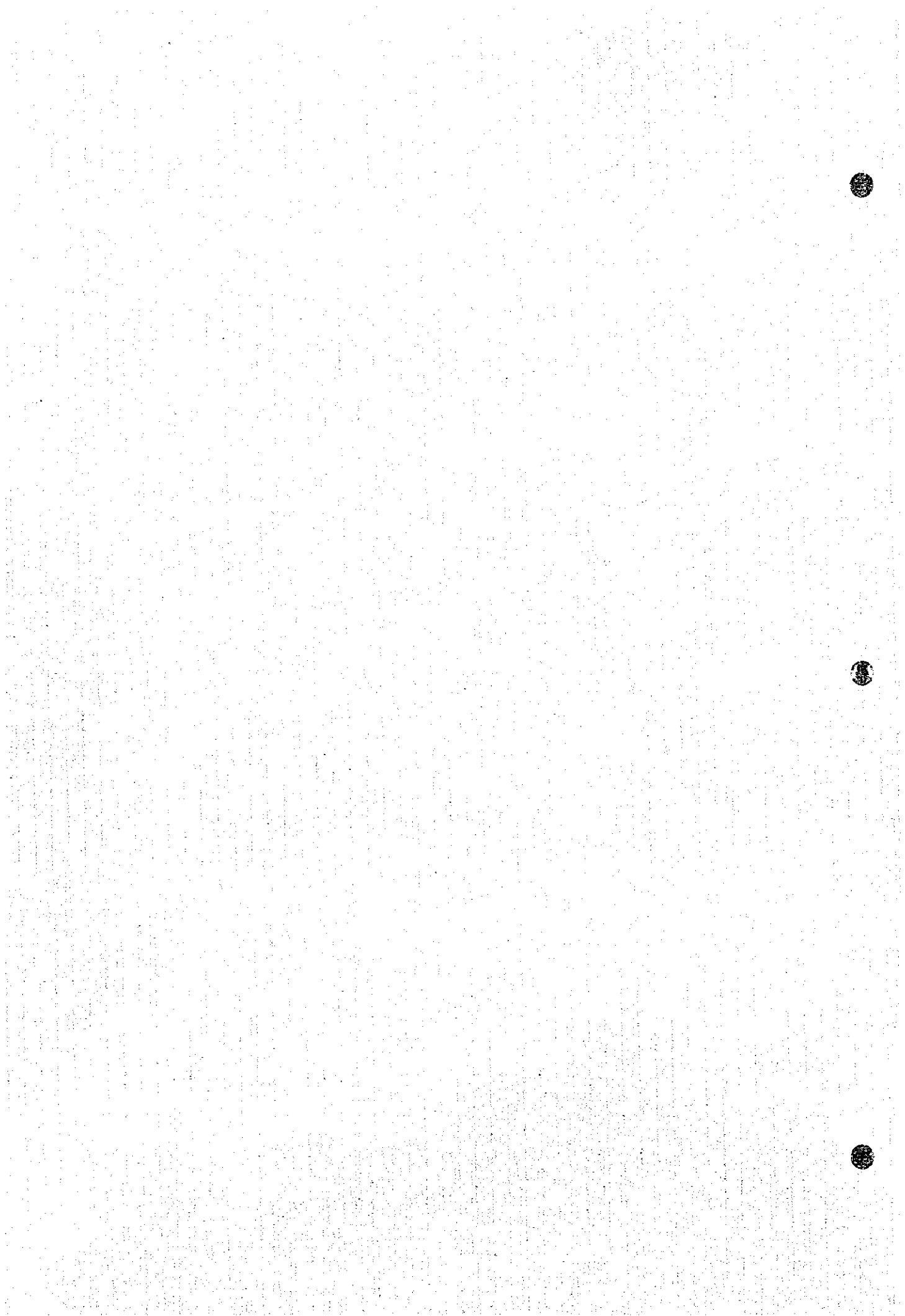


Chapter 5

***EXISTING SECTOR ARRANGEMENTS
AND INSTITUTIONAL CAPACITY***



5. EXISTING SECTOR ARRANGEMENTS AND INSTITUTIONAL CAPACITY

5.1 General

Much has happened in the sector since 1987 when the national master plan was initially prepared. The water supply, sewerage and sanitation sector is presently in a transition stage. The Local Government Code of 1991 has re-defined the role, relationship and linkages of central, provincial, municipal and barangay institutions in the provision of basic services, including water and sanitation. The responsibility for water supply and sanitation functions were lodged with various national agencies. The new direction mandates the LGUs to play a larger role in planning and implementing water supply and sanitation projects. This raises serious institutional capacity and resource reallocation issues.

Chapter Five provides an overview of existing sector policies and arrangements as a basis for formulating modifications and improvements. It identifies current capacity building issues which need to be addressed in the early stages of master plan implementation. Most importantly, it assesses the impact of the present centralized delivery system at the local levels.

5.2 Sector Reforms

The GOP has set the future agenda for sector reform. These initiatives followed the completion of the Water Supply Sector Reform Study and the National Urban Sewerage and Sanitation Strategy Study. The GOP has endorsed the major recommendations of these studies through the following NEDA resolutions:

- (1) NEDA Resolution No. 4 (series of 1994): LGUs, in the context of the LGC and related decentralization efforts, now play a lead role in service delivery. The resolution allows LGUs to implement all levels of water supply projects and redefines the roles of other sector agencies. LWUA shall implement only financially viable Level III water supply projects in areas outside the MWSS jurisdiction. DILG's participation will consist of general administration and institution building, such as assistance to the LGUs in the formation of Rural and/or Barangay Waterworks and Sanitation Association and in the identification of water supply systems. *DPWH, together with DILG and DOH, will provide technical assistance (within a period of about 2 years) to LGUs in the planning, implementation and operation and maintenance of water supply facilities.*

- (2) NEBA Resolution No. 5 (series of 1994) provides that LGUs shall primarily be the implementors of the sanitation/sewerage programs with the national government providing assistance to develop their capabilities. It reaffirms the principle of provision of sewerage and sanitation services on the basis of consumer demand and willingness-to-pay. The resolution also mandates the establishment of a Central Project Support Office (CPSO) at LWUA to assist LGUs in the formulation, preparation and implementation of sewerage and sanitation projects.

5.3 Sector Institutions

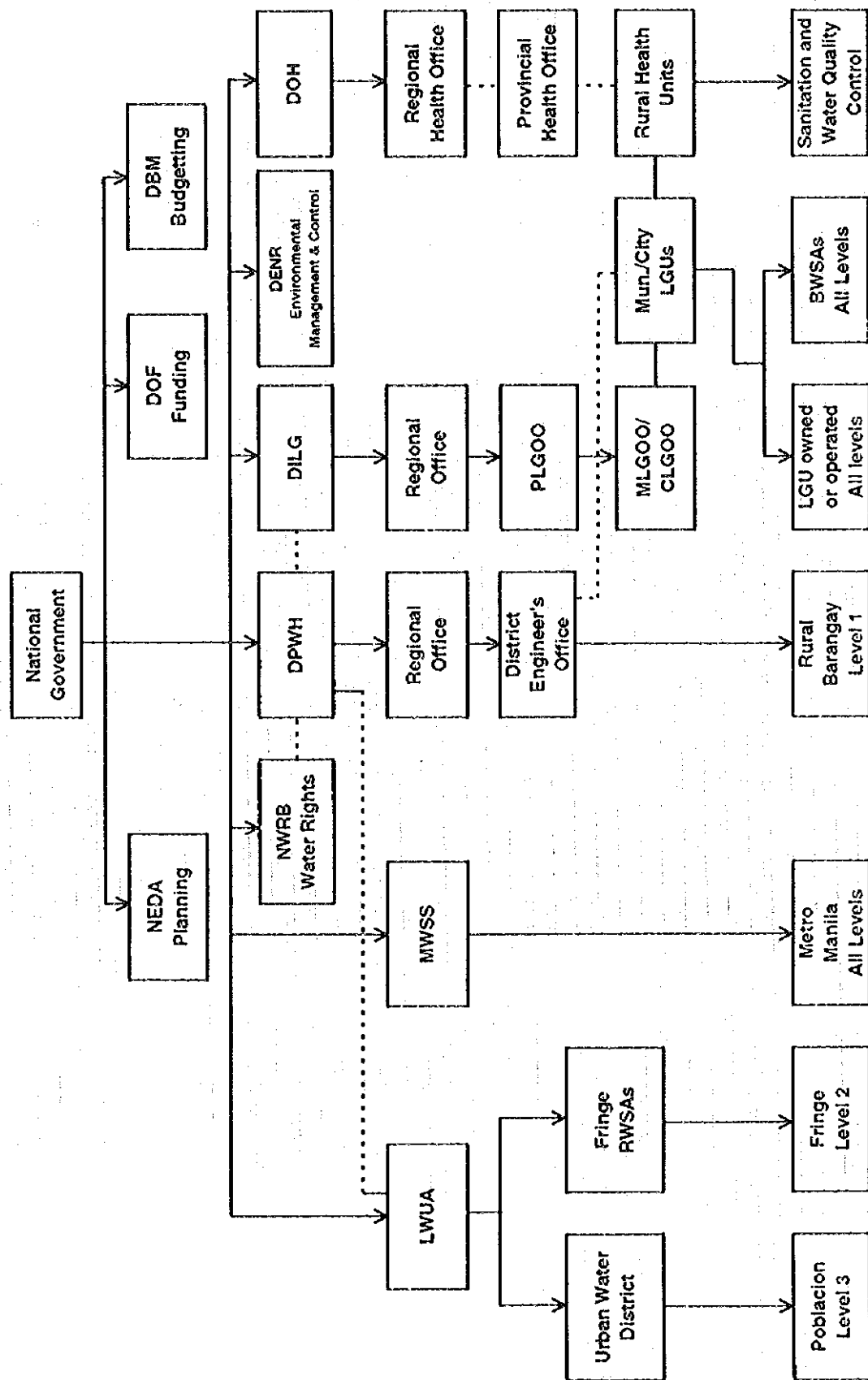
(1) Existing Institutional Arrangements

It was noted in the beginning of this chapter that the water supply, sanitation and sewerage sector is in transition. The Local Government Code however mandates major changes in sector structure and performance in the future when full devolution takes place. The Implementing Rules and Regulations (IRR) reflecting the new sector role of the LGUs and national agencies are still being developed at the time of the preparation of this plan. As such, sector projects are still led generally by national agencies in coordination with LGUs. The following discussion on institutional arrangements therefore presents the starting point of the transition (i.e., the existing set-up).

At the central level, there are three (3) line departments (DILG, DPWH and DOH) and two (2) government-owned and controlled corporations (LWUA and MWSS) responsible for planning and implementation (refer to Figure 5.3.1, Functional Relationship). Other GOP departments are concerned with macro-planning, national resource allocation decisions, as well as exercise of regulatory powers for tariff setting, and environmental protection and management issues.

At the provincial and municipal levels, there are central agency field offices (of DPWH and DILG) and LGU offices working in the sector. DOH field offices, however, have since been devolved and most of its resources are already under LGU supervision. DPWH has also devolved to the LGUs some of its functions, specifically the installation and maintenance of locally-funded water supply projects. Water Districts, RWSAs and BWSAs have been organized to deal with the actual delivery of services. Some LGUs continue to operate municipal or provincial water and sanitation systems. As the LGC is gradually put into operation, many of the responsibilities and resources currently admi-

Figure 5.3.1 - Functional Relationships



nistered by central departments may be devolved to LGUs. Project management offices (PMOs, at the central level), *ad hoc* inter-agency committees and task forces have been organized to address coordination issues.

There are many water and sanitation activities outside the government realm. The private sector, NGOs and community-based organizations (CBOs), out of necessity, are rehabilitating publicly-installed, non-operating facilities or constructing new ones.

The current major institutional issues are those of management of the transition process and of re-establishing leadership in the sector most especially at the local level. Major resource realignments and capacity building initiatives are needed. The new set of implementing rules and regulations is being formulated during the preparation of this plan.

(2) Sector Finance

The water sector reform study reports that in order to increase nationwide water supply coverage to about 87% by 1998, new investments of about P39.3 billion will be needed. Of this, only P12.8 billion has been secured, i.e., carried over from existing projects. In addition, the level of public investment in water supply has declined in real terms in recent years. During the period 1988 through 1992, P17.268 billion was allocated of which only P10.453 B was disbursed. Despite the declining trend in investments, the water sector fund utilization rate is only 60.5% - indicating serious institutional planning and implementation capacity issues. The delay in the institutional response to the policy shifts has invariably contributed to this decline in activity level.

If the new arrangements are to flourish, the issue of LGU access to external sources of capital development funds (backed by GOP guarantees) needs to be addressed.

5.4 Sector Agencies at the National Level

(1) Department of the Interior and Local Government (DILG)

Responsibility: The Department has the mandate of strengthening local capacity for delivery of basic services, including water and sanitation. It is responsible for providing general administration and institution-building support to LGUs including assistance in the formation and training of BWSAs; coordination of master plan preparation; sourcing

of external funds; formulation and installation of sector management systems, including O&M and BWSA financial management systems. Ultimately, DILG is geared to provide a range of support activities to develop the capability of LGUs to provide, manage, operate and maintain water supply projects either directly or through community-based organizations, like BWSAs.

Current Activities: On a transitory basis, interagency provincial and municipal water task forces have been established in some provinces. These task forces (TFs) are the current sector entry point of DILG. Through the TFs, barangays needing improved water supply and households needing sanitation improvements are identified and organizations are formed. Training activities are also done with the TFs. Conferences are held regularly to assess performance and review sector experiences. Training generally follows the cascade approach from the national up to the barangay level.

Resources: The PMO for Water Supply and Sanitation is established under the Assistant Secretary for Plans and Programs. About sixty (60) staff members comprise the PMO. It has four (4) operating divisions (Administration; Finance and Procurement; Project Planning; and Field Operations). Its Work Program is integrated with the DILG Annual Plan of Implementation. Like other line Departments, DILG's annual budget allocation goes through the general appropriations review and approval process in Congress which usually requires a one-year lead time. Action officers are assigned for every active province. Monitoring and evaluation of project implementation are done by the provincial director and municipal local government operation officer (MLGOO). Funds for sector training and BWSA formation are channeled through the regional and provincial DILG offices.

(2) Local Water Utilities Administration (LWUA)

Responsibility: LWUA is a specialized lending institution mandated to promote and oversee the development of provincial water utilities based on financial viability of projects. Most water utilities were under the LGUs until 1973, when some LGUs opted to waive their control over the utility and organize water districts (WDs) to qualify under the LWUA program. In 1987, LWUA responsibilities were expanded to include assistance to Level II Rural Waterworks and Sanitation Associations (RWSAs). The provision of Level II and III service and of wastewater disposal systems in communities outside Metropolitan Manila are largely coordinated through the LWUA. The WDs cur

rently serve about 18.43 M consumers in about 703 cities and municipalities. NEDA Resolution No. 4 directs LWUA to focus on its development banking role and to finance only viable WDs. Since its establishment in 1972, LWUA has formed 544 WDs (486 of which have availed of loans totaling P 4.0 B). It has completed over 880 water supply projects.

Activities: LWUA has since developed a wide array of support services for WD development.

Institutional development services for WDs and RWSAs include: formation, management advisory services, training programs, management audits and operations reviews, installation of uniform commercial practices systems; information and marketing support.

Financial services include: economic and financial analysis, tariff analysis and fund sourcing. Various types of loans are available to finance the construction of water systems; reactivation of non-operating systems, rehabilitation and expansion of facilities; and training. Special loans finance watershed management projects; construction of administration buildings; purchase of service vehicles, communication and computer facilities; restoration of facilities damaged by calamities; initial or emergency operational needs. Commodity loans support generation of additional service connections.

Technical services: LWUA oversees the planning, design, construction, and control of quality standards to improve the water system facilities of WDs and RWSAs. LWUA formulates uniform standards for design, materials and construction to lower project costs and disseminates periodic water supply industry performance indicators.

LWUA consults with interested LGUs on the formation of WDs and RWSAs. Public hearings are held prior to the formation of WDs and tariff adjustments. Where tariff increases are not accepted, improvement projects are either reviewed or shelved altogether. LWUA collaborates with LGUs and consumers on all phases of WD improvement programs especially during the construction of water supply facilities.

Resources: LWUA maintains and fields a pool of management advisors, trainers, engineers and other professionals to give WDs and RWSAs proper guidance in their operation and administration. In addition, the Central Sewerage and Sanitation Program Support Office (CPSO) was recently established at LWUA to coordinate the

implementation of sewerage and sanitation projects at the national level and to assist LGUs and WDs plan and manage sewerage and sanitation projects and programs at the local level.

LWUA training programs embrace efforts directed at the training and education needs of those who manage and operate water supply systems and those who provide assistance from the national level so that the water systems will succeed. Training for the water districts comprise about 20 technical and 20 management courses while in-house courses such as cadetship training for fresh engineering graduates, management advisors, and supervisors courses on construction project management, and computer education.

(3) Department of Public Works and Highways (DPWH)

Responsibility: The Department is responsible for the construction and major repair/rehabilitation of rural water supply systems (Level I) and for the planning and execution of sewerage projects in some cities and larger poblaciones in the country with participation of LGUs.

Activities: The actual construction of the projects are done through contract or force account by the regional and district offices of the Department or other designated agencies under supervision of the PMO and in accordance with approved work programs. The following describes the current project planning and programming process for water supply projects. The central office advises regional office that funding will be available and requests for proposals for a specified number of projects. The regional office allocates the total number of projects among the district offices and directs preparation of a Program of Work (PoW) with a listing of sites. A draft PoW is submitted to the PPDO for comments. In most instances, this is reviewed by the Provincial Board. PPDO endorses the PoW to the DPWH Regional Office. The PoW is sent to the PMO-RWS at the central office which authorizes the release of budget allotment. DEO is now cleared to start construction. Reporting is done based on accomplishments.

Resources: The PMO for Rural Water Supply was established in 1981 (Ministry Order 14) to "manage and direct the planning, design, construction, organization and maintenance of foreign-assisted rural water supply projects" of the Department. It consists of a 44 technical and 26 administrative staff (regular). In addition, as the loan project packages may require, project staff are recruited on contract. At the field level, the

Department maintains about 92 District Engineering Offices. Most of the DEOs are staffed with a water engineer, drilling crews and equipment. In some DEOs, staff have been assigned to oversee BWSA formation and training activities.

