

JAPAN INTERNATIONAL COOPERATION AGENCY

DEPARTMENT OF THE INTERIOR AND LOCAL GOVERNMENT  
THE REPUBLIC OF THE PHILIPPINES

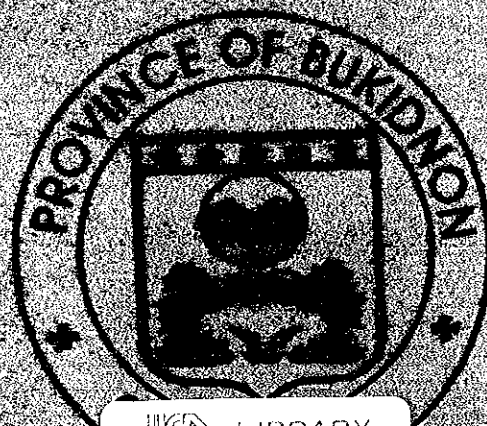
THE STUDY ON THE  
PROVINCIAL WATER SUPPLY, SEWERAGE AND  
SANITATION SECTOR PLAN  
IN  
THE REPUBLIC OF THE PHILIPPINES

VOLUME I - [ I ]

MAIN REPORT

PROVINCIAL WATER SUPPLY, SEWERAGE AND  
SANITATION SECTOR PLAN  
FOR THE PROVINCE OF

BUKIDNON



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NIPPON JOGESUIDO SEKKEI CO., LTD.



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Republic of the Philippines  
**PROVINCE OF BUKIDNON**  
Provincial Capitol

**OFFICE OF THE PROVINCIAL GOVERNOR**



**MESSAGE**

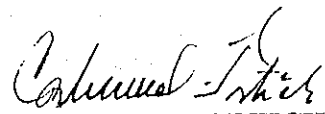
*The need for water in Bukidnon has activated the local government leadership in evolving ways to fill such a need. The formulation of a Provincial Water Supply Sanitation and Sewerage Sector Plan (PW4SP), through the technical assistance of the Japan International Cooperation Agency (JICA) through the Water Supply and Sanitation Program Management Office (WSS-PMO) is a triumphant step in that direction.*

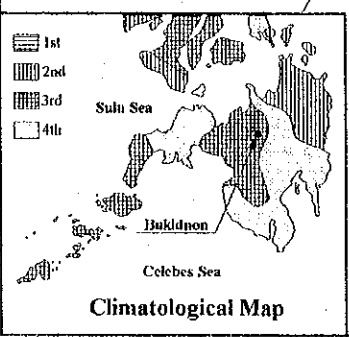
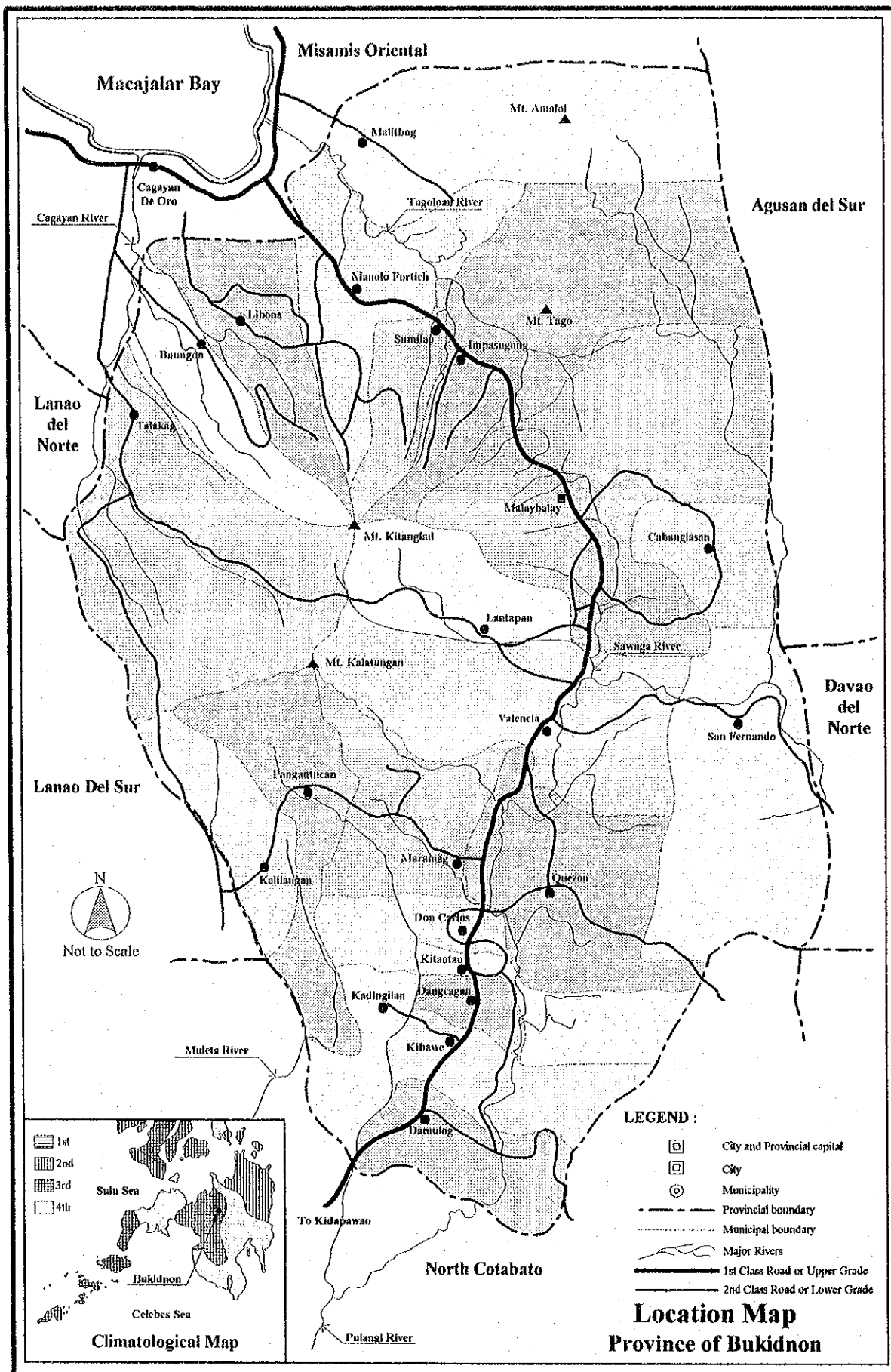
*The crucial role of the JICA Consultants headed by Mr. Masatoshi Momose is also gratefully acknowledged especially the technical expertise offered to our Provincial Sector Planning Team (PSPT). JICA has taken a pivotal role hand in hand with the Department of Interior and Local Government in providing technical assistance in the formulation of this plan.*

*The importance of water development touches many other basic services and needs of our people in the field of social development. Health, sanitation, prevention of mortality from possible epidemics - these are only few of the social touchstones that adequate and potable water supply assists.*

*This provincial water supply sanitation and sewerage sector plan will serve as basis for the execution of sector development from Local Government Units budget base on local services and share from the Internal Revenue Allotment (IRA) from the national government and private sector investments.*

*Let us join hands together and support the Plan, a much welcome prospect in the province. Indeed, Bukidnon will greatly benefit if everyone lends a hand for the concretion and realization of this plan. May this day be soon.*

  
**CARLOS O. FORTICH**  
Provincial Governor



- LEGEND :**
- City and Provincial capital
  - City
  - Municipality
  - Provincial boundary
  - Municipal boundary
  - Major Rivers
  - 1st Class Road or Upper Grade
  - 2nd Class Road or Lower Grade

**Location Map**  
**Province of Bukidnon**



**PROVINCIAL WATER SUPPLY, SEWERAGE AND  
SANITATION SECTOR PLAN**

**VOLUME I MAIN REPORT**

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SANITATION SECTOR PLAN**

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**PROVINCIAL WATER SUPPLY, SEWERAGE AND  
SANITATION SECTOR PLAN**

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# PROVINCIAL WATER SUPPLY, SEWERAGE AND SANITATION SECTOR PLAN

## LIST OF ABBREVIATIONS

---

AC-PO	-	Area Coordinator-Project Officer
ADB	-	Asian Development Bank
AIDAB	-	Australian International Development Assistance Bureau
AIM	-	Asian Institute of Management
AIP	-	Annual Investment Plans
BC	-	Barangay Council
BDC	-	Barangay Development Council
BLGF	-	Bureau of Local Government Finance
BMGS	-	Bureau of Mines and Geo-Sciences (defunct), the now Mines and Geo-Sciences Bureau
BOD	-	Biochemical Oxygen Demand
BOD/Officers	-	Board of Director/Officers
BWP	-	Barangay Water Program
BWSA	-	Barangay Waterworks and Sanitation Association
CBO	-	Community-Based Organizations
CD	-	Community Development
CDA	-	Cooperative Development Authority
CDF	-	Countryside Development Fund
CDTS	-	Community Development and Training Specialist
CEP	-	Capacity Enhancement Program
CIDA	-	Canadian International Development Agency
CLGOO	-	City Local Government Operations Officer
CO-CD	-	Community Organization-Community Development
CPC	-	Country Program for Children
CPH	-	Census on Population and Housing
CPSO	-	Central Project Support Office
CSC	-	Civil Service Commission
D/D	-	Detailed Design
DA	-	Department of Agriculture
DAP	-	Development Academy of the Philippines
DBM	-	Department of Budget and Management
DECS	-	Department of Education, Culture and Sports
DENR	-	Department of Environment and Natural Resources
DEO	-	District Engineering Office
DF	-	Development Fund
DILG	-	Department of the Interior and Local Government
DOF	-	Department of Finance
DOH	-	Department of Health
DPWH	-	Department of Public Works and Highways
DSWD	-	Department of Social Welfare and Development
DTI	-	Department of Trade and Industry
EVS	-	Environmental Sanitation
F/S	-	Feasibility Study
FHSIS	-	Field Health Service Information System
FW4SP	-	First Water Supply, Sewerage and Sanitation Sector Project
GAD	-	Gender and Development
GFI	-	Government Financial Institution
GO	-	Government Office
GOP	-	Government of the Philippines

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## List of Abbreviations

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GOJ	-	Government of Japan
HH	-	Household
IBRD	-	International Bank for Reconstruction and Development
IEC	-	Information, Education and Communication
IRA	-	Internal Revenue Allotment
IRR	-	Implementing Rules and Regulations
ITN	-	International Training Network
JICA	-	Japan International Cooperation Agency
LBP	-	Land Bank of the Philippines
LGC	-	Local Government Code
LGU	-	Local Government Unit
LWUA	-	Local Water Utilities Administration
MDC	-	Municipal Development Council
MDF	-	Municipal Development Fund
MEO	-	Municipal Engineer's Office
MHO	-	Municipal Health Office
MLGOO	-	Municipal Local Government Operations Officer
MOA	-	Memorandum of Agreement
MOOE	-	Maintenance Operating and Overhead Expenses
M/P	-	Master Plan
MPDO	-	Municipal Planning and Development Office
MS	-	Monitoring Specialist
MSL	-	Municipal Sector Liaison
MSLT	-	Municipal Sector Liaison Team
MTPDP	-	Medium-Term Philippine Development Plan
MWSS	-	Metropolitan Waterworks and Sewerage System
MWSTF	-	Municipal Water and Sanitation Task Force
NAMRIA	-	National Mapping and Resource Information Authority
NCRFW	-	National Commission on the Role of Filipino Women
NDCC	-	National Disaster Coordinating Council
NEDA	-	National Economic and Development Authority
NGOs	-	Non-Governmental Organizations
NIA	-	National Irrigation Administration
NMP	-	National Master Plan
NMYC	-	National Manpower Youth Council
NSDW	-	National Standard for Drinking Water
NSO	-	National Statistics Office
NSMP	-	National Sector Master Plan
NWRB	-	National Water Resources Board
O&M	-	Operation and Maintenance
ODA	-	Overseas Development Assistance
OECF	-	Overseas Economic Cooperation Fund
PA	-	Provincial Administrator
PAIASO	-	Provincial Accounting and Internal Audit Service Office
PBO	-	Provincial Budget Office
PD	-	Presidential Decree
PDC	-	Provincial Development Council
PEO	-	Provincial Engineer's Office
PHO	-	Provincial Health Office
PIO	-	Public Information Office
PGSO	-	Provincial General Services Office
PLGOO	-	Provincial Local Government Operations Officer
PMC	-	Project Monitoring Committee
PMO	-	Project Management Office
PMU	-	Provincial Monitoring Unit

## List of Abbreviations

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POPCOM	-	Population Commission
PoW	-	Program of Work
PPAC	-	Philippine Plan of Action for Children
PPDC	-	Provincial Planning and Development Coordinator
PPDO	-	Provincial Planning and Development Office
PSPT	-	Provincial Sector Planning Team
PST	-	Provincial Sector Team
PTA	-	Parent Teacher Association
PTO	-	Provincial Treasury Office
PW4SP	-	Provincial Water Supply, Sewerage and Sanitation Sector Plan
PWSC	-	Provincial Water Supply and Sanitation Coordinator
PWSO	-	Provincial Water and Sanitation Office
RA	-	Republic Act
RDC	-	Regional Development Council
RDCC	-	Regional Disaster Coordinating Council
RHO	-	Regional Health Of
RHUs	-	Rural Health Units
RPMC	-	Regional Project Monitoring Committee
RSI	-	Rural Sanitary Inspector
RWSA	-	Rural Waterworks and Sanitation Association
SB	-	Sanggunian Bayan
SP	-	Sanggunian Panlalawigan
SSI	-	Supervicing Sanitary Inspector
SWL	-	Static Water Level
TESDA	-	Technical Education and Skills Development Authority
TCP	-	Teacher-Child-Parent
UNDP	-	United Nations Development Programme
UNICEF	-	United Nations International Children's Emergency Fund
VIP	-	Ventilated Improved Pit Latrine
WASAMS	-	Water and Sanitation Monitoring System
WATSAN	-	Water and Sanitation
WC	-	WATSAN Center
WD	-	Water District
WHO	-	World Health Organization
WID	-	Women in Development
WSSE	-	Water Supply and Sanitation Engineer
WSS-PMO	-	Water Supply and Sanitation-Project Management Office



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**EXECUTIVE SUMMARY**

**ES**



## EXECUTIVE SUMMARY

### 1. Introduction

#### Background and Objectives

The Provincial Water Supply, Sewerage and Sanitation Sector Plan (PW4SP) for the province of Bukidnon was prepared by the Provincial Sector Planning Team with technical assistance from Japan International Cooperation Agency (JICA). The PW4SP will be the basis for execution of sector development from proceeds of sector loan by foreign donors, LGU's budget including internal revenue allotment from the National Government and private sector investments.

The PW4SP covers a Long-Term Development Plan (2004-2010) and a Medium-Term Investment Plan (1999-2003) to achieve the provincial targets of water supply, sewerage and sanitation sector. The plan includes arrangements and logistics for implementation and measures to strengthen operational frameworks and institutional capabilities that embody community development and gender responsiveness. As an initial step towards capability building, the Study was designed with the end view of strengthening the LGUs capability in sector plan preparation through conduct of series of workshop and hands-on training.

#### Planning Approach for Future Sector Development

The primary bases of the PW4SP are national sector policies and strategies, as well as major legislation and regulations relevant to the sector. The guidelines for setting the provincial sector targets are the three national level plans: the Philippine National Development Plan (1999-2024), the Water Supply, Sewerage and Sanitation Master Plan of the Philippines (1988-2000) and the Updated Medium Term Philippine Development Plan (1996-1998). The GOP recently approved the IRR providing detailed arrangements on the devolution of WATSAN responsibilities and resources. Parallel to this are the current sector policies and strategies, to wit: i) self-reliance and local community management of services; ii) an integrated approach to water, sanitation and hygiene education; iii) cost sharing arrangement; iv) cost recovery of capital and O&M; v) private sector participation; and vi) an integrated water resources strategy.

The PW4SP will help ensure that sector investments are optimized in consideration of fund and water source availability constraints as well as planning capacity. It is envisaged that the Plan will be progressively updated as its implementation proceeds. Furthermore, future detailed studies and plans for project implementation shall be conducted in the context of the PW4SP.

A data management system was established as a tool to come up with the outputs commensurate to the objectives of the provincial plan and at the same time reflect the planning approach. It will provide a map of relative needs in the province allowing for adjustment and updating when further information becomes available. Different scenarios may be worked out by planners using the program by changing key parameters based on planning assumptions and conditions.

#### Report Composition

Three (3) study reports were prepared as follows: i) Main Report (Volume I) which presents the results of the whole study consisting of 12 chapters; ii) Supporting Report (Volume II); and iii) Data Report (Volume III). Supporting materials including alternative studies and detailed calculations, and data/information constitute the last 2 reports.

## **2. Provincial Profile**

The landlocked province of Bukidnon is one of the 4 provinces in Region X, the Northern Mindanao Region. The City of Malaybalay, the seat of the provincial government is about 91km south of Cagayan de Oro City, the regional center. It is comprised of 21 municipalities and 1 component city with 464 barangays broken down into 82 urban and 382 rural. The province is classified as 1<sup>st</sup> class. At the municipal level, 4 municipalities belong to 5<sup>th</sup> class, the rest has higher classification. The population of the province was 940,403 in 1995 with an annual growth rate of 2.05% between 1990 to 1995.

#### Physical Features

The province has 2 types of climate under the Coronas classification. Type III, which is experienced in the northern part is characterized by the absence of a very pronounced maximum rain period with a short dry season. Type IV, which is experienced in the southern part has a rainfall that is more or less evenly distributed throughout the year. The average annual rainfall was registered at 2,567.28mm. The topography of the province is generally described by slightly undulating and rolling upland areas cut by deep and wide valleys. There are clusters of small volcanoes, mostly extinct, the most dominant is Mt. Kitanglad with an elevation 2,838 meters.

There are 2 major surface waters in the northern part of the province, the Tagoloan River and the Cagayan River with watersheds of 1,704km<sup>2</sup> and 1,521km<sup>2</sup>, respectively. The Pulangi, Sawaga and Muleta rivers drain the southern part of the province and have a total watershed

of 23,169km<sup>2</sup>. A mere 33% of the total land area of the province constitute the remaining forestland, while 37% and 30% are devoted to grassland and agriculture, respectively. Built-up area is less than 1% of the total provincial area. The existing land use pattern must be enhanced by rehabilitation of watersheds in order to pursue a sustainable growth of the province.

#### Socio-economic Aspects

Bukidnon is basically an agricultural province. The major economic activities are farming and livestock production. The average annual family income in 1994 was ₱ 52,627 which, was below the national average of ₱ 83,161. Moreover, about 70% of the total number of families lived within and below the established poverty threshold income of ₱ 43,659 in Region X.

All municipalities have electric supply with 54% household coverage. Telecommunication service is also available in all municipalities, giving 100% coverage. Inter-municipal land transportation is available by means of jeepneys, buses and cars. There are only 28 banking institutions and 3,444 industrial/commercial establishments and 20 tourism-related facilities. With regard to social services, there are 762 schools, 33 hospitals, and 291 health units and barangay health stations.

Provincial population growth rates had been declining for the last 6 censal years. The 1997 population was estimated to provide the planning base for this provincial plan. Considering the 1995 NSO classification of urban and rural barangays, rural population accounts for 70%, while the remaining 30% is urban.

An indicator of health problem related to water supply and sanitation is the high incidence of water-related diseases. The reported cases in the province were typhoid, viral hepatitis, diarrhea, cholera, intestinal parasitism, skin disease, malaria, dengue fever and schistosomiasis.

Environmental problems related to wastewater discharge and unsanitary solid waste disposals are occurring in parts of the province. Major pollution sources in urban areas are domestic wastewater and dumped garbage. Only 22% of the total households in the province relied on the municipal refuse collection services.

### 3. Existing Facilities and Service Coverage

The service coverage of each sub-sector is estimated as percentages of served population/households/utilities against the total number. In water supply, safe classification of Level I facilities is introduced and further categorized into public or private. Apart from household toilets, school toilets and public toilets are included in the sanitation components in view of public hygiene improvement. Preliminary discussions on solid waste management are also considered.

#### Water Supply

The province has 30 Level III systems operating under different type of ownership (authority or association). These are 5 water districts, 7 municipal waterworks and 18 RWSAs operated systems. Most of these systems adopt the combined system with communal faucet (Level II service). Common issues encountered are rationing due to insufficient water pressure caused by unlimited connections, inadequate capacity of distribution pipes due to inappropriate planning and designing, and irregular regular disinfection. Collection efficiency of water charges is quite high in bigger networks, which is in contrast with smaller waterworks offices that experienced very poor collection performance due to weak management practice.

