,154	1	50,000	-45,000
Backward Castes	146	25,000	4,30,840	187	33,032	1,28,123
Other Castes	2	57,452	6,38,250	5	50,000	45,400
<b>All Castes</b>	<b>381</b>	<b>16,969</b>	<b>1,78,074</b>	<b>545</b>	<b>18,603</b>	<b>79,747</b>

**Table 14. Caste-wise average net assets (Gross assets minus gross liabilities) in the selected villages**

It is notable that in Palayaseevaram where agriculture has been in steep decline that the SC population seems to be better off compared to Magaral in so far as assets are concerned. Relative to Magaral, the average net assets (total assets minus total liabilities) of the SC population in



Palayaseevaram is about four times higher (see Table 14). This can be attributed to the higher level of mobility of people for urban employment. It was believed also that many SC households in Palayaseevaram were engaged in lucrative, but illegal, sand-mining activities. On the other hand, landowners seem to be still better off in Magaral compared Palayaseevaram in terms of net assets ownership, perhaps because of the better land values which are linked to the relatively better groundwater availability.

Although the overall importance of agriculture as an occupation is on the decline in Magaral and has virtually been wiped out in Palayaseevaram, the data presented in this section gives an impression that there has been an increase in prosperity in the study villages compared two decades ago. Let us see who has prospered and factors which have contributed to their prosperity:

- Most of those who have had access to good groundwater have prospered. Historically, this class of farmers have benefited from profitable agriculture and, during the last three decades, from water sales.
- Some of the well-to-do farmers, or rather members of their households, have gained access to good non-farm employment in the Chennai city. Their remittances have made a major difference to family incomes
- The SC community by and large in Palayaseevaram village and to some extent in Magaral seem to be better off. This can be attributed in part to illegal sand mining from the Palar river. Furthermore, Palayaseevaram village is on the main corridor to and hence well connected to the city of Chennai. Since the SC community (mostly landless) is relatively mobile, members of this social group have been able to earn better incomes as compared to communities who are less mobile.
- All communities have benefited to some extent from proximity to Chennai and improved transport links. Amongst other benefits has improved access to better education and health care facilities .

## **8 The myth of prosperity, adaptive strategies and sustainability of livelihoods**

A series of questions relating to poverty and livelihoods were posed in the Introduction of this paper. As a result of the survey findings, it possible to further elaborate the questions as follows:

1. To what extent have water sales affected agriculture in peri-urban villages? Also, as overexploitation of water resources is a trend right across the region, to what extent do trends in water supply and demand differ in peri-urban areas as opposed to rural areas? Equally important, are communities in peri-urban areas better or less able to cope with the affects of over-exploitation of water resources when compared to communities in rural areas?
2. To what extent do fast-changing lifestyles in peri-urban villages contribute to increased demands for water and other services?
3. Have water-related changes resulted in prosperity or deprivation in peri-urban villages? Do the majority feel better-off or worse-off due to the spread of cities?

The first set of questions are important if the extent of water extraction for urban areas is a large relative to water availability in the villages. Therefore, it is necessary to consider the scale of water transfers from the study villages relative to demand and use by domestic and agricultural users within the village boundaries. In the 2000 and 2004, around 11 Mcum and 1 Mcum of water was exported

from Magaral. The area of paddy that could have been irrigated with this water would have been 348 ha and 115 ha. The lower level of water transfer in 2004 can be explained by falling groundwater levels and associated well failure. However, it is clear from the above statistics that water sales from Magaral village have been significant and that they have had a destabilizing affect on agricultural. However, as areas under irrigation have also been declining in rural areas, it can be argued that water sales have only accelerated a trend that can be found throughout the region.

The second and third sets of questions are highly relevant because many village-level respondents indicated that they feel better off as compared to two decades ago. As the survey questions were highly subjective, it is likely that respondents are putting a relatively high value on access to goods and services that are perceived to be an integral part of urban lives and livelihoods. As such respondents possibly put a fairly low value on the costs of accessing these goods and services and in particular increased expenditure on various items such as health, education, clothing, transport and social functions such as marriages. The indications are that a large majority find it difficult to match income with the increased demands of their households. It is also clear the environmental degradation is an increasingly important in terms of livelihoods and quality of live. Declining water tables have affected the reliability of domestic water supplies and environmental pollution has affected health standards. What's more, the existing village institutions like Panchayat have become increasingly powerless and unable to compete with powerful urban institutions such as the Chennai Metro Water Board. While water rights for urban populations are often negotiated collectively by the municipal service providers, rural water rights are often taken for granted. The case studies presented here illustrate the fact that urban institutions effectively ignored the rights and demands of these villages. This makes living in these villages even more uncertain, insecure and difficult, besides making mockery of village-level institutions.