(4) Department of Health (DOH)

Responsibility: The Department is the principal health policy-making and implementing agency. Its main function is to develop and implement sanitation programs nationwide and administer health education aimed at reducing morbidity due to, among others, waterborne and sanitation related illnesses specifically diarrhea diseases which ranked second leading cause of morbidity among the population in the past years. Its role in the water supply program is in the promotion of safe water supplies through water quality surveillance.

Activities: A major program of DOH (Environmental Health Service) is the improvement of the environmental sanitation conditions to make it more conducive to promotion and maintenance of the health of the people. The priority program components include water supply and sanitation (water treatment and disinfection, quality monitoring and surveillance), excreta and sewage disposal, wastewater collection and disposal. DOH also implements *Water for Life* project which calls for spring development for use in Level I systems and for organizing BWSAs. DOH is also responsible for the provision of sanitation facilities in rural areas.

Operating budgets come from general appropriations in the national budget. Capital expenditure funds to support construction of excreta and waste disposal systems come from project funds. Under the First Water Supply, Sewerage and Sanitation Sector Project, DOH administered a project subsidy of P105.00 (cost of the bowl) per toilet. Similar arrangements are ongoing with the IBRD-assisted FW4SP. In addition, it supervises the construction of public school toilets and sullage removal units and the distribution of household toilet bowls.

Resources: The health care system is delivered through five organizational levels: Central headquarters; Regional Health Offices and general and special hospitals; Provincial Health Offices, including provincial and district hospitals; Municipal Health Offices; and, Rural Health Units/Barangay Health Stations. Its unique structure enables the Department to reach up to the barangay level through its grassroots network of barangay

health workers and volunteers. DOH manages regional and provincial laboratories with technicians who carry out water quality tests. It should be noted that a substantial segment of its institutional structure (from the provincial level downwards) has been devolved and is now supervised by the respective LGU.

Through its far-reaching network, DOH conducts health education campaigns which focus on women and children health in rural communities. The program is supported by centrally-produced information, education and communication materials. Enrichment of hygiene education lesson plans for the school curricula is undertaken by DECS and DOH. Together with UNICEF, CIDA and other bilateral agencies, DOH has produced and distributed IEC materials with key messages on water supply, sanitation and hygiene behavior.

DOH provides training focused on skills development of its health workers, volunteers and community artisans. Its training programs are either conducted by in-house staff or commissioned through non-government organizations (NGOs). Provincial and district sanitary engineers and inspectors are trained on skills development and planning. Chemists and laboratory technicians are trained on tools and techniques to support ongoing drinking water quality programs. BWSAs are instructed, among others, on protection and disinfection of water supply sources, constructing and maintaining toilets.

(5) Other National Agencies

Other national agencies provide macro-planning, funding and support, and regulatory guidelines for the water supply and sanitation sector.

The National Economic and Development Authority (NEDA), as the central planning office, ensures that all agency plans and programs are consistent with national priorities in the Medium-Term Public Investment Program and the Priority Sub-Sector Activity Layout. External grants and loan proposals are reviewed and approved at NEDA. It also coordinates the establishment of a system for national sector master planning and the monitoring system (with DILG).

The Department of Finance (DOF) is responsible for the generation and management of the financial resources of the government. It reviews and approves all public sector debt;

oversees the fiscal soundness of public investments based on equity, cost recovery and economic growth, and sets the fiscal deficit of major government corporations, as part of the public sector borrowing program.

The Department of Budget and Management (DBM) plans the budget allocations for the government agencies, including capital and operating expenditures, equity infusion to public corporations, grants and subsidies for Congressional approval. DBM also ensures that budget releases conform with approved plans and programs.

The Department of Environment and Natural Resources (DENR) formulates and enforces policies and guidelines for environmental protection and pollution control. It is responsible for watershed protection and water resources management. It checks compliance of major projects with environmental guidelines. DENR works with all environmental management agencies and special regulatory bodies.

The Department of Education, Culture and Sports (DECS) implements hygiene education programs through schools using the *Teacher-Child-Parent (TCP)* approach. Health and sanitation messages are integrated in the curricula and special activities are designed to make the parents and other family members learn and put them into practice. The program is supplemented by a wide range of learning materials (workbooks) while prototypes of safe water sources and water-sealed toilets are set up in schools. DECS assists in the GOP school toilet building project by identifying priority schools and by supporting DOH's integrated health information, education and communication campaign using the formal and non-formal educational system.

The National Water Resources Board (NWRB) coordinates the overall policy framework for water resources development and management. NWRB was created to guide an orderly and scientific development of all water resources in the Philippines consistent with the principles of optimum utilization, conservation and protection to meet present and future needs. NWRB also deals with water rights issues. NEDA Board Resolution No. 4 strengthens the NWRB by increasing its control over the private extraction of groundwater.

The Metropolitan Waterworks and Sewerage System (MWSS) provides for the potable water supply and sewerage needs of Metropolitan Manila and its contiguous areas.

5.5 Sector Agencies at the Local Level

(1) Provincial Level.

Under Sec. 17 of the Local Government Code, the LGU is responsible for the sector functions including: delivery of health services and infrastructure facilities intended to service the needs of the province, such as inter-municipal waterworks, drainage and sewerage, among others.

- 1) The Provincial Planning and Development Office (PPDO) is primarily tasked to formulate an integrated economic, social, physical and other development plans and policies for review and consideration of the Provincial Development Council. To evolve plans and programs necessary for implementation, the Office conducts continuing studies, researches, and training programs. It also coordinates all sector plans and studies undertaken by the different function groups or agencies, and monitors and evaluates the implementation of the programs, projects and activities in the province.

Under the existing organizational set-up, the PPDO is composed of 29 regular personnel assigned in five (5) divisions, namely: Plans and Programs; Research/Evaluation and Statistics, Special Projects, Enterprise Development and Administrative (refer to Figure 5.5.1, Supporting Report).

In 1982, the PPDO formed the Provincial Water Task Force (PWTF) to coordinate the implementation of USAID-funded Barangay Water Program (BWP) in the province which aimed at constructing levels I and II water supply projects. At the termination of the BWP in 1987, PPDO retained the task force to continue functioning. However, it is presently not very active doing its assigned tasks.

Under the 20% development fund, a certain amount is allotted to the sector based on the prioritized lists submitted to and approved by the Provincial Development Council and in coordination with the PEO. The list includes the requests coming from different barangays and NGOs. As a matter of policy, the recipient barangay is required to put up a counterpart contribution for the proposed project, either in cash, materials or labor.

- 2) The Provincial Engineer's Office (PEO) is mandated to undertake, among others, the construction, maintenance, improvement and repair of provincial roads, bridges and other public works. It also provides engineering services such as investigation and survey, engineering designs, feasibility studies and project management to other government offices. It exercises technical supervision on all engineering offices of the component municipalities. Presently, PEO maintains one (1) drilling rig.

Under its existing structure, the PEO has six (6) divisions consisting of 198 regular personnel (refer to Figure 5.5.2, Supporting Report). Distribution of personnel by division is as follows:

Administrative	12
Construction	10
Maintenance	110
Plans and Design	10
Materials & Quality Control	7
Equipment	<u>49</u>
Total	198

- 3) The Provincial Health Office (PHO) carries out an efficient, effective and economical health-related projects and activities in the province. It formulates guidelines for program implementation and other rules and regulation to ensure the delivery of basic services and the provision of adequate facilities relative to health services.

Some of its impact programs includes maternal and child health, control of diarrheal disease, TB, leprosy and malaria, "Sangkap Pinoy" programs, family planning, expanded immunization, nutrition, "Tubig, Kubeta, Oresol (TKO)" and improvement of health facilities and equipments.

Its present organizational set-up is composed of 93 personnel distributed into three (3) services -- Public Health, Hospital and Administrative. (refer to Figure 5.5.3, Supporting Report). A Planning Unit is existing under the Office of the Provincial Health Officer. Operation of the provincial and different district hospitals is also under the Health Officer.

To assist in its programs implementation, the PHO has formed the Provincial Council for Health Concern with members coming from different sectors including the private and NGOs. Recently, PHO implemented a project on Environmental Sanitation by constructing six (6) public school toilets and 12 level I water supply facilities. This program is in conjunction with DOH's "Water for Life" program.

(2) Municipal and Barangay Level

The municipality, consisting of a group of barangays, serves primarily as a general purpose to the government for the coordination and delivery of basic services and effective governance of the inhabitants within each territorial jurisdiction. The barangay, on the other hand, is the basic political unit and serves as a primary planning and implementing unit of government policies, plans, programs, projects and activities in the community. It serves as forum wherein the collective views of the people may be expressed, crystallized and considered, and where disputes may be amicably settled. The barangay manages the services and facilities related to the delivery of basic services.

1) Municipal Planning and Development Office (MPDO)

Mandate: The Municipal Planning and Development Office is mandated to coordinate the formulation and implementation of all development plans, policies and programs in the municipality. It sets down an integrated economic, social, physical, and other development plans and policies for consideration of the local government council. It likewise conducts continuing studies, researches and training programs necessary to evolve plans and programs for implementation. It also monitors and evaluate the implementation of the different development programs and projects in accordance with the approved development plan.

Activities: The regular activities of MPDOs include: Preparation of the municipal comprehensive plans and other development planning documents for the consideration of the local development council; Analyze the income and expenditures patterns, and formulate and recommend fiscal plans and policies for consideration with the finance committee of the local government unit concerned; Promote people participation in the development planning within the LGU; Exercise supervision and control over the secretariat of the local development council.

Resources: The Municipal Planning and Development Office typically consists of following personnel: Municipal Planning and Development Officer as head of office; Project Development Officer; Statistician; Draftsman and Zoning Inspector.

2) Municipal Engineer's Office (MEO)

Mandate: The MEO is responsible for the administration, coordination, supervision of all construction, maintenance, improvement and repair of roads, bridges, and other engineering and public works in the municipality. It likewise initiates, reviews and recommend changes in policies and objectives, plans and programs, techniques and procedures and practices in the infrastructure development and publicworks in general of the LGU.

Activities: The MEO provide engineering services to the LGU, including investigation and survey, engineering designs, feasibility studies and project management.

Resources: The MEO is typically composed of the Municipal Engineer, who prepares engineering plans, specifications and designs; draftsman who drafts simple infrastructure plan; and a staff who maintains equipment and materials belonging to the municipality.

3) Barangay Councils (BCs)

The Barangay Councils provide among other policy directions, priorities of the barangay towards the enhancement of the general welfare of its constituents. Specifically, the Barangay Development Council is primarily responsible in the formulation of a Barangay Development Plan embodying therein the identified needs and priorities in terms of programs, projects to be funded by their 20% Development Fund and for possible fund sourcing.

4) Rural Health Units/Barangay Health Stations (RHU/BHS)

RHUs are under the supervision of the Municipal Health Officer. In 1995, there were 94 barangay health stations and 27 rural health units where a variety of medical services like, medical application, bandaging and inoculations are administered under the direction of Rural Health Officer.

(3) Field Offices of Central Sector Agencies

1) DPWH District Engineering Office (DEO)

Mandate: The DEO administers, coordinates and supervises the planning, execution and management of public works and highways projects and activities in the district. It undertakes public works by administration or by contract. It is the approving body of all public infrastructure projects including work programs, plans, specifications, estimates and others. It also conducts public bidding.

Resources: The DEO of Abra consists of six (6) sections with 76 regular and contractual personnel. The sections are: Planning and Design, Construction, Maintenance Finance, and Administrative. It also maintains one (1) drilling rig.

2) Local Development Council/Provincial Development Council (LDC/PDC)

The main function of the LDC is to formulate long-term, medium-term and annual socio-economic development plans and policies; annual public investment programs; appraise and prioritize socio-economic development programs and projects; promote the inflow and direction of private investment capital; coordinate, monitor and evaluate the implementation of the development programs and projects.

The PDC is headed by the Governor. It is composed of all mayors of component municipalities, chairman of the committee on appropriation of the Sangguniang Panlalawigan, the Congressman and representatives of NGO's operating in the province.

(4) Water Districts (WDs)

A water district is a local government corporation formed pursuant to Presidential Decree No. 198, organized for the purpose of serving the water supply requirements of the residents within its franchise area. Technical and financial assistance (loans) are provided by LWUA to the water districts. LWUA also exercises regulatory functions vis a vis the districts.

A water district, to be self-sufficient, is operated in a business-like manner to generate enough revenues from its water sales. The income is used to meet operational expenses, debt service and reasonable reserves for contingencies.

At present, there are three (3) water districts organized in the province. These are Bangued, Dolores and Lagangilang. Dolores WD, however, is not fully operational yet and the municipal government has to provide subsidies to maintain its operation .

(5) Rural Waterworks and Sanitation Associations (RWSAs)

RWSAs are organized by beneficiaries to facilitate participation in the planning, construction, operations, maintenance and management of water and sanitation projects. The RWSA operates and maintains the community water supply system. The members contribute at least 10% of the project cost as local equity and pay a monthly service fee sufficient to operate, maintain and amortize the project. Most RWSAs provide Level II or III service.

Presently, there are no operational RWSAs in the province.

(6) Barangay Waterworks and Sanitation Association (BWSAs)

Republic Act 6716 has mandated the construction of at least one Level I (point source) water supply system in every barangay and the formation of a Barangay Waterworks and Sanitation Association (BWSA) to operate and maintain the system/s. Membership in the BWSA is voluntary in nature and a typical association should have at least 50 members (households). Its goal is to improve the health and economic well-being of its members by improving access to safe and potable water for domestic use at a reasonable cost. It is a non-stock cooperative which manages and owns the water supply facility constructed through their own resources or with external capital development assistance.

The association is mandated 1) to operate, manage and own the water supply facility; 2) to mobilize the members' resources (financial contributions to the cooperative fund) for the construction, operation and maintenance of the system.

The organizational structure of the BWSA consists of 1) General assembly of members; 2) Board of directors; 3) Election committee; 4) Education and training committee; 5) Audit and supervisory committee and 6) Management staff.

To organize a BWSA, a community meeting is convened and the barangay leaders are informed that the barangay has been selected by the LGU for possible water supply

assistance. This is usually preceded by a resolution from the barangay requesting for the assistance. A structural survey is conducted to determine whether the barangay meets the criteria for assistance. The survey also forms the basis of the feasibility study. The LGU then prepares a preliminary engineering report and feasibility study which is presented to the barangay for approval. Upon acceptance by the people, the LGU submits the annual implementation plan (AIP), together with the FS for funding allocation.

Upon approval of the AIP, the application to organize a BWSA is filed with the PPDO who forwards the application to the Director of the Cooperative Development Authority, and the BWSA is formed.

At present, there is only one BWSA known to be operating level II water supply system. This BWSA is located in Bagcagan. There are no recent inventories and surveys that may provide information as to the actual number of BWSAs formed, registered and that are operational in the province.

(7) Others (including the private sector and NGOs)

"Rang-ay ti Abra Foundation" is a local NGO which implements water and environmental health-related projects in the province. It has recently provided deep wells in selected rural barangays. These projects were done with the participation of the community.

5.6 Project Management Policies/Activities at the Local Level

Present trends show that there are no definite policies being observed in undertaking sector projects at the provincial and municipal levels. The following activities are currently being followed in the province.

(1) Project identification and priority setting

Although a set of criteria has been established in identifying and prioritizing sector projects, it is normally not being followed. Project selection is mostly the prerogative of the local chief executives (governor or mayor) although initial screening is done by the planning officer (PPDO/MPDO) based mainly on proposals submitted by project proponents.

(2) Project preparation and planning

Feasibility studies are usually undertaken by the planning officer of local government units although some suggestions are surfacing as to the possibility of tapping the services of other units that are more capable of doing the studies as well as the assistance of local NGOs. Detailed designs are undertaken by the provincial or municipal engineering office.

(3) Community mobilization

The provincial/municipal planning office are required to conduct community consultation prior to the implementation of project. However, there is no definite approach as to this activity that is being observed by the planning staff. As such, the PPDO is recommending to tap the assistance of local NGOs in community mobilization.

(4) Procurement of goods and services and bid document preparation

The PPDO and MPDO are responsible for the procurement of goods and services and the corresponding biddings. They are being assisted by the provincial/municipal engineering office.

(5) Project implementation

The Provincial Engineering Office (PEO) and/or the Municipal Engineering Office (MEO) take charge of project implementation, i.e. construction of infrastructure facilities including drilling.

(6) Operation and maintenance

Once completed, the project is turned over to the local residents through a community organization (mostly RWSAs). Rehabilitation of facilities is being initiated by the community and is referred to the provincial or municipal engineering office. Sourcing of spare parts needed for the rehabilitation, repair or maintenance is also the responsibility of the RWSA. Since cost-recovery is the policy on sector projects, the RWSA sees to it that membership fees are collected from the users to be used for future needs.

(7) Monitoring and evaluation

The PPDO and MPDO usually undertake the monitoring and evaluation of projects being implemented. For water supply projects, waterquality testing is done periodically by the PHO.

(8) Financing

Budget allocation passes through the local development councils (PDCs/MPDs) which approve funds for the implementation of projects.

5.7 External Support Agencies Active in the Sector

(1) Multilateral Agencies

The World Bank (IBRD) currently supports the First Water Supply, Sewerage and Sanitation Sector Project or FW4SP (Loan 3242PH). This project provides capital funds (US\$ 58.0 M) for rural water supply in Luzon provinces and sanitation nationwide based on completed provincial master plans. The project concept calls for a community-based approach through BWSAs. The project is due to close in 1995 and preparations for a successor project, with DILG as implementing agency, will be started shortly. In addition, the Bank is preparing two new loans for LWUA implementation - the Urban Water Supply Project and the Urban Sewerage and Sanitation Project. Through its various trust fund facilities, the Bank has arranged for various technical assistance grants and other support activities.

The Asian Development Bank (ADB) supports the Second Island Provinces Project (1052-PHI-SF). The project provides US\$24.0 M (loan) to a counterpart budget of Pesos 202.45 M. A small technical assistance component has been allocated for well drilling training, water quality and installation of pumps. This DWPH-executed project was effective through 1994. Both of the island provinces projects focus on technology and the physical installation of facilities. A follow-on third "islands project" is under discussion. ADB is also supporting the LWUA Municipal Water Supply Project which includes a technical assistance grant for institution building activities at LWUA and the eight (8) participating WDs.

