2007

URBAN WATER SUPPLY AND WATER TARIFFS IN UTTAR PRADESH

Prof. Nishith Rai
Dr. Awadhesh Kumar Singh

Regional Center For Urban And Environmental Studies
Lucknow University Campus,
Lucknow.

URBAN WATER SUPPLY AND WATER TARIFFS IN UTTAR PRADESH

The growing population of urban areas and exerting considerable pressure on urban services, Indian cities are not able to supply water services adequately and efficiently. Most urban areas have depleted, polluted and destroyed their local sources of water. Most urban water supply authorities face problems of water deficit. The cost of water production is gradually increasing while the cost recovery is becoming a daunting task. The revenue deficit is gradually increasing and local bodies are facing problem in cost recovery since water is a merit good. They find themselves in different situation for sustaining and maintaining water resources and water supply to consumers. Most of the local bodies in the state of Uttar Pradesh face acute problem of resourcelessness and in absence of rationalized water pricing their problem becomes more chronic. Against this view point, present study purports to review the status of urban water supply and tariff in Uttar Pradesh and suggesting measures for augmenting resources and improving water supply in the state. The report is based on secondary data and pertinent literature collected from internet, published and documented sources. It is hoped that the study will be useful in understanding the dynamics of urban water supply and improving the resource recovery.

Urbanization:

Urbanization is a global phenomenon experienced by developed as well as developing countries. There is migration from villages to town and cities which results in growth of metropolitan cities since they provide multiple avenues, services and amenities viz. education, health care, employment, business and entertainment options, etc. People also migrate for economic opportunities and urban life styles. Though urbanization brings about development in the social, economic and cultural spheres of life but some times it disturbs the ecological system. Rapid and unplanned growth of urban agglomeration generates a series of negative environmental and social effects. Today urban India presents a very pathetic scene. Cities have become a site of rotting garbage, degrading drainage system and shocking night soil removal system. Besides, poor have practically no access to covered toilets and in many towns and cities, the majority have to defecate in the open. The untreated sewage being dumped into the nearest water body leads to health hazards.

India is one of the least urbanized countries in the world because between 1951 and 2001, the level of urbanization increased by 13 percentage points only. However, it has the second largest urban population in the world and more than two thirds of it lives in urban agglomerations. The four mega cities viz., Mumbai, Kolkata, Delhi and Chennai with a population of more than 6 millions each in 2001, account for almost one fourth of population living in cities. As per 2001 census, 285 million population i.e. 27.8 per cent of 1027 million total population of India is residing in 4368 cities and towns in the country, where as in 1991, 25.7 per cent population lived in urban areas. The decadal growth in urban population during 1991-2001 has been 31.2 per cent whereas at the beginning of the 20th century only 10.8 per cent

of total 218 million population of the country resided in cities and towns. The number of million plus cities has increased to 35 in 2001 from 12 in 1981 and 23 in 1991. These 35 million plus cities account for 107.9 million urban population of the country. As per projections of government of India, the urban population of the country in 2011 will be 405.26 million and 553.04 million in 2021. Thus, around one third population is expected to live in urban areas. (Table 1)

Table - 1

Urbanization in India

Year	Percentage of Urban Population	Number of Towns	Total Population (Millions)	Urban Population (Millions)
1901	10.8	1827	238.39	25.85
1911	10.3	1815	252.09	25.95
1921	11.2	1949	251.32	28.09
1931	12.0	2072	278.98	33.46
1941	13.9	2250	318.66	44.16
1951	17.3	2843	361.23	62.44
1961	18.0	2365	439.23	78.13
1971	19.9	2590	548.15	109.11
1981	23.3	3378	159.46	159.56
1991	25.7	3768	846.30	217.61
2001	27.8	4368	1048.15	296.97

Source: Census, 2001

There has been phenomenon growth in the number of towns and urban agglomerations over the period of 1901 to 2001, however, annual exponential growth rate of urban population is low. Even, in the recent, the growth has been reported to be declining. There have been just 2.06 per centage points increase in proportion of urban population to total population during 1991 to 2001.

An analysis of the distribution of urban population by size cartagories reveals that the process of urbanization in India has been large city oriented. This is proved that a high proportion of urban population being concentrated in class I cities, which has gone up systematically over the decades in the last century, the massive increase in proportion of class I cities from 26 per cent in 1901 to 85.20 per cent in 1991 while it declined to 68.67 per cent in 2001, has been attributed to faster growth of large cities. The number of class one cities has grown to 393 in 2001 from 24 in 1901. There has been more than five fold increase in the number of class one cities since 1951 (Table 2).

Table - 2

Number of Towns and Percentage of Urban Population in Different Size Categories

Year	Class I	Class II	Class III	Class IV	Class V	Class VI	Total
1901	24 (26.00)	43 (11.29)	130 (15.64)	391 (20.83)	744 (20.14)	479 (6.10)	1827
1911	23 (27.48)	40 (10.51)	135 (16.4)	364 (19.73)	707 (19.31)	485 (6.57)	1815
1921	29 (29.70)	45 (10.39)	145 (15.92)	370 (18.29)	734 (18.67)	571 (7.03)	1949
1931	35 (31.20)	56 (11.65)	183 (16.8)	434 (18.00)	800 (17.14)	509 (5.21)	2072
1941	49 (38.23)	74 (11.42)	242 (16.35)	498 (15.78)	920 (15.08)	407 (3.14)	2250
1951	76 (44.63)	91 (9.96)	327 (15.72)	608 (13.63)	1124 (12.97)	569 (3.09)	2365
1961	102 (51.42)	129 (11.23)	437 (16.94)	719 (12.77)	711 (6.87)	172 (0.77)	2365
1971	148 (57.24)	173 (10.92)	558 (16.01)	827 (10.94)	623 (4.45)	147 (0.44)	2590
1981	218 (60.37)	270 (11.63)	743 (14.33)	1059)19.54)	758 (3.50)	253 (0.50)	3378
1991	300 (65.20)	345 (10.95)	947 (13.19)	1167 (7.77)	740 (2.60)	197 (0.29)	3768
2001	393 (68.67)	401 (9.67)	1151 (12.23)	1344 (6.84)	888 (2.36)	191 (0.23)	4368

Source: India Infrastructure Report, 2006.

The startling fact is that the proportion of population living in smaller towns has shown declining trend over the period while there is massive growth in population of larger towns. Importantly, growth of population in smaller towns has been reported negative while the growth of population in larger cities and towns has been found massive. During 2001, the high

proportion of urban population to total population has been reported to be in Delhi, Pondicherry, Goa, Chandigarh, Maharastra, Mizoram, Lakshadeep, Tamil Nadu, Karnataka, Gujarat etc. The high rate of growth of urban population during 1991-2001 has been reported high in Dadra & Nagar Haveli (14.59 per cent),, followed by Arunachal Pradesh (7.00 per cent), Andaman & Nicobar (4.14 per cent), Sikkim (4.83 per cent), and Delhi (4.14 per cent).

Uttar Pradesh occupies the central position in the northern India. It is the most populous state in the country. The state witnessed a tremendous growth in its urban population during the last three decades. Between 1971-81 the decadal growth was about 60.62 per cent, the highest in the country. In 1981-91 the growth had been about 38.97 per cent, second after Orissa. As per 2001, every fifth person in the state is residing in urban centres. The total urban population of the state has been raised to be 347 lakh showing an increase of about 39 per cent over the urban population of the state.

Uttar Pradesh is the most populous state in the country which accounts for 16.4 per cent of the country's population. It is also the fourth largest state in geographical area covering 9 per cent of the country's geographical area. The pace of urbanization has been lower in the state. The level of urbanization has been reported lower than most of the other states. In 2001, 20.78 per cent population of the state was found living in urban areas. During 1991-2001, urban population grew by 2.84 per cent per annum (Table 3).

Table - 3

Tends of Urbanization in Uttar Pradesh

Census year	No. of UA's and Towns	Total Urban Population	Percentage of Urban Population	Decadal Growth	Annual Growth
1901	349	5223025	11.20	-	-
1911	350	4720939	10.26	-9.61	-1.01
1921	367	4728727	10.61	0.16	0.02
1931	375	5354962	11.28	13.24	1.24
1941	385	6749767	12.52	26.06	2.31
1951	410	8225068	13.65	21.86	2.31
1961	215	8983900	12.81	9.23	0.88
1971	256	11653740	13.90	29.72	2.60
1981	598	18749979	17.83	60.89	4.76
1991	631	25971891	19.68	38.52	3.26
2001	670	34512624	20.78	32.88	2.84

Source: Census of India, 2001, Uttar Pradesh

As per census, there are 670 towns and cities in the state. Most of the towns and cities are categorized as class IVth and Class IIIrd having population in between 10,000 to 50,000. However, urban population is concentrated in large towns and cities.

During 2002, there were 384 urban local bodies in India. Out of total urban local bodies in India, 107 ULBs were Municipal Corporations, 1443 Municipal Corporations and 2091 Nagar Panchayats. The highest number of local bodies were reported in Tamil Nadu (719) followed by Uttar Pradesh (628), Madhya Pradesh and Maharashtra. In the state of Uttar Pradesh, there are 628 urban local bodies. Out of these, there are 12 Nagar Nigams, 193 Nagar Palika Parishads, and 423 Nagar Panchayats. About forty per cent population lives in Nagar Palika Parishads while 37 per cent population lives Municipal Corporations (Table 4).

Table - 4

Urban Local Bodies in U.P.

