

CHAPTER III
PRESENT CONDITION OF WATER RESOURCES
DEVELOPMENT AND USE

III. PRESENT CONDITION OF WATER RESOURCES DEVELOPMENT AND USE

3.1 Municipal and Industrial Water

3.1.1 General Water Use

(1) Registered water rights

The water rights of a water resource have been granted by the NWRB, before applicants utilize a water source for their own facilities. The granted water right data have been stored in a database of NWRB with respect to the purpose of water use, quantity of water, etc. The NWRB's database is the only source to grasp the state of use of water resources on a nation wide basis. The propriety of each water right application is evaluated by the NWRB based on registered data on available water sources and the standard criterion for each water use sector. The standard criterion or procedure for water rights grant is as follows:

<u>Water Use Sector</u>	<u>Standard Criterion or Procedure for Water Rights Grant</u>
Domestic	0.0029 lps per capita
Commercial	The application shall be examined and approved by NWRB, while WD issues a clearance for processing water permit.
Industrial	The application shall be examined and approved by NWRB, while DENR issues a clearance for processing water permit.
Irrigation	1.5 lps per ha for paddy field (Other crops and plants have the different standard values.)
Livestock	0.00024 lps per head for cattle and swine, and 0.0000146 lps per head for poultry
Recreation	0.6 lps per ha for the planned golf course area
Fishery	3.15 and 6.30 lps per ha for prawns in freshwater and brackish water respectively, and 0.9259 lps per ha for other than prawns
Hydropower	The application shall be examined and approved by NWRB, while NPC issues a clearance for processing water permit.

(2) Type of source

The water resource is generally categorized into two types, namely "surface water" and "groundwater". The groundwater is classified into "wells" and "springs" in accordance with the mode of its extraction. In the NWRB's database on water right, the water resources for which water rights are applied are classified into one of those three types. In case of well, on the other hand, it is noted that the different kind of structures, namely "shallow and deep wells", "dug and driven wells", "infiltration wells and galleries" and so on, are utilized to extract groundwater.

It might be advantageous for water rights applicants to develop surface water, if it is sufficiently available in quality and quantity. Especially in case of large-scale municipal, industrial and irrigation water supply, development of surface water is preferred to groundwater due to the lower cost. On the other hand, generally, groundwater is assessed

to have higher quality (suitable as drinking water) than surface water and it is distributed more widely in populated area. Especially in an area where it is costly to develop surface water due to the topographical disadvantage such as an area which does not allow water supply by gravity flow, groundwater consisting chiefly of spring source could be developed at adequate cost.

(3) Water usage

In the NWRB's database, the water use sectors are classified into eight categories, namely domestic, commercial, industrial, irrigation, power, livestock, recreation and fishery sectors. All of the water rights applications are classified into one of the eight sectors. In this study, registered data in the NWRB's database were analyzed statistically under the following conditions:

- Municipal water comprises domestic, commercial and industrial water.
- Some of commercial and industrial water is categorized into domestic water concerning the Level-III water supply system.
- Unutilized surface water amount for water rights which were granted to MWSS and Leyte Metro WD were excepted from the present water use based on the information obtained from the concerned agencies.
- Water for hydropower is utilized for energy generation only. Therefore, it isn't consumed actually.

Other water uses take place in the livestock, recreation and fishery sectors except for irrigation sector. In this study, the water use in sectors other than the irrigation sector is categorized into municipal, industrial and other water use taking into account the present situations of the public water supply and privately owned systems as shown below:

Water Use Sector	Allotment of Water Use		Privately Owned Facility
	Public Water Supply System		
	Level-III	Level-II and -I	
Domestic water	Municipal	Municipal	Municipal
Commercial water	Municipal	-none-	Municipal
Industrial water	Municipal	-none-	Industrial
Other usage	Municipal	-none-	Other water use
Irrigation water	-none-		Irrigation

Table 3-1 represents the registered water rights by water use sector. The features of sectoral water use are seen from the water right data as follows:

- The irrigation water reaches about 56,000 MCM/year, accounting for 91.8% of total water amount for the granted water rights.
- Municipal and industrial water occupies only 6.7% of the total granted water amount.
- 52.6% of municipal water relies on surface water, while remaining 47.4% on

groundwater.

- The granted municipal water amount is closely related with population.
- In WRR III, there is a large amount of surface water for the granted water rights, including that for "Angat River". The river water is utilized for water supply to the service area of MWSS, which is located within WRR IV.
- WRR IV has a large amount of the granted groundwater for municipal water, which is mainly utilized in the outskirts of Metro Manila.
- More than 40% of the granted municipal water is occupied by the NCR and its outskirts.
- The majority of sources of industrial water are surface water, which accounts for 85.3% of the granted total industrial water.
- The granted industrial water amount is closely correlated with GRDP.
- In the four water resources regions, WRR VI, X, XI and XII, a larger proportion of the granted surface water for industrial water use is applied for the use in mining including refinery, milling and manufacturing.
- The majority of irrigation water relies on surface water, accounting for 98.8% of the total granted irrigation water.

3.1.2 Existing Water Supply Systems

(1) Municipal water supply

In this study, municipal water supply comprises public water supply for urban and rural areas and privately owned water sources for domestic and commercial use. This study focuses on the water demand projection for public water supply.

Types of facilities and Definition of Service Level Standard

The National Sector Plan defines the service levels and system components of water supply systems and facilities as shown in Table 3-2 and summarized below:

(a) Level-III System

The Level-III system, individual house connection system at the municipal level, is usually established and operated by the Water Districts under the technical and financial assistance of LWUA. Presently, the number of water supply system presently in operation reaches 404 systems all over the country. Table 3-3 shows them by water resource region. Meanwhile, MWSS, which is the largest water supply system in the Philippines, provides water to about 7.1 million persons as of 1995 in Metro Manila and its adjoining area.

(b) Level-II System

The Level-II system, communal faucet system, is designed to cater for barangay level water supply with a limited service coverage and supply capacity. These systems have been implemented by different agencies such as DPWH, LWUA, DENR and DILG/LGU's, relying mainly on spring water sources. These facilities are operated by LGU's, RWSA's or NGO's. The following table

shows the number of Level-II systems relating to DPWH:

Number of Level-II Water Supply Systems													
Region	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	total
Operational	-	18	15	67	176	52	54	18	247	230	65	-	942
Non-Operational	-	-	-	3	8	9	4	-	34	10	6	1	75
Total	-	18	15	70	184	61	58	18	281	240	71	1	1017

Data Source: Spring Development for Water Supply Level-II System, as of January 1997 (DPWH/PMO)

(c) Level-I Facility

Level-I facility, point source system, is common in rural barangays, the majority of which are owned privately. Major facilities are different types of wells equipped with hand-pumps or developed springs with conveyance pipes and one communal faucet.

Classification of Urban and Rural Areas

The NSO classifies a barangay as urban when it satisfies any of the following conditions on the economic and social functions:

- (a) In their entirety, all municipal jurisdictions which, whether designed as chartered cities, provincial capital or not, have a population density of at least 1,000 persons per square kilometer.
- (b) Poblaciones or central districts of municipalities and cities which have a population density of at least 500 persons per square kilometer.
- (c) Poblaciones or central districts (not included in nos. 1 and 2) regardless of population size which have the following:
 - Street pattern, i.e., network of streets either at parallel or in right angle orientation,
 - At least six establishments (commercial, manufacturing, recreational and/or personal services), and
 - At least three of the following:
 - i) a town hall, church or chapel with religious services carried on at least one month,
 - ii) a public plaza, park or cemetery,
 - iii) a market place or building where trading activities are carried on at least once a week, and
 - iv) a public building like school, hospital, culture and health center or library.
 - Barrios/barangays having at least 1,000 inhabitants which meet the conditions set forth in No. 3 above, and in which the occupation of inhabitants is predominantly non-farming/fishing.

All areas not falling under the urban classification are defined as rural area.

Service Coverage

In this study, service coverage was classified into two groups, namely Level-III system and Level-I system including II system, since the Level-II system is limited in service coverage and supply capacity utilizing spring sources.

The service coverage of Level-III system in both urban and rural areas was clarified based on the data obtained from MWSS and LWUA. That of Level-I facility including Level-II system was estimated considering several provincial sector plans prepared by DILG and the report prepared by DPWH.

Table 3-4 shows existing service coverage of urban and rural areas of the provinces which are referred in the provincial sector plan. Table 3-5 tabulates the nationwide Level-I service coverage.

As for the provinces, which are not included by the provincial sector plan, an average service coverage of the plan of 69% was applied to urban areas and likewise an average service coverage of 73% was applied to rural areas. The existing service coverage by WRR is shown in the following table and Figure 3-1:

Region	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Total
Urban	74	64	64	66	67	69	69	69	69	69	84	69	68
Rural	75	67	67	69	79	80	77	80	76	78	77	74	75
Total	74	67	67	66	76	73	73	77	73	74	80	72	72

The overall existing service coverage is summarized in following table:

	Urban Area			Rural Area	Total
	Metro Manila	Other Urban Area	Sub-total		
Level III system	62%	30%	39%	5%	22%
Level I, II system	-	40%	29%	70%	49%
Total	62%	70%	68%	75%	72%

As of 1995, around 72 % of the total population were assumed to have an access to the public water supply system. The service coverage reaches 62% in Metro Manila, 70% in other urban areas and 75% in the rural areas. The remaining 28% of the population were not covered by the public water supply system and were considered to have utilized privately owned water sources.

Present Water Demand

The present water demand of Level-III system was estimated based on the data collected

from MWSS and LWUA, while that of Level-I facility including Level-II system was estimated by multiplying the population served by an assumed unit water consumption of 30 lpcd. Tables 3-6 and 3-7 show the present water demand of MWSS and the WDs.

Table 3-8 together with Figures 3-2 and 3-3 represents the present water demand for municipal water supply by WRR. The total amount of water was estimated to be 1,958 MCM/year. Among them, water demand in WRR IV including Metro Manila was estimated at 1,131 MCM/year, which accounts for 57 % of the total water demand for public water supply.

Adding the water demand for the above privately owned water sources to that for public water supply, the total water demand for domestic use comes to be 2,172 MCM/year applying the same unit water consumption rate of 30 lpcd to the domestic use as shown in Table 3-9.

Further, if the privately owned commercial water which is shown below is added to the above total water amount, the total amount of municipal water was estimated to be 2,187 MCM/year:

Privately Owned Commercial Water by WRR

												(Unit: MCM/year)
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Total
0.2	0.0	0.4	8.9	0.0	2.4	0.5	0.6	0.0	0.0	0.3	1.7	15.0

Data Source: NWRB

(2) Industrial Water Supply

Industrial water is classified into two groups; the water supplied by municipal water supply system and privately owned water sources (self-supplied industrial water). However, industrial water through municipal water supply systems generally occupies a small proportion. Accordingly, in this study, the privately owned water sources are focused on.

Likewise, registration of water rights for other water uses is required in utilizing water sources for industrial purposes. However, many factories/facilities seem to utilize the water sources, especially ground water, without registration.

Table 3-10 represents past water rights granted for industrial use. Based on these water rights, the existing industrial water demand was estimated to be 2,335 MCM/year as shown in Table 3-11 and Figures 3-4 and 3-5.

The water demand in WRR IV including Metro Manila and WRR VI, among them, occupied 28% and 25 % of the total volume, respectively. Especially in WRR VI, there exist milling facilities and sugar factories, which consume a large amount of surface water.

3.1.3 Issues and Problems of Existing Water Supply Systems

(1) Metro Manila

The water shortage in Metro Manila, in particular, is critical because of the high population density and brisk economic activities therein. Further, the unaccounted-for water shares more than half of the total water production as shown in Table 3-6. The operation and management of water supply system of Metro Manila has been just turned over to the private sector from MWSS. The key issue would be how to expand and improve the whole system including water source and distribution facilities to meet the water demand.

(2) Metro Cebu

According to the annual report of the Metro Cebu Water District (MCWD), as of December 1995, MCWD was able to serve 36% of total demand and produced water of 11,220 m³/day on an average. Even with these figures, demand still far outweighs supply. Hence, a series of water resource development projects need to be studied and implemented to reduce the gap between the supply and demand. These projects include the Mananga Phase I and II, Lusaran Dam, and Inabanga I and II. Yet, despite these projects, the need for more water continues.

(3) Davao City

On the other hand, regarding water source for Davao City, the water district is planning a surface water development by BOT. The water shortage in Davao City is expected to be solved through the realization of the new development project.

3.2 Agriculture

3.2.1 Existing Irrigation Systems

As of December 1996, there are 11,089 irrigation systems all over the country, of which 173 are NIS, 9,107 are CIS, 256 are SWIM, 569 are diversion dams and 984 are STW. As a whole, the present irrigation systems cover a total irrigation service area of about 1.36 million ha or about 43 percent of the 3.2 million ha potential irrigable area to be devoted to rice cultivation. The status of the irrigation development as of December 1996 is presented in Table 3-12 by province and water resources region. In the Table, a province with coverage of more than two water resources regions is delineated based on the hydrological boundaries. Figures 3-6 to 3-17 show the location of irrigation development schemes in each water resources region.

(1) National Irrigation System (NIS)

Presently, there are 651,812 ha of irrigation service area covered by the 173 NIS or about 48 percent of the total irrigation service area of the country. However, it was observed that the average irrigated areas between 1985 and 1995 account for only 73 percent of the total irrigation service area during wet season and about 62 percent of the total irrigation service area during the dry season. The average cropping intensity is derived to be 135.2 percent.

(2) Communal Irrigation System (CIS)

Generally, the CIS is served by the unregulated flow of small rivers and streams. An intake without diversion weir is usually provided for this system. As of December 1996, there are 9,107 CIS with a total service area of 670,018 ha, occupying about 49 percent of the total irrigation service area. The CIS is further classified into amortizing, non-amortizing and private systems. During wet season, the irrigated area reaches 63 percent of the total irrigation service area, but during the dry season, irrigated area drops to 44 percent. The average cropping intensity is derived to be 107.3 percent. A summary of the inventory of the Communal Irrigation Systems (CIS) is presented in Table 3-13.

(3) Small Water Impounding Projects (SWIM)/Diversion Dams

NIA, BSWM and DPWH implemented a total of 256 SWIM projects with total irrigation service area of 15,762 ha. BSWM developed 569 diversion dams with a total irrigation service area of 21,233 ha. The SWIM projects and diversion dams nationwide cover an irrigation service area of 36,995 ha, which is equivalent to about 3 percent of the total irrigation service area.

(4) Groundwater Irrigation Systems

The use of groundwater for irrigation is being explored at many places where surface water is unavailable. This is an alternative solution to the more costly construction of complex irrigation facilities. As of December 1996, BSWM implemented 984 shallow tubewell irrigation systems nationwide with a total irrigation service area of 2,878 ha. The NWRB's water rights data reveal that there are 1,382 approved permits allowing the tapping of groundwater for irrigation. The total amount of water to be withdrawn is 21,200 lps, which covers a service area of approximately 14,400 ha. The service area was estimated based on average water requirement of 1.5 lps/ha per the NWRB's datum as shown in Table 3-14.

3.2.2 Issues and Problems of Existing Irrigation Systems

The performance of irrigation systems is affected not only by the delayed onset of rainy season, droughts and floods, but also by poor water management and operation and maintenance (O&M) of the systems. The water management and O&M of the systems are not being conducted properly and effectively due to the following factors:

(1) Water Management

One factor is given by the absence of measuring devices for river as well as irrigation canal discharge. With this situation, it becomes difficult to determine whether the present water use is sufficient or not. Consequently, the NIS offices were unable to prepare an applicable cropping calendar based on the probable water supply.

Another factor is the insufficient information to the farmers on water delivery and distribution schedule. More often, farmers do not follow the cropping calendar due to lack of water delivery and distribution schedules.

Another contributing factor is the lack of drainage and water control facilities. Most systems have defective diversion works, inadequate drainage and other on-farm facilities.

(2) Operation & Maintenance (O&M)

Problems on this aspect include poor O&M works due to the shortage of fund and technical staff. Insufficient fund for O&M is given by low ISF collection being encountered by irrigation offices. For this reason, funds for O&M cost of water control facilities are not properly allocated to NIS offices concerned. This causes deterioration of irrigation and drainage facilities resulting in poor water management wherein irrigation water cannot be delivered and distributed efficiently.

Another factor is the lack of O&M manuals that can be put into proper use by farmer-beneficiaries. The O&M manuals available to them cannot be easily understood and utilized effectively. The "General Operation and Maintenance Manual" prepared by NIA was not utilized for the purpose because the field staff were not able to understand its contents.

3.2.3 Existing Irrigation Development Plans Formulated by NIA and BSWM

The 10-year Irrigation Development Programs prepared by each of the Planning Group of NIA and BSWM covering the period from 1997 to 2006 were collected for the Study. These programs describe the irrigation development plans under the jurisdiction of each agency. There are twenty seven (27) on-going major irrigation projects, twenty three (23) priority irrigation projects, eighteen (18) other irrigation projects, and three (3) other related projects. NIA planned to develop a total of 373,845 ha of new irrigation areas and rehabilitate or improve existing irrigation areas of 882,056 ha. The new irrigation areas include 340,308 ha for National Irrigation Projects (NIPs) and 33,537 ha under the Communal Irrigation Projects (CIPs). For rehabilitation of existing areas, 833,915 ha are under NISs and 44,141 ha are under CISs. NIA is also planning to undertake the improvement of selected NISs with a total service area of 211,000 ha. It is also endeavored to sustain O&M of NISs covering a total service area of 651,812 ha as well as to reforest 11,300 ha in the Magat watershed. On top of these, NIA also planned to improve a total of 2,350 km drainage facilities and access roads with a total length of 6,061 km. Moreover, sixty-seven (67) SWIM projects would also be implemented within the period.

The Department of Agriculture (DA) has entrusted the implementation of Small Scale Irrigation Infrastructure Project to the BSWM. These projects include SWIP/DD, STW and SFR. The BSWM programmed the development of new irrigation areas with a total area of 132,015 ha for SWIP/DD, 165,933 ha for STW and 23,068 ha for SFR. No rehabilitation of existing systems is included in the program.

The on-going and proposed major irrigation projects are listed as follows:

On-going projects

- 1) Diversified Crops Irrigation Project II (WRR 3)
- 2) Palawan Integrated Area Development Project II – Irrigation Component (WRR4)
- 3) Bohol Irrigation Project I (WRR 7)
- 4) Visayas Communal Irrigation Participatory Project (WRR 6, WRR 7, & WRR 8)
- 5) Malitubog-Maridagao Irrigation Project (WRR 12)
- 6) Second Communal Irrigation Development Project (Nationwide)
- 7) Kabulnan Irrigation & Integrated Area Development Project (WRR 12)
- 8) Pampanga-Delta Development Project-Irrigation Component (WRR 3)
- 9) Irrigation Operation Support Project II (IOSP II) (Nationwide)
- 10) Lower Agusan Development Project- Irrigation Component (WRR 10)
- 11) Irrigation Systems Improvement Project II (WRR 7)
- 12) Casecnan Multipurpose Irrigation Project (WRR 3)
- 13) Water Resources Development Project (Nationwide)
- 14) Repair and Rehabilitation of Existing National and Communal Irrigation Facilities (Nationwide)
- 15) Repair and Rehabilitation of Existing Service and Access Roads in NIS and Farm to Market Roads (Nationwide)
- 16) Repair and Establishment of Groundwater Pump Projects (Nationwide)
- 17) Small Reservoir Irrigation Project (Nationwide)
- 18) Rehabilitation, Repair and Improvement of Drainage & Flood Protection System in NIS and CIS (Nationwide)
- 19) Feasibility Study and Detailed Engineering of Proposed Irrigation Projects (Nationwide)
- 20) Agri-Institutional Development Program (Nationwide)
- 21) Apayao-Abulog Irrigation System Improvement Project (WRR 2)
- 22) Rehabilitation of Areas Affected by Mt. Pinatubo (WRR 3)
- 23) Itbayat Integrated Agricultural Development Project (WRR 2)
- 24) Catubig Irrigation Project (WRR 8)
- 25) Dolores Irrigation Project (WRR 8)
- 26) Basey Irrigation Project (WRR 8)
- 27) Bubunawan-Tumalaong Irrigation Project (WRR 10)

Priority Irrigation Projects

- 28) Addalam River Irrigation Project (WRR 2)
- 29) Infanta Impounding Project (WRR3)
- 30) Pump Projects for Corn and Other Diversified Crops (WRR 2)
- 31) Upland Irrigation & Small Rural Development Project (WRR 4)

- 32) Revitalization of Central Luzon Groundwater Irrigation Project (WRR 3)
- 33) Southern Philippines Irrigation Sector Project (WRR 6, WRR 10 & WRR 11)
- 34) Aklan RIS and Rural Areas Environment Improvement Project (WRR 6)
- 35) Bohol Irrigation Project II (WRR 7)
- 36) Lower Agno (San Roque) Irrigation Project (WRR 3)
- 37) Pump Irrigation Project II (Nationwide)
- 38) Rationalization Project and Irrigation Water Use for Angat-Maasin River Irrigation System (WRR 3)
- 39) Baligatan Mini-Hydro Project II (WRR 2)
- 40) North Lawis Irrigation Project (WRR 3)
- 41) Help for Catubig Agricultural Advancement Project Stage I (WRR 8)
- 42) Control and Prevention of Sedimentation and Siltation in Irrigation Canal and Facilities (Nationwide)
- 43) Mapanuepe Lake Irrigation Project (WRR 3)
- 44) Sibalom-San Jose Reservoir Project (WRR 6)
- 45) Ilocos Sur Transbasin Project (WRR 1)
- 46) Ilocos Norte Irrigation Project(Palsiguan) Phase II (WRR 1)
- 47) Land Reclamation and Resettlement Project (WRR 12)
- 48) Lake Mainit Integrated Area Development Project- Irrigation Component (WRR10)
- 49) Negros Occidental Irrigation Package (WRR 6)
- 50) Jalaur Irrigation Systems and Rural Area Development Project (WRR 6)

Other Irrigation Projects

- 51) Improvement of O&M of Pump Irrigation Systems (WRR 1, WRR2, WRR 5)
- 52) Quipot Irrigation Project (WRR 4)
- 53) Malitbogay Irrigation Project (WRR 8)
- 54) Kadingilan Irrigation Project (WRR 12)
- 55) Tumauni Reservoir Project (WRR 2)
- 56) Small Scale Irrigation Development Project (Nationwide)
- 57) Bicol River Basin Flood Control & Irrigation Development Project- Irrigation Component-Package I (WRR 5)
- 58) Balintingon Reservoir Project (WRR 3)
- 59) Titay Valley Irrigation Project (WRR 9)
- 60) Wind Turbine for Pump Irrigation Systems (Nationwide)
- 61) Magat Watershed and Erosion Control Project (WRR 2)
- 62) Matuno River Irrigation Project (WRR 2)
- 63) Malitbog-Libungan Transbasin Irrigation Project (WRR 12)
- 64) Jalaur Alternative Scheme Project (WRR 6)
- 65) Mabini Irrigation Project (WRR 3)
- 66) Asue River Basin Development Project (WRR 6)
- 67) Saug River Multipurpose Project (WRR 11)
- 68) Malitbog-Maridagao Irrigation Project (WRR 12)

Other Programs

- 69) Operation and Maintenance Subsidy for NIS (Nationwide)
- 70) Comprehensive Agrarian Reform Project- Irrigation Component (Nationwide)
- 71) Agrarian Reform Infrastructure Support Project- Irrigation Component (Nationwide)

Small Scale Irrigation Projects (BSWM)

- 72) Small Water Impounding Projects/Diversion Dams (SWIP/DD)
- 73) Shallow Tubewell (STW)
- 74) Small Farm Reservoir (SFR)

3.2.4 Present Condition of Livestock, Poultry and Fishery Production

(1) Livestock and Poultry

Livestock consists of cattle, carabao and hog. But goats and sheep are not included in this classification. In case of poultry, only broiler chicken was considered. The population and production of cattle, carabao, hog and chicken in 1996 are as follows:

1996 Inventory of Livestock and Poultry			
	Population (1000 head)	Production (1000 metric ton)	Slaughtered Livestock (1000head)
Cattle	2,012	213	533
Carabao	2,708	104	260
Hog	8,807	1,213	7,582
Total	13,606	1,530	8,374
Poultry (Chicken)	100,273	947	100,273

Data Source: Bureau of Agricultural Statistics

The 1996 inventory shows that the shares of slaughtered livestock consist of 13.9 % for cattle, 6.8 % for carabao and 79.3 % for hog. According to the LDC, the average live weight of cattle and carabao is 380 kg/head, hog is 80 kg/head and chicken is 1.3 kg/head. The market age of cattle and carabao ranges from 2 to 3 years, hog from 4 to 6 months and broiler chicken is about 45 days.

(2) Fisheries

The total fish production in 1996 is 2.69 million tons. The commercial fishery accounted for 893,210 tons or 33 percent of the total production. Municipal inland production accounts for 186,670 tons or 7 percent of total production, while municipal marine is 785,720 tons or 29 percent of the total production. The aquaculture production accounted for 825,390 tons or 31 percent of the total production.

3.2.5 Existing Expansion Plans of Livestock and Fishery Production and National Policy

The target of the Medium-Term Livestock Development Plan by 1998 is to increase the population of cattle, carabao and hog to 3.0 million, 2.5 million and 10.8 million, respectively and chicken to more than 100 million. Since there is no available study results on livestock beyond 1998, this study made the projection based on the framework for major agricultural commodities in terms of GDP and production estimated in the socio-economic analysis.

The study adopted the average live weight per head of cattle, carabao and hog, as determined by the Livestock Development Council (LDC). As a result, the population of cattle was estimated to increase from 2.02 million heads in 1996 to 3.0 million heads by the year 2000.