The United Nations Development Programme (UNDP), through its Danish Trust Fund facilities, has actively supported the preparation of provincial master plans. In addition, its Institution Building through Decentralized Implementation of Community-Managed Water and Sanitation Projects, is assisting DILG-PMO in developing models and approaches for community-based water and sanitation in selected pilot areas. The project bears a strong poverty alleviation focus. UNDP is also in the final stages of a country project to assist GOP in strengthening the groundwater databank in the country through a US\$ 682,500 grant.

The United Nations Children's Fund (UNICEF) supports the sector through the Philippines Plan of Action for Children. Apart from hardware support in priority project sites, UNICEF assists NEDA in updating of the national master plan. UNICEF works through the inter-agency committee on environmental health and through NGOs. With the World Health Organization (WHO), UNICEF is assisting in the preparation of information, education and communication (IEC) materials and in strengthening the sector monitoring system.

(2) Bilateral Agencies

The Japan International Cooperation Agency (JICA) extends technical cooperation in the basic design study for the Rural Environmental Sanitation Project (Phase III). This project, to be jointly implemented by DPWH and DOH, envisages the construction of Level I and II water systems and school toilet facilities in rural areas of ten (10) provinces through grants. With DPWH, rural water supply systems are being constructed at the evacuation centers for the Pinatubo refugees. JICA also supports the groundwater development study in Cavite province (with LWUA) and the institutional development activities at MWSS. JICA is providing the services of the Study Team preparing provincial sector plans in nine (9) provinces.

The Overseas Economic Cooperation Fund (OECF) is financing the RWS IV Project through 1995. It provides a loan of up to Yen 5.08 B to counterpart funds of Pesos 400 M. It envisages construction/rehabilitation of Level I systems, construction of workshop buildings and procurement of various equipment. OECF is supporting the Provincial Cities Water Supply Project of LWUA and the Angat Water Supply Optimization Project of MWSS.

The Australian International Development Assistance Bureau (AIDAB) is supporting the Central Visayas Water and Sanitation Project through a A\$ 14.65M grant. The project is

implemented by the LGUs and the regional development council. Project components include: planning and monitoring information systems; infrastructure planning and rehabilitation; and institution building with an emphasis on community management based on experiences from other AIDAB-funded projects. The Project has been extended through 1997.

5.8 Current Community Development and Training Approaches

5.8.1 Community Development

Community development activities of the province are done primarily by the Provincial Planning and Development Office (PPDO). The PPDO is composed of 29 regular personnel, of which 11 technical staff perform various community works. These staff assist communities to identify their needs and problems, and consequently propose suitable and viable projects to be implemented in the community. The PPDO also coordinate with different financial institutions to seek financial assistance for the proposed projects.

5.8.2 Human Resources Development & Training

There are very few sector-related training programs organized by the province. The training courses being conducted are on general management and administrative matters. The province acknowledges the need for improving the capabilities of its staff and those of the municipal governments. At present, however staff training in the province is done on an ad hoc basis. Each of the provincial offices are responsible to train their staff. Most of the training courses previously attended by the staff were organized by the regional agencies and project offices. Training materials and other resources are thus scattered among various provincial units and project offices.

The National Manpower and Youth Council (NMYC) has a training center in the province although major courses being offered are on practical electricity and carpentry. Three other training institutions- ASAT, ASIST and DWCB, also exist in the province but they have yet to offer courses relevant to the sector.

5.8.3 Sanitation/Hygiene Education

The health/hygiene education program of the PHO, focuses mainly on disease prevention. In implementing the health education program on sanitation, the PHO employs various means in disseminating information to different communities. Various modes are used, including radio, local newspapers and public fora. Health educational materials from the DOH consisting of posters, streamers, comics and stickers are used.

5.9 Existing Sector Monitoring

(1) National Level

The primary sources of sector data are the field office and staff of DPWH, DOH, LWUA, MWSS and NSO. Other agencies, including NEDA and LGUs, use data from these agencies. Each of these agencies run its own project (or activity) monitoring systems largely based on required reports of its field offices. Current reporting requirements focus on physical accomplishments and capital expenditures. One serious shortcoming is the assumption that all constructed facilities are functioning and in use.

Apart from regular project monitoring, instructions are issued to conduct inventories of facilities (with actual status). The last completed inventory was done in 1990. These surveys are done in conjunction with sector or area planning studies. Only the NSO gathers and assesses information nationwide on a regular basis as part of its Census on Population and Housing (CPH). The CPH "long form" is administered on 10% of the households once every ten years. NSO plans to increase the CPH "short form" frequency to every five years. Water and sanitation is not included in the short form.

There is wide dissatisfaction among implementors themselves over the existing monitoring system. Monitoring report preparation is seen as a nuisance to performing one's job, and is thus haphazardly done. This leads to the problem of reliability of information coming from the field. There is a need to establish a system which is perceived as having a direct link to performance, similar to project-based monitoring.

(2) Local Level

Monitoring of sector activities and overall performance is not undertaken in the province. What is being done is project monitoring only although there is no formal monitoring system being developed for this purpose. The PPDO and PEO are assigned to undertake monitoring of projects but only Level I water system are considered. The monitoring system of the PPDO is primarily concerned with the procurement and delivery of inputs, and adherence to work schedule. Thus, the number of hand pumps delivered and installed in a barangay, and its status (functional or non-functional) normally appear in the monitoring and evaluation form of waterworks projects.

The monitoring scheme being practiced in the province is designed to find out if the objectives of the project was achieved and if implementation schedules were followed. The scheme also requires to institutionalize reporting system relative to the project's progress and accomplishments. Feedback and comments on the proposed and completed projects are also gathered.

Chapter 6

PAST FINANCIAL PERFORMANCE IN WATER SUPPLY AND SANITATION



6. PAST FINANCIAL PERFORMANCE IN WATER SUPPLY AND SANITATION

6.1 General

Locally funded programs and projects for the water supply and sanitation sector have been devolved from central government agencies to LGUs since 1992 according to the Local Government Code of 1991 and NEDA Board Resolution No. 4 (1994).

In order to clarify the flow and contents of funds to the sector under this transitional period and to apply for the planning of financial arrangements, this chapter sets forth (1) past public investment to the sector by central government agencies and LGUs; (2) roles of the Internal Revenue Allotment (IRA) to the sector financing; (3) cost recovery and financial performances of WDs/associations; and (4) affordability of users at present.

6.2 Past Public Investment

6.2.1 Past Public Investment by the Central Government Agencies and LGUs

The recent development of the water supply and sanitation sector in the province was mainly achieved by line agencies such as DPWH, LWUA, DILG and DOH as well as the provincial government, which is shown in Table 6.2.1.

Table 6.2.1 Previous Sector Investment to the Province by Concerned Agency

Unit: 1,000 Pesos

Funding Category		1990-94				
Agency	Funds	Level I	Level II	Level III	Sewerage	Sanitation
DILG						
DPWH	Foreign Fund 1) Local Fund 2)	3,216 30,089				
LWUA 3)				3,614		
DOH						
Province	Provincial Government	1,983	2,867			1
Municipality	Municipal Government					
Others	NGO, CDF, CCAP	2,005				1,233

Sources: Each central agency and the provincial government

Notes:

- 1) Of the total amount, P 3 million was allotted by the FW4SP funded by the World Bank in 1994.
- 2) Investment between 1990 and 1991; Locally funded projects were devolved to LGUs since 1992.
- 3) Investment from 1991 to 1994.
- 4) CDF - Countryside Development Fund

Investments for Level I facilities from the local fund of DPWH amounted to P30,089 thousand during the years 1990 and 1991, covering 95 deep wells, 295 spring development and 12 rehabilitation works. DPWH had not provided any local funds to the sector since 1992, however, P3,000 thousand was allotted in 1994 through foreign funded project.

The LWUA had released a total of P3,614 thousand during the period of 1992 to 1994 to improve and expand the water supply facilities of Bangued Water District.

DILG had no investment from 1990 to 1994, although Barangay Water Program (BWP) had been implemented during 1980's. DOH accomplished 10 school toilets in the province in 1993 under the FW4SP program. The provincial government also financed an amount of P4,851 thousand to the relevant sector in the period of 1990-1994.

According to "Philippines Water Supply Reform Study in 1993", P311 per capita was invested on water projects in Metro Manila, P200 per capita on projects in urban areas outside Metro Manila, and about P30 per capita benefiting the rural population during 1990-1991.

In the province, an estimated amount of P166 per capita was invested by DPWH and the provincial government during the said period. From the fact that most of the investments were allocated to Level I and Level II water supply systems in the rural areas, per capita investment of the province is much larger than the national average of P30. In this regard, the national government had given priority to the sector investment of the province during 1990-1991.

6.2.2 Sources of Local Funds

According to the Local Government Code of 1991, 40% of the national internal revenue taxes of the 3rd fiscal year preceding the current year (from 1994 onwards) is allocated to LGUs nationwide, specifically to the administrative units of (1) province (23%); (2) city (23%); (3) municipality (34%); and barangay (20%). Further, respective Internal Revenue Allotments (IRA) in different administrative levels are allotted to all administrative units concerned according to the manner of calculation in terms of population, land area and other factors.

As shown in Table 6.2.2, IRA allotted to the province ranged from 0.7 to 0.9 % of the national total IRA between 1990 and 1994. On the other hand, the total IRA to all municipalities of the province was arranged with 0.7 - 1.0% to the national total IRA for nationwide municipalities (refer to Table 6.2.1, Supporting Report).

Table 6.2.2 Past Internal Revenue Allotment to the Province of Abra in 1990-94

		Unit: Pesos				
		1990	1991	1992	1993	1994
National	I National Total of IRA					
	(a) IRA to all provinces	2,031,174,331	2,697,481,707	4,571,136,402	8,445,600,000	11,498,994,198
	(b) IRA to all municipalities *	3,054,601,475	4,046,837,742	7,127,522,550	12,484,800,000	16,325,288,074
Province	II IRA to Abra Province					
	(1) Total: (2) + (3)	37,124,396	48,463,732	112,294,304	189,565,682	257,637,734
	(2) Provincial Government	14,130,823	18,861,955	40,506,223	66,866,084	97,587,678
	Percentage against (a)	(0.70)	(0.70)	(0.89)	(0.79)	(0.85)
	(3) Municipalities	22,993,573	29,601,777	71,788,081	122,699,598	160,050,056
	Percentage against (b)	(0.75)	(0.73)	(1.01)	(0.98)	(0.98)
	III Total Income of the Provincial Government	21,618,878	25,536,076	41,700,296	69,558,411	99,087,844
	Percentage of IRA	(65.36)	(73.86)	(97.14)	(96.13)	(98.49)
	IV Total Income of Municipalities**	n. a.	2,007,398	26,296,022	49,782,158	n. a.
	Percentage of IRA		(93.55)	(97.18)	(83.51)	
Municipality	V IRA to Municipalities ***					
	Total	22,993,573	29,601,777	71,788,081	122,699,598	160,050,056
		(100.0)	(100.0)	(100.0)	(100.0)	(100.0)
	1. Bangued	2,041,001	2,611,993	4,374,125	7,666,091	10,311,495
		(8.9)	(8.8)	(6.1)	(6.2)	(6.4)
	2. Boliney	670,124	833,023	2,341,432	4,022,950	5,166,973
		(2.9)	(3.0)	(3.3)	(3.3)	(3.2)
	3. Bucay	1,169,938	1,436,300	3,012,629	5,179,298	6,888,274
		(5.1)	(4.9)	(4.2)	(4.2)	(4.3)
	4. Bucloc	391,868	518,916	1,745,065	2,828,706	3,795,959
		(1.7)	(1.8)	(2.4)	(2.3)	(2.4)
	5. Dagupan	481,538	631,138	1,967,426	3,323,402	4,255,376
		(2.1)	(2.1)	(2.7)	(2.7)	(2.7)
	6. Danglas	716,373	935,323	2,535,413	4,329,918	5,592,070
		(3.1)	(3.2)	(3.5)	(3.5)	(3.5)
	7. Dolores	710,882	837,512	2,150,525	3,548,723	4,916,179
		(3.1)	(3.0)	(3.0)	(2.9)	(3.1)
	8. La Paz	884,216	1,158,428	2,619,820	4,386,133	5,898,528
		(3.8)	(3.9)	(3.6)	(3.6)	(3.7)
	9. Lacub	924,356	1,222,830	3,200,073	5,586,529	6,960,910
		(4.0)	(4.1)	(4.5)	(4.6)	(4.3)
	10. Lagangiling	877,631	1,128,011	2,504,321	4,232,728	5,722,705
		(3.8)	(3.8)	(3.5)	(3.4)	(3.6)
	11. Lagayan	628,251	779,549	2,134,687	3,626,628	4,747,040
		(2.7)	(2.6)	(3.0)	(3.0)	(3.0)
	12. Langiden	559,726	718,458	2,111,363	3,505,777	4,638,089
		(2.4)	(2.4)	(2.9)	(2.9)	(2.9)
	13. Liguian-Bay	961,928	1,261,529	3,148,695	5,452,721	6,850,543
		(4.2)	(4.3)	(4.4)	(4.4)	(4.3)
	14. Luba	796,228	1,016,362	2,489,648	4,273,871	5,575,218
		(3.5)	(3.4)	(3.5)	(3.5)	(3.5)
	15. Malibcong	1,054,454	1,378,337	3,424,742	5,968,933	7,403,321
		(4.6)	(4.7)	(4.8)	(4.9)	(4.6)
	16. Manabo	737,673	955,493	2,355,405	3,939,741	5,248,449
		(3.2)	(3.2)	(3.3)	(3.2)	(3.3)
	17. Penarrubia	511,245	663,039	1,902,824	3,078,498	4,261,014
		(2.2)	(2.2)	(2.7)	(2.5)	(2.7)
	18. Pidigan	714,706	934,842	2,220,043	3,728,878	5,079,492
		(3.1)	(3.2)	(3.1)	(3.0)	(3.2)
	19. Pilar	827,010	1,041,723	2,459,332	4,158,862	5,597,223
		(3.6)	(3.5)	(3.4)	(3.4)	(3.5)
	20. Sal-Lapadan	640,868	822,672	2,192,686	3,652,948	4,782,109
		(2.8)	(2.8)	(3.1)	(3.0)	(3.0)
	21. San Isidro	459,068	591,866	1,769,582	2,910,403	4,004,176
		(2.0)	(2.0)	(2.5)	(2.4)	(2.5)
	22. San Juan	758,682	973,077	2,299,728	3,934,121	5,346,166
		(3.3)	(3.3)	(3.2)	(3.2)	(3.3)
	23. San Quintin	545,975	714,913	1,996,156	3,350,765	4,492,377
		(2.4)	(2.4)	(2.8)	(2.7)	(2.8)
	24. Tayum	829,903	1,046,762	2,325,900	3,941,371	5,303,570
		(3.6)	(3.5)	(3.2)	(3.2)	(3.3)
	25. Tinig	2,094,606	2,739,745	6,215,172	11,182,204	13,442,532
		(9.1)	(9.3)	(8.7)	(9.1)	(8.4)
	26. Tubo	1,392,489	1,760,353	4,139,159	7,301,592	8,955,321
		(6.1)	(5.9)	(5.8)	(6.0)	(5.6)
	27. Villavieja	609,834	789,583	2,152,130	3,587,807	4,814,837
		(2.7)	(2.7)	(3.0)	(2.9)	(3.0)

Sources:

(1) Department of Budget and Management, (2) Bureau of Local Government Finance (DOF) and (3) Provincial Annual Report

Notes:

*IRA to barangays is not included. **Data do not fully cover all the municipalities. ***Figures in bracket are shares (%) in the total of all municipalities in the province.

For the provincial government, the IRA has been the most important financial source of the total revenue as experienced, with 96% - 98% of the total revenue of the provincial government between 1992 and 1994. The expenditures of the provincial government for the relevant sector in 1994 were reported at P 828 thousand, about 0.9% of the IRA.

As for municipality, distribution share to each municipality in the province was within a certain range between 1990 and 1994. Municipalities, which had the share of more than 5% of the provincial total in 1994, were Bangued, Tineg and Tubo.

6.3 Cost Recovery

The capital cost the Level I systems is free to the community, while operation and maintenance is the responsibility of the associations. As for Level II systems, the capital cost is shouldered by the RWSA through a loan or grants. Water charges collected by each association cover cost of operation and maintenance, and loan amortization. According to the Loan Department of LWUA, the new loan disbursement to RWSAs has been stopped for the last couple of years.

For Level III system, WDs or RWSAs bear the entire capital cost financed by LWUA through loans with concessional terms of 8.5% - 12.5% interest rate and repayment period extending up to 30 years. Less capable WDs are granted from the LWUA to receive soft loans that are interest free during the first 5 years' operation. In the occasion of the first assistance by the LWUA, the loan for the full investment required could be provided for the WDs. For the expansion/rehabilitation works of the WDs, 90 % of required investments may be granted by a loan and remaining 10% shall be arranged by the equity of WDs. The cost of amortizing the loan and operation and maintenance of the system is recovered through monthly water bills. Details of financial performance with cost recovery are discussed in section 6.5.

Regarding sanitation sector, construction of the superstructure and the depository of household toilet is through self-help.

6.4 Affordability

Table 6.4.1 indicates the affordability by level of sector service. At present the current water bills in the province seem to be almost within an affordable range based on the experiences, although actual income is different from municipality to municipality and barangay to barangay.

Table 6.4.1 Affordability in Water and Sanitation Services

Income/Level of Services	Amount (Pesos)	% to Monthly Income	Affordable Range (%) 5)
Median Monthly Income 1)	2,356	100.00	-
Average Level III: Monthly Water Bill 2)	123	5.2	5.0 or less
Average Level II: Monthly Water Bill 3)	30 - 60	1.3 - 2.5	2.0 - 3.0
Monthly Level I Expenditures 3)	5 - 10	0.2 - 0.4	1.0 or less
Private Toilet Construction Cost - Flush Type Toilet 4)	34,900	-	-

Notes:

- 1) 1991 Family Income and Expenditures Survey, NSO
(Median of the provincial figure is inflated to 1994 prices)
- 2) Data from LWUA. It is assumed that 19 cum will be consumed per family
- 3) Common figures in the province
- 4) Current prices by JICA Study Team
- 5) Based on the experiences mainly from LWUA, DPWH and DILG

On the other hand, construction cost of private toilet seems to be expensive comparing with the family income. The estimated cost of flush type toilet facility is 15 times higher than the median monthly family income in the province. Therefore, subsidy from LGUs may be necessary.

