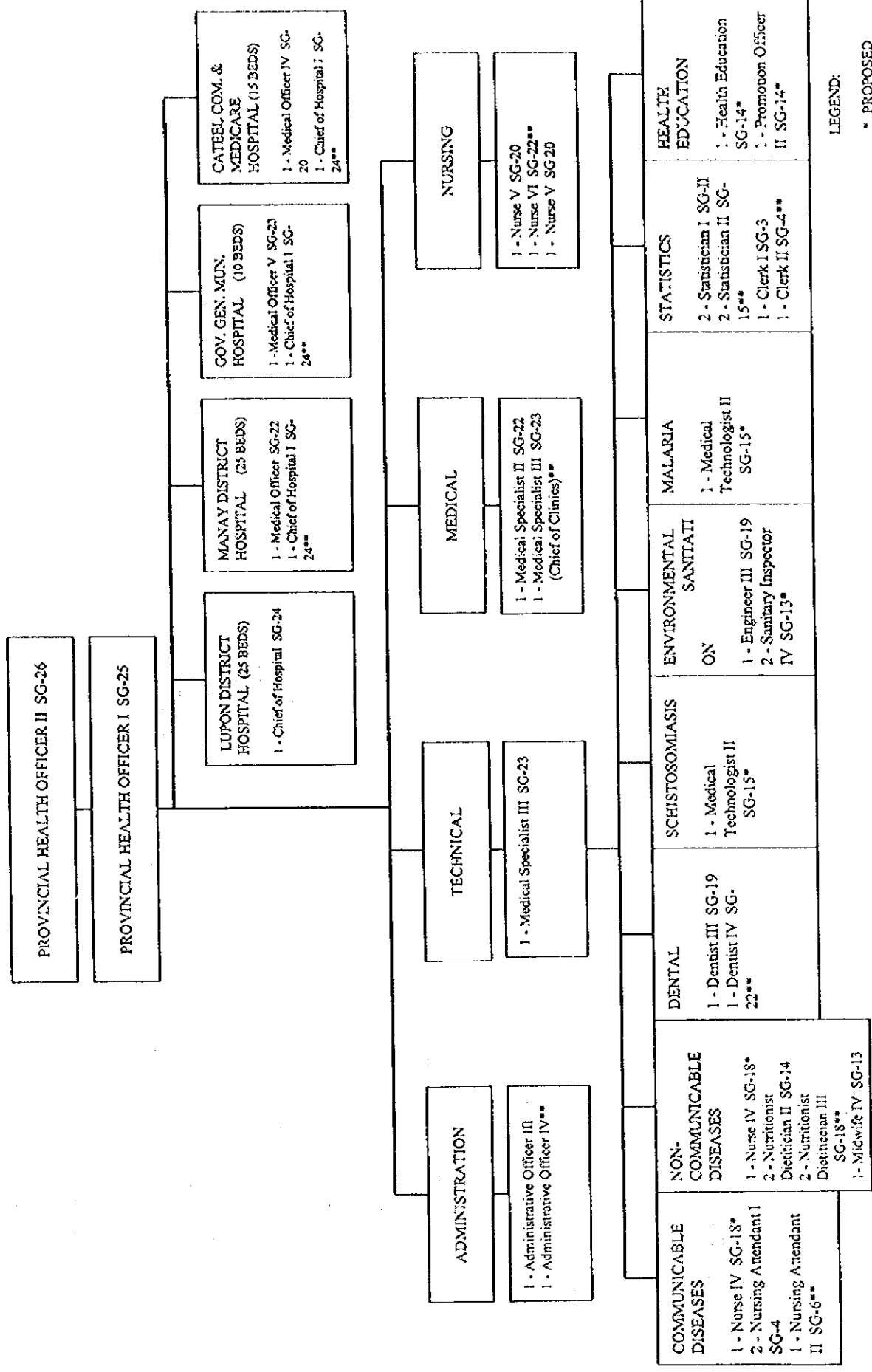


Figure 5.5.2 Organization Chart. Provincial Engineering Office of Davao Oriental



LEGEND:
 * PROPOSED
 ** UPGRADING

Figure 5.5.3 Organization Chart, Provincial Health Office of Davao Oriental

5.6 External Support Agencies in the Sector

Table 5.6.1
Priority Areas/Terms and Conditions, Programs and Projects by Donor

Donor	Priority Areas/Terms and Conditions	Programs and Projects in the Sector/Executing Agency
OECD	Providing project loans for <i>capital infrastructure (urban, rural), agricultural development, export promotion</i> . Can finance 75% of total project cost of total foreign exchange component, whichever is higher. Interest Rate: 2 to 3%; 30-year amortization with 10-year grace period. Environmental projects; interest free.	Water Supply and Sanitation Project-23rd Yen Package/DILG; Co-financing AWSOP with World Bank and ADB/MWSS.
ADB	Providing both capital and technical assistance; Project loans: <i>agriculture, agri-industry, energy, social infra., transport and communications</i> ; Program Loans: sector loans (e.g., <i>forestry, livestock, environment</i>). Can finance 60% of total project cost or 100% of foreign exchange cost whichever is higher. Special cases can finance up to 80% of total project cost. Terms: Interest rate- pool-based variable; commitment charge of 0.75% per annum; 25 years amortization period including 5-year grace period.	Rural Water Supply and Sanitation Sector Project/DPWH; Small Towns Water Supply Sector Project/LWUA; Technical Assistance for Water Supply and Sanitation Sector Study/NEDA; Co-financing AWSOP with World Bank and OECF/MWSS.
AUSAID	Providing grant aid for <i>education, training, development planning, resource management, environmental management, health/population, infrastructure</i> (e.g., <i>water supply, coal energy development</i>), <i>social infrastructure, community development and agriculture</i> ; providing also supplies of commodities (steel cattle, drilling).	Water supply program in Central Visayas/RDCs and LGUs; Feasibility Study for Northern Mindanao Water and Sanitation Project.
DANIDA	Providing capital and technical assistance for <i>water supply and sanitation services and facilities, telecom ancillary equipment, small-scale power projects, environmental project, fishery and cold storage and post-harvest facilities</i> ; Can finance up to 100% of foreign exchange goods and services of Danish origin, 10% local cost on a case-to-case basis. Technical assistance can be negotiated for conduct of feasibility studies if implementation of the project will require Danish financing in the future.	Water supply projects for 10 towns/LWUA; Feasibility Study for control of pollution in the Pasig River-Metro Manila; Water Supply and Sanitation Data Bank.
Government of France	Grants for feasibility studies and detailed design for projects in priority areas, e.g., <i>power generation, telecommunication, research involving high technology, water supply, air navigational equipment, etc.</i> Can finance 100% of foreign exchange costs of goods and services of French origin.	Feasibility Study for water supply project in Rizal province.

Priority Areas/Terms and Conditions		Programs and Projects in the Sector/Executing Agency	
Donor German Agency for Technical Cooperation (GTZ)	Providing grants for technical assistance. Promotion of small and medium-scale industries, rural development, technical training, health/family planning, and environmental protection (forest management).	Water Supply for 20 Towns/LWUA; a national water supply and sanitation on-going program; special TA programs for cost recovery, monitoring and evaluation.	
JICA	Providing a combination of capital assistance thru grant-aid and technical assistance thru Technical Cooperation for development survey and project type assistance which is a combination of experts, equipment and training. Technical assistance for conduct of feasibility studies/master plans, provision of training, limited provision of equipment. Capital assistance for provision of equipment/materials for construction of hospitals, schools, research, social welfare centers. Priority areas include basic infrastructure, e.g. construction of facilities and supply of equipment; project development for sectors dealing with basic services (agriculture, health public welfare, environment) and human resource development (education, research, training). Can finance 100% of foreign exchange costs of civil works, equipment, training (in Japan) and of all goods and services of Japanese origin.	Groundwater study in Manila; Feasibility Study for Balara Water Treatment Plant; Feasibility Study.	
UNDP	Providing technical assistance for capacity building, human resource training, technology transfer, policy research, planning, technology development and pre-investment studies. Technical assistance are formulated within country program (CP) frameworks: 6th CP (1997-2001) -poverty and sustainable livelihood, protection and regeneration of the environment and sound governance, gender equality.	WATSAN Program for LGUs and selected BWSAs/DILG.	
UNICEF	Providing grant aids for technical assistance. Priority area: social services, particularly for children.	Community-based water supply program in Palawan Province; Water supply and sanitation Study for Southern Mindanao.	
USAID	Providing grant aid within its strategic objectives. Six strategic objectives and one special objectives are: Accelerate the economic transformation of Mindanao; Improve national systems for trade and investment; Reduce population growth and improve maternal and child health; Enhance management of renewable national resources; reduce emissions of greenhouse gas; broaden participation in public formulation/implementation (selected areas); prevent rapid increase of HIV/AIDS.	Barangay Water Program (BWP) for communities with populations of less than 10,000; TA for private sector participation in the sector.	
World Bank	Providing capital assistance in the form of under IBRD and IDA. IBRD (Project/Program) Loans: interest rate = less than 7%; 20 years amortization with 5 years grace period; IDA Loans: interest free with 30 to 40-year amortization period. Providing also technical assistance in the form of ESW, IDP, Poverty and Human Resource Development Project Preparation and Policy Notes. Can finance 100% of foreign exchange costs of the project. Priority areas: power and energy, roads and railways, telecommunications, ports, water supply and sanitation, agriculture and social services.	AWSONP co-financed with ADB and OECF/MWSS; TA for a Water Supply Sector Program Study/DILG; TA on private sector participation in the water supply and sanitation sector. Water Distriets Development Project.	

5.7 Project Management Arrangement, and Issues and Problems
 5.7.2 Institutional Aspect

Table 5.7.1 Office/Agencies involved in WATSAN project

Office/Agencies	Nature of Involvement
Provincial Engineering Office	Assists in the construction, operation and maintenance of the WATSAN facilities
Provincial Health Office	Conducts water quality examination Provides toilet facilities
DILG, Provincial Office	Conducts/assists training especially on topics related to human resource development
Barangay/Municipal governments thru MPDO	Identifies projects Provides counterpart support during implementation
District Engineering Offices I & II, DPWH Water Districts	Provides pipes Implements central govt. funded projects Provides water supply coverage in urban areas
CIDA-PMO Regional Office	Provides technical and financial assistance through its Local Govt. Support Program
Provincial General Services Office	Responsible in procurement of materials
Provincial Accounting and Audit Office, Provincial Budget Office & Provincial Treasury Office	Responsible in financial releases
NGOs	Provides consultancy services especially in CO/CD works
Sangguniang Panlalawigan	Appropriates funds

5.8 Community Development

5.8.1 General

(1) RESULTS OF THE BARANGAY KEY INFORMANT SURVEY FOR DAVAO ORIENTAL.

I. BARANGAY

A. General

The barangay is the smallest political unit in the Philippines. It is headed by a barangay captain who is elected for a three-year term. Together with the barangay council, the barangay captain is responsible for running the affairs of the barangay. Water supply and sanitation sector projects are important to the barangay. Benefits are directly related to health and productivity, as well to improved economic activities in the community.

The key informant survey was conducted in five barangays representing four municipalities in Davao Oriental. The key informants were either an official of the barangay council, an official of the BWSA, or a recognized community leader. The purpose of the survey was to find out the degree and type of government assistance on the sector that cascades from the national government down to the barangay level. The barangays surveyed were: San Rafael, Cateel; Poblacion, Banay-Banay; Macangao, Lupon; and Dawan and Bados, both in Mati.

B. Community Organization

1. Manner of Participation in Sector Development

The need for water supply and sanitation facilities is discussed within and prioritized by the barangay development council (BDC). If the barangay is not able to finance the WATSAN project from its own funds, the BDC then endorses the project to the municipality. Again, the prioritization and funding of the endorsed project is discussed in the municipal development council (MDC). If the municipality can finance said project, then it does so, usually by providing technical and material support. The barangay is asked to contribute its share, which is usually in the form of free labor. If, however, the municipality cannot fund the barangay's request, the project is once again endorsed, but this time to the province. The project is then discussed/prioritized and provided funding by the provincial development council. If implemented by the province, a counterpart is

asked of the barangay and sector participation is in the form of free labor and/or donations in cash or in kind.

2. Existing Community Organization Serving /Acting as the Water Association

The BWSA is still the WATSAN organization that serves the community. None of the barangays was able to identify any community-based organization that could act as a water association, aside from the BWSA.

3. Role of the Barangay Council in O&M Assistance in the Form of Funds/ Manpower/Materials

Of the four BWSAs that have been organized, two had association members who have been trained to operate and maintain the facilities. However, barangay councils in all the barangays surveyed are willing to pay for the training of BWSA members on O&M of the facilities.

II. COMMUNITY PARTICIPATION

A. General

Beneficiaries' participation is recognized as one of the determining factors in the success of the WATSAN sector plans on the community level. Participation by the barangay people is measured by their willingness to organize themselves into a water association and contribute their share towards its sustained operation. This may come in the form of free labor, donations in kind or in cash, or their active involvement in the management, operation and maintenance of the WATSAN facilities.

B. Socio-Economic Conditions

1. Average Monthly Income in the Rural Area

The average monthly income of the households in the barangays surveyed range from ₱2,000.00 to ₱4,000.00. The list of economic activities shows the following: farming, poultry, vegetable gardening, livestock raising, and sari-sari-store. The list shows both genders equally involved in these economic activities.

2. Water Borne/Water Related Diseases

Incidence of waterborne and water related diseases were reported in three of the barangays surveyed. This could be traced to unsafe sources of supply, especially in the barangays where BWSAs are no longer in operation or in fringe areas not presently served by the BWSA facilities.

C. Willingness to Participate

1. Initiating the Organization of a WATSAN Association

Only one out of the five barangays surveyed does not have a committee on water and sanitation. All the respondents indicated the barangay council's willingness to participate in sector projects by initiating the formation of a water and sanitation association in their communities. At the same time all respondents indicated that the barangay council is willing to pay for the training for the user-beneficiary volunteers on O&M. In the area of health and sanitation education, everyone also believed that the barangay council has the capability to implement information dissemination activities.

D. Status of BWSAs/NGOs/CBOs/POs

1. Number of Barangays with Functional BWSAs

Four out of five barangays surveyed have a BWSA organized in their communities. Of these, only two barangays have functional BWSAs.

2. Status of NGOs/CBOs/POs

All the barangays reported having NGOs/CBOs that do work in their communities. The areas of concern are in farm technology, ecology/environmental protection, and peace and order. Those specifically related to sector needs are: (1) Cateel Farmers Association (headed by Mr. Agardo Reyes) that specializes in community organizing; and (2) Pagear (headed by Miss Florentina Magpusao) which specializes on environment.

E. O&M Practices by Beneficiaries

1. Facility Conditions

The barangays are supplied with water from a combination of sources: shallow wells and deep wells. All barangays reported that the facilities are still functional but occasionally have problems. Most respondents, however, believe that water is safe for drinking.

2. Common Difficulties and O&M Problems Encountered

Common problems cited by the respondents range from defective pumps, to no funds for maintenance work, lack of financial support, wells drying up and rusty, foul smelling water. The problems show that the users/beneficiaries still have the thinking that O&M is a task that belongs to others such as the barangay council or the municipality. Prevalent is also the dole-out mentality; where the people just wait for O&M funds rather than generating this through water fees.

F. Water Charges Adopted and Collection Efficiency

1. Sufficiency of Collected Charges for O&M

The majority of key informants believe that fees charged are not sufficient to cover for the operation and maintenance of the WATSAN facilities. The users in all barangays surveyed were reported to be paying their water fees.

2. Current Practices with Affordability by Users and Manner of Fee Collection

The BWSA collector was responsible for collecting the fees in two barangays, the treasurer in one barangay, and the caretaker in another barangay. The cost of water was below ₱10.00 per month in all barangays.

G. Requests by the Beneficiaries on O&M of the Facilities from LGUs and other Sources

1. Government Subsidies Requested by End Users

Only Barangay San Rafael in Cateel was a recipient of technical and institutional assistance from the provincial government. It received IEC materials for health and hygiene education program and some construction materials for the improvement of the facilities.

III. GENDER

A. General

The importance placed on gender is still something new in the province. However, the survey results point to growing responsiveness to sector projects, with an increasing awareness as to why there must be gender equality.

B. Gender in the Composition of the Barangay Council

In the five barangays surveyed, the total number of barangay council members is 47. Of this number, 32 were males and 15 females. The barangay councils are still male-dominated; that is, there was no case that the women outnumbered men in the composition of the council. All of these barangays are also headed by male barangay captains.

C. Gender in the Composition of the BWSA

Respondents from only three barangays indicated the gender composition of their respective BWSA board. In the three barangays, the men outnumbered women, 30-3 in the board. The women members were reserved the traditional roles, such as that of secretary or treasurer of the board.

D. Gender in Participation in the O&M of the Water Facilities

The men believe that they participate more in the O&M of the water facilities. On the other hand, the women almost overwhelmingly indicated that they also participate in operating and maintaining the WATSAN facilities. The men stated their functions as: (1) being the chairman or officer of the BWSA, (2) collecting certain fees for the O&M of facilities; and

(3) undertaking of repair/remedial action for O&M of the facilities. The women, on the other hand, stated their functions as: (1) being an officer of the BWSA (secretary or finance officer); (2) in charge of collecting water fees or purchase materials; (3) maintaining the surroundings of the facilities; and, (4) disseminate information to the members.

E. Gender in Knowledge or Awareness of Sector Related Information

There is no gender bias when it came to awareness of sector related information. Both women and men were knowledgeable as seen from the answers to questions such as assistance extended by LGUs, facility conditions, O&M practices, and the status of BWSA.

(2) RESULT OF GROUP INTERVIEW (DAVAO ORIENTAL)

1.1 General

Group interviews were conducted in two selected barangays representing two municipalities in the province of Davao Oriental. The objectives of the group survey/interviews were to identify potential service population and service level desired by the community, to assess the degree of involvement of both men and women in planning, managing, operating and maintaining WATSAN projects; and the willingness and capacity to pay of potential users.

The Project Team conducted the interviews on two sets of interviewees: an all female group and an all male group, each consisting of a minimum of 10 and a maximum of 20 participants. None of the respondents belonged to the same household. Answers to interview questionnaires were made by raising of hands. The group interviews were conducted in the following barangays: Manikling (San Isidro) and Matiao (Mati).

1.2 Demographic Profile

(1) Population

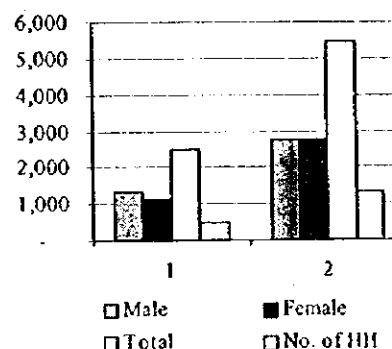
The aggregate population in the two barangays totaled 7,956, breakdown of which is as follows: Manikling, 2,474 (1,336 males, 1,138 females) and Matiao, 5,482 (2,740 males, 2,742 females). Males outnumbered females by almost three percent.

(2) Households

As indicated by the respondents, there are 1,781 households in the two barangays. Breakdown per barangay is: Manikling, 457 and Matiao, 1,324. The figure represents an average of almost five members per household.

TABLE 1: TOTAL POPULATION OF BARANGAYS AND NUMBER OF HOUSEHOLDS

BARANGAY (MUNICIPALITY)	M	F	T	NO. OF HH
1. Manikling (San Isidro)	1,336	1,138	2,474	457
2. Matiao (Mati)	2,740	2,742	5,482	1,324
TOTAL	4,076 (51.25%)	3,880 (48.75%)	7,956 (100%)	1,781



(3) Composition of Barangay Councils

There are 14 barangay council members in the two barangays. Of the barangay council members, eight were males and six females. All barangay captains were males.

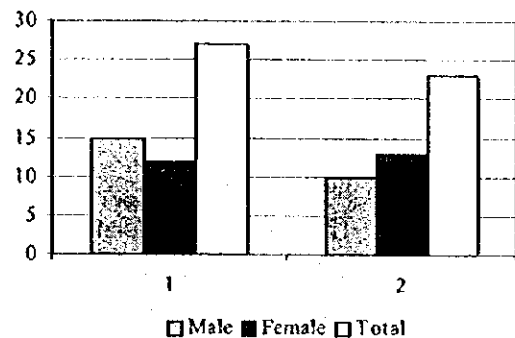
1.3 Respondents' Profile

(1) Number and Gender of Respondents

There were 50 respondents in the group interviews. Of these, 25 or 50 percent were males while the other half were females. Below is the breakdown of the number of respondents by gender for each barangay:

TABLE 2: NUMBER OF RESPONDENTS

BARANGAY (MUNICIPALITY)	M	F	T
1. Maikling (San Isidro)	15	12	27
2. Matiao (Mati)	10	13	23
TOTAL	25 (50%)	25 (50%)	50 (100%)

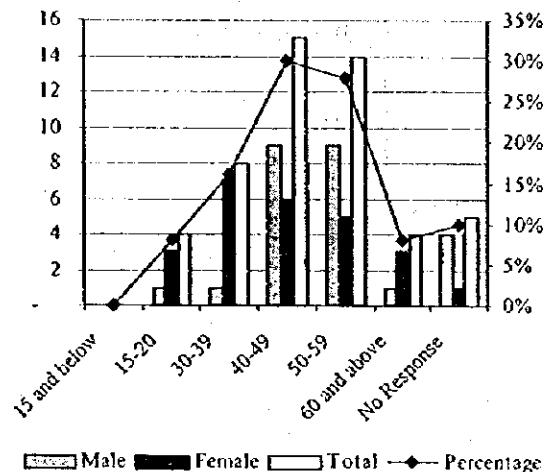


(2) Age Bracket

The majority of the respondents or 15 belonged to 40 to 49 age bracket, with males outnumbering females, 9 to 6. A total of 14 (9 males, 5 females) were under the 50 to 59 age bracket, while 8 respondents (1 male, 7 females) belonged to 30 to 39 age bracket. Five respondents did not respond to this question.

TABLE 3: AGES OF THE RESPONDENTS

AGE BRACKET	M	F	T	%
15 and below	-	-	-	-
15-20	1	3	4	8.00
30-39	1	7	8	16.00
40-49	9	6	15	30.00
50-59	9	5	14	28.00
60 and above	1	3	4	8.00
No Response	4	1	5	10.00
TOTAL	25	25	50	100.00

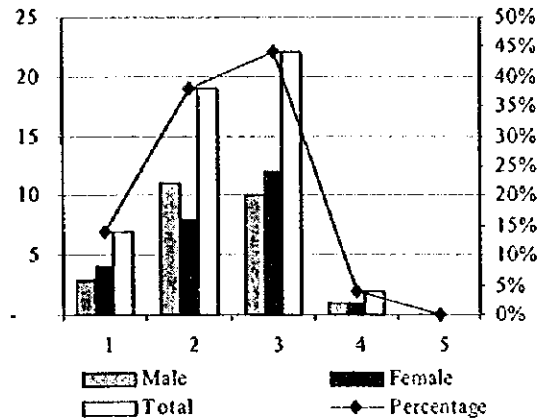


(3) Level of Education

Most of the respondents have attended higher education as 22 reached the college level. A higher percentage (38%) or 19 interviewees attended high school education while seven respondents reached up to elementary level only; while nobody pursued post-graduate courses, two of the participants took up vocational courses.

TABLE 4: RESPONDENTS' LEVEL OF EDUCATION

EDUCATIONAL LEVEL	M	F	T	%
1. Elementary	3	4	7	14
2. High School	11	8	19	38
3. College	10	12	22	44
4. Vocational	1	1	2	4
5. Post Graduate	-	-	-	-
TOTAL	25	25	50	100.00

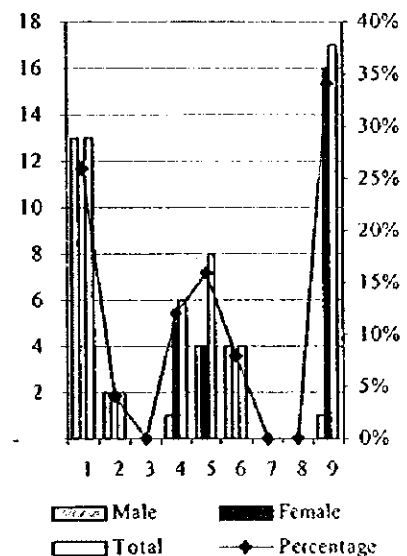


(4) Occupation

The majority of the respondents (33) were engaged in various occupations. Of those working, most (13 males) were engaged in either farming or fishing. Eight (4 males, 4 females) were professionals, six (1 male and 5 females) were into business, four males were office workers and two males were technicians. Most of those not working were females.

TABLE 5: OCCUPATION OF RESPONDENTS

OCCUPATION	M	F	T	%
1. Farmer/Laborer	13	-	13	26.00
2. Technician	2	-	2	4.00
3. Service Worker	-	-	-	-
4. Businessman/woman	1	5	6	12.00
5. Professional	4	4	8	16.00
6. Office Worker	4	-	4	8.00
7. Dressmaker	-	-	-	-
8. Others	-	-	-	-
9. No Work	1	16	17	34.00
TOTAL	25	25	50	100.00



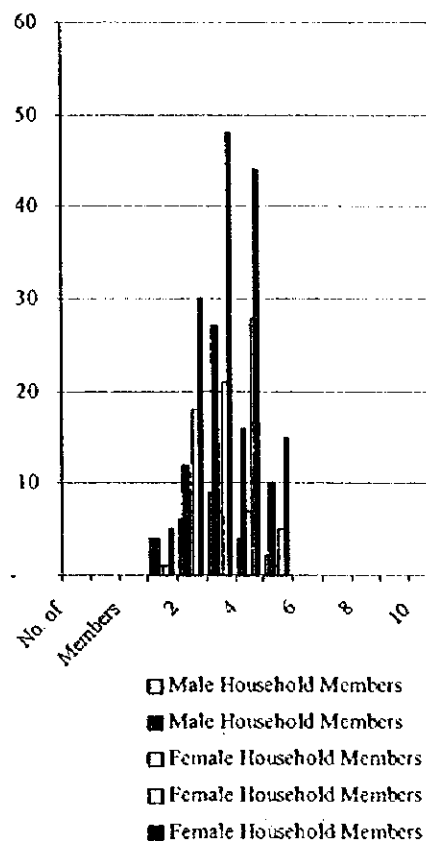
1.4 Socio Economic Profile

(1) Number of Household Members

The total number of household members of the respondents was 142. Females outnumbered males in the respondents' households. There were 73 or 51% females; while there are 69 or 49% males. The figures represent a low average of only three members per household.

TABLE 6: NUMBER OF HOUSEHOLD MEMBERS

NO. OF HH MEMBERS	MALE HOUSEHOLD MEMBERS		FEMALE HOUSEHOLD MEMBERS		TOTAL HOUSEHOLD MEMBERS
	NO. OF RESPONDENTS	TOTAL MALE HH MEMBERS	NO. OF RESPONDENTS	TOTAL FEMALE HH MEMBERS	
1	4	4	1	1	5
2	6	12	9	18	30
3	9	27	7	21	48
4	4	16	7	28	44
5	2	10	1	5	15
6	-	-	-	-	-
7	-	-	-	-	-
8	-	-	-	-	-
9	-	-	-	-	-
10	-	-	-	-	-
TOTAL	25	69 (57.00%)	25	73 (43.00%)	142 (100.00%)

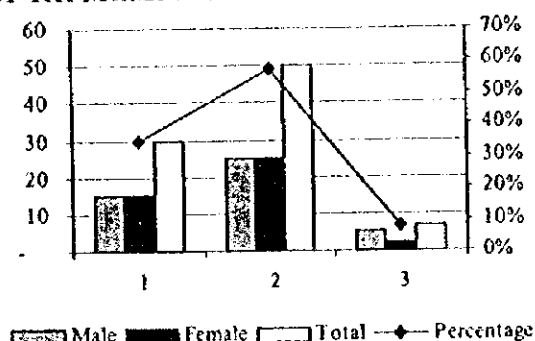


(2) Ages of Household Members

As pointed out by most male and female respondents, the majority of the household members belonged to the 15-60 age bracket. There was an equal number of males and females under this group age at 25 each. The 15 and below age level was the second largest age group; while the 60 and above age group has the least number in it.

TABLE 7: AGES OF HH MEMBERS

AGE	M	F	T	%
1. 15 and below	15	15	30	34.50
2. 15-60	25	25	50	57.45
3. 60 and above	5	2	7	8.05
TOTAL	45	42	87	100.00

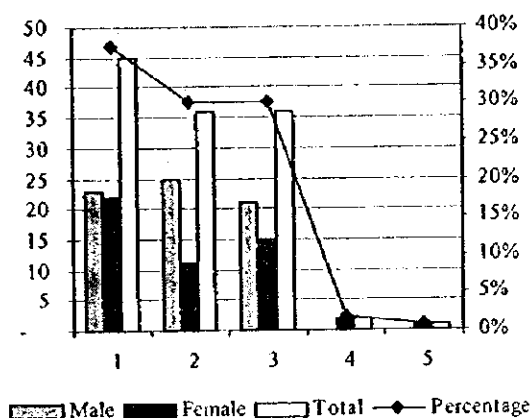


(3) Level of Education of Household Members

There were some 120 household members who have attained some degree of education, with the males outnumbering the females. Of these, the majority (45) have reached elementary education. Thirty six members have studied high school while the same number pursued college education. Only one pursued post graduate and two took up vocational course.

TABLE 8: LEVEL OF EDUCATION OF HH MEMBERS

EDUCATIONAL LEVEL	M	F	T	%
1. Elementary	23	22	45	37.50
2. High School	25	11	36	30.00
3. College	21	15	36	30.00
4. Vocational	-	2	2	1.65
5. Post Graduate	-	1	1	0.85
TOTAL	69	51	120	100.00

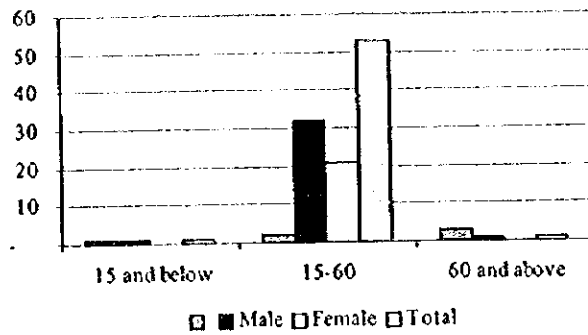


(4) Employed Household Members

There were 55 among the respondents' household members who were gainfully employed or had a regular source of income. Employed men outnumbered working women, 34 to 21. The majority of these productive people belonged to the 15 to 60 age bracket with 32 males and 21 females, for a total of 53. There was only one member in each of the 15 and below and 60 and above age groups who was gainfully employed.

TABLE 9: EMPLOYED HH MEMBERS

AGE BRACKET	M	F	T
15 and below	1	-	1
15-60	32	21	53
60 and above	1	-	1
TOTAL	34	21	55



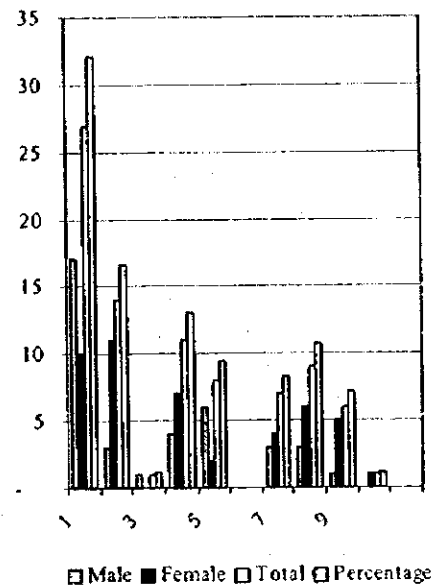
(5) Occupation of Household Heads and Other Members

The majority of the household heads and members were engaged in either farming or fishing where they derived income. Males constituted the majority of workers in this field. There was a high number of professionals (14) and office workers (11). Other household members were businessmen/women (9); laborers (8); and service workers (7). There were also six who were either vendors, carpenters, and/or dressmakers.

Most of those who were gainfully employed (39) earned an average monthly income from ₱5,000.00 to ₱14,999. Others received a salary of ₱5,000 and below. One had a monthly income of more than ₱15,000.

TABLE 10: OCCUPATION OF HH MEMBERS

OCCUPATION	M	F	T	%
1. Farmer/Fisherfolk	17	10	27	32.14
2. Professional	3	11	14	16.67
3. Technician	1	-	1	1.19
4. Office Worker	4	7	11	13.10
5. Laborers	6	2	9	9.52
6. Equipment Operator/Welder	-	-	-	-
7. Service Worker	3	4	7	8.33
8. Businessman/woman	3	6	9	10.71
9. Vendor/Carpenter/Dressmaker	1	5	6	7.14
10. Others	-	1	1	1.19
TOTAL	38	46	84	100.00



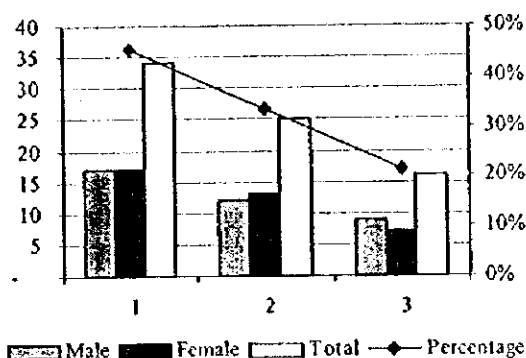
(6) Economic Activities

Aside from their regular source of income, household members engaged in other economic activities to augment their monthly income. As indicated by most of the

respondents, livestock/poultry raising was the main livelihood project of the people. Men were more involved in economic activities than women. Vegetable gardening was the second most popular livelihood project followed by Sari-sari store operation. From these economic activities, almost all of the household members earned less than ₱500.00. Sixteen members earned more than ₱500.00 out of these livelihood activities.

TABLE 11: ECONOMIC ACTIVITIES OF HH MEMBERS

ECONOMIC ACTIVITY	M	F	T	%
1. Livestock/Poultry	17	17	34	45.35
2. Vegetable/gardening	12	13	25	33.35
3. Sari-Sari Store	9	7	16	21.30
TOTAL	38	37	75	100.00

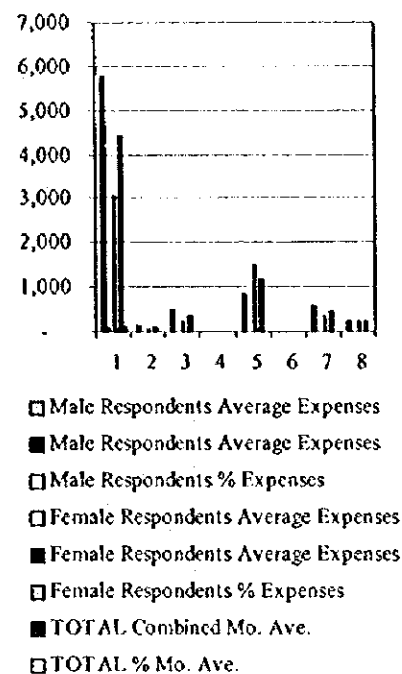


(7) Average Expenditures of Household

As indicated by the respondents, the average monthly expenditure of a family was ₱6,675.75. The male respondents indicated higher monthly expenditures at ₱7,996.50 as compared to the female respondents' average monthly expense of ₱5,355.00. Both the male and female interviewees said the biggest expenditure was allotted to food at an average of ₱4,412.50 a month, which is 66.10% of the total monthly expenditures. The lowest family expenditure for both male and female interviewees was for water with an average expense of ₱82.00 a month or 1.20% of the monthly expenses. Education was the second highest expenditure with an average of ₱1,160.00 (17.40%), followed by recreation (₱456.25 or 6.80%). Electricity consumed more than 5% of the monthly expenses at ₱340.00. Surprisingly, expenses for clothing were not included in the monthly expenditure. Except for education, the male respondents gave higher estimates for all items.

TABLE 12: AVERAGE EXPENDITURES OF IIIH MEMBERS

ITEM	M		F		T	
	MONTHLY AVERAGE	%	MONTHLY AVERAGE	%	COMBINED MO. AVERAGE	%
1. Food	₱ 5,775.00	72.20	₱ 3,050.00	56.95	4,412.50	66.10
2. Water	114.00	1.40	50.00	0.90	82.00	1.20
3. Electricity/Fuel	472.50	5.90	207.50	3.86	340.00	5.10
4. House Rental	-	-	-	-	-	-
5. Education	835.00	10.45	1,485.00	27.70	1,160.00	17.40
6. Clothing	-	-	-	-	-	-
7. Recreation	575.00	7.20	337.50	6.30	456.25	6.80
8. Others	225.00	2.80	225.00	4.20	225.00	3.40
TOTAL	₱ 7,996.50	100.00	₱ 5,355.00	100.00	₱ 6,675.75	100.00

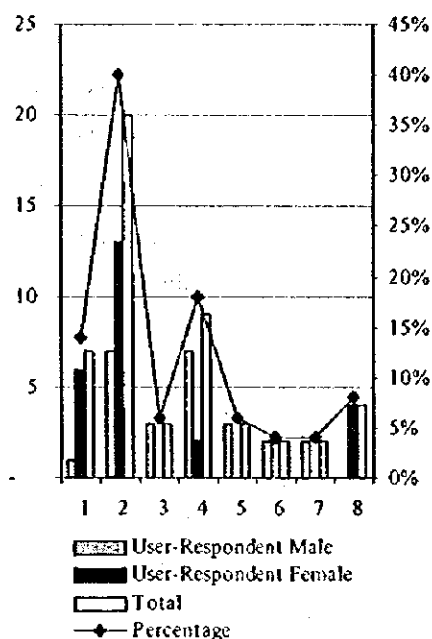


(8) Practices

Source of Drinking Water. The majority of the respondents (20) indicated that the people get their source of drinking water from communal deep wells. Other sources mentioned were: community faucets (9 respondents); communal free flow well, (7); and, communal and private shallow well (3 respondents each).

TABLE 13: SOURCES OF DRINKING WATER

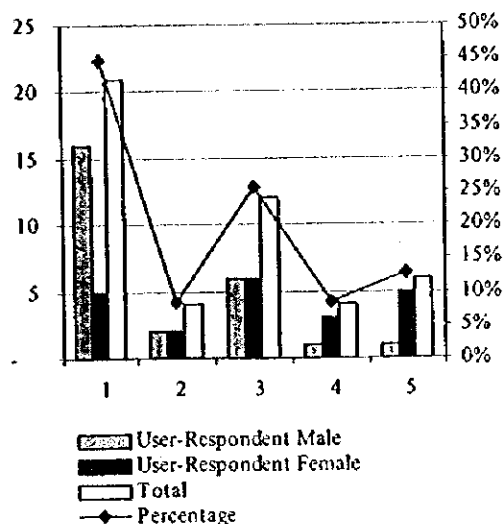
SOURCE	USER-RESPONDENT		T	%
	M	F		
1. Communal Free Flow Well	1	6	7	14.00
2. Communal Deep Well	7	13	20	40.00
3. Communal Shallow Well	3	-	3	6.00
4. Community Faucet	7	2	9	18.00
5. Private Shallow Well	3	-	3	6.00
6. Private Deepwell	2	-	2	4.00
7. Private Free-Flow well	2	-	2	4.00
8. No Response	-	4	4	8.00
TOTAL	25	25	50	100.00



Responsible for Fetching Water. For the majority of the male respondents (16), the husband is still the one responsible for hauling drinking water for family use. For most of the female interviewees (6), however, it was the male children who were doing the task of hauling water. The women also shared the burden as eight respondents indicated that the wife and the female children were the ones fetching water.

TABLE 14: RESPONSIBLE FOR FETCHING DRINKING WATER

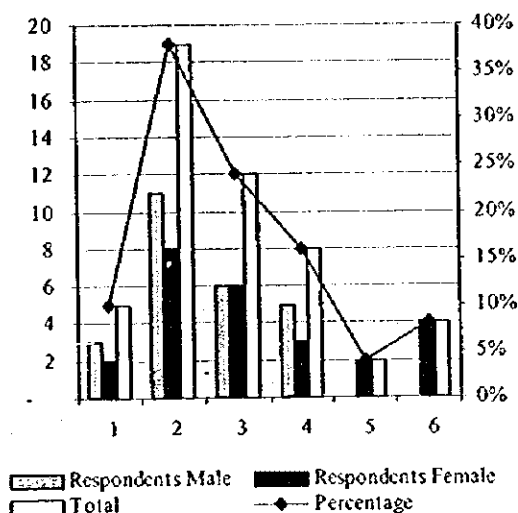
FAMILY MEMBER	USER-RESPONDENT		T	%
	M	F		
1. Husband	16	5	21	44.70
2. Wife	2	2	4	8.50
3. Male Children	6	6	12	25.55
4. Female Children	1	3	4	8.50
5. Others	1	5	6	12.75
TOTAL	26	21	47	100.00



Frequency of Fetching Water. The majority of respondents (11 males and 8 females) indicated that families fetch drinking water twice a day. For 12 interviewees (6 males and 6 females), it took three times a day to haul water for domestic use. Eight interviewees said they get water four times a day; five indicated once a day, and two said five times a day. Four respondents did not reply on this topic.

TABLE 15: FREQUENCY OF FETCHING DRINKING WATER

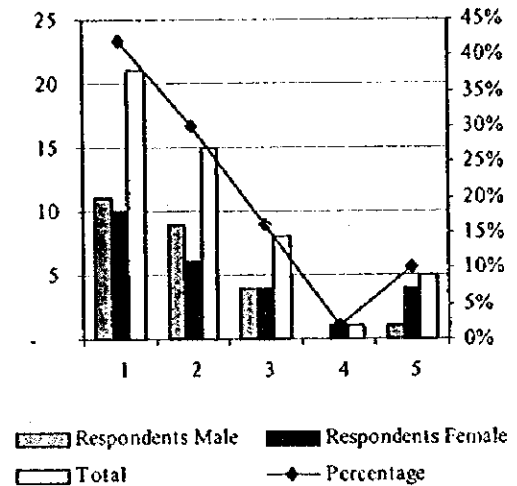
FREQUENCY	RESPONDENTS		T	%
	M	F		
1. Once a Day	3	2	5	10.00
2. Twice a day	11	8	19	38.00
3. 3x a day	6	6	12	22.00
4. 4x a day	5	3	8	16.00
5. 5x a day	-	2	2	4.00
6. No response	-	4	4	8.00
TOTAL	25	25	50	100.00



Duration of Fetching Water. For most of the respondents (11 males and 10 females), it takes about 10 minutes to fetch water from the source to their house. Fifteen respondents (9 males, 6 females) indicated 20 minutes; while eight respondents said it takes about 30 minutes. Five respondents did not respond to this question.

TABLE 16: DURATION FOR FETCHING DRINKING WATER

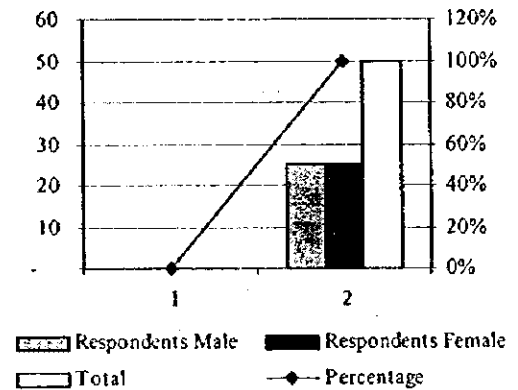
DURATION	RESPONDENTS		T	%
	M	F		
1. About 10 minutes	11	10	21	42.00
2. About 20 minutes	9	6	15	30.00
3. About 30 minutes	4	4	8	16.00
4. More than 30 minutes	-	1	1	2.00
5. No Response	1	4	5	10.00
TOTAL	25	25	50	100.00



Problems with Source. All of the respondents admitted that they have problems with the current water source.

TABLE 17: PROBLEMS WITH SOURCE OF WATER

RESPONSE	RESPONDENTS		T	%
	M	F		
1. No Problem	-	-	-	-
2. There are Problems	25	25	50	100.00
TOTAL	25	25	50	100.00



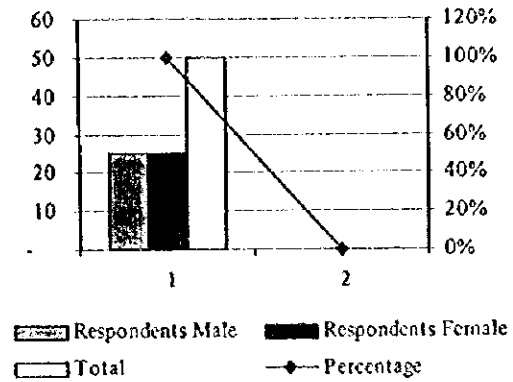
1.5 Institutional

(1) Presence of BWSA

All of the respondents indicated that there is a BWSA in their communities.

TABLE 18: KNOWLEDGE OF THE EXISTENCE OF BWSA

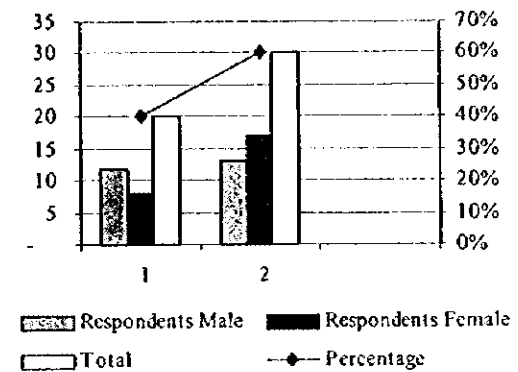
RESPONSE	RESPONDENTS		T	%
	M	F		
1. Yes	25	25	50	100.00
2. No	-	-	-	-
TOTAL	25	25	50	100.00



Corollary to this, the majority of the respondents (13 males and 17 females for a total of 30) indicated that they are not members of the BWSA. The rest, 12 males and 8 females or a total of 20, were either officers and/or members of the BWSA.

TABLE 19: MEMBERSHIP TO THE BWSA

RESPONSE	RESPONDENTS		T	%
	M	F		
1. Yes	12	8	20	40.00
2. No	13	17	30	60.00
TOTAL	25	25	50	100.00

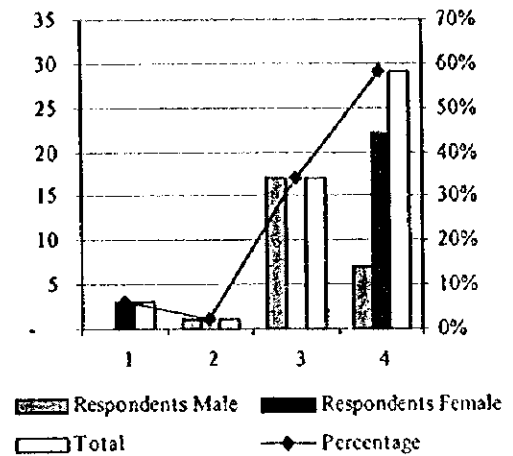


(2) Who maintains the facilities of the BWSA?

The majority of the respondents (29) could not determine the people responsible for maintaining the facilities. But for most of those who were knowledgeable, they indicated that someone from the BWSA is responsible for maintaining water supply facilities

TABLE 20: RESPONSIBLE FOR MAINTAINING WATSAN FACILITIES

RESPONSE	RESPONDENTS		T	%
	M	F		
1. Someone in the Barangay	-	3	3	6.00
2. Professional Caretaker	1	-	1	2.00
3. Someone in the BWSA	17	-	17	34.00
4. No Response	7	22	29	58.00
TOTAL	25	25	50	100.00

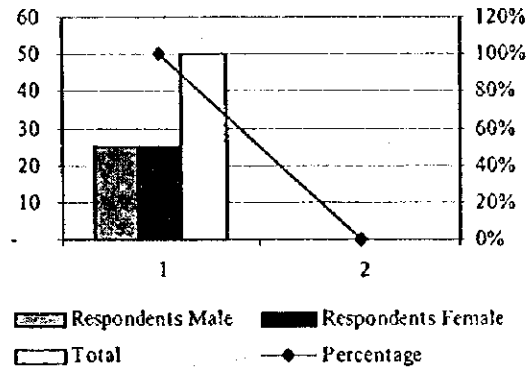


(3) Interested to be a member of BWSA

Significantly, all respondents indicated interest in becoming a member of BWSA once it is formed and/or activated in their respective barangays.

TABLE 21: INTEREST OF RESPONDENTS TO JOIN BWSA

RESPONSE	RESPONDENTS		T	%
	M	F		
1. Interested	25	25	50	100.00
2. Not Interested	-	-	-	-
TOTAL	25	25	50	100.00

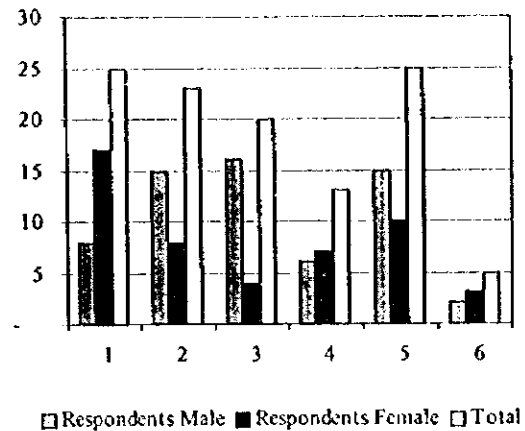


(4) How can respondents become actively involve in BWSA affairs?

The respondents indicated that they are willing to be involved in the BWSA affairs. The majority said they can contribute cash and/or become officers of the association. Another 23 can provide free labor while 20 interviewees can assist if the repair and maintenance of the facilities. Some 13 participants can help in the collection of water fees while five would just be an ordinary BWSA member.

TABLE 22: HOW RESPONDENTS CAN BECOME ACTIVELY INVOLVED IN WATSAN PROJECTS

RESPONSE	RESPONDENTS		T
	M	F	
1. Contribute Cash	8	17	25
2. Contribute Labor	15	8	23
3. Do repair/maintenance	16	4	20
4. Collection of Fees	6	7	13
5. Be Officer	15	10	25
6. Just Member	2	3	5

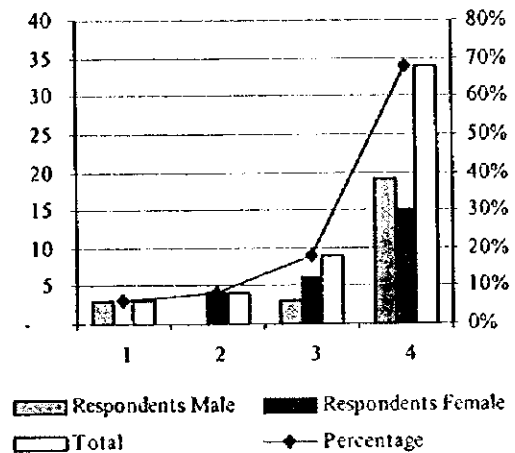


(5) If not interested, where to get source of water

In the event that these respondents will not be members of the BWSA, majority (34) could not determine where to fetch water. On the other hand, nine would get from spring, four from communal well and the other three from private wells.

TABLE 23: SOURCES OF DRINKING WATER OF NON-BWSA MEMBERS

SOURCE OF WATER	RESPONDENTS		T	%
	M	F		
1. Private Well	3	-	3	6.00
2. Communal Well	-	4	4	8.00
3. Spring	3	6	9	18.00
4. No Response	19	15	34	68.00
TOTAL	25	25	50	100.00

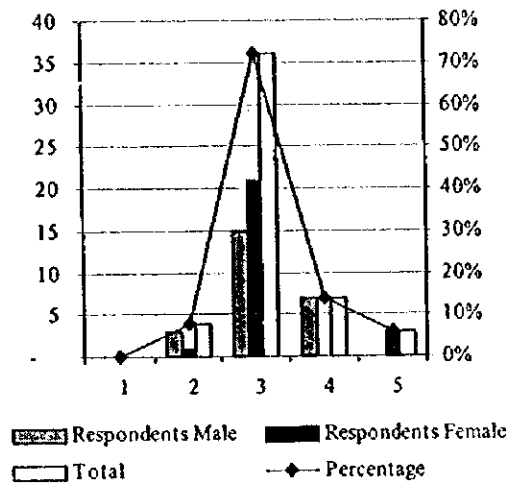


(6) Responsible for minor repairs of water facilities

Somebody in the barangay, according to the majority of the respondents (36), was responsible for doing minor repairs of the family's water supply facility. However for seven respondents, the professional technicians are doing the repair works. The male family members also do the task, according to four interviewees.

TABLE 24: RESPONSIBLE FOR MINOR REPAIRS

RESPONSIBLE PERSON	RESPONDENTS		T	%
	M	F		
1. Female Member	-	-	-	-
2. Male Member	3	1	4	8.00
3. Somebody in the Barangay	15	21	36	72.00
4. Professional Caretaker	7	-	7	14.00
5. No Response	-	3	3	6.00
TOTAL	25	24	50	100.00



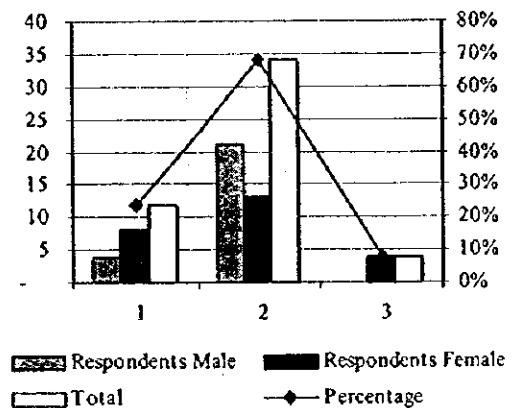
1.6 Training Activities

(1) Training Program attended in 1997

Majority of the respondents, 21 male and 13 female respondents, said they did not attend any training program in 1997. For four male and eight female interviewees, they were able to attend training programs/seminars. Four female participants did not respond to this issue.

TABLE 25: TRAINING ATTENDED BY RESPONDENTS IN 1997

RESPONSE	RESPONDENTS		T	%
	M	F		
1. Yes	4	8	12	24.00
2. No	21	13	33	68.00
3. No Response	-	4	4	8.00
TOTAL	25	25	50	100.00



(2) Kinds of Training Program

The respondents attended various training programs in 1997. Table 26 summarizes the training programs/seminars attended by the respondents during the year.

TABLE 26: TRAINING COURSES ATTENDED BY RESPONDENTS IN 1997

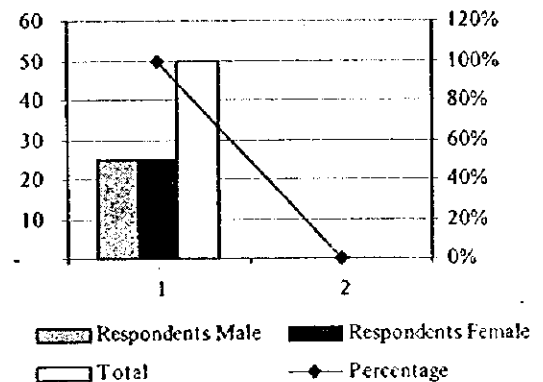
BARANGAY	MALE	FEMALE
Barangay Manikling (San Isidro)	<ol style="list-style-type: none"> 1. FRISP - :Local Participatory Planning 2. Barangay Polisia Laban sa Krimen (Crime Prevention) 3. Financial Administration 4. Lupon Tagapamayapa (Barangay Justice) 	<ol style="list-style-type: none"> 1. Participatory Planning 2. Waste Management 3. Minimum Basic Needs 4. Maternal and Child Health 5. Bgy. Administration 6. Bgy. Treasurers' Training
Matiao (Mati)	<ol style="list-style-type: none"> 1. Rural Waterworks and Sanitation Program 	<ol style="list-style-type: none"> 1. Barangay Administration

(3) On BWSA Training

All the respondents were not aware of any training program for BWSA members. However, all of them wanted to attend in any BWSA training program for the barangay.

TABLE 27: WILLINGNESS TO ATTEND BWSA-RELATED TRAINING PROGRAMS

RESPONSE	RESPONDENTS		T	%
	M	F		
1. Yes	25	25	50	100.00
2. No	-	-	-	-
TOTAL	25	25	50	100.00

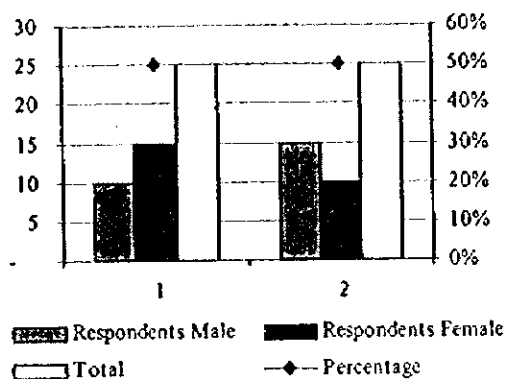


(4) Training on Health Education

Half of the respondents have attended health education training program. The other half said they have not heard of any health training program. If given a chance, however, the respondents wanted to attend WATSAN related training programs such as: BWSA Skills Training Program (O&M); Health and Sanitation; Proper Usage of Water; Barangay Development; and, Livelihood.

TABLE 28: PARTICIPATION IN HEALTH EDUCATION AND TRAINING

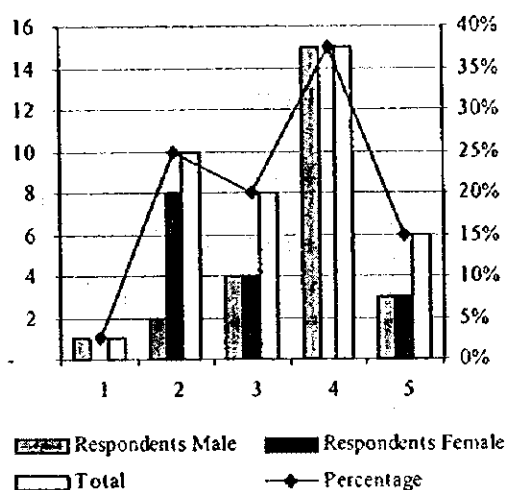
RESPONSE	RESPONDENTS		T	%
	M	F		
1. Yes	10	15	25	50.00
2. No	15	10	25	50.00
TOTAL	25	25	50	100.00



In the event that training programs will be conducted, the majority of male respondents (15) wanted to attend training programs that would be conducted for three days. On the other hand, the majority of female respondents can attend for more than three days. Ten interviewees wanted one day while eight opted for two days.

TABLE 29: DESIRABLE TRAINING PERIOD

RESPONSE	RESPONDENTS		T	%
	M	F		
1. Less than 1 day	1	-	1	2.50
2. One day	2	8	10	25.00
3. Two days	4	4	8	20.00
4. Three days	15	-	15	37.50
5. More than 3 days	3	13	16	15.00
TOTAL	25	25	50	100.00



1.7 Community Development

(1) CBOs and contact persons

As pointed out by the respondents, some community-based organizations have been doing different development works in the barangays. Table 30 lists down these NGOs/CBOs and their contact persons:

TABLE 30: NGOS/CBOS IN THE BARANGAYS

BARANGAY	CONTACT PERSON
<p>A. Mankling (San Isidro)</p> <ol style="list-style-type: none"> 1. Women's Organization 2. LUMAD 3. Coconut Farmers Organization 4. Barangay Women Council 5. Self-Employment Assistance and Livelihood 	<p>Ms. Esterlita Campo Ms. Carmita Gil Mr. Ernesto Tequin Ms. Esterlita Campo Ms. Aurora Benigiaan</p>
<p>B. Matiao (Mati)</p> <ol style="list-style-type: none"> 1. BMSA 2. MACADACO 3. Datecor Multi-Purpose Cooperative 4. Brotherhood Association 5. MASFA 6. Tua Tua Farmers' Cooperative 7. Barangay Housekeepers Association 	<p>Mr. Rogelio Caparas, Jr. Mr. Ramir Bocasnot Mr. Andunico Pahir, Jr. Mr. Ramir Bacasnot Mr. Lionso Lobos Mr. Arnulfo Cabating Mr. Carlos Millar</p>

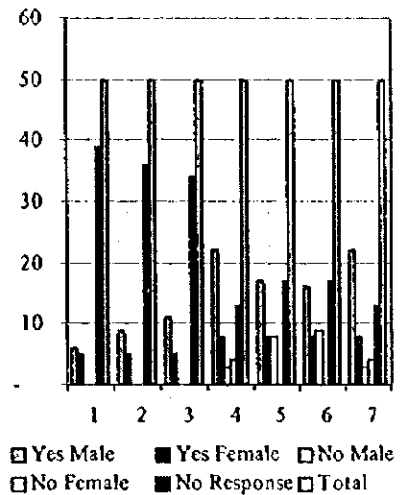
(2) Were the respondents consulted on their respective roles and responsibilities?

A low percentage among the respondents were consulted and/or briefed on their roles and responsibilities on the planning, design and construction of previous water supply facilities. This is also true for the operation and maintenance and financing aspects of the system. Only 11 respondents (6 males, 5 females) were consulted during the planning and design of their water system. Fourteen were briefed on their participation in the operation and maintenance; while 16 were briefed on the financing aspect of the project.

On the other hand, the majority of the respondents (30) were consulted when the BWSA was formed in their respective barangays. Half of the participants were involved in the discussion of the proposed water fee as well as when the level/type of services and water fees were agreed upon. The majority of the respondents (30) also participated during the construction of the system.

TABLE 31: RESPONDENTS CONSULTED/INVOLVED IN PAST WATSAN PROJECTS

BWSA ACTIVITIES	YES		NO		NO RESPONSE	T
	M	F	M	F		
1. Planning, Design & Construction	6	5	-	-	39	50
2. O&M of the System	9	5	-	-	36	50
3. Financing of the System	11	5	-	-	34	50
4. BWSA Formation	22	8	3	4	13	50
5. Water Fee Decision	17	8	8	-	17	50
6. Level of Service Decided	16	8	9	-	17	50
7. Construction of Facilities	22	8	3	4	13	50

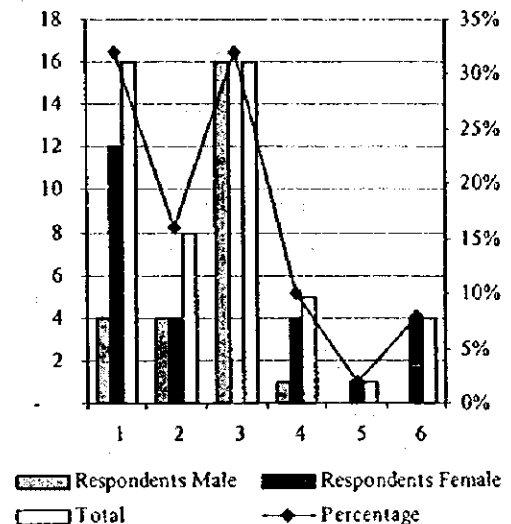


(3) How did the respondents participate in past construction projects?

All of the respondents participated in the construction of previous WATSAN facilities. The majority of male respondents (16) provided free labor, 12 contributed cash, four donated the site while another four provided land. Half of the female respondents (12) provided cash, four donated the site, while another four provided materials. Four female interviewees did not respond.

TABLE 32: PARTICIPATION IN PAST CONSTRUCTION PROJECTS

TYPE OF PARTICIPATION	RESPONDENTS		T	%
	M	F		
1. Provided Cash	4	12	16	32.00
2. Donated Site	4	4	8	16.00
3. Provided Labor	16	-	16	32.00
4. Provided Materials	1	4	5	10.00
5. Others	-	1	1	2.00
6. No Response	-	4	5	10.00
TOTAL	25	25	50	100.00



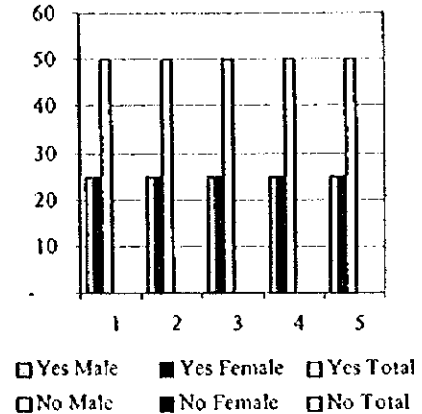
(4) Will the respondents participate in future projects?

For future projects, all of the respondents indicated that they would participate and/or contribute in all phases of development projects such as in the formation of BWSA, the

formulation of water rates, in the selection of sites, construction of facilities and in the operation and maintenance.

TABLE 33: WILLINGNESS/TYPE OF PARTICIPATION IN FUTURE PROJECTS

PROJECT ACTIVITY	YES			NO		
	M	F	T	M	F	T
1. Formation of BWSA	25	25	50	-	-	-
2. Water Rates Formulation	25	25	50	-	-	-
3. Selection of Sites	25	25	50	-	-	-
4. Construction of Facilities	25	25	50	-	-	-
5. Operation & Maintenance	25	25	50	-	-	-



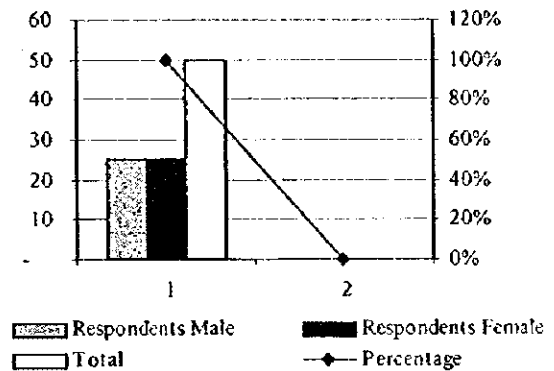
1.8 Financial Aspects

(1) Are respondents presently paying for their water supply?

All of the respondents claimed they are presently paying for their water supply.

TABLE 34: NUMBER OF RESPONDENTS PRESENTLY PAYING WATER FEE

RESPONSE	RESPONDENTS		T	%
	M	F		
1. Yes	25	25	50	100.00
2. No	-	-	-	-
TOTAL	25	25	50	100.00

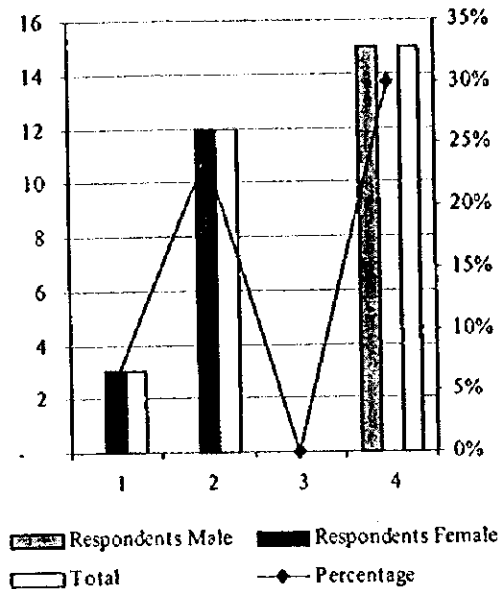


(2) If so, how much per household?

Of those presently paying, the majority indicated that they were paying more than ₱50.00. Fifteen male respondents said they were paying fees ranging from ₱21.00 to ₱30.00. Twelve female participants were being charged between ₱6.00 to ₱10.00 while another three have been paying below ₱5.00.

TABLE 35: PRESENT WATER FEES PAID

WATER FEES	RESPONDENTS		T	%
	M	F		
1. P2.00 - P5.00	-	3	3	6.00
2. P6.00 - P10.00	-	12	12	24.00
3. P11.00 - P20.00	-	-	-	-
4. P21.00 - P30.00	15	-	15	30.00
5. P31.00 - P40.00	-	-	-	-
6. P41.00 - P50.00	-	-	-	-
7. Above P50.00	10	8	18	36.00
8. No Response	-	2	2	4.00
TOTAL	25	25	50	100.00

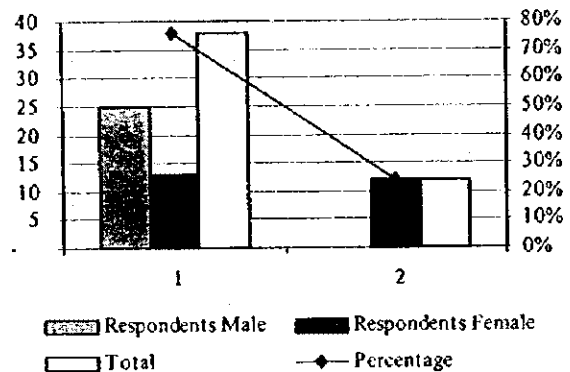


(3) Is the water fee enough for O&M?

The majority of the respondents (38) indicated that the fees being collected were enough to operate and maintain the facilities. The rest (12) said the fees were not enough for the operation and maintenance of the facilities.

TABLE 36: ADEQUACY OF WATER FEE FOR O&M

RESPONSE	RESPONDENTS		T	%
	M	F		
1. Yes	25	13	38	76.00
2. No	-	12	12	24.00
TOTAL	25	25	50	100.00

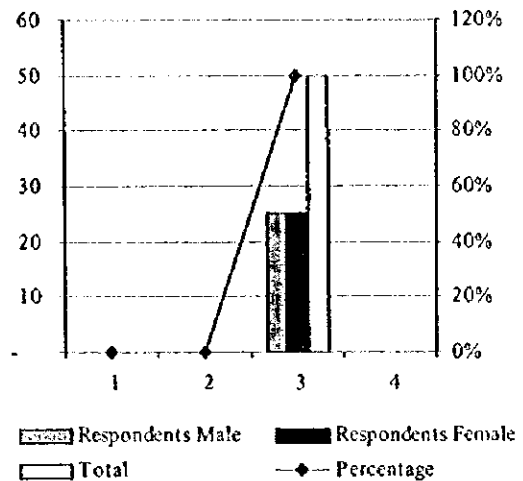


(4) Who shoulders the O&M of Facilities?

All the respondents could not determine which group/s in the community shoulder the operation and maintenance of the water supply facilities.

TABLE 37: RESPONSIBILITY FOR SHOULDERING THE O&M COSTS

PERSON	RESPONDENTS		T	%
	M	F		
1. Barangay Council	-	-	-	-
2. Municipal Government	-	-	-	-
3. Owner of the Well	-	-	-	-
4. Uncertain	25	25	50	100.00
TOTAL	25	25	50	100.00

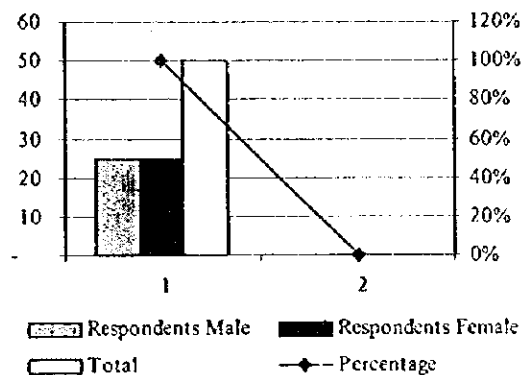


(5) Are the people willing to pay for O&M of future facilities?

All the respondents expressed willingness to pay/contribute for the operation and maintenance of future facilities.

TABLE 38: RESPONDENTS' WILLINGNESS TO PAY FOR FUTURE FACILITIES

RESPONSE	RESPONDENTS		T	%
	M	F		
1. Yes	25	25	50	100.00
2. No	-	-	-	-
TOTAL	25	25	50	100.00

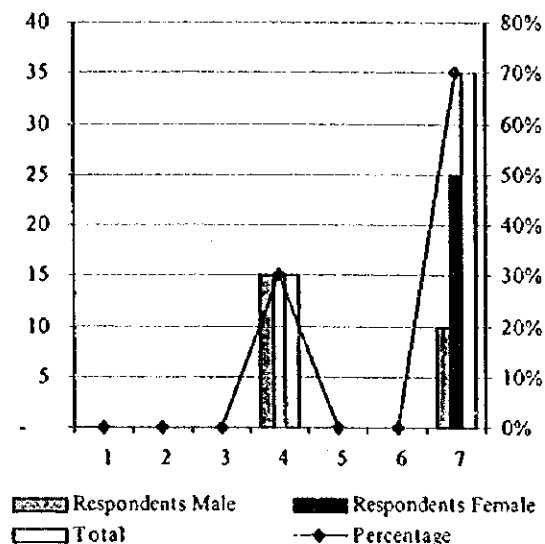


(6) How much are respondents willing to pay?

The majority of the respondents (35) who were willing to pay claimed they can pay as much as P50.00 and above per month. The rest (15) could only pay a fee ranging from P21.00 to P30.00.

TABLE 39: AMOUNT RESPONDENTS ARE WILLING TO PAY

RESPONSE	RESPONDENTS		T	%
	M	F		
1. P2.00 - P5.00	-	-	-	-
2. P6.00 - P10.00	-	-	-	-
3. P11.00 - P20.00	-	-	-	-
4. P21.00 - P30.00	15	-	15	30.00
5. P31.00 - P40.00	-	-	-	-
6. P41.00 - P50.00	-	-	-	-
7. Above P50.00	10	25	35	70.00
TOTAL	25	25	50	100.00

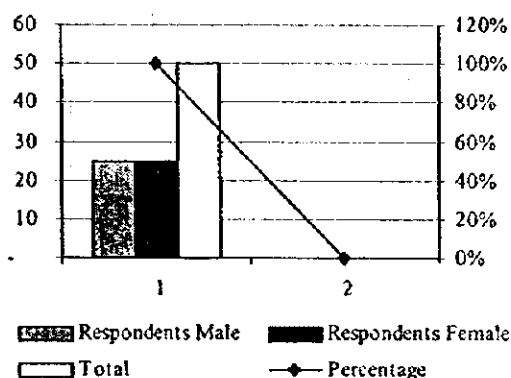


(7) Are you willing to contribute for future projects?

Significantly, all the respondents indicated their willingness to contribute in cash or kind for the construction of WATSAN facilities in their respective barangays.

TABLE 40: WILLINGNESS OF RESPONDENTS TO CONTRIBUTE FOR FUTURE FACILITIES

RESPONSE	RESPONDENTS		T	%
	M	F		
1. Yes	25	25	50	100.00
2. No	-	-	-	-
TOTAL	25	25	50	100.00

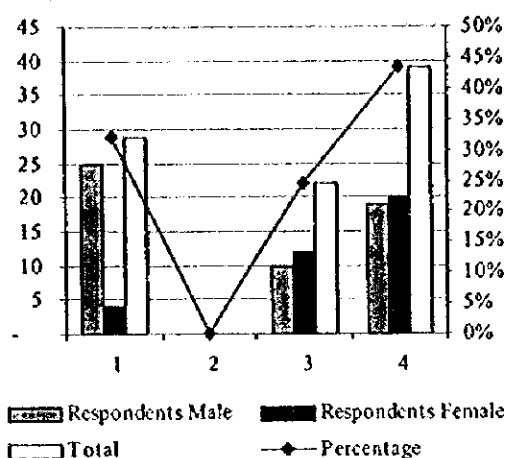


(8) If so, what kind?

The respondents were willing to contribute for future facilities. Some 39 interviewees indicated they can provide the land where the water facilities will be put up. Another 29 can provide free labor while 22 can contribute materials. None of the respondents would like to contribute cash.

TABLE 41: TYPES OF CONTRIBUTION

RESPONSE	RESPONDENTS			
	M	F	T	%
1. Labor	25	4	29	32.22
2. Cash	-	-	-	-
3. Materials	10	12	22	24.44
4. Land	19	20	39	43.33
TOTAL	54	36	93	100.00



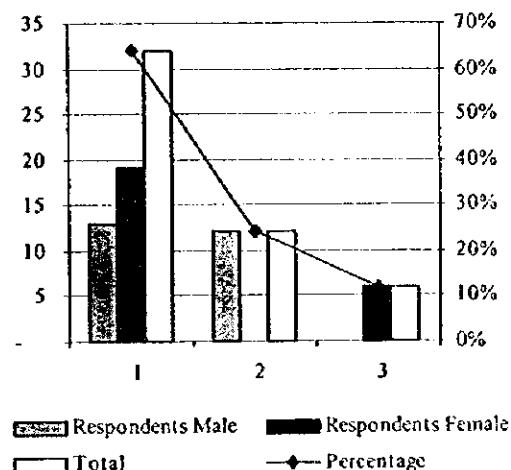
1.9 Health and Sanitation

(1) Type of toilet

The majority of the respondents (32) use private toilets which flush to septic tank. Another 12 male interviewees utilize private pit latrine while six female participants use toilets that flush straight to the sea.

TABLE 42: TYPE OF TOILETS RESPONDENTS USE

RESPONSE	RESPONDENTS			
	M	F	T	%
1. Private HH Toilet Flushed to Septic Tank	13	19	32	64.00
2. Private HH Pit Latrine	12	-	12	24.00
3. Private HH Toilet w/c Flushes Straight to Sea	-	6	6	12.00
TOTAL	25	25	50	100.00



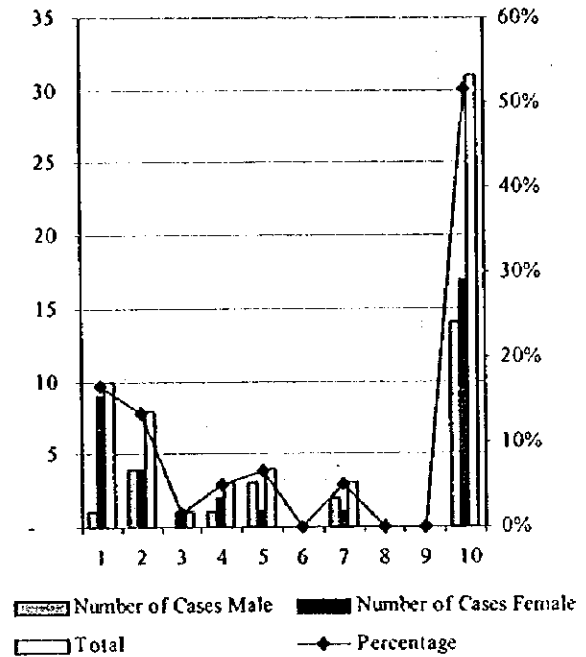
(2) Who got sick during the past year? What sickness?

The respondents indicated that in 1997, a total of 60 persons in their households were afflicted with various diseases although most of these were not water-related. For water-related diseases, the leading illness was stomach pain which afflicted 10 persons. The second leading illness was skin disease, which afflicted 8 persons. Kidney trouble came in third with four cases; diarrhea and intestinal flu had three cases each while gastroenteritis had one case.

Most susceptible were the females when 35 of them were afflicted with various illnesses, with high cases of stomach pain (9) and skin diseases with four cases. On the other hand, 25 cases hit the male household members. Most susceptible were the eldest son when 13 cases affected them.

TABLE 43: WATER-RELATED ILLNESSES

DISEASE	NUMBER OF CASES		T	%
	M	F		
1. Stomach Pain	1	9	10	16.65
2. Skin Diseases	4	4	8	13.30
3. Gastroenteritis	-	1	1	1.65
4. Diarrhea	1	2	3	5.00
5. Kidney trouble	3	1	4	6.65
6. Schistosomiasis	-	-	-	-
7. Intestinal Flu	2	1	3	5.00
8. Malaria	-	-	-	-
9. Typhoid Fever	-	-	-	-
10. Others	14	17	31	51.65
TOTAL	25	35	60	100.00

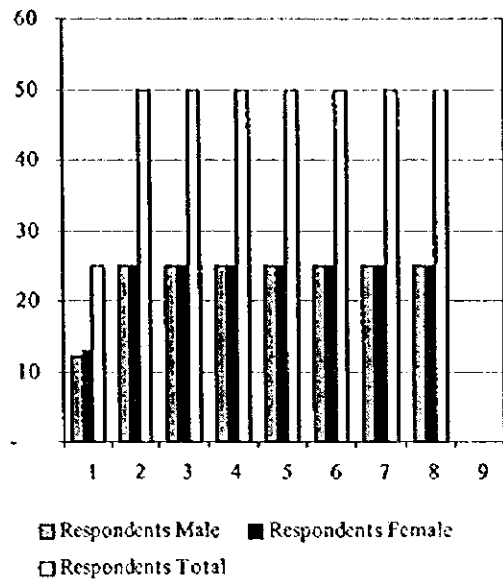


(3) Health and hygiene practices

Most respondents recognized the importance of good health and hygiene practices. As indicated by them, the respondents learned about health and sanitation matters from all available sources except from the NGOs. (Refer to Table 44).

TABLE 44: WHERE PEOPLE LEARNED HEALTH AND HYGIENE EDUCATION

RESPONSE	RESPONDENTS		
	M	F	T
1. Relatives and Friends	12	13	25
2. Health Workers/Inspectors	25	25	50
3. Radio	25	25	50
4. Television	25	25	50
5. School	25	25	50
6. Newspaper	25	25	50
7. Health Clinics	25	25	50
8. Hospitals	25	25	50
9. NGOs	-	-	-



5.8.5 Utilization of NGOs

LIST OF NGOs / CBOs for DAVAO ORIENTAL

NAME OF NGOs / CBOs	CONTACT PERSON
A. Mati	
1. Alang sa Davao Oriental Foundation	Mr. Emmanuel Bongar, Executive Director
2. BMSA	Mr. Rogelio Caparas, Jr.
3. MACADACO	Mr. Ramir Bacasnot
4. Datecor Multi-Purpose Cooperative	Mr. Andunico Palir, Jr.
5. Brotherhood Association	Mr. Ramir Bacasnot
6. MASFA	Mr. Lionso Lobos
7. Tua Tua Farmer's Cooperative	Mr. Amulfo Cabating
8. Barangay Houseseekers Association	Mr. Carlos Millar
9. Camansi Multi-Purpose Cooperative	Mr. Cristito Lubang
10. Knights of Columbus	Mr. Honesto Tengson
11. Camansi Homeowner's Association	Mr. Conrado Valencia
12. Camansi Handicraft Producer's Association	Ms. Minda Polimandan
13. Dawan Farmer's Cooperative	Mr. Deogracias Bucton
14. Tagamot Small Farmers Association	Mr. Eddie Tanares
15. Dawan Small-Scale Fishery	Mr. Nicolas Tanares
16. Participative Agro-Ecology Enhancement Research Program	Mr. Bonifacio Morales, Sr.
17. PAGER (Environmental Protection Group)	Dr. Cirilo Valles
B. San Isidro	
1. Women's Organization	Ms. Estrelita Campo
2. LUMAD	Ms. Carmila Gil
3. Coconut Farmer's Organization	Mr. Ernesto Tequin
4. Barangay Women's Council	Ms. Esterlita Campo
5. Self-Employment Assistance and Livelihood	Ms. Aurora Benigiaan
C. Banganga	
1. Women's Organization	Mrs. Mila Balug
2. BARC	Mr. Manuel Sadugan
E. Banay-Banay	
1. Ecumenical Movement for Action & Development	Mr. Ramon Urbanozo
2. Democratic Society Crime Busters	Mr. Nonito Quiandro
F. Lupon	
1. Macangao Multi-Purpose Cooperative	Mr. Macandong Matiba
2. GKK	Mr. Edwin Fernandez
3. Macangao Women's Association	Ms. Emilia Baralonge

5.8.6 Existing Community Development Process

Detailed Typical CD Process in Agusan del Sur

1) **Make courtesy calls.** Courtesy calls are made to barangay/sitio officials prior to the conduct of meetings with the community. Then, a series of meetings and community assemblies are done where the WATSAN program is introduced, its significance and impact taken up and the importance of organizing promoted. This is followed by a more detailed presentation/orientation of the project – its concept, features, history, stakeholders, and the CO process utilized. Depending on the level of community awareness regarding the program/project, two or three meetings/assemblies are needed before doing the baseline survey.

2) **Preparation of profile (secondary information) and survey forms.**

(a) **General information.** Distance from barangay to poblacion, mode of travel, time and fare; no. of sitio/purok; dominant ethnic groups, common occupation of residents; demographic data (no. of household, male and female population) by sitio/purok, no. of dwelling structures, school buildings, other buildings, availability of electricity by sitio/purok.

(b) **Barangay WATSAN status.** Existing water supply systems, by sitio/purok, by type and service level, no. of facilities (functioning), potability, no. of HH served, who installed, who operates, user charges, if any; HHs toilet facilities, by sitio/purok, no. of HHs with private toilets by type, no. of HH using shared toilets by type, no. of HH without toilets; no. of community waste disposal systems by sitio/purok, by method and wastewater system; no. of reported morbidity and mortality cases of water-borne/contact/vector-borne diseases of barangay residents.

(c) **WATSAN related programs and projects in the barangay.** Existing WATSAN programs/project by type of activity, implementing organization/agency, sponsoring funding agency, specify years when operated in barangay, name of community association organized, if any; past WATSAN programs/projects by type of activity, implementing organization/agency, sponsoring funding agency, specify years when operated, name of community association organized, if any; Community organizations in the barangay, watsan related groups/organization and other community organizations, its name of group/organization, sitios where members are, sponsoring agencies, year organized and status; other barangay facilities.

(d) Resources for barangay water supply and toilet facilities fabrication. Brief description of water sources-undeveloped springs, streams and other water sources which can be tapped and developed, sources which can be improved including estimated distance to center of HHs to be served, availability of water, estimated flows during dry and wet seasons; water and well depths by sitio/purok, by season; availability of construction materials for water supply and toilet if available for free at barangay or at hardware/other stores, its sources, name and address of store, materials available, distance from barangay and means of transport for materials; sources of pumps and spare parts for pumps – name and address of dealer/store, types of pumps/parts available and distance from barangay; barangay residents with skills in water supply system construction and maintenance, type of skill, no. of persons and remarks; well drillers and water supply contractors who can be tapped for barangay works, their name address, services rendered and charging rates; local fabricators of toilet bowls, their name, location, type/description of toilet bowl.

3. **Identify of community volunteers.** As an initial step in community organizing, a core group of about 7 persons consisting of community leaders is formed. This is the formation of an informal community organization that will assist the CD worker in the preparation of CO strategies, community profiling, identification of project sites, and other work.
4. **Conduct baseline survey.** In the conduct of this survey, focus group discussion was applied and the results validated during barangay spot mapping. The barangay spot map reflects the location of structures (scaled) and different facilities/infrastructure. This serves as a planning tool in the development of WATSAN program for the area.
5. **Inspect/identify project sites and validate projects.** An assembly is called again to present the results of the survey, its profile, assessment and needs. The CD team situates the community, i.e., *where they are now in the sector*. A member of the CD team will then facilitate the surfacing of thoughts from the group in terms of identifying the needs for WATSAN facilities, how project will be implemented in their area, how the facility will be designed and constructed, and how the community perceives their role in the project. In some cases, the community request technical assistance from the Center on site selection of identified areas.
6. **Conduct technical and community consultative meetings of members and officers together with barangay officials.** By this time, the core group has already specific

projects to be implemented. Together with these interim officers, meetings with barangay officials are undertaken to determine local counterpart funding support to the program/project.

7. **Facilitate project implementation.** After funding has been assured, the CD team facilitates the implementation of the project through supervision and monitoring progress of construction. Contribution from the community comes in the form of free labor (*pahina*).
8. **Consolidate BWSA Organization.** The core group formulates the by-laws and policies of the organization and have these ratified by the members. The election of BWSA officers follows. A barangay resolution is passed endorsing the association and submitted to the Municipal Development Council/Sangguniang Bayan for registration/accreditation. Parallel to this activity is the completion of the facility and in most cases, the turn-over of the facility to the newly-organized BWSA, which can coincide with the swearing-in of BWSA officials.
9. **Conduct training on skills and management to BWSA officials** by the Center. The module includes topics on: human resource development (self and group awareness, communication skills, group facilitation and conducting meeting, effective community work, leadership skills and roles of officers and members, and conflict management); technical (hydrogeology and site selection, well construction and identification of handpump parts, equipment plumbing tools and materials for construction and repairs, hand pump principles of operation, maintenance and approach in trouble shooting, spring development, types of spring, their characteristics and method of developing, operation and maintenance of tank, spring box and distribution line, excreta, liquid and solid disposal system, water related diseases-prevention/control and water quality surveillance); financial management; project planning management; and action planning.
10. **Undertake follow-up activities.** The CD team after the construction of the WATSAN facilities undertakes follow-up activities such as monitoring and evaluation and the provision of recommendations/adjustments on the O&M of the facilities, where needed.

Source: DILG/WATSAN UNDP-PHI as modified by Province of Agusan del Sur

13

14

15

6. PAST FINANCIAL PERFORMANCE IN WATER SUPPLY AND SANITATION
 6.2 Past Public Investment
 6.2.1 Sources of Local Fund

Table 6.2.1 Income and Expenditures of Municipalities of Davao Oriental, 1994-1998

Municipality	1994	1995	1996	1997	1998
1. Banganga					
Income	46,710,255.83	52,460,646.71	55,320,715.00	63,719,443.00	69,932,643.00
IRA	22,368,042.00	24,485,000.00	26,101,000.00	28,101,000.00	33,715,000.00
Tax	24,066,213.83	26,383,157.78	28,118,515.00	34,570,243.00	34,791,743.00
Misc. & Operating Revenue	276,000.00	1,092,488.93	1,001,200.00	1,048,200.00	1,425,900.00
Grants and Aids	0.00	500,000.00	100,000.00	0.00	0.00
Expenditures	18,503,049.00	24,080,615.60	26,543,559.78	18,713,233.00	0.00
Personal Services	9,570,522.00	11,798,554.32	13,809,506.00	14,255,783.00	0.00
MOOE	4,194,527.00	5,877,847.68	5,091,225.00	4,247,450.00	0.00
Capital Outlays	4,738,000.00	3,538,129.71	2,298,000.00	210,000.00	0.00
Others	0.00	2,866,083.89	5,344,828.78	0.00	0.00
2. Banaybanay					
Income	27,535,574.00	44,437,589.01	48,621,709.09	37,884,401.00	43,335,078.00
IRA	12,785,356.00	13,083,420.00	15,144,000.00	19,266,000.00	20,229,000.00
Tax	14,053,133.00	15,043,587.00	16,015,702.52	16,558,051.00	20,940,578.00
Misc. & Operating Revenue	697,085.00	16,310,582.01	17,462,006.57	2,060,350.00	2,165,500.00
Grants and Aids	0.00	0.00	0.00	0.00	0.00
Expenditures	8,195,653.26	14,552,152.85	0.00	12,715,960.87	15,968,168.24
Personal Services	6,479,103.26	7,255,539.20	0.00	10,550,460.87	13,549,668.24
MOOE	1,716,550.00	2,428,500.00	0.00	2,165,500.00	2,418,500.00
Capital Outlays	0.00	400,000.00	0.00	0.00	0.00
Others	0.00	4,468,113.65	0.00	0.00	0.00

Table 6.2.1 Income and Expenditures of Municipalities of Davao Oriental, 1994-1998

Municipality	1994	1995	1996	1997	1998
3. Boston					
Income	17,695,079.36	17,406,931.00	20,089,701.00	21,724,972.00	13,207,186.00
IRA	7,900,931.00	8,665,000.00	9,272,482.00	11,636,483.00	11,635,093.00
Tax	9,638,738.36	8,493,931.00	10,625,719.00	9,840,489.00	1,222,593.00
Misc. & Operating Revenue	155,410.00	248,000.00	191,500.00	187,000.00	349,500.00
Grants and Aids	0.00	0.00	0.00	0.00	0.00
Government Operation Expenditures	6,059,278.45	15,992,496.00	6,684,227.47	61,000.00	9,518,766.67
Personal Services	4,863,510.08	5,905,119.00	4,236,335.80	6,951,917.00	8,976,417.00
MOOE	1,195,768.37	5,797,983.00	1,178,992.67	2,330,552.00	542,349.67
Capital Outlays	0.00	4,289,394.00	1,268,899.00	806,000.00	0.00
Others	0.00	0.00	0.00	0.00	0.00
4. Caraga					
Income	34,477,422.00	35,014,730.00	38,495,686.65	33,423,108.00	49,724,449.95
IRA	16,132,192.00	17,712,000.00	18,933,521.00	23,395,619.00	23,396,000.00
Tax	18,032,730.00	17,075,230.00	19,299,330.83	9,840,489.00	26,030,649.95
Misc. & Operating Revenue	312,500.00	227,500.00	262,834.82	187,000.00	297,800.00
Grants and Aids	0.00	0.00	0.00	0.00	0.00
Expenditures	2,490,098.55	2,378,342.71	16,800,973.11	7,324,616.75	0.00
Personal Services	1,945,098.55	2,061,342.71	13,070,545.99	6,551,937.08	0.00
MOOE	385,500.00	252,000.00	2,983,082.22	772,679.67	0.00
Capital Outlays	159,500.00	65,000.00	747,344.90	0.00	0.00
Others	0.00	0.00	0.00	0.00	0.00

Table 6.2.1 Income and Expenditures of Municipalities of Davao Oriental, 1994-1998

Municipality	1994	1995	1996	1997	1998
5. Cateel					
Income	22,718,016.99	32,954,036.00	52,562,735.65	43,244,202.00	41,084,513.00
IRA	10,336,153.00	14,828,000.00	25,748,095.00	19,653,251.00	18,857,000.00
Tax	12,116,881.11	17,838,586.00	26,497,560.30	23,272,951.00	21,878,013.00
Misc. & Operating Revenue	264,982.88	287,450.00	317,080.35	318,000.00	349,500.00
Grants and Aids	0.00	0.00	0.00	0.00	0.00
Expenditures	8,557,372.96	11,874,496.60	15,307,066.70	20,658,559.46	16,982,970.17
Personal Services	6,399,844.29	8,161,143.32	10,136,229.48	12,156,443.37	13,441,573.90
MOOE	1,580,913.27	2,993,353.28	4,174,812.33	6,322,116.09	3,541,396.27
Capital Outlays	576,615.40	720,000.00	996,024.89	2,180,000.00	0.00
Others	0.00	0.00	0.00	0.00	0.00
6. Gov. Generoso					
Income	29,611,430.00	30,738,711.00	33,711,322.00	35,475,270.00	46,232,100.00
IRA	13,754,735.00	13,753,245.00	15,249,611.00	16,436,335.00	20,243,000.00
Tax	15,295,595.00	16,504,511.00	17,423,611.00	18,118,335.00	25,217,000.00
Misc. & Operating Revenue	561,100.00	480,955.00	1,038,100.00	920,600.00	772,100.00
Grants and Aids	0.00	0.00	0.00	0.00	0.00
Expenditures	10,206,511.25	10,296,031.45	11,429,957.78	13,903,973.24	0.00
Personal Services	7,095,000.53	6,619,799.13	8,254,547.28	11,651,973.24	0.00
MOOE	2,529,958.72	3,080,232.32	3,036,410.50	2,204,500.00	0.00
Capital Outlays	581,552.00	596,000.00	139,000.00	47,500.00	0.00
Others	0.00	0.00	0.00	0.00	0.00

Table 6.2.1 Income and Expenditures of Municipalities of Davao Oriental, 1994-1998

Municipality	1994	1995	1996	1997	1998
7. Lupon					
Income	40,907,559.00	49,804,222.00	54,052,641.00	62,603,338.00	74,976,218.00
IRA	22,534,022.00	24,772,000.00	26,496,000.00	32,571,000.00	35,828,000.00
Tax	17,446,337.00	23,493,522.00	25,806,941.00	27,796,638.00	36,116,518.00
Misc. & Operating Revenue	927,200.00	1,538,700.00	1,749,700.00	2,235,700.00	3,031,700.00
Grants and Aids	0.00	0.00	0.00	0.00	0.00
Expenditures	10,512,797.00	14,162,441.00	20,161,688.05	28,628,017.60	37,058,095.00
Personal Services	8,056,297.00	10,883,541.00	13,006,847.00	16,151,788.00	19,911,811.00
MOOE	2,456,500.00	3,158,400.00	4,408,759.00	5,558,390.00	5,672,707.00
Capital Outlays	0.00	120,500.00	40,000.00	12,396.00	100,000.00
Others	0.00	0.00	2,706,082.05	6,905,443.60	11,373,577.00
8. Manay					
Income	29,346,587.90	32,167,039.00	34,246,251.00	40,436,664.00	43,870,345.00
IRA	13,981,939.00	15,445,000.00	16,595,000.00	20,402,000.00	20,402,000.00
Tax	15,147,329.26	16,489,603.00	17,341,202.00	19,388,964.00	22,737,245.00
Misc. & Operating Revenue	217,319.64	232,436.00	310,049.00	645,700.00	731,100.00
Grants and Aids	0.00	0.00	0.00	0.00	0.00
Expenditures	9,484,235.95	15,993,481.69	17,258,988.28	19,434,664.00	0.00
Personal Services	6,740,740.63	9,055,004.42	10,991,088.35	11,541,141.09	0.00
MOOE	2,743,495.32	3,513,688.41	3,705,419.43	5,891,522.91	0.00
Capital Outlays	0.00	3,424,788.86	2,562,480.50	2,002,000.00	0.00
Others	0.00	0.00	0.00	0.00	0.00

Table 6.2.1 Income and Expenditures of Municipalities of Davao Oriental, 1994-1998

Municipality	1994	1995	1996	1997	1998
9. Mati					
Income	67,988,998.37	74,440,949.45	82,637,365.33	87,071,776.00	99,019,307.00
IRA	29,522,253.00	32,699,000.00	35,445,882.00	42,471,307.00	44,595,000.00
Tax	34,631,928.73	39,379,046.19	43,616,323.83	42,615,969.00	49,614,307.00
Misc. & Operating Revenue	3,834,816.64	1,799,703.26	3,519,159.50	1,984,500.00	4,810,000.00
Grants and Aids	0.00	563,200.00	56,000.00	0.00	0.00
Expenditures	24,854,887.54	43,625,358.20	50,697,808.98	47,510,469.00	37,284,962.52
Personal Services	15,408,941.38	24,326,037.76	24,811,360.70	32,643,453.00	31,832,313.52
MOOE	6,272,714.16	15,820,864.07	20,078,297.13	12,092,016.00	5,452,649.00
Capital Outlays	3,173,232.00	3,478,456.37	5,808,151.15	2,775,000.00	0.00
Others	0.00	0.00	0.00	0.00	0.00
10. San Isidro					
Income	24,051,959.96	26,304,932.51	28,874,649.59	35,166,126.50	40,484,000.00
IRA	11,398,626.00	12,606,000.00	13,567,000.00	15,009,000.00	17,763,000.00
Tax	12,334,079.06	13,348,869.31	14,309,910.79	18,663,126.50	21,181,000.00
Misc. & Operating Revenue	319,254.90	350,063.20	997,738.80	1,494,000.00	1,540,000.00
Grants and Aids	0.00	0.00	0.00	0.00	0.00
Expenditures	8,063,126.73	11,569,636.22	13,663,733.45	16,571,392.88	22,003,245.45
Personal Services	5,693,561.12	8,245,276.46	9,600,473.52	12,031,154.88	14,270,631.45
MOOE	2,091,806.61	3,051,339.42	3,963,259.93	4,412,502.00	6,323,031.00
Capital Outlays	277,759.00	273,020.34	100,000.00	127,736.00	1,409,583.00
Others	0.00	0.00	0.00	0.00	0.00

Table 6.2.1 Income and Expenditures of Municipalities of Davao Oriental, 1994-1998

Municipality	1994	1995	1996	1997	1998
11. Tarragona					
Income	20,558,609.92	22,935,566.72	24,636,000.00	27,587,156.00	36,367,686.00
IRA	9,970,635.00	10,943,734.00	11,767,456.00	14,724,000.00	17,669,000.00
Tax	10,467,348.67	11,883,603.06	12,589,044.00	12,563,956.00	17,795,482.00
Misc. & Operating Revenue	120,626.25	108,229.66	279,500.00	299,200.00	903,204.00
Grants and Aids	0.00	0.00	0.00	0.00	0.00
Expenditures	10,136,449.49	7,445,674.44	10,139,950.10	7,921,131.76	0.00
Personal Services	4,829,124.50	4,971,867.27	6,849,144.60	6,898,831.76	0.00
MOOE	3,866,776.34	2,018,483.33	2,450,805.50	934,300.00	0.00
Capital Outlays	1,440,548.65	455,323.84	840,000.00	88,000.00	0.00
Others	0.00	0.00	0.00	0.00	0.00

Source: Municipalities and PPDO.

Table 6.2.2 Past Internal Revenue Allotment to Municipalities from Central Government

	1994	1995	1996	1997	1998
1. IRA to all municipalities (National total)	16,325,288,074	18,768,952,000	19,607,715,553	24,849,000,000	28,245,815,434
2. IRA to municipalities in Davao Oriental					
<i>Total</i>	164,684,923	189,742,399	214,320,047	243,665,688	264,332,093
Baganga	22,368,042	24,485,000	26,101,000	28,101,000	33,715,000
Banaybanay	12,785,356	13,803,420	15,144,000	19,266,000	20,229,000
Boston	1,900,931	8,665,000	9,272,482	11,636,483	11,635,093
Caraga	16,132,192	17,712,000	18,933,521	23,395,619	23,396,000
Cateel	10,336,192	14,828,000	25,748,095	19,653,251	18,857,000
Governor Generoso	13,754,735	13,753,245	15,249,611	16,436,335	20,243,000
Lupon	22,534,022	24,772,000	26,496,000	32,571,000	35,828,000
Manay	13,981,939	15,445,000	16,595,000	20,402,000	20,402,000
Mati (Capital)	29,522,253	32,699,000	35,445,882	42,471,000	44,595,000
San Isidro	11,398,626	12,606,000	13,567,000	15,009,000	17,763,000
Tarragona	9,970,635	10,973,734	11,767,456	14,724,000	17,669,000
3. Share (%) in national total by municipality					
<i>Total</i>	1.0088	1.0109	1.0930	0.9806	0.9358
Baganga	0.1370	0.1305	0.1331	0.1131	0.1194
Banaybanay	0.0783	0.0735	0.0772	0.0775	0.0716
Boston	0.0116	0.0462	0.0473	0.0468	0.0412
Caraga	0.0988	0.0944	0.0966	0.0942	0.0828
Cateel	0.0633	0.0790	0.1313	0.0791	0.0668
Governor Generoso	0.0843	0.0733	0.0778	0.0661	0.0717
Lupon	0.1380	0.1320	0.1351	0.1311	0.1268
Manay	0.0856	0.0823	0.0846	0.0821	0.0722
Mati (Capital)	0.1808	0.1742	0.1808	0.1709	0.1579
San Isidro	0.0698	0.0672	0.0692	0.0604	0.0629
Tarragona	0.0611	0.0585	0.0600	0.0593	0.0626

Sources: (1) Department of Budget and Management and (2) Bureau of Local Government Finance.



7. WATER SOURCE DEVELOPMENT

7.3 Groundwater Sources

7.3.2 Groundwater Availability in the Province

(1) Major Information and References

The Groundwater Availability Map was prepared using the following information and reference (detailed list of reference is presented in Table 7.3.1, Data Report):

- Administrative and Topographical Maps of the Province published by NAMRIA with scale of 1:150,000 and 1:50,000, respectively.
- Geological Map of the Philippines published by BMGS with a scale of 1:1,000,000.
- Water Resource Investigation conducted by NWRB, 1986.
- Well Inventory Database prepared by NWRB, LWUA and DPWH.
- Well Inventory Database in the province.
- General information on groundwater condition by DPWH-DEO and PPDO.
- Well Log Data by DPWH-DEO.
- Water source information by Water Districts.

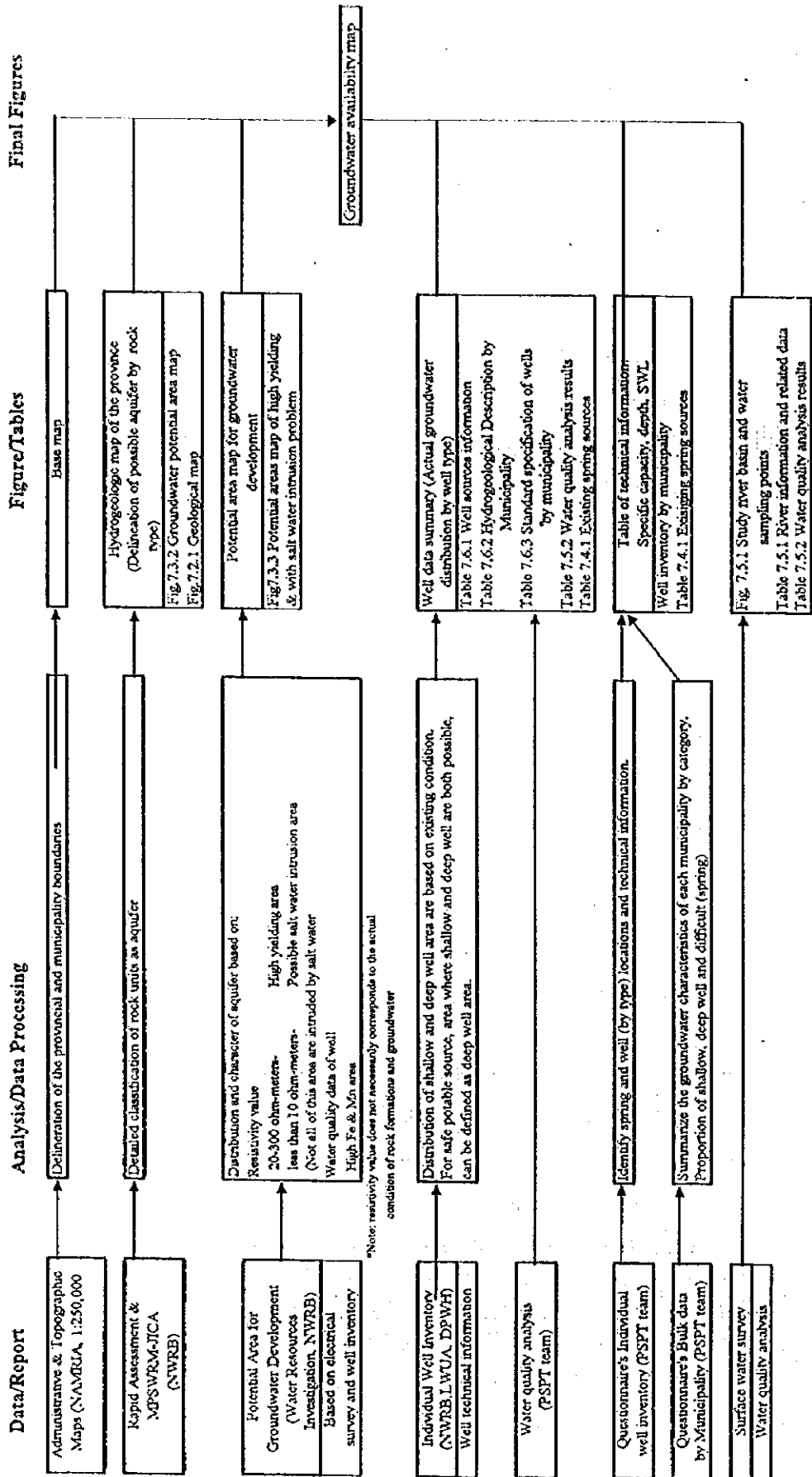
(2) Approach and Methodology

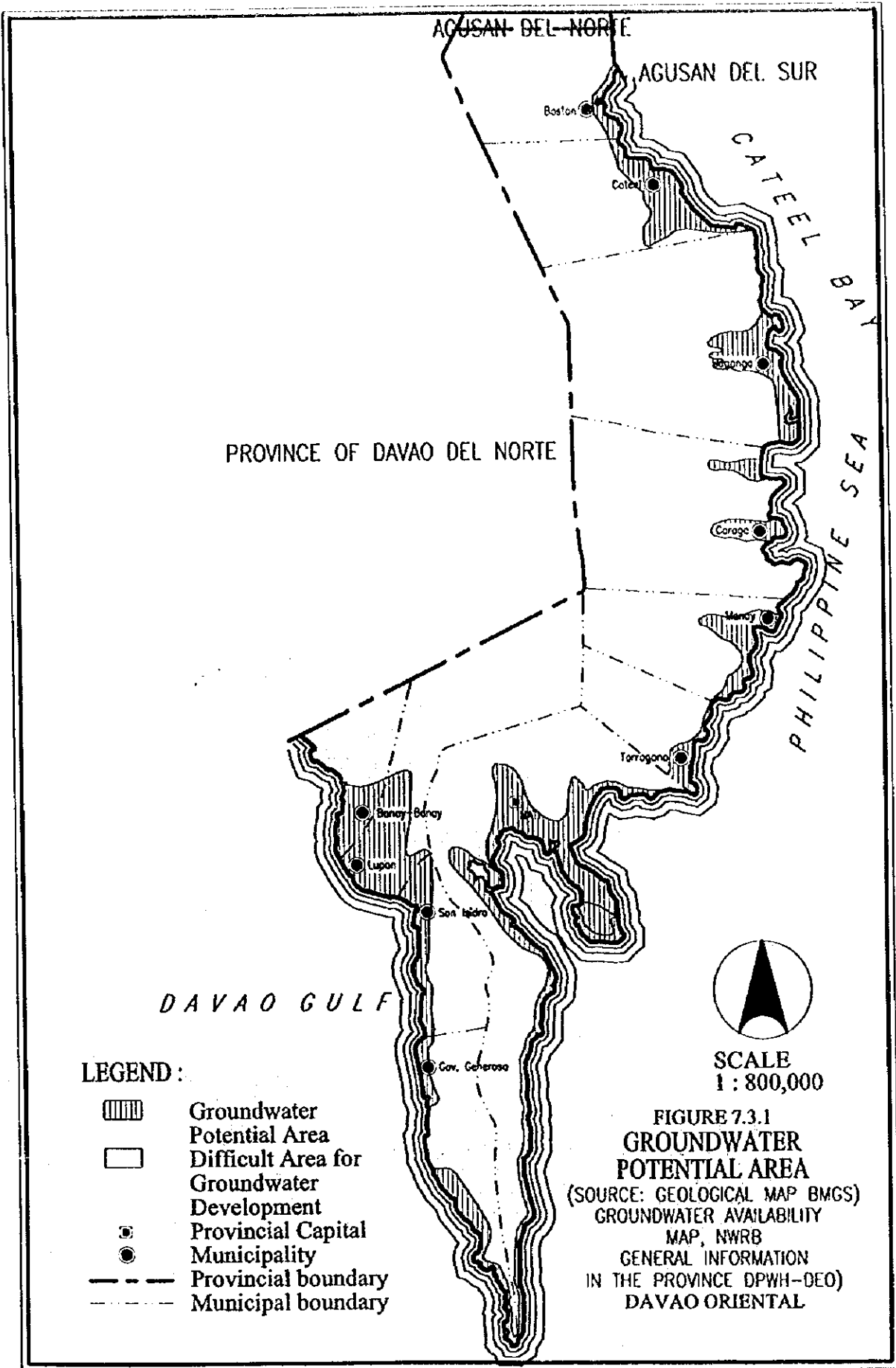
The procedure in preparing the Groundwater Availability Map is explained below with work flow depicted in Figure 7.3.1.

- 1) Prepare a base map with a scale of 1:250,000. The topographical map of NAMRIA (1:250,000) was used as a reference map. Basic information including rivers and provincial and municipal boundaries are indicated in the prepared base map.
- 2) The groundwater potential areas, based on the geology of the province, are delineated on the base map. The Recent alluvial and/or beach deposits, Pliocene-Quaternary sedimentary formation (clay, silt, sand and gravel) and Pliocene-Quaternary volcanic rock units (pyroclastics, debris flow, and tuff) are regarded as possible aquifers considering their high porosity and permeability.

Boundaries between groundwater development potential areas and difficult areas were defined and delineated as presented in Figure 7.3.2.

Figure 7.3.1 WORK FLOW OF GROUNDWATER AVAILABILITY MAP





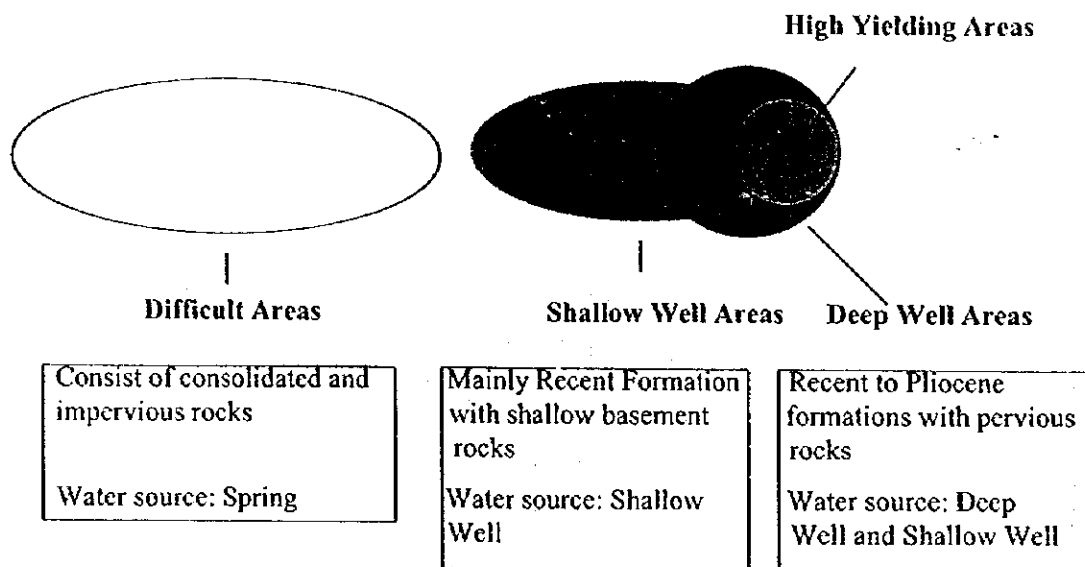
DISK NAME : DAVAO-ORIENTAL(DISK1)
FILENAME : DAVAO-ORIENTAL(GPA)

- 3) Areas with potential high yielding aquifer in the Water Resources Investigation of NWRB, are reflected in the defined groundwater potential areas.

Based on the results of electric resistivity survey of the above investigation, resistivity values from 20 to 210 ohm-meter indicate a potential high yielding formation. Values less than 10 ohm-meter suggest clayey layer. Figure 7.3.3 shows the boundaries of areas with high and low yielding aquifers.

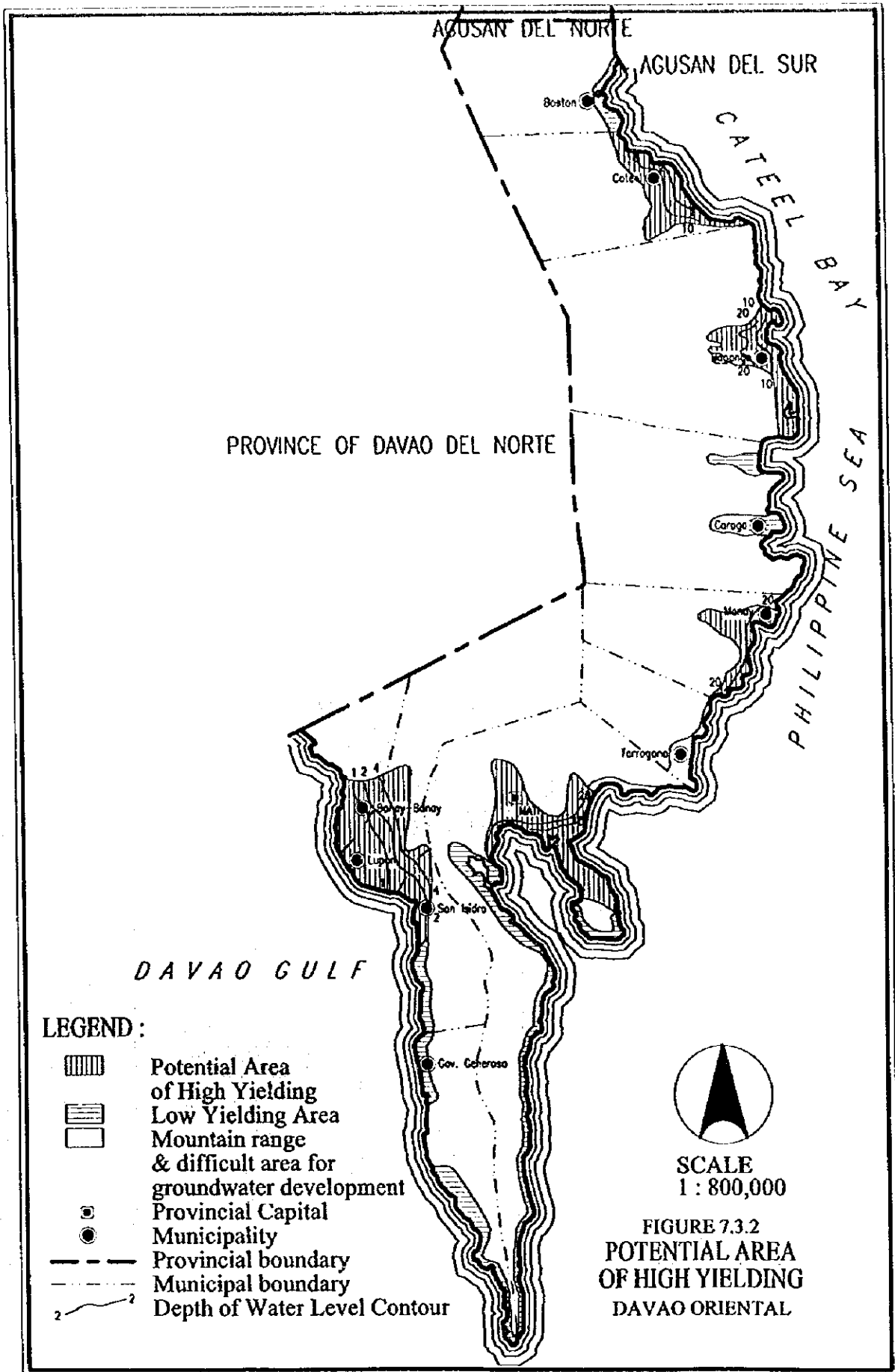
- 4) Delineate shallow and deep well areas based on well database of NWRB and DPWH-central office, well inventory of DPWH-DEO (refer to Table 7.3.1, Data Report) and rock distribution. Figure 7.3.4 presents the categorization in terms of groundwater utilization.

Figure 7.3.4 Area Category in Groundwater Utilization







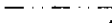



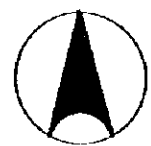
Shallow well areas are defined on the following basis:

- (a) Predominance of serviceable shallow wells and presence of deep wells with water quality problem and/or low yielding aquifers.
 - (b) Occurrence of impervious rocks beneath the Recent formation at shallow depth.
- 5) Based on the information provided by NWRB's well inventory and the data obtained through the questionnaires, well specifications for each municipality are established



LEGEND :

-  Potential Area of High Yielding
-  Low Yielding Area
-  Mountain range & difficult area for groundwater development
-  Provincial Capital
-  Municipality
-  Provincial boundary
-  Municipal boundary
-  Depth of Water Level Contour



SCALE
1 : 800,000

FIGURE 7.3.2
POTENTIAL AREA
OF HIGH YIELDING
DAVAO ORIENTAL

DISK NAME : DAVAO-ORIENTAL(DISK1)
FILENAME : DAVAO-ORIENTAL(PART)

as shown in the map. These specifications are used as references in evaluating the groundwater availability in each locality. Individual well locations with technical information are presented in Figure 7.6.1, Data Report.

(3) Future updating and utilization of the map

For future updating of the map, the following procedure shall be employed.

- 1) Referring to the results of any supplementary water sources investigation by various agencies, re-define the potential area for groundwater development by applying the aforementioned procedures.
- 2) Update the provincial database using the questionnaire made for the study to make necessary revision of the delineated boundaries of groundwater categories.

7.4 Spring Sources

The numbers and discharge of developed and untapped springs by municipality are shown in Table 7.4.1. The data are derived from the information obtained through the questionnaires and Table 7.1.1 Water Source Information, Data Report.

Table 7.4.1 Existing Spring Sources

Municipality	Developed Spring		Untapped Spring		
	Number	Discharge (l/sec)	Number	Discharge (l/sec)	
				Ave.	Range
Banaybanay	16	< 2.8			
Lupon	36	< 2.8	6	9.22	7.56-11.36
San Isidro	30	< 2.8	9	1.06	0.14-3.33
Gov. Generoso	46	< 2.8	14	1.00	0.14-0.56
	4	> 2.8			
Mati	105	< 2.8	9	11.06	0.17-0.83
	2	> 2.8			

Municipality	Developed Spring		Untapped Spring		
	Number	Discharge (l/sec)	Number	Discharge (l/sec)	
				Ave.	Range
Mati	105	< 2.8	9	11.06	0.17-0.83
	2	> 2.8			
Tarragona	31	< 2.8			
	5	> 2.8			
Manay	29	< 2.8			
Caraga	25	< 2.8			
Baganga	35	< 2.8			
Cateel	10	< 2.8	8	31.00	0.11-1.67
	2	> 2.8			
Boston	16	< 2.8	3	2.28	0.14-0.83
	7	> 2.8			
TOTAL	399		49	9.25	

7.5 Surface Water Source

The major rivers in the province were identified to evaluate their potentials as water supply source to meet the future water needs of the province. The following criteria were adopted for the selection:

- rivers currently utilized for domestic water supply,
- rivers which have gauging stations and
- rivers with watersheds of 100 sq.km or more.

Based on the above criteria, the selected major rivers were the Cateel River, the Manurigao River, the Caraga River, the Casauman River, the Bitanagan River and the Sunlog River as shown in Table 7.5.1. Some of the major rivers have tributaries and originate from Davao del Norte.

The gauging stations in the province are located at the Cateel River and the Caraga River, which are shown in Figure 7.5.1. The runoff records of these gauging stations are lacking

Table 7.5.1 Gauging Station & River Water Use by Major River Basins

River Basin		Information from Gauging Station				Surface Water Use (Water Rights) in Watershed				
Major River	Stream & Main Systems	Drainage ¹ sq. km	Location No. in Figure 7.5.1	River Flow Rate (Q: cum/sec)		Municipality in watershed	Domestic cum/sec	Industrial cum/sec	Irrigation cum/sec	Others ² cum/sec
				Peak Qp	Max. Q ₉₅	Mini. Q ₅	Data Period			
Cateel	Stream-A	No Existing Gauging Station								
	Cateel Main									
Manurigao	Stream-B	264.0(1); 9.6 km from mouth		406.14	401.52	19.90	1958-59			
	Manurigao Main	No Existing Gauging Station								
Caraga	Stream-C	468.0(2); 4.8 km from mouth		NA ²	NA ²	NA ²				
Casauman	Casauman Main	No Existing Gauging Station								
Bitanagan	Stream-D	No Existing Gauging Station								
Sunlog	Stream-E	No Existing Gauging Station								
	Sunlog Main	No Existing Gauging Station								

Source: Philippine Water Resources Summary Data, established January 1980 by NWRRC

Notes: Drainage¹ : Watershed Area at Gauging Station

NA² : Record is lacking.

Qp : Peak Discharge of Daily Maximum Discharge

Q₉₅ : Maximum Daily Discharge of Weighted Daily Discharge

Q₅ : Minimum Daily Discharge of Weighted Daily Discharge

Others³ : Including Livestock, Recreation & Fisheries

NR⁴ : Surface water utilization was not registered in NWRB Database, as of March 1997.

(Province)⁵ : Out of Applicable Area

presently. Therefore, the runoff records of the gauging stations in other provinces were adopted for stream flow estimation. The runoff records were obtained from the "Philippine Water Resources Summary Data" established in 1980 by the NWRC. The records from gauging stations and the present uses (water rights) from the major rivers in respective municipalities are summarized in Table 7.5.1.

(1) Surface Water Utilization/Water Rights

As seen in Table 7.5.1, the present water uses in watershed of major rivers total 5.63 cu.m/sec only. Additionally, the water rights of 1.91 cu.m/sec from other rivers are utilized in the province. The total surface water utilization is estimated 7.54 cum/sec in the province. There is no surface water development for domestic water supply use in the province.

(2) River Flow Analysis

The flow duration curves, derived from the available runoff records, are shown in Figure 7.5.2. Because of the lacked runoff records at major rivers in the province, the specific discharge at some gauging stations in the provinces of Davao del Norte and Surigao del Sur were used. Records from the Carac-an River, the Tago River, the Hijo River, the Tagum River and the Agusan River were used to estimate the specific discharge in the major rivers of Davao Oriental.

The stream flow, maintenance flow, diversion flow and return flow are usually used to estimate the exploitable surface water potential. In this study, the stream flow was considered as flow potential for domestic use and the diversion flow value was treated as the equivalent to the discharge of water rights registration in surface water use. Detailed study on the return flow has not been performed due to the difficulties in investigating the relating hydrological parameters within the entire watersheds in the province. Therefore, the return flow was not considered for the estimation of exploitable potential.

It is generally accepted that to secure the required volume for water supply, each water use sector adopts different return periods. Usually, the dependability of domestic water supply is taken to be 90% or higher of the whole hydrologic period (10-year or longer return-period).

Percent of Time (%) (No. in Figure 7.5.1)	Specific Discharge (cum/sec/100sq.km)						
	Cateel River 1	Caraga River 2	Carac-an River in other province	Tago River in other province	Hijo River in other province	Tagum River in other province	Agusan-MP NWRB-MP
10%	-	-	46.47	39.95	4.21	8.48	16.27
20%	-	-	27.63	28.61	3.54	7.14	11.96
30%	-	-	19.91	23.38	3.23	6.13	9.96
40%	-	-	15.26	20.95	3.14	5.34	8.36
50%	-	-	10.83	18.39	2.82	4.59	7.27
60%	-	-	8.65	16.34	2.52	4.08	6.31
70%	-	-	6.62	13.38	2.39	3.78	5.37
80%	-	-	5.09	12.41	2.07	2.97	4.23
90%	-	-	3.56	8.15	1.66	2.35	2.08
100%	-	-	2.53	3.42	0.80	1.01	0.67
Period of Data Used	-	-	'50-'70	'59-'70	'51-'70	'49-'69	'79-'83

Source: Philippine Water Resources Summary Data, as of Jan. 1980 by MWRC
Interim Report, Master Plan Study on Water Resources Management, as of Oct. 1997 by NWRB

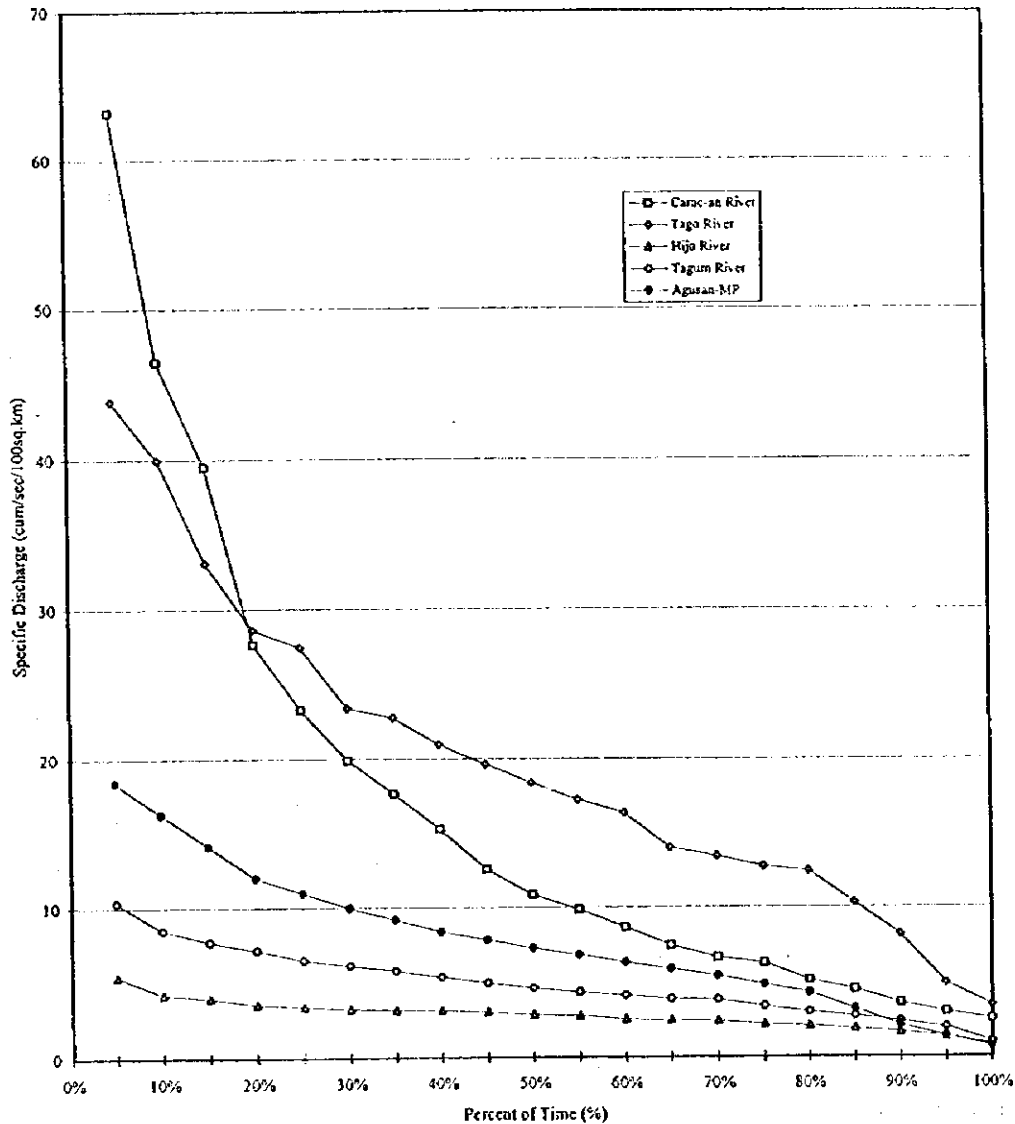


Figure 7.5.2 River Flow Duration Curve

In determining the river maintenance flow, such factors as runoff characteristics, navigation, fishing, picturesque scenery, salt water intrusion, clogging of river mouth, riparian structures, groundwater table, flora and fauna, and river water quality shall be considered to maintain the normal function of the river. In the Philippines, 10% of the dependable flow of the river is at least required as minimum maintenance flow. Therefore, the maintenance flow was calculated as the dependable flow for irrigation, which equals to 80% (5-year return-period) of the whole hydrologic period.

Finally, the exploitable potential of surface water in the province was studied in reference to inflow to and outflow from the respective municipalities. The results are summarized in Table 7.5.2.

(3) Surface Water Quality

The results of water quality survey are summarized in Table 7.5.1, Data Report. The sampling locations were selected basically at the upstream boundary of the respective municipalities. In the said table, Class AA and Class A of the "DENR Water Quality Criteria for Fresh Water" are shown as a reference for the raw water evaluation. The PNSDW-1994 is also used to evaluate water quality with reference to the turbidity and the trace elements. The water quality of the selected rivers is classified as "Class A," although the tested parameters are limited. However, high Fe and Mn contents were observed in the Cateel and Sunlog Rivers.

7.6 Future Development Potential of Water Sources

7.6.1 Groundwater

A well inventory covering all the municipalities shows that there are 5,413 existing wells in the province, while 86 wells are recorded in the inventory made by NWRB (see Table 7.1.1 and 7.3.1, Data Report). Despite the smaller number of wells included in NWRB data, they were used in the analysis since they provided technical information. Of the total 86 wells, 81 have complete information; depth, static water level and specific capacity. Data are summarized in Table 7.6.1 Existing Well Sources.

Considering the well information, the most productive wells are those having depth ranging from 6 m to 19 m and from 24 m to 100 m. The good yielding wells have static water level

Table 7.5.2 Probability of Surface Water

Surface Water Sources		Related Data				Probability of Surface Water (10-year return-period)													
Major Surface Water	Stream & Main Systems	Location Municipality & Province upstream to down	River Connection outlet or inlet	Watershed Area in		Sp. D (return-period)		Inflow to Municipality		Outflow from Municipality									
				Location (1)	Upstream (2)	10-year (3)	5-year (4)	S/Flow (5) cu.m/sec	M/Flow (6) cu.m/sec	Use (7) cu.m/sec	Potential (8) cu.m/sec	S/Flow (9) cu.m/sec	M/Flow (10) cu.m/sec	Use (11) cu.m/sec	Potential (12) cu.m/sec				
Cateel	Stream-A	Davao del Norte		239.04	0.00	2.82	4.66	0.00	0.00	0.00	6.74	1.11	0.00	5.62	7.03	1.16	0.00	5.87	
		Cateel	to Cateel Main	10.40	239.04	2.82	4.66	6.74	1.11	0.00	0.00	7.03	1.16	0.00	5.62	7.03	1.16	0.00	5.87
		Davao del Norte		254.98	0.00	2.82	4.66	0.00	0.00	0.00	0.00	7.19	1.19	0.00	6.00	7.19	1.19	0.00	6.00
		Baganga		317.82	254.98	2.82	4.66	7.19	1.19	0.00	0.00	16.15	2.67	0.03	13.45	16.15	2.67	0.03	13.45
		Cateel	from Stream-A	176.87	572.79	2.82	4.66	16.15	2.67	0.03	0.00	28.17	3.49	1.52	23.15	28.17	3.49	1.52	23.15
Manungao	Stream-B	Davao del Norte		63.74	0.00	2.82	4.66	0.00	0.00	0.00	1.80	0.30	0.00	1.50	1.80	0.30	0.00	1.50	
		Baganga		282.50	63.74	2.82	4.66	1.80	0.30	0.00	9.76	1.61	0.02	8.12	9.76	1.61	0.02	8.12	
		Caraga	to Manungao Main	12.86	346.25	2.82	4.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Manungao Main		223.10	0.00	2.82	4.66	6.29	1.04	0.00	0.00	6.29	1.04	0.00	5.25	6.29	1.04	0.00	5.25
		Caraga	from Stream-B	135.01	223.10	2.82	4.66	6.29	1.04	0.00	0.00	9.43	1.56	0.00	7.87	9.43	1.56	0.00	7.87
Caraga		Davao del Norte		334.66	0.00	2.82	4.66	0.00	0.00	0.00	9.43	1.56	0.00	8.00	9.43	1.56	0.00	8.00	
		Caraga		244.30	334.66	2.82	4.66	9.43	1.56	0.00	16.32	2.70	0.03	13.60	16.32	2.70	0.03	13.60	
		Casauman		31.87	0.00	2.82	4.66	0.00	0.00	0.00	0.00	0.90	0.15	0.00	0.75	0.90	0.15	0.00	0.75
		Davao del Norte		45.00	31.87	2.82	4.66	0.90	0.15	0.00	2.17	0.36	0.01	1.80	2.17	0.36	0.01	1.80	
		Caraga	to Casauman Main	69.64	76.88	2.82	4.66	2.17	0.36	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Casaanman	Stream-C	Davao del Norte		207.17	0.00	2.82	4.66	0.00	0.00	0.00	5.84	0.97	0.00	4.87	5.84	0.97	0.00	4.87	
		Manay		69.43	207.17	2.82	4.66	7.80	1.29	0.87	19.36	2.52	0.87	15.97	19.36	2.52	0.87	15.97	
		Davao del Norte	from Stream-C	263.62	276.59	2.82	4.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		Lupon		31.87	0.00	2.01	2.52	0.00	0.00	0.00	0.64	0.08	0.00	0.56	0.64	0.08	0.00	0.56	
		Manay	from Stream-C	76.73	31.87	2.01	2.52	0.64	0.08	0.00	2.18	0.27	0.97	1.49	2.18	0.27	0.97	1.49	
Bataganagan		Davao del Norte		31.64	108.61	2.01	2.52	2.18	0.27	0.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		Lupon		31.87	0.00	2.01	2.52	0.00	0.00	0.00	0.64	0.08	0.00	0.56	0.64	0.08	0.00	0.56	
		Davao del Norte		29.20	31.87	2.01	2.52	0.64	0.08	0.00	1.22	0.15	0.02	1.05	1.22	0.15	0.02	1.05	
		Banaybanay		40.19	61.07	2.01	2.52	1.22	0.15	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		Lupon	to Sunlog Main	55.38	0.00	2.01	2.52	0.00	0.00	0.00	1.11	0.14	0.01	0.96	1.11	0.14	0.01	0.96	
Sunlog	Stream-D	Davao del Norte		14.62	55.38	2.01	2.52	1.11	0.14	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		Banaybanay		175.30	0.00	2.01	2.52	0.00	0.00	0.00	3.52	0.44	0.00	3.07	3.52	0.44	0.00	3.07	
		Lupon	to Sunlog Main	116.93	175.30	2.01	2.52	3.52	0.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		Davao del Norte		116.93	175.30	2.01	2.52	0.00	0.00	0.00	9.30	0.74	2.16	6.39	9.30	0.74	2.16	6.39	
		Lupon	from Stream-D & E																

Notes:
 Sp. D (Specific Discharge) was analyzed by monthly mean flow records from gauging station.
 S/Flow (Stream Flow) was estimated specific discharge (10-year return-period) multiplied by upstream area.
 M/Flow (Maintenance Flow) was estimated 10% of river flow in case of 5-year return-period.
 Sp.D (10-year or 5-year return-period) without gauging station was adopted by the other analysis result from near gauging station.
 Inlet & outlet "User" (Water Rights) are summed up by NWRB Database, as of March 1997.
 Unit Q for Specific Discharge is cu.m/sec/100 sq.km.
 S/Flow, M/Flow & Use in final outlet flow of each stream system was added to respective inlet flows of main system.

Table 7.6.1 Existing Well Sources

Municipality	Type	Number	Depth (m)		SWL (m)		Sp. Cap. (l/sec/m)	
			Ave.	Range	Ave.	Range	Ave.	Range
Baganga	SW	10	10.15	6.03 - 17.07	6.09	2.43 - 12.19	1.19	0.20 - 4.20
	DW	-						
	Total	10	10.15		6.09		1.19	
Banay-banay	SW	1	10.37	10.37 - 10.37	1.52	1.52 - 1.52	1.45	1.45 - 1.45
	DW	3	44.72	35.06 - 55.80	2.24	0.61 - 3.66	2.1	0.00 - 2.10
	Total	4	36.13		2.06		1.94	
Boston	SW	-						
	DW	-						
	Total							
Carraga	SW	3	7.93	6.10 - 9.75	4.57	1.82 - 7.31	1.35	0.54 - 1.86
	DW	4	40.09	26.22 - 62.50	10.52	6.09 - 16.16	0.14	0.03 - 0.32
	Total	7	26.31		7.97		0.66	
Cateel	SW	5	9.51	9.14 - 10.98	3.2	2.13 - 4.57	0.95	0.31 - 1.54
	DW	-						
	Total	5	9.51		3.2		0.95	
Gov. Generoso	SW	10	12.33	8.52 - 15.85	2.34	0.56 - 5.48	0.79	0.12 - 1.66
	DW	2	24.54	23.78 - 25.30	5.03	3.96 - 6.10	0.08	0.08 - 0.08
	Total	12	14.37		2.79		0.67	
Lupon	SW	10	9.45	7.62 - 15.24	2.29	1.22 - 4.57	0.77	0.55 - 1.03
	DW	6	47.15	24.40 - 76.22	6.55	1.83 - 25.91	0.87	0.27 - 1.46
	Total	16	23.59		3.89		0.81	
Manay	SW	5	16.88	14.63 - 18.59	9.51	6.09 - 12.80	1.5	0.27 - 4.20
	DW	2	33.08	31.09 - 35.06	14.33	12.19 - 16.46	0.13	0.02 - 0.24
	Total	7	21.51		10.89		1.11	
Mati	SW	9	9.96	7.31 - 13.72	3.11	1.52 - 6.10	0.99	0.47 - 1.86
	DW	5	55.79	25.00 - 100.00	27.34	6.10 - 73.17	0.6	0.14 - 1.45
	Total	14	26.33		11.76		0.85	
San Isidro	SW	4	10.06	7.32 - 14.33	3.43	1.22 - 5.79	1.21	0.25 - 1.66
	DW	1	24.47	24.47 - 24.47	1.52	1.52 - 1.52	0.55	0.55 - 0.55
	Total	5	12.94		3.05		1.08	
Tarragona	SW	3	10.87	6.40 - 17.68	5.99	3.65 - 9.76	0.53	0.29 - 0.69
	DW	-						
	Total	3	10.87		5.99		0.53	
Provincial	SW	60	10.75	6.03 - 18.59	4.21	0.56 - 12.80	1.07	0.12 - 4.20
	DW	23	38.55	23.78 - 100.00	9.65	0.61 - 73.17	0.64	0.00 - 1.20
	Total	83	18.45		5.72		0.95	

Source: NWRB Well Inventory Database

Notes:

- * Based on the data from Feasibility Study of WDs, LWUA and DPWH (Questionable data were disregarded)
- ** Estimated figures from hydrogeological continuity of the aquifer.
- *** No related technical information available.

Legend:

SWL = Static Water Level SP. Cap = Specific Capacity Ave. = Average
 SW = Shallow Well DW = Deep Well

varying from about 1.5 m to 27 m and specific capacity of about 0.5 l/sec/m to 2.1 l/sec/m.

Based on the hydraulic characteristics and distribution of wells in Davao Oriental, good aquifers occur in the recent sediments that are distributed in Banaybanay and Lupon in the western part; Mati in the central part; and in areas of Manay, Caraga, Baganga, Cateel, and Boston along the eastern coastal line. The recent sediments are distributed only in small scale and are possible to be developed by means of shallow and deep wells. In the poblacion of Banaybanay and the eastern area of Mati, there are about 50 free flowing wells with depth of 36 m. On the other hand, shallow well areas are distributed southwest and southeast of the large peninsula that is located south of Lupon, and in the tip of the small peninsula located south of Mati.

As indicated in Figure 7.3.2 Main Report, salt water intrusion occurs in shallow groundwater around the western tip of the large peninsula. Salt water intrusion is also observed west of Mati, south of Manay, north of Caraga, and the periphery area of Boston. Groundwater with high iron content is distributed east and northeast of Mati and in portions of Caraga, Baganga, and Cateel. The well depth in municipalities of Mati and Baganga ranges from 18 m to 24 m.

As alternative water sources, the untapped springs can be developed for future use. These are the most reliable water sources in the areas considered as difficult for well development (mostly occupied by mountains). The untapped springs are distributed in the eastern mountainous areas of Lupon, San Isidro, Gov. Generoso, Mati, Cateel, and Boston.

The detailed hydrogeological characteristics of each municipality are summarized in Table 7.6.2, while individual well locations with technical information are shown in Figure 7.6.1 Individual Well Location and Specification Map, Data Report.

Table 7.6.2 Hydrogeological Description by Municipality

MUNICIPALITY	TOPOGRAPHY	EXISTING CONDITIONS										DATA INTERPRETATION					
		GEOLOGIC UNITS (%)			WELL INFORMATION				SPRINGS			GROUND WATER AVAILABILITY		AQUIFER FORMATION	ESTIMATED AQUIFER DEPTH RANGE (m)	OTHERS	
		K	N ₁	N ₂	N ₃	DEPTH (m)	AVE. SWI. (m/d)		AVE. SP. CAP. (1/m)	NO. TAPPED	NO. UNTAPPED	SW	DW				DF
							SW	DW						SW	DW	NO.	
Baganga	flat to mountainous	10	30	0	60	0	6-17	6.09	0.20-4.20 (1.19)	22	<2.8	20	0	80	Alluvium/Plio-Pleistocene rocks	6-60	Potential aquifer expected in the alluvial deposits and low relief hills.
Baruy-banay	flat to hilly	10	5	0	30	55	10-35	1.52	1.45-1.45 (1.45)	15	<2.8	0	30	70	Alluvium/Plio-Pleistocene rocks	2-80	Potential aquifer expected in the alluvial deposits and low relief hills. Groundwater sources should be located away from the shoreline to prevent saltwater intrusion.
Boston	flat to hilly	0	5	0	70	25				20	<2.8	10	0	90	Miocene and older rocks	-	Largely spring area.
Caraga	flat to mountainous	5	20	10	65	0	16-9	4.57	10.52-0.54-1.86 (1.35)	33	<2.8	0	10	90	Miocene and older rocks	-	Largely spring area.
Cateel	flat to hilly	15	0	0	75	10	9-10	3.2	0.31-1.54 (0.95)	11	-	20	0	80	Alluvium/Plio-Pleistocene rocks	3-60	Potential aquifer expected in the alluvial deposits and low relief hills. Groundwater abstraction should be monitored to prevent saltwater intrusion.
Gen. Generoso	flat to mountainous	20	40	0	40	0	8-15	2.34	0.12-1.66 (0.79)	48	<2.8	0	10	90	Miocene and older rocks	-	Aquifer can be expected along the coastal area at low yield. Largely spring area.
Lupon	flat to hilly	25	5	0	15	55	17-15	2.29	0.55-1.03 (0.77)	36	<2.8	0	10	90	Alluvium/Plio-Pleistocene rocks	3-80	Potential aquifer expected in the alluvial deposits and low relief hills. Most area falls under the category of difficult area for well development. Spring and surface water sources are recommended as supplement.
Manay	flat to mountainous	2	10	55	30	3	14-18	9.51	0.27-4.20 (1.5)	29	<2.8	0	20	80	Alluvium/Plio-Pleistocene rocks	6-60	Potential aquifer expected in the alluvial plains and low relief hills. Groundwater sources should be located far from the coast line to prevent saltwater intrusion.

MUNICIPALITY		TOPOGRAPHY		EXISTING CONDITIONS												DATA INTERPRETATION								
				GEOLOGIC UNITS (%)			WELL INFORMATION						SPRINGS			GROUND WATER AVAILABILITY			AQUIFER FORMATION	ESTIMATED AQUIFER DEPTH RANGE (mbsgl)	OTHERS			
							R	N3	N2	N1	O	DEPTH (m)		...AVE. SWI (mbsgl)		MAX. (AVE.) SP. CAP. (l/s/m)		NO.				TAPPED AVE. Q (l/s)	NO.	UNTAPPED AVE. Q (l/s)
				SW	DW	SW						DW	SW	DW	SW	DW								
Mail		Flat to mountainous		10	10	0	10	70	7-19	25-100	3.11	27.34	0.47-1.86 (0.99)	0.14-1.45 (0.6)	200	<2.8	9	11.06	0	20	80	Alluvium/Plio-Pleistocene rocks	3-80	Potential aquifer expected in the alluvial plains and low relief hills. Over pumping of freshwater should be limited to prevent encroachment of salt water inland.
San Jidro		Flat to mountainous		10	10	0	0	80	7-14	24.47	3.43	1.52	0.25-1.66 (1.21)	0.55	42	<2.8	9	1.06	0	10	90	Alluvium/Plio-Pleistocene rocks	3-60	Potential aquifer expected in the alluvial plains and low relief hills. Spring and surface water sources can be developed to supplement groundwater.
Tarragona		Flat to mountainous		5	5	5	65	20	6-17		5.99		0.29-0.69 (0.53)		35	<2.8			0	10	90	Miocene and older rocks	6-20	Largely spring areas. Wells may be drilled along the alluvial deposits but may not produce good yield.

7.6.2 Springs

Untapped spring source identification data are shown in Table 7.6.3. These data were collected and tabulated by questionnaire sheets-untapped spring information format, Data Report, including the parameters of barangay name, owner, discharge, transmission line length, and elevation difference.

Table 7.6.3 Untapped Spring Water Source Identification

Municipality	Barangay Name	Number	Untapped Spring			
			Owner	Discharge (m ³ /hr)	T.L.L. (km)	Elevation Difference (m)
Lupon	Don Marinao	1	Private	27.2	1.0	20.0
		1	Private	27.2	2.0	20.0
		1	Public	27.2	0.5	20.0
		1	Public	27.2	1.0	40.0
		1	Public	40.9	1.0	20.0
		1	Public	40.9	1.5	30.0
San Isidoro	Baon	1	Private	1.1	0.5	N.A.
	Bitaosan	1	Public	3.0	2.3	50.0
	Lapu-lapu	1	Private	1.2	1.2	30.0
	Maputi	1	Private	1.9	1.0	40.0
		1	Private	2.8	2.3	80.0
	San Miguel	1	Public	0.5	0.7	6.0
	Sto. Rosario	1	Private	6.0	1.5	300.0
		1	Private	6.0	1.0	300.0
Suplon	1	Private	12	2.0	15.0	
Gen. Generoso	Dadue	1	Public	1.2	0.8	7.5
	Chicote	1	Public	9.6	N.A.	1.0
	Lavigan	1	Private	5.0	0.6	60.0
	Oregon	1	Private	10	2.0	200.0
	Roxas	1	Private	2.4	1.4	6.0
Gen. Generoso	Sergio Osmera	1	Private	2.4	0.9	90.0

Note: N.A. Data not available

T.L.L. Transmission line length

Municipality	Barangay Name	Number	Untapped Spring			
			Owner	Discharge (m ³ /hr)	T.L.L. (km)	Elevation Difference (m)
Gen. Generoso	Sergio Osmera	1	Private	2.4	1.0	60.0
		1	Private	2.4	0.8	50.0
		1	Private	2.4	1.7	60.0
	Surop	1	Private	6.0	2.0	20.0
	Tandang Sora	1	Private	1.2	0.3	30.0
		1	Private	1.2	1.0	50.0
	Tibanban	1	Private	3.0	0.5	0.0
	Tiblawan	1	Private	0.6	1.8	106.0
Mati	Don Sarvador	1	Public	227.1	3.0	180.0
	Sainz	1	Public	0.6	1.5	N.A.
		1	Private	1.5	2.0	70.0
		1	Private	N.A.	2.0	100.0
		1	Private	N.A.	2.0	70.0
		1	Public	1.2	2.0	50.0
	Sanghay	1	Private	2.7	2.0	100.0
		1	Private	2.7	1.0	100.0
	Tamisan	1	Private	N.A.	2.0	70.0
Cateel	Abijod	1	Private	136.3	5.0	3.0
	Taytayan	1	Private	4.8	3.0	9.0
	Sta. Filomena	1	Private	10	5.0	3.0
	Mainit	1	Public	600	0.5	3.0
		1	Private	600	0.4	N.A.
	Aliwagnag	1	Private	10	1.0	9.0
	Aragon	1	Private	10	6.0	13.5
	San Rafael	1	Private	10	5.0	3.0
Boston	Simylao	1	Private	10	0.5	98
	Carmen	1	Private	4.5	3.0	86
	Cawtihan	1	Public	10	1.0	34

Note: N.A. Data not available

T.L.L Transmission line length

7.7 Water Source Development for Medium-Term Development Plan

7.7.1 Spacing Allocation for Level II and III Wells

The pumping rates required for Level I systems are fairly lower than that for Level II and III systems. The well interference in Level I systems need not to be studied in terms of spacing of wells and production rate, since most formations in shallow and deep well areas generally have enough groundwater development potential. As Level II and III wells are usually expected to produce larger discharge to meet the water demand, the spacing of wells to avoid the well interference has to be considered. Spacing allocation for Level II and III wells was examined considering specific capacity, pumping rate, and assumed drawdown of 1 cm at interference radius for a pumping duration of 16 hours.

(1) Specific Capacity

According to the existing well source information, specific capacity was considered with ranges from 0.5 l/s/m to 6.5 l/s/m. To simplify the calculation, an average value in each range is adopted in the calculation of interference radius.

(2) Pumping Rate

The pumping rate was estimated by assuming a drawdown of 10 m with the average value of specific capacity and 16 operation hours/day of pumps. The formula used to determine proper well spacing is the Jacob modified equation. Drawdown at the interference boundary is assumed to be 1 cm after a pumping duration of 16 hours.

Table 7.7.1 presents the estimated spacing requirements and number of wells to be constructed per sq. Km. The spacing interval between adjacent wells to avoid the well interference is planned to be more than twice distances of the calculated interference radius.

Table 7.7.1 Spacing Arrangements for Planned Wells

Range of Specific Capacity (l/s/m)	Estimated Pumping Rate (m ³ /day)	Estimated Interference Radