# CHAPTER 9

# WATER RESOURCES MANAGEMENT AND URBAN ENVIRONMENT

## WATER RESOURCES MANAGEMENT

Water resources are crucial for the future development of the Union Territory of Pondicherry. Despite the National Water Policy of 1987 and the draft policy of 2002, Pondicherry like many other states and Union Territories does not have a rational water policy. The water resources of the Union Territory continue to be undervalued and overused without regard to current costs and future requirements, as indicated in this chapter. There is also increasing water pollution due to urbanisation and industrialisation of the Union Territory.

The Union Territory of Pondicherry consists of four constituent regions – Pondicherry, Karaikal, Mahe and Yanam. Although all the four are coastal areas, the water resources issues in each of these regions are different because the use pattern varies from region to region. The focus of the discussion in this chapter will be on the Pondicherry region because it is the largest of the constituent regions and is already facing serious problems of management.

### Pondicherry Region

The Pondicherry region is supposed to have plentiful water resources because of good rainfall. The annual rainfall of about 1250 mm in about 50 rainy days is received from both the southwest and northeast monsoons. It is well watered by two rivers that originate in Tamil Nadu – the Gingee and the Pennaiyar – which flow into the Bay of Bengal. There are also 84 tanks which have the capacity to store water for irrigation. The region has substantial quantities of groundwater of fairly good quality. However, the over-extraction of ground water, neglect of tanks, and pollution by both sewage and industrial waste has resulted in serious water resource problems in the region. The water resources of the region is an important asset which benefits the whole regional economy – agriculture, industries and households. Proper management including pricing of water is needed to ensure optimal utilisation of this valuable natural endowment for the future well being of the region.

**Water Availability**

The annual rainfall of the region replenishes both the surface and ground water. Estimates of the surface and ground water resources of the Pondicherry region are as follows:

***Surface Water***

Water and Power Consultancy Services (WAPCOS) have estimated the annual runoff as 59.5 million cubic meters (MCM), 41 MCM, and 25 MCM at 50per cent, 75 per cent and 90 per cent dependability. The annual utilisable runoff is estimated to be 49.5 MCM. Much of this runoff can be stored in the 84 tanks that dot the landscape, in particular the Ousteri and Bahour tanks. There are 59 system tanks (i.e. tanks that are connected to river systems) and 25 non-system (rainfed) tanks which irrigate about 6600 hectares of land (Table 9.1). The system tanks receive supply from the two rivers and three major tributaries. Water from the rivers and tributaries are conveyed to the tanks through feeder channels. Apart from the 25 non-system tanks there are nearly 500 ponds that can also hold rainwater (Table 9.2). Over time, there has been neglect of the tanks, and the tank beds have been encroached. By serving as percolation ponds, the tanks also recharge ground water in the command areas. The rehabilitation of the tanks could increase the utilisable surface water potential to some extent. However, we will assume the potential to be 49 MCM.

**Table 9.1**
**Tanks in the Pondicherry Region**

| Sl.No | Commune/ Municipality | System tanks | Non- system tanks | Total number of tanks | Command area in hectares |
|---|---|---|---|---|---|
| 1. | Pondicherry | 2 | 0 | 2 | 230.8 |
| 2. | Ozhukarai | 0 | 2 | 2 | 589.8 |
| 3. | Villianur | 4 | 11 | 15 | 1399.2 |
| 4. | Mannadipet | 19 | 8 | 27 | 1291.7 |
| 5. | Nettapakkam | 11 | 4 | 15 | 976.0 |
| 6. | Bahour | 22 | 0 | 22 | 1784.2 |
| 7. | Ariankuppam | 1 | 0 | 1 | 320.9 |
| | **Total** | **59** | **25** | **84** | **6592.6** |

**Source:** Dhan Foundation (2002).

**Table 9.2**
**Ponds in Pondicherry Region**

| Sl. No. | Name of the taluk | No. of ponds |
|---|---|---|
| 1. | Bahour sub-taluk | 173 |
| 2. | **Pondicherry taluk** | 174 |
| 3. | Villianur sub-taluk | 151 |
| | Total | 498 |

**Source:** Dhan Foundation (2002).

***Ground Water***

Pondicherry is endowed with substantial groundwater resources. The utilisable ground water resources (at 85per cent of the gross recharge potential) is assessed at 151 MCM. Since alluvial aquifers cover about 90 per cent of the Pondicherry region, water level in the wells is fairly shallow ranging between 12 to 14 metres below ground level. In the tank command areas alone there are 70-80 shallow wells and about 1000 tube wells. Overall, there are some 8000 tubewells in the Pondicherry region which extract water for agriculture, industry, and domestic purposes.

***Total Annual Water Availability***

Thus, the total annual availability of water for all uses in the Pondicherry region is 49 MCM (surface water) + 151 MCM (ground water) = 200 MCM per year. Annual per capita availability is roughly 200 cubic metres per person which indicates that the Pondicherry region is an area of water scarcity. It is widely accepted that regions of the world with per capita water availability of less than 1000 cubic metres annually are facing water scarcity. Despite the fact that Pondicherry is believed to have plentiful water resources, it can be categorized to be a region facing water scarcity in relation to demand.

**Water Requirement**

Water is a basic requirement for all sectors of the economy.

***Agricultural Use***

The water requirements in 1995-96 was 174.4 MCM to irrigate 24926 ha. If approximately 22000 hectares of agricultural land remain under irrigation in the year 2020, the water requirement would be 154 MCM, at the same level of water use per hectare. New technologies / crops which are less water intensive would reduce the water

requirement further. As a conservative estimate, we will assume that the water requirement in 2020 will be around 150 MCM in the agricultural sector.

***Industrial Use***

Currently around 50 of the 5000 small, medium and large-scale units use about 8.5 MCM. If there is a doubling of water intensive units by 2020, the requirement could be around 17 MCM. A conservative estimate would be about 20 MCM for the industrial sector.

***Domestic Use***

The total annual domestic requirements for the urban and rural population of the Pondicherry region in 2020 can be estimated as follows:

Urban Requirement 0.80 million @ 100 litres per day = 80.0 million litres per day (mld)

Rural Requirement 0.27 million @ 40 litres per day = 10.8 million litres per day (mld)

Total drinking water requirement = 90.8 MLD

This amount is equivalent to 33 million cubic metres per year or 33 MCM

**Total Requirement**

Thus the total annual water requirement in 2020 is estimated to be:

| | |
|---|---|
| Agricultural Use: | 150 MCM |
| Industrial Use: | 20 MCM |
| Domestic Use: | 33 MCM |
| Total Requirement | 203 MCM |

Other estimates place the requirement much higher at 248 MCM. The total availability of 200 MCM is likely to be fully utilised by 2020, and some of the water currently used in agriculture will have to be diverted for domestic and industrial use. Furthermore, some of the coastal aquifers will have to be artificially recharged to prevent the wall of seawater from moving further in. There will also be a loss of availability of water, particularly for drinking due to the salinity in the ground water in the coastal areas. The Pondicherry region is therefore likely to face serious water shortages in the next two decades.

Thus, the challenge for the next twenty years is to manage the limited water resources more prudently to ensure that sufficient water is available for all the economic sectors. Since the region is fairly small, transport of water over long distances is not needed. Conversion of agricultural land to urban areas such as housing, industries, etc. is taking place at a rapid pace. It should be possible, therefore, to divert the water from irrigation to urban uses without too much difficulty. However, care should be taken that the storage of runoff in the form of tanks and ponds is ensured not only for direct surface use but also for percolation and recharge since groundwater is the major source (75per cent or more) in the region. If the tanks and ponds get filled in to provide land for housing, then their storage potential would be seriously affected and the yield of both surface and ground water will be reduced over the long term. Pollution and seawater intrusion further reduce the availability of fresh water for various uses.

**Water Management Problems in Pondicherry**

***a) Ground Water Depletion***

The excessive extraction for all uses has caused a drop in the water table at a number of locations such as Katterikuppam, Krishnapuram, Sorapet and Ariyur. The declining trend over 10 years is of the order of 15 to 30 metres in the west and about 7 metres in the eastern part of Pondicherry. Urban sprawl has also contributed to lower recharge through reduction of vegetation cover and wetlands. In the agricultural areas, open wells are now replaced by tubewells with submersible pumpsets. Extraction has gone to 35-50 metres and upto 100 metres in some places. A secular decline in the water table levels clearly indicates that use exceeds recharge i.e. there is unsustainable extraction of groundwater. This situation can be reversed only by ensuring either greater storage for recharge or by decreasing the amount abstracted.

***b) Seawater Intrusion***

In a coastal region like Pondicherry, there is the added danger of the ingress of seawater. In 10 to 15 villages, where groundwater has become saline, the villagers are supplied water through tankers from commune headquarters. The shallow aquifers along the coast show signs of salinity. Due to overpumping, there has been a reversal of gradient in certain areas like Kalapet, Muthialpet, Mudaliarpet, Kirumambakkam, and Panithittu.

Salt water has intruded upto a distance of 5 to 7 km from the coast. Any further extraction of groundwater has to be done only beyond this distance.

***c) Industrial Pollution***

Surface water and ground water have been affected by industrial pollution. The Mettupalayam industrial estate has contaminated the surrounding ground water with heavy metals, salts and fluoride. Two borewells have been closed since they were found unfit for drinking and new ones were drilled. Ground water in Pillayarkuppam – Kirumambakkam has also been contaminated with heavy metals. We discuss these issues in more detail under urban environment.

***d) Sewage Pollution***

The amount of sewage generated in Pondicherry is so much that an irrigation canal is acting as a main sewer. 30 per cent of the municipal area does not have a proper drainage system. Most of the sewage reaches the sea without treatment and the urban waterways, tanks and ponds have become severely polluted.

***e) Water Pricing***

Water charge of Rs. 0.50 per cubic metre is levied for domestic connections and Rs. 1.50 per cubic metre for commercial and institutional purposes, these rates are far too low since the cost of supplying water is Rs. 5 per cubic metre. Farmers extracting groundwater do not have to pay for power. This is undesirable both from the view point of energy policy and water policy.

**Other Regions**

All the four regions of the Union Territory are coastal areas with relatively good rainfall and shallow groundwater. There is therefore good potential for rainwater harvesting and undertaking various measures to recharge the ground water. Despite high rainfall, Mahe is facing serious drinking water problems. Mahe is to be supplied drinking water through a dedicated pipeline provided by the Kerala Water Authority but funded by the Union Territory. Rainwater and roof water harvesting systems are to be encouraged in Mahe to augment the local ground water. Karaikal is located in the deltaic region of the Cauvery, and is dependent on the releases of water in the Cauvery. Desilting of ponds and feeder canals is to be undertaken. Yanam is located in the delta of the Godavari and could

receive surplus flows from that river. Water quality monitoring is to be taken up at Mahe and Yanam. The water problems of Karaikal and Yanam are not as serious as those in the Pondicherry region and Mahe.

**Vision For 2020**

Serious water management problems are likely to occur in the Pondicherry region, if adequate remedial measures and policies are not taken up in earnest by the Union Territory.

***1. Regulation of Groundwater***

Virtually every sector of the Pondicherry economy is dependent on the extraction of ground water. Although the region has high rainfall, the utilisation of water has been done without careful consideration of the consequences. Furthermore, the Union Territory is already facing a growing urban demand which has to be balanced against the declining agricultural use for irrigation. These tradeoffs can be managed only if there is proper regulation of ground water extraction. The Union Territory has passed a Ground Water Regulation Act and will set up the administrative machinery for monitoring the extraction and use of ground water. It is also necessary to have a hydrological data centre where the water resources data should be maintained and analyzed, so that the regulatory work is facilitated. Both water quantity and water quality data can be entered into the database. Periodic mapping should be done to study the situation on a continuous basis. The assistance of the Central Ground Water Board could be sought for this purpose. The regulatory authority should issue permits for all pumpsets above a certain horsepower, define well spacing requirements, and ensure that unsustainable use of ground water does not occur.

***2. Water Pricing***

A major cause for the over-extraction is the under-pricing of water. The Union Territory can no longer afford to have low tariff levels of Rs. 0.50 per cubic metre for domestic and Rs. 1.50 per cubic metre for commercial and industrial uses when the cost of supply is of the order of Rs. 5 per cubic metre. Industrial users should be required to bear the full cost of Rs. 5 per cubic metre while some subsidy could be given to domestic users, but the tariff should initially be no less than Rs. 2 per cubic metre which is the rate charged in Tamil Nadu. Ultimately domestic consumers should also pay the full cost of domestic

water supply. Farmers also should be required to pay for the consumption of electricity, so that there is a deterrent against over-extraction of water for irrigation. The flat rate per pumpset levied annually is hardly a disincentive. Revenues from the increased water tariff can also help to make the water sector financially sustainable. It may be necessary to subsidize supply for the urban poor or for rural water supply.

### *3. Water Quality Monitoring*

Discharge of effluents by industries and domestic waste is polluting both surface water and ground water. A water quality monitoring network has to be established to collect relevant data for action to be taken by the Department of Environment. Since seawater intrusion is also occurring along the coast, monitoring of salinity levels is necessary to ensure that the wall of sea water does not move in further. Water quality data from all the four regions needs to be fed to a centralized data centre where the information can be analyzed periodically. Educational institutions like Polytechnics, Colleges and Research Institutions can also be involved in water quality monitoring to supplement the efforts of the Government.

### *4. Conservation Measures:*

Apart from pricing and regulation, the Union Territory should embark on an educational campaign to promote water conservation. T.V., Radio, as well as educational material in schools should focus on conservation. Agriculture, industry, and domestic users can be informed of the steps that they can take to conserve water through harvesting, leak detecting, proper utilisation, and waste reduction. Pollution of water by improper disposal of wastes also contaminates certain sources of fresh water. In the Union Territory, the danger posed by seawater intrusion needs to be highlighted to ensure that further ingress does not occur. Protection of wetlands such as the Kaluveli lake and the Kirumambakkam wetlands is also needed to recharge the ground water and prevent the inward movement of sea water.

### *5. Tank Rehabilitation*

The tanks and ponds of the Pondicherry region have to be protected and rehabilitated not only for irrigation but for recharging the ground water. Tanks should also be treated as ecosystems and restored accordingly. Currently, the Union Territory government is implementing a project costing Rs. 34.73 crore, of which the European Union is

contributing 81per cent, the Union Territory Government 13 per cent and the Water Users Associations 6 per cent. The duration of the project is seven years. The Union Territory Government has to give high priority to this project, since it is crucial for the future well being of both farmers and other users in the Pondicherry region. Close monitoring and evaluation of the project should be undertaken to ensure that the objectives are realised.

### *6. Drinking Water*

Despite the comparative abundance of water in the rural areas, there are 40 no source villages and 90 partially covered (i.e. less than 40 litres per capita per year) villages in the Union Territory. It should be the goal to ensure 100 per cent coverage of all villages and towns in the Union Territory by 2020. The town of Mahe should be provided with dependable water supply by the Kerala Water Authority by 2020. Surface water can be tapped from the tanks and ponds, treated and distributed to decrease the dependence on ground water. The Union Territory Government has formulated a scheme to tap surplus water from the Bahour and Oussudu tanks to augment urban water supply. External assistance can be sought for this scheme and for the underground drainage system for the Pondicherry region mentioned below. All the four regions of the Union Territory should have dependable drinking water supply in terms of both quantity and quality norms by 2020.

### *7. Underground Drainage System*

Domestic sewage is causing pollution of the urban waterways, tanks and ponds of the region. It is important that the urban areas of the region, particularly Pondicherry and Oulgaret municipalities are totally sewered. There should also be proper treatment of the sewage collected, before it is discharged into the sea. The Public Works Department has prepared a proposal for Rs. 124 crore which has been sent to the Ministry of Urban Affairs and Employment, Government of India. The Ministry of Environment and Forests may also be contacted, since substantial funding is available under the National River Action Plan. French assistance may be sought since France has considerable expertise in the water sector, and their connections with Pondicherry can be a major incentive for them to invest in the urban wastewater system. There is an Indo-French Consortium for the Water Sector which can be instrumental in facilitating the process.

In summary, water is an important natural asset of the Union Territory which must be used judiciously to promote development. However, in the long term the unsustainable use of water can hamper the development process. There are already danger signals which must be heeded if the future growth of the Union Territory is to be safeguarded. Limitations may also have to be placed on water intensive crops or industries that may take up large quantities of water. These limitations will require institutional / regulatory measures that will have to weigh the benefits and costs of these activities in terms of water use. In addition, regulatory procedures must be put in place with regard to the extraction of ground water. Proper valuation of water for pricing decisions has to be done. Farmers would have to be charged for power to ensure that water is not pumped out indiscriminately. Steps should also be taken to diminish and control water pollution, and also rehabilitating the tanks. The Union Territory should give serious consideration to formulating a water policy, which should be followed strictly. Thus, prudent management of water resources is a key element in the 2020 Vision for the Union Territory.

**URBAN ENVIRONMENT**

The Union Territory of Pondicherry is predominantly urban. 6.48 lakh of the total population of 9.73 lakh (66.5 per cent) lived in urban areas in 2001. This proportion is likely to increase to 75-80 per cent by the year 2020. Migration takes place not only from the rural areas of Pondicherry to the urban, but also from the adjoining rural areas of Tamil Nadu, swelling the urban population of the Union Territory. There are 5 municipalities in the Union Territory – Pondicherry and Oulgaret in the Pondicherry region, Karaikal, Mahe and Yanam. For administrative purposes, Mahe and Yanam are considered to be totally urban.

**Urban Population**

The growth of the urban population of the Union Territory is shown in the following table.

**Table 9.3**

**Growth of Urban Population of Pondicherry Union Territory1971-2001**

| Year | 1971 | 1981 | 1991 | 2001 |
|---|---|---|---|---|
| Urban Population | 198288 | 316047 | 516985 | 648233 |
| Total Population | 471707 | 604471 | 807785 | 973829 |
| **Per cent of Urban population** | **42.04** | **52.28** | **64** | **66.57** |

**Source:** Census of India (various issues).

It is seen that the urban population is growing at a faster rate than the total population. The urban population of the Union Territory is likely to increase to 8 lakh out of a total population of 10.72 lakh in 2021, if the degree of urbanisation is 75 per cent. Part of this increase of about 1.5 lakh will be due to natural growth and the rest due to migration. In the previous decade (1991-2001), the migration component comprised 25 per cent of the increase. If we assume that the same proportion will be due to migration, this increase will be about 0.4 lakh and the rest (1.1 lakh) due to natural increase. The increase of 1.5 lakh will be distributed among the four constituent regions, but the predominant destination will be the Pondicherry region. Thus, the Pondicherry region has to plan urban services, housing, etc. for an increase of atleast 1 lakh of the urban population by 2020. Furthermore, the backlog in terms of deficiency of services and housing has to be made up. Migration to Karaikal may also increase since the infrastructure facilities are better compared to the adjoining areas of Tamil Nadu.

Nearly 25 per cent of the urban population of the Union Territory live in slums and squatter settlements. There is also a large floating population of migrants who come in daily from adjoining pockets of Tamil Nadu. This problem is exacerbated by having Tamil Nadu enclaves within the geographical boundaries of Pondicherry. These enclaves use the facilities of Pondicherry without contributing resources.

***Urban Area of Pondicherry***

Urban Pondicherry consists of 5 municipalities– Pondicherry and Oulgaret municipalities in the Pondicherry region, Karaikal, Mahe and Yanam. Pondicherry and Oulgaret cover an area of 57.25 sq. km. – 20.64 sq. km. under Pondicherry municipality and 36.6 sq. km. under Oulgaret out of the total area of 293 sq. km. of the Pondicherry region. Two of the Commune Panchayats, Ariankuppam and Villianur are partly urbanised and should be

considered part of the Pondicherry Urban Agglomeration. Karaikal municipality covers an area of 35.2 sq. km. out of a total area of 161 sq. km. Mahe and Yanam are considered to be totally urban with areas of 9 and 20 sq. km. respectively. The pattern and trend of urbanisation differ from region to region.

Urban activities in the Pondicherry region include industrial and commercial development as well as rapidly expanding residential areas. Mahe and Yanam have commercial and residential areas, but little industrial development.

The congestion of housing and road space has led to severe stress on the infrastructural facilities and amenities. Traffic has also increased due to an increase in the number of vehicles. This has led to both congestion and air pollution. The rapid growth of industries in the Pondicherry region has also led to air and water pollution and problems with disposal of hazardous wastes.

Urbanisation has many consequences, but we will focus on three:

(1) **Impact on urban services** – Urban services such as solid waste management, traffic and transport, and drainage facilities are not commensurate with the growing urban population. The deterioration of urban services in turn degrades the quality of the urban environment. Industries have also come up without proper systems for treatment and disposal of wastes, contributing to pollution of air, water and land. The access to urban services is discussed in the chapter on human development.

(2) **Inadequate housing and slums** – Migration from the surrounding rural areas both in Pondicherry and Tamil Nadu leads to urban congestion. Since the poor cannot afford good housing, slums tend to proliferate. Services in slums are even worse than that of the general population.

**(3) Urban governance** – Pondicherry has special problems because some local services are provided by the Union Territory Government rather than the local bodies. Since the 74$^{th}$ Amendment to the Constitution has prescribed that various functions be vested with the urban local bodies, it will be necessary to delegate these functions. Property taxes and other local taxes / user charges would also have to be levied to ensure that the local bodies are financially sustainable and can carry out the functions delegated to them.

## Urban Services

The rapid growth of the Pondicherry region has resulted in increase in the generation of wastes both solid and liquid. When these wastes are not properly disposed, the quality of the environment is degraded.

### a) *Solid Waste Management*

Solid wastes consists of household garbage, industrial / commercial solid wastes, construction debris, and biomedical / hospital wastes.

#### *Household Garbage*

About 190 tonnes per day of Municipal Solid Waste (MSW) is generated in Pondicherry and about 120 tonnes per day in Oulgaret municipality. Wastes are currently dumped in low-lying areas. PASIC, an autonomous public sector corporation has started to produce compost on a small-scale with the household garbage. Proper disposal of all the solid waste is necessary to ensure that it does not pollute the air, water or land or become a public health hazard. MSW is not a serious problem in Karaikal as yet because the per capita waste generation is low and a dumping site is available at Kottucherry. However, it may be a good time to develop a good solid waste system there so that problems do not arise in the future.

#### *Biomedical Wastes*

Nearly 1 ton per month of biomedical waste is generated in the Pondicherry region. Due to non-segregation of wastes, some hospital wastes get mixed up with domestic wastes. 73 per cent of the health care establishments are disposing their wastes within the hospital premises while the rest give the wastes to the municipality. There are several small clinical units and laboratories who dispose their wastes with household wastes, which are dumped in low-lying areas. Biomedical / hospital wastes need to be carefully regulated, so that it does not become a public health problem.

### b) *Sewage and Wastewater*

The amount of sewage generated in Pondicherry is so great that an irrigation canal has become a major sewer, and the local urban tanks and ponds have become severely polluted. 30 per cent of the Pondicherry municipal area remains unsewered. Treatment plants have been set up at Karuvadikuppam and Lawspet. The efficiency of the treatment

plant at Lawspet is not satisfactory. Most of the sewage reaches the sea without treatment, affecting the coastal ecosystem. Stagnation of sewage and drainage has led to severe mosquito problems in Pondicherry. Drains, cess pits, and septic tanks are major locations for the breeding of mosquitoes. An integrated underground sewerage scheme is being planned for the Pondicherry region. Karaikal will also require a sewerage system by 2020.

**c) *Industrial Pollution***

Rapid industrial growth has taken place during the nineties. The Union Territory now has 42 large, 125 medium, and 6388 small-scale units. Most of the units are located in the Pondicherry region and particularly in 4 industrial estates – Mettupalayam (43 per cent), Sedarpet (19 per cent), Thattanchavadi (15 per cent) and Kattukuppam (3 per cent). Since the estates are proximate to residential areas, pollution from the estates affects the quality of the environment in the surrounding region.

i) Mettupalayam, the biggest of the industrial estates has both medium and small-scale industries comprising leather, electrical, chemical, food processing, rubber and plastic units. It does not have a good drainage system or a treatment plant. The untreated effluents form a general drain which combines with the sewage from the nearby residential areas. The effluents are carried into open lands and residential areas during the rainy season. Groundwater in the region is also getting affected. The effluents from the area contain high levels of heavy metals such as chromium, nickel, lead, copper and iron. The industrial solid wastes are also not managed properly.

ii) Sedarapet industrial estate also does not have proper drainage, and effluents drain to the low-lying areas and ultimately to ponds. Water from these ponds is used for agriculture by adjacent villages. Moreover the bird and fish population is affected by the effluents. High sulphate content is reported in the local ground water. Kalapet and Kirumambakkam are other areas affected by industrial pollution. Air pollution from some of the industrial areas is also a cause of concern.

Thus, industrial pollution from the estates and other locations has begun to affect the quality of the air, water, and land and therefore the quality of life of the surrounding

region. Regulatory measures have to be implemented to ensure proper environmental management. Either individual or common effluent treatment plants may be needed. Further growth of industries should take into account the environmental consequences, particularly the use of water as well as the potential for pollution of the air or water or disposal of hazardous wastes. Environment friendly industries can be encouraged in the Pondicherry region. Maintenance of the existing industrial estates also needs to be given priority so that there are proper roads, drainage and water supply. The disposal of toxic wastes is also a matter of concern, following the surreptitious dumping of toxic wastes in Ousteri tank in 1993. Location of toxic waste industries needs to be surveyed and monitored to ensure that these wastes are disposed in an environmentally sound manner.

**d)** ***Roads, Traffic and Transport***

At present 2,398 km of roads are maintained by the PWD, Municipalities and Commune Panchayats, of which 1,970 km (82.15 per cent) are surfaced and 428 km (17.85 per cent) are unsurfaced. Rural roads in the Commune Panchayats account for nearly 50 per cent of the road length in the Union Territory (Table 9.4). The quality of roads has deteriorated significantly in the recent past, becoming a hindering factor for further growth. The focus has to be, therefore, on overcoming existing deficiencies and improving the quality rather than extending the road network.

Efforts are being made to improve the quality of roads. During the Ninth Five Year Plan period, 14 high density traffic intensive urban roads of length 43 km were upgraded. 304 km of district and rural roads were also upgraded. A link road was also strengthened under the Central Road Fund Scheme. The East Coast Road in Pondicherry is to be converted from 2 lanes to 4 lanes.

**Table 9.4**
**Road Length in Union Territory of Pondicherry (2000)**

| Sl.No. | | Surfaced Roads (km) | Unsurfaced Roads (km) | Total |
|---|---|---|---|---|
| 1. | Maintained by PWD | 603 | -- | 603 |
| 2. | Municipalities | 557 | 48 | 605 |
| 3. | Commune Panchayats (Rural) | 810 | 380 | 1190 |
| | **Total** | 1970 | 428 | 2398 |

**Source:** Directorate of Economics and Statistics, Govt.of Pondicherry

Table 9.5 provides data on the road density and motor vehicle density in Pondicherry and other Union Territories and states. It is seen that the road density is much less than in Delhi or Chandigarh but higher than in Tamil Nadu or the all-India average. Since Pondicherry Union Territory is largely urban, there is need to increase the road density in the future to facilitate faster and better communication.

**Table 9.5**

**Road and Motor Vehicle Density in Pondicherry**

| Union Territory | Road density km/000 sq. km | Motor vehicle density per sq.km |
|---|---|---|
| Delhi | 17,961 | 2017.5 |
| Goa | 2,314 | 71.6 |
| Chandigarh | 15,936 | 3948.9 |
| Pondicherry | 4,908 | 259.1 |
| Tamil Nadu | 1,588 | 27.52 |
| All India | 750 | 12.31 |

**Source**: CMIE (2001)

Table 9.6 provides data on the registered motor vehicles in the Union Territory. There are 2,30,255 vehicles in Pondicherry out of which nearly 75 per cent are two wheelers.

**Table 9.6**

**Registered Motor Vehicles in Union Territory of Pondicherry (2000)**

| Sl. No. | Type of Vehicles | 2000 |
|---|---|---|
| 1. | Goods Vehicles:<br>(including three wheelers) | 7,778 |
| 2. | Passenger Vehicles:<br>i) Four wheelers and above<br>a) Buses<br>b) Cars & Station Wagons<br>c) Taxis<br>d) Jeeps<br>ii) Three wheelers<br>iii) Two wheelers | <br><br>3,502<br>42,850<br>1,340<br>3,829<br>4,017<br>1,61,803 |
| 3. | Tractors | 2,105 |
| 4. | Trailers | 1,485 |
| 5. | Others | 1,546 |
| 6. | **Total** | **2,30,255** |

**Source:** Directorate of Economics and Statistics.

It must be noted that the number of registered vehicles is for the Union Territory and not for the urban areas alone. However, a predominant number of passenger vehicles is likely to be operated in the urban area.

It is seen from Table 9.5, however, that like road density, the motor vehicle density is less than in other Union Territories or smaller states but higher than the all-India average. The number of registered motor vehicles is not likely to grow rapidly since Tamil Nadu has imposed an entry tax on vehicles registered in Pondicherry plying in Tamil Nadu. The motor vehicle density is already high on the urban roads of Pondicherry, resulting in both congestion and pollution.

Ambient air quality levels are deteriorating on account of the high density of vehicles, particularly two wheelers. Diesel driven vehicles and tempos are a major source of pollution. Licenses for new tempos have been stopped. Narrow roads and heavy increase in the two-wheeler population make it difficult for buses to ply through all the routes. The congested bus routes are also the cause for traffic accidents.

**Urban Housing and Slums**

The number of occupied houses in the urban areas of Pondicherry is estimated to be about 90,000 units providing housing for 4.5 to 5 lakhs of the population. With an urban population of 6.73 lakh in 2001 and assuming that 30 per cent of the housing stock is below standards, the shortage of housing units is calculated to be about 70,000 units. With an increase in urban population of about 1 lakh by 2020, there will be need for atleast 20,000 to 30,000 units. Thus, the total urban housing requirement by 2020 will be of the order of 100,000 units (including the backlog). The quality of housing and access to services is discussed in the human development chapter.

As Pondicherry has become more and more urbanised, demands on housing have also increased significantly. The housing sector, however, has grown much slower than other service sectors, namely at less than 5 per cent. This is largely due to the shortage of available land for housing purposes. As a result, housing shortages have become significant, mostly in Pondicherry town.

Shortage of housing has resulted in the growth of slums. It was estimated that there were 244 slums in Pondicherry with a population of 1.53 lakh in 1991. The Slum

Clearance Board, moreover, has identified approximately 25,000 homeless families in Pondicherry. This number too is likely to increase even if urban growth slows down unless appropriate steps are taken to encourage the growth of the housing sector.

An associated problem is that of unplanned growth. In order for the government to keep pace with increasing housing demands, many new colonies have emerged without proper planning. Infrastructure is inadequate and basic needs such as sewerage facilities are not up to par.

**Vision For 2020**

The continuing urbanisation of the Union Territory will require institutions and policies to manage the process so that some of the adverse consequences can be mitigated and could be addressed in a systematic manner.

***Urban Waste Management***

Of prime importance is the collection and disposal of solid wastes. The urban local bodies can contract with either private firms or NGOs to collect and transport household wastes to the disposal sites. The current practice of dumping the wastes in low-lying areas should be discontinued. The Supreme Court has ordered that solid wastes must be disposed in an environmentally sound manner. The Union Territory should examine various options – sanitary landfilling, composting, biomethanation etc. and evaluate the technical and economic feasibility of each option. It is also important to protect the wetlands and tanks and not dump refuse in them.

Most states are regulating the disposal of biomedical wastes. The Union Territory should devise a regulatory system and also assist small clinics and laboratories to segregate their wastes and dispose them properly. Industrial solid wastes also have to be regulated and disposed in a secured landfill or disposal site. Hazardous wastes will require special facilities and regulatory procedures.

Liquid wastes – both sewage and industrial wastes are already posing a serious problem in the Pondicherry region. An underground drainage system is required now for Pondicherry and for Karaikal by 2020. Cleaning up the waterways and desilting of the tanks should continue and resources need to be utilized in this regard to improve the

quality of the urban environment. Industrial effluents have to be treated at source and / or in a common effluent treatment facility. The Union Territory should charge for the collection and treatment of sewage and industrial effluents. The sewage treatment plants need to be upgraded so that they meet effluent standards. Sludge from the plants has also to be disposed properly. Burning of sludge and solid waste should be avoided.

***Roads and Transport***

Proposals already exist under the Tenth Five-Year Plan, to upgrade 200 km of state highways and district roads and to make a variety of other road improvements. Also, construction of major and minor bridges has been planned, together totaling an investment of Rs.157.50 crore. Proposals for Rs.109.60 crore have also been put forward under the National Highway and Central Road Fund Schemes. The Union Territory is not contemplating BOT projects since it feels that private sector participation may not be forthcoming. However, it proposes to levy tolls on some by-pass roads.

The Government of Pondicherry may look into the possibility of private sector participation more carefully over the next decade both for construction and maintenance. Private firms may be able to mobilize finance particularly for urban roads. If Pondicherry is to attract tourism and industry, the quality of urban roads has to be substantially improved. In any case, if tolls are to be collected on by-pass roads, it is not clear why the maintenance of urban roads should not be entrusted to private firms. Then the PWD can focus more on district and rural roads, and also on the small towns of the Union Territory.

The main priority should be to rationalise a road transport taxation system in line with that proposed for the country in the Tenth Five-Year Plan. This should be aimed at creating a cost effective transport system and at removing procedural hurdles for private sector participation.

In planning for the future, it is necessary to improve the public transport. Currently, there are only 3,500 buses plying in the Union Territory. Improved transport facilities would reduce levels of air pollution from private vehicles. Privatisation of bus services could also be considered. A separate study of the transport system can be taken up by the Union Territory.

Improvements in roads and the transportation services of Pondicherry are critical for enhancing the quality of life in the Union Territory. Privatisation of both road and public transport need to be assessed in planning for 2020, since it would not be possible for the Union Territory to generate the resources to provide all the necessary services.

***Housing and Slums***

The government will have to take a number of steps to address the problem of housing shortage. Given the government's own projections of housing shortage for the year 2001, it is unlikely that the government can meet these demands on its own. The government should, therefore, focus primarily on low income (and to some extent middle income) housing and slum ugradation and improvement.

The main government actors are the Housing Board and the Slum Clearance Board. Money for housing is made available through both Centrally Sponsored Schemes and the Union Territory Government. At present the Integrated Development of Small and Medium Towns is the main centrally sponsored scheme. This scheme is actually aimed at providing good housing and infrastructural facilities to small and medium towns so that migration to big cities slows down. Though the government will have to continue to give grants-in-aid to the Housing Board, the Housing Board must initiate schemes which retrieve a part of the cost from buyers. There are plans for the Housing Board to set up a Housing Finance Company. The Housing Board must attempt to design houses which are low cost and comfortable so that they serve as a model for the future. It is also possible, moreover, for the Housing Board to move towards joint venture projects in which private companies invest capital as is being done in other states of the country.

The Slum Clearance Board will have to play a much more active role in the future given the growth of slums in Pondicherry. The current focus on slum upgradation and environmental improvements, promoted through the National Slum Developmental Programme, needs to be further emphasized. However, in addition to physical upgradation of slums, efforts must be made to provide economic opportunities for slum dwellers as well.

The wider role of the government in terms of housing has to be that of a facilitator in line with what was envisaged in the National Housing and Habitat Policy, 1998 of the

Government of India. It is neither possible nor desirable for the government alone to meet current and future housing shortages. The government must encourage private participation in housing activities by extending incentives to private developers in the form of loans (from lending agencies), reduction in rates of interest and stamp duty, and simplification of registration procedures without of course compromising urban town planning rules and regulations. This will enable the government to focus on low income housing.

The role of the private sector is most important in terms of middle and high income housing. IT entrepreneurs, for example, will only come to Pondicherry if good housing facilities are available. If the above mentioned incentives are in place, private developers will be more keen to invest in the housing market in Pondicherry. Good, affordable housing will be major boon for service sector professionals keen to come to Pondicherry.

A comprehensive Housing Policy must be formulated for Pondicherry which maps out a new facilitating role for the government and a more active role for the private sector. This housing policy must also move away from an emphasis only on physical construction to housing in terms of residential development. This should be done in a manner which highlights Pondicherry's rich cultural tradition and creates an attractive urban landscape.

***Urban Governance***

Rapid urbanisation requires an institutional set up that can respond to urban concerns and issues in a responsible and integrated manner. The Town and Country Planning Department has to plan for the future of Pondicherry. A high priority would be the preparation of a regional plan for Pondicherry. Similarly a regional plan has to be prepared for the Karaikal region. Infrastructure investments should be made consistent with the Regional Plan. The Town and Country Planning Department should have links with all the line agencies dealing with housing, roads, water and sewer, environment and industries.

The municipalities in the Union Territory should ensure that planning permission has been accorded before providing infrastructural services like water and electricity.

Registration of documents can also be done based on plan approval. Apartment complexes, commercial buildings etc. should have a provision for rainwater harvesting. Recycling of water can be taken up wherever possible.

Heritage is an integral part of the urban fabric of Pondicherry. An inventory of heritage buildings as well as provision for a heritage fund must be made to improve the structures in the historical areas. The protection of heritage is discussed at length in the section on tourism. The Housing and Urban Development policy for Pondicherry must emphasize the rich cultural and historical tradition of the Union Territory.

The 74$^{th}$ Amendment to the Constitution has prescribed that local functions be delegated to the urban local bodies. This is a good opportunity for the Union Territory government to shed some of its functions to the municipalities and the urban commune panchayats. However, a district development plan can be prepared by the Town and Country Planning Department. Local functions such as water supply, sewerage, solid waste management, streets, etc. should be delegated to the urban local bodies. If Pondicherry and Oulgaret municipalities are merged into a single corporation, the new corporation can carry out the local functions envisioned in the Twelfth Schedule.

The quality of the urban environment is dependent on appropriate actions being taken to improve waste management, control industrial pollution, manage the transportation system, facilitate the provision of housing particularly for low income groups, and most important have local institutions that can effectively deliver services. Pondicherry has an excellent opportunity over the next two decades to make the urban areas of the Union Territory livable for local residents and an attractive destination for tourists – Indian and foreign, if appropriate decisions are taken now.