6.5 Past Financial Performance of WDs and RWSAs/BWSAs

Only Bangued Water District is currently managed in the province. Additional four (4) WDs were institutionally established as of now, but they are not operational. Table 6.5.1 and Table 6.5.2 show financial indicators and loan status of the WD in 1995, respectively. The WD seems to be financially sound under the status that the revenue exceeded the total cost for the operation and maintenance and monthly amortization, although some arrears are reported. As of now, the WD has received loans of P 7,917 thousand from LWUA.

Table 6.5.1 Financial Indicators of Water Districts

Water District	Descriptions						
	No. of Metered Connections	No. of Flat Rate Connections	Average Monthly Rate	Average Consump. per Conn.	Average O&M Costs	Average Revenue	Collection Efficiency
	Nos.	Nos.	Pesos/cu.m.	cu.m/mo.	Pesos/mo.	Pesos/Mo.	Percent (%)
Bangued	2,456	-	6.47	19	243,152	432,464	87

Source: IDS, LWUA

Note: There are four (4) other water districts in the province, but they are not operational or do not have the system yet.

Table 6.5.2 Loan Status of Water Districts

Water District	Descriptions			
	Total Loan Availed	Remaining Payment Period 1)	Average Monthly Amortization	Current Arrears
	1000 Pesos	Months	Pesos	1000 Pesos
Bangued	7,917	295	88,798	3,761

Sources: Loans Operation Div., LWUA (As of May, 1995)

Note: 1) The longest remaining payment period among several loans is indicated.

Most of the facilities managed by RWSAs and BWSAs were constructed under grant conditions by central government agencies (DPWH, DILG and LWUA) and LGUs with the recipient providing some equity contribution in the form of materials or labor. The associations are responsible for the operation and maintenance of the systems, but financial performance of the associations tends to face difficulties partly because the beneficiaries do not recognize the cost requirements. The information from the LWUA on the registration of Level II systems revealed that there are 15 RWSAs in the province, to which a total of P 5,602 thousand was invested for the construction of facilities by different central government agencies.

Chapter 7

WATER SOURCE DEVELOPMENT



7. WATER SOURCE DEVELOPMENT

7.1 General

The study on water source development covers the entire province to come up with a "Groundwater Availability Map" which identifies the areas with available potable water sources. The study gives an emphasis on groundwater sources rather than surface water considering the better quality and economy of utilizing groundwater for domestic water supply.

The study has two major components: (1) interpretation of existing geological and groundwater conditions, (2) preparation of Groundwater Availability Map to show groundwater potential areas under three categories. Standard well specifications by municipality were also established as reference for the future requirement of the water supply sub-sector.

The major data used in the study were obtained from concerned agencies (NAMRIA, BMGS, NWRB, LWUA, DPWH and PPDO) and supplemented by the information gathered through questionnaires. Among the information, the Geologic Map published by then BMGS, the Water Resource Investigation Report and the Well Inventory Database of NWRB were essential for the analysis of geological characteristics, projection of high yielding area and possible area with salt water intrusion, and classification of groundwater potential area, respectively.

The Groundwater Availability Map may be used for provincial level master plan at present. However, updating the map is a requisite to gain more information on prevailing groundwater conditions using the questionnaires prepared for the study. An annual review and updating of the database will enable the LGUs to implement water source development on a project site basis.

The database on existing groundwater sources and their conditions is summarized in Table 7.1.1 (Well data from each municipality are presented in Table 7.1.1, Water Source Information, Data Report). It shows that there are 433 shallow wells, 944 deep wells and 218 developed springs existing in the province. About 60% of these water sources are public facilities. Of the total wells, 94% remains functional at present. In addition to the above sources, 50 undeveloped springs are accounted.

Table 7.1.1 Existing Groundwater Sources in the Province

Description	Shallow Well	Deep Well	Spring	Total
1. Number of water sources	433	944	218	1,595
2. Profile of different sources	27%	59%	14%	100%
3. Owned by Government Agency	284	451	217	952
4. Privately owned	149	493	1	643
5. Sources with quality problem	-	-	-	-
6. Non-functional wells	29	48		77
7. Undeveloped springs			50	50
8. Untapped springs			2	2

7.2 Geology

The rock units in the province are classified into three (3) main groups based on the ages of rock formations. These are, from the oldest to youngest, the Pliocene and Older Rocks, the Pliocene to Pleistocene Rocks and the Recent Deposits. The grouping of the rocks is related to their potential as groundwater sources. The younger rocks are considered the most important to groundwater because of their high porosity and permeability relative to the older rocks. The distribution of these rock groups is shown in Figure 7.2.1, Geological Map of the Province.

(1) Pliocene and older rocks

These rocks cover about 91% of the provincial area. In the eastern half of the province, Eocene to Oligocene andesitic/dacitic lava and pyroclastics are extensive. These rocks are intruded by quartz diorite running in north-south direction, parallel to the geologic structures in the region. In the western half of Abra, Early to Late Miocene conglomerate, sandstone, shale and limestone are widespread. Rocks belonging to the group are highly fractured compared with younger formations in the province.

(2) Pliocene and Pleistocene rocks

About 3% of the total provincial area is consists of Pliocene to Pleistocene rocks, which include the low-lying ridges of Danglas, La Paz and Langiden. The rocks are mainly layers of sandstone, shale and siltstone with minor tuff, limestone, and conglomerate. The thickness of the formation, as measured in other localities, ranges from 1600 m to 3300m.

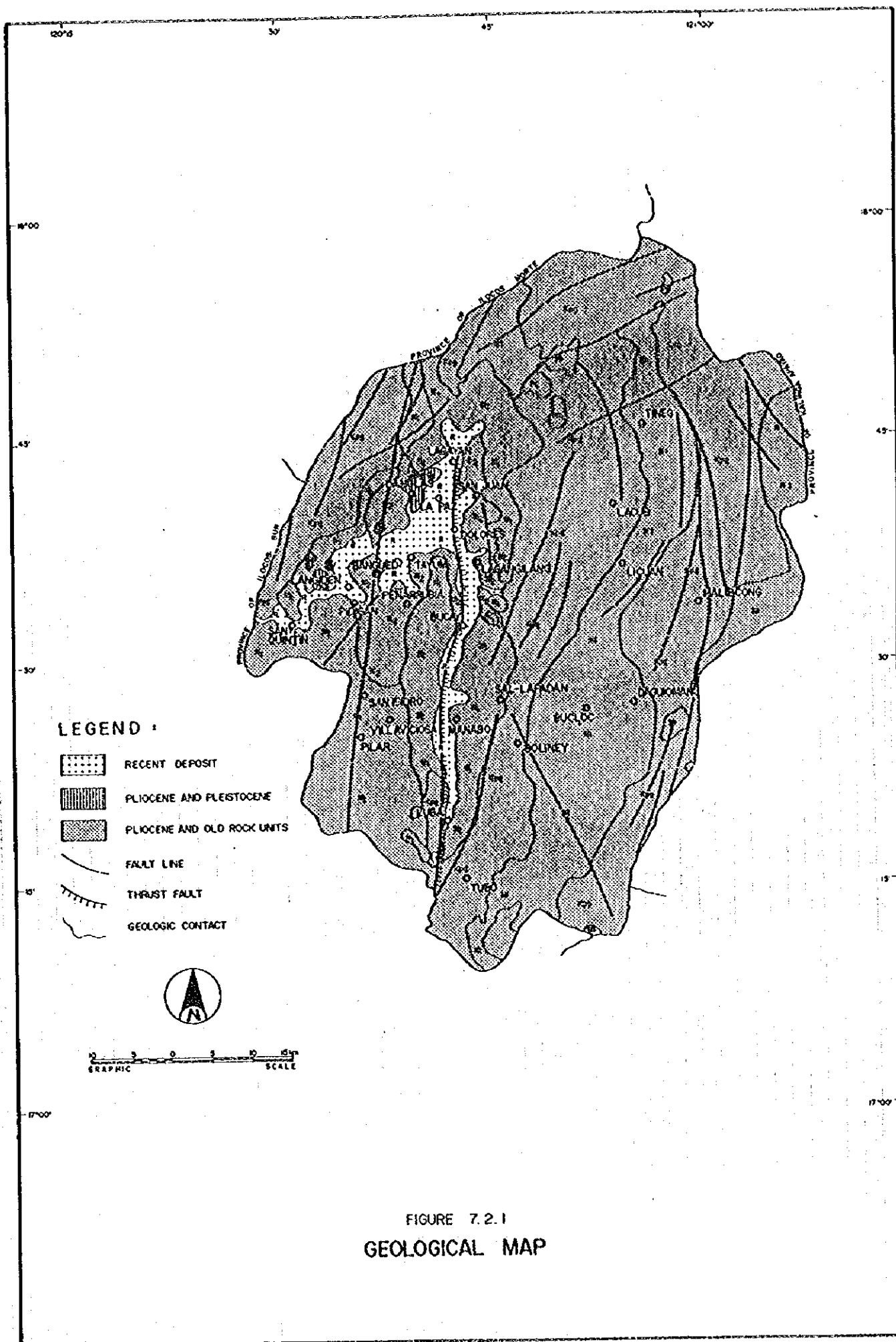


FIGURE 7.2.1
GEOLOGICAL MAP

(3) Recent deposits

These deposits mainly occur in the flood plains of Abra and Tineg rivers covering about 6% of the total land area of the province. They are made up of unconsolidated layers of clay, silt, sand and gravel with thickness of about 30m and becomes less towards the edge of the valley plains. The deposits largely underlie the flat to gently sloping areas of San Quintin, Pidigan, Langiden, Bangued, Tayum, La Paz, Lagayan, Dolores, Langangilang, Bucay, Manabo and Luba.

7.3 Groundwater Sources

7.3.1 Classification of Groundwater Sources

For planning purposes, the province is divided into the following groundwater categories:

(1) Shallow well areas

These are areas having water bearing rock formations extending not more than 20m in depth from the ground surface. Shallow well areas are usually located in alluvial and coastal plains where Recent unconsolidated materials overlie impervious rocks at shallow depth. The extent of completely shallow well area is limited, because most of the Recent formations are thick or deposited on the Late Pliocene to Pleistocene rocks that usually have multiple aquifers located at greater depths.

(2) Deep well areas

In deep well areas, the aquifers are located more than 20m from the ground level. These areas could be found in portions underlain by the Pliocene to Pleistocene and Recent formations. Most of these areas have more than one aquifer occurring at various depths. Areas where shallow and deep wells could be developed are categorized as deep well areas.

(3) Difficult areas

These are areas not suitable for well. The areas under this category are largely consist of rock formations older than Pliocene in age. The groundwater availability in the aforementioned rocks is very low and is usually confined in the opened rock fractures. Springs are the common sources of water supply in these areas.

In addition to the above classification, areas potential to have high yielding aquifers and with saline water intrusion problem are also presented based on NWRB's geo-resistivity survey and results of water quality examination of some wells.

7.3.2 Groundwater Availability in the Province

The Groundwater Availability Map presented in Figure 7.3.1 shows the distribution of the three groundwater categories in the province. It also depicts areas potential for high yielding wells and with saline water intrusion. The well information, such as depth, static water level, and specific capacity; given in the figure are averages of limited data available in each municipality that were taken as reference. The major databases used in the preparation of the map were obtained from BMGS and NWRB. The methodology and procedure with respective outputs are discussed in Section 7.3, Supporting Report. Technical well information in each municipality is also presented in Table 7.6.1 of the same report.

As mentioned above, the interpretation of existing groundwater condition is based on limited data. The well parameters (depth, static water level and specific capacity) indicated in the map are anticipated to vary within a specific municipality, since the ground characteristics change with depth and direction. Particularly, the specific capacities of wells are very variable, which depend on aquifer characteristics, well type and design, and method of construction. Most of the wells in the inventory of NWRB are driven wells, which have limited intake sections that are usually not properly set in the most permeable layers. Thus, majority of these wells have low specific capacities. Bored and gravel packed wells are expected to have higher specific capacities than wells constructed using conventional methods.

(1) Shallow well areas

No shallow well area is defined in the province. The Recent alluviums, where shallow aquifers usually occur, are thick or underlain by formations with relatively deep aquifers. Shallow wells in Abra have average depth of 14.72m (7.62 to 19.82m). These wells have average static water level of 6.40 mbgl (2.44 to 10.67mbgl) and specific capacity of 1.15 l/sec/m of drawdown (0.18 to 4.96 l/sec/m).

(2) Deep well areas

These areas are found where the Miocene to Quaternary sediments are extensive. Deep well areas account for about 30% of the province total land domain covering the central and southwestern sections. These include parts of Danglas, La Paz, Lagayan, San Juan, Dolores, Langangilang, Tayum, Bangued, Langiden, Bucay, Pidigan, Peñarrubia, San Isidro, Villaviciosa, Pilar, Manabo, and Luba. Moreover, the existing deep wells in the province have an average depth of 44.23m (21.03 to 222.56m) with average static water

level of 10.14mbgl (2.13 to 24.39 mbgl) and average specific capacity of 0.38 l/sec/m of drawdown (0.02 to 6.30 l/sec/m).

(3) Difficult areas

Since the geologic framework of the province is largely older than Miocene, about 70% of its land is classified as difficult areas. These could be found in the eastern half and extreme west portion of the province, particularly in the municipalities of Tineg, Lacub, Licuan, Malibcong, Sal-lapadan, Buloc, Daguioman, Boliney and Tubo.

(4) Water quality of groundwater

The groundwater in the province is generally potable except in some areas with odor and high calcium and magnesium concentrations. In Poblacion, La Paz and Siblong, Bucay water becomes objectionable because of odor. This is probably caused by methane or hydrogen sulfide gas derived from decomposition of organic matters that are buried in the sediments. In addition, the hard water quality in the province, particularly in Dolores, Bangued, Peñarubia, Lagayan, Danglas, San Juan, Langangilang, Tayum, San Isidro and Villaviciosa is attributed to excessive concentration of calcium and magnesium dissolved from the limestone that is distributed in the central portion of Abra.

The areas mentioned above are indicated in the Groundwater Availability Map.

7.4 Spring Sources

Spring is a natural outlet of groundwater at the ground surface. It occurs when water table intersects the ground surface, usually along the contacts of pervious and impervious rock formations and through rock fractures. Because of the intense fracturing, particularly older formations, and the presence of large solution openings in limestone, secondary permeability is induced to the rocks that favors spring development.

For this study, springs are categorized into developed, undeveloped and untapped springs. A developed spring is utilized and must have sanitary protection, otherwise it is classified as undeveloped spring, which is considered as unsafe water source. An untapped spring, as the name implies, is unutilized and flowing in its natural state.

The province is dissected by several faults and has undergone series of folding that resulted in intense fracturing, practically in older rock formations. In addition, it has fairly extensive



limestone formations with numerous sinkholes. Based on the inventory of water sources made for the study, there are 219 developed springs in the province. These springs have discharges ranging from 0.20 to 3.00 l/sec. Likewise, a total of 50 undeveloped springs is reported in Bucloc, Licuan, Langangilang, Malibcong, Pilar, Tineg, Tubo and Villaviciosa with yield varying from 0.02 to 33.33 l/sec. In Tubo, two (2) untapped springs have been identified each with potential yield of 1.00 l/sec. Technical information on spring sources in each municipality is presented in Table 7.4.1, Supporting Report.

7.5 Surface Water Source

Abra river is the principal stream draining the province. It flows toward the north and abruptly changes its course to the west upon Tineg river, its largest tributary, joins in Dolores to discharge into the Luzon Sea in Caoayan, Ilocos Sur. Other than Tineg, the river's main tributaries include Sinalang, Soot, Malapaao, Ulep, Ikmin, Manikbel, Bucloc and Baay rivers. The drainage areas of these rivers range from 25 to 500sq.km. These rivers are currently used for irrigation. Moreover, the Abra river is a potential source of domestic water supply considering its perennial flow of approximately 10 m³/sec during the time of sampling and proximity to densely populated areas.

Water quality analysis of Abra river was conducted to determine the surface water quality in the province. The results of the analysis showed that the river water was turbid with high iron content and Biochemical Oxygen Demand (BOD), exceeding the maximum limit for Class "A" fresh surface water (refer to 7.5 Water Quality Analysis Results, Supporting Report). This river water will require complete treatment for use as source of domestic water supply.

7.6 Future Development Potential of Water Sources

Based on the study of existing water sources, groundwater is considered safe and more economical source for future water supply requirements of the province.

Shallow wells are the most economical water source for Level I service. Considering the existing wells in the province, the potential aquifers for shallow wells occur between 8 and 20 mbgl. One disadvantage of shallow wells is the lowering of water level during dry spell that consequently reduces the discharges of the wells. Another disadvantage is the usual high susceptibility of shallow aquifers to direct infiltration of surface pollutants.

In general, deep wells have better water quality and invariable yields when developed with appropriate technology. This is because of aquifers' relatively deeper location that makes them less susceptible to surface contaminants. The usual confinement of deep aquifers resulted in rise of water level above the aquifers. Lowering of water level does not affect the saturated thickness, therefore, deep well discharges remain constant. In the Recent alluvial deposits, Pliocene to Pleistocene rocks and probably Miocene limestone, deep aquifers occur from 21 to 55 mbgl.

Additional wells can still be developed to meet the future water supply demand of the province. Prior to any well development, a detailed groundwater resource study must be considered for its optimum utilization. For planning purpose, standard well specifications for each of the municipality were prepared as presented in Table 7.6.3, Supporting Report. The parameters, such as well depth, static water level and specific capacity provided in the specifications were estimated from the available data gathered for the study.

The identified untapped springs can be developed as supplemental/alternative water sources. These are the most reliable water sources in areas considered difficult for well development, particularly in Tineg, Lacub, Licuan, Malibcong, Sal-lapadan, Buloc, Daguioman, Boliney and Tubo. Prior to spring development, supplementary study must also be conducted to determine the effect of seasonal fluctuation of discharge and water quality.

Chapter 8

***FUTURE REQUIREMENTS IN WATER
SUPPLY AND SANITATION IMPROVEMENT***



8. FUTURE REQUIREMENTS IN WATER SUPPLY AND SANITATION IMPROVEMENT

8.1 General

Phased investments for provincial sector development are planned in the same manner as adopted in the National Sector Master Plan (NSMP); Medium-Term Investment covering the years 1996 to 2000 and Long-Term Development covering the period 2001 to 2010.

Targets of provincial service coverage for the two phases are established as percentages of beneficiaries or utilities to be served by sub-sector. Service coverage in the base year (1995) and national sector targets indicated in the NSMP and the Medium-Term Philippine Development Plan (MTPDP) are the bases of the study. Sector targets which are not prescribed in the national plan; school and public toilets as well as sewerage are assumed based on the current conditions. In addition, preliminary discussions on solid waste management are included as a vital component of sanitation sector.

Projection of frame values by municipality is undertaken for respective sub-sectors; future population by urban and rural area, the number of student enrollment to public schools and the number of public utilities. Reference base figures for the study of framework are the 1990 Census of Population and Housing and the statistical data of the province and information from relevant agencies. Provincial population by target year is projected referring to the manner of declining growth rates of regional population projected by NSO, while the base year population (1995) is estimated in application of the 1980-1990 growth rates by municipality (broken down to urban and rural areas). The population distribution to urban and rural areas prepared by NSO in 1990 is modified to meet actual conditions in the classification of the areas.

Types of required facilities and their implementation criteria according to service level standards are referred to the said Master Plan. Some planning conditions and assumptions not prescribed in the national plan are conferred to the relevant standards of sector agencies and provincial government. For sewerage requirements, the deficit in sanitation must first be addressed. Partial upgrading of on-site disposal to a sewerage system (off-site disposal) is envisaged in the final target year.

In estimating future requirements by municipality, additional population (or number of students/public utilities) to be served by sub-sector is first calculated as a shortfall at target years in comparison between target and base year service coverage. In this regard,

planned/on-going projects to be completed by 1995 are considered as part of base year service coverage. Required number of facilities by sector component is then estimated corresponding to the said additional population (or number of students/public utilities) to be served. Rehabilitation work for Level I facilities limited to new deep wells to be constructed under PW4SP is taken into account. Generally, rehabilitation of deep wells and shallow wells constructed by means of conventional method is difficult.

Logistic support is considered as a minimum requirement of LGUs for community development and training, and other relevant activities along with the implementation of PW4SP. The types and number of well drilling/rehabilitation equipment and supporting vehicle for Level I facilities are also suggested as reference information.

Project priority for medium-term development is discussed entailing general criteria to identify specific projects. However, at the provincial level master plan, municipal priority ranking is rather suggested to be used for allocation of provincial fund.

8.2 Targets of Provincial Sector Plan

Provincial sector targets for the year 2000 and 2010 are determined as the provincial average of the desirable minimum level for each sub-sector. Table 8.2.1 summarizes the target percentages to be served by sub-sector. Details by sub-sector are discussed in this sub-section.

(1) Water supply

The base year service coverage was calculated as a total of those in 1995 and expected by planned/on-going projects scheduled to be completed by the end of 1995. Table 8.2.2 shows service coverage for planning purpose (details are referred to Supporting Report).

The base year service coverage in urban area (91%) is far exceeding the MTPDP sector target (71%) for the year 2000, while rural area (77%) is below the sector target of 85%. The high service coverage in urban area has been achieved mainly by utilization of spring sources for Level III and II systems as well as improvement of dug wells.

Considering the existing conditions, water supply sector targets were determined by urban and rural area. Phase I development shall be focused on the furtherance of service coverage as high as 98% in urban area and improvement in rural area up to 90%. Phase II targets are planned to increase rural water supply coverage to 95% as envisaged in the NSMP, while 98% for urban water supply to maintain Phase I achievement.

Table 8.2.1 Provincial Sector Targets

Sub-Sectors		Phase I (1996-2000)		Phase II (2001-2010)	
Water Supply		Population Coverage (%)	Additional Population to be Served	Population Coverage (%)	Additional Population to be Served
Urban Water Supply		98	6,052	98	30,507
Rural Water Supply		90	27,114	95	23,847
Sanitation		Households Coverage (%)	Additional Households to be Served	Households Coverage (%)	Additional Households to be Served
Urban	Household Toilets	77	11,758	93	25,323
	Flush	25	612	50	4,840
	Pour Flush	75	505	50	786
	VIP	0	0	0	0
Rural	Flush	10	842	25	1,687
	Pour Flush	85	9,013	75	18,010
	VIP	5	786	0	0
School Toilet		Coverage (%)	Additional Public School Students to be Served	Coverage (%)	Additional Public School Students to be Served
		75	14,507	90	11,180
Public Toilet		Coverage (%)	Additional Public Utilities with Sanitary Toilets	Coverage (%)	Additional Public Utilities with Sanitary Toilets
		90	5	100	5
Sewerage		Not Applicable		Coverage (%)	Population to be Served
				50	8,707
Solid Waste		Coverage (%)	Additional Households to be Served	Not Applicable	
		50	4,037		

Table 8.2.2 Base Year Service Coverage of Water Supply

Municipalities	Type	Population 1995	Population Served by 1995 Facilities				
			Level III	Level II	Level I	Total	% Coverage
Bangued (Capital)	Urban	14,904	10,309	0	4,115	14,424	97
	Rural	22,455	4,309	2,544	13,762	20,615	92
	Total	37,359	14,618	2,544	17,877	35,039	94
Boliney	Urban	770	675	35	0	710	92
	Rural	3,424	2,265	340	0	2,605	76
	Total	4,194	2,940	375	0	3,315	79
Bucay	Urban	2,753	0	1,080	1,467	2,547	93
	Rural	11,107	290	4,357	4,877	9,524	86
	Total	13,860	290	5,437	6,344	12,071	87
Bucloc	Urban	0	0	0	0	0	0
	Rural	2,120	0	1,008	0	1,008	48
	Total	2,120	0	1,008	0	1,008	48
Daguio	Urban	0	0	0	0	0	0
	Rural	1,500	0	610	0	610	41
	Total	1,500	0	610	0	610	41
Danglas	Urban	1,555	0	364	1,157	1,521	98
	Rural	1,701	215	712	641	1,568	92
	Total	3,256	215	1,076	1,798	3,089	95
Dolores	Urban	1,867	1,250	0	595	1,845	99
	Rural	7,395	125	579	6,466	7,170	97
	Total	9,262	1,375	579	7,061	9,015	97
Lacub	Urban	671	0	324	0	324	48
	Rural	1,815	0	476	382	858	47
	Total	2,486	0	800	382	1,182	48
Lagangilang	Urban	2,490	1,025	0	1,206	2,231	90
	Rural	9,772	435	0	6,531	6,966	71
	Total	12,262	1,460	0	7,737	9,197	75
Lagayan	Urban	854	0	0	594	594	70
	Rural	2,580	0	531	318	849	33
	Total	3,434	0	531	912	1,443	42
Langiden	Urban	350	0	120	220	340	97
	Rural	2,206	0	221	1,894	2,115	96
	Total	2,556	0	341	2,114	2,455	96
La Paz	Urban	3,362	0	0	3,089	3,089	92
	Rural	9,058	0	0	6,835	6,835	75
	Total	12,420	0	0	9,924	9,924	80
Licuan	Urban	654	395	190	0	585	89
	Rural	3,391	965	1,198	0	2,163	64
	Total	4,045	1,360	1,388	0	2,748	68
Luba	Urban	1,167	815	116	0	931	80
	Rural	4,765	605	1,139	0	1,744	37
	Total	5,932	1,420	1,255	0	2,675	45

Table 8.2.2 Base Year Service Coverage of Water Supply (Cont'd.)

Municipalities	Type	Population 1995	Population Served by 1995 Facilities				
			Level III	Level II	Level I	Total	% Coverage
Malibcong	Urban	0	0	0	0	0	0
	Rural	3,705	0	2,845	0	2,845	77
	Total	3,705	0	2,845	0	2,845	77
Manabo	Urban	3,968	0	1,196	2,511	3,707	93
	Rural	4,515	0	2,219	1,934	4,153	92
	Total	8,483	0	3,415	4,445	7,860	93
Penarrubia	Urban	1,049	829	220	0	1,049	100
	Rural	4,299	1,596	784	1,525	3,905	91
	Total	5,348	2,425	1,004	1,525	4,954	93
Pidigan	Urban	2,655	0	980	1,638	2,618	99
	Rural	7,113	0	732	5,671	6,403	90
	Total	9,768	0	1,712	7,309	9,021	92
Pilar	Urban	1,303	1,000	178	0	1,178	90
	Rural	7,660	965	1,156	3,587	5,708	75
	Total	8,963	1,965	1,334	3,587	6,886	77
Sal-lapadan	Urban	1,424	0	660	0	660	46
	Rural	3,892	0	2,614	0	2,614	67
	Total	5,316	0	3,274	0	3,274	62
San Isidro	Urban	552	0	240	285	525	95
	Rural	3,572	0	330	2,753	3,083	86
	Total	4,124	0	570	3,038	3,608	87
San Juan	Urban	1,329	0	216	877	1,093	82
	Rural	7,797	0	0	5,601	5,601	72
	Total	9,126	0	216	6,478	6,694	73
San Quintin	Urban	738	0	260	0	260	35
	Rural	3,968	0	1,665	889	2,554	64
	Total	4,706	0	1,925	889	2,814	60
Tayum	Urban	2,268	1,500	50	621	2,171	96
	Rural	9,569	520	2,227	5,332	8,079	84
	Total	11,837	2,020	2,277	5,953	10,250	87
Tineg	Urban	0	0	0	0	0	0
	Rural	3,109	0	1,215	0	1,215	39
	Total	3,109	0	1,215	0	1,215	39
Tubo	Urban	0	0	0	0	0	0
	Rural	5,111	1,215	1,814	0	3,029	59
	Total	5,111	1,215	1,814	0	3,029	59
Villaviciosa	Urban	788	0	520	236	756	96
	Rural	4,209	0	2,582	1,152	3,734	89
	Total	4,997	0	3,102	1,388	4,490	90
Provincial Total	Urban	47,471	17,798	6,749	18,611	43,158	91
	Rural	151,808	13,505	33,898	70,150	117,553	77
	Total	199,279	31,303	40,647	88,761	160,711	81

(2) Sanitation

1) Household toilets

As with water supply, the base year service coverage is calculated as shown in Table 8.2.3 reflecting any planned or on-going projects scheduled to be completed by 1995 (details are referred to Supporting Report).

The province has a base year service coverage of 54%, which is below the current national average coverage of 77%. Urban area registers a level of 77% that is the same as the national average coverage. Rural area however, has only 46% considering some "shared users". By type of sanitary toilet facility, the existing percentage composition to total households is as follows:

Type	Urban (%)	Rural (%)
Flush	14	4
Pour-flush	85	86
VIP latrine	1	10

To lessen the gap of the service coverage between the urban and rural area and to attain an equitable distribution of this basic facility, the same target is applied to both areas. Provincial target of Phase I for household toilets is planned to be 77%, which is the current national average coverage and the present service coverage in urban area. For Phase II, the MTPDP target of 93% is adopted.

The existing composition of the 3 facility types serves as an indicator in the distribution for Phase I, while for Phase II, VIP latrine is phased-out.

2) School toilets

The base year service coverage of public school students is shown in Table 8.2.4 counting expected coverage of any planned or on-going projects scheduled to be completed by 1995 (details are referred to Supporting Report).

Present service coverage is 50% applying the standard number of public school students to be served by one (1) unit of toilet facility. The low level is due to the absence of facilities.

Table 8.2.3 Base Year Service Coverage of Household Toilets

Municipality	Area	Households and Population Using Sanitary Toilets									
		1995		Number of Households				Served Population	Coverage (%)		
		Population	No. of HHs	Flush	Pour Flush	VIP Latrine	Total		Flush	Pour Flush	VIP Latrine
Bangued (Capital)	Urban	14,904	2,816	556	1,899	0	2,455	12,966	20	67	0
	Rural	22,455	4,152	5	187	0	192	1,123	0	5	0
	Total	37,359	6,968	561	2,086	0	2,647	14,089	8	30	0
Boliney	Urban	770	139	7	13	0	20	108	5	9	0
	Rural	3,424	630	2	93	0	95	514	0	15	0
	Total	4,194	769	9	106	0	115	622	1	14	0
Bucay	Urban	2,753	511	16	190	0	206	1,101	3	37	0
	Rural	11,107	1,966	0	689	30	719	4,110	0	35	2
	Total	13,860	2,477	16	879	30	925	5,211	1	35	1
Bucloc	Urban	0	0	0	0	0	0	0	0	0	0
	Rural	2,120	379	5	100	30	135	763	1	26	8
	Total	2,120	379	5	100	30	135	763	1	26	8
Daguoman	Urban	0	0	0	0	0	0	0	0	0	0
	Rural	1,500	284	5	73	33	111	585	2	26	12
	Total	1,500	284	5	73	33	111	585	2	26	12
Danglas	Urban	1,555	302	3	206	10	219	1,135	1	68	3
	Rural	1,701	334	6	106	90	202	1,021	2	32	27
	Total	3,256	636	9	312	100	421	2,156	1	49	16
Dolores	Urban	1,867	375	19	210	3	232	1,158	5	56	1
	Rural	7,395	1,346	9	633	9	651	3,550	1	47	1
	Total	9,262	1,721	28	843	12	883	4,708	2	49	1

Table S.2.3 Base Year Service Coverage of Household Toilets (Cont'd.)

Municipality	Area	Households and Population Using Sanitary Toilets									
		1995		Number of Households				Served Population	Coverage (%)		
		Population	No. of HHs	Flush	Pour Flush	VIP Latrine	Total		Flush	Pour Flush	VIP Latrine
Lacub	Urban	671	123	3	120	0	123	671	2	98	0
	Rural	1,815	326	0	226	0	226	1,252	0	69	0
	Total	2,486	449	3	346	0	349	1,923	1	77	0
Lagangilang	Urban	2,490	467	48	259	0	307	1,643	10	55	0
	Rural	9,772	1,747	6	853	0	859	4,788	0	49	0
	Total	12,262	2,214	54	1,112	0	1,166	6,431	2	50	0
Lagayan	Urban	854	161	3	119	6	128	683	2	74	4
	Rural	2,580	485	1	263	21	285	1,522	0	54	4
	Total	3,434	646	4	382	27	413	2,205	1	59	4
Langiden	Urban	350	74	5	69	0	74	350	7	93	0
	Rural	2,206	454	2	205	0	207	1,015	0	45	0
	Total	2,556	528	7	274	0	281	1,365	1	52	0
La Paz	Urban	3,362	638	19	605	0	624	3,295	3	95	0
	Rural	9,058	1,799	6	906	33	945	4,801	0	50	2
	Total	12,420	2,437	25	1,511	33	1,569	8,096	1	62	1
Licuan	Urban	654	121	7	110	0	117	634	6	91	0
	Rural	3,391	576	3	384	4	391	2,306	1	67	1
	Total	4,045	697	10	494	4	508	2,940	1	71	1
Luba	Urban	1,167	202	6	177	2	185	1,074	3	88	1
	Rural	4,765	886	4	373	129	506	2,716	0	42	15
	Total	5,932	1,088	10	550	131	691	3,790	1	51	12

Table 8.2.3 Base Year Service Coverage of Household Toilets (Cont'd.)

Municipality	Area	1995		Households and Population Using Sanitary Toilets						
		Population	No. of HHs	Number of Households			Served Population	Coverage (%)		
				Flush	Pour Flush	VIP Latrine		Flush	Pour Flush	VIP Latrine
Malibcong	Urban	0	0	0	0	0	0	0	0	0
	Rural	3,705	632	34	188	148	2,186	5	30	23
	Total	3,705	632	34	188	148	2,186	5	30	23
Manabo	Urban	3,968	757	9	433	0	2,301	1	57	0
	Rural	4,515	891	5	527	4	2,709	1	59	0
	Total	8,483	1,648	14	960	4	5,010	1	58	0
Penarrubia	Urban	1,049	191	120	46	25	191	63	24	13
	Rural	4,299	767	237	185	345	4,299	31	24	45
	Total	5,348	958	357	231	370	5,348	37	24	39
Pidigan	Urban	2,655	476	63	363	0	2,363	13	76	0
	Rural	7,113	1,302	0	970	0	5,335	0	75	0
	Total	9,768	1,778	63	1,333	0	7,698	4	75	0
Pilar	Urban	1,303	236	16	123	0	769	7	52	0
	Rural	7,660	1,442	5	606	0	3,217	0	42	0
	Total	8,963	1,678	21	729	0	3,986	1	43	0
Sal-lapadan	Urban	1,424	261	6	122	0	698	2	47	0
	Rural	3,892	710	0	499	99	3,269	0	70	14
	Total	5,316	971	6	621	99	3,967	1	64	10
San Isidro	Urban	552	91	2	79	0	491	2	87	0
	Rural	3,572	652	0	431	0	2,358	0	66	0
	Total	4,124	743	2	510	0	2,849	0	69	0

Table 8.2.3 Base Year Service Coverage of Household Toilets (Cont'd.)