The BFAR prepared the Medium-Term Fisheries Management and Development Program for the period from 1993 to 1998. The said program aims to achieve aquaculture productivity of 2.4 tons per ha per year by 1998.

Recently, the Agricultural and Fisheries Modernization Act of 1997 was passed by the Philippine Congress and was subsequently signed into law as Republic Act (R.A.) No. 8435. This has paved the way for the enactment of the Philippine Fisheries Code of 1998 (R.A. 8550) mandating the DA and the BFAR to ensure the attainment of the following objectives:

- a. Conservation, protection and sustained management of the country's fishery and aquatic resources,
- b. Poverty alleviation and the provision of supplementary livelihood among the municipal fisherfolk,
- c. Improvement of productivity of aquaculture with ecological limits,
- d. Optional utilization of offshore and deep-sea resources, and
- e. Upgrading of post-harvest technology.

3.3 Surface Water and Hydropower Development

3.3.1 Existing Large-Scale Reservoir Type Projects

(1) Existing Major Dams

There exist five major dams in the Philippines, which were developed as multipurpose project. These are Angat dam, Magat dam, Pantabangan dam, Ambuklao dam, and Binga dam, all of which lie in Luzon island. Their main features are summarized below:

Main features of Existing Major Dams in the Philippines

Item	Angat	Magat	Pantanb-angan	Antbuklao	Binga
- Purpose	WS/IR/HP/FC	IR/HP/FC	WS/IR/HP	HP/FC	HP/FC
- Year of completion				1956	1960
- Name of river	Angat	Cagayan	Pampanga	Agno	Agno
- Catchment area (km ²)	568	4,123	853	617	860
- Mean inflow (m ³ /sec)	59.2	210.0	-	30.0	52.3
- Type of dam	Rockfill	Rockfill	Earthfill	Rockfill	Rockfill
- Height of dam	131	114	107	129	107.4
- Effective storage volume (10 ⁶ m ³)	850	782	1,757	258	33
- Sediment storage volume (10 ⁶ m ³)	-	210	130	-	32.6

Note : WS ; Water Supply, IR ; Irrigation, HP ; Hydropower, FC ; Flood control

As seen in table above, the existing major storage type dams were constructed in Luzon island as the multipurpose dam, not exclusively for hydropower generation. Thus, it is foreseen that the large-scale storage type dams in the country will be implemented unexceptionably for the purpose of development of the hydropower generation, combined by other development purposes such as irrigation, municipal water supply, flood control.

(2) Other Existing Large Scale Reservoir Type Projects Utilizing Natural Lake

The other existing reservoir type schemes with comparatively large regulation capacity are those developed for the single purpose of hydropower generation utilizing natural lake. These are the Caliraya Hydroelectric Project on the Caliraya river flowing down into the Laguna de Bay in Luzon island, and a series of hydropower projects on the Agus river in Mindanao island which harness the Lanao lake for the reservoir as well as the head along the Agus river.

The first pumped storage type development was realized in the Kalayaan Pumped Storage Hydroelectric Project (KPSHP) by providing waterway facilities between the Laguna lake and Caliraya reservoir. The KPSHP utilizes the surplus energy during the off-peak time of power demand to pump up the lake water to the upstream Caliraya reservoir, while the stored water is released to the Laguna lake to generate power during the high peak demand.

In the Agus river basin, there are six power stations (Agus I, II, IV, V, VI, VII) on the Agus river which is a sole outlet of the Lanao lake with a surface area of about 360 km². The lake water is first regulated by the Agus I project which utilizes the lake with a large active storage volume of 1,715 million m³ for the seasonal regulation of inflow thereto.

The main features of the above existing hydropower projects are summarized below:

Name of Existing Hydropower Project	Region	River Name	Installed Capacity (MW)	Effective Storage Volume (million m ³)
- Caliraya Pumped H.E. Plant (KPSHP)	IV	Kaliraya & Laguna De Bay	32	78
- Agus I	XII	Agus I	80	1,715

3.3.2 Situation of Existing Major Reservoirs in the Philippines

(1) General

The information on present situation of the existing major dams and reservoirs was obtained from the previous study reports on their rehabilitation as well as the documents describing sedimentation studies on those basins during the first stage field investigation. In general, the specific problem on those reservoirs is the current remarkable increase of sediment inflow into the reservoir except for the Angat reservoir for which no sedimentation problem is reported so far.

Out of the five existing major dams, the sedimentation on the Magat and Pantabangan reservoirs have been investigated by the joint team of NPC and NIA. According to the latest information by the joint team, the Magat reservoir is affected by the extraordinary increase of sediment inflow after the July 1990 earthquake took place.

(2) Sedimentation on the Magat Reservoir

The Magat dam situated in the Cagayan river basin, whose construction was completed in 1982, occupies a larger catchment area of around 4,123 km² as compared with the other four major existing dams. In the original design, the sediment rate was adopted at 5.5 MCM per year or 1.3 mm/year in the denudation rate. According to the "Report on the Sedimentation Study on the Magat Reservoir", the sediment transport into Magat reservoir has increased significantly after the July 1990 earthquake took place. The following table shows the historical sedimentation rate of the reservoir that was analyzed through the bathymetric survey of the reservoir:

Year of Survey	Measured Volume of Sediment deposited in reservoir (MCM)	Estimated Average Sedimentation Rate (MCM/Year)	Total Capacity Lost in %		Estimated Catchment Denudation Rate (mm/year)
			Active Storage	Dead Storage	
1984	22.0	7.3 (1982-84)	1.3	3.0	1.77
1988/1989	49.0	6.7 (1985-89)	2.3	11.0	1.63
1995	179.0	18.6 (1990-95)	8.4	44.0	4.50

The report states that the extraordinary high sedimentation rate observed between 1990 and 1995 is attributable primarily to the 1990 earthquake which has led to the massive landslides in the upper basins of the Magat reservoir. It emphasizes that the catchment degradation also results from the man-made activities such as uncontrolled forest fires,

illegal logging, unmanaged grazing, shifting cultivation and other improper land management practices. Consequently, the reservoir life has been diminished to about 43 years, should the present sedimentation rate continue from now on. To improve and cope with the aggravated basin condition, the concerned governmental agencies recommended to rehabilitate more than 50 % of the catchment area which covers the most critical area with respect to the catchment degradation through the implementation of effective forest protection schemes, massive reforestation as well as adoption of other various erosion control measures/practices in cooperation with the DENR and concerned provincial government. However, it is informed that those rehabilitation plans have not yet been implemented due to lack of funds required therefor.

(3) Pantabangan Reservoir

With regard to the Pantabangan reservoir on the Panpanga river, the reservoir sedimentation rate was measured three times to date. However, the results of the most latest measurement performed in September 1996 has not been made available yet, since the survey results are still under collation by the joint team. The results of the earlier two times of measurements for the reservoir sedimentation rate are summarized as follows:

Year of Survey	Period Covered by the Survey	Estimated Sediment Rate (MCM/year)	Estimated Catchment Denudation Rate (mm/year)
1985	1973-1985	7.36	8.6
1989	1986-1989	4.70	5.5
Mean	1973-1989	6.75	7.8

It appears that the above denudation rates are considerably high, even in comparison with those of severely eroded basins in the world. As a result of the estimate, the reservoir life is estimated to be 107 years based on the observed sedimentation rate of 6.75 MCM/year. However, there is a possibility that the latest survey results might reveal the extraordinarily high rate as came out in case of the Magat reservoir, since the Pantabangan dam is located nearer to Baguio, epicenter of the 1990 earthquake, than the Magat dam.

(4) Ambuklao Reservoir

There exist two reservoir type dams on the Angat dam, namely the Binga dam and Ambuklao dam. In 1988, the study of the Ambuklao dam rehabilitation was completed by JICA. The study clarified the situation of and necessity of rehabilitation for the main dam and its appurtenant structures as well as the reservoir sedimentation. As a result of the study, it was pointed out that the sedimentation is the most critical problem of the project and that, due to the problem, hydropower generation would be suspended for a certain period.

The report states that the deposit level around power intake had reached almost the intake sill level. It was estimated through the study that the annual sediment yield of the Agno

river basin would be about 3.6 million m³ at the Ambuklao dam with a catchment area of 617 km². It corresponds to specific sedimentation rate of 5,337 m³/km²/year or denudation rate of 5.3 mm/year.

(5) Necessity of Watershed Management Programs for Water Resources Development Plans

As mentioned above, some of the existing reservoirs in the Philippines have been filled up with larger sediment inflow than originally designed, shortening the reservoir life to a considerable extent. The sediment inflow into existing irrigation facilities has become significantly large in recent years, as stressed in the WRDP's report, so that the huge amount of costs are required to be disbursed to dredge the sediment deposited in those irrigation facilities. Therefore, the appropriate measures need to be taken for the existing reservoirs and their catchments, which face the increase of sediment inflow due to the watershed degradation, in order to restore the normal reservoir function as well as to keep the reservoir life as originally designed and to retain it as long as possible.

To cope with the sedimentation problems in the existing reservoirs, first of all, it is recommended that the watershed management plan contemplated for the Magat reservoir be implemented in earlier stage in coordination with the concerned agencies and regional governments.

In planning the new reservoir schemes for water resources development, it is indispensable to contemplate the watershed management plan in addition to the favorable water resources development plan in order to ensure the sustainable development, taking into consideration the aforesaid present situation of existing reservoirs.

3.3.3 Storage Type Dam Development Plans by NPC

(1) Hydropower Projects Proposed by NPC

Table 3-15 lists the existing hydropower projects and proposed schemes by NPC. Out of them, the proposed hydropower schemes were studied at different levels such as definite design, feasibility study, pre-feasibility study. The hydropower projects are largely classified in accordance with the mode of utilization of streamflow for the purpose of power generation as follows:

- Run-of-river type with or without a pond for daily regulation of streamflow
- Reservoir type with a reservoir for seasonal regulation of streamflow
- Lake outlet type which utilize a natural lake for reservoir
- Pumped storage type

Out of the above four development types, the reservoir and lake outlet types have the function to seasonally regulate the streamflow. The proposed schemes categorized into these two types were picked out by water resources region from the project list provided by NPC as shown in Table 5-2 of the succeeding Chapter V.

(2) 1996 Power Development Program (1996 PDP)

To date, most of the development plans for major reservoir type projects have been worked out with the initiative of NPC, placing the first priority on hydropower development. NPC has an intention to implement those promising hydropower projects proposed in the previous studies, sooner or later, with funds from international financing agencies or by BOT in order to meet the increasing power demand with the indigenous resource as far as possible. Accordingly, the implementation plan on the reservoir type schemes that are established by NPC would have a significant effect on the available water in the concerned river basins from the quantitative point of view. The latest power development plan prepared by NPC was collected during the first stage field investigation, titled the 1996 Power Development Program (1996) PDP. It is foreseen that the future power development plan including reservoir type hydropower schemes be implemented in line with the 1996 PDP. The overall policy on hydropower schemes is explained in the following paragraphs.

(3) Background

The main participants in the Philippine electric power sector consist of National Power Corporation (NPC), independent power producers (IPP), electric power distributors and retailers, and other regulatory agencies. The power generation is undertaken by either NPC or other power producers through energy conservation arrangements, but the bulk transmission line is exclusively owned by NPC. The government regulatory bodies with regard to the power supply are the Department of Energy (DOE) and Energy Regulatory Board (ERB). The DOE is the policy-making body in the energy sector, while the ERB regulates the prices of electricity and petroleum products.

NPC prepared the 1996 Power Development Program (the 1996 PDP) in September 1996 to set out the country's total plan in meeting future power requirements through the coordinated addition of required generation and transmission facilities. Although the 1996 PDP aims to set out the power requirements in the short term of 1996 to 2000 and the mid-term of 1997 to 2005, it also attempts to envision those in the long term of 2006 to 2025. Thus, the 1996 PDP shows the new power development plans including hydropower so as to cope with the future economic growth in the gross domestic products (GDP), dividing the horizon into the three categories, namely the short-term, medium-term and long-term horizons.

(4) Power Demand Projection in the 1996 Power Development Program

The power demand forecast in the 1996 Power Development Program is made for each of the short-term, medium-term and long-term programs which cover the period between 1996 and 1999, between 2000 and 2005 and between 2006 and 2025, respectively.

Short-term and middle-term demand forecast

The forecast is primarily based on the Gross Domestic Products (DRDP) and its components projected by the National Economic and Development Authority (NEDA). The power demand forecast reveals that the power and energy demand in each grid system

grows at comparatively high ratio as shown in Tables 3-16.

As a result of the power demand forecast, the power demand is forecast to increase at an annual average rate of 11.2 %, 11.9 %, 14.6 % in the Luzon, Visayas, Mindanao power systems for the period from 1996 to 2005, respectively. While, the energy sales in those three power systems are predicted to increase at an annual average rate of 10.8 %, 12.3 %, 16.3 % for the same period, respectively. Consequently, the power demand and energy sales for the entire Philippines are estimated to reach 16,256 MW and 93,313 GWh in 2005, respectively. This shows that the power demand and energy sales in the entire Philippines would increase at annual average rate of 11.9 % for the period. Thus, the 1996 Power Development Program exhibits considerably high growth rates of power and energy demand up to the year 2005 in order to support the high economic growth rates forecast by NEDA. The high growth rates of power demand and energy sales thus predicted are attributed to the high annual increase rates of the GRDP estimated by NEDA at more than 7 % for the period from 1996 to 2005.

Long-term demand forecast

The 1996 Power Development Program presents the results of the long-term power demand forecast for the period from 2006 to 2025 in order to provide the framework for designing the appropriate policy direction for the long-term power development programs. Since the NEDA's figures of GRDP were not available for the period, the annual growth rates between 2006 and 2015 and between 2015 and 2025 were assumed at 7.2 % and 6.2 %, respectively. Consequently, the power demand in the Philippines is predicted to reach 71,267 MW in 2025, which is equivalent to around 13.4 times that in 1995 (5,299 MW).

Hydropower Potential

The major hydropower potential in the entire Philippines is identified at 245 sites, amounting to 12,308 MW in total installed capacity as shown in Table 3-17. These potential sites include the 2,278 MW of existing hydropower plants. Thus, hydropower potential sites of about 10,000 MW are left undeveloped over the country. The hydropower potential to be developed in the future in the respective major grid systems is summarized as follows:

<u>Hydropower Potential Remained Undeveloped (MW)</u>			
<u>Major Grid</u>			
<u>Luzon</u>	<u>Visayas</u>	<u>Mindanao</u>	<u>Philippine</u>
7,316	417	2,297	10,030

3.3.4 Hydropower Projects Committed and Needed by NPC

(1) Committed Hydropower Projects for Early Implementation

Almost all of the power projects needed by NPC for the period from 1996 to 1999 are already under construction or proceeded for implementation. Table 3-18 lists those committed power plants including hydropower projects. Of those, the following hydropower projects are planned to be developed as reservoir type projects which are

expected to contribute the seasonal regulation of streamflow of the river:

No.	Name of Hydropower Project	Location	Active Storage Capacity (MCM)	Installed Capacity (MW)	Scheduled Commissioning Year
1	Casecnan	Luzon (Region II)	1,183	140	1999
2	Tagoloan II	Mindanao (Region X)	121	68	2002
3	Bul.-Batang	Mindanao (Region X)	102	150	2004
4	Pulangui V	Mindanao (Region XII)	1,190	300	2004
5	San Roque	Luzon (Region I)	530	345	2005

(2) Prioritized Small Hydro Projects

The 1996 PDP mentions the proposals for new and renewable energy (NRE) systems, which comprise, solar, wind, etc., as well as small hydro projects included in the first priority list. Out of those small hydro projects, the following two ones are planned to be developed as storage type hydropower projects:

No.	Name of Hydropower Project	Location	Active Storage Capacity (MCM)	Installed Capacity (MW)
1	Addalam A	Luzon (Region II)	32	45
2	Ilaguen B	Luzon (Region II)	31	46

3.4 Groundwater

3.4.1 Municipal Groundwater

(1) Level-III Water Supply Systems

The management of the viable L-III water supply systems is handled by two organizations: MWSS and LWUA, under the DPWH. These independent organizations, formed from the previous agency NWASA, have different service areas. Metro Manila and its surrounding area are under the aegis of MWSS and those areas outside of Metro Manila are LWUA's territories.

Ex-MWSS (turned over to Manila Water Company and Maynilad Water Service Inc.)

The ex-MWSS L-III water supply system has large surface water fed system that has three water rights for utilizing the intake facilities located at the Angat Dam in the province of Bulacan in WRR-III. Also, a large number of wells are located in the ex-MWSS service area. According to the operation records provided by the MWSS, there are 265 existing wells owned by the MWSS. The production amount and facility numbers of these wells decreased year by year. As of December 1995, 156 wells (58.9%) were abandoned due to saline water intrusion, lowered water levels, or the deterioration of the facilities.

The records for groundwater production in 1995 provided by the MWSS are shown in Table 3-19. The features of these operation records are as follows:

- The majority of the groundwater in the ex-MWSS service areas was produced in the southern part of Manila, where the municipalities of Taguig, Paranaque, Las Pinas and Muntinlupa are located.
- MWSS had 17 registered wells (1995)—down from 265 wells in 1991.
- The groundwater production of MWSS was 26.9 MCM/year in 1995.

LWUA (Level-III operated by the WDs)

The production of each WD's facilities was summarized as shown in Table 3-20. However, the data from the WDs doesn't mention the categorized sources' production. As reasonable approach, well production was estimated by taking the grant amount for spring and surface water from total production. This was because the number of grants and facilities for spring and surface water sources were probably almost the same quantity of their production, and usually their intake amount was larger than groundwater sources. Therefore, the WDs might have been granted such water rights.

The grant amount ratio is shown in Figure 3-18. The groundwater production amount and unit consumption, based on production amount and service population, is shown in Figure 3-19. The particulars of this information are shown below.

- For L-III water supply systems, 85.9% of their sources were developed using groundwater (with wells and springs).
- The groundwater production of the WDs facilities was estimated at 560.1 MCM/year in 1995. The total figures for each WRR and source type are:

													(Unit: MCM/year)	
WRR	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Total	
Well	18.9	6.2	130.4	60.8	16.9	38.3	59.2	2.8	21.9	35.3	45.1	9.2	445.0	
Spring	5.8	1.0	5.4	38.6	15.9	7.4	11.2	3.5	8.5	9.3	1.9	6.7	115.1	
Level-III	24.7	7.2	135.8	99.4	32.8	45.7	70.4	6.3	30.4	44.6	47.0	15.8	560.1	

(2) Level-II Water Supply Systems

These systems have been implemented by different government agencies (the DPWH, LWUA, the DILG and the DENR), who encouraged the use of spring sources. LGUs, the RWSA or NGOs operated these systems. These Level-II water supply systems have an adequately served consumption rate of at least 60 lpcd. Therefore, the estimated production for Level-II systems is shown in Table 3-21 and below.

													(Unit: MCM/year)	
WRR	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Total	
Level-II	2.7	3.5	7.0	11.3	4.3	5.4	4.5	3.8	3.7	3.7	3.0	4.5	57.4	

(3) Level-I Water Supply Facilities

The DILG/DPWH Level-I water supply services cover parts of the rural areas and also those urban areas that are not covered by the Level-III systems. The DPWH was the leading implementing government agency until 1991, when the DPWH transferred the responsibilities for the rural water supply programs to the DILG/LGUs. Thereafter, the DILG has prepared the master plan for the provincial sectors such as water supply and sanitation. However, for implementing projects, the DILG/LGUs still need a great deal of the DPWH's assistance and technology.

The DPWH provided well construction records until 1995 based on the inventory survey in 1987. These records include the annual Level-I well construction results. These records are shown in Table 3.4-4 and Figure 3.4-3. The DPWH estimated the operational Level-I wells and their production, which are shown in Figure 3.4-4. The features of this information are as follows:

- On average, more than 14,000 wells were constructed by the DPWH annually.
- The DPWH concentrated on the construction of L-I wells on the Central Luzon Plain.
- The groundwater production of L-I wells was estimated at 312.1 MCM/year in 1995; the production figures by each WRR are:

													(Unit: MCM/year)	
WRR	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Total	
Level-I	11.8	17.4	43.7	37.1	26.1	34.8	30.1	20.8	19.8	20.5	18.6	31.4	312.1	

(4) Privately Owned Level-I Facilities

To determine the L-I production figures, the population served and unit water consumption were estimated. The 1995 census and the service coverage were used to calculate the rest of the population. The unit water consumption was adopted from LWUA's standard L-I service level.

The L-I water supply facilities have an adequately served consumption rate of at least 20 lpcd. In consideration of the population density by province level, an additional unit water consumption, based on the consumption rate of 20 lpcd, was adopted in the same manner as the public L-I water supply. Finally, the unit water rate for the L-I systems was modified for a more realistic result. The estimated production for privately owned L-I systems is shown below.

													(Unit: MCM/year)	
WRR	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Total	
Level-I	6.6	11.2	28.6	71.5	11.6	15.4	14.7	8.7	10.4	11.3	8.3	15.1	213.4	

(5) Privately Owned Commercial Water Facilities

A comparative examination of the registered wells in the MWSS service areas and the facilities owned by the WDs indicated that the non-registered well production was almost proportional to the registered wells. Therefore, in addition to the estimation of

commercial groundwater source production, the well production amount was put at two times the granted amount. The estimated granted amount of groundwater water rights for commercial use is shown below:

(Unit: MCM/year)													
WRR	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Total
Commercial	0.2	-	0.4	8.9	0.0	2.4	0.5	0.6	-	-	0.3	1.7	15.0

(6) Conclusion of Present Municipal Water Production

These production rates were adopted for further study of the GWRDPs. For example, municipal water demands, as well as the future additional demand, were forecasted based on these figures. It should be noted that the present groundwater production was estimated utilizing many conditional assumptions. For the future review of this master plan, a basic investigation into the actual conditions should be implemented by the concerned government agencies in the next census year.

The following figures are the aggregate of each sum of the municipal groundwater production at present (1995).

Present Production/Demand of Municipal Water

(Unit: MCM/year)							
WRR	Ex-MWSS	LWUA	Level-II	Level-I	Private	Commercial	Total
I	-	24.7	2.7	11.8	6.6	0.2	46.0
II	-	7.2	3.5	17.4	11.2	-	39.3
III	-	135.8	7.0	43.7	28.6	0.4	215.5
IV	26.9	99.4	11.3	37.1	71.5	8.9	255.1
V	-	32.8	4.3	26.1	11.6	0.0	74.8
VI	-	45.7	5.4	34.8	15.4	2.4	103.7
VII	-	70.4	4.5	30.1	14.7	0.5	120.2
VIII	-	6.3	3.8	20.8	8.7	0.6	40.2
IX	-	30.4	3.7	19.8	10.4	-	64.3
X	-	44.6	3.7	20.5	11.3	-	80.1
XI	-	47.0	3.0	18.6	8.3	0.3	77.2
XII	-	15.8	4.5	31.4	15.1	1.7	68.5
Total	26.9	560.1	57.4	312.1	213.4	15.0	1,184.8

3.4.2 Industrial Groundwater

Industrial groundwater consumers from the L-III domestic water supply systems were not included in the calculation of industrial groundwater as the other facilities for industrial water were privately owned. The only way to estimate the present production of industrial water was to use the grant amounts of the water rights registered by the NWRB database system. Also, for the industrial Economic-Zones' water supply systems, there was no available detailed data and/or information from the concerned government agencies such as PEZA or the DTI. Therefore, the detailed data and/or information from the water rights

registration provided by the NWRB estimated the existing industrial groundwater.

Using the same procedures as for the L-III groundwater categories, the production of unregistered wells was counted as the same amount as the grants. The estimation of the groundwater water rights grants amount for industrial water is as follows.

(Unit: MCM/year)

WRR	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Total
Industrial	5.3	0.7	83.7	202.2	1.6	45.6	88.0	20.4	1.4	43.3	16.0	6.3	514.4

3.4.3 Groundwater for Irrigation

The facilities for irrigation water are primarily privately owned. The NIA, the DPWH and the BSMW provided the available data and/or information for irrigation groundwater. Only arable land areas and their coverage were included in this data. The only way to estimate the present production of irrigation water was by the capacity of the facilities, as estimated from water rights grants of the NWRB registration system.

Table 3-23 shows the existing conditions of the cultivated land areas. The coverage of irrigated land was put at 43.6 % (approximately 1,362,000 ha) of total arable area (about 3,126,000 ha). Out of this amount, 99.8 % of the irrigated land was supplied by surface water.

According to the water rights registration records, 98.8 % of grants for irrigation water was surface water. The remaining 1.2 % consisted of groundwater grants and the amount from wells was estimated as the same value of spring source. From the number of facilities provided by the NIA, etc. and their capacities as estimated by the grants amount, the production amount for irrigation groundwater was estimated in Table 3-24. These estimation results are shown in Figure 3-22. The estimation result of the groundwater water rights for irrigation water is shown below.

(Unit: MCM/year)

WRR	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Total
Irrigation	64.0	29.2	120.1	46.1	25.6	110.6	64.0	9.4	19.9	40.6	41.1	125.1	695.6

3.4.4 Present Groundwater Production

Shown below is the aggregate of each usage sum for the present groundwater production.

Present Production/Demand of Groundwater

(Unit: MCM/year)

WRR	Municipal	Industrial	Irrigation	Others	Total
I	46.0	5.3	64.0	0.0	115.3
II	39.3	0.7	29.2	0.2	69.4
III	215.5	83.7	120.1	4.3	423.6
IV	255.1	202.2	46.1	20.1	523.5
V	74.8	1.6	25.6	0.6	102.6
VI	103.7	45.6	110.6	34.9	294.8
VII	120.2	88.0	64.0	29.5	301.7
VIII	40.2	20.4	9.4	0.2	70.2
IX	64.3	1.4	19.9	0.2	85.8
X	80.1	43.3	40.6	4.1	168.1
XI	77.2	16.0	41.1	26.5	160.8
XII	68.5	6.3	125.1	2.5	202.4
Nation	1,184.8	514.4	695.6	123.1	2,517.9

3.5 Flood

3.5.1 Major Disaster and Flood Records

As far as the annual rainfall amount is concerned, it can be said that the Philippines is endowed with water resources. Owing to the seasonally and geographically uneven distribution of rainfall occurrence, however, the Philippines has suffered from severe flooding almost every year as well as the occasional drought damages in some basins. Especially, major flood damages have been caused by typhoons which pass over islands of the Philippines during the wet season with the exception of the central and southern Mindanao. In general, there are only a limited number of the major rivers in the affected regions that have enough carrying capacity to pass down the excessive flow resulting from the unusual rainstorm.

It is said that the Philippines is the country which has suffered the greatest number of disasters in this century. Table 3-25 lists the major disaster records which occurred in the Philippines between 1980 and 1995. Out of the damages caused by disasters, the flood damage occupies a large part of the total damage in the country. It has brought about habitually destructive floods causing damages to crops, properties and inhabitants in the affected area. According to the Report on Nationwide Flood Control Plan and River Dredging Program which was prepared in 1982, the annual flood damages in the entire country were estimated to amount to seven billions of Pesos. The recent information also reveals that in the whole Philippines the annual average flood damage amounts to 5 billion pesos due to the insufficient provision of flood control facilities and drainage facilities in Metro Manila and major river basins. Thus, it is essential to promote the implementation of the flood control drainage plans formulated on a comprehensive basis to ensure the stable economic growth in the country from now on.

DPWH is responsible for planning and implementation of the flood control and drainage projects in the country. Out of the total budget of 13.9 billion Pesos allocated to the basic infrastructure program in 1994, about 1.9 billion pesos or 14 % of the total budget is disbursed to the flood control sector.

3.5.2 Existing Flood Control Plans

The nationwide flood control plan was established through the study on river dredging. In the study, a flood control plan was worked out for each of the 12 major river basins. These river basins are the Laoag, Agno, Pampanga Bicol, Amnay-Patrick, Panay, Jalaur, Ilog, Agusan, Tagaloan and Mindanao river basins. The Study proposed mainly river dredging and diking works to expand the river carrying capacity in order to solve the flooding problems in the downstream low-land areas.

After the nationwide flood control plan, a lot of studies on flood control and drainage improvement have been carried out for the specific basins at a study level of master plan and/or feasibility. According to the Medium Term Infrastructure Program prepared by DPWH (DPWH-MTIP), the Government intends to implement the flood control and drainage projects placing a priority on the following 12 major river basins and Metro Manila:

Prioritized Basin or Area on Flood Control by DPWH

Water Resources Region	Prioritized Major River Basin or Area on Flood Control
WRR I	Laoag
WRR II	Cagayan
WRR III	Agno and Pampanga
WRR IV	Amnay-Patrick and Metro Manila
WRR V	Bicol
WRR VI	Panay, Jalaur and Ilog
WRR X	Agusan and Tagaloan
WRR XII	Mindanao

Data Source : DPWH-MTIP

The locations of above major river basins and area are shown in Figure 3-23. Out of the above river basins, the flood control works for the Agno, Pampanga and Agusan river basins are now under construction under DPWH. With regard to the Cagayan river basin, the implementation of the flood control plans has been suspended because of the long-lasting disordered public peace in the basin, although the comprehensive master plan was formulated through the previous study. At present, it is expected that a feasibility study for the promising flood control project in the Cagayan basin will proceed toward future implementation.

The total budget for these projects nominated in the DPWH-MTIP is estimated to be about 21 billion Pesos. In the DPWH-MTIP, the majority of the flood control plans are

proposed to be of the flood protection dikes or flood walls. On the other hand, it is recommended to consider the multi-purpose dam with the function of flood control, as far as possible, in formulating a new reservoir type dam for the water resources development. In the Master Plan Study on the Cagayan River Basin Development which was carried out in 1987, the comprehensive flood control plan which consists of river dredging works and provision of multi-purpose dam in the upper reaches was formulated to mitigate the flood damages in the lower reaches.

3.6 Water Quality

3.6.1 Overview of Water Quality in the Philippines

Human settlement, industry and agriculture are thought to have considerably polluted both inland and coastal waters. Domestic sewage contributes approximately 52% of the pollution load while industry contributes the remaining 48% (DENR). This continuing pollution could seriously compromise the country's water resources' potential for domestic, agriculture and industrial uses.

The Philippines government has performed vigorous monitoring on the rivers in Metro Manila, such as the Pasig River, the Markina River, the Sun Juan River, the Paranaque River and the Tullahan-Tinajeros River. This monitoring result shows very high BOD values and low DO values, indicating that non-treated municipal sewage is flowing into the rivers. Also some monitoring has been performed on downstream reaches of the rivers in Luzon outside Metro Manila and in Visayas and Mindanao. They also show the contamination with domestic, industrial and agricultural effluents. However, the water quality data on upstream reaches of those rivers are very limited. These data are, indeed, acutely necessary to judge the water quality of rivers at the proposed dam sites. Two (2) methods are employed to judge the water quality of rivers at the proposed dam sites, in such a situation of scarce water quality data.

- (1) The Philippines government designated the list of classified rivers outside Metro Manila, and this information may be utilized to judge the water quality, especially when the water is developed for municipal and industrial purposes.
- (2) Population and land usage at the upstream of the dam sites. A high population means much domestic effluent, and this effluent must cause water quality deterioration.

3.6.2 Existing Water Quality Standards

The water quality classification in the Philippines is shown in Table 3-26. The list of officially classified rivers, excluding those of Metro Manila, as of 1997, is tabulated in Table 3-27, in which the rivers rated at class-AA and class-A are judged to be suitable for

municipal water supply. As a result, almost half of the river shown in Table 3-27 could still be tapped for drinking water, requiring only approved disinfection to meet the National Standards for Drinking Water (NSDW).

Table 3-1 WATER RIGHTS BY USAGE-WISE (NWRB)

Water Use Sector	Type	I	II	III	VI	V	VI	VII	VIII	IX	X	XI	XII	Total
Municipality (MCM/year)	W/S	29.1	13.0	95.1	243.9	18.1	45.2	37.8	3.5	2.9	10.7	55.3	26.2	620.8
	Sp	120.5	1.8	4.2	82.6	46.8	16.8	15.5	11.8	4.5	26.3	8.8	61.7	401.3
	SW	29.1	1.4	909.7	47.4	0.7	8.5	24.0	32.5	15.7	6.8	44.0	14.9	1,134.7
	Total	178.6	16.2	1,009.0	373.9	65.7	70.4	117.3	47.8	23.1	43.8	108.2	102.8	2,156.8
Industrial (MCM/year)	W/S	2.5	0.4	41.9	58.4	0.4	17.8	42.9	8.4	0.7	6.8	8.0	2.9	231.1
	Sp	1.1	-	-	0.1	0.8	9.9	2.1	3.7	-	29.6	-	0.5	47.9
	SW	67.7	15.4	123.6	321.8	18.2	523.6	77.8	11.0	4.3	167.1	199.1	65.7	1,617.3
	Total	71.3	15.8	167.4	420.3	19.4	551.4	122.8	23.0	5.0	203.6	207.1	80.1	1,806.3
Irrigation (MCM/year)	W/S	2.3	11.5	187.4	57.8	11.1	46.9	5.8	2.5	-	1.1	5.5	22.7	354.8
	Sp	57.6	11.8	15.6	26.6	12.0	19.3	59.3	7.7	5.1	19.8	35.6	74.2	341.6
	SW	3,309.6	8,122.0	12,396.4	6,503.4	2,693.0	4,636.4	1,588.4	2,062.0	1,037.6	4,091.5	3,460.3	5,413.5	55,313.9
	Total	3,309.5	8,145.3	12,599.4	6,587.8	2,716.1	4,702.5	1,653.6	2,072.2	1,042.7	4,112.4	3,501.4	5,510.4	56,013.3
Other Usage (MCM/year)	W/S	0.0	-	2.1	6.8	-	13.2	11.6	-	0.0	0.1	0.1	0.9	34.9
	Sp	0.0	0.2	-	6.5	0.6	8.5	6.4	0.2	0.1	3.9	26.3	0.8	53.3
	SW	0.2	9.5	8.2	389.4	73.5	109.8	138.9	1.8	45.2	6.9	48.5	0.8	832.8
	Total	0.2	9.7	10.3	402.7	74.1	131.4	156.9	1.9	45.4	10.9	74.9	2.5	921.0
Total (MCM/year)	W/S	33.9	24.8	326.5	406.9	29.7	123.1	138.2	14.3	3.7	18.8	69.0	52.7	1,241.6
	Sp	179.2	13.7	19.8	115.9	60.2	54.4	83.3	23.3	9.7	79.6	70.7	137.2	847.1
	SW	3,406.6	8,148.4	13,439.9	7,261.9	2,785.4	5,278.3	1,829.2	2,107.2	1,102.7	4,272.3	3,751.9	5,514.9	58,898.7
	Total	3,619.7	8,187.0	13,786.2	7,784.7	2,875.3	5,455.8	2,050.6	2,144.9	1,116.4	4,370.7	3,891.6	5,704.8	60,987.4

Data Source : Database for Water Right (NWRB), as of 31 March 1997

Note

- W/S: Well
- Sp : Spring
- SW: Surface water

Table 3-2 COMPOSITION OF WATER SUPPLY SYSTEM AND FACILITY BY SERVICE LEVEL

Discription	Level-I (Point Source Facility)	Level-II (Communal Faucet System)	Level-III (Individual House Connection)
1. Water Sources	- Drilled/driven shallow well - Drilled/driven deep well - Dug well - Spring - Rain collector	- Drilled/driven shallow well - Spring - Infiltration gallery	- Drilled deep well - Spring - Infiltration gallery - Surface water intake
2. Water Treatment	- Generally none. - Disinfection of well is conducted periodically by local health authorities. - Iron removal facilities are provided in problem areas.	- Generally none. - Disinfection facility is provided at some places.	- Disinfection is provided. - The system with a surface water source has a series of water treatment facilities.
3. Distribution System	None	Piped system provided with reservoirs.	Piped system provided with reservoirs and pumping facilities.
4. Delivery and Service Level	At point (within 250 m)	Communal faucets (within 25 m)	Individual house connection household tap
5. Consumption Rate (Adequately served)	at least 20 lpcd	at least 60 lpcd	at least 100 lpcd

Data Source : National Sector Plan

Table 3-3 NUMBER OF LEVEL-III SYSTEM

WRR	Province	Total	Number of Municipal Water Supply Systems by Population Served							
			no system	4,999 or less	5,000 9,999	10,000 14,999	15,000 19,999	20,000 49,999	50,000 99,999	100,000 or more
I	5	29	9	8	4	2	2	1	2	1
II	8	42	26	10	2	2	0	2	0	0
III	7	120	34	22	20	8	9	18	5	4
IV	12	74	6	28	16	10	2	4	4	4
V	6	43	6	17	8	2	1	7	2	0
VI	6	75	22	31	8	5	3	2	2	2
VII	4	23	4	5	8	1	1	2	1	1
VIII	6	35	13	12	4	0	4	1	0	1
IX	5	26	8	11	1	0	1	4	0	1
X	7	29	6	9	4	2	0	6	1	1
XI	4	28	7	8	4	4	2	1	1	1
XII	7	32	11	12	4	0	2	2	0	1
Total	77	556	152	173	83	36	27	50	18	17

Table 3-4 EXISTING SERVICE COVERAGE BY PROVINCIAL SECTOR PLANS

WRR	Province	Urban Water Supply			Rural Water Supply		
		Urban Population (x1,000)	Served Population (x1,000)	(%)	Rural Population (x1,000)	Served Population (x1,000)	(%)
I	Abra	42	38	91%	154	119	77%
	Benguet	310	214	69%	231	164	71%
	Ilocos Norte	138	115	83%	345	224	65%
	Ilocos Sur	128	97	76%	417	296	71%
II	Batanes	5	5	92%	9	8	90%
	Ifugao	16	9	56%	134	103	77%
	Isabela	295	159	54%	866	520	60%
	Kalinga-Apayao	45	28	62%	193	137	71%
	Nueva Vizcaya	97	83	86%	237	137	58%
	Quirino	33	20	61%	98	62	63%
	III	Bataan	346	266	77%	146	117
Bulacan		1,453	1,046	72%	322	235	73%
Nueva Ecija		443	288	65%	1,063	840	79%
Pampanga		1,189	702	59%	447	353	79%
Pangasinan		911	592	65%	1,268	938	74%
Tarlac		273	188	69%	672	538	80%
Zambales		319	287	90%	250	100	40%
IV	Batangas	831	582	70%	828	530	64%
	Marinduque	28	21	75%	172	52	30%
	Occidental Mindoro	178	125	70%	160	70	44%
	Oriental Mindoro	91	75	82%	517	326	63%
	Palawan	230	184	80%	411	275	67%
	Rizal	1,257	855	68%	55	40	73%
	Romblon	49	33	68%	195	94	48%
V	Albay	262	160	61%	743	557	75%
	Camarines Norte	118	73	62%	321	257	80%
	Camarines Sur	501	356	71%	931	745	80%
Total		9,588	6,601	69%	11,185	7,836	70%

Data Source: Provincial Water Supply, Sewerage and Sanitation Sector Plan

Table 3-5 RURAL WATER SUPPLY ESTIMATE OF NEEDS

Year	Rural Pop.	Pop. Served *			Pop. Served (functioning) **		No. of Wells
		Annual	Cumulative	(%)	(%)	(%)	
1987	24,356,294	0	15,379,999		11,534,999	47.36%	667,808
1988	29,585,433	918,710	16,298,709	55.09%	12,453,709	42.09%	674,875
1989	30,354,655	2,445,430	18,744,139	61.75%	14,899,139	49.08%	693,686
1990	31,158,400	3,354,780	22,098,919	70.92%	18,253,919	58.58%	719,492
1991	32,694,430	2,990,910	25,089,829	76.74%	21,244,829	64.98%	742,499
1992	33,539,930	1,892,930	26,982,759	80.45%	23,137,759	68.99%	757,060
1993	34,383,134	659,490	27,642,249	80.39%	23,797,249	69.24%	762,133
1994	35,226,334	1,134,250	28,776,499	81.69%	24,931,499	70.78%	770,858
1995	36,069,531	1,371,370	30,147,869	83.58%	26,302,869	72.92%	781,407
1996	36,907,406	522,600	30,670,469	83.10%	26,825,469	72.68%	785,427
1997	37,742,993	1,230,550	31,901,019	84.52%	28,056,019	74.33%	794,893
1998	38,578,583	1,246,960	33,148,009	85.92%	29,303,009	75.96%	804,483
1999	39,414,169	1,240,720	34,388,729	87.25%	30,543,729	77.49%	814,029
2000	40,252,044	1,280,170	35,668,830	88.61%	31,823,830	79.06%	823,576

Data Source: DPWH

Note: * Percent Population Coverage at 130 persons per well

** Population Served to account non-functioning wells 25% of stock

Table 3-6 WATER PRODUCTION AND VOLUME OF WATER SOLD BY MWSS

Year	Water Production						year	Total (mld)	Volume Sold Total (MCM/year)	Revenued Water (%)	Non-Revenued Water (%)
	GW (MCM/year)	GW (mld)	SW (MCM/year)	SW (mld)	Total (mld)	Total (MCM/year)					
1985	30	81	757	2,075	2,156	787	303	830	303	38	62
1986	30	83	874	2,395	2,478	905	311	851	311	34	66
1987	28	76	835	2,287	2,364	863	337	922	337	39	61
1988	30	81	849	2,327	2,408	879	359	985	359	41	59
1989	29	79	859	2,354	2,433	888	376	1,030	376	42	58
1990	33	91	876	2,399	2,491	909	385	1,054	385	42	58
1991	34	93	780	2,136	2,229	814	386	1,059	386	48	52
1992	28	77	823	2,256	2,333	851	383	1,049	383	45	55
1993	26	70	907	2,485	2,556	933	397	1,088	397	43	57
1994	27	73	983	2,693	2,766	1,010	419	1,148	419	42	59
1995	27	75	949	2,599	2,674	976	426	1,168	426	44	56
1996	30	82	1,100	3,013	3,095	1,130	436	1,194	436	39	61

Data Source: MWSS

Table 3-7 EXISTING WATER DEMAND FOR WATER DISTRICTS

Region	Number of WDs	Q (m ³ /day)	Q (MCM/year)	Population Served	lpcd	Population '95	Service Ratio
I	20	71,726	26.18	440,160	162.95	1,227,180	36%
II	10	19,829	7.24	128,920	153.81	956,460	13%
III	86	375,037	136.89	1,865,560	201.03	6,258,060	30%
IV	67	291,111	106.26	1,153,980	252.27	4,664,170	25%
V	37	96,781	35.33	489,310	197.79	2,351,140	21%
VI	54	132,175	48.24	695,740	189.98	3,617,330	19%
VII	19	202,897	74.06	516,330	392.96	2,097,800	25%
VIII	22	47,788	17.44	328,750	145.36	1,429,280	23%
IX	18	107,733	39.32	488,270	220.64	1,372,940	36%
X	23	130,646	47.69	716,550	182.33	1,944,090	37%
XI	21	160,894	58.73	1,028,500	156.44	2,139,650	48%
XII	22	42,692	15.58	251,540	169.72	1,906,570	13%
Total	399.00	1,679,309	612.95	8,103,610	207.23	29,964,670	27%

Data Source: List of WDs as of Jan. 1997 and LWUA's Annual Reports as of 1995 & 1996

Table 3-8 WATER DEMAND FOR PUBLIC WATER SUPPLY IN 1995

WRR	Type	Water Demand (MCM/year)		
		Total	Urban Area	Rural Area
I	L-III	26	15	11
	L-I, II	14	4	11
	Sub-total	41	18	22
II	L-III	7	5	3
	L-I, II	21	4	17
	Sub-total	28	8	20
III	L-III	137	111	26
	L-I, II	51	21	30
	Sub-total	188	131	56
IV	L-III	1,082	1,053	29
	L-I, II	48	20	28
	Sub-total	1,131	1,073	58
V	L-III	35	22	13
	L-I, II	30	6	25
	Sub-total	66	28	38
VI	L-III	48	31	17
	L-I, II	40	13	27
	Sub-total	89	44	44
VII	L-III	74	60	14
	L-I, II	35	13	22
	Sub-total	109	73	36
VIII	L-III	17	9	8
	L-I, II	25	6	19
	Sub-total	42	15	27
IX	L-III	39	34	5
	L-I, II	23	5	19
	Sub-total	63	39	24
X	L-III	48	40	8
	L-I, II	24	6	18
	Sub-total	72	46	26
XI	L-III	59	55	4
	L-I, II	22	3	18
	Sub-total	80	58	22
XII	L-III	16	15	1
	L-I, II	36	10	26
	Sub-total	52	25	27
Total	L-III	1,589	1,448	141
	L-I, II	369	110	259
	Total	1,958	1,558	400

Table 3-9 EXISTING SERVICE COVERAGE AND WATER DEMAND FOR PUBLIC WATER SUPPLY SYSTEM AND PRIVATE WATER SOURCE (1/2)

Region	Type	Coverage/ Demand	Total	Urban	Rural
I	Public	Population (x 1,000)	2,362	775	1,587
		Pop. Served (x 1,000)	1,757	571	1,186
		Coverage (%)	74%	74%	75%
	Private	Water Demand (MCM/year)	41	18	22
		Pop. Served (x 1,000)	606	204	401
		Coverage (%)	26%	26%	25%
	Total	Water Demand (MCM/year)	6.63	2.24	4.40
Total Water Demand			47	20	27
II	Public	Population (x 1,000)	3,054	640	2,414
		Pop. Served (x 1,000)	2,028	406	1,622
		Coverage (%)	66%	63%	67%
	Private	Water Demand (MCM/year)	28	8	20
		Pop. Served (x 1,000)	1,026	234	792
		Coverage (%)	34%	37%	33%
	Total	Water Demand (MCM/year)	11.23	2.56	8.67
Total Water Demand			39	11	29
III	Public	Population (x 1,000)	9,111	4,933	4,178
		Pop. Served (x 1,000)	6,497	3,369	3,128
		Coverage (%)	71%	68%	75%
	Private	Water Demand (MCM/year)	188	131	56
		Pop. Served (x 1,000)	2,614	1,564	1,050
		Coverage (%)	29%	32%	25%
	Total	Water Demand (MCM/year)	28.63	17.13	11.50
Total Water Demand			216	148	68
IV	Public	Population (x 1,000)	19,395	15,210	4,185
		Pop. Served (x 1,000)	12,866	9,982	2,883
		Coverage (%)	66%	66%	69%
	Private	Water Demand (MCM/year)	1,131	1,073	58
		Pop. Served (x 1,000)	6,529	5,228	1,301
		Coverage (%)	34%	34%	31%
	Total	Water Demand (MCM/year)	71.49	57.25	14.25
Total Water Demand			1,202	1,130	72
V	Public	Population (x 1,000)	4,325	1,221	3,105
		Pop. Served (x 1,000)	3,265	823	2,442
		Coverage (%)	75%	67%	79%
	Private	Water Demand (MCM/year)	66	28	38
		Pop. Served (x 1,000)	1,061	398	663
		Coverage (%)	25%	33%	21%
	Total	Water Demand (MCM/year)	11.61	4.35	7.26
Total Water Demand			77	32	45
VI	Public	Population (x 1,000)	5,777	2,359	3,418
		Pop. Served (x 1,000)	4,371	1,626	2,744
		Coverage (%)	76%	69%	80%
	Private	Water Demand (MCM/year)	89	44	44
		Pop. Served (x 1,000)	1,406	732	674
		Coverage (%)	24%	31%	20%
	Total	Water Demand (MCM/year)	15.40	8.02	7.38
Total Water Demand			104	52	51
VII	Public	Population (x 1,000)	5,015	2,298	2,716
		Pop. Served (x 1,000)	3,672	1,586	2,086
		Coverage (%)	73%	69%	77%
		Water Demand (MCM/year)	108.59	72.57	36.02

Table 3-9 EXISTING SERVICE COVERAGE AND WATER DEMAND FOR PUBLIC WATER SUPPLY SYSTEM AND PRIVATE WATER SOURCE (2/2)

	Private	Pop. Served	(x 1,000)	1,343	712	630
		Coverage	(%)	27%	31%	23%
		Water Demand	(MCM/year)	15	8	7
	Total	Water Demand		123	80	43
VIII		Population	(x 1,000)	3,367	1,013	2,354
	Public	Pop. Served	(x 1,000)	2,576	699	1,877
		Coverage	(%)	77%	69%	80%
		Water Demand	(MCM/year)	42	15	27
	Private	Pop. Served	(x 1,000)	791	314	477
		Coverage	(%)	23%	31%	20%
		Water Demand	(MCM/year)	8.66	3.44	5.22
	Total	Water Demand		51	18	32
IX		Population	(x 1,000)	3,581.63	1,252.21	2,329.43
	Public	Pop. Served	(x 1,000)	2,629.70	864.02	1,765.68
		Coverage	(%)	73%	69%	76%
		Water Demand	(MCM/year)	62.76	38.78	23.99
	Private	Pop. Served	(x 1,000)	951.94	388.18	563.75
		Coverage	(%)	27%	31%	24%
		Water Demand	(MCM/year)	10.42	4.25	6.17
	Total	Water Demand		73.19	43.03	30.16
X		Population	(x 1,000)	3,954.76	1,724.81	2,229.95
	Public	Pop. Served	(x 1,000)	2,926.51	1,190.12	1,736.40
		Coverage	(%)	74%	69%	78%
		Water Demand	(MCM/year)	71.84	46.25	25.59
	Private	Pop. Served	(x 1,000)	1,028.25	534.69	493.56
		Coverage	(%)	26%	31%	22%
		Water Demand	(MCM/year)	11.26	5.85	5.40
	Total	Water Demand		83.10	52.11	31.00
XI		Population	(x 1,000)	5,777	2,359	3,418
	Public	Pop. Served	(x 1,000)	4,371	1,626	2,744
		Coverage	(%)	76%	69%	80%
		Water Demand	(MCM/year)	89	44	44
	Private	Pop. Served	(x 1,000)	1,406	732	674
		Coverage	(%)	24%	31%	20%
		Water Demand	(MCM/year)	15.40	8.02	7.38
	Total	Water Demand		104	52	51
XII		Population	(x 1,000)	4,909	1,701	3,208
	Public	Pop. Served	(x 1,000)	3,533	1,174	2,359
		Coverage	(%)	72%	69%	74%
		Water Demand	(MCM/year)	52	25	27
	Private	Pop. Served	(x 1,000)	1,376	527	849
		Coverage	(%)	28%	31%	26%
		Water Demand	(MCM/year)	15.07	5.78	9.29
	Total	Water Demand		67	31	36
Total		Population	(x 1,000)	68,613	34,619	33,994
	Public	Pop. Served	(x 1,000)	49,120	23,548	25,572
		Coverage	(%)	72%	68%	75%
		Water Demand	(MCM/year)	1,958	1,558	400
	Private	Pop. Served	(x 1,000)	19,493	11,070	8,422
		Coverage	(%)	28%	32%	25%
		Water Demand	(MCM/year)	213.44	121.22	92.22
	Total	Water Demand		2,172	1,679	492

Table 3-10 WATER RIGHTS FOR INDUSTRIAL WATER (1/3)

(Unit: lps)

Region	1986			1987			1988			1989		
	GW	SW	Total	GW	SW	Total	GW	SW	Total	GW	SW	Total
I	579	911	1,490	579	911	1,490	580	1,117	1,698	580	1,315	1,896
II	1	489	490	1	489	490	1	489	490	1	489	490
III	1,178	3,880	5,058	1,178	3,880	5,058	1,210	4,015	5,225	1,225	4,015	5,240
IV	1,040	7,748	8,788	1,040	7,751	8,791	1,040	7,751	8,791	1,043	7,751	8,794
V	172	444	616	172	444	616	172	444	616	172	444	616
VI	755	16,202	16,957	755	16,202	16,957	755	16,202	16,957	757	16,202	16,959
VII	1,140	1,905	3,045	1,140	1,905	3,045	1,140	1,905	3,045	1,140	1,905	3,045
VIII	382	348	730	382	348	730	382	348	730	382	348	730
IX	13	134	147	13	134	147	13	134	147	13	134	147
X	1	6,408	6,408	1	6,408	6,408	1	6,408	6,408	1	6,408	6,408
XI	0	4,912	4,913	0	4,912	4,913	0	5,182	5,182	0	5,182	5,182
XII	0	2,819	2,819	0	2,819	2,819	0	2,819	2,819	0	2,819	2,819
Total	5,261	46,201	51,462	5,261	46,204	51,465	5,294	46,815	52,108	5,313	47,013	52,326

Table 3-10 WATER RIGHTS FOR INDUSTRIAL WATER (2/3)

(Unit: lps)

Region	1990			1991			1992			1993		
	GW	SW	Total	GW	SW	Total	GW	SW	Total	GW	SW	Total
I	580	1,565	2,146	580	1,645	2,226	582	1,645	2,227	617	1,645	2,262
II	366	489	855	366	489	855	366	489	855	377	489	866
III	1,226	4,015	5,241	1,226	4,015	5,241	1,226	4,045	5,271	1,255	4,045	5,300
IV	1,090	7,751	8,842	1,100	7,751	8,851	1,132	7,810	8,943	1,142	7,813	8,956
V	172	444	616	172	444	616	172	444	616	172	444	616
VI	757	16,202	16,959	758	16,202	16,960	833	16,452	17,285	852	16,452	17,305
VII	1,140	1,905	3,045	1,140	1,905	3,045	1,225	2,016	3,241	1,249	2,016	3,265
VIII	382	348	730	382	348	730	382	348	730	382	348	730
IX	13	134	147	13	134	147	17	134	151	17	134	151
X	2	6,408	6,410	2	6,408	6,410	2	6,408	6,410	2	6,408	6,410
XI	0	5,182	5,182	0	5,182	5,182	13	5,182	5,195	13	5,740	5,753
XII	0	2,819	2,819	0	2,819	2,819	0	2,819	2,819	0	2,819	2,819
Total	5,729	47,263	52,992	5,740	47,343	53,083	5,950	47,793	53,743	6,079	48,354	54,434

Table 3-10 WATER RIGHTS FOR INDUSTRIAL WATER (3/3)

(Unit: lps)

Region	1994			1995			1996		
	GW	SW	Total	GW	SW	Total	GW	SW	Total
I	617	1,645	2,262	617	1,645	2,262	647	1,645	2,292
II	498	489	987	498	489	987	498	489	987
III	1,255	4,045	5,300	1,263	4,045	5,308	1,466	4,045	5,512
IV	1,157	7,813	8,970	2,897	13,053	15,950	3,463	13,093	16,557
V	172	444	616	172	503	675	172	562	734
VI	881	16,602	17,483	881	16,605	17,485	899	16,725	17,624
VII	1,407	2,442	3,849	1,418	2,476	3,895	1,430	2,511	3,941
VIII	382	348	730	382	348	730	389	365	755
IX	22	135	157	22	135	157	22	135	157
X	93	6,456	6,549	93	6,456	6,549	102	6,456	6,558
XI	64	6,567	6,632	94	6,567	6,661	220	6,567	6,787
XII	0	2,819	2,819	0	2,824	2,824	63	3,965	4,027
Total	6,548	49,807	56,355	8,337	55,147	63,485	9,372	56,559	65,931

Data Source: NWRB

Note: GW--Ground Water, SW--Surface Water

Table 3-11 INDUSTRIAL WATER DEMAND IN 1995

Region	Ground Water (MCM/year)	Surface Water (MCM/year)	Total (MCM/year)
I	5.3	67.7	72.9
II	0.7	15.4	16.1
III	83.7	125.6	209.3
IV	202.2	423.6	625.8
V	1.6	18.2	19.8
VI	45.6	523.6	569.3
VII	88.0	77.8	165.8
VIII	20.4	11.0	31.4
IX	1.4	4.3	5.7
X	43.3	167.1	210.4
XI	16.0	199.1	215.1
XII	6.3	85.7	92.0
Total	514.4	1,719.1	2,233.5

Table 3-12 LIST OF NATIONAL IRRIGATION SYSTEMS AS OF 1996 (1/2)

SYSTEM	WARR	Province Served	No. of Systems	Service Area (ha)	Actual Irrigated Area (ha)			Cropping Intensity (%)		
					Wet	Dry	Total	Wet	Dry	Total
Region 1										
Agno-Sinucalan	III	Pangasinan	2	12130	7016	5000	12016	58.09	41.22	99.31
Antibayan-Dipelo	III	Pangasinan	3	6302	3250	792	4042	51.57	12.57	64.14
Atburayan	I	La Union	1	3120	3250	2530	5810	95.03	75.73	170.76
Ilocos Norte	I	Ilocos Norte	8	6175	5038	4243	9278	81.59	69.66	150.25
Ilocos Sur	I	Ilocos Sur	3	3310	3370	1238	4608	87.76	32.24	120
Lower Agno-Totonuguen	III	Pangasinan	1	7500	3722	2025	5797	50.29	27.00	77.29
Masahp	I	La Union	1	1585	1300	716	2016	82.02	45.17	127.19
San Fabian-Dumuloc	III	Pangasinan	2	3594	2395	1387	3782	66.64	38.59	105.23
Subtotal			21	41546	29421	17988	47409	66.05	40.38	106.43
Region 2										
Abulog-Apayao-Panipona	II	Cagayan-Apayao	2	10895	4500	5032	9532	41.30	46.10	87.49
Bugayao	II	Cagayan	1	1812	1020	1431	2501	56.29	81.73	138.02
Banabur	II	Cagayan	1	1087	680	990	1670	62.56	91.08	153.63
Baya	II	Cagayan	1	1353	452	745	1199	33.41	55.14	88.54
Dummun	II	Cagayan	1	1502	962	1385	2347	64.05	92.21	156.26
IAAPIS	II	Cagayan	1	2306	990	1300	2280	42.50	56.37	98.87
Lower Chico	II	Cagayan	1	1856	1226	895	2121	66.06	48.22	114.28
Magapi	II	Cagayan	1	7500	3730	7170	10900	43.73	95.60	145.33
Mahig	II	Isabela	1	2427	1370	1480	2850	56.45	60.98	117.43
MARIS District I	II	Isabela	1	24054	18662	18362	37024	77.58	78.91	156.5
MARIS District II	II	Isabela	1	24158	21925	21947	43872	89.89	89.70	179.59
MARIS District III	II	Isabela-Iligao	1	24793	16763	16539	33302	67.61	68.71	134.32
MARIS District IV	II	Isabela	1	24087	17597	17756	35353	73.06	73.72	146.77
San Pablo-Cabagan	II	Isabela	1	1273	686	696	1382	53.89	54.67	108.56
Solana-Tuguegarao	II	Cagayan	1	1000	679	507	1186	67.90	50.70	118.6
Pindocanuan	II	Cagayan	1	880	460	461	921	52.27	52.39	104.66
Tumagan	II	Isabela	1	3615	1651	2253	3904	45.67	62.32	107.99
Upper Chico (CAR)	II	Kalinga-Apayao-Isabela	1	17551	9689	9600	19289	55.20	54.70	109.90
Zinundangan	II	Cagayan	1	2045	1289	1869	3158	61.39	91.30	132.79
Subtotal			20	154504	104921	111089	216060	67.94	71.90	139.84
Region 3										
Bucay	III	Zambales	1	1231	No operation					
Angat-Masam	III	Bulacan	1	31435	21555	26464	48019	69.48	84.05	152.54
Camiling	III	Tarlac	1	8600	6776	3250	10026	78.79	37.79	116.58
Coto-Casulanan	III	Bataan-Panganga	2	1427	400	483	883	28.03	33.85	61.88
Nayon-Baylo	III	Zambales	2	1948	1550	1625	3175	84.70	83.42	168.12
NEPIS	III	Nueva Ecija	1	1313			0			0
Sta. Tomas	III	Zambales	1	3924	No operation					
TASMORIS	III	Tarlac	2	13976	No operation					
Porac-Gumain	III	Pampanga	1	4405	1001	2554	3555	23.41		81.38
UPRIS District I	III	Nueva Ecija	1	24362	20616	16577	37193	82.59	66.41	149
UPRIS District II	III	Nueva Ecija	1	23913	22682	13663	35745	94.85	54.63	143.48
UPRIS District III	III	Nueva Ecija	1	29848	20564	16052	36616	68.90	53.78	122.68
UPRIS District IV	III	Nueva Ecija	1	23311	17388	10809	28197	75.54	45.39	120.94
Subtotal			16	170841	113262	90877	204139	66.30	53.19	119.49
Region 4										
Agos	IV	Quezon	1	1119	1119	1112	2238	100.00	100.00	200
Aminay-Patric	IV	Mindoro Occ.	1	2213	900	900	1800	40.67	40.67	81.34
Baco-Burayao	IV	Mindoro Or.	1	6327	3928	3469	7397	62.08	54.83	116.91
Caguray	IV	Mindoro Occ.	1	3308	982	279	1211	29.69	6.92	36.61
Canlingas	IV	Ronibon	1	256	284	256	540	110.94	100.00	210.94
Cavite FLIS	IV	Cavite	1	13066	8425	3662	12287	64.38	29.51	93.89
Orsat	III	Aurora	1	485	320	380	700	65.98	78.35	144.33
DHL	IV	Quezon	3	3309	2520	2787	5307	76.16	84.22	160.38
Laguna FLIS	IV	Laguna	6	3250	2130	1891	4021	65.54	58.13	123.72
Lumintao	IV	Mindoro Occ.	1	1504	1002	721	1723	66.62	47.94	114.56
Malatgao-Batang-Batang	IV	Palawan	2	3200	3484	2517	6001	108.88	78.66	187.53
Sta. Maria-Mayor	IV	Laguna	2	1773	975	991	1966	54.99	55.89	110.89
Pagbaban	IV	Mindoro Occ.	1	1005	653	653	1306	64.98	64.98	129.95
Palco	IV	Batangas	1	886	826	826	1652	93.23	93.23	186.46
Pula-Bansud	IV	Mindoro Or.	2	3830	3343	3343	6686	87.28	87.28	134.57
Sta. Cruz-MMBL	IV	Laguna	5	4977	3377	3180	6557	67.85	63.89	131.75
Mag-asawang Tubig	IV	Mindoro Or.	1	1700	400	665	1065	23.53	39.12	62.65
Subtotal			31	52228	34668	27789	62457	66.38	53.21	119.59
Region 5										
Bant-Buh-Lalo	V	Camarines Sur	2	9720	4824	4491	9315	49.63	45.20	95.83
Cagayay	V	Camarines Sur	1	1755	506	1400	1906	28.83	79.77	108.6
Daet-Talsay-Matogdon	V	Camarines Norte	2	2748	2580	2526	5106	93.95	91.99	185.94
Inarhas-Tigman-Hinayaman	V	Camarines Sur	1	3542	2775	2776	5551	78.35	78.37	156.72
Libmanan-Cabusao	V	Camarines Sur	1	2593	No Operation					
MNOH	V	Albay	4	1916	1343	1941	3884	99.85		199.59
Pili-Bulan-San Francisco	V	Sorsogon	3	1200	950	800	1750	79.17		145.83
Subtotal			14	23412	13578	13934	27512	58.00	59.52	117.51
Region 6										
Aganan-Sta. Barbara	VI	Iloilo	2	8262	7062	3185	10547	85.48	42.18	127.66
Aklan-Panakuyan	VI	Aklan	2	4816	4216	4216	8432	87.54	87.54	175.08
Bago	VI	Negros Occ.	1	12700	9723	8093	17816	76.56	63.72	140.28
Barotac-Viejo	VI	Iloilo	1	1774	1400	933	2383	78.92	55.41	134.33
Jalaur-Sugbo	VI	Iloilo	3	14400	11556	8550	20106	80.25	59.38	139.63
Mambusao	VI	Capiz	1	1423	990	878	1868	69.57	61.70	131.27
Pangipian	VI	Negros Occ.	1	1775	957	940	1897	53.92	52.96	106.87
Sibajon-San Jose	VI	Antique	1	5065	4375	3036	7411	86.38	53.94	146.32
Sibajon-Tajuban	VI	Iloilo	1	2020	1624	550	2174	80.40	27.23	107.62
Subtotal			13	52235	41993	30731	72634	59.22	58.83	139.06

Table 3-12 LIST OF NATIONAL IRRIGATION SYSTEMS AS OF 1996 (2/2)

SYSTEM	WRA*	Province Served	No. of Systems	Service Area (ha)	Actual Irrigated Area (ha)			Cropping Intensity (%)		
					Wet	Dry	Total	Wet	Dry	Total
Region 7 & 8										
Bao	VIII	Northern Leyte	1	1917	1802	1795	3597	91.00	93.64	137.64
Banahaan-Talak	VIII	Northern Leyte	4	6041	4116	4122	8238	68.13	68.23	136.37
Mainit Pangso	VIII	Northern Leyte	2	2184	1760	1478	3238	80.59	67.67	119.26
Dagupan-Guinaona	VIII	Northern Leyte	2	1495	750	893	1633	50.13	59.02	109.16
Bilo	VIII	Northern Leyte	1	1411	1332	1313	2645	91.40	93.05	187.46
Balira-Itawon-Gibuga	VIII	Northern Leyte	4	1715	1388	1273	2661	80.93	74.23	155.16
Hindang-Hilongos-Dasay	VIII	No.-So. Leyte	2	1078	1078	1078	2156	100.00	100.00	200
Subtotal			16	15842	12226	11942	24168	77.17	75.38	152.56
Region 9										
Dipolo	IX	Misamis Occ.	1	1600	923	821	1750	58.06	51.31	109.38
Labangan	IX	Zamboanga Sur	1	3195	2500	1906	4406	78.25	61.53	139.78
Salug	IX	Zamboanga Sur	1	7224	5905	5600	11595	82.90	77.52	160.51
Sibuguey Valley	IX	Zamboanga Sur	1	3143	2300	2310	4610	73.18	73.50	146.68
Subtotal			4	15162	11724	10637	22421	77.32	70.55	147.88
Region 10										
Manupali	XII	Bukidnon	1	4395	1311	1627	2938	29.83	37.02	66.85
Muleta	XII	Bukidnon	1	4062	1326	1272	2598	32.64	31.31	63.96
Pulangui	XII	Bukidnon	1	8547	8263	8336	16599	96.68	97.53	194.21
Roxas-Kuya	XII	Bukidnon	1	753	763	781	1547	101.33	104.12	205.44
Rugnan	XII	Lanao del Sur	1	2500	207	154	361	8.28	6.18	14.44
Subtotal			5	20257	11870	12179	24043	58.60	60.09	118.09
Region 11										
Allah 1	XII	South Cotabato	1	10639	11970	6075	18045	113.58	57.64	171.22
Bahru	X	Davao del Norte	1	3203	3197	3135	6392	97.80	95.90	193.7
Busayan	XI	South Cotabato	1	710	587	530	1117	82.68	74.65	157.32
Lasang	XI	Davao del Norte	1	4450	4373	4432	8805	98.27	99.60	197.87
Lupon	XI	Davao Oriental	1	2131	2245	2245	4490	105.35	105.35	210.7
Padada	XI	Davao del Sur	1	3512	3529	3393	6922	100.49	96.61	197.1
Saug	XI	Davao del Norte	1	2941	3003	2625	5628	102.11	89.26	191.36
Silay	XI	South Cotabato	1	1406	1246	1225	2471	88.62	87.13	175.75
Banga-Market	XII	South Cotabato	3	5157	5315	4428	9743	103.06	85.86	189.93
Libuganon	XI	Davao del Norte	1	7093	10726	8338	19064	151.22	117.55	268.77
Saug-Libuganon	XI	Davao del Norte	1	479	469	500	969	97.91	104.38	202.3
Dumaguil	XII	South Cotabato	1	2300	1361	1300	2661	59.17	56.52	115.7
Lambayong	XII	South Cotabato	1	11033	10139	4003	14172	91.90	36.55	128.45
Kipaliku	XI	Davao del Norte	1	1500	2359	1797	4156	157.27	119.80	277.07
Mat	XI	Davao del Sur	1	2509	2568	2584	5152	102.35	102.99	205.34
Subtotal			17	59023	63087	45640	109727	106.87	79.01	195.89
Region 12										
Allah 2 - Lambayong	XII	South Cotabato	1							
Kabacan-Pagalungan	XII	No. Cota-Maguindanao	2	5018	4400	4395	8795	87.68	87.58	175.27
Libungan	XII	No. Cota-Maguindanao	1	9360	8799	5596	14395	94.01	59.79	153.79
Malasila	XII	North Cotabato	1	4006	3360	3193	6553	83.87	79.71	163.58
Mtlang	XII	North Cotabato	1	2981	2100	1913	4013	70.45	64.17	134.62
Telayan	XII	Maguindanao	1	700	35	358	393	5.00	51.14	56.14
Maranding	XII	Lanao del Norte	1	4500	3466	3437	6903	77.02	76.38	153.4
Aio	XII	Maguindanao	1	2300	2233	1855	4088	97.09	80.65	177.74
Subtotal			9	28865	24393	20747	45140	84.51	71.83	156.38
CARAGA										
Andanan	X	Agusan del Sur	1	3418	3096	3106	6202	90.83	90.80	181.56
Cabadbaran	X	Agusan del Norte	2	3212	2100	1932	4032	65.38	60.15	125.53
Cantilan	XI	Surigao del Sur	1	1786	1496	1500	2996	83.76	83.99	167.75
Gibong	X	Agusan del Sur	1	2156	2116	2156	4272	98.14	100.00	198.14
Simulao	X	Agusan del Sur	1	2119	2180	2207	4387	102.89	104.15	207.03
Tago	XI	Surigao del Sur	1	2202	2345	2104	4449	106.49	95.55	202.04
Subtotal			7	14891	13333	13006	26338	89.54	87.33	176.87
TOTAL			173	651812	474436	407612	882043	72.79	62.54	135.32

*Water Resources Region

Data Source: National Irrigation Administration

Table 3-14 STATUS OF IRRIGATION DEVELOPMENT BY PROVINCE AS OF DECEMBER 1996 (1/3)

Water Resources Region (WRR)/Province	Potential Irrigable Area (ha)/	N I S D		C I S D		S W I M 4 / SW/P/SRIP		Diversion Dam S/		Shallow Tube Well		Total Service Area (ha)	Ratio of Irrigation Developm. (%)
		Number	Service Area (ha)	Number	Service Area (ha)	Number	Service Area (ha)	Number	Service Area (ha)	Number	Service Area (ha)		
WRR I													
Abra	16,740	-	-	273	12,823	-	-	2	110	-	-	12,933	77
Benguet***	5,004	-	-	338	6,480	-	-	-	-	-	-	6,480	129
Ilocos Norte	49,660	8	6,175	798	30,061	15	700	18	576	35	119	37,631	76
Ilocos Sur	30,034	3	3,840	232	12,869	-	-	23	731	29	90	17,530	58
La Union	16,986	2	5,005	269	9,473	4	242	16	510	19	101	15,331	90
Total	118,424	13	15,020	1,850	71,706	19	942	59	1,927	83	310	89,905	76
WRR II													
Batanes	-	-	-	2	25	-	-	-	-	-	-	25	34
Cagayan	147,280	12	29,029	183	19,071	18	931	5	249	38	121	49,401	37
Ifugao	19,410	-	528	171	6,432	4	42	4	115	-	-	7,117	48
Isabela	252,870	7	113,955	42	6,111	16	714	1	18	28	119	120,917	44
Kalinga Apayao	47,660	1	10,916	199	9,632	2	40	10	396	29	108	21,092	106
Mt. Province	7,500	-	-	945	7,902	-	-	4	40	-	-	7,942	50
Nueva Vizcaya	48,520	-	-	255	23,603	11	489	2	125	-	-	24,217	19
Quirino	23,970	-	76	81	4,135	11	310	1	15	-	-	4,536	43
Total	547,210	20	154,504	1,878	76,911	62	2,526	27	958	95	347	235,246	71
WRR III													
Aurora	16,630	1	485	83	11,058	1	30	6	274	-	-	11,847	68
Bataan	11,520	1	521	84	6,648	-	-	19	613	16	36	7,818	129
Benguet***	3,336	-	-	275	4,244	-	-	2	57	-	-	4,301	69
Bulacan	51,970	1	27,767	61	6,015	8	1,531	9	340	20	52	35,705	58
Nueva Ecija	208,640	5	94,028	95	24,336	10	1,454	2	240	47	94	120,152	75
Pampanga	57,370	2	19,178	133	22,794	2	216	19	728	50	121	43,037	55
Pangasinan	180,500	8	27,478	484	69,432	10	410	24	938	51	142	98,400	35
Tarlac	114,530	3	24,476	55	13,555	6	1,075	14	547	42	80	39,733	38
Zambales	38,200	4	6,919	87	7,277	1	50	5	114	26	59	14,419	55
Total	682,696	25	290,852	1,327	165,359	38	4,766	100	3,851	252	582	375,410	41
WRR IV													
Barangas	9,260	1	886	64	2,724	4	23	9	106	9	15	3,754	56
Cavite	23,760	1	13,086	5	310	1	18	-	-	-	-	13,414	54
Laguna	27,510	13	10,000	101	4,574	-	-	9	342	-	-	14,916	47
Marinduque	2,190	-	-	34	993	1	12	1	15	-	-	1,020	40
Mindoro Occidental	56,170	5	8,030	70	14,259	-	-	2	45	-	-	22,374	36
Mindoro Oriental	56,710	4	11,857	59	8,225	-	-	4	145	45	80	20,307	50
Palawan	28,610	2	3,200	66	11,109	-	-	2	48	-	-	14,357	53
Quezon	27,850	4	4,428	229	9,632	-	-	20	683	-	-	14,743	35
Rizal	9,330	-	-	59	3,192	2	80	1	40	-	-	3,312	36
Romblon	5,570	1	256	50	1,718	2	22	-	-	-	-	1,996	45
Total	246,960	31	51,743	737	56,776	10	155	48	1,424	54	95	110,193	41

Table 3-14 STATUS OF IRRIGATION DEVELOPMENT BY PROVINCE AS OF DECEMBER 1996 (2/3)

Water Resources Region / Province	Potential Irrigable Area (ha) /	N I S 2		C I S 3		S W I M 4 / S W P / S K I P		Diversion Dam 5		Shallow Tube Well		Ratio of Irrigation Developm. %	
		Number	Service Area (ha)	Number	Service Area (ha)	Number	Service Area (ha)	Number	Service Area (ha)	Number	Service Area (ha)		
													Total Service Area (ha)
WRR V													
Albay	54,620	4	1,946	364	31,393	1	15	8	499	-	-	33,853	62
Camarines Norte	22,590	2	2,746	101	3,186	1	33	6	119	-	-	6,084	27
Camarines Sur	123,700	6	17,520	288	37,369	3	263	14	750	49	151	56,053	45
Cananduanes	3,770	-	-	45	1,662	-	-	9	228	-	-	1,890	50
Masbate	19,880	-	-	147	3,972	7	654	-	-	-	-	4,626	23
Sorsogon	15,100	2	1,200	178	8,560	2	65	9	214	11	39	10,078	67
Total	239,660	14	23,412	1,123	86,142	14	1,030	46	1,810	60	190	112,584	47
WRR VI													
Aklan	10,510	2	4,816	28	2,248	1	40	10	335	-	-	7,439	71
Antique	24,020	1	5,065	136	8,983	1	38	7	160	21	60	14,306	60
Capiz	13,670	1	1,423	28	2,413	1	50	13	307	5	15	4,208	31
Guimaras &	75,160	-	-	-	-	-	-	2	45	-	-	45	48
Iloilo	71,000	7	26,456	109	7,768	20	1,278	4	92	47	139	35,733	24
Negros Occ.***	678	2	14,475	25	2,174	1	40	3	121	34	106	16,916	52
Negros Or.***	195,038	13	52,235	330	23,823	24	1,446	40	1,110	107	318	78,932	40
Total	30,090	-	-	228	9,526	41	1,085	4	106	16	37	10,754	36
Cebu	5,860	-	-	50	3,525	1	5	4	76	-	-	3,606	62
Negros Occ.***	2,890	-	-	2	597	1	100	1	20	-	-	717	25
Negros Or.***	14,112	-	-	55	6,093	2	800	7	445	-	-	7,338	56
Siquijor	52,952	-	-	20	465	-	-	4	91	-	-	556	43
Total	84,380	16	15,842	401	33,893	13	602	30	473	7	14	50,824	60
WRR VIII													
Biuran &	55,620	-	-	-	-	-	-	3	65	-	-	65	69
Northern Leyte	5,690	15	15,456	147	22,671	3	131	3	50	7	14	38,322	94
Southern Leyte	4,070	1	386	123	4,601	4	255	7	118	-	-	5,360	57
Eastern Samar	10,860	-	-	63	2,099	4	149	5	83	-	-	2,331	28
Northern Samar	8,140	-	-	45	2,889	2	67	7	104	-	-	3,060	21
Western Samar	84,380	16	15,842	401	33,893	13	602	30	473	7	14	50,824	60
Total	420	-	-	2	186	-	-	-	-	-	-	186	44
Misamis Occ.	6,440	-	880	45	5,116	2	22	6	112	-	-	6,130	95
Sulu	-	-	-	-	-	3	150	-	-	-	-	150	11
Tawi-Tawi	32,310	-	-	-	-	2	11	-	-	-	-	11	18
Zamboanga Norte	43,770	4	14,282	126	12,890	7	514	16	564	39	151	28,401	65
Zamboanga Sur	82,940	4	15,162	224	23,536	15	707	34	1,125	39	151	40,681	49
Total	420	-	-	2	186	-	-	-	-	-	-	186	44
WRR IX													

Table 3-14 STATUS OF IRRIGATION DEVELOPMENT BY PROVINCE AS OF DECEMBER 1996 (3/3)

Water Resources Region / Province	Potential Irrigable Area (ha) 1/	NIS2/		CIS3/		SWIP / SRIP		Diversion Dam 5/		Shallow Tube Well		Total		Ratio of Irrigation Developm. (%)
		Number	Service Area (ha)	Number	Service Area (ha)	Number	Service Area (ha)	Number	Service Area (ha)	Number	Service Area (ha)	Service Area (ha)	Service Area (ha)	
WRR X														
Agusan Norte	52,490	2	3,212	74	5,570	1	47	20	828	-	-	-	9,657	18
Agusan Sur	56,450	3	2,691	87	5,615	1	40	9	232	-	-	-	13,578	24
Bukidnon***	7,718	-	-	12	2,381	-	-	3	80	72	278	-	2,739	35
Camiguin	14,000	-	-	13	508	-	-	10	146	-	-	-	654	20
Misamis Oriental	17,584	-	-	32	1,791	-	-	8	305	3	8	-	2,104	32
Divao del Norte***	13,070	-	-	12	2,224	-	-	2	120	5	16	-	5,629	50
Surigao del Norte	161,312	6	14,172	333	23,703	3	154	75	2,560	80	301	-	40,890	25
Total														
WRR XI														
Divao del Norte***	80,976	5	16,463	47	8,521	2	120	6	508	4	18	-	25,630	32
Divao del Oriental	17,770	1	2,131	22	2,160	-	-	2	40	-	-	-	4,331	24
Divao del Sur	33,280	2	6,021	61	12,878	2	804	11	695	1	3	-	20,401	61
Sarangani														
South Cotabato***	23,135	2	2,116	20	3,888	-	-	-	-	14	42	-	6,046	26
Surigao del Sur	40,290	2	3,988	25	2,912	-	-	5	128	-	-	-	7,028	17
Total	195,451	12	30,719	175	30,359	4	924	24	1,371	10	63	-	63,436	32
WRR XII														
Bukidnon***	79,982	4	17,757	61	7,640	4	256	16	714	-	-	-	26,367	33
Lanao del Norte	12,560	1	4,500	76	9,375	-	-	10	480	-	-	-	14,355	114
Lanao del Sur	47,190	1	2,500	9	1,237	-	-	8	190	-	-	-	3,927	8
Maguindanao	109,110	3	4,233	59	9,375	2	90	5	230	63	148	-	14,076	13
North Cotabato	141,360	4	20,132	72	9,744	2	134	12	1,077	95	264	-	31,351	22
South Cotabato***	77,245	4	12,995	47	7,395	1	40	4	265	-	-	-	20,695	27
Sultan Kudarat	51,870	2	16,034	50	12,838	-	-	11	930	14	62	-	29,864	58
Total	519,317	19	78,151	374	57,604	9	520	66	3,886	172	473	-	140,634	27
Grand Total	3,126,340	173	651,812	9,107	670,018	256	15,762	569	21,233	984	2,878	-	1,361,703	44

Notes

1. *** : Province divided by the Water Resources Region
2. 1/ : Estimated Potential Irrigable Area by NIA, which is based on the 3% slope criteria
3. 2/ : Based on NIA Inventory of NIS (1996 Report)
4. 3/ : Based on NIA Inventory of CIS (1996 Report)
5. 4/ : Based on Inventory of Completed and Operational Projects of BSWM, DPWH and NIA (1996 Report)
6. 5/ : Based on Inventory of Completed Projects of BSWM (1996 Report)

Table 3-15 LIST OF PROPOSED HYDROELECTRIC PROJECT BY NPC (1/8)

Project	Resources Region	Location	Name of River	Type of Development	Active Storage Volume	Water		Project Cost (Millions)	Project Output	Purpose	Status/Remarks
						Withdrawal (cfs)	Installed Capacity (MW)				
<i>(Luzon Hydro Electric Project)</i>											
<i>Central Luzon Autonomous Region (CAR)</i>											
<i>Mountain</i>											
1. Ambulao	3	Ambulao, Bokod, Benguet	Ayao River	Reservoir	48,000,000	-	75	P 131.735 (Original Capital Cost)	400 Gwh	Power Generation & Flood Control	Completed
2. Banga HEP	3	Banga, Itogon, Benguet	Ayao River	Reservoir	38,000,000	8,36,000	100	999.321	516 Gwh	Power Generation & Flood Control	Completed
<i>Lowland</i>											
3. Tabu HEP	3	Tabu, Benguet	Ayao River	Reservoir	-	-	120	P 3,449.25 (1984 Price Level) 1 US \$ = P20.00	520 Gwh	Power Generation & Flood Control	Pre-Feasibility Study completed
4. Tinongan HEP	1	San Juan, Abra	Dinanguan River, Tingi River	Reservoir	-	24,500	178	P 6,108.00 (1984 Price Level) 1 US \$ = P20.00	718 Gwh	Power Generation & Flood Control	Feasibility Study completed
5. Apayao HEP	2	Kalinga Apayao	Apayao River	Reservoir	2,164,000,000	101,000	360	\$08 (1991 Price Level) 1 US \$ = P21.85	1,479 Gwh	Power Generation & Flood Control	Feasibility Study completed
6. Tanshan D SHYP	2	Kalinga Apayao	Tanshan River	Reservoir	9,000,000	23,900	27	\$47.70 (1993 Price Level) 1 US \$ = P28.00	79.7 Gwh	Power Generation & Flood Control	Feasibility Study completed
7. Pasi D SHYP	2	Kalinga Apayao	Pasi River	Run-of-river	-	21,400	17	\$29.30 (1993 Price Level) 1 US \$ = P28.00	65.8 Gwh	Power Generation	Feasibility Study completed
8. Pasi B SHYP	2	Kalinga Apayao	Pasi River	Run-of-river	-	66,000	29	\$27.30 (1993 Price Level) 1 US \$ = P28.00	78.9 Gwh	Power Generation	Feasibility Study completed
9. Pasi C SHYP	2	Kalinga Apayao	Pasi River	Run-of-river	-	17,000	22	\$13.10 (1993 Price Level) 1 US \$ = P28.00	28.6 Gwh	Power Generation	Feasibility Study completed
10. Salitan A SHYP	2	Kalinga Apayao	Salitan River	Run-of-river	-	3,000	10	\$18.20 (1993 Price Level) 1 US \$ = P28.00	24.6 Gwh	Power Generation	Feasibility Study completed
11. Salitan B SHYP	2	Kalinga Apayao	Salitan River	Run-of-river	-	11,900	24	\$20.90 (1993 Price Level) 1 US \$ = P28.00	110.6 Gwh	Power Generation	Feasibility Study completed
12. Lantao A SHYP	2	Kalinga Apayao	Salitan River	Run-of-river	-	4,000	12	\$21.10 (1993 Price Level) 1 US \$ = P28.00	32.76 Gwh	Power Generation	Feasibility Study completed
13. Lantao B SHYP	2	Kalinga Apayao	Salitan River	Run-of-river	-	-	21	\$16.40 (1993 Price Level) 1 US \$ = P28.00	51.3 Gwh	Power Generation	Feasibility Study completed
14. Anaharan A SHYP	1	Benguet	Kibungan	Run-of-river	-	-	63.8	\$47.20 (1993 Price Level) 1 US \$ = P28.00	124.8 Gwh	Power Generation	Feasibility Study completed

Table 3-15 LIST OF PROPOSED HYDROELECTRIC PROJECT BY NPC (28)

Project	Resource Region	Location	Name of River	Type of Development	Active Storage Volume	Water Withdrawal (lps)	Installed Capacity (MW)	Project Cost (Millions)	Project Output	Purpose	Status/Remarks	
												Water
15. Amburayan C SHYP	1	Benguet	Kunungan River	Run-of-river	-	3,000	29.5	\$40.5K (1993 Price Level) 1 US \$ = P28.00	90.5 Gwh	Power Generation	Feasibility Study completed	
16. Nalalang A SHYP	1	Benguet	Nalalang River	Run-of-river	-	9,500	29.5	\$52.8K (1993 Price Level) 1 US \$ = P28.00	121.5 Gwh	Power Generation	Feasibility Study completed	
17. Nalalang B SHYP	1	Benguet	Nalalang River	Run-of-river	-	17,400	45.4	\$61.02 (1993 Price Level) 1 US \$ = P28.00	207.6	Power Generation	Feasibility Study completed	
18. Apayao-Abubog HEP	2	Pudol, Kalinga Apayao	Apayao-Abubog River	Reservoir	1,200 MCM	562,000	600	P 8,958.8K (1983 Price Level) 1 US \$ = P11.00	163.2 Gwh	Power Generation	Feasibility Study completed	
19. Chico IV HEP	2	Tungang, Kalinga Apayao	Chico River	Reservoir	435 MCM	86,300	360	P4,991.5K (1983 Price Level) 1 US \$ = P11.00	96.5 Gwh	Power Generation	Feasibility Study completed	
20. Amburayan HEP	1	Henguen	Amburayan River Kunungan River	Run-of-river	-	36,400 9,100	93	\$112.77 (1992 Price Level) 1 US \$ = P26.00	354.7 Gwh	Power Generation	Feasibility Study completed	
Region 1												
Zone 1												
1. Bakun C SHYP	1	Ilocos Sur	Bakun River	Run-of-river	-	7,800	18.4	\$34.4K (1993 Price Level) 1 US \$ = P28.00	25.9 Gwh	Power Generation	Feasibility Study completed	
2. Bakun AB SHYP	1	Ilocos Sur/Benguet	Bakun River	Run-of-river	-	7,800	45	\$51.05 (1993 Price Level) 1 US \$ = P28.00	162.4 Gwh	Power Generation	Feasibility Study completed	
3. Bakun A SHYP	1	Benguet	Bakun River	Run-of-river	-	7,800	16.4	\$36.0K (1993 Price Level) 1 US \$ = P28.00	62.6 Gwh	Power Generation	Feasibility Study completed	
4. Bakun B SHYP	1	Ilocos Sur/Benguet	Bakun River	Run-of-river	-	8,400	29.2	\$49.77 (1993 Price Level) 1 US \$ = P28.00	105.9 Gwh	Power Generation	Feasibility Study completed	
5. Bakun S SHYP	1	Ilocos Sur	Bakun River	Run-of-river	-	3,500	6.4	\$21.10 (1993 Price Level) 1 US \$ = P28.00	24.6 GWh Power	Power Generation	Feasibility Study completed	
6. San Roque Multipurpose Project	3	San Manuel, Pangasinan	Ayno River	Reservoir	670,000,000	94,500	396	P 60,921	24.6 GWH Power Irrigation-70,400 Hrs. Flood Control-Pangasinan Plain Water Quality- Inhabitants of the area	Power Generation, Flood control and Irrigation	Feasibility Construction was deferred	
7. Balinguagan Multi-Hydro Project	3	San Manuel, Pangasinan	Ayno River	Reservoir	530,000,000	83,000	345	\$769.50 (1994 Price Level) 1 US \$ = P28.00	24.6 GWH Power Irrigation-70,500 Hrs. Flood Control-Pangasinan Plain Water Quality- Inhabitants of the area	Power Generation, Flood Control, Irrigation and Water Quality	Upgrading of Feasibility Study completed last Aug 94	
8. Balinguagan Mini-Hydro Project	3	Mabini, Pangasinan	Balinguagan River	Run-of-river	-	3,350	3.69	P 1,32.5K (1993 Price Level)	12.45 Gwh	Power Generation	Pre-Feasibility Study Completed	

Table 3-15 LIST OF PROPOSED HYDROELECTRIC PROJECT BY NPC (3/8)

Project	Resources Region	Location	Name of River	Type of Development	Active Storage Volume	Water Withdrawal (ups)	Installed Capacity (MW)	Project Cost (Millions)	Project Output	Purpose	Status/Remarks
8. Dapalo Mini-Hydro Project	3	San Quinob, Pangasinan	Dapalo River	Run-of-river	-	2,250	4.02	P 133.31 (1993 Price Level)	15.25 Gwh	Power Generation	Pre-Feasibility Study Completed
9. Baracoe Mini-Hydro Project	3	Mangalaren, Pangasinan	Baracoe River	Run-of-river	-	1,600	3.55	P 97.49 (1993 Price Level)	10.61	Power Generation	Pre-Feasibility Study Completed
10. Pila Mini-Hydro Project	3	Mangalaren, Pangasinan	Pila River	Run-of-river	-	3,000	6.34	P 214.38 (1993 Price Level)	18.64 Gwh	Power Generation	Pre-Feasibility Study Completed
Region 2											
Exiting											
1. Magat River Multipurpose Project	2	Agunitado, Rantao, Santiago, Isabela	Magat River	Reservoir	1.25 billion cum.	-	360	P 2,879	12.75 Gwh	Power Generation	Completed
2. Aduana SHYP	2	Quinob	Aduana River	Reservoir	32 MCM	39,500	40	501.70 (1993 Price Level)	102.7 Gwh	Power Generation	Feasibility Study Completed
3. Iloguen B. SHYP	2	Isabela	Iloguen River	Reservoir	31 MCM	49,500	58	1 US \$ = P 26.00 \$ 15.90 (1993 Price Level)	204.4 Gwh	Power Generation	Feasibility Study Completed
4. Dadiyan HEP	2	Saaba, Nueva Vizcaya	Dadiyan River	Reservoir	454 MCM	30,000	152	P 3,050.39	957 Gwh	Power Generation	Feasibility Study Completed
5. Casuaran Transbasin Diversion Project	2	Naglipunan, Quinob, Pantabangan, Nueva Ecija	Casuaran River	Reservoir	1,183 MCM	66,420	San Jose NE: 150 Pantabangan: 100 Masway: 12	P 8,132.35 (1988 Price Level) 1 US \$ = P 21.00	1,579 Gwh 92,300 tps	Trigation and Power Generation	Feasibility Study Completed
6. Casuaran Pure Power Spillway Project	2	Naglipunan, Quinob	Casuaran River	Reservoir	474.9 MCM 25.23 MCM	49,600	D.S. Plant: 22	601.40	7.29 Gwh	Power Generation	Feasibility Study Completed
7. Casuaran Phases Transbasin Project	2	Casuaran, Nueva Viz. Pantabangan, Nueva Ecija	Abica River	Reservoir	58.2 MCM 300.6 MCM	37,000 66,400	Mambulan: 270 Pantabangan: 50 Masway: 12	5,533.1 1st Stage 2nd Stage	738.8 Gwh 472.1 Gwh	Power oriented or Irrigation oriented scheme	Feasibility Study Completed
8. Sinabagan B. SHYP	2	Naglipunan, Quinob	Sinabagan River	Run-of-river	-	4,890	5.16	P 256.08	21.44 Gwh	Power Generation	Feasibility Study Completed
9. Sinabagan E. SHYP	2	Naglipunan, Quinob	Sinabagan River	Run-of-river	-	8,900	4.37	P 243.31	33.09 Gwh	Power Generation	Feasibility Study Completed
10. Maluno Multipurpose Project	2	Nueva Vizcaya	Maluno River	Reservoir	97 MCM	37,400	180	P 4,781.14 (1988 Price Level)	528 Gwh	Power Generation	Feasibility Study Completed
11. Atanan Hydropower Project	2	Iloguen, Isabela	Abuan River	Reservoir	159 MCM	36,000	42	593.90 (1995 Price Level)	227 Gwh	Power Generation	Feasibility Study on-going
12. Buner (Quinob) Mini-Hydro Project	2	Sa. Praxedes, Casayan	Buner River	Run-of-river	-	1,930	3.76	P 96.48 (1994 Price Level)	143.3 Gwh	Power Generation	Feasibility Study Completed
13. Sipi Falls Mini-Hydro Project	2	Sa. Praxedes, Casayan	Sipi Falls	Run-of-river	-	670	0.46	P 25.89 (1994 Price Level)	1.85 Gwh	Power Generation	Pre-Feasibility Study Completed
Region 3											
Exiting											
1. Angat HEP	3	Norzanon, Bulacan	Angat River	Reservoir	850 MCM	75,000	Mun: 200 Adu: 40	P 315.344	Power Water supply 566 MGD Irrigation: 30,000 hrs	Municipal Water sup Irrigation Power Generation Irrigation	Completed

Table 3-15 LIST OF PROPOSED HYDROELECTRIC PROJECT BY NPC (4/8)

Project	Water Resources Region	Location	Name of River	Type of Development	Active Storage Volume	Water Withdrawal (lps)	Installed Capacity (MW)	Project Cost (Millions)	Project Output	Purpose	Status Remarks
2. Masinag HEP	3	Pandabangan, Nueva Ecija	Pampanga River	Run-of-river (Afterbay)		43,600	12	P 132.07	Power/Lurzon Grid	Power Generation	Completed
3. Pantabangan HEP	3	Pantabangan, Nueva Ecija	Pampanga River	Reversible	(1,753 MCM)	43,600	100	P 236,739	Power/Lurzon Grid Irrigation 109,400 has.	Irrigation Power Generation	Completed
Proposed											
4. Islog-Balog Multipurpose Project	3	Balog-Balog, Tarlac	Tudac and Bula River	Reservoir	575 MCM	60,000	33	P 2,316.43	96.5 Gwh	Irrigation Power Generation	Feasibility Study Completed
5. Moring River Mini-Hydro Project (Scheme A)	3	Hataan	Moring River	Run-of-river		2,550	2.07	P 118.12 (1994 Price Level)	8.58 Gwh	Power Generation	Pre-Feasibility Study Completed
Region 4 Existing											
1. Caliraya HEP	4	Lumban, Laguna	Caliraya River	Reservoir	78 MCM	13,500	32	P 18,238	Power/Lurzon Grid	Power Generation	Completed
2. Kalyaan Pumped Storage HEP (Stage 1)	4	Kalyaan, Laguna	Layuna Lake	Pumped Storage		300,000	300	P 1.98	Power/Lurzon Grid	Power Generation	Completed
Proposed											
3. Bolosan HEP	4	Majayjay, Laguna	Bolosan River	Run-of-river		58,100	17	N 195.02 (1993 Price Level)	54.32 Gwh	Power Generation	Completed
4. Kanab I	4	Infanta, Quezon	Apos River	Reservoir			112.6	(1993 Price Level) P 171.11	460 Gwh	Power Generation	Completed
5. Apos Katiwa HEP	4	Infanta, Quezon	Apos River	Reservoir	570 MCM	108,200	140		602 Gwh	Power Generation	Feasibility Study Completed
6. Lumot River Dam	4	Cavalli, Laguna	Lumot River	Diversion Dam	44 MCM	3,600	5	P 5.00	Power/Lurzon Grid	Power Generation	Completed
7. Amnay MPHEP	4	Sibuyan, Mindoro Occ.	Amnay River	Reservoir	430 MCM	71,100	60	P 1,426,383 (1983 Price Level)	258 Gwh	Irrigation Power Generation	Feasibility Study Completed
8. Manila Water Supply III Project	4	Tanday, Rizal	Kalua River	Reservoir		25,200	30	1 US \$ = P 11.00 Power only = P 697.11 (1988 Price Level) 1 US \$ = P 21.00	153 Gwh	Water Supply Power Generation	Definite Design Completed
(Lurzon Hydro Electric Project)											
9. Kalyaan Pumped Storage Project (Stage 2)	4	Kalyaan, Laguna	Layuna Lake Caluya Lake	Pumped Storage		6,710	300	N 148.41 (1993 Price Level) 1 US \$ = P 26.00	410 Gwh	Power Generation & Flood Control	Feasibility Study Completed
10. Agubang SHYP	4	Occidental Mindoro	Agubang River	Reservoir	(1.5 MCM)		14	\$ 29.46 (1992 price Level) 1 US \$ = P 28.00	39 Gwh	Power Generation & Flood Control	Feasibility Study Completed
11. Buraboy SHYP	4	Occidental Mindoro	Buraboy River	Run-of-river			3.2	\$ 11.72 (1992 price Level) 1 US \$ = P 28.00	12.03 Gwh	Power Generation & Flood Control	Feasibility Study Completed
12. Dulangan SHYP	4	Araon, Oriental Mindoro	Dulangan River	Run-of-river			24	\$ 14.78 (1992 price Level) 1 US \$ = P 28.00	79.63	Power Generation & Flood Control	Feasibility Study Completed
13. ARB SHYP	4	San Teodoro, Oriental Mindoro	Alig River	Run-of-river			30.5	N 39.61 (1992 price Level)	148.07	Power Generation & Flood Control	Feasibility Study Completed

Table 3-15 LIST OF PROPOSED HYDROELECTRIC PROJECT BY NPC (5/8)

Project	Water Resources Region	Location	Name of River	Type of Development	Active Storage Volume	Water Withdrawal (l/s)	Installed Capacity (MW)	Project Cost (Millions)	Project Output	Purpose	Status/Remarks
14. Caturan SHYP	4	Naguan, Oriental Mindoro	Caturan River	Run-of-river	-	-	18	\$2,009 (1992 Price Level) 1 US \$ = P 24.00	82.23 Gwh	Power Generation & Flood Control	Feasibility Study Completed
15. Bongabong SHYP	4	Bongabong, Oriental Mindoro	Bongabong River	Run-of-river	-	-	28.2	\$4,399 (1992 Price Level) 1 US \$ = P 24.00	110 Gwh	Power Generation & Flood Control	Feasibility Study Completed
16. Langogan SHYP	4	Puerto Princesa, Palawan	Langogan River	Run-of-river	-	-	5.6	\$15.62 (1992 Price Level) 1 US \$ = P 24.00	27.12 Gwh	Power Generation & Flood Control	Feasibility Study Completed
17. Babuyan SHYP	4	Puerto Princesa, Palawan	Babuyan River	Run-of-river	-	-	6.8	\$17.70 (1992 Price Level) 1 US \$ = P 24.00	24.18 Gwh	Power Generation & Flood Control	Feasibility Study Completed
Region 5 I. Cawayan HEP	5	Cawayan, Sorsogon	Cawayan River	Run-of-river	-	650	0.4	P 0.605	Power Luzon Grid	Power Generation & Flood Control	Completed
2. Lake Buluan HEP	5	Sorsogon Sta. Justina, Buhay, Contantes Sur	Lake Buluan	Reservoir	-	11,000	1.8	P 5.766	Power Luzon Grid	Power Generation & Flood Control	Completed
(Visayas Hydro Electric Project)											
Region 6 I. Rago HEP	6	Murcia, Negros Occidental	Rago River	Reservoir	164 MCM	25,120	183	P 319.39 (1991 Price Level) 1 US \$ = P 11.00	497 Gwh	Power Generation & Flood Control	Definitive Design Completed
2. Jajar Multipurpose Project	6	Jajar, Iloilo	Jajar River	Reservoir	316.8 MCM	7,040	20	P 294.27 (1986 Price Level) 1 US \$ = P 21.00	58.18 Gwh	Power Generation & Flood Control	Definitive Design Completed
3. Tapa Multipurpose Project	6	Tapa, Cebu	Tapa River	Reservoir	30.5 MCM	14,300	7.1	P 587.04 (1988 Price Level) 1 US \$ = P 21.00	31.4 Gwh	Power Generation & Flood Control	Pre-Feasibility Study Completed
4. Tumbalon	6	Madruga, Alagan	Tumbalon River	Run-of-river	-	-	29.1	\$40.58 (1988 Price Level) 1 US \$ = P 21.00	125 Gwh	Power Generation & Flood Control	Feasibility Study Completed
5. Villa Siga	6	Villa Siga, Antique	Villa Siga River	Run-of-river	-	-	32.5	\$58.16 (1988 Price Level) 1 US \$ = P 21.00	125.1 Gwh	Power Generation & Flood Control	Feasibility Study Completed
Region 7 I. Loboc HEP	7	Loboc, Bohol	Loboc River	Run-of-river	-	14,340	1.2	P 2,043 (1983 Price Level) 1 US \$ = P 14.00	9.5 Gwh	Power Generation	Completed
2. Amian	7	Amian, Negros Oriental	Amian River	Run-of-river	-	70	9.8	P 2,586 (1983 Price Level) 1 US \$ = P 14.00	Power Negros Grid	Power Generation	Completed
3. Upper Loboc HEP	7	Campoman Sevilla, Bohol	Loboc River	Reservoir	-	17,070	12	P 436.38 (1983 Price Level) 1 US \$ = P 14.00	69,063 Gwh	Power Generation	Feasibility Study Completed
4. Sicoyong	7	Sicoyong, Negros Oriental	Sicoyong River	Run-of-river	-	-	17.8	\$30.14 (1992 Price Level) 1 US \$ = P 24.00	30.62 Gwh	Power Generation	Feasibility Study Completed

Table 3-15 LIST OF PROPOSED HYDROELECTRIC PROJECT BY NPC (6/8)