There are 152 Level II systems operating in the municipalities and a component city. The majority of which are utilizing spring sources (132 systems), while 19 systems use deep wells and 1 is using surface water. Most of the waterworks applying pumping systems has limited water supply. This is due to insufficient capability of facilities and inability to collect payments of electric charges. About 30% of the waterworks office impose a flat rate water charge between 5 to 20 Pesos/HH/month. The rest supplies water free of charge. Repair works are often done with the assistance of the MEO or Task Force Division of the Provincial Government.

Level I facilities are common in rural barangays, majority of which are privately owned. Of the 12,140 operational Level I facilities, 21% are shallow wells. According to the PHO, 50% of the shallow wells are considered as unsafe water sources. All deep wells, covered/improved dug wells and developed springs are regarded as safe water sources. Most of these unsafe sources are located in nearby potential pollution sources, hence, for new construction of shallow wells, proper site selection and appropriate construction method shall be applied together with periodic water quality monitoring. Percentage shares between public



and private Level I facilities for rural water supplies are 13% and 87%, respectively. The share of developed springs in public facilities is 46%.

About 78% or 770,300 of the present population (982,300 comprising 30% in urban area and 70% in rural area) are adequately served. Under area classification, 74% of urban population and 80% of rural population have access to safe water sources/facilities. Of the served population, 17% or 130,900 persons are served by Level III systems. About 73% or 562,600 persons depend on Level I facilities, while the rest relies on Level II systems.

#### Sanitation and Sewerage

The service coverage with sanitary toilets in the province is 67% or 123,500 of the total households, which is higher than the national coverage of 60%. These toilets consist of 13% flush type, 67% pour-flush type and 20% VIP/sanitary pit privy. In municipalities that have high water service coverage (Valencia, Quezon), high sanitation coverage occurs, and adversely, in low water supply coverage (Don Carlos, Kadingilan), low sanitation coverage also occurs. Service coverage in urban area is a high 87%, while in rural area, a much lower coverage of 59% is reflected. Although high percentage of sanitary toilets is disclosed in urban areas, problems arise from the unsatisfactory disposal of the effluent from the septic tanks or the direct discharge of wastewater to the local drains. Sullage management is unheard of. There is no sewerage system in the province at present.

The province has a total of 2,638 toilets installed in 742 schools. Only 36% of the students is adequately served by sanitary toilets. The present average ratio of 109 students per sanitary toilet is far below the service level standard of 40 students per sanitary facility. Some of these facilities are not being used due to lack of water supply, destroyed plumbing fixtures and water tank seepage. There are 89 public toilets found in public utilities; public markets, bus/jeepney terminals, and parks or plazas in the province. Of these public toilets, 97% are sanitary. However, the manner of usage and maintenance are improper rendering the facilities unsanitary. At present, no specific arrangement are made for the operation and maintenance, as well as the collection of fees to cover such cost.

#### **4. Existing Sector Arrangements and Institutional Capacity**

##### Institutional Framework

The Local Government Code has essentially re-defined the roles, relationships, and linkages of central, provincial, municipal and barangay institutions in the provision of social basic services, including water and sanitation. The new direction mandates the LGUs to play a

larger role in planning and implementing water supply and sanitation projects. However, this has raised serious institutional capacity and resource reallocation issues.

Drastic changes took place among the DPWH, DILG, DOH and LGUs after the government's decentralization and issuance of NEDA Board Resolution No.4 (1994). To ensure common interpretation of the Resolution, the Implementing Rules and Regulations (IRR) for the relevant sector was prepared. The role of implementing water supply projects, which DPWH used to undertake, has been transferred to the LGUs. The functions of the IPHO under the DOH have also been devolved to the LGUs. It is now the DILG, which provides overall coordination over the implementation of WATSAN projects of LGUs. The Water Supply and Sanitation-Project Management Office (WSS-PMO), a unit within DILG, is the main office responsible for water and sanitation activities.

At the provincial and municipal levels, there are central agency field offices (DPWH and DILG) and LGU offices working on the sector. Water districts, RWSAs, and BWSAs have been organized to deliver the services. Some LGUs implement and operate municipal or provincial water and sanitation systems. Project management offices (PMOs at the central level), ad hoc inter-agency committees, and task forces have been organized to address coordination issues.