Municipality	Area	Households and Population Using Sanitary Toilets									
		1995		Number of Households				Served Population	Coverage (%)		
		Population	No. of HHs	Flush	Pour Flush	VIP Latrine	Total		Flush	Pour Flush	Total
San Juan	Urban	1,329	278	18	205	0	223	1,063	6	74	80
	Rural	7,797	1,544	14	533	0	547	2,729	1	35	35
	Total	9,126	1,822	32	738	0	770	3,792	2	41	42
San Quintin	Urban	738	143	7	64	34	105	539	5	45	73
	Rural	3,968	789	5	186	302	493	2,460	1	24	62
	Total	4,706	932	12	250	336	598	2,999	1	27	64
Tayum	Urban	2,268	449	51	293	0	344	1,746	11	65	77
	Rural	9,569	1,686	117	1,092	0	1,209	6,890	7	65	72
	Total	11,837	2,135	168	1,385	0	1,553	8,636	8	65	73
Tineg	Urban	0	0	0	0	0	0	0	0	0	0
	Rural	3,109	578	14	178	34	226	1,213	2	31	39
	Total	3,109	578	14	178	34	226	1,213	2	31	39
Tubo	Urban	0	0	0	0	0	0	0	0	0	0
	Rural	5,111	923	2	223	39	264	1,482	0	24	29
	Total	5,111	923	2	223	39	264	1,482	0	24	29
Villavieja	Urban	788	151	13	103	0	116	607	9	68	77
	Rural	4,209	796	2	494	0	496	2,610	0	62	62
	Total	4,997	947	15	597	0	612	3,217	2	63	65
Provincial Total	Urban	47,471	8,962	997	5,808	80	6,885	36,444	11	65	77
	Rural	151,808	28,076	489	11,203	1,350	13,042	70,823	2	40	46
	Total	199,279	37,038	1,486	17,011	1,430	19,927	107,267	4	46	54

Table 8.2.4 Base Year Service Coverage of Public School Toilets and Public Toilets

Municipality	Public Schools Toilets			Public Toilets		
	1995 Total No. of Public School Students	Std. No. of Public School Students that can be Served by Base Year (1995) Sanitary Toilets	Coverage (%)	Number of PUs in 1995	Number of PU with Sanitary Toilets in Base Year (1995)	Coverage (%)
Bangued (Capital)	6,690	2,550	38	6	6	100
Boliney	785	785	100	0	0	0
Bucay	4,472	1,800	40	1	1	100
Bucloc	358	100	28	0	0	0
Daguioman	367	367	100	0	0	0
Danglas	557	550	99	0	0	0
Dolores	1,617	1,300	80	1	1	100
Lacub	294	294	100	0	0	0
Lagangilang	2,254	2,254	100	1	1	100
Lagayan	955	955	100	0	0	0
Langiden	423	423	100	0	0	0
La Paz	2,146	750	35	0	0	0
Licuan	557	300	54	0	0	0
Luba	1,106	200	18	0	0	0
Malibcong	799	0	0	0	0	0
Manabo	1,949	600	31	1	1	100
Penarrubia	816	816	100	1	1	100
Pidigan	2,197	1,350	61	0	0	0
Pilar	2,268	700	31	1	0	0
Sal-lapadan	935	500	53	0	0	0
San Isidro	883	200	23	0	0	0
San Juan	2,264	1,400	62	1	1	100
San Quintin	870	850	98	0	0	0
Tayum	1,919	900	47	0	0	0
Tineg	818	0	0	0	0	0
Tubo	1,556	550	35	0	0	0
Villaviciosa	743	0	0	1	0	0
Provincial Total	40,598	20,494	50	14	12	86

Note: PU - Public Utilities

In the absence of national targets for school toilets, the existing level of service coverage is the base in setting up the targets. It is expected that all new construction of public school buildings will entail sanitary toilets enabling the coverage to increase on a high level. For Phase I and II, 75% and 90% are set, respectively.

3) Public toilets

The base year service coverage considering expected additional coverage by 1995 is shown in Table 8.2.4 (details are referred to Supporting Report).

About 86% of the existing public utilities is served with sanitary toilets. This can be attributed by the fact that majority of the public utilities (mostly public markets) are provided by sanitary toilet facilities.

In setting up the targets without national targets as of now, the indicator would be the existing level of coverage. Accordingly, a 100% coverage for Phase I and II is assumed. As with schoolbuildings, it is expected that all new construction of public utilities will be provided by sanitary toilets, consequently the high targets.

(3) Sewerage

Given the non-existence of sewerage systems in any municipality at the present time, this plan does not consider the service during Phase I. For Phase II, a target of 50% coverage was applied to urban population of municipalities with more than 10,000 urban population provided by Level III water supply systems.

(4) Solid waste

The municipal level data in 1995 on the number of households served by the municipal refuse collection revealed that the current practice is limited to only urban areas. The base year service coverage for urban area by municipality is reflected in Table 8.2.5.

Table 8.2.5 Base Year Service Coverage of Municipal Solid Waste System in 1995

Municipality	Total No. of Households	No. of Urban Households	No. of Household Served*	Coverage of Households (%)	Coverage of Urban HHs (%)
Bangued (Capital)	6,968	2,816	702	10	25
Boliney	769	139	0	0	0
Bucay	2,477	511	0	0	0
Bucloc	379	0	0	0	0
Daguio	284	0	0	0	0
Danglas	636	302	0	0	0
Dolores	1,721	375	0	0	0
Lacub	449	123	0	0	0
Lagangilang	2,214	467	0	0	0
Lagayan	646	161	0	0	0
Langiden	528	74	0	0	0
La Paz	2,437	638	0	0	0
Licuan	697	121	0	0	0
Luba	1,088	202	0	0	0
Malibcong	632	0	0	0	0
Manabo	1,648	757	0	0	0
Penarrubia	958	191	0	0	0
Pidigan	1,778	476	0	0	0
Pilar	1,678	236	0	0	0
Sal-lapadan	971	261	0	0	0
San Isidro	743	91	0	0	0
San Juan	1,822	278	0	0	0
San Quintin	932	143	0	0	0
Tayum	2,135	449	0	0	0
Tineg	578	0	0	0	0
Tubo	923	0	0	0	0
Villaviciosa	947	151	0	0	0
Provincial Total	37,038	8,962	702	2	8

* Equivalent to total number of urban households served

A mere 2% of the total households in the province relied on municipal refuse collection using trucks or an 8% urban household coverage. Only Bangued is covered with a municipal service with 3 units of collection truck.

No national targets have yet been set. However, considering the present level of coverage, a 50% urban household coverage is applied for the medium-term period (2000).

8.3 Projection of Frame Values

8.3.1 Population Projection

Future population for all municipalities by urban and rural area was projected for the target years of 2000 and 2010 together with the present population in 1995 as a planning base year.

The NSO projection at provincial and municipal levels was not available by the time of study. The future population was therefore projected in the following manner (details are included in Supporting Report). Reference information/data used for the study are:

- Population census data of 1980 and 1990 on different administrative levels,
- Annual population growth rates for future regional population projected by NSO, and
- The 1992 Philippine Yearbook.

The past population development at different administrative levels was first reviewed to come up with the demographic characteristics of the region and province. Through review of NSO regional population projection and the 1992 Philippine Yearbook, the behavior of population development through the future was analyzed. Referring to these demographic study, population projection of the province by target year was carried out in assumption of declining annual growth rates employing a simple compounded formula $(1+r)^n$. Present population in 1995 was also estimated in the same manner. Major study results are presented as follows:

- (1) Review of past population development in the province and population distribution in 1990 to urban and rural areas.

The past population development during the census period from 1980 to 1990 revealed that:

- The province recorded 1.4% of average annual growth rate, lower than the regional rate at 2.3%, as a conservative growth, and

- Percentage of provincial population to the regional population slightly decreased from 17.5% in 1980 to 16.1% in 1990 and urban population percentage adversely decreased.

(2) Review of the NSO regional population projection in view of annual growth rates (base year 1990) and the demographic conditions presented in the 1992 Philippine Yearbook.

Annual growth rates of regional population projected by NSO were analyzed using simplified formula. The conservative growth rates were calculated reflecting demographic characteristics of moderate decline of fertility and mortality described in the 1992 Philippine Yearbook. Future behaviors of provincial population are assumed to follow more or less same as those of regional ones, unless specific development takes place in the province.

(3) Estimation of present provincial population (1995) applying 1980-1990 average annual growth rate of respective municipalities (further broken down to urban and rural areas) assuming that the behaviors of past population development prevailed up to the present.

(4) Projection of provincial population by target year:

- The manner of discount in annual growth rates of regional population for the target years was applied for provincial population projection, however the minimum growth rate was assumed at 1.00 % for planning purpose.
- Population in 2000 was projected from the base year 1995 applying the annual growth rate of 1.13 % (21.5% discount of the growth rate of the province observed during last census decade, 1980-1990).
- Population in 2010 with the base year of 2000 was projected applying the annual growth rate of 1.00 %
- Present profile of population distribution both in urban and rural areas is assumed to prevail through the future.

Population by target year and the year 1995 is presented in Table 8.3.1 covering all municipalities broken down to urban and rural areas. Number of households by target year was also studied and included in Table 8.3.5, Supporting Report.

Table 8.3.1 Future Population by Urban and Rural Area by Municipality

Municipality	1990			1995			2000			2010		
	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Bangued (Capital)	14,027	20,157	34,184	14,904	22,455	37,359	15,765	23,753	39,518	17,413	26,237	43,650
Boliney	730	3,043	3,773	770	3,424	4,194	814	3,622	4,436	899	4,001	4,900
Bucay	2,668	10,678	13,346	2,753	11,107	13,860	2,912	11,749	14,661	3,217	12,978	16,195
Bucloc	0	1,932	1,932	0	2,120	2,120	0	2,243	2,243	0	2,478	2,478
Daguioman	0	1,413	1,413	0	1,500	1,500	0	1,587	1,587	0	1,753	1,753
Danglas	1,432	1,610	3,042	1,555	1,701	3,256	1,645	1,799	3,444	1,817	1,987	3,804
Dolores	1,725	6,852	8,577	1,867	7,395	9,262	1,975	7,822	9,797	2,182	8,640	10,822
Lacub	620	1,706	2,326	671	1,815	2,486	710	1,920	2,630	784	2,121	2,905
Lagangilang	2,255	8,993	11,248	2,490	9,772	12,262	2,634	10,337	12,971	2,910	11,418	14,328
Lagayan	835	2,936	3,771	854	2,580	3,434	903	2,729	3,632	997	3,015	4,012
Langiden	343	2,109	2,452	350	2,206	2,556	370	2,334	2,704	409	2,578	2,987
La Paz	3,050	8,190	11,240	3,362	9,058	12,420	3,556	9,582	13,138	3,928	10,585	14,513
Licuan	635	3,062	3,697	654	3,391	4,045	692	3,587	4,279	764	3,963	4,727
Luba	1,015	4,548	5,563	1,167	4,765	5,932	1,234	5,041	6,275	1,363	5,569	6,932
Malibcong	0	3,494	3,494	0	3,705	3,705	0	3,919	3,919	0	4,329	4,329
Manabo	3,603	4,194	7,797	3,968	4,515	8,483	4,197	4,776	8,973	4,636	5,276	9,912
Penarrubia	945	3,948	4,893	1,049	4,299	5,348	1,110	4,547	5,657	1,226	5,023	6,249
Pidigan	2,428	6,379	8,807	2,655	7,113	9,768	2,809	7,524	10,333	3,103	8,311	11,414
Pilar	1,266	7,185	8,451	1,303	7,660	8,963	1,378	8,103	9,481	1,522	8,951	10,473
Sal-lapadan	1,277	3,664	4,941	1,424	3,892	5,316	1,506	4,117	5,623	1,663	4,548	6,211
San Isidro	496	3,248	3,744	552	3,572	4,124	584	3,778	4,362	645	4,173	4,818
San Juan	1,228	7,217	8,445	1,329	7,797	9,126	1,406	8,247	9,653	1,553	9,110	10,663
San Quintin	655	3,638	4,293	738	3,968	4,706	781	4,197	4,978	863	4,636	5,499
Tayum	2,174	8,871	11,045	2,268	9,569	11,837	2,399	10,122	12,521	2,650	11,181	13,831
Tineg	0	3,068	3,068	0	3,109	3,109	0	3,289	3,289	0	3,633	3,633
Tubo	0	4,589	4,589	0	5,111	5,111	0	5,406	5,406	0	5,972	5,972
Villaviciosa	762	3,850	4,612	788	4,209	4,997	834	4,452	5,286	921	4,918	5,839
Provincial Total	44,169	140,574	184,743	47,471	151,808	199,279	50,214	160,582	210,796	55,465	177,384	232,849

8.3.2 School Enrollment Projection

From the estimated 1995 total population of the province, the number of children who would be enrolling in elementary and high school levels for all municipalities is derived.

School age population is extrapolated from the 1990 NSO age group classification of 5-9, 10-14 and 15-19 years old bracket by municipality. The age group for the elementary level is from 7 to 13 years, while that for the high school level is from 14 to 17 years. The percentage of school age population for the target years is based on the existing composition or structure of the 1990 population.

From the school age population, the number of children who would attend either private or public school, by target year is computed using the projected participation rate. The participation rate by target year varies depending on the socio-economic condition of the province. Generally, an improved economy will result to a higher participation rate. For the province,

an increase in the participation rate in both private and public schools is foreseen by 2000 and 2010.

The number of public school students by target year is then derived from the projected number of children who will attend school. A participation rate for public school enrollment is established based on the existing participation rate of public school students to the total school age population. A slight increase of 5% from the 1995 rate is foreseen in 2000 and another 3% from the 2000 rate in 2010. (details are referred to Table 8.3.6, Supporting Report).

Table 8.3.2 shows the projected number of public school students by municipality, by target year. A total of 45,291 and 50,168 public school students is estimated to enroll in 2000 and 2010, respectively.

Table 8.3.2 Projected Public School Enrollment and Number of Public Utilities by Municipality

Municipality	Number of Public School Students			No. of Public Utilities		
	1995	2000	2010	1995	2000	2010
Bangued (Capital)	6,690	7,851	8,858	6	6	7
Boliney	785	858	956	0	0	0
Bucay	4,472	4,916	5,287	1	1	1
Bucloc	358	391	439	0	0	0
Daguioman	367	402	428	0	0	0
Danglas	557	617	682	0	1	1
Dolores	1,617	1,846	2,009	1	1	2
Lacub	294	322	408	0	0	0
Lagangilang	2,254	2,711	3,047	1	1	2
Lagayan	955	1,027	1,140	0	0	0
Langiden	423	456	489	0	0	1
La Paz	2,146	2,493	2,712	0	0	0
Licuan	557	404	480	0	0	1
Luba	1,106	1,185	1,337	0	0	0
Malibcong	799	872	952	0	0	0
Manabo	1,949	2,134	2,390	1	1	1
Penarrubia	816	987	1,118	1	1	1
Pidigan	2,197	2,401	2,681	0	0	0
Pilar	2,268	2,442	2,610	1	1	1
Sal-lapadan	935	1,019	1,123	0	0	0
San Isidro	883	949	1,063	0	1	1
San Juan	2,264	2,461	2,631	1	1	1
San Quintin	870	971	1,095	0	1	1
Tayum	1,919	2,159	2,459	0	0	0
Tineg	818	884	964	0	0	0
Tubo	1,556	1,657	1,812	0	0	0
Villaviciosa	743	876	998	1	1	1
Provincial Total	40,598	45,291	50,168	14	17	22

8.3.3 Projection of the Number of Public Utilities

The number of public utilities (limited to public markets and bus/jeepney terminals) by target year is projected in urban areas for all municipalities. The provincial physical framework plan and the hierarchy of urban settlements study serve as references in the projection. Bus or jeepney terminals are considered in major transport routes of the province.

Three (3) public markets/bus terminals are planned to be constructed by 2000, and another 5 by 2010. Refer to Table 8.3.2 for the total number of public utilities by municipality by target year (details are referred to Table 8.3.7, Supporting Report).

8.3.4 Planning Area and its Projected Population for Sewerage

Urban areas with more than 10,000 population provided by Level III water supply systems in 2010 serve as the planning area. Population in the area is considered as the potential population to be served. Only the capital town of Bangued has a population of more than 10,000 by year 2010.

8.3.5 Number of Households to be Served by Municipal Solid Waste Collection System

The number of urban households in 2000 is the potential households for the planning (refer to Table 8.3.5, Supporting Report).

8.4 Types of Facilities and Implementation Criteria

In principle, types of facilities and their implementation criteria as prescribed in the NSMP are adopted to this PW4SP.

8.4.1 Water Supply

The following are major conditions and assumptions applied to urban and rural water supply, which are intended as a guide for the implementation of sector projects.

(1) Urban water supply

1) Service level

It shall be noted that a national policy for urban water supply is a Level III system in general as the most suitable measure. Therefore, for the investment needs of the sector development, it is assumed in this PW4SP that underserved and/or unserved

urban population at present and in the future will be provided with individual house connections. However, it does not intend to exclude Level I and II facilities from being implemented in urban area in the future as individual cases.

2) Utilization of existing facilities

The existing Level I and II facilities are considered to be utilized during the Phase I period. However, the population served by these facilities are assumed to be absorbed by Level III service in Phase II.

3) Water source

Majority of existing Level III systems are utilizing deep wells in view of economy and easy O&M. In this context, priority is given to deep wells wherever applicable. Spring source is considered only in difficult area where deep well construction is not applicable.

The groundwater productivity was assumed based on the study results of water sources in Chapter 7 and presented in Table 8.4.1.

Table 8.4.1 Groundwater Productivity

Municipality	Specific Capacity (liter/sec/m)	Well Depth (meter)	Groundwater Productivity per Deep Well (cu. m/16 hr)
Bangued (Capital)	2.50	50	1,440
Boliney	0.00	0	0
Bucay	2.50	50	1,440
Bucloc	0.00	0	0
Daguioman	0.00	0	0
Danglas	2.50	50	1,440
Dolores	2.50	50	1,440
Lacub	0.00	0	0
Lagangilang	2.50	50	1,440
Lagayan	2.50	50	1,440
Langiden	2.50	50	1,440
La Paz	2.50	50	1,440
Licuan	0.00	0	0
Luba	1.00	30	576
Malibcong	0.00	0	0
Manabo	2.50	30	1,440
Penarrubia	2.50	50	1,440
Pidigan	2.50	50	1,440
Pilar	1.00	30	576
Sal-lapadan	1.00	30	576
San Isidro	1.00	30	576
San Juan	2.50	50	1,440
San Quintin	2.50	50	1,440
Tayum	2.50	50	1,440
Tineg	0.00	0	0
Tubo	0.00	0	0
Villaviciosa	1.00	30	576

4) Number of systems

In principle, one Level III system is considered for urban area of every municipality. When any Level III system exists, the future requirements are considered as an expansion of the existing system, otherwise a new system was considered.

In addition to the above, any rural barangay/s being served by the existing urban Level III system are considered to be continued throughout the future. A merged Level III system covering more than two municipalities is also considered, if technical and economic conditions are being met.

5) Rehabilitation

Rehabilitation of existing and future facilities is assumed to be undertaken by the operating bodies.

(2) Rural water supply

1) Service level

The Level I systems are generally planned for rural areas where houses are scattered (deep and/or shallow wells). Spring development is excluded, in principle, from the Level I planning in view of cost effectiveness. However, difficult area, such as upland municipalities wherein well construction is not suitable, is considered to be served by spring sources. Level II systems are considered where houses are clustered and suitable untapped spring is available.

Service level standards are set forth as 15 households per source for Level I and 5 households per communal faucet for Level II, as defined in the national plan.

Application of Level III systems in rural areas may be considered in a case to case basis in actual implementation.

2) Utilization of existing facilities

The existing facilities/systems in all service levels were considered to be utilized throughout the future.