Project	Water Resources Region	Location	Name of River	Type of Development	Active Storage Volume	Water Withdrawal (cms)	Installed Capacity (MW)	Project Cost (Millions)	Project Output	Purpose	Status/Remarks
5. Okay	7	Pinaroph, Negros Oriental	Okay River	Run-off-river	-	-	1.18	P 14.13 (1992 Price Level) 1 US \$ = P 28.00	24.91 Gwh	Power Generation	Feasibility Study Completed
6. Saron	7	Saron, Negros Oriental	Saron River	Run-off-river	-	-	5.4	P 6.67 (1992 Price Level) 1 US \$ = P 28.00	21.99 Gwh	Power Generation	Feasibility Study Completed
Region 8 Proposed 1. Carabig Valley Comprehensive Devt. Project	8	Carabig Northern Samar	Carabig River	Reservoir	99.9 MCM	32,000	30	P 666.06 (1988 Price Level) 1 US \$ = P 21.00	21.00 Gwh	Power Generation	Feasibility Study Completed
2. Taft	8	Taft, Eastern Samar	Taft River	Run-off-river	-	-	36.26	P 521.42	101.96 Gwh	Power Generation	Feasibility Study Completed
3. Biting	8	Balinggia Eastern Samar	Biting River	Run-off-river	-	-	17.21	P 306.33	23.53 Gwh	Power Generation	Feasibility Study Completed
4. Bulasao	8	Loreme, Eastern Samar	Bulasao River	Run-off-river	-	-	10.85	P 183.02	40.74 Gwh	Power Generation	Feasibility Study Completed
Region 9 Proposed 1. Polandok Scheme 2	9	Lobato, L.B. Postigo, Zamboanga del Norte	Polandok River	Run-off-river	-	9,160	6.89	P 229.87	37.44 Gwh	Power Generation	Pre-Feasibility Study Completed
2. Polandok Scheme A	9	Lobato, L.B. Postigo, Zamboanga del Norte	Polandok River	Reservoir	-	8,500	10.54	P 477.76	35.93 Gwh	Power Generation	Pre-Feasibility Study Completed
3. Diabyu	9	Kallipunan Zamboanga del Norte	Diabyu River	Reservoir	-	-	12.32	P 2281.3	33.93 Gwh	Power Generation	Pre-Feasibility Study Completed
Region 10 Existing 1. Agusan HEP	10	Damilag, Mariposa Bukidnon	Agusan River	Run-off-river	-	1,800	1.6	P 32.15	10.5 Gwh	Power Generation	Completed
2. Palangui IV	12	Marinag, Bukidnon	Palangui River	Run-off-river	-	-	-	P 2093.7 (1984 Price Level) 1 US \$ = P 14.00	1,013 Gwh	Power Generation	Completed
Proposed 3. Palangui III	12	Lumbayo, Valencia Bukidnon	Palangui River	Reservoir	-	67,300	90	P 5,745.30 (including IDC)	382 Gwh	Power Generation Irrigation Flood Control	Feasibility Study Completed
4. Palangui II	10	Malaybalay, Bukidnon	Palangui River	Reservoir	5.5 MCM	38,050	70	P 3,165.974 (1984 Price Level) 1 US \$ = P 14.00	257 Gwh	Power Generation	Pre-Feasibility Study Completed
5. Palangui V	12	Pres. Roxas, North Cotabato	Palangui River	-	-	-	300	P 907 (1992 Price Level)	1,506 Gwh	Power Generation	Pre-Feasibility Study Completed

Table 3-15 LIST OF PROPOSED HYDROELECTRIC PROJECT BY NPC (78)

Project	Resources Region	Location	Name of River	Type of Development	Active Storage Volume (775 MCM)	Water		Project Cost (Millions)	Project Output	Purpose	Status/Remarks
						Withdrawal (lps)	Installed Capacity (MW)				
6. Pulungan I	10	Mindoro (North Bukidnon)	Pulungan River	Reservoir	-	15,740	24	P 546.43 (1984 Price Level) 1 US \$ = P 14.00	105 Gwh	Power Generation	Pre-Feasibility Study Completed
7. Bulang-Batang	10	Talakeg, Bukidnon	Cayanan River	Reservoir	-	38,900	150	P 5,202.12 1 US \$ = P 14.00	590 Gwh	Power Generation	Feasibility Study Completed
8. Cagayan IN	10	Talakeg, Bukidnon	Cagayan River	Reservoir	-	59,600	-	P 4,354.46 (with IDC)	572 Gwh	Power Generation	Pre-Feasibility Study Completed
9. Tagabalan II	10	Impangung, Bukidnon	Tagabalan River	Run-of-river	-	26,000	68	P 3,071.6 1 US \$ = P 28.00	356 Gwh	Power Generation	Feasibility Study Completed
10. Ugalaban	10	Talakeg, Bukidnon	Cagayan River	Run-of-river	-	61,500	160	P 3,790.24 (excluding IDC)	737 Gwh	Power Generation	Feasibility Study Completed
11. Amasy	10	Talakeg, Bukidnon	Amasyg River	Run-of-river	-	12,100	52	P 1,850.38 (1988 Price Level) 1 US \$ = P 21.00	376 Gwh	Power Generation	Pre-Feasibility Study Completed
12. Odlongan A	10	Cingoz City Misamis Oriental	Odlongan River	Run-of-river	-	7,400	16.17	P 240.81	34.18 Gwh	Power Generation	Pre-Feasibility Study Completed
13. Odlongan E	10	Mianis Oriental	Odlongan River	Run-of-river	-	8,670	5.21	P 154.8	20.04 Gwh	Power Generation	Pre-Feasibility Study Completed
14. Pugu A	10	Jabonga & Kitcharo, Agusan del Norte	Pugu River	Run-of-river	-	27,400	18.7	P 1,011.304 1 US \$ = P 28.00	82.9 Gwh	Power Generation	Feasibility Study Completed
15. Pugu B	10	Jabonga & Kitcharo, Agusan del Norte	Pugu River	Run-of-river	-	26,600	15.1	P 713.919 1 US \$ = P 28.00	71 Gwh	Power Generation	Feasibility Study Completed
16. Pugu D	10	Jabonga & Kitcharo, Agusan del Norte	Pugu River	Run-of-river	-	10,800	11.4	P 16.64 1 US \$ = P 28.00	51.6 Gwh	Power Generation	Feasibility Study Completed
17. Pugu E	10	Jabonga & Kitcharo, Agusan del Norte	Pugu River	Run-of-river	-	16,866	6.8	P 35.43 1 US \$ = P 28.00	31.1 Gwh	Power Generation	Feasibility Study Completed
18. Asiga	10	Samtogo, Agusan del Norte	Asiga River	Run-of-river	-	9,200	11.3	P 22.29 1 US \$ = P 28.00	46.6 Gwh	Power Generation	Feasibility Study Completed
Region II											
19. Canel	11	Cireli, Davao Oriental	Canel River	Run-of-river	-	11,400	17.9	P 36.36 1 US \$ = P 28.00	28.7 Gwh	Power Generation	Feasibility Study Completed
20. Sujanon	11	Sujanon, Davao City	Sujanon River	Run-of-river	-	8,100	18.3	P 29.23 1 US \$ = P 18.00	46.9 Gwh	Power Generation	Feasibility Study Completed
21. Tamagan	11	Tamagan, Davao City	Tamagan River	Run-of-river	-	5,800	15.9	P 31.82 1 US \$ = P 28.00	48.2 Gwh	Power Generation	Feasibility Study Completed
22. Siguil	11	Maisam, South Cotabato	Siguil River	Run-of-river	-	7,200	15.1	P 30.40 1 US \$ = P 28.00	53.8 Gwh	Power Generation	Feasibility Study Completed
23. Lunon	12	Lake Sebu, Surallah, South Cotabato	Lunon River	Run-of-river	-	3,100	21.1	P 20.47 1 US \$ = P 28.00	56.3 Gwh	Power Generation	Feasibility Study Completed

Table 3-15 LIST OF PROPOSED HYDROELECTRIC PROJECT BY NPC (S/S)

Project	Water Resources Region	Location	Name of River	Type of Development	Active Storage Volume	Water Withdrawal (cfs)	Installed Capacity (MW)	Project Cost (Millions)	Project Output	Purpose	Status/Remarks
Region 12											
Existing											
1. Agos I	12	Marawi City, Lanao del Sur	Agos River	LOT	-	94,700,000	80	P 1,352.52 (1983 Price Level) U.S. \$ = P 14.00	456 Gwh	Power Generation	Completed
2. Agos II	12	Saguayan, Lanao del Sur	Agos River	LOT	-	100,000	180	P 667.42 (1983 Price Level) U.S. \$ = P 14.00	750 Gwh	Power Generation	Completed
3. Agos IV	12	Bala, Lanao del Sur	Agos River	LOT	-	115,000	158	P 1,049.00	702 Gwh	Power Generation	Completed
4. Agos V	12	Iddoh, Lanao del Sur	Agos River	-	-	17,500	55	P 620.00	265 Gwh	Power Generation	Completed
5. Agos VI	12	Fuentes, Iligan City	Agos River	-	-	100,000	260	P 448,274 Revaluated Cost 1982	1016 Gwh	Power Generation	Completed
6. Agos VII	12	Fuentes, Iligan City	Agos River	-	-	100,000	84	P 624.22 U.S. \$ = P 7.50	274 Gwh	Power Generation	Completed
Proposed											
7. Agos III	12	Iddoh, Lanao del Norte	Agos River	-	-	95,000,000	225	P 4,469.53 (1985 Price Level) U.S. \$ = P 18.50	1,665 Gwh	Power Generation	Feasibility Study Completed
8. Tira AC	12	Leloh, Maguindanao	Tira River	Run-of-river	-	21,700	30.6	\$57.72 U.S. \$ = P25.00	85 Gwh	Power Generation	Feasibility Study Completed
9. Luangan	12	Bacolod, Lanao del Norte	Luangan River	Run-of-river	-	-	11.9	\$15.29 U.S. \$ = P25.00	72.89	Power Generation	Feasibility Study Completed
10. Pulangui V	12	Norili, Cotabato	Pulangui River	Run-of-river	-	-	300	\$397.00 U.S. \$ = P38.00	1,353 Gwh	Power Generation	Feasibility Study Completed
11. Pulangui VI	12	Datu Sanalla, Pres. Roxas, Norte Cotabato	Pulangui River	Run-of-river	-	233,000	70	P 1,001.07 (1984 Price Level)	340 Gwh	Power Generation	Feasibility Study Completed
12. Magatay	12	Magatay, Maguindanao & Sultan Kudarat	Magatay River	Run-of-river	-	-	66	U.S. \$ = P14.00 P 543.21 (1984 Price Level) P 250.34	314.9 Gwh	Power Generation	Pre-Feasibility Study Completed
13. Kabanacan Scheme AB	12	Magpet, North Cotabato	Kabanacan River	Run-of-river	-	2,470	6.96	U.S. \$ = P 21.00	31.29 Gwh	Power Generation	Pre-Feasibility Study Completed
14. Kabanacan Scheme D	12	Magpet, North Cotabato	Kabanacan River	Run-of-river	-	8,26	4.24	P172.3	24.45 Gwh	Power Generation	Pre-Feasibility Study Completed

Table 3-16 SHORT-TERM AND MID-TERM POWER AND ENERGY DEMAND FORECAST

(1) Power Demand

Year	Energy Sales by Grid System (GWh/year)			Whole Philippines	
	Luzon	Visayas	Mindanao	Total	Increase Ratio (%)
1995	3,877	585	837	5,299	-
1996	4,239	657	959	5,855	10.5
1997	4,744	739	1,130	6,613	12.9
1998	5,397	832	1,359	7,588	14.7
1999	6,079	955	1,587	8,621	13.6
2000	6,779	1,080	1,822	9,681	12.3
2001	7,484	1,254	2,059	10,797	11.5
2002	8,266	1,405	2,321	11,992	11.1
2003	9,135	1,556	2,610	13,301	10.9
2004	10,102	1,676	2,930	14,708	10.6
2005	11,177	1,796	3,283	16,256	10.5
Average Annual Growth Rate (%)					
i) between 1996 and 2000	11.8	13.0	16.8	12.8	
ii) between 2001 and 2005	10.5	10.7	12.5	10.9	
iii) between 1996 and 2005	11.2	11.9	14.6	11.9	

Data Source : 1996 PDP by NPC

(2) Energy Demand

Year	Energy Sales by Grid System (GWh/year)			Whole Philippines	
	Luzon	Visayas	Mindanao	Total	Increase Ratio (%)
1995	23,161	3,024	4,251	30,436	-
1996	24,415	3,482	5,635	33,532	10.2
1997	27,331	3,918	6,641	37,890	13.0
1998	31,088	4,406	7,989	43,483	14.8
1999	35,019	5,062	9,330	49,411	13.6
2000	39,054	5,794	10,711	55,559	12.4
2001	43,111	6,727	12,102	61,940	11.5
2002	47,616	7,536	13,640	68,792	11.1
2003	52,623	8,348	15,339	76,310	10.9
2004	58,191	8,995	17,219	84,405	10.6
2005	64,383	9,636	19,294	93,313	10.6
Average Annual Growth Rate (%)					
i) between 1996 and 2000	11.0	13.9	20.3	12.8	
ii) between 2001 and 2005	10.5	10.7	12.5	10.9	
iii) between 1996 and 2005	10.8	12.3	16.3	11.9	

Data Source : 1996 PDP by NPC

Table 3-17 HYDROPOWER POTENTIALS IN THE PHILIPPINES

Grid System	Status of Scheme	Installed Capacity		Energy Output	
		(MW)	(Share)	(GWh)	(Share)
(1) Luzon	Existing	1,273	15 (%)	3,818	12 (%)
	Prefeasibility	3,444	40 (%)	14,895	47 (%)
	Feasibility	1,922	22 (%)	6,907	22 (%)
	Definite Design	1,950	23 (%)	6,185	19 (%)
	Subtotal (1)	8,589	100 (%)	31,805	100 (%)
(2) Visayas	Existing	13	3 (%)	51	3 (%)
	Prefeasibility	95	22 (%)	403	27 (%)
	Feasibility	226	53 (%)	833	55 (%)
	Definite Design	96	22 (%)	229	15 (%)
	Subtotal (1)	430	100 (%)	1,516	100 (%)
(3) Mindanao	Existing	992	30 (%)	4,571	32 (%)
	Prefeasibility	1,193	36 (%)	4,799	34 (%)
	Feasibility	1,104	34 (%)	4,768	34 (%)
	Definite Design	-	-	-	-
	Subtotal (1)	3,289	100 (%)	14,138	100 (%)
Whole Philippines	Existing	2,278	19 (%)	8,440	18 (%)
	Prefeasibility	4,732	38 (%)	20,097	42 (%)
	Feasibility	3,252	26 (%)	12,508	26 (%)
	Definite Design	2,046	17 (%)	6,414	14 (%)
	Subtotal (1)	12,308	100 (%)	47,459	100 (%)

Data source : 1996 Power Development Program by NPC

Table 3-18 POWER CAPACITY NEEDED TO BE ADDED BETWEEN 1996 AND 2025

Year	Hydro		Indigenous Energy Resources				Imported Energy Resources				Total	
	(1)	(2)	NRE/SM:HY	Geo-thermal	Coal	Natural Gas	Subtotal	Coal	Oil	Other fuels		Subtotal
1996	0	0	0	0	0	0	0	0	50	0	50	50
1997	0	0	0	220	0	0	220	0	100	0	100	320
1998	0	0	0	480	0	0	480	300	550	0	850	1330
1999	140	0	140	80	0	0	220	1550	0	0	1550	1770
Sub-total-1	(140)	(0)	(140)	(780)	(0)	(0)	(920)	(1,850)	(700)	(0)	(2,550)	(3,470)
2000	29	0	29	40	0	900	969	0	0	0	0	969
2001	32	0	32	0	0	900	932	300	0	150	450	1382
2002	68	0	68	0	250	600	918	0	0	950	950	1868
2003	0	0	0	0	250	600	850	0	0	450	450	1300
2004	750	0	750	0	100	0	850	0	0	950	950	1800
2005	569	0	569	120	0	0	689	0	0	1350	1350	2039
(Subtotal-2)	(1,448)	(0)	(1,448)	(160)	(600)	(3,000)	(5,208)	(300)	(0)	(3,850)	(4,150)	(9,358)
2006-2010	473	579	1,052	720	600	1,500	3,872	0	0	9,701	9,701	13,573
2011-2015	984	860	1,844	230	610	0	2,684	0	0	16,549	16,549	19,233
2016-2020	427	548	975	40	0	2,000	3,015	0	0	19,485	19,485	22,500
2021-2025	261	460	721	80	0	0	801	0	0	23,199	23,199	24,000
(Subtotal-3)	(2,145)	(2,447)	(4,592)	(1,070)	(1,210)	(3,500)	(10,372)	(0)	(0)	(68,934)	(68,934)	(79,306)
Total (1996-2025)	3,733	2,447	6,180	2,010	1,810	6,500	16,500	2,150	700	72,784	75,634	92,134

Data Source : 1996 PDP by NPC

Note : Short-term : 1996 - 1999, Medium term : 2000 - 2005, Long-term : 2006 - 2025

Table 3-19 PRODUCTION RECORDS OF MWSS IN 1995

Province	Municipality	Production (MCM/year)	Number (Nos.)	Capacity (MCM/year)
Metro Manila	1 Valenzuela	0.0	1	0.02
	2 Navotas	0.1	1	0.07
	3 Malabon	0.2	1	0.16
	4 Quezon (C)	3.0	12	0.25
	5 Caloocan (C)	-	-	-
	6 Marikina	-	-	-
	7 Manila (C)	-	-	-
	8 San Juan	-	-	-
	9 Mandaluyon	-	-	-
	10 Pasig	0.0	1	0.02
	11 Makati	3.0	13	0.23
	12 Pasay (C)	0.7	3	0.24
	13 Pateros	-	-	-
	14 Taguig	0.1	1	0.14
	15 Paranaque	0.5	3	0.17
	16 Las Pinas	0.3	1	0.29
	17 Muntinlupa	1.0	6	0.17
	Subtotal	8.9	43	0.21
Rizal	1 Montalban	1.2	4	0.31
	2 San Mateo	1.5	5	0.30
	3 Antipolo	4.7	17	0.28
	4 Cainta	0.7	3	0.24
	5 Taytay	2.1	7	0.30
	Subtotal	10.3	36	0.29
Cavite	1 Bacoor	1.1	6	0.18
	2 Imus	0.6	2	0.30
	3 Kawit	1.1	4	0.28
	4 Cavite (C)	2.1	11	0.20
	5 Noveleta	1.8	5	0.37
	6 Rosario	0.8	2	0.41
	Subtotal	7.7	30	0.26
	Total	26.9	109	0.25

Data Source : Operational Report of 1st, 2nd, 3rd and 4th Quarter, 1995 (MWSS)

Table 3-20 PRODUCTION AND FACILITIES OF WATER DISTRICTS (LWUA)

(Unit: MCM/year)

Water Resources Region (WRR)	Facilities			Water Supply Index			
	DW	SP	SW	Production	Popul. Served	Pop.'95	Coverage
WRR I	106	32	4	26.18	440,160	1,227,180	35.9%
WRR II	48	3	-	7.24	128,920	956,460	13.5%
WRR III	337	8	3	136.89	1,865,560	6,258,060	29.8%
WRR IV	383	69	11	106.26	1,153,980	4,664,170	24.7%
WRR V	62	63	7	35.33	489,310	2,351,140	20.8%
WRR VI	87	29	7	48.24	695,740	3,617,330	19.2%
WRR VII	128	17	1	74.06	516,330	2,097,800	24.6%
WRR VIII	18	11	5	17.44	328,750	1,429,280	23.0%
WRR IX	28	8	2	39.32	488,270	1,372,940	35.6%
WRR X	48	23	3	47.69	716,550	1,944,090	36.9%
WRR XI	51	8	3	58.73	1,028,500	2,139,650	48.1%
WRR XII	31	6	-	15.58	251,540	1,906,570	13.2%
Total	1,327	277	46	612.95	8,103,610	29,964,670	27.0%

Data Sources: List of Water Districts, as of January 1997 and Annual Reports of Water Districts as of 1995 & 1996 (LWUA)

Table 3-21 ESTIMATION OF PRODUCTION FOR L-II WATER SUPPLY SYSTEMS

(Unit: MCM/year)					
Water Resources Region (WRR)	Category (Urban/Rural)	Population in 1995	Service Coverage	Population Served	Level-II Production
WRR I	Total	2,362,180	5.2%	122,931	2.7
	Urban	470,258	1.6%	7,524	
	Rural	1,891,922	6.1%	115,407	
WRR II	Total	3,054,225	5.2%	159,788	3.5
	Urban	589,329	1.6%	9,429	
	Rural	2,464,896	6.1%	150,359	
WRR III	Total	9,111,124	3.5%	321,529	7.0
	Urban	5,205,546	1.6%	83,289	
	Rural	3,905,578	6.1%	238,240	
WRR IV	Total	19,395,047	2.6%	513,829	11.3
	Urban	14,872,647	1.6%	237,962	
	Rural	4,522,400	6.1%	275,866	
WRR V	Total	4,325,368	4.5%	195,188	4.3
	Urban	1,525,763	1.6%	24,412	
	Rural	2,799,605	6.1%	170,776	
WRR VI	Total	5,777,016	4.2%	245,158	5.4
	Urban	2,383,120	1.6%	38,130	
	Rural	3,393,896	6.1%	207,028	
WRR VII	Total	5,014,652	4.1%	203,507	4.5
	Urban	2,275,267	1.6%	36,404	
	Rural	2,739,385	6.1%	167,102	
WRR VIII	Total	3,366,953	5.1%	172,602	3.8
	Urban	728,494	1.6%	11,656	
	Rural	2,638,459	6.1%	160,946	
WRR IX	Total	3,581,617	4.8%	170,136	3.7
	Urban	1,074,282	1.6%	17,189	
	Rural	2,507,335	6.1%	152,947	
WRR X	Total	3,954,742	4.3%	170,737	3.7
	Urban	1,566,713	1.6%	25,067	
	Rural	2,388,029	6.1%	145,670	
WRR XI	Total	3,760,145	3.7%	139,135	3.0
	Urban	2,005,198	1.6%	32,083	
	Rural	1,754,947	6.1%	107,052	
WRR XII	Total	4,909,195	4.2%	205,770	4.5
	Urban	2,082,018	1.6%	33,312	
	Rural	2,827,177	6.1%	172,458	
Total	Total	68,612,264	3.8%	2,620,310	57.4
	Urban	34,778,635	1.6%	556,458	
	Rural	33,833,629	6.1%	2,063,851	

- Notes : 1. The population in 1995 is quoted from the 1995 census provided from the NEDA.
 2. The service coverage for each category of urban and rural population are quoted from the average estimated in the Provincial Water Supply and Sanitation Sector Plan, as of 1995 (DILG).
 3. The unit consumption for Level-II domestic water is limited to 60 Lpcd. in the National Sector Plan.