The current major institutional issues are: (1) managing the transition process, and (2) re-establishing the leadership for the sector. Major resource realignments and capacity building initiatives are needed. At the local level, the LGUs' capability to handle sector projects is insufficient and will require substantial input and support.

There is wide dissatisfaction among implementers themselves over the existing monitoring system. This leads to the problem of reliability of information coming from the field. There is a need to establish a system similar to project-based monitoring which will have a direct link to performance.

#### Community Development

The Province of Bukidnon has had experience in community development work through many of the projects it has handled in the past. The province believes in community participation as one of the basis for its development and follows this precept in coming up with barangay development plans. But WATSAN sector projects are considered as just one component in its over-all planning system in the province. Thus, there is no CD process or frame-

work designed strictly for the sector. The manner by which CD/CO work is done was how it was done in past sector projects, particularly the Barangay Water Program.

While a unit exists within the PPDO and PHO to take charge of CD work for its development projects, these units remain as boxes in the organization chart. As such, there is an apparent lack of the identified major responsible players on CD in the LGUs, particularly for the WATSAN sector. These create a serious gap to the critical linkage and support of sector projects, from the provincial to the municipal and as far down as the barangay levels.

There have been training programs on social mobilization for community development; but for these programs to be effective, it should be made regular and should reach out to all the LGUs in the province. As for the NGOs, there are several working with the province. These NGOS can be tapped for their varied expertise, more particularly in community mobilization/organizing work.

#### Gender Consideration

The Province of Bukidnon has been implementing GAD projects for some time now. The inclusion or utilization of gender-sensitive approaches to planning and implementing WATSAN sector projects has been limited, however, to the health and sanitation and hygiene aspects or projects. The total mainstreaming or integration of gender into WATSAN sector projects has still to be realized.

Key informant surveys and group interviews were conducted to determine the degree of community participation on the sector of barangay officials and their constituents, with emphasis on gender-related issues. The following were the findings, from the surveys and interviews:

- The barangay councils were male-dominated; four of the five barangay captains were males.
- While there is no gender bias when it came to awareness of sector related information, women are not given enough responsibilities in the O&M of water facilities. The respondents agreed that women could undertake simple repair and maintenance or handle water bill collection.
- Men constituted the majority of the population in the two barangays.
- The men were responsible for fetching water, which was done three times a day for 30 minutes.
- Both men and women were not consulted on their roles and responsibilities on past WATSAN projects but indicated willingness to actively participate in future projects.

- The respondents attended various training programs in 1997. Both the male and female respondents, however, wanted to attend training programs for BWSA members, including health education.

## 5. Past Financial Performance in Water Supply and Sanitation

Since the devolution of the water supply and sanitation project to the LGUs in 1992, the LGUs have been dependent on the Internal Revenue Allotment (IRA) for their financial requirements. For the period 1995-1997, the IRA of the province represented about 86.62% of the total income. The provincial government has no economic enterprises but it receives municipal income, not on a regular basis from the following: fees and charges from small-scale mining and sand and gravel operations. It manages a provincial hospital subsidizing for their operation, since hospital fees being charged are very low. In addition, it has a health insurance project and a low-cost housing project, which are being subsidized by the province.

On the other hand, actual expenditures for the same period were 81.34% of the total revenue. These expenditures are further broken down into personnel (39.62%), capital outlay (17.00%), and operation and maintenance expenses (24.72%).

The funds for the development are part of the capital outlay of the province. The amount of debt servicing capacity of the provincial government is computed to be ₱ 85.6 million for the year 1998, which represents the maximum loanable amount through the MDF.

Funds for the capital outlay are mainly derived from 20% DF of the IRA. During the period 1994-1998, the 20% DF of the province was not sufficient to cover the actual expenditures for 1995 and 1997. For 1998, it is projected that the 20% DF is more than adequate to cover the capital expenditures of the province. The province allocates a higher percentage of about 3.76% of its IRA funds to WATSAN sector as compared to the other provinces' allocation of about 2% or less of IRA to WATSAN.