3) Water source

For Level I facilities, deep well construction is given priority wherever applicable in view of safety against possible contamination and stable water supply. Standard specifications of shallow and deep wells are summarized in Table 8.4.2 based on the water source evaluation results presented in Chapter 7. Conventional construction

method (driven well) may be employed under the favorable substrata or hydro-geological conditions. The standard structure of wells in application of "open-hole drilling and gravel pack" is presented in Figure 8.4.1, Supporting Report.

Table 8.4.2 Standard Specifications of Level I Wells

Specification	Shallow Well	Deep Well
Construction Method	Open-hole drilling and gravel pack	
Casing Diameter	50 mm	100 mm
Borehole Diameter	150 mm	200 mm
Ranges of Well Depth	Standard Depth	
0 - 20 m	20 m	N.A.
21 - 40 m	N.A.	30 m
41 - 60 m	N.A.	50 m
61 - 80 m	N.A.	70 m

For Level II systems, only untapped springs suitable for water supply purpose are considered. Identified untapped springs are presented in Table 7.4.1, Supporting Report.

4) Number of systems/facilities

Number of Level I wells is estimated based on the service level standard; while, the number of springs coincides with the number of Level II systems.

5) Rehabilitation

Rehabilitation of existing Level I wells is not considered, since most of the existing wells constructed by driving method are not suitable for rehabilitation to recover their functions. However, minor repair work for handpump and concrete apron is a requisite.

8.4.2 Sanitation

The conditions and assumptions are established for the different sanitation components to serve as guides in the implementation of projects.

(1) Household toilets

Three types of sanitary toilet facilities for individual houses are considered for Phase I; flush, pour-flush and VIP. While for Phase II, flush and pour-flush are planned considering the improvement of living standard.

The type of toilet facilities is dependent on the existing or planned service level of water supply in the community. In urban and rural areas with Level I or II water supply facilities, only pour-flush and/or VIP are considered, while in urban areas with Level III water supply systems, flush type toilets requiring a piped water connection are included.

(2) School toilets

Standard service level currently used by DECS (50 students per unit facility) is employed for both phases.

The standard toilet facility (1 building) with 5 units of toilet bowl to serve for 250 students is adopted for planning purpose, which is modified from FW4SP design to provide a shallow well as a water source.

(3) Public toilets

As a minimum requirement, at least 1 sanitary toilet facility is assumed to be provided for respective utilities: public market and bus/jeepney terminal.

The standard FW4SP design with 6-units of toilet bowl for the market is adopted. In this design, it is assumed that water supply will be tapped from the existing system, hence an elevated water tank is provided.

8.4.3 Urban Sewerage

The commencement of staged implementation of the sewerage program is planned in Phase II for the limited urban area (50% of urban population served by Level III system for the municipalities with urban population of more than 10,000). It is practical to start the program fully using the existing facilities to allow for lower initial investment cost than starting at once a conventional sewerage system (refer to Figure 8.4.2 Staged Improvement in Sewage Collection Method, Supporting Report).

Low cost off-site technologies such as small bore sewer for collection of effluent from septic tank are to be adopted. Improvement of sewage collection method may be gradually achieved from combined sewer to separate sewerage system.

Sewage treatment facilities may range from community scale septic tank or imhoff tank to aerated lagoon systems and to a more advanced treatment process such as oxidation ditch.

For this PW4SP, aerated lagoons are assumed as a representative treatment facility for planning purpose. Daily average wastewater quantity is assumed to be 100 liters per capita per day.

8.4.4 Solid Waste

In terms of facility requirements, this PW4SP only studied the number of refuse collection trucks required for the year 2000. A rated capacity of 5 cu.m truck/vehicle is considered for calculation of required units of truck. Disposal of solid waste shall be studied in detail through investigations, F/S and D/D. Unit solid waste generation for urban area is assumed to be 0.418 kg. per capita per day.

8.5 Service Coverage by Target Year

8.5.1 Water Supply

The service coverage in terms of population to be served by target year was estimated by urban and rural area by municipality. The service coverage in rural area was further subdivided by service level (Level I & Level II) to finally come up with physical requirements.

Base figures applied to estimate the future service coverage and the additional population to be served are:

- provincial sector targets,
- population projection by target year, and
- base year service coverage (served population) by existing facilities.

Future requirements in terms of additional population to be served were then estimated by urban (Level III) and rural (Level I & II) area by municipality as a shortfall to meet the population to be served in each target year. The population served in base year is adopted as the population served in target year, when the former population exceeds the population to be served in the target year/s. Manner of calculation is specifically presented by phase.

(I) Phase I requirements

Additional service coverage was estimated as a shortfall of the population to be served in Phase I comparing with the population served in base year. In this connection, existing facilities both in urban and rural areas are assumed to be utilized during the Phase I period.

The utilization of untapped springs for Level II systems was given priority during Phase I period for rural water supply. At the time of this plan preparation, two (2) untapped springs in Tubo were identified.

(2) Phase II requirements

Additional service coverage was estimated as a shortfall of the population to be served in Phase II comparing with the population served in Phase I. In this regard, existing facilities in rural area were assumed to be utilized through the two Phases, while urban population served by Level I and II facilities in base year was assumed to be absorbed by Level III service during Phase II period.

Table 8.5.1 exhibits the population to be served by target year, while Figures 8.5.1 and 8.5.2 present maps showing service coverage by 2000 and 2010, respectively (details are referred to Supporting Report).

Through the Phase I development, approximately 33,200 persons in the province will be served by additional water supply services, of which 6,100 persons or 18% of the total will be urban population and 27,100 persons or 82% will be rural population.

In the Phase II period, a total of 54,400 persons, of which 30,500 persons or 56% in urban area and 23,800 persons or 44% in rural area, will be further benefited by water supply services. This additional service coverage in urban area includes upgrade of service level for 25,400 persons served by Level I and II facilities in 1995.

8.5.2 Sanitation

(1) Household toilets

The service coverage (number of households to be served) by different types of sanitary facility is estimated by urban and rural area by municipality for the years 2000 and 2010.

The future service coverage and additional households to be served are estimated to meet the provincial targets using the number of household served in the base year and the number of households in target years.

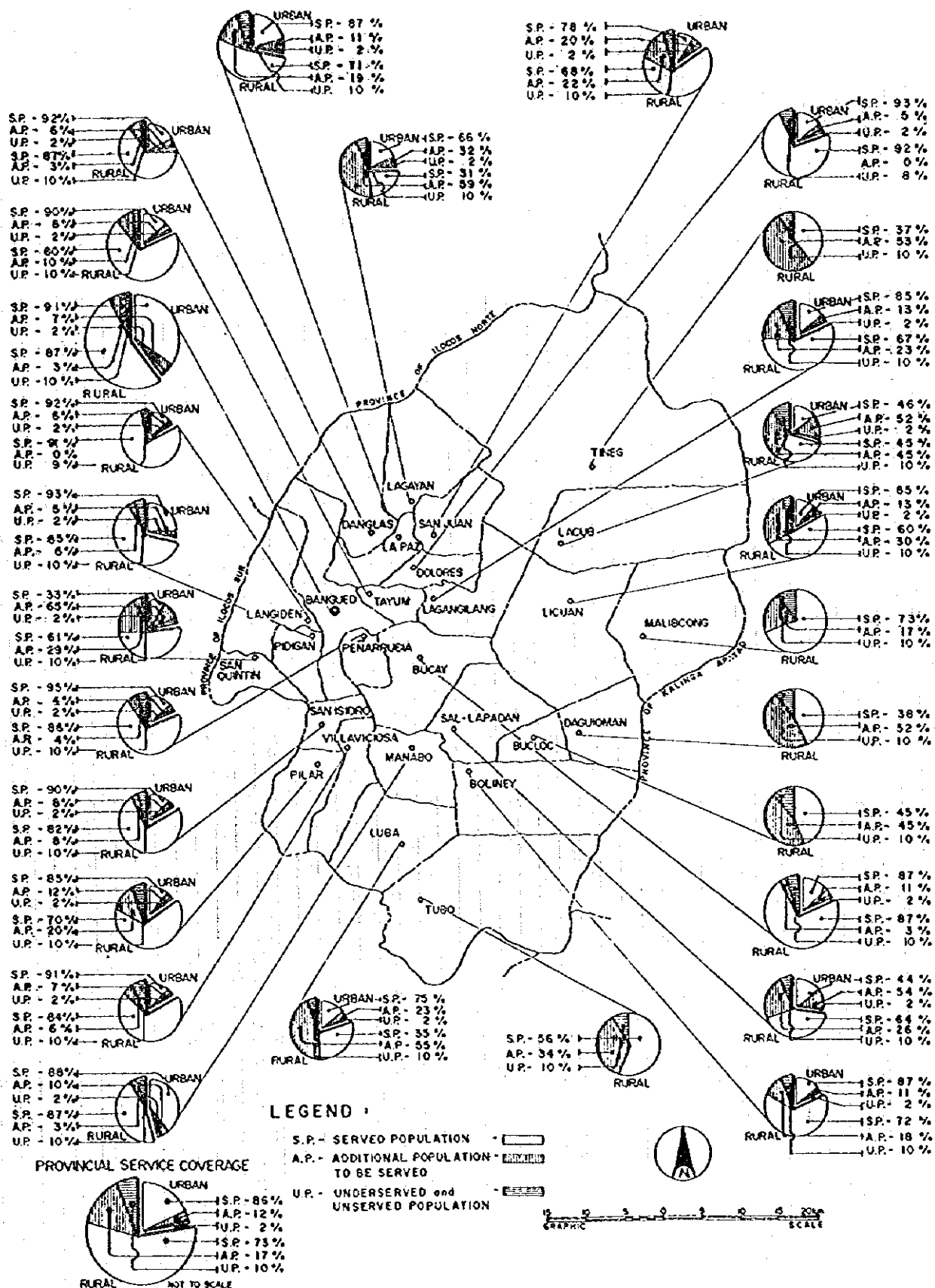
Additional number of households to be served by different type of facility by urban and rural area by municipality is the shortfall of the number of households to be served in target years comparing with either that in base year or in Phase I (details are referred to

Table 8.5.1 Population to be Served by Target Year (Water Supply)

Municipalities	Type	Phase I (2000)					Phase II (2010)				
		Total Population		Service Coverage			Total Population		Service Coverage		
		Level III	Level II	Level I	Total	Additional Population to be Served	Level III	Level II	Level I	Total	Additional Population to be Served
Bangue (Capital)	Urban	15,765	11,335	0	4,115	15,450	1,026	0	0	1,026	17,476
	Rural	23,753	4,309	2,544	14,525	21,378	0	0	763	763	26,237
	Total	39,518	15,644	2,544	18,640	36,828	1,026	0	763	2,552	43,650
Boliney	Urban	814	763	35	0	798	88	0	0	88	809
	Rural	3,622	2,265	340	655	3,260	0	0	655	655	4,001
	Total	4,436	3,028	375	655	4,058	88	0	655	1,398	4,900
Bucay	Urban	2,912	307	1,080	1,467	2,854	307	0	0	307	3,217
	Rural	11,749	290	4,357	5,927	10,574	0	0	1,050	1,050	12,978
	Total	14,661	597	5,437	7,394	13,428	307	0	1,050	2,407	16,195
Bucloc	Urban	0	0	0	0	0	0	0	0	0	0
	Rural	2,243	0	1,008	1,011	2,019	0	0	1,011	1,011	2,478
	Total	2,243	0	1,008	1,011	2,019	0	0	1,011	2,022	2,478
Daguoman	Urban	0	0	0	0	0	0	0	0	0	0
	Rural	1,587	0	610	818	1,428	0	0	818	818	1,753
	Total	1,587	0	610	818	1,428	0	0	818	1,636	1,753
Dangas	Urban	1,645	91	364	1,157	1,612	91	0	0	91	1,817
	Rural	1,799	215	712	692	1,619	0	0	51	51	1,987
	Total	3,444	306	1,076	1,849	3,231	91	0	51	193	3,804
Dolores	Urban	1,975	1,341	0	595	1,936	91	0	0	91	2,182
	Rural	7,822	125	579	6,466	7,170	0	0	0	0	8,640
	Total	9,797	1,466	579	7,061	9,106	91	0	0	91	10,822
Lacub	Urban	710	372	324	0	696	372	0	0	372	768
	Rural	1,920	0	476	1,252	1,728	0	0	870	870	2,121
	Total	2,630	372	800	1,252	2,424	372	0	870	1,242	2,905
Lagangilang	Urban	2,634	1,375	0	1,206	2,581	350	0	0	350	2,910
	Rural	10,337	455	0	8,868	9,303	0	0	2,337	2,337	11,418
	Total	12,971	1,810	0	10,074	11,884	350	0	2,337	5,024	14,328
Lagayan	Urban	903	291	0	594	885	291	0	0	291	997
	Rural	2,729	0	531	1,925	2,456	0	0	1,607	1,607	3,015
	Total	3,632	291	531	2,519	3,341	291	0	1,607	3,505	4,012
Langiden	Urban	2,334	0	221	1,894	2,115	0	0	0	23	2,578
	Rural	2,704	23	341	2,114	2,478	23	0	0	23	2,987
	Total	5,038	23	562	4,008	4,593	23	0	0	46	5,565
La Paz	Urban	3,556	396	0	3,089	3,485	396	0	0	396	3,928
	Rural	9,582	0	0	8,624	8,624	0	0	1,789	1,789	10,585
	Total	13,138	396	0	11,713	12,109	396	0	1,789	3,974	14,513
Lucena	Urban	692	488	190	0	678	93	0	0	93	764
	Rural	3,587	965	1,198	1,065	3,228	0	0	1,065	1,065	3,963
	Total	4,279	1,453	1,388	1,065	3,906	93	0	1,065	2,223	4,727
Lubu	Urban	1,234	1,093	116	0	1,209	278	0	0	278	1,336
	Rural	5,041	605	1,139	2,793	4,537	0	0	2,793	2,793	5,569
	Total	6,275	1,698	1,255	2,793	5,746	278	0	2,793	5,864	6,932

Table 8.5.1 Population to be Served by Target Year (Water Supply) (Cont'd.)

Municipalities	Type	Phase I (2000)					Phase II (2010)				
		Total Population		Service Coverage			Total Population		Service Coverage		
		Level III	Level II	Level I	Level II	Level I	Level III	Level II	Level I	Level II	Level I
Mabuhang	Urban	0	0	0	0	0	0	0	0	0	0
	Rural	3,919	0	682	682	682	4,329	0	2,845	1,268	4,113
	Total	3,919	0	682	682	682	4,329	0	2,845	1,268	4,113
Manabo	Urban	4,197	406	2,511	4,113	4,113	4,636	4,543	0	4,543	4,137
	Rural	4,776	0	2,219	2,079	4,298	5,276	0	2,219	2,793	5,012
	Total	8,973	406	3,415	4,590	8,411	9,912	4,543	2,219	2,793	9,555
Pinarrobia	Urban	1,110	868	220	0	1,088	39	1,226	1,201	0	1,201
	Rural	4,547	1,596	784	1,712	4,092	5,023	1,596	784	2,392	4,772
	Total	5,657	2,464	1,004	1,712	5,180	5,062	2,797	784	2,392	5,973
Pitagan	Urban	2,809	135	980	1,638	2,753	3,103	3,041	0	3,041	2,906
	Rural	7,524	0	732	6,040	6,772	8,311	0	732	7,163	7,895
	Total	10,333	135	1,712	7,678	9,525	11,414	3,041	732	7,163	10,936
Pilar	Urban	1,378	1,172	178	0	1,350	1,522	1,492	0	0	1,492
	Rural	8,103	965	1,156	5,172	7,293	8,951	965	1,156	6,382	8,503
	Total	9,481	2,137	1,334	5,172	8,643	10,473	2,457	1,156	6,382	9,995
San-lapadan	Urban	1,506	816	660	0	1,476	1,663	1,630	0	1,630	814
	Rural	4,117	0	2,614	1,093	3,705	4,548	0	2,614	1,707	4,321
	Total	5,623	816	3,274	1,093	5,181	6,211	1,630	2,614	1,707	5,951
San Isidro	Urban	584	47	240	285	572	645	632	0	632	585
	Rural	3,778	0	330	3,070	3,400	4,173	0	330	3,634	3,964
	Total	4,362	47	570	3,355	3,972	4,818	632	330	3,634	4,596
San Juan	Urban	1,406	285	216	877	1,378	1,553	1,522	0	1,522	1,237
	Rural	8,247	0	7,422	7,422	0	9,110	0	0	8,655	8,655
	Total	9,653	285	216	8,299	8,800	10,663	1,522	0	8,655	10,177
San Quintin	Urban	781	505	260	0	765	863	846	0	846	341
	Rural	4,197	0	1,655	2,112	3,777	4,636	0	1,655	2,739	4,404
	Total	4,978	505	1,925	2,112	4,542	5,499	846	1,655	2,739	5,250
Tayum	Urban	2,399	1,680	50	621	2,351	2,650	2,597	0	2,597	917
	Rural	10,122	520	2,227	6,363	9,110	11,181	520	2,227	7,875	10,622
	Total	12,521	2,200	2,277	6,984	11,461	13,831	3,117	2,227	7,875	13,219
Tineg	Urban	0	0	0	0	0	0	0	0	0	0
	Rural	3,289	0	1,215	1,745	2,960	3,633	0	1,215	2,236	3,451
	Total	3,289	0	1,215	1,745	2,960	3,633	0	1,215	2,236	3,451
Tubo	Urban	0	0	0	0	0	0	0	0	0	0
	Rural	5,406	1,215	2,914	736	1,836	5,972	1,215	2,914	1,544	5,673
	Total	5,406	1,215	2,914	736	1,836	5,972	1,215	2,914	1,544	5,673
Villavicosa	Urban	834	61	520	236	817	921	903	0	903	842
	Rural	4,452	0	2,582	1,425	4,007	4,918	0	2,582	2,090	4,672
	Total	5,286	61	3,102	1,661	4,824	5,839	903	2,582	2,090	5,575
Provincial Total	Urban	50,214	23,850	6,749	18,611	49,210	55,465	54,357	0	54,357	30,497
	Rural	160,592	13,505	34,998	96,164	144,667	177,384	13,505	34,998	120,011	168,514
	Total	210,796	37,355	41,747	114,775	193,877	232,849	67,862	34,998	170,011	222,871



Supporting Report). However, when the number of households to be served in target year/s is less than or equal to that in base year, no additional number of households to be served is counted.

In the determination of the number of households to be served by flush type toilet, when the number of households to be served in the target year is bigger than in base year, the target coverage is applied with conditions. When the target coverage is bigger than Level III water supply coverage, the latter coverage is adopted, while in the other case, the target coverage is applied. In cases where the target coverage is less than that in base year, the base year coverage is adopted.

For Phase I, any type of existing facilities both in urban and rural areas is to be utilized during Phase I period. For Phase II, water-sealed toilet facilities in Phase I both in urban and rural areas are to be utilized.

The projected number of served households at the end of the Phase I period is 30,329. The additional households to be served totaled to 11,758, of which 9% is urban households and 91% is rural households. While at the end of Phase II period, the number of served households is 54,143. The additional households to be served are 25,323. Of this, 22% is urban households and the rest, 78% is rural. Table 8.5.2 summarizes the number of households to be served by target year for urban and rural areas by municipality. Figures 8.5.3 and 8.5.4 present maps showing service coverage by 2000 and 2010, respectively.

(2) School toilets

The service coverage (number of public school students to be served) is estimated by municipality for the years 2000 and 2010.

The future service coverage and additional number of students to be served are estimated using the number of students served in the base year, the number of students in target years and the provincial sector targets.

Additional number of students to be served by municipality is the shortfall of the number of students to be served in targets comparing with either that in base year or in Phase I (details are referred to Supporting Report). However, when the number of students to be served in target/s is less than or equal to the base year, no additional number of students to be served is considered.

Table 8.5.2 Additional Number of Households to be Served by Target Year (Household Toilets)

Municipality	Area	Phase I (2000)										Phase II (2010)														
		Total Households					No. of Served Households					Add'l No. of Households to be Served					No. of Served Households					Add'l No. of Households to be Served				
		Flush	Pour	VIP Latrine	Total		Flush	Pour	VIP Latrine	Total		Flush	Pour	VIP Latrine	Total		Flush	Pour	VIP Latrine	Total		Flush	Pour	VIP Latrine	Total	
Bangued (Capital)	Urban	2,975	573	1,718	0	2,291	17	0	0	17	4,353	2,024	2,024	0	4,048	1,451	306	0	1,757							
	Rural	4,390	339	2,879	169	3,387	334	2,692	169	3,195	6,559	1,077	5,023	0	6,100	738	2,144	0	2,892							
	Total	7,374	912	4,597	169	5,678	351	2,692	169	3,212	10,912	3,101	7,047	0	10,148	2,189	2,450	0	4,639							
	Urban	148	28	86	0	114	21	73	0	94	225	105	104	0	209	77	18	0	95							
Boliuey	Rural	671	52	439	26	517	50	346	26	422	1,000	233	697	0	930	181	258	0	439							
	Total	819	80	525	26	631	71	419	26	516	1,225	338	801	0	1,139	258	276	0	534							
	Urban	539	57	358	0	415	41	168	0	209	804	374	374	0	748	317	16	0	333							
	Rural	2,098	52	1,482	81	1,615	52	793	81	896	3,245	73	2,945	0	3,018	21	1,463	0	1,484							
Bucloc	Total	2,637	109	1,840	81	2,030	93	961	81	1,105	4,049	447	3,319	0	3,766	338	1,479	0	1,817							
	Urban	401	0	0	0	0	0	0	0	0	620	5	572	0	577	0	283	0	283							
	Rural	401	5	289	15	309	0	189	0	189	620	5	572	0	577	0	283	0	283							
	Total	802	5	598	15	609	0	378	0	378	1,240	10	1,144	0	1,154	0	566	0	566							
Daguoman	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
	Rural	299	5	213	12	230	0	140	0	140	438	5	402	0	407	0	189	0	189							
	Total	299	5	213	12	230	0	140	0	140	438	5	402	0	407	0	189	0	189							
	Urban	316	17	226	0	243	14	20	0	34	454	211	211	0	422	194	0	0	194							
Donglas	Rural	355	27	231	14	272	21	125	0	146	497	54	408	0	462	27	177	0	204							
	Total	669	44	457	14	515	35	145	0	180	951	265	619	0	894	221	177	0	398							
	Urban	395	76	228	0	304	57	18	0	75	546	254	254	0	508	178	26	0	204							
	Rural	1,422	23	1,017	55	1,095	14	384	46	444	2,160	31	1,978	0	2,009	8	961	0	969							
Lacub	Total	1,817	99	1,245	55	1,399	71	402	46	519	2,706	285	2,232	0	2,517	186	987	0	1,173							
	Urban	131	25	76	0	101	22	0	0	22	196	91	91	0	182	66	15	0	81							
	Rural	343	0	251	13	264	0	25	13	38	530	0	493	0	493	0	242	0	242							
	Total	474	25	327	13	365	22	25	13	60	726	91	584	0	675	66	257	0	323							
Lagangilang	Urban	497	96	287	0	383	48	28	0	76	728	339	338	0	677	243	51	0	294							
	Rural	1,846	78	1,272	71	1,421	72	419	71	562	2,855	109	2,546	0	2,655	31	1,274	0	1,305							
	Total	2,343	174	1,559	71	1,804	120	447	71	638	3,583	448	2,894	0	3,332	274	1,325	0	1,599							
	Urban	170	31	98	0	131	30	0	0	30	249	116	116	0	232	83	18	0	101							
Lagayan	Rural	515	1	376	20	397	0	113	0	113	754	1	700	0	701	0	324	0	324							
	Total	685	34	474	20	528	30	113	0	143	1,003	117	816	0	933	83	342	0	425							
	Urban	77	5	54	0	59	0	0	0	0	102	47	48	0	95	42	0	0	42							
	Rural	476	2	347	18	367	0	142	18	160	645	2	598	0	600	0	251	0	251							
La Paz	Total	553	7	401	18	426	0	142	18	160	747	49	646	0	695	42	251	0	293							
	Urban	671	75	442	0	517	56	0	0	56	982	457	456	0	913	362	14	0	306							
	Rural	1,916	6	1,395	74	1,475	0	489	41	530	2,646	6	2,455	0	2,461	0	1,060	0	1,060							
	Total	2,587	81	1,837	74	1,992	56	489	41	586	3,628	463	2,911	0	3,374	382	1,074	0	1,456							
Lecuan	Urban	128	25	74	0	99	18	0	0	18	191	89	89	0	178	64	15	0	79							
	Rural	608	47	398	23	468	44	14	19	77	991	230	692	0	922	183	294	0	477							
	Total	736	72	472	23	567	62	14	19	95	1,182	319	781	0	1,100	247	309	0	556							
	Urban	213	41	123	0	164	35	0	0	35	341	159	158	0	317	118	35	0	153							
Luba	Rural	934	72	611	36	719	68	238	0	306	1,392	151	1,144	0	1,295	79	433	0	612							
	Total	1,147	113	734	36	883	103	238	0	341	1,733	310	1,302	0	1,612	197	568	0	765							

Table 8.5.2 Additional Number of Households to be Served by Target Year (Household Toilets) (Cont'd.)

Municipality	Area	Phase I (2000)										Phase II (2010)									
		Total Households					No. of Served Households					Add'l No. of Households to be Served					No. of Served Households				
		Total		VIP		Total		Total		Total		Total		Total		Total		Total		Total	
		Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
Malibong	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	664	34	451	26	511	0	263	0	263	0	1,082	34	972	0	1,006	0	521	0	521	0
	Total	664	34	451	26	511	0	263	0	263	0	1,082	34	972	0	1,006	0	521	0	521	0
Manabo	Urban	807	78	543	0	621	69	110	0	179	0	1,159	539	539	0	1,078	461	0	0	461	0
	Rural	936	5	680	361	721	0	153	32	185	0	1,319	5	1,319	0	1,222	0	542	0	542	0
	Total	1,743	83	1,223	361	1,342	69	263	32	364	0	2,478	544	1,761	0	2,300	461	542	0	1,003	0
Penarubia	Urban	202	120	46	25	191	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	812	237	185	345	767	0	0	0	0	0	1,256	292	876	0	1,168	55	691	0	746	0
	Total	1,014	357	231	370	958	0	0	0	0	0	1,563	435	1,019	0	1,454	78	788	0	866	0
Puligan	Urban	502	63	324	0	387	0	0	0	0	0	2,078	0	1,933	0	1,933	0	933	0	933	0
	Rural	1,368	0	1,000	53	1,053	0	30	53	83	0	2,854	361	2,294	0	2,655	298	970	0	1,288	0
	Total	1,870	63	1,324	53	1,440	0	30	53	83	0	3,811	177	3,027	0	3,549	129	32	0	161	0
Pilar	Urban	251	48	145	0	193	52	22	0	54	0	2,238	241	1,840	0	2,081	123	840	0	963	0
	Rural	1,529	118	1,000	59	1,177	113	394	59	566	0	2,619	418	2,017	0	2,435	252	872	0	1,124	0
	Total	1,780	166	1,145	59	1,370	145	416	59	620	0	4,161	193	3,944	0	4,387	140	36	0	176	0
San-lapadan	Urban	274	53	158	0	211	47	36	0	83	0	1,137	0	1,057	0	1,444	140	545	0	685	0
	Rural	749	0	548	29	577	0	49	0	49	0	1,531	193	1,251	0	1,501	67	8	0	75	0
	Total	1,023	53	706	29	788	47	85	0	132	0	2,668	286	2,308	0	2,945	207	55	0	150	0
San Isidro	Urban	97	8	67	0	75	0	6	0	6	0	1,043	75	1,043	0	1,120	67	475	0	542	0
	Rural	687	0	503	26	529	0	72	26	98	0	1,204	75	1,043	0	1,279	71	478	0	549	0
	Total	784	8	570	26	604	0	78	26	104	0	2,247	150	2,086	0	2,419	138	953	0	1,091	0
San Juan	Urban	293	56	170	0	226	38	0	0	38	0	2,278	14	2,105	0	2,440	124	947	0	1,071	0
	Rural	1,617	14	1,169	62	1,245	0	636	62	698	0	2,666	194	2,286	0	2,860	231	1,323	0	1,554	0
	Total	1,910	70	1,339	62	1,471	38	636	62	736	0	4,944	208	4,581	0	5,300	355	1,370	0	1,625	0
San Quintin	Urban	150	29	87	0	116	22	21	0	45	0	1,159	5	1,073	0	1,078	0	464	0	549	0
	Rural	830	5	609	32	646	0	423	0	423	0	1,375	105	1,174	0	1,279	71	478	0	549	0
	Total	980	34	696	32	762	22	446	0	468	0	2,534	110	2,423	0	2,357	71	942	0	1,098	0
Tayum	Urban	470	90	272	0	362	39	0	0	39	0	663	308	309	0	617	218	37	0	255	0
	Rural	1,276	117	1,183	68	1,368	0	91	68	159	0	2,795	130	2,469	0	2,999	13	1,286	0	1,399	0
	Total	1,746	207	1,455	68	1,730	39	91	68	198	0	3,458	438	2,778	0	3,216	231	1,323	0	1,554	0
Tineg	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	609	14	432	23	469	0	254	0	254	0	908	14	810	0	844	0	398	0	398	0
	Total	609	14	432	23	469	0	254	0	254	0	908	14	810	0	844	0	398	0	398	0
Tubo	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	983	76	643	38	757	74	420	0	494	0	1,493	304	1,084	0	1,388	228	441	0	669	0
	Total	983	76	643	38	757	74	420	0	494	0	1,493	304	1,084	0	1,388	228	441	0	669	0
Villavieja	Urban	160	13	110	0	123	0	7	0	7	0	230	107	107	0	214	94	0	0	94	0
	Rural	840	2	613	32	647	0	119	32	151	0	1,230	2	1,142	0	1,144	0	529	0	529	0
	Total	1,000	15	723	32	770	0	126	32	158	0	1,460	109	1,249	0	1,358	94	529	0	623	0
Provincial Total	Urban	9,466	1,609	5,692	25	7,376	612	505	0	1,117	0	13,868	6,449	12,449	0	12,899	4,840	786	0	5,626	0
	Rural	29,690	1,331	20,216	1,456	23,003	842	9,014	786	10,641	0	44,348	3,018	38,226	0	41,244	1,687	18,010	0	19,697	0
	Total	39,156	2,940	25,908	1,481	30,379	1,454	9,518	786	11,758	0	58,216	9,467	44,676	0	54,143	6,527	18,796	0	25,323	0

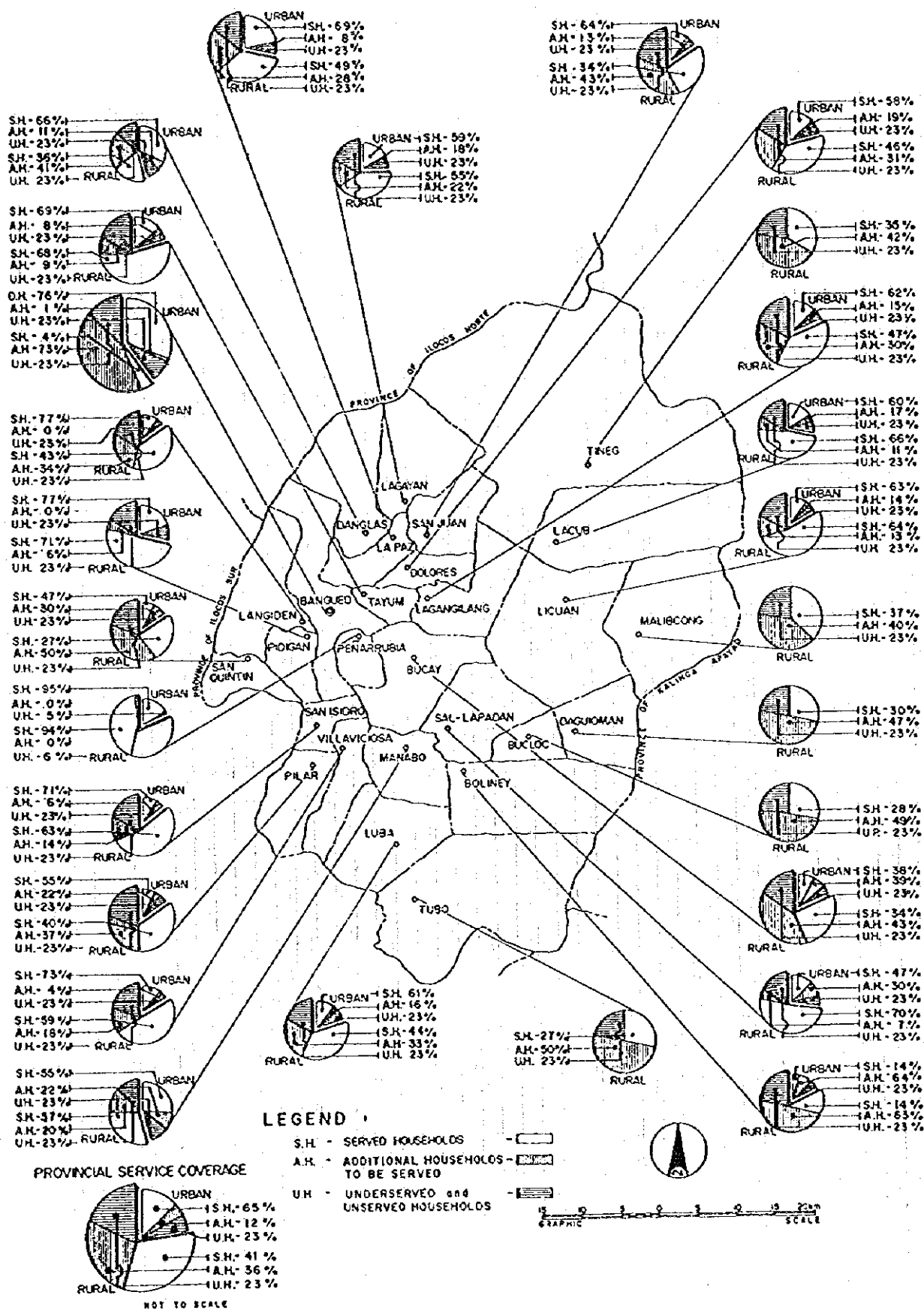


FIGURE 8.5.3
MAP SHOWING HOUSEHOLD TOILETS SERVICE COVERAGE BY 2000

The existing facilities are to be utilized during Phase I period, while the facilities in Phase I are to be utilized during Phase II period.

The projected number of served students at the end of Phase I period is 33,971. The additional students to be served totaled to 14,507. While at the end of Phase II period, the projected number of served students is 45,151. The additional students to be served are 11,180. Table 8.5.3 summarizes the number of public school students to be served by target year.

Table 8.5.3 Additional Number of Public School Students to be Served by Target Year (School Toilets)

Municipality	Phase I (2000)			Phase II (2010)		
	Total No. of Public School Students	No. of Public School Students to be Served	Add'l. No. of Public School Students to be Served	Total No. of Public School Students	No. of Public School Students to be Served	Add'l. No. of Public School Students to be Served
Bangued (Capital)	7,851	5,888	3,338	8,858	7,972	2,084
Boliney	858	644	0	956	860	216
Bucay	4,916	3,687	1,887	5,287	4,758	1,071
Bucloc	391	293	193	439	395	102
Daguio	402	302	0	428	385	83
Danglas	617	463	0	682	614	151
Dolores	1,846	1,385	85	2,009	1,808	423
Lacub	322	242	0	408	367	125
Langangilang	2,711	2,033	0	3,047	2,742	709
Lagayan	1,027	770	0	1,140	1,026	256
Langiden	456	342	0	489	440	98
La Paz	2,493	1,870	1,120	2,712	2,441	571
Licuan	404	303	3	480	432	129
Luba	1,185	889	689	1,337	1,203	314
Malibcong	872	654	654	952	857	203
Manabo	2,134	1,601	1,001	2,390	2,151	550
Peñarrubia	987	740	0	1,118	1,006	266
Pidigan	2,401	1,801	451	2,681	2,413	612
Pilar	2,442	1,832	1,132	2,610	2,349	517
Sal-Iapadan	1,019	764	264	1,123	1,011	247
San Isidro	949	712	512	1,063	957	245
San Juan	2,461	1,846	446	2,631	2,368	522
San Quintin	971	728	0	1,095	986	258
Tayum	2,159	1,619	719	2,459	2,213	594
Tineg	884	663	663	964	868	205
Tubo	1,657	1,243	693	1,812	1,631	388
Villavieja	876	657	657	998	898	241
Provincial Total	45,291	33,971	14,507	50,168	45,151	11,180

(3) Public toilets

The service coverage of public utilities with sanitary toilet facility is estimated by municipality for the years 2000 and 2010.