Category	Number	Population		Area (sq. km.)
		1991	2001	
Nagar Nigam	12 (1.91)	9401485 (37.75)	1282450 (36.83)	1280.24 (26.85)
Nagar Palika Parisad	193 (30.73)	10711425 (43.01)	13867538 (39.86)	2017.65 (39.26)
Nagar Panchayat	423 (67.36)	4793744 (19.24)	8109423 (23.21)	1741.40 (33.88)
Total	628 (100.00)	34906654 (100.00)	34789411 (100.00)	5139.29 (100.00)

Source: J.S. Mishra, A Quest for Dream Cities, Har Anand Publications, Delhi, 2002

Water Resources:

Historically, civilization in India have largely evolved and developed around water bodies. During the last decades since Independence, India has witnessed phenomenon development of water resources and has largely successfully met the demand of water for many of the diverse uses in the country. Consequently, the country has achieved self sufficiency in food grains. Investments in water related infrastructure in the country have resulted in rapid expansion in the urban energy and industrial sectors. Infrastructure for safe drinking water has been provided to about 85 per cent of India's urban and rural population. However, these remain significant challenges in providing sustainable services, especially for the poor. India's fragile water resources are stressed and depleting, while sectoral demands (including drinking water, industry, agriculture and others) are growing rapidly accordance to urbanization, population increase, rising incomes and industrial growth . In the era of liberalization and globalization, cities and towns are emerging as the centre of growth. Thus, water supply and sanitation could arise due to urbanization. Intersectoral allocations, planning and management of increasingly fragile water resources have emerged as a major challenge due to declining per capita water availability and deteriorating quality of water.

India receives an annual rainfall equivalent of about 4000 billion cubic meters (BCM). This source of water is unevenly distributed both spatially as well as temporarily. Most of the rainfall is confined to monsoon season, from June to September and levels of precipitation vary from 100 mm a year in western Rajasthan to over 9000 mm a year in northeastern

state of Meghalaya. India's rivers carry 90 per cent of water during the period from June-November. Thus, only 10 per cent of the river flow is available during the other six months. The utilizable water resource availability in the country varies from 18417 cubic meters in Brahmaputra valley to as low as 180 cubic meters in the Sabarmati basin. Rajasthan has only one per cent of the country's water resources while Bihar has just five per cent of the water resources. At the Independence India's population was less than 400 million and per capita water availability over 5000 cubic meters per year. Today, the population has grown to over a billion and per capita water availability has fallen to hardly 2000 cubic meters per annum and actual usable quantity is around 1122 cubic meters per annum.

Environmental problems including water quality degradation from agro-chemicals, industrial and domestic pollution, ground water depletion, water logging, soil salinization, siltation, degradation of wastelands, eco system impacts and various health related problems have caused concern to policy makers and administrators. Thus, management of water resources is imperative rather than development of the resources.

Water and Sanitation Programmes

Water supply and sanitation were added to the national agenda during the first five year planning period (1951-56). In 1954, the first national water supply programme was launched as part of the government's health plan. Central and state administration provided equal funding mainly for rural piped water supply schemes, with limited provision for point sources such as wells and boreholes. The Ministry of Water Resources drafted a

National Water Policy in 1987 to guide the planning and development of water resources through out the country. The policy included several recommendations which were subsequently adopted by the states. The recommendations focussed on the need for introducing (i) water resource management and accorded domestic water supply the highest priority; (ii) design standards for ground water structures to protect ground water sources, (iii) water quality monitoring and mapping and (iv) data management and valuation. The policy has been recently revised in 2002 and has accorded primacy to drinking water. The features of the National Policy as under:

1. Drinking water should be a priority in the providing and operation of water supply systems including irrigation systems.
2. Maintenance of existing water resources schemes should be given special attention under these institutional arrangements.
3. A participatory approach should be adopted, and water user associations and local bodies should be involved in related operations. There should also be maintenance training leading to the eventual transfer of management to local bodies and user groups.
4. Private sector participation should be encouraged in planning, development and management to introduce corporate management practices and improve service efficiency.
5. A standardized national information system with a network of data banks and databases, which integrate and strengthen the existing central and state level agencies should be established.
6. Exploitation of ground water resources should be so regulated as not to exceed the recharging possibilities as also to ensure social equity. While states have been asked to formulate state water policies based

on National Water Policy, 2002 within the next two years, some states such as Karnataka, Madhya Pradesh, Orissa, Rajasthan and Tamil Nadu have already drafted state policies based on the new national policy.

Water supply and sanitation were added to the national agenda during the first five year planning (1951-56). Since then successive plan periods have made provisions for strengthening the water supply and sanitation sectors in different ways. From the 8th Plan period (1992-97) onwards, greater efforts were made through reform and restructuring agendas to deal with the problems that had been identified in the sector. The 9th Plan (1997-2002) took this agenda forward by advocating the decentralization of distribution system to local bodies and the private sector including management of capital works. The focus on private sector participation in construction, financing and maintenance of water supply in urban and rural areas was strengthened. The emphasis was given on demand driven participatory efforts to set up and manage the water supply systems. The 10th Plan (2002-07) envisages 100 per cent coverage of rural and urban areas through institutional reforms, efficient operation, management, and equitable distribution. The plan recognizes the challenge of providing water supply and sanitation to a rapidly providing urban population and lays emphasis on urban water supply and sanitation by highlighting the problems and suggesting measures for alleviating them. Some of the measures advocated are restructuring of the water bodies and other local institutions in water supply and achieving sustainability through effective operation and maintenance (Table 5).

Table - 5

Milestones in Water Supply and Sanitation in India

Years	Focus
1951-56 (First Five year Plan)	Water Supply and Sanitation adopted to national agenda
1954	First National Water Supply and Sanitation Programme was launched as part of Health Plan
1956-61 (Second Five Year Plan)	Funds were provided to develop and strengthen State Public Health Engineering Department
1961-66 (Third Five Year Plan)	Problem villages were identified as those without drinking water source within distance of 1.6 km.
1968	Priority given to villages with acute scarcity of drinking water
1972-73	Accelerated Rural Water Supply Programme (ARWSP) was launched.
1975	ARWSP was replaced by 20 Points Minimum Needs Programme aimed at full rural coverage
1977-78	ARWSP reintroduced
1980-85 (Sixth Five Year Plan)	Importance given to WSS sector increased

1980-81	Low Cost Sanitation Scheme initiated for urban areas
1985	Rural Water Supply and Sanitation was handed over to Department of Rural Development under Ministry of Agriculture
1986	Central Rural Sanitation Programme and National Technology Mission launched
1987	National Water Policy drafted by the Ministry of Water Resources with emphasis on domestic water supply, protection of ground water sources and water quality monitoring and mapping
1991	National Technology Mission was renamed as Rajeev Gandhi National Drinking Water Mission aimed at covering rural areas cost effectively before the end of the 8th Five Year Plan
1992-97 (Eighth Five Year Plan)	Problems with sector identified and reform agenda put forward. Emphasis on treating water as commodity, privatization, local bodies for operation and maintenance, proper linkages between water supply and sanitation.
1993-94	Mega city scheme for five metro cities
1997-2002 (Ninth Five Year Plan)	Provisions were made for 100 per cent water supply coverage in urban and rural areas, 60 per cent sanitation in urban areas and 30 per cent in rural areas, emphasis on decentralization and privatization.
2002	National Water Policy priority was given for providing drinking water to humans and animals, regular monitoring of surface and ground water quality, regulating to use of groundwater.

2002-07 (Tenth Five Year Plan)	Provisions were made for 100 per cent coverage of urban and rural population, managing water as commodity, change in the role of government from direct service provider to facilitator leading to privatization. Focus was given not only on investment requirements, but on institutional re-structuring, better services, people's participation, and managerial improvement also.

Source: Ganesh Pangare et. al. Springs of Life, Academic Foundation, Delhi, 2006

The First Five Year Plan periods were characterized by relatively negligible investments in water supply and sanitation. Since the beginning of the Sixth Five Year Plan (1980-85) and the launch of the International Drinking Water Supply and Sanitation Decade, India has substantially increased its commitment to the water supply and sanitation sector. The Ninth Plan provided for Rs. 395 billion as outlay from the water supply and sanitation sector, which works out to about 4.6 per cent of the plan outlay. Over the various plan periods, there has however been a shift in the ratio of UWSS to RWSS. Up-to the Fifth Plan (1974-1979), investments in UWSS were relatively higher. This changed since Annual Plan of 1979-90, and the RWSS sector was the focus of increasing investments. However, during the Ninth Plan, the gap has narrowed. (Table - 6).

Table - 6

Plan Investment in Water Supply and Sanitation in India

Plan Period	Outlays (Rs. million)	Percentage of Total Plan outlay	UWSS Plan Outlays (Rs. million)	Percentage of Urban Outlay
I (1951-56)	490	1.46	430	1.28
II (1956-61)	720	1.07	440	0.65
III (1961-66)	1057	1.23	897.7	1.04
Annual Plan (1966-69)	1064	1.60	430	0.18
IV (1969-74)	4370	2.75	2820	1.77
V (1974-79)	10306	2.62	5494.4	1.40
Annual Plan (1979-80)	4302	3.43	1979.3	1.58
VI (1980-85)	40470	4.15	17666.8	1.81
VII (1985-90)	65224	3.62	29657.5	1.65

Annual Plan (1990-92)	44272	3.23	17213.7	1.26
VIII (1992-97)	167110	3.85	59822.8	1.38
IX (1997-2002)	395380	4.60	186240	2.17

Source: Planning Commission, Government of India, Delhi, 2002

The projections made by the Ministry of Urban Development for the Tenth Plan period for urban water supply and sanitation are Rs. 283 billion and Rs. 494 billion, respectively. Investments necessary for urban water supply by 2015 and 2025 will be Rs. 96 billion and Rs. 258 billion, respectively and for urban sanitation, the figures will be Rs. 208 billion and Rs. 539 billion by 2015 and 2025, respectively.