Planned sector investments during the period 1994-1998 in the AIP amounted to about ₱218.37 million, but the actual expenditures for the sector from the 20% DF were only ₱29.58 million or only 13.54% of the required investments. Of the investments, Level II and III amounted to about ₱ 163.98 million, while Level I water supply was only ₱ 16 million or one tenth the investment for Levels II and III.

The sector projects in previous years were implemented by the task force under the Provincial Engineering Office (PEO) and the DILG (BWP-institutional building, UNDP-WATSAN and CIDA - capability building). Currently, the provincial government provides the prioritized WATSAN projects with funds under the social services sector. The PEO-Waterworks implements the provincial government funded projects under the General Fund. For sector implementation, the following are the local funding sources and corresponding implementing agencies: funding sources are the provincial government, the CDF (Congressmen) and the municipal government. The respective implementing agencies are the PEO-Waterworks, the DPWH-District Office and the Municipal Government.

With regard to the capital cost recovery for Level I water supply, it was free to the community in the past. For Level II systems, the capital cost is shouldered by the RWSAs through a loan or grant, while for Level III, the WDs or RWSAs bear the entire cost. Level III systems are usually financed by the LWUA for a period of up to 30 years with interests ranging from 8.5-12.5 %. For less capable WDs, soft loans without interest for the first 5 years of operations are available. Regarding sanitation sector, construction of the superstructure and the depository of household toilet is through self-help.

In 1998, a cost-sharing scheme was authorized, which prescribed that for any central government grants that are provided for the development of Level I water supply and sanitation facilities to the limited municipalities, the LGUs and beneficiaries concerned shall share the capital cost required. No subsidies from the central government will be provided for the construction of Level II and Level III water supply systems.

The O&M cost for Level I and II water supply system is the responsibility of the users. It is mandatory that the community shall organize themselves into an association, which handles collection of water charges as well as O&M of the facility. However, most of the RWSAs and BWSAs reportedly had difficulty to manage the systems, since beneficiaries do not recognize the cost requirements. The monthly fees for Level I in the active association range from ₱10 to ₱50 /household /month. For Level III systems, the O&M cost is basically covered by the user's fees. LWUA's policy is to make WDs financially viable, self-sufficient and be able to repay their loans obtained to improve water supply services. Four (4) WDs and 11 waterworks are currently operational in the province. These WDs have no current loan arrears with LWUA.

The percentage of water fee to median monthly household income is about 4.5% for Level III, 2.97% for Level II and 1.45% for Level I. Thus, the current water rates in all service lev-

els are within an affordable range. On the other hand, construction cost of household toilet seems to be expensive comparing with the family income.

## 6. Water Source Development

The study on water source development covers the entire province. It gives an emphasis on groundwater availability rather than surface water considering its economic advantages and current practices in potable water use.

The geologic rock units observed in the province are classified into 3 main groups based on the ages of the rock formations: the Miocene and Older Systems, the Plio-Pleistocene Series, and Recent Deposits. The Miocene and Older systems are largely distributed in the eastern, northeastern, and northwestern sides of the province. The Plio- Pleistocene series are widely distributed in most of the western areas of the province, covered by the piedmont areas of two old non-active volcanoes, Mt. Kitanglad and Mt. Tago. The Recent Deposits are distributed only along the Pulangi River flowing from southeast to northeast between the volcanoes and the eastern plateau.

For planning purposes in the development of groundwater sources, the provincial area is divided into shallow well, deep well and difficult areas. No solo shallow well area is defined in the province. Deep well area covers about 55% of Bukidnon, while difficult area falls on the remaining area. The shallow and deep wells in the piedmont areas with higher elevation around the two old volcanoes are affected by water quality problems such as high Fe and Mn contents.

Based on the inventory of water sources prepared during the study, the province has 806 developed springs currently serving the province, which come out from high volcanic mountain areas in the central and eastern parts of the province. A total of 108 untapped springs for future development are reported in the mountainous municipalities, which belong to the volcanic areas and the Central Mindanao Cordillera. Municipalities outside these areas have few untapped springs.

According to the existing well inventory, the depth of potential aquifers occurs between 20 to 180m in the Recent alluvium and the Plio-Pleistocene rocks. The development of deep wells is more advantageous than shallow wells considering the safe quality and invariable yield of deeper aquifers.