Table 3-23 IRRIGATION SYSTEMS AND WATER RIGHTS (NIA & NWRB) unit Amount: MCM/year

WRR	Irrigation System				Registered Water Rights														
	Arable-area (ha.)	Total		Coverage %	SW			GW			SW			DW			SP		
		Facilities	Area (ha.)		Area (ha.)	Facilities	Area (ha.)	Area (ha.)	Facilities	Area (ha.)	Facilities	Area (ha.)	Facilities	Area (ha.)	Facilities	Area (ha.)	Facilities	Area (ha.)	Facilities
I	121,760	2,301	94,206	77%	2,218	91,896	83	310	980	3,310	30	2	452	187	17	135	58		
II	547,210	2,082	235,246	43%	1,987	234,899	95	347	862	12,396	187		452	187	17	135	16		
III	662,730	1,374	359,262	54%	1,122	358,680	252	882	1,207	6,503	160		58	58	41	160	27		
IV	263,590	971	122,040	46%	917	121,945	54	95	602	2,693	49		11	11	16	16	12		
V	239,660	1,257	112,584	47%	1,197	112,394	60	190	724	4,636	55		47	47	18	18	19		
VI	197,250	513	79,362	40%	406	79,044	107	318	396	1,588	20		6	6	105	59			
VII	50,740	437	22,541	44%	421	22,504	16	37	394	2,062	10		2	2	21	8			
VIII	84,380	467	50,824	60%	460	50,810	7	14	124	1,038					3	5			
IX	76,500	263	34,551	45%	224	34,400	39	151	336	4,691	4		4	1	21	20			
X	230,150	615	67,759	29%	540	67,473	75	286	329	3,460	10		6	6	13	36			
XI	189,900	218	63,019	33%	208	62,982	10	37	365	5,413	83		23	23	16	74			
XII	462,470	591	120,312	26%	405	119,798	186	514	7,573	55,314	936		355	355	462	345			
Nation	3,126,340	11,089	1,361,703	44%	10,105	1,358,825	984	2,878	13,892	102,506	1,869		698	698	868	677			

Notes: 1. Based on the 3% slope criteria, estimated by NIA Inventory
 2. Based on Inventory of completed and Operational Projects of USW, DPWH and NIA (1996 Report)
 3. Based on Database of Water Rights Registration, as of 31 March 1997 (NWRB)

Table 3-24 PRODUCTION FOR IRRIGATION (NWRB)

WRR	Types of Sources												Total	
	SW				DW				SP				Facilities	Amount (MCM/year)
	Facilities No.	Capacity (MCM/year)	Amount (MCM/year)	Capacity (MCM/year)	Facilities No.	Capacity (MCM/year)	Amount (MCM/year)	Capacity (MCM/year)	Facilities No.	Amount (MCM/year)				
I	2,218	3.38	7,490.5	0.08	6.4	135	0.51	57.6	2,436	7,584.5				
II	1,987	6.48	12,869.5	0.18	17.4	56	0.21	11.8	2,338	12,998.7				
III	1,122	14.38	16,135.4	0.41	104.5	17	0.92	15.6	1,391	16,255.5				
IV	917	5.39	4,940.8	0.36	19.5	41	0.65	26.6	1,012	4,987.0				
V	1,197	4.47	5,354.6	0.23	13.6	16	0.75	12.0	1,273	5,380.2				
VI	406	6.40	2,599.9	0.85	91.3	18	1.07	19.3	531	2,710.5				
VII	421	4.01	1,688.7	0.29	4.7	105	0.56	59.3	542	1,752.7				
VIII	460	5.23	2,407.4	0.25	1.7	21	0.37	7.7	488	2,416.8				
IX	224	8.37	1,874.3	0.38	14.8	3	1.71	1.48	266	1,894.2				
X	540	12.18	6,575.6	0.28	20.8	21	0.94	19.8	636	6,616.2				
XI	208	10.52	2,187.7	0.55	5.5	13	2.74	35.6	231	2,228.8				
XII	405	14.83	6,006.7	0.27	50.9	16	4.64	74.2	607	6,131.9				
Nation	10,105	6.94	70,131.3	0.36	351.1	462	0.75	344.6	11,551	70,827.0				

Table 3-25 DAMAGES CAUSED BY MAJOR NATURAL DISASTERS
BETWEEN 1980 and 1995 (1/7)

Year	Type of Disaster	Date of Occurrence	Areas Affected	Population Affected		Casualties			Houses Damaged		Value of Damages (billion pesos)
				Families	Persons	Dead	Injured	Missing	Totally	Partially	
1980	Flooding	Jan. 04	Davao del Norte	5,196		2					0.0150
	TS Biring	Mar. 20-24	Region 8	565	2,825		4		1	6	0.0030
	T Ditang	May 07-15	Regions 1&3	2,535	1,554				528	3,168	0.0020
	T. Gloring	May 23-26	Region 3								0.0010
	T Lusing	Jul. 08-11	Regions 1,2, & 4								0.0060
	T Nitang	Jul. 19-22/	Regions 1 to 5	58,731	264,116						0.1020
	T Osang	Jul. 22-27									
	TS Yoning	Oct. 28-30	Regions 2 to 6								0.0020
	T Aring	Nov. 01-07	Regions 1 to 6 & 8	24,564	138,453	13			5,431	2,954	1.3560
	TD Basiang	Nov. 13	AMlan								0.0010
	Flooding	Dec. 19-25	Regions 10 & 11	121,332	73,679	336	14,298				0.3460
1981	Landslide	May 29	Iloilo city			5	2				
	TS Daling	Jun. 28-Jul. 0	Regions 4 & 5	1,286	58,651	21	36	19	3,356	1,551	0.0620
	TS Elang	Jul. 03-05	Regions 2 to 4			8		27			0.0080
	T Rubing	Aug. 16-21	Regions 1 to 2	8,526	47,575	5			1,195	7,125	0.1060
	Landslide	Aug. 24	Benguet								0.0030
	Tornado	Oct. 12	Davao del Norte	38							0.0040
	T Unsing	Oct. 12-14	Cebu			1					0.0040
	T Yeyeng	Nov. 17-21	Regions 4 & 5	5,663	3,633	4	6		67	9	0.0010
	T Anding	Nov. 22-27	Regions 1 to 4	111,411	655,269	68	42		4,911	98,324	0.5050
	T Dinang	Dec. 23-27	Regions 4, 5, 8	112,639	674,619	188	1,838		4,237	52,161	0.5870
1982	Flooding	Jan. 25-30	Regions 9, 10, 12	81,328	436,687	27	1		45		0.0990
	T Akang	Mar. 12-15	Regions 10 & 11	23,911	11,292	25	8	48	188	11,147	0.0480
	T Bising	Mar. 23-28	Regions 7, 8, 10	1,324	657,274	112	85		58,244	18,233	0.5880
	Flooding	Jun. 01	Maguindanao & Sultan Kudarat			2	232				
	Tornado	Jun. 02	Tarlac					29			0.0010
	Tsunami	Jun. 23	Davao del Norte, Sur, & Oriental	818							0.0010
	T Emang	Jul. 12-16	Regions 1 & 3	11,883	6,597	1	5	2	431	573	0.0910
	T Norming	Aug. 20-27/ Sep. 02-04	Regions 1, 3, 4, & 6	31,522	185,827	29	4	23	5,365	14,895	0.0830
	T Ruping	Sep. 05-11	Regions 3 to 7	44,383	2,484	65	26	29	5,599	18,486	0.1990
	T Weling	Oct. 12-15	Regions 1, 2	1,532	31,431	96	183		12,464	34,111	0.6320
	T Aring	Dec. 02-08	Eastern Luzon, Batanes Group & Eastern & Central Visayas	41	246				44	4	0.0010
	T Bidang	Dec. 08-11	Regions 1, 3, & 5								0.0145
1983	Drought	Jan. to Mar.	Regions 1 to 12	422,765							0.7630
	Tsunami	Jun. 02	Tarlac								0.0010
	Tsunami	Jun. 16	Davao del Sur			2	5				0.0010
	T Auring	Jul. 10-11	Region 4	62	193				31		0.0020
	T Bebeng	Jul. 14-16	Regions 3 to 5 & 8	12,811	628,985	115	27		2,954	76,346	0.4670
	Earthquake	Aug. 18	Ilocos Norte			19	176				0.0010
	T Herming	Sep. 03-08	Regions 1& 2	1,489	8,935	3		15	195	69	0.0090
	Tsunami	Sep. 16	Bohol	1		2					
	Flooding	Sep. 23	Lanao del Sur	1,835		11					0.0010
	Flooding	Nov. 05	Bohol								0.0030
	Flooding	Nov. 30	Bohol								0.0010
1984	TS Maring	Aug. 27-30	Regions 1 to 4, 6 to 8, 10 & 11	92,271	47,962	121	17	26	673	6,341	0.0410
	T Nitang	Aug. 31-Sep.	Regions 4, 6, 7, 8, 10 & 11	273,794	163,296	9	443		18,219	142,653	3.9140
	TS Reining	Aug. 31-Sep.	Regions 1, 3, 4, & 4-A	1,954	1,815	63		18	74	891	0.0040
	TS Undang	Nov. 03-06	Regions 4-A to 8	373,491	1,936,732	895	272	2,526	2,114	16,356	0.0020

**Table 3-25 DAMAGES CAUSED BY MAJOR NATURAL DISASTERS
BETWEEN 1980 and 1995 (2/7)**

Year	Type of Disaster	Date of Occurrence	Areas Affected	Population Affected		Casualties			Houses Damaged		Value of Damages (billion pesos)
				Families	Persons	Dead	Injured	Missing	Totally	Partially	
1985	T Kuring	Jun. 20-24	Regions 1 to 3	13,581	77,542	53	6	69	1,789	7,985	0.2280
	T Daling	Jun. 25-29	Regions 3, 4, & 4-A	94,661	511,067	65	4	-	253	1,854	0.3520
	T Miling	Sep. 01-04	Regions 1 & 4	85	70	5		7	26	49	0.0130
	T Saling	Oct. 15-20	Regions 1 to 5	209,842	1,054,063	88	7		63,136	201,263	2.1320
1986	Flooding	Jan. 08	Surigao del Norte			1					0.0080
	Flooding & Landslide	Jun. 28	Davao Oriental	612		3	3				0.0010
	T Gading	July. 6-10	Regions 1 to 4 & NCR	142,052	730,357	106	16		2,689	13,896	0.6790
	T Miding	Aug. 17-Sep. 04	Regions 1, 3, 4, 6 & NCR	96,540	538,386	17	4		473	699	0.2630
	TD Oyang	Oct. 06-07	Regions 3, 4, 4-A & NCR	22,538	125,669	26	27	21			0.0540
	T Pasing	Oct. 10-14	Regions 4-A & 8	3,082	18,492	4			52	414	0.0290
	TS Ruping	Oct. 17-20	Regions 5 & 8	259	1,248	2			49	136	0.7340
	T Aning	Dec. 20-23	Regions 6, 7 & 11	22,771	110,113	13	108	10	3,843	21,212	0.0820
1987	Drought	Jan. to Apr.	Regions 1 to 12								0.7070
	T Herming	Aug. 08-13	Regions 4, 5 & 8	228,286	1,253,398	85	414		61,758	114,922	2.0650
	T Ising	Aug. 13-19	Regions 2 & 3	13,247	55,563	5			89	954	0.1150
	Storm Surge	Aug. 22	Aparri, Cagayan	27							0.0450
	T Neneng	Sep. 04-10	Regions 1 & 2	32	177						0.0920
	T Pepang	Oct. 21-25	Regions 1 & 2	60,504	310,214	100	79	13	18,396	31,557	0.5190
	T Sisang	Nov. 23-27	Regions 4, 5 & 8	318,968	2,019,385	100	79		153,339	175,449	1.1190
	T Trining	Dec. 14-18	Regions 4, 5 & 8	47,591	243,797	22	35	20	8,754	22,488	0.1730
1988	Landslide	Apr. 04	Davao Oriental			24					
	T Biring	May 30-Jun. 03	Regions 3, 4 & NCR	13,010	65,000	8	2	1	93	169	0.0270
	Tomado	Jun. 13	Masantol, Pampanga					2			0.0030
	Earthquake	Jun. 24	Mindoro Occidental								0.8350
	T Huaning	Jul. 16-19	Regions 1 & 2	19,224	102,169	6			3,560	15,116	0.2400
	T Unsang	Oct. 21-26	Regions 1 to 11	537,152	2,742,666	157	316		38,932	146,781	5.6360
	TS Welpring	Nov. 01-05	Regions 4, 6, 8, 9, 10	28,826	144,136	41	1	1	86	516	0.0240
	T Youing	Nov. 05-08	Regions 4 to 9	575,782	3,027,601	217	149	133	91,673	192,877	2.7450
	Earthquake	Nov. 17	Northern Samar								0.0070
	Earthquake	Nov. 17	Sorsogon								0.0100
	Earthquake	Nov. 17	Western Samar								0.0080
Earthquake	Nov. 17	Masbate								0.0030	
1989	Flooding	Jan. 15-20	Regions 5 & 8	81,152	459,730	101	79		1,826	22,355	0.3920
	Landslide	Jan. 16	Davao del Norte			5	14				0.0010
	TS Biring	May 15-19	Regions 2 to 5 & NCR	12,282	73,184	13	3	40	652	4,392	0.0740
	Flooding	Jun. 08	South Cotabato								0.0010
	T Goring	Jul. 14-17	Regions 1 to 4, 6, 9 & 10	95,269	488,757	90	386		8,845	46,269	1.3630
	T Openg	Sep. 07-12	Regions 1, 2 & NCR, & CAR	97,911	505,756	44	21	3	1,157	24,638	0.5800
	T Rubing	Oct. 02-07	Regions 1, 2 & CAR	39,095	219,178	119	192	28	14,064	19,245	0.1910
	T Saling	Oct. 09-10	Regions 1, 3, 4, 5, 8 & NCR	135,245	682,699	58	121		12,273	37,699	1.3940
	T Tasing	Oct. 14-20	Regions 1 to 3, NCR & CAR	109,961	551,043	47	363		19,270	48,940	0.8830
	Landslide	Oct. 16	Muntinlupa	67		14	10				
TS Using	Nov. 16-22	Regions 2, 3, 4, 8 & NC	12,837	62,205	11	1		212	3,401	0.0080	

**Table 3-25 DAMAGES CAUSED BY MAJOR NATURAL DISASTERS
BETWEEN 1980 and 1995 (3/7)**

Year	Type of Disaster	Date of Occurrence	Areas Affected	Population Affected		Casualties			Houses Damaged		Value of Damages (billion pesos)
				Families	Persons	Dead	Injured	Missing	Totally	Partially	
1990	Drought	Jan. to Apr.	Regions 1 to 12	220,269	1,189,309						3.3860
	Earthquake	Feb. 03	Region 7 (Bohol)	10,931	54,059	10	273		199	2,949	0.1220
	Flashflood	Jun. 12	Regions 9 (Zamboanga del Sur)	1,534	8,108	36			168	163	0.4000
	T Bising	Jun. 18-23	Regions 1 to 4, 8, 10, NCR & CAR	42,193	227,269	64	17	8	306	2,684	0.2000
	T Klaring	Jun. 24-28	Regions 1 to 3 & 9	16,440	82,355	8			40		0.0600
	Earthquake	Jul. 16	Regions 1 to 4, CAR & NCR	227,918	1,255,248	1,283	2,786		25,207	77,249	12.2000
	T Gading	Aug. 15-20	Regions 1, 3, 5 & NCR	6,697	32,974	2			3	591	0.0250
	T Heling	Aug. 24-27	Regions 1 to 4 & CAR	52,471	243,431	36	42	3	456	513	0.0450
	T Hiang	Aug. 28-30	Regions 1 to 4 CAR & NCR	130,219	568,675	50	53		684	1,961	1.5200
	T Loleng	Sep. 05-08	Regions 1 & 2	5,591	27,959						
	T Midng	Sep. 12-15	Regions 1 (Ilocos Sur, Norte, & Abra)	2,337	11,521	2	2	5	20	105	
	T Ruping	Nov. 10-14	Regions 4 to 12	1,010,004	5,498,290	508	1,278		22,026	630,885	10.8460
1991	Drought	Jan. to Apr.	Regions 6, 9, 10, 11 & 12								1.6310
	TS Auring	Mar. 10-14	Region 4 (Quezop)	123	858	14	6		143	63	
	Mt. Pinatub	Jun. 12-15	Region 3 (6 provinces)		1,180,132	850	184		40,867	67,862	10.4240
	T Diding	Jun. 13-15	Region 5 (Catanduanes)	2,037	10,185				2,013	24	
	Lahar I	Jun. to Sep.	Region 3 (6 provinces)	33,479	161,545	16	9		2,378	444	0.4940
	T Elang	Jul. 08-11	Region 4 (Bataan)				2	3			
	T Trining	Oct. 23-30	Regions 1, 2 & CAR	105,347	534,307	82	55		8,070	58,305	3.4690
	TS Uring (Ormoc city)	Nov. 02-05	Regions 6 & 8	43,397	223,985	5,101	292		5,232	25,272	1.0440
	T Yayang	Nov. 14-18	Region 4			2					0.0700
1992	Drought	Jan. to Apr.	Regions 6, 9, 10, 11 & 12	209,255	1,027,103						4.0940
	Earthquake	Mar. 09	Baguio City, Mt. Province, Kalinga Apayao, Abra			1	1				0.1820
	Red Tide	Jun. to Dec.	Regions 3, 4 & NCR		58,500	10	67				
	T Konsing	Jul. 03-12	Regions 2 & 3	4,027	5,135	3			5	15	0.0210
	Flashflood	Jul. 09-21	Region 3	144,476	707,870	22			1,569	3,137	0.6810
	Mt. Pinatub	Jul. 09-21	Region 3	19,932	69,102	6	7		1,712		0.5510
	Lahar II										
	T Ditang	Jul. 12-21	Regions 3 & NCR	27,902	134,417	36	77		478	1,305	0.4710
	T Gloring	Aug. 16-19	Regions 3, 4 & NCR	148,049	725,956	22			1,428	3,072	1.3470
	T Isang	Aug. 26-31	Regions 1, 2, & CAR	23,677	114,084	19	1		214	197	0.1730
	T Lusing	Aug. 31- Sep. 05	Regions 1, 2, & CAR	31,787	171,603	10	1		393	145	0.9030
	TS Maring	Sep. 18-23	Regions 1, 2, 3 & CAR	113,686	570,130	27	13		785	3,272	2.1550
	T Paring	Oct. 18-27	Regions 1, 2, 3 & CAR	6,816	34,480	1	4		11		0.0010
	Flashflood	Dec. 28-30	Regions 11	11,430	58,093	17			27	20	0.1340
1993	Drought	Jan. to Mar.	Batanes								0.0170
	Mt. Mayon Volcano	Feb. 02	Region 5 (8 Mun. of Albay & Legaspi City)	21,600	106,917	80	9				0.0730
	Flooding	Jan. 8 & 26, Feb. 05, Mar. 10 & 11 (6 prov. & 01 & Apr. 12 3 cities)	Mindanao, Regions	66,010	340,988	27			158	336	1.0750
	Flood	Feb. 02-04	Southern Leyte	110	606	4	4		4	4	0.0230
	Unusal Cold Spell	February (Last week)	Aparri, Cagayan	5,198	25,990	25	27				
	Fish Kill	Jan. to Feb.	Laguna	2,500	15,000						
	Red Tide	Jan. to Jun.	Region 3 (bataan, Bulacan, & Pampanga); Region 4 (Cavite); Metro Manila (Navotas, Paranaque, & Malabon)	24,598	117,439						

**Table 3-25 DAMAGES CAUSED BY MAJOR NATURAL DISASTERS
BETWEEN 1980 and 1995 (4/7)**

Year	Type of Disaster	Date of Occurrence	Areas Affected	Population Affected		Casualties			Houses Damaged		Value of Damages (billion pesos)
				Families	Persons	Dead	Injured	Missing	Totally	Partially	
	T Goring	Jun. 23-27	Region 1 (4 provs. & 3 cities) CAR (5 prov. & 1 city) Region 2 (4 prov.) Region 3 (3 prov.) Region 4 (3 prov. & 1 city) NCR (2 muns. & 2 cities)	153,949	812,830	75	121	13	35,069	79,695	2,7750
	TS Haling	Jul. 07-09	Active LPS East of Surigao	180	548	2					0.0040
	T Openg	Aug. 06-08	1,300 km ENE of Catanduanes	83,026	455,170	21	7	5	1,838	12,841	1.5850
	TS Rubing	Aug. 16-19	Region 3 (4 provs. & 1 city) NCR (Pasay City & Taguig) Region 4 (3provs. & 1 city)	57,427	269,396	5	1		143	698	0.0980
	TS Huling	Aug. 22-26	Region 6 (Capiz & Iloilo)	3,830	22,308	4	1		243	361	0.1570
	TS Walding	Sep. 08-12	Region 2 (Batanes)	2,368	14,208	2		9			0.0510
	TS Yeyeng	Sep. 13-16	Region 3 (Olongapo city) Region 1 (Ilocos Norte & Pangasinan)	7,035	37,610						
	Flashfloods	Sep. 15 Sep. 17	Davao Oriental (Matí) Davao del Norte & Maguindanao	45 2,285	215 11,571			1			0.0010 0.0060
	Locust Infestation	Last part of August and early part of September	Region 3 (Zambales & Subic Bay) Region 11 (Davao del Sur)								0.0080
	T Kadjang	Sep. 30-Oct. 07	LPA east of Aurora	415,813	2,060,677	126	37	26	2,249	9,078	8.7520
	T Husing	Oct. 28-Nov. 02	East of Virac, Catanduanes	83,026	455,170	21	7	5	1,838	12,841	1.5850
	TS Luring	Nov. 19-22	LPA over Catanduanes	7,065	45,327	8	1	4			0.0280
	T Monang	Dec. 03-04	840 kms east of Samar	259,738	1,334,251	272	607	90	60,299	158,801	2.3400
	T Naning	Dec. 11-12	700 kms ESE Casiguran, Aurora	98,799	463,925	93	579	10	30,013	54,918	1.3290
	T Puring	Dec. 24-29	1,100 kms east of Mindanao	340,081	1,877,921	157	276	52	34,154	127,204	2.7320
1994	A T Akang	Jan. 4-6	Region 4, 5	9,909	49,159	45	26	17	522	3,039	0.0796
	Flooding	Jan. 16 Jan. 18-29	Davao Oriental Davao del Norte Davao Oriental Davao Del Sur	3,017 4,068	16,430 17,610				31 9	47 28	0.0045 0.0351
	Epidemic Outbreak	Jan. 24 Feb. 3	Davao Oriental Davao del Norte	9 3,978	50 19,184						0.0026
	Landslide	Feb. 5 Feb. 18 Mar. 18-29	Region 11, Davao del N Region 11, Davao del Su Region 11, Davao del N Davao Oriental	10 11 3,966	60 66 19,320	4 3 12	3 3 1			3 8	0.0071
	BTS Bising	Apr. 1-9	Region 6, 7, 8 & 10	118,061	587,671	19	72	10	11,824	56,048	0.4076
	Tornado	Apr. 13	Reg 11, Zamboanga del	68	320		2		20	40	
	Earthquake	May 14	Pagadian City	128	729	4			31	92	0.0010
	Flooding	May 18-24	Davao del Norte, Davao del Sur, Davao Oriental, Davao City	10,751	49,494	4	3	1	52	12	0.0173

**Table 3-25 DAMAGES CAUSED BY MAJOR NATURAL DISASTERS
BETWEEN 1980 and 1995 (5/7)**

Year	Type of Disaster	Date of Occurrence	Areas Affected	Population Affected		Casualties			Houses Damaged		Value of Damages (billion pesos)
				Families	Persons	Dead	Injured	Missing	Totally	Partially	
CTD Deling	May 24-26	Region 7		1,822	8,788	1			10	31	0.1453
Flooding	May 26-27	Region 12, Maguindana Lanao del Sur		20,828	98,094						0.1131
Tomado	Jun. 4	Cotabato province Region 11		9	47				2	9	0.0000
DTD Gading	Jun. 21-24	South Cotabato									
Flooding	Jun. 30	Region 3, NCR		11,010	56,112	3					
	Jun. 30	Region 10		1,040	4,520	5		5	91	147	0.0025
	Jun. 30	Cagayan de Oro City									
Flooding	July 3	Maguindanao, Sulu		1,993	11,958						0.0014
	July 3	Cotabato, Sultan Kudarat									
	July 3	Region 11		190	1,140	1					
	July 3	South Cotabato									
	July 3	Sarangani Island		100	600					119	0.0022
	July 3	Carmen		450	2,700						
	July 3	Kabacan		280	1,002						
	July 3	Aleosan		4,506	18,682						
Red Tide	July 5	Bataan and Zamboanga del Sur		2,288	12,300						
Earthquake	July 5	Southern Leyte						2			0.0027
Landslide	July 7-9	South Cotabato		302	1,816						
	July 7-9	Davao Oriental									
ET Hiang & TS Loleng	July 7-10	Region 1, 2, 3		32,700	166,564	11	21	6	2,174	11,589	0.1553
Red Tide	July 8	Bulacan		1,355	6,220						
	July 15	Cavite		459	2,250						
Epidemic Outbreak	July 16	Region 11, Davao City		8		5	5				
GTD Normi	July 18-19	Region 1, 3		127,647	616,860	12	9	1	101	204	0.0045
Flooding	July 25	Lanao del Norte									0.0019
HIS Oyang and TD Pasi	July 25-29	Region 1, 3, 4, 6, 7 ARM		60,129	336,069	48	9	2	505	689	0.1338
	July 31- Aug. 3										
Monsoon Waves	July 26	Lanao del Sur		1,833	11,000					2,500	0.0031
	July 26	Davao City		401	1,412	1	1		144	185	
Epidemic Outbreak	July 27	South Cotabato		27	90	30					
	July 29	South Cotabato		130	280				119		0.0018
Tornado	July 29	Region 9		12	89	12					
	July 29	Zamboanga del Sur									
Drought	Aug. 1st week	North Cotabato		418	2,508						0.0033
	Aug. 1st week	Region 12									
T Ritang	Aug. 4-7	Region 1 and CAR		3,303	16,838	4			29	68	0.0073
Flooding	Aug. 8	Region 11		136	826	1			2	80	0.0026
	Aug. 8	Davao Oriental									
Locusts Infestation	Aug. 2nd week	North Cotabato		353	1,765						0.0040
Flooding	Aug. 21	Region 12 (Arakan)		158	948				22		0.0026
	Aug. 21	North Cotabato									
	Aug. 21	Region 10, Bukidnon									
	Aug. 21	Lantapan									
	Aug. 30	Region 10		535	2,615						
	Aug. 31	Davao del Norte									
	Aug. 31	Region 10 & 12		114	513	6					
	Aug. 31	North Cotabato (Midsayap, Carmen, Matalom, Pres. Roxas Magpet & Kabacan)		817	4,085						0.0300

**Table 3-25 DAMAGES CAUSED BY MAJOR NATURAL DISASTERS
BETWEEN 1980 and 1995 (6/7)**

Year	Type of Disaster	Date of Occurrence	Areas Affected	Population Affected		Casualties			Houses Damaged		Value of Damages (billion pesos)
				Families	Persons	Dead	Injured	Missing	Totally	Partially	
1980	JTS Weling	Sept. 7-11	Region 1, 2	15,605	70,597	10					0.1836
	Monsoon Waves	Sept. 10	Region 11, Davao City	3	15				28	60	
	Flooding	Sept. 15	Region 12 Lanao del Norte (Kapatagan)						14		0.0019
		Sept. 21	Region 9 Zamboanga del Sur	920	4,600				81		0.0158
		Sept. 22	Region 12 Sarangani Province (Maasin & Kiamba) Davao del Sur	24	144						0.0033 0.0010
	Lahar III	Sept. 22	Bohol (Jagna & Valencia)	1,190	5,590						0.0037
		Sept.	Pampanga (Bacolor and Porac)	11,805	55,951	20	1	2	1,648	37	0.0104
	Epidemic Outbreak	Oct. 12	Davao Oriental	44	200	4					
		Oct. 15	Davao City	6	30	2					
	KT Katring Monsoon Waves	Oct. 18-21	Region 3, 4 and NCR	59,097	287,737	45	24	6	14,596	44,472	0.0014
Nov. 3		Davao City	1	6				2			
KT Garding	Dec. 7	Davao del Norte	959	4,203	2				5	0.0038	
	Dec. 8	Davao Oriental	65	309							
	Dec. 19-23	Region 4, 5, 6, 7, 8 & 10	177,945	857,837	44	86	5	28,778	107,158	0.6475	
1995	Drought	Jan. 9	Lanao del Sur	13,103	65,515						0.1021
	Flooding	Jan. 20	Agusan del Sur	9,928	49,640	5					0.0266
		Jan. 5-17	Davao del Norte Davao Oriental	19,377 980	84,377 5,494	6			31 3		0.1256 0.0689
	Drought	Feb. 7	Cagayan Isabela Quirino	20,616	97,436						0.2281 0.1813 0.0002
		Feb. 8-9	Davao del Norte Surigao del Sur Davao Oriental	24,993 530 4,412	99,588 2,429 23,834	4 1		1			0.0910 0.0093 0.0414
	Drought	Mar. 3	Guimaras Antique	33	198						0.0215
	Flooding	Mar. 16-18	Davao Norte Davao Oriental	4,800 20	19,200 120	1 1			3		0.0068 0.0002
		Apr. - May	Limay, Bataan Abucay, Bataan Bulacan Cavite	1,495 4,200 1,355 459	7,475 21,000 6,220 2,250						
	Tornado	Apr. 21	Pampanga	124	620						
	Flooding	May 13	South Cotabato	10	48				5	5	0.0001
May 30		South Cotabato	21,019	95,759						0.1608	
TY Auring	May 31- Jun.	Regions 3, 4, & 5	427	2,118	6		2	151	337	0.0675	
Flooding	Jun. 7	Ronibon			3		2			0.0015	
Tornado	Jun. 10	Misamis Oriental	11	66							
Flooding	Jan. 30	Maguindanao								0.0153	
	Jul. 4	Iligan City & Lanao del Norte									
	Jul. 9	Davao City	131	791				5	126		
	Jul. 10	Davao City	350	250	1						
	Jul. 10	Sultan Kudarat	2,279	11,395						0.0153	
	Red Tide	Jul. 13	Cavite City	4,454	19,292		6				
	Flooding	Jul. 15	Davao Oriental	231	1,386						0.0013
		Jul. 16	Toril, Davao City			4		2			
	Jul. 21-22	Jagna, Bohol			1					0.0004	
	Jul. 22	Maguindanao	12,665	50,660						0.0806	
Jul. 24	North Cotabato Sultan Kudarat								0.0129 0.0416		

**Table 3-25 DAMAGES CAUSED BY MAJOR NATURAL DISASTERS
BETWEEN 1980 and 1995 (777)**

Year	Type of Disaster	Date of Occurrence	Areas Affected	Population Affected		Casualties			Houses Damaged		Value of Damages (billion pesos)
				Families	Persons	Dead	Injured	Missing	Totally	Partially	
	TS Karing	Jul. 27-31	Region 1, 2, 3 & CAR	12,734	68,186	2		2		251	0.1630
	Landslide	Aug. 3	Kalilangan, Bukidnon	50	250	2					0.0023
	Flooding	Aug. 16	Cotabato								0.0040
			Sultan Kudarat	105	525						
			Kalalinga, Bukidnon	422	1,900						0.0092
	F Gening	Aug. 25-31	Regions 1, 2, 3, 4, 5	39,357	195,885	3	3		72	824	0.1702
	F Helming	Sept. 2-5	Region 3	24,013	104,416	8			713	458	0.0083
		Sept. 2	Gen. Santos City	14	70					14	
		Sept. 4	Palawan	20	100						0.0005
				1,840	10,300				2		
		Sept. 10	Cagayan de Oro City	146	509						0.0050
		Sept. 11	Palawan	200	1,000						
		Sept. 13	Cotabato City	1,329	6,382						
	TD Ising	Sept. 14-17	Regions 1 & 3	6,432	34,590	1					0.1784
	T Luding	Sept. 21-22	Region 1	1,611	5,422	1	3		15	293	
	TS Mameng	Sept. 27-Oct.	Regions 1, 3, 4, 5, 6, 7, 8, 10, & NCR	241,430	1,240,668	133	108	130	13,234	21,852	3.1727
	Flooding	Oct. 25	Kamalansig, Bukidnon	1,121	5,605					63	0.1903
	TS Pepang	Oct. 26-30	Regions 4, 6, 7 & 8	234,522	1,254,774	116	49	125	53,907	156,979	0.4235
	Flooding	Oct. 27-28	Negros Occidental	9,139	155,475	12	1	4	452	677	
	T Rosing	Oct. 31-Nov.	Regions 1, 2, 3, 4, 5, 7, NCR & CAR	960,777	4,683,618	916	2,860	376	225,872	530,908	10.8187
	Flooding	Dec. 2-4		735	4,055	11		3	8		0.0037
		Dec. 10	Siquijor								0.0002
		Dec. 14	Davao del Norte	6,335	32,940	2					0.0030
			Davao City			4	1	6	14		
		Dec. 17	Aklan	3,695	22,151	1			11	498	0.0723
		Dec. 24	Aurora	3,277	13,108	8		3			
		Dec. 24-26	Cagayan	14,342	76,074	1					0.2912
			Isabela	5,599	25,299			15			0.3296
			Nueva Vizcaya								0.0020
	T Trining	Dec. 25-30	Regions 7, 8, & 12	39,266	199,794	7	2	4	175	7,222	0.2877

Table 3-26 CLASSIFICATION OF WATERS

1. FRESH SURFACE WATERS	
Classification	Beneficial Use
Class AA	Public Water Supply Class I. Waters having watersheds which are uninhabited and otherwise protected and which require only approved disinfection in order to meet the National Standards for Drinking Water (NSDW) of the Philippines.
Class A	Public Water Supply Class II. Sources of water supply that will require complete treatment (coagulation, sedimentation, filtration and disinfection) in order to meet the NSDW.
Class B	Recreational Water Class I. Waters for primary contact recreation such as bathing, swimming, skin diving, etc. particularly those designated for tourism purposes.
Class C	<ol style="list-style-type: none"> 1. Fishery Water for the propagation and growth of fish and other aquatic resources. 2. Recreational Water Class II (Boating, etc.) 3. Industrial Water Supply Class I (for manufacturing processes after treatment)
Class D	<ol style="list-style-type: none"> 1. For agriculture, irrigation, livestock watering, etc. 2. Industrial Water Supply Class II (e.g. cooling, etc.) 3. Other inland waters, by their quality, belong to this classification
2. COASTAL AND MARINE WATERS	
Classification	Beneficial Use
Class SA	<ol style="list-style-type: none"> 1) Waters suitable for the propagation, survival and harvesting of shell fish for commercial purposes. 2) Tourist zones and national marine parks and reserves established under Presidential Proclamation No.1801 existing laws and/or declared as such by the appropriate government agency. 3) Coral reef parks and reserves designated by law and concerned authorities.
Class SB	<ol style="list-style-type: none"> 1) Recreational Water Class I (Areas regularly used by the public for bathing, swimming, skin diving, etc.) 2) Fishery Water Class I (Spawning areas for Chanos-chanos or "Bangus" and similar species.)
Class SC	<ol style="list-style-type: none"> 1) Recreational Water Class II (e.g. boating, etc.) 2) Fishery Water Class II (Commercial and sustenance fishing) 3) Marshy and/or mangrove areas declared as fish and wildlife sanctuaries.
Class SD	<ol style="list-style-type: none"> 1) Industrial Water Supply Class II (e.g. cooling, etc.) 2) Other coastal and marine waters, by their quality, belong to this classification.

Data Source : DENR

Table 3-27 UPDATED LIST OF CLASSIFIED WATER BODIES OF MARCH 1997 (1/7)

UPDATED LIST OF CLASSIFIED WATER BODIES AS OF MARCH 1997					
Name of River		Location	Region	Class	Year
1		Ilocos Sur	1	A	1993
2	Lower	Pangasinan	1	C	1993
3		Ilocos Sur-La Union	1	C	1993
4		La Union	1	B	1993
5		Ilocos Norte	1	A	1993
6		Pangasinan	1	B	1993
7		La Union	1	A	1993
8	Lower	La Union	1	C	1993
9		Ilocos Norte	1	A	1993
10		Ilocos Sur	1	A	1993
11	Upper	Pangasinan	1	A	1993
	Lower	Pangasinan	1	C	1993
12		Ilocos Norte	1	A	1993
13		Pangasinan	1	C	1993
14		Kalinga Apayao	CAR	C	1993
15	Upper	Benguet	CAR	A	1993
16	Upper	Benguet	CAR	B	1994
17		Mt. Province	CAR	C	1993
18		Benguet	CAR	C	1993
19		Benguet	CAR	A	1993
20		Benguet	CAR	C	1995
21		Mt. Province	CAR	C	1993
22		Mt. Province	CAR	C	1993
23	Upper	Benguet	CAR	A	1975
	Lower	La Union	1	C	1975
24		Kalinga Apayao	CAR	A	1993
25		Abra	CAR	B	1993
26	Upper	Tuba Benguet	CAR	B	1993
27	Upper	Mt. Province	CAR	B	1994
28		Isabela	2	C	1993
29		Isabela	2	D	1993
30	Upper	Cagayan	2	B	1994
	Lower	Cagayan	2	C	1994
31	Upper	Quezon	2	A	1993
	Lower	Cagayan	2	C	1993
32		Isabela	2	C	1993
33		Isabela	2	C	1993
34		Isabela	2	C	1993
35		Isabela	2	C	1993
36		Cagayan	2	C	1993
37		Isabela	2	C	1993
38		Nueva Vizcaya	2	C	1993
39		Isabela	2	D	1993
40		Cagayan	2	C	1993
41		Isabela	2	D	1993

Note: Preliminary Classification

Table 3-27 UPDATED LIST OF CLASSIFIED WATER BODIES OF MARCH 1997 (2/1)

UPDATED LIST OF CLASSIFIED WATER BODIES AS OF MARCH 1997						
Name of River		Location	Region	Class	Year	
42		Tangatan*	Cagayan	2	C	1995
43		Sta. Fe	Nueva Vizcaya	2	C	1993
44		Siffu	Isabela	2	C	1993
45		Tamauni	Isabela	2	D	1993
46	Upper	Tuguegarao	Cagayan	2	B	1993
	Lower	Tuguegarao	Cagayan	2	C	1993
47		Aguang	Nueva Ecija	2	A	1993
48	Upper	Angat	Bulacan	3	B	1993
	Lower	Angat	Bulacan	3	C	1993
49		Bagac Bay	Bataan	3	SB	1993
50		Balagtas	Bulacan	3	C	1975
51		Bamban	Tarlac	3	A	1993
52		Bambang	Bulacan	3	C	1975
53		Bancal	Zambales	3	C	1993
54		Binuangan	Bulacan	3	C	1975
55	Upper	Bocaue	Bulacan	3	A	1975
	Lower	Bocaue	Bulacan	3	C	1975
56		Bucau	Zambales	3	B	1993
57		Bulacan	Bulacan	3	C	1975
58		Cabigo Point	Bataan	3	SC	1993
59		Calumpit	Bulacan	3	C	1975
60		Camiling	Tarlac	3	C	1993
61		Eguia	Zambales	3	D	1933
62		Guiguinto	Bulacan	3	C	1975
63		La Paz	Tarlac	3	A	1993
64		Lawis	Zambales	3	B	1993
65		Looc Bay	Bataan	3	SB	1993
66		Mabayuan	Zambales	3	A	1993
67	Upper	Marilao	Bulacan	3	A	1975
	Lower	Marilao	Bulacan	3	C	1975
68		Meycauayan	Bulacan	3	C	1975
69		Napot Point	Bataan	3	SC	1993
70	Upper	Nayom*	Zambales	3	B	1995
	Lower	Nayom*	Zambales	3	C	1995
	Lower	Cagayan	Cagayan	2	C	1993
71		O'Donnel	Tarlac	3	C	1993
72	Upper	Pamatawan	Zambales	3	B	1993
	Lower	Pamatawan	Zambales	3	C	1994
73	Upper	Pampanga	Nueva Ecija	3	A	1975
	Lower	Pampanga	Pampanga	3	C	1975
74		Pantabangan	Nueva Ecija	3	C	1993
75		Pantal	Zambales	3	C	1993
76		Parongking	Zambales	3	C	1993
77		Polo	Bulacan	3	C	1975
78	Upper	Porac	Pampanga	3	A	1993

Note: Preliminary Classification

Table 3-27 UPDATED LIST OF CLASSIFIED WATER BODIES OF MARCH 1997 (3/7)

UPDATED LIST OF CLASSIFIED WATER BODIES AS OF MARCH 1997					
Name of River		Location	Region	Class	Year
78 Porac	Lower	Pampanga	3	C	1993
79 Rio Chico		Tarlac	3	C	1993
80 San Fernando		Pampanga	3	C	1975
81 San Juan		Bataan	3	C	1975
82 Sinocalan		Zambales	3	C	1993
83 Sorabia		Tarlac	3	A	1993
84 Sta. Rita	Upper	Zambales	3	A	1993
Sta. Rita	Lower	Zambales	3	C	1993
85 Sto. Tomas		Zambales	3	A	1993
86 Tarlac		Tarlac	3	C	1993
87 Banadero		Laguna	4	C	1975
88 Balete		Oriental Mindoro	4	C	1993
89 Bansud		Oriental Mindoro	4	C	1993
90 Batangas Bay		Batangas	4	SC	1993
91 Baroc		Oriental Mindoro	4	C	1993
92 Binambang		Batangas	4	C	1975
93 Boac		Marinduque	4	C	1975
94 Bongabong		Oriental Mindoro	4	D	1993
95 Bulalacao		Oriental Mindoro	4	C	1993
96 Buso-buso		Rizal	4	C	1993
97 Butas		Oriental Mindoro	4	C	1993
98 Caguray		Occidental Mindoro	4	A	1993
99 Dacanlao		Batangas	4	C	1993
100 Dumacaa		Quezon	4	C	1993
101 Iyam		Quezon	4	C	1993
102 Kalumpang		Batangas	4	C	1993
103 Katubusan		Palawan	4	C	1993
104 Lagnas		Quezon	4	C	1993
105 Lumintao		Occidental Mindoro	4	A	1993
106 Mag-asawang Tubig		Oriental Mindoro	4	A	1993
107 Magbando		Occidental Mindoro	4	A	1993
108 Malaking ilog		Tiaong, Quezon	4	C	1993
109 Malatgao		Palawan	4	A	1993
110 Malaylay-Buco		Oriental Mindoro	4	A	1993
111 Manoburao		Occidental Mindoro	4	A	1993
112 Masin		Quezon	4	C	1993
113 Mogpog		Marinduque	4	C	1975
114 Molino		Cavite	4	C	1993
115 Pagbahan		Occidental Mindoro	4	C	1993
116 Pagsanjan		Laguna	4	B	1993
117 Palico		Batangas	4	C	1975
118 Pandanan		Palawan	4	C	1993
119 Pansipit		Batangas	4	C	1993
120 Puerto Galera (Mulle Bay)		Oriental Mindoro	4	SA	1996
121 Pula		Oriental Mindoro	4	C	1993

Note: Preliminary Classification

Table 3-27 UPDATED LIST OF CLASSIFIED WATER BODIES OF MARCH 1997 (4/7)

UPDATED LIST OF CLASSIFIED WATER BODIES AS OF MARCH 1997						
Name of River		Location	Region	Class	Year	
122		Pulang Tubig	Oriental Mindoro	4	A	1993
123		Rosario	Lobo, Batangas	4	A	1993
124		Sumagui	Oriental Mindoro	4	C	1993
125		San Cristobal	Laguna	4	C	1993
126	San Juan	Upper	Batangas	4	A	1993
	San Juan	Lower	Laguna		C	1993
127		San Pedro	Laguna	4	C	1975
128		Sta. Cruz	Laguna	4	C	1975
129		Sta. Rosa	Laguna	4	B	1993
130		Sapang Baho	Quezon	4	C	1993
131		Tayuman	Palawan	4	C	1993
132		Teretian	Palawan	4	C	1993
133		Tigas	Laguna	4	A	1993
134	Ylang-Ylang	Upper	Cavite	4	B	1980
	Ylang-Ylang	Lower	Cavite	4	C	1980
135		Bicol	Camarines Sur	5	A	1993
136		Bombon	Albay	5	A	1993
137		Cawayan	Sorsogon	5	B	1994
138	Daet	Upper	Camarines Norte	5	A	1993
	Daet	Lower	Camarines Norte	5	C	1993
139		Gumaus	Camarines Norte	5	D	1993
140	Labo	Upper	Camarines Norte	5	A	1993
	Labo	Lower	Camarines Norte	5	C	1993
141		Lagonoy	Camarines Sur	5	C	1993
142		Malaguit	Camarines Norte	5	C	1993
143		Naga	Camarines Sur	5	C	1993
144		Quinale	Albay	5	C	1993
145		Pawili	Camarines Sur	5	C	1993
146	Salog River*	Upper	Sorsogon	5	B	1995
	Salog River*	Lower	Sorsogon	5	C	1995
147		San Francisco	Albay	5	B	1996
148		Tagas	Albay	5	C	1994
149	Talisay	Upper	Camarines Norte	5	A	1993
	Talisay	Lower	Camarines Norte	5	C	1993
150		Tayli	Albay	5	A	1993
151		Yawa	Albay	5	A	1975
152	Aklan	Upper	Aklan	6	A	1993
	Aklan	Lower	Aklan	6	B	1993
153		Alacaygan	Iloilo	6	C	1993
154		Alugon	Capiz	6	C	1975
155		Bago	Negros Occidental	6	C	1993
156		Balantias	Iloilo	6	B	1993
157		Barotac	Iloilo	6	B	1993
158		Batiano	Iloilo	6	C	1994
159	Caiman	Upper	Antique	6	A	1993

Note: Preliminary Classification

Table 3-27 UPDATED LIST OF CLASSIFIED WATER BODIES OF MARCH 1997 (5/7)

UPDATED LIST OF CLASSIFIED WATER BODIES AS OF MARCH 1997						
Name of River		Location	Region	Class	Year	
159	Caiman	Lower	Antique	6	B	1993
160	Calajunan Creek		Iloilo	6	C	1996
161	Cangaranan		Antique	6	A	1993
162	Guimbal		Iloilo	6	B	1993
163	Himoga-an		Negros Occidental	6	C	1993
164	Hog	Upper	Negros Occidental	6	A	1975
	Hog	Lower	Negros Occidental	6	C	1975
165	Jalaur	Upper	Iloilo	6	A	1975
	Jalaur	Lower	Iloilo	6	C	1975
166	Jaro - Agaman		Iloilo	6	C	1993
167	Jaro	Upper	Iloilo	6	A	1993
	Jaro	Lower	Iloilo	6	B	1993
168	Malihao*	Upper	Negros Occidental	6	B	1995
	Malihao*	Lower	Negros Occidental	6	C	1995
169	Palawan		Antique	6	A	1993
170	Panay		Capiz	6	A	1993
171	Pontevedra		Negros Occidental	6	C	1975
172	Salamanca		Negros Occidental	6	C	1975
173	Sicaba		Negros Occidental	6	C	1975
174	Sibalom*		Iloilo - Antique	6	B	1996
175	Sibalom	Upper	Antique	6	A	1993
176	Sipalay	Upper	Negros Occidental	6	A	1975
	Sipalay	Lower	Negros Occidental	6	C	1975
177	Tumagbok	Upper	Iloilo	6	A	1994
	Tumagbok	Lower	Iloilo	6	C	1994
178	Abatan*	Upper	Bohol	7	A	1995
	Abatan*	Middle	Bohol	7	B	1995
	Abatan*	Lower	Bohol	7	C	1995
179	Argao	Upper	Cebu	7	A	1994
	Argao	Lower	Cebu	7	B	1994
180	Balamban	Upper	Cebu	7	A	1994
	Balamban	Lower	Cebu	7	B	1994
181	Banica*	Upper	Negros Oriental	7	A	1996
	Banica*	Middle	Negros Oriental	7	B	1996
	Banica*	Lower	Negros Oriental	7	C	1996
182	Danao*	Upper	Cebu	7	A	1995
	Danao*	Lower	Cebu	7	B	1995
183	Guindarohan	Upper	Cebu	7	A	1996
	Guindarohan	Lower	Cebu	7	C	1996
184	Loboc*		Bohol	7	B	1995
185	Luyang	Upper	Cebu	7	A	1994
	Luyang	Lower	Cebu	7	C	1994
186	Manaba*	Upper	Bohol	7	A	1996
	Manaba*	Middle	Bohol	7	B	1996
	Manaba*	Lower	Bohol	7	C	1996

Note: Preliminary Classification

Table 3-27 UPDATED LIST OF CLASSIFIED WATER BODIES OF MARCH 1997 (6/7)

UPDATED LIST OF CLASSIFIED WATER BODIES AS OF MARCH 1997						
Name of River		Location	Region	Class	Year	
187	Ocoy*	Upper	Negros Oriental	7	A	1996
	Ocoy*	Lower	Negros Oriental	7	B	1996
188	Panamangan		Negros Oriental	7	C	1993
189	Sapang Daku	Upper	Cebu	7	A	1994
	Sapang Daku	Lower	Cebu	7	C	1994
190	Tanjay		Negros Oriental	7	B	1993
191	Bao		Leyte	8	A	1993
192	Taft		Samar	8	C	1993
193	Tigbao*		Leyte	8	C	1996
194	Mercedes*	Upper	Zamboanga	9	B	1996
	Mercedes*	Lower	Zamboanga		C	1996
195	Tumaga*	Upper	Zamboanga	9	A	1995
	Tumaga*	Middle	Zamboanga	9	B	1995
	Tumaga*	Lower	Zamboanga	9	C	1995
196	Adgawan		Agusan del Sur	10	A	1993
197	Agusan*	Upper	Misamis Oriental	10	A	1996
	Agusan*	Lower	Misamis Oriental	10	C	1996
198	Agusan*		Agusan del Norte	10	C	1993
199	Alae*	Upper	Bukidnon	10	A	1996
	Alae*	Lower	Bukidnon	10	C	1996
200	Balatocan		Misamis Oriental	10	A	1993
201	Bigaan*	Upper	Misamis Oriental	10	A	1995
	Bigaan*	Lower	Misamis Oriental	10	C	1995
202	Cabadbaran		Agusan del Norte	10	A	1993
203	Cagayan		Misamis Oriental	10	A	1993
204	Clarín		Misamis Occidental	10	A	1993
205	Cabulig		Misamis Oriental	10	A	1993
206	Cugman	Upper	Misamis Oriental	10	A	1994
	Cugman	Lower	Misamis Oriental	10	C	1994
207	Gibong		Agusan del Sur	10	A	1993
208	Gingoog		Misamis Oriental	10	A	1993
209	Gingoog Bay		Misamis Occidental	10	SC	1993
210	Ihawan		Misamis Oriental	10	A	1993
211	Iponan		Misamis Oriental	10	A	1993
212	Odiangan		Misamis Oriental	10	A	1993
211	Ojot		Agusan del Norte	10	A	1993
214	Oroquieta		Misamis Occidental	10	A	1993
215	Magallanes		Agusan del Norte	10	C	1993
216	Magpayang		Misamis Oriental	10	A	1993
217	Magsaysay		Misamis Oriental	10	A	1993
218	Naawan		Misamis Oriental	10	A	1993
219	Palilan*	Upper	Misamis Oriental	10	A	1993
	Palilan*	Lower	Misamis Oriental	10	C	1993
220	Polangi		Bukidnon	10	A	1993
221	Sawaga		Bukidnon	10	A	1993

Note: Preliminary Classification

Table 3-27 UPDATED LIST OF CLASSIFIED WATER BODIES OF MARCH 1997 (7/7)

UPDATED LIST OF CLASSIFIED WATER BODIES AS OF MARCH 1997						
Name of River		Location	Region	Class	Year	
222		Simulao	Agusan del Sur	10	A	1993
223		Solana	Misamis Oriental	10	A	1993
224		Surigao	Surigao del Norte	10	A	1993
225		Tagolo-an	Misamis Oriental	10	A	1993
226		Tubay	Agusan del Norte	10	A	1993
227	Upper	Umalag*	Misamis Oriental	10	A	1995
	Lower	Umalag*	Misamis Oriental	10	C	1995
228		Wawa	Agusan del Norte	10	A	1993
229	Upper	Davao*	Davao City	11	A	1995
	Lower	Davao*	Davao City	11	B	1995
230	Upper	Digos*	Davao del Sur	11	B	1995
	Lower	Digos*	Davao del Sur	11	C	1995
231		Hijo-Masara*	Davao del Norte	11	D	1995
232		Lasang*	Davao City	11	B	1995
233		Padada*	Davao del Sur	11	D	1995
234	Upper	Sibulan*	Davao del Sur	11	A	1995
	Lower	Sibulan*	Davao del Sur	11	B	1995
235		Talomo*	Davao City	11	B	1995
236		Tagum*	Davao del Norte	11	D	1995
237		Tuganay*	Davao del Norte	11	B	1995
238		Agus	Lanao del Norte	12	C	1993
239		Allah*	Sultan Kudarat	12	B	1995
240		Libungan*	Cotabato	12	D	1996
241	Upper	Marble	Cotabato	12	B	1994
	Lower	Marble	Cotabato	12	D	1994
242		Matingao	Cotabato	12	B	1994
243		Nuangan*	Cotabato	12	D	1996
244		Panguil Bay*	Lanao del Norte	12	SC	1996
245		Polangi*	Cotabato	12	D	1995
246		Rio Grande de Mindanao*	Cotabato	12	C	1995
247	Upper	Marikina	Metro Manila	NCR	A	1975
	Lower	Marikina	Metro Manila	NCR	C	1975
248		Paranaque-Zapote	Metro Manila	NCR	C	1975
249		Pasig	Metro Manila	NCR	C	1975
250		San Juan	Metro Manila	NCR	C	1975
251		Tullahan-Tenejeros	Metro Manila	NCR	C	1975

Note: Preliminary Classification