Name of the Village	Particulars regarding	Only non-farm employment dependent households	Only farm dependent employment households	Both farm and non-farm dependent employment households	Total
<b>Magaral</b>	No. of households	80	205	96	381
	Average yearly income /hh	36,488	14,437	33,280	23,815
<b>Palayaseevaram</b>	No. of households	297	46	185	528
	Average yearly income /hh	29,039	10,970	25,989	26,396

**Table 15. Adaptive strategies and sustainability of livelihoods**

Sustainability of livelihoods depends upon access to natural resources (land and water), access to gainful employment and secure income. The adaptive strategies of people to declining groundwater conditions and declining agriculture include a shift to non-farm employment, selling of land, migration to the city, illegal sand mining, dairy farming and sheep rearing. Average annual incomes of those who have successfully shifted to gainful non-farm employment are quite high compared to those who entirely depend upon agriculture (see Table 15). But important questions that remain include: To what extent are these non-farm jobs are regular? and Can everyone get access to non-farm employment and therefore get relieved from poverty? Not all are fortunate to get access to non-farm

jobs because access to non-farm jobs depends upon factors such as skills, education, capacity to commute, capacity to communicate and so forth. A majority of people in villages seem to lack these qualities and as result they run the risk of being unemployed.

As stated in the Introduction, it is often regarded that 'cities are the engines of growth/development'. This view is based on a long-term development paradigm that puts a high weighting on economic growth. It is indeed important to understand and analyse whether this view takes full account of the livelihood needs of all social groups within rural, peri-urban and urban populations. Results presented in this paper indicate that economic growth and the process urbanisation results in a situation whereby some social groups are distinct winners but others are losers. City expansion results in an increased demand for resources in terms of land and water. As discussed earlier, these resources are absorbed by cities to the gain of some groups but to the detriment of others.

Increasing population, declining agricultural activities and ecological and environmental degradation compels people to migrate to cities. This in turn results in stress on urban infrastructure and increased demands for water and land. In order to cope with this pressure the city continues to expand in an unplanned manner and in a process goes on indefinitely. Thereby contributing to a vicious circle of urban and peri-urban conflicts and stress. The key issues include: how to break this vicious circle? and what might be the role of government and civil society and stakeholders such a process?

## **9 Analytical summary and conclusions**

Mass poverty in India is characterized by lack of purchasing power and malnutrition and unfulfillment of all basic necessities of life. Since independence, policies of all successive governments both at the Centre and State levels have been oriented towards poverty eradication. But poverty is still a dreadful menace which threatens India's progress. So what has gone wrong with India's policies? Let us take the specific case of peri-urban villages in Chennai.

Peri-urban villages are subjected to the same stresses as rural villages. However, by being located in the hinterland of an urban area, peri-urban villages are subjected to additional stresses but they also benefit from opportunities that are not as readily available to rural villages. Government policies tend to be city-centered and instead of attacking poverty in peri-urban areas they often exacerbate it. The social groups, that are most affected, are the landless and, those who depend heavily upon agriculture for their livelihood. In the absence of deliberate government efforts to create alternate livelihood options in peri-urban villages, people try to obtain non-farm employment. However much non-farm employment is irregular and transitory. As is often the case in such situations of rapid change, female-headed households are the most vulnerable and the most likely to be exploited.

Finally, the analysis attempted in this short paper brings out the following points:

- Export of water from peri-urban areas to urban areas has contributed significantly to lowering of groundwater tables and a deterioration in the functionality of surface-water bodies such as village tanks and ponds. Hence export of water to urban areas has contributed to the indebtedness many farmers who have seen their investments in irrigation fail.
- The decline in the importance of agriculture in peri-urban areas has had a knock-on effect on the many social groups that traditionally have relied on agriculture as a source of employment (e.g. labourers). The net result is that landless agricultural labourers and marginal farmers migrate to urban areas for want of employment. This creates problems in the urban areas and increases the vulnerability of this social group.

- While some social groups have gained from water sales a majority have been suffering due to lack of assured and gainful employment and from increasingly unreliable domestic water supplies.
- Findings presented in the paper indicate that a large number of people feel better off compared to what they were two decades ago. These tend to be those that have been able to take full advantage of the opportunities that are provided by nearby urban areas.
- The most important question therefore is: what is the enabling environment that is needed to support effective diversification of livelihood strategies? Abilities to adapt depends upon several factors such as education, transport net work, skill acquisition and so on. What concrete efforts are taken by the government to create this enabling environment?
- This is precisely the point where consideration must be given to improved planning of water-related service delivery in rural, peri-urban and urban areas and multi-stakeholder participation in planning processes. The aim being to create stakeholder platforms that identify solutions to problems from which both urban and peri-urban areas could benefit (i.e. win-win situations!).

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