The institutional responsibility for supplying water in urban areas is divided between centre and the states. The Central Government's role is to formulate policies, frame guidelines, monitor and finance the services, while the state governments plan, design, and execute water supply projects through local bodies such as municipal boards and water agencies. The Ministry of Urban Development is the main central level Department responsible for India's urban infrastructure. The CPHEEO, created in 1953 is the technical wing of the Ministry. The state Government allocates water resources, generates funds and frames policies. The urban local body is responsible for distribution and supply through piped networks,

augmentation of water supplies, purification, operation and maintenance and collection of water charges. The urban local bodies are classified into Municipal Corporations, Nagar Palika Parishads and Nagar Panchayats, depending on the population size.

Government of Uttar Pradesh constituted a Corporation by the name of Uttar Pradesh Jal Nigam in the year 1975 which came into existence with effect from 18 June, 1975. Its area of operation extends to whole of Uttar Pradesh excluding cantonment areas under an Act called as Uttar Pradesh Water Supply & Sewerage Act, 1975. The basic objective of creating this Corporation is development and regulation of water supply and sewerage services and for matters connected therewith. Piped water supply facility has been provided in 623 towns and in 28923 habitations through 1037 schemes. Interestingly, till the time of independence piped water supply was provided in 28 towns of the state, but now all the towns are covered under piped water supply networks.

The Accelerated Urban Water Supply Programme was initiated in 1993-94 to provide safe and adequate water supply facilities for towns having population less than 20,000 as per 1991 census. Under the scheme, the Centre matches the funds provided by the state government which includes a 5 per cent town contribution. In special cases, 100 percent finance is available as the central share. The AUWSP is being administered through the CPHEEO at the Centre. Until March, 2002, 223 projects for 654 towns were approved at an estimated cost of Rs. 817.70 crores. An amount of Rs. 337.37 crores has been released by the centre to the states for the

implementation of these projects. About 240 schemes have been completed with 98 being in the state of Uttar Pradesh.

The Mega city scheme was initiated in 1994-95 and is applicable to Mumbai, Kolkata, Chennai, Bangalore and Hyderabad. The sharing of grants between central and the state governments is th ratio of 25:25 and the balance 50 per cent is expected to be met by financing institutions and the capital markets. Borrowing could be by the implementing agencies. The implementing agency provides project related finance for urban infrastructure including water supply, sewerage, drainage, sanitation, city transport networks, land development, slum improvement and solid waste management.

Revolving funds for water supply and sewerage schemes in Uttar Pradesh is shown in Table 7.

Table - 7

Revolving Funds for Water Supply and Sewerage Schemes in U.P.

Year	Funds Released (Rs. in Lakh)	Funds Received by U.P. Jal Nigam (Rs. in lakh)	Expenditure (Rs. in lakh)
2000-01	6327.15	6174.91	2566.18
2001-02	2623.26	2938.94	1444.48
2002-03	3448.43	3290.00	1944.68
2004-05	2515.47	2515.17	4762.46
2005-06	3508.17	3508.17	667.64

Source: U.P. Jal Nigam, Lucknow

After discontinuance of grant-in-aid to urban local bodies as a consequence of 74th Constitutional Amendment Act, state government started giving interest free loan from revolving fund to various urban local bodies on their request for implementation of water supply and sewerage schemes in urban areas. Importantly, Accelerated Urban Water Supply Programme was started in 1994-95 and is being implemented in phases in 425 towns having population less than 20,000 as per 1991 census. Out of these 425 towns, Government of India has sanctioned schemes for 390 towns costing Rs. 308.30 crore and remaining 35 towns are already having adequate water supply system. Out of 390 schemes 202 schemes have been commissioned till date and remaining 188 are under construction which are scheduled to be completed by March 2007 (Table 8).

Table -8

Accelerated Urban Water Supply Programme in U.P.

(As on April 2005)

Phase	Number of Towns included	Estimated Cost of the Phase (Rs. in lakh)	Expenditure (Rs. in lakh)	Towns where Projects have been Commissioned
1.	41	2833.20	3129.21	41
2.	26	2213.33	2208.49	26
3.	25	1949.23	2069.38	25
4.	41	3483.93	3390.16	41
5.	57	4505.01	3804.94	54

6.	65	5150.14	2941.68	14
7.	126	9807.95	2782.54	1
8.	2	84.01	17.00	-
9.	7	802.95	-	-
Total	390	30829.75	20423.40	202

Source: U.P. Jal Nigam, Lucknow

The state government included urban water supply under district plan for the first time in 2003-04 and a budget of Rs. 1119.65 lakh was sanctioned which was subsequently increased to Rs. 2000.00 lakhs and Rs. 5966.68 lakh in 2004-05 and 2005-06. For the year 2006-07, the proposed outlay is Rs. 5967 lakh. After 74th Constitutional Amendment Act, the practice of giving aid to urban local bodies for implementing water supply schemes was discontinued. However, from the year 2005-06 the programme of urban water supply has been revised and budget provision of Rs. 2680 lakh has been made for water supply in various towns of the state. For the year 2006-07, the proposed outlay is Rs. 1000.00 lakh. Government of India has launched National Urban Renewal Mission in December 2005 for providing infrastructure facilities in towns having population of more than one million. Under this programme, 7 towns viz., Kanpur, Agra, Varanasi, Allahabad, Lucknow, Meerut, and Mathura have been included. The City Development Plans of a few cities have already been approved while Detailed Projects Reports are being prepared for availing financial support from Central Government. Integrated Infrastructure Development for Small and Medium Towns has also been implemented in the state in order to improve the urban infrastructure, including water supply and sanitation.

Water Supply:

In 1991 census data claimed that nearly two thirds of the households in India had access to safe drinking water. The current figures indicate that around 92 per cent of the urban population is taking water from a protected source. However, there are states like Assam, Kerala, Mizoram, Orissa and Sikkim who get inadequate water supply coverage (Table 9).

Table - 9

Water Supply in Urban Areas of India

Level of Water Supply Population Provided with water supply (%)	States
I. High (more than 85%)	Andhra Pradesh, Arunachal Pradesh, Delhi, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, M.P., Maharashtra, Meghalaya, Nagaland, Rajasthan, U.P., West Bengal
II.Medium (75-85%)	Bihar, Goa, Manipur, Punjab, Tamil Nadu, Tripura
III. Low (less than 75%)	Assam, Kerala, Mizoram, Orissa, Sikkim
Per capita water availability	

High (over 160 lpcd)	Delhi, Jammu & Kashmir, Maharashtra, Orissa, U.P., Chandigarh, Pondicherry
Medium (Between 120-160 lpcd)	Andhra Pradesh, Bihar, Gujarat, West Bengal
Low (less than 120 lpcd)	Haryana, Karnataka, Punjab, Rajasthan, Tamil Nadu, Kerala, M.P., Manipur, Tripura

In terms of per capita availability of drinking water in class I cities across the states, water shortage was reported to be more acute in eastern coastal states, while the larger states were fairly able to meet the 125 litres per capita per day requirement. In terms of per capita availability across the metropolitan cities, availability of water varied from 75.8 lpcd in Chennai to 307 lpcd in Kanpur during 1995. An assessment of the water supply status in class I cities indicate that about 37 per cent of them received less than 100 lpcd water supply followed by 31 per cent between 100-145 lpcd and rest 32 per cent more than 145 lpcd in 1995. The water shortage appears to be more acute in the class I cities of Haryana, Andhra Pradesh, Rajasthan and Tamil Nadu, whereas 55.6 to 68.4 per cent of these cities received less than 100 lpcd of water. The situation is much more grim in case of the increasing class II towns. The analysis indicates that 21 to 30 per cent of the class II towns in the states of Tamil Nadu, Rajasthan and Gujarat received less than 40 lpcd of water during 1995. Out of 3931 cities in the country about 77 cities have 100 per cent water supply coverage. The per capita water supply ranges from as low as 9 lpcd in Tuticorin to as high as 584 lpcd in Triuvannamalai. Similarly around 203 of the class II towns have low per capita supplies of less than 100 lpcd. About 40 per cent of households living

in slums are without access to safe drinking water. Water is generally available for only two to eight house a day in most cities. Even, in many towns and cities like Bhavnagar in Gujarat, Agartala in Tripura, Chennai in Tamil Nadu, water is supplied for a few hours every 2 to 3 days in a week. The availability of safe drinking water in metropolitan cities vary from 58 lpcd in Visakhapattanam to 264 lpcd in Lucknow (Table - 10).

Table - 10

Availability of Safe Drinking Water in Metropolitan Cities of India

City	Per capita Water Supply (lpcd)
Greater Mumbai	170
Kolkata	100
Delhi	155
Chennai	65
Bangalore	100
Hyderabad	90
Ahmadabad	116
Pune	220
Surat	180
Kanpur	118
Jaipur	97
Lucknow	264
Nagpur	130
Patna	107
Patna	107

Indore	80
Vadodara	135
Bhopal	130
Coimbatore	109
Ludhiana	140
Kochi	129
Visakhapattanam	58
Agra	134
Varanasi	103
Madurai	72
Meerut	185
Nashik	140
Jabalpur	95
Allahabad	111

Source: Rajya Sabha Unstarred Question, dated 12-7-2004

A Study of NIUA (2005) indicated that coverage by water supply is higher in metropolitan cities (98 per cent) than in Class I cities (91 per cent) and class II towns (89 per cent). Importantly, supply for non-domestic uses exceeded one fourth of the total sample. The average per capita supply in the sampled urban centres was reported to be 150 litres per capita per day with a range of 20 lpcd to 308 lpcd. The metropolitan cities have almost one and a half times the average supply available in class I cities and over the times the average per capita domestic supply in the sampled urban centres was reported to be 128 lpcd with a range of 14 to 258 lpcd. Interestingly,

water supply situation in urban India is distressing with almost 46 per cent the sampled urban centres are not getting adequate water supply as per CPHEEO norms. An estimation of the demand supply gap in water supply indicates that an additional 1466 mld of water would be required to bridge the gap between demand and supply in the 137 urban centres that do not get adequate water.

As it has been already mentioned that 623 towns of the Uttar Pradesh have been covered with piped water supply but still a very large number of towns either do not have water supply as per the prescribed standards or they lack in terms of storage capacity or distribution system. Mega cities (3) receive 150 lpcd, towns with population more than one lakh (34) were sewerage system exists 135 lpcd, and other towns (586) get 70 lpcd water supply. The status of availability of water supply against the norms is shown in Table 11.

Table - 11

Demand and Supply Position of Water in Metro Cities (2001)

City	Demand (million ltr./day)	Supply (million ltr./day	Supply against demand (%)
Delhi	3830	880	22.97
Lucknow	560	120	21.42
Kokata	2258	690	30.55
Jaipur	349	313	89.68

Bhopal	335	70	20.89
Indore	318	134	42.13
Vishakhapattanam	305	146	47.87
Mumbai	4000	1030	25.75
Hyderabad	956	186	19.45
Chennai	1894	105	5.54
Bangalore	840	135	16.07

Source: NIUA, 2001, Delhi.

Water supply in municipal Corporations in U.P. is shown in table 12.

Table -12

Water Supply in Municipal Corporations of U.P. (As on April 2005)

City/Local Body	Population (2001 census)	Standard Rate of Water Supply as per norms (lpcd)	Water Available (mld)	No. of Tube - wells	Distribution Network (km.)	No. of Hand pumps
Agra	1275134	135	270	55	690	4094
Aligarh	669087	135	75.08	58	502	1970
Allahabad	135	217.00	147	1090	2505	1018092
Bareilly	718092	135	119.81	40	50350	1250

Kanpur	2532138	150	367.0	127	13150	8470
Lucknow	2207340	150	440.0	349	1800	4500
Ghaziabad	968521	135	240	202	980	2915
Meerut	1074229	135	163.70	74	960	3551
Varanasi	1400000	150	125.0	113	544	2140
Gorakhpur	622701	135	70.0	55	550	1866
Moradabad	641240	135	85.0	34	285.0	1275
Jhansi	383644	135	100.50	12	320	1882

Source: U.P. Jal Nigam, Lucknow, 2006

The largest distribution network has been reported in Lucknow, Kanpur, Meerut and Allahabad where as the availability of water has been reported higher in Lucknow, Kanpur, Agra, and Allahabad.

The status of water supply in India is shown in table 13.

Table - 13

Status of Water Supply in India

Indicator	Metropolitan cities	Class I cities	Class II cities	Total
Population '000	71429	59123	10473	141025
Coverage of Pop.(%)	98	91	89	94
Per capita Supply (lpcd)	182	124	83	150
Per Capita domestic supply	148	106	69	128

(lpcd)				
% of Urban Centres	50	40	52	46
Water PC Supply below city norms	68	76	79	77
% of Supply required to be added to reach city norms	5	25	42	13
Out of water required to reach city norms (mld)	1397	2209	439	4045
Unaccounted for water (%)	24	16	11	21
% of Connection (metered)	60	52	39	55
Staff per 1000 connections	14.5	7.9	6.8	10.9
Cost Recovery (%)	70	55	44	65
Revenue Receipts (Rs. per kl.)	2.16	1.02	1.21	1.73
Revenue Exp. (Rs. per kl)	3.09	1.88	2.44	2.66
Deficit per kl (Rs.)	-0.93	-0.86	-1.23	-0.93
Revenue Receipt./ per capita	149.43	48.65	39.41	100.55
Revenue Exp. per Capita	214.12	89.40	77.86	153.89
Per capita Deficit (Rs.)	-64.69	-40.75	-38.45	-53.34

Source: NIUA, June, 2005

Table - 14

Water Supply in Cities of U.P.

City/Town	Total Quantity of Water Supplied (mld)	Quantity of water supplied by uses (mld)		Per Capita Supply (lpcd)	Installed Production capacity (mld)	% of utilization Capacity	Average hours of supply per day
		Domestic	Non Domestic				
Kanpur	310	225	85.0	124	350	89	5
Lucknow	410	349	61.5	164	455	90	6
Varanasi	220	198	22.0	191	360	61	8
Agra	250	201	49	217	376	66	8
Aligarh	47	35	12	78	48	97	6
Allahabad	210	181	29	207	230	91	9
Bareilly	80	72	8	107	110	73	8
Etawah	20	18	1	139	24	81	10
Faizabad	22	-	-	127	29	74	6
Ghaziabad	110	-	-	124	120	92	6
Gorakhpur	74	58	16	123	82	90	6
Hapur	14	-	-	70	14	100	4
Jhansi	77	76	1	152	70	110	2
Mathura	27	-	-	67	33	80	3
Meerut	132	-	-	106	150	88	5
Mirzapur	25	24	0.5	119	28	89	5
Moradabad	48	-	-	72	55	87	8
Muzaffarnagar	46	36	10	142	48	96	8
Rae Bareilly	13	11	2	74	15	90	6
Rampur	20	-	-	62	20	89	12
Saharanpur	49	36	13	91	50	98	9
Sitapur	17	-	-	114	22	78	6
Unnao	21	21	-	174	24	88	6

Source: NIUA Survey, 1999.

The per capita water supply ranges in between 83 lpcd in class II towns to 182 lpcd in metropolitan cities while per capita domestic supply ranges in between 69 lpcd in class II towns to 148 lpcd in metropolitan cities. The cost recovery of water supply is in between 44 per cent in class II towns to 70 per cent in metro cities. Thus, there is revenue deficit of Rs. -0.93 per kl. It has been reported higher in class II towns as compared to other urban centres.

Per capita water supply in the cities of Uttar Pradesh is shown in table 14. The per capita water supply ranges in between 48 lpcd in Firozabad to 217 lpcd in Agra. The larger cities like Agra, Lucknow, Kanpur, Varanasi, and Allahabad have larger quantity of water supply while smaller towns get low quantity of water supply. Importantly, installed production capacity (mld) has been reported to be high in Lucknow followed by Agra, Varanasi, Kanpur and Allahabad, however, utilization capacity in these cities for a larger duration of water supply however, actual duration of water supply is observed to be low. Even, the pressure of water supply is found to be low in most of the cities and towns.

The provision of safe drinking water as per stipulated norms and standard in urban areas for towns with piped water supply but without sewerage system is 70 litres per capita daily (lpcd), for cities with piped water supply and existing or planned sewerage system, it is 135 lpcd, for metropolitan and mega cities with piped water supply and sewerage, it is 150 lpcd and for public stand posts it is 40 lpcd. According to the guidelines of

Central Public Health and Environmental Engineering Organization (CPHEED)per capita water supply in class I cities should be in the range of 150 to 200 lpcd, while in reality in all class I cities, it ranges from 50 to 140 lpcd, for below the guidelines. The gap in demand is taken care of by private vendors, who run as unregulated and unorganized water markets. Even, in certain urban centres, people collect rain water for domestic use. They have also installed their endegenous hand pumps and tube-wells for drawing water for different uses. In most cities and towns, the existing systems are not operated and maintained to their full capacity. The capacity utilization has been less than 50 per cent in 40 per cent towns. Even, physical losses are typically high due to leakages. Most of the towns lack treatment facilities and thus, effluents entering the water sources are highly hazardous.

Sources of drinking water is shown in table 15.

Table - 15

Source of Drinking Water in Selected States

State	Tap			Hand Pumps/Tube Wells			Well		
	Census 2001	NSSO 1998	NFHS 1998-99	Census 2001	NSSO 1998	NFHS 1998-99	Census 2001	NSSO 1998	NFHS 1998-99
India	36.7	24.4	38.7	41.2	46.2	39.2	18.2	23.7	18.7
Punjab	33.6	27.6	36.7	64.0	70.6	62.2	0.8	1.7	1.0
Haryana	48.1	37.9	47.1	37.9	45.6	40.1	11.7	16.4	11.8
Rajasthan	35.3	24.8	24.8	32.9	45.6	40.1	11.7	16.4	11.8

Uttar Pradesh	23.7	10.9	13.5	64.1	62.9	72.1	11.6	21.0	12.7
Bihar	3.7	1.5	7.8	82.9	69.7	67.6	12.6	27.7	22.5
Assam	9.2	7.8	11.0	49.6	49.4	49.1	26.7	27.6	29.1
West Bengal	21.4	9.9	25.3	67.1	71.5	64.0	10.0	16.7	9.1
Gujarat	62.3	52.9	70.3	21.8	28.2	14.2	11.7	13.9	10.3
Maharashtra	64.0	55.1	68.0	15.8	19.2	13.8	17.8	22.3	15.8
Andhra Pradesh	48.1	32.1	51.7	32.0	42.8	26.8	16.5	18.9	18.0
Karnataka	58.9	33.3	68.0	25.7	48.6	19.0	12.4	14.5	11.7
Kerala	20.4	13.3	17.7	3.0	1.6	2.2	71.982.4	2.4	77.9
Tamil Nadu	62.5	55.8	67.6	23.0	28.1	17.4	10.6	11.6	11.2

Source: Census 2001, NSSO 1999, NFHS 1998-99

Water supply through tap is found to be low i.e. 36.7 per cent as per 2001 census. This is found more pronouncing in Assam, Bihar, and Kerala while water supply through tap is found significantly high in Mahrashtra, Karnataka, Gujarat, Tamil Nadu, and Andhra Pradesh. Water supply through handpumps and tubewells has been found to be significantly higher in West Bengal, Punjab, Bihar, and Assam. Even, a larger propotion of households fetch drinking water from surface sources i.e. wells. Urban centres depend on both surface and ground water sources for supplying water. However, the dependence on any source would be based on the availability and the cost factors. While some urban centres may depend entirely on surface sources, such as rivers, lakes, and reservoirs, others may use a combination of surface and ground water sources. The survey of

NIUA, 1999 indicates that almost two-thirds of the urban centres depend on surface water and one-third on ground water. Metropolitan cities mainly depend on surface water sources with partial dependence on ground water sources. In Uttar Pradesh, Kanpur, Varanasi, Agra, Moradabad and Jhansi, are mainly depend on surface water sources. However, smaller towns and cities are mainly depend on ground water sources, through ground water sources are depleting gradually and demand for rainwater harvesting (Table 16).

Table - 16

Source of Water Supply

City/Towns	Present Source of Water Supply (mld)			% of water	
	Surface source	Ground source	Total	Surface	Ground
Kanpur	310	-	310	100	-
Lucknow	240	170	410	59	41
Varanasi	220	-	220	100	-
Agra	250	-	250	100	-
Aligarh	-	47	47	-	100
Allahabad	90	120	210	43	57
Bareilly	-	80	80	-	100
Etawah	-	20	20	-	100
Faizabad	-	22	22	-	100
Firozabad	-	12	12	-	100
Ghaziabad	-	110	110	-	100
Gorakhpur	-	74	74	-	100

Hapur	-	14	14	-	100
Jhansi	68	9.2	77	88	12
Mathura	-	27	27	-	100
Meerut	-	132	132	-	100
Mirzapur	8.0	17	25	32	68
Moradabad	48	-	48	100	-
Muzaffarnagar	-	46	46	-	100
Rai Bareilly	-	13	13	-	100
Kanpur	-	20	20	-	100
Saharanpur	-	49	49	-	100
Sitapur	-	17	17	-	100
Unnao	-	21	21	-	100

Source: NIUA, Survey 1999

Deficit of water supply is shown in table 17. The larger cities have more supply deficit while smaller towns and cities have less water supply deficit. The water supply has been reported worst in Lucknow, Kanpur, Bareilly, Faizabad, Mathura and Gaziabad. The problem becomes acute when the quality of drinking water deteriorates due to hydrological and pollution factors.

Table - 17

Water Supply, Demand and Supply Deficit as per CPHEEO Norm and City Norm, 1999

City/Town	Water Supplied CPHEEO Norm				Demand for Water		Supply Deficit (mld)	
	mld.	lpcd.	Norm lpcd	Adopted by city (lpcd)	CPHEEO Norm	City Norm	CPHEEO Norm	City Norm
Kanpur	310	124	150	200	375	500	65	190
Lucknow	410	164	150	250	375	625	0	215
Varanasi	220	191	150	270	173	311	0	91
Agra	250	217	70	150	81	173	0	0
Aligarh	47	78	135	97	81	58	35	12
Allahabad	210	207	135	250	137	254	0	44
Bareilly	80	107	135	225	101	169	21	89
Etawah	20	139	70	175	10	25	0	5
Faizabad	22	127	70	130	12	22	0	0.50
Ghaziabad	110	124	135	200	120	177	10	67
Gorakhpur	74	123	135	150	81	90	7	16
Hapur	14	70	135	200	27	40	13	26
Jhansi	77	152	70	160	35	81	0	4
Mathura	27	67	135	200	54	80	27	53
Meerut	132	106	135	200	169	250	37	118
Mirzapur	25	119	135	200	28	42	3	17
Moradabad	48	72	70	120	47	80	0	32
Muzaffarnagar	16	142	70	200	23	65	0	19
Rae Bareilly	19	74	70	160	12	28	0	15

Rampur	20	62	70	200	22	63	2	44
Saharanpur	49	91	70	225	38	122	0	73
Sitapur	17	114	70	200	11	30	0	13
Unnao	21	174	135	180	16	22	0	0.78

Source: NIUA, Survey 1999.

Options for water supply to urban areas could be explored through in-situ water harvesting, repairing, renovating and properly maintaining existing water storage structures, huge scope of demand side management measures including proper pricing, saving from wastage and conservation, and recycling waste water. In Delhi, and Tamil Nadu, some efforts are already underway to harvest local water sources for the augmenting water supply in the respective cities. Having exhausted, destroyed and polluted the nearby sources and neglected using the potential of local sources, cities are reaching out to far away sources for their water supply needs. Bangalore (K.R. Sagar), Ahmadabad (Dharoi), Hyderabad (Nagarjuna Sagar), Delhi (Tehri and Renuka dam) Chennai (Telugu Ganga) are planning to exploit new sources of drinking water from 100 to 480 km. distance.

It is often recommended that all connections should be metered so as to improve revenues from water supply as also to improve supplies. Metering will allow charging by the quantity of water consumed and well also allow for leakages detection. Unmetered connections will generally encourage wastage of water, through the amount of water that can be drawn will be determined by the duration of supply. The survey undertaken by NIUA, 1999 indicates that less than one third of the sampled urban centres

do not have any metered connections. The proportion of metered connections ranges from 9 to 100 per cent. The situation is grim in Meerut, Mirzapur, Allahabad and Gorakhpur where most of the water connections were found non-metered (Table 18).

Table -18

Water Supply Connections and Percentage of Connections Metered in U.P.

City/Town	No. of Water Supply Connections			% of Connections Metered		
	Domestic	Non-Domestic	Total	Domestic	Non-Domestic	Total
Kanpur	115073	3250	118323	43	100	93
Lucknow	180000	11023	191023	61	68	62
Varanasi	70567	2190	72757	62	64	62
Agra	108800	2900	111700	97	100	97
Aligarh	30750	3300	34050	100	100	100
Allahabad	87000	1215	88215	45	100	46
Bareilly	46625	2172	48797	100	99	100
Etawah	14430	884	15314	100	34	96
Faizabad	11965	1410	13375	100	100	100
Firozabad	17300	2125	19425	100	100	100
Ghaziabad	8482	0	8482	65	-	65
Gorakhpur	15825	344	16200	95	80	94

Hapur	8014	5141	13155	57	53	55
Jhansi	27487	552	28040	99	100	100
Mathura	15302	1000	16302	62	-	58
Meerut	70314	4598	84912	3	100	9
Mirzapur	16100	365	16465	40	96	42
Moradabad	31000	1000	32000	-	-	-
Muzaffarnagar	26860	650	27510	-	-	-
Rae Bareilly	4131	542	4773	100	100	100
Rampur	13995	302	14297	86	100	86
Saharanpur	28200	2530	30730	100	100	100
Sitapur	7000	400	7400	91	100	91
Unnao	4700	350	5050	100	100	100

Source: NIUA Survey 1999.

Water Pricing

Water pricing is a complex issue because water is merit good. Water pricing policy is intended to save many objectives such as equity, efficiency, financial sustainability, and full cost recovery. Urban water is under priced in relation to the cost incurred on the provision of water resulted in serious concerns about the financial viability and sustainability of urban water utilities. Under pricing has resulted in poor and un-reliable water services. Water is provided at subsidized rate because poor could not afford it. However, in practice, it is the rich, not the poor who always benefit disproportionately from subsidized water services. Unreserved people in

urban areas pay much higher price for the water. Thus, water pricing is important for water demand management to achieve efficient and sustainable use of water.

Several types of water tariffs are used in water sector. They include (i) increasing block tariffs, (ii) uniform volumetric charge, (iii) linear water charges. The increasing block tariff is an alternative to marginal cost. It is based on volumetric component. In the price structure, water use per billing is divided into a number of discrete blocks for which separate prices can be set. A water user in particular category, such as domestic water consumption, is charged a relatively low per unit price for consumption up to a specified amount. This amount defines the end of the initial or first block. A user who consumes more water faces a higher per unit price for this additional consumption until reaching the end of the second block, and then a still higher price until reaching the end of the top block structure. Increasing block tariffs are popular tariff structure in many developing countries. Water utilities in Bangalore, Delhi, and Hyderabad use block tariff for domestic and non-domestic supplies in combination with other price structures. Bangalore uses five water blocks with each block of 25 kls, the price per unit in the fifth block is set 9.4 times the price in the first block. In Delhi, there are four blocks of 10 kls each, with the unit price in the terminal block being 8.6 times that in the initial block Hyderabad uses four blocks of unequal sizes, and the price per unit of water in the fourth block is set 3.7 times higher than the price in the first block. Increasing block tariff is commonly used in non-domestic metered supplies. Compared with domestic supplies, the price structure for non domestic supplies is several times higher. A uniform volumetric charge may differ according to the

category of users. Although simple to use, a uniform rate does not provide any incentive to consumers to affect savings on water use. Single tariff rate is in use in Kanpur, Indore, Surat, Madurai and other cities. The differentiation of rate ranges in between Rs. 2 per kl to Rs. 5 per kl for domestic use and Rs. 8 per kl to Rs. 22 per kl for industrial use in these cities. A linear water charge rises with consumption. It prevails in Kerala where a monthly water charge is specified for discrete quantities of water. Thus, a consumer in Kerala is required to pay a monthly charge of Rs. 22 or a consumption not exceeding 10 kls, the charge increases to Rs. 25 for a consumption level of 11 kls, and rises to Rs. 550 for a consumption of 100 kls per month.

These pricing structures show sharp variations and complex nature. Where the water charges are levied by the Municipal Corporations, little change have been made in their format and structure, however, mere statutory board has been set up for the provision of water, attempts have been made for revision in water pricing in order to meet the rising cost of water provision. In the state of Uttar Pradesh, Municipal Corporation Act has mode provision for imposing tax in order to maintain water structures and sustain water supply. Water tax in Municipal Corporations is levied in between 7.5 per cent to 12.5 per cent of Annual Rental Value of house while 22 per cent to 32 per cent of ARV is being levied for property tax. Thus, Municipal Corporations cannot impose higher rate of water tax unless the Act is amended. The other local bodies have no such binding however they have to pass the water tax rates from their respective Boards for imposing the tax and its recovery. Generally, water tax is levied in between 7 per cent to 12 per cent of ARV. In most of the cities and towns, there is no water tax,

however, water charges are being imposed which range in between Rs. 120 to Rs. 360 per annum. Some local bodies also charge connection charges for water supply. Interestingly, most of the local bodies in U.P. provide water supply only for domestic purposes; however, users generally convert it for non-domestic, commercial and institutional purposes.

Revenue Receipts and Expenditure

It is found that prices charged for urban water utilities donot covers the costs incurred on its provision. A recent study conducted by NIUA, 2005 showed that (i) the cost of water provision were in excess of recoveries in nearly 76 per cent of cities and towns, and (ii) the operation and maintenance costs of water supply systems were approximately 22 per cent higher than the receipts from water charges and water tax levied in lieu of water charges. The deficit i.e. costs in excess of revenue receipts are estimated at Rs. 524 mld. The annual deficits on account of water were Rs. 20 per capita in metropolitan cities, Rs. 40 per capita in cities in the population range of 100,000 and one million, and Rs. 30 per capita in towns which have a population of over 50,000 but less than 100,000 persons. The survey has shown that the annual losses on operation and maintenance of the urban water supply systems would be in between Rs. 9000 to Rs. 10000 million.

Thus, nominal pricing of water by the local bodies and poor recovery of dues has made the urban local bodies bankrupt. They have little or no funds to maintain the water supply networks and upgrades the treatment plants. Revenue generations is poor due to lack of proper tariff and failure

in the recovery of dues. Overtime, demand increased, while the infrastructure continued to deteriorate and costs escalated. Due to a paucity of funds, many water service providers are not financially viable and are unable to maintain services without subsidies. The percentage of revenue generation to operation and maintenance costs in Kolkata, Nagpur, Pune, Ludhiana and Lucknow was found less than 50 per cent. The recovery revenue against cost of water production in a few cities of Uttar Pradesh shows variations. The least recovery was reported in Moradabad (16.57 per cent followed by Aligarh (25.5 per cent), and Gorakhpur (49.76 per cent) while recovery has been found satisfactory in Ghaziabad (91.67 per cent), and Allahabad (75.44 per cent). Thus, cost of production of water is much higher as compared to recovery of revenue (Table 19).

Table -19

Cost of Production of Water and Recovery in Selected Cities of U.P.

City	Cost of Production	Recovery	Percentage of Recovery
Lucknow	2.53	1.59	62.84
Moradabad	1.75	0.29	16.57
Jhansi	0.04	0.03	75.0
Allahabad	4.56	3.44	75.44
Gorakhpur	2.11	1.05	49.76
Kanpur	0.16	0.08	50.0
Aligarh	2.00	0.51	25.5
Gaziabad	0.12	0.11	91.67
Agra	4.47	2.99	66.89

Source: Rastriya Sahara, 15 January 2007

Per capita revenue receipts and revenue expenditure is shown in table 20. Per capita revenue receipts has been found higher in Bangalore, Chennai, Mumbai and Hyderabad, while in most of the cities of Uttar Pradesh, it ranges in between Rs. 3 to Rs. 83. Similarly, per capita revenue expenditure is found low in most of the cities in the state. However, per capita revenue expenditure is reported higher than per capita revenue receipts in most of the cities and towns. Thus, annual revenue gap has been found higher in Delhi, Kolkata, Ahmadabad, Faizabad, and Chennai. Cost recovery and revenue expenditure gap in U.P. as shown in table 21 also show dismal picture. Saharanpur, Muzaffar Nagar, Allahabad and Agra have managed some how to recover the cost of water supply to the greater extent while cost recovery is found dismal in Unnao, Sitapur, Rai Bareilly, Moradabad, Mirzapur, Jhansi, Faizabad and Bareilly. Revenue expenditure gap (Rs. per kl) is reported significantly high in Bareilly, Faizabad, Lucknow and Kanpur.

Table - 20

Per Capita Revenue Receipts and Revenue Expenditure in U.P.

City/Town	Revenue Receipts (Rs. lakhs)	Revenue Expenditure (Rs. lakhs)	Annual Revenue Receipts per Capital (Rs.)	Annual Revenue Expenditure per Capita (Rs.)	Annual Revenue Gap per Capita (Rs.)
Ahmadabad	270	3947	7.9	116	-108
Bangalore	15384	14909	333	323	10
Kolkata	947	7534	16	131	-114

Chennai	16258	11858	379	276	102
Delhi	7547	46829	67	416	-349
Hyderabad	10623	10052	266	252	14
Kanpur	1090	926	45	38	7
Lucknow	1159	2118	49	89	-40
Varanasi	540	779	48	69	-21
Mumbai	35513	26275	324	240	84
Agra	920	1008	83	91	-8
Aligarh	122	108	20	18	2
Allahabad	565	645	57	65	-8
Bareilly	123	485	17	67	-50
Etawah	17	52	13	38	-25
Faizabad	49	228	30	139	-110
Firozabad	14	26	6	11	-5
Ghaziabad	251	287	31	35	-4
Gorakhpur	106	178	18	30	-12
Hapur	22	29	11	15	-4
Jhansi	95	197	20	41	-21
Mathura	46	97	12	26	-14
Meerut	113	201	10	17	-7
Mirzapur	17	46	8.5	22	-14
Moradabad	21	50	3	8	-5
Muzaffarnagar	87	87	27.88	27.87	0.01
Sitapur	8	25	5.7	17	-12

Sourc: NIUA Survey 1999.

Table -21

Cost Recovery and Revenue Expenditure Gap in U.P.

City/Town	Water Supplied (mld)	Revenue Receipts (Rs. lakhs)	Revenue Expenditure (Rs. lakh)	Cost Recovery (% Receipts to Expenditure)	Receipts Expenditure Gap (Rs. lakhs)	Revenue Expenditure Gap/kl (in Rs.)
Kanpur	310	1090	926	118	164	0.1
Lucknow	410	1159	2118	55	-959	-0.6
Varanasi	220	540	779	69	-239	-0.3
Agra	250	920	1008	91	-80	-0.1
Aligarh	47	122	108	113	14	0.1
Allahabad	210	565	645	88	-79	-0.1
Bareilly	80	123	485	25	-362	-1.2
Etawah	20	17	52	34	-35	-0.5
Faizabad	22	49	228	21	-179	-2.3
Firozabad	12	14	26	52	-13	-0.3
Ghaziabad	110	251	287	87	-36	-0.1
Gorakhpur	74	106	178	60	-72	-0.3
Hapur	14	22.5	29.3	77	-16.9	-0.1
Jhansi	77	95	197	48	-101	-0.4
Mathura	27	46	97	48	-50	-0.5
Meerut	132	113	201	56	-88	-0.2
Mirzapur	25	17	46	38	-29	-0.3
Moradabad	48	21	50	41	-24	-0.2
Muzaffarnagar	46	87.28	87.25	100	0.03	0
Rai Bareilly	13	17	45	39	-27	-0.5
Rampur	20	15.8	22.9	69	-7.1	-0.1
Saharanpur	49	79.7	78.3	102	1.4	0.01

Sitapur	17	8	25	33	-17	-0.3
Unnao	21	9	29	30	-20	-0.3

Source: NIUA, Survey 1999.

In the state of Uttar Pradesh, most of the cities and towns do not collect user charges for water supply. The revenue collection is more or less confined to water tax which is a crucial part of holding tax (property). However, water charges are collected in Meerut, Moradabad, Aligarh and Allahabad to the greater extent. Connection charges are also being imposed in most of the cities and towns, however, its contribution in revenue receipts is found to be nominal (Table 22).

Table - 22

Revenue Receipts from Water Supply (%)

City	Water Tax	Water Cess	Water Charges	Connection Charges	Supply charges	Others
Kanpur	44	-	-	-	55	1
Lucknow	77	-	23	-	-	-
Varanasi	78	-	14	92	-	7
Agra	17	79	-	-	-	4
Aligarh	34	-	66	-	-	-
Allahabad	16	-	84	-	-	-
Bareilly	80	-	17	3	-	-
Etawah	96	-	2	-	-	2

Faizabad	38	-	12	-	-	50
Firozabad	93	-	-5	0.05	-	1.2
Ghaziabad	89	-	8	-	-	8
Gorakhpur	99.8	-	-	-	0.2	-
Hapur	85	-	12	2	-	0.7
Jhansi	9	85	-	-	0.9	5
Mathura	98	-	0.8	0.9	-	-
Meerut	-	-	91	9	-	-
Mirzapur	80	10	-	0.03	-	10
Moradabad	-	-	88	12	-	-
Muzaffarnagar	62	-	26	1.6	-	11
Rai Bareilly	97	-	-	-	0.3	1.7
Rampur	65	-	35	-	-	0.1
Saharanpur	96	0.1	2	2	-	-
Sitapur	95	5	-	-	-	0.5
Unnao	97	-	-	-	-	5

Source : NIUA, Survey 1999.

Revenue expenditure on water supply is mainly confined to salary and wages of staff, consumables including electricity. There is no fund for maintenance of water structures. During 1997-98, revenue expenditure on water supply was reported significantly high in larger cities i.e. class one cities and municipal corporations (Table 23).

Table - 23

Revenue Expenditure on Water Supply in U.P.

City	Salary and Wages	Electricity	Consumables	Repairs and Replacements	Others	Interest	Total (Rs. lakhs)
Kanpur	71	15	6	7	1	-	926
Lucknow	54	38	5	4	-	-	2118
Varanasi	54	34	9	3	-	-	779
Agra	53	10	20	4	14	-	1008
Aligarh	67	5	27.4	-	0.6	-	107.8
Allahabad	71	11	5	13	-	-	645
Bareilly	25	31	14.4	-	-	-	485
Etawah	-	100	-	-	-	-	52
Faizabad	12	88	-0.4	-	-	-	228
Firozabad	-	100	-	-	-	-	26
Ghaziabad	45	-	54.6	-	-	-	287
Gorakhpur	46	3	26	11	14	-	178
Hapur	96	-	3.7	-	-	-	29
Jhansi	40	22	1	24	3	-	197
Mathura	74	-	24.9	-	1	-	97
Meerut	-	-	100	-	-	-	201
Mirzapur	-	-	100	-	-	-	46
Moradabad	91	-	9.8	-	-	-	50
Muzaffarnagar	49	1	-	5	45	-	87
Rai Bareilly	92	-	7	-	-	0.4	44.5
Saharanpur	76	-	13.7	-	-	-	78
Sitapur	-	-	100	-	-	-	25
Unnao	-	-	100	-	-	-	29

Source: NIUA Survey, 1999.

Volumetric rates (Rs. kl/m) are imposed in cities and towns. Water charges for industrial and commercial purposes are found to be significantly higher as compared to the water rates for domestic and institutional purposes. However, the present rates are very low in most of the cities and towns as against the increasing cost of water production (Table 24).

Table - 24

Water Tariffs in U.P.

City/Town	Cost of Production of water (1997-98) Rs./kl	Consumption Based Rates			Volumetric Rates (Rs/kl/m on total)	
		Domestic	Non Domestic	Industrial	Commercial	Institutional
Kanpur	3.48	2.00	-	10	6.0	4.0
Lucknow	4.00	2.00	-	-	6.00	4.0
Meerut	-	2.20	10.0	-	-	-
Agra	1.10	3.00	-	22.80	22.80	-
Allahabad	3.00	2.50	-	12.50	7.50	5.0
Ghaziabad	-	0.60	-	1.50	1.10	0.60
Bareilly	1.70	0.75	-	2.50	2.00	0.75
Moradabad	-	-	-	-	-	-
Gorakhpur	1.70	0.75	-	2.00	2.00	2.00

Aligarh	4.95	0.75	-	3.00	3.00	3.00
Saharanpur	-	0.60	1.10	-	-	-
Jhansi	9.00	2.00	4.00	-	-	-
Mathura	-	1.00	-	2.00	2.00	1.00
Muzaffarnagar	-	0.60	1.10	-	-	-
Rampur	-	0.80	1.50	-	-	-

Source: NIUA Survey, 1999.

The water tax ranges in between 7 per cent of ARV to 17.50 per cent of ARV depending upon the size of the town/city or water need. The local bodies also charge one third water connection charges which range in between Rs. 120 to 5000 for domestic purposes; Rs. 120 to Rs. 1560 for industrial, commercial and institutional purposes (Table 25).

Table 25

Water Tax and Connection Charges in U.P.

City/Town	One time water connection charges (Rs.)				Year of last Revision	Water Tax
	Domestic	Industrial	Commercial	Institutional		
Kanpur	1000	1000	1000	-	1994	-
Lucknow	-	-	-	-	1996	12.5 ARV
Varanasi	1560	1560	1560	-	1994	14% of ARV
Meerut	500	500	500	-	1998	-
Agra	275	275	275	275	1994	14% of ARV
Allahabad	5000	-	-	-	1999	14% of ARV

Ghaziabad	-	-	-	-	-	10% of ARV
Bareilly	120	120	120	120	1986	10% of ARV
Moradabad	300	-	450	-	1990	14% of ARV
Gorakhpur	500	1000	1000	1000	1990	14% of ARV
Aligarh	-	-	-	-	1997	7% of ARV
Saharanpur	500	-	1250	500	1987	12% of ARV
Jhansi	650	650	650	650	1994	12.5% of ARV
Mathura	250	250	250	250	1999	17.5% of ARV
Muzaffarnagar	500	1000	1000	1000	1998	12% of ARV
Rampur	250	250	250	250	1999	10% of ARV

Source : NIUA Survey, 1999

The one time water connection charges are found to be very nominal in most of the cities and towns. The local bodies mainly impose and collect water tax which is also insignificant as against increasing cost of water production and water supply (Table 26).

Table - 26

Existing Structure of Water Tax and Charges in U.P.

Name of Town/City	Water Tax	Connection Charges (Rs.)	Water Charges (per year)	Year of last Revision	Water Tax/ Charges	
					Domestic	Non Domestic
Firozabad	10% of ARV	180	-	-	-	-
Khandla	10% of ARV	22	-	1996	-	-
Shahjahanpur	10% of ARV	-	-	2003	-	-
Faizabad	10% of ARV	50	-	2004	-	-
Farrukhabad	12% of ARV	53	120	1978	-	-
Mirzapur	10% of ARV	700	-	1995	-	-

Bahraich	7% of ARV	-	120	2003	-	-
Aligarh	12% of ARV	-	240	-	-	-
Badaun	10% of ARV	600	300	2001	-	-

Source: Discussions held with Tax Superintendents, RCUES, Lucknow, 20th January, 2007.

Privatization of Water

The poor performance of water supply agencies has been used for encouragement of private sector participation in urban water supply. The World Bank claims that the private sector participation can yield improvement in water supply, provide additional management skills and improve management incentives, having government agencies on policy decisions. In certain cities, public private partnership models have been introduced in order to improve urban water supply and reduction in water production cost.

Water markets or trading of water for commercial and non commercial proposes have arisen mainly out of scarcity and because public utility systems are unable to meet the demands of the population. The sale of water through tankers is one of the most lucrative small scale business

today. Besides tankers, small scale vendors sell water in tins and cans, transporting them from the source to the consumers in a variety of vehicles. In many places, suppliers install bore-wells and lay pipelines to supply water directly to households and commercial establishments. Aside, from these small scale vendors, the bottled water industry has become one of the fasted growing industries in the country. Today, the bottled water sector is one of the fastest growing industries in the country. Globalization, an increase in income levels among people and greater awareness about safe drinking water, rise in water crisis and declining water quality has triggered off the trade of bottled water in India. The market for packaged water is in between Rs. 8 billion to Rs. 10 billion which is increasing at the rate of 40 per cent per annum.

Need for Reforms

The growing emphasis on fiscal discipline in the post liberalization era has made it difficult for governments to continue to provide financial support to loss making infrastructure services, particularly water supply and sanitation. There is now a growing consensus for augmentation and management of environmental infrastructure services through public-private partnership and restructuring service delivery mechanism. Augmentation of water supply, sanitation, and solid waste services and improvement in service, quality call for significant investment. However, the state cannot finance all such infrastructure projects on its own. Thus, private investment would be required to augment the efforts of the state in these critical sector of development.

The constitutional Amendments in 1992 have led to decentralization of responsibility to the local bodies, thereby increasing the latter's functional areas and giving them more powers. However, these institutions are still in the process of building their financial capabilities and institutional capabilities to address issues in service delivery. For instance, service departments within the municipal authorities charged with water supply and sanitation functions, often work with limited resources and without any commitments towards resource mobilization. Due to lack of coordination among the organizations, a situation has emerged when the responsibilities and powers of various authorities in delivering a single service are ambiguous and unclear. Moreover, inefficient revenue collection by the local bodies coupled with inadequate and highly subsidized user charges for provision of services and high administration costs is a major problem. This has deteriorated the financial health of urban local bodies and thus increaing dependence on state governments and other external agencies for loans and grants. Enforcement of rational tariffs and cost recovery would be pre-requisites for expanding institutional financial flows. However, these reforms cannot take place unless proper legal and regulatory frameworks for such investments are created and developed to ensure full cost recovery.

It is imperative to upgrade existing urban infrastructure to enable it to deliver effectively urban services. The role and responsibilities of urban local bodies have been redefined in the context of decentralized governance. Thus, urban service providers are to be well equipped with a broad spectrum of skills, and expertise to undertake a wider variety of taxes pertaining to different developmental activities. Thus, training needs for municipal employees is imperative. In the changed context, role of government at state

and local levels should only be as a facilitator and not as a provider of services. Various studies of regulatory mechanisms for infrastructure sector in country show that strengthening of regulatory agencies would be required in order to separating regulatory and operational services and also increasing the role of private sector. Moreover, for real decentralization, alongwith the devolution of functions and powers to local bodies to raise financial resources and enhancing technical capabilities would also be required. The need for effective regulation of ground water extraction is also well realized. Similarly, water sources and promoting water treatment, privatized or funds could be tapped to generate resources to augment service coverage. In the post liberalization era, it would be difficult for the state government to perpetually finance losses in public sector enterprises. Private capital and initiative may help accomplish operational efficiency and investment. The local bodies may contract services of billing metering, maintenance of water sources, treatment of water collection of user charges, tax water cess etc. while regulatory role may be strengthened through community participation. The six components in the water and sanitation delivery system viz. (i) capturing water at its sources; (ii) transmitting water to a place; (iii) treating water; (iv) delivery water to the users; (v) collecting waste water from users, and (vi) treating the waste water. Similarly, water tariffs are to be rationalized through regular revision and using appropriate models of water pricing.

Options for water supply to urban areas could be explored through water harvesting. It could be one of the promising options in order to meet the growing water requirement. Water harvesting is not a new technology, though such practices are prevalent to overcome the vagaries and

inadequacy in water supply. There are two practices of rain water harvesting viz. (i) roof top harvesting, recharge ground water and storage it in underground tanks; (ii) recycling waste water. These practices may improve water level in ground aquifer and water quality and quantity in the residential areas. Restoring the existing water harvesting structures such as lakes, ponds, open well, Bavalies and other water bodies is also imperative. We have to utilize the full potential of existing infrastructure and local water harvesting systems. Institutional approach is required the understanding the role of community, environment and the governance system in solving the resource crisis. Adequate awareness building measures are imperative to facilitate innovative methods of water supply option. Decentralization may also ensure the sustainability of the water supply programme. The decentralized system with participation of residents of rain water harvesting may be introduced in order to improve the recharge of groundwater and water supply. Urban water supply agencies need to decentralize planning, regulation and monitoring functions for evolving efficient water supply options. Participation by water users well ensures the use of appropriate design choices, and management practices of diverse water supply options in accordance with local requirements.

Recommendations

- Experiences of best practices in the field of water supply, rainwater harvesting, water resources management, water pricing, privatization of water, water supply options waste water treatment, decentralization of water supply, and management options etc. should be documented and also used in planning and implementation of water supply in the state and also to promote cross sectoral learning in this sector.
- Measures should be taken to initiate capacity building in urban centres for estimation of unaccounted for water. Metering of connections, both for bulk supply and rational distribution must be encouraged. Standard meters should be made available at reasonable cost to all urban local bodies for the purpose.
- Tariff should be rationalized with the introduction of increasing block tariff structure in local bodies. The water pricing should be based on categories of water users such as domestic, non-domestic, institutional, industrial and commercial while domestic consumers should charged less for water supply and industrial users should be charged comparatively high. The increasing rate of water tariff should also be imposed on the bodies of categories of domestic and non-domestic users, depending on size of water consumption.
- Tariff should be increased at certain given intervals depending on inflation, power tariff, increasing cost of water production and maintenance of water utilities.

- Ground water depletion can be checked by under taking rainwater harvesting in all the urban centres. Specific programmes/schemes should be initiated for aquifer recharge. These schemes and programmes should be based on decentralized approaches of water resources management and water harvesting.
- The local bodies should be strengthened through providing them capacity building and autonomy to decide on increase in water tariff required to cover at least operation and maintenance costs.
- All the urban local bodies should be made compulsory to impose user charges for water supply to be various categories of consumers. Besides imposing water tax, local bodies should also impose water price depending upon the size of water consumption. The water price should vary depending on the categories of users and size of water consumption.
- Improving cost recovery should be linked with grants or fiscal transfers. Financial incentives may also be given to urban local bodies showing improved cost recovery.
- Private sector participation should be encouraged. Unbundling of services such as billing, metering, collection, recovery etc. may improve efficiency of urban local bodies. The regulatory role of urban local bodies should be given to them while other functions may be given to private sector. Private sector may also be encouraged for participation in water production and supply to different users.
- Public private partnership must be couraged for financing water supply projects to cover the entire urban population. The best

practices of public private partnership should be learnt and be adopted for managing the water supply based on it.

- The existing pricing structure is unsustainable and lacks incentives. It calls for reforms urgently and essentially. Tariff should be designed to cover costs incurred on supplying water. The water charges based on property tax need reforms to bring changes in property tax and Rent Control Act.
- The differentiation in the water charges, water tax and water pricing is needed to achieve revenue targets while promoting at the same time efficiency and equity objectives in service provision.
- The revenue base of water utilities is grossly unbalanced. Hence, water utilities must rationalize price structure depending on the size of water consumption and uses of water.
- Rationalization of tariff structures would require necessary legislative changes, and developing a system of incentives and sanctions at state level to encourage reforms. Large governing water and municipal government in the state need reforms in order to implement the 74th Amendment for devolving urban water supply and sanitation responsibility to municipalities and discharging these responsibilities.
- Reforms are also needed for restructuring water Boards - Jal Nigam and Jal Sansthan by disaggregating them by function, separating service provision from regulatory and policy responsibilities, commercializing the service provision entities, and evolving the private sector in management of new commercialized entities.
- The urban local bodies are also supposed to develop best practices and producedures in areas of accounting, auditing, procurement, tariff

rationalization, customer consultation and integrating service to disadvantaged groups with the maintenance of service delivery.

- Consumer and citizens groups used to be involved in the development of customer consultation mechanisms and in the development of reforms at the local body level. Civil societies need to contribute to the development of new mechanism and pilot projects to involve and serve disadvantaged groups.

References

Boland J. and Whittington D., The Political Economy of Water Tariff in Developing Countries: Increasing Block Tariff Verses Uniform Price with Rebate, in Political Economy of Water Pricing Reforms (ed) by Ariel Diner, Oxford University Press, Oxford, 2000.

Dinar, Ariel and Subramaniam (ed), Water Pricing Experiences: An International Perspectives, World Bank Technical Paper, No. 386, World Bank, Washington, 1997.

Government of India -National Water Policy, Ministry of Water Resources, New Delhi, 1987.

Government of India -National Water Policy, Ministry of Water Resources, New Delhi, 2002.

Marie, W. and Zeran et. Marie Llorente, Institutional Innovation in the Indian Water Supply Sector, Centre de Sciences Humanities, New Delhi, 1999.

MIDS - Policies of Urban Water Supply: A Strategy Paper, Madras Institute of Development Studies, Chennai, 1995.

MUAE, Report of the Working Group on Urban Water Supply and Sanitation Sector for the Ninth Five Year Plan (1997-2002); Ministry of Urban Affairs and Employment, Government of India, New Delhi, 1996.

NIUA, Status of Water Supply, Sanitation and Solid Waste Management in Urban Areas, National Institute of Urban Affairs, New Delhi, June 2005.

NIUA, Water Supply and Water Tariff, Statistical Volume I, National Institute of Urban Affairs, New Delhi, June 2005.

ORG - Financing, Pricing and Cost Recovery of Water Supply and Sanitation Services, Operations, Research Group, New Delhi, 1996.

Padwal, Rajan, Issues of Pricing Urban Water Department of Economics, University of Mumbai, Working Report, No. 13

Pangare, Ganesh et. al., Springs of Life: India's Water Resources, Academic Foundation, Delhi, 2006.

Planning Commission - Report of the Steering Committee on Drinking Water Supply and Sanitation for the Tenth Five Year Plan, Planning Commission, New Delhi, February 2002.

PSI - Future Domestic Water Requirements Working Paper, People's Science Institution, Dehradun, 1998.

Rent, Joel, V.S. Saravaran, The Water Sanitation and Marie Helene Zerrah Scenario in Indian Metropolitan Cities: Resources and Management Occasional Paper, Centre de Sciences Humanities, New Delhi.

SANDRP - Assessment of Water Supply Options for Urban India, South Asia Network on Dams, Rivers and People, New Delhi, November, 1999.

Thakkar, Urban Water Sector: Some Important Issues, Centre for Science and Environment, New Delhi, 1997.

UN - Guidelines on Strategic Planning and Management of Water Resources, United Nations, New York, 2004.

UNDP - Reforms in Drinking Water and Sanitation, UNDEP - teri, Delhi, 2004.

World Bank - Urban Water Supply and Sanitation Report, Vol. I, India Water Resources Sector Review, World Bank, Delhi, 1998.

World Bank - Urban Water Supply and Sanitation, IBRD, World Bank, and DFID, Allied Publishers Ltd., Delhi, 1999.

World Bank - Water Pricing Experiences: An International Perspective, World Bank, Washington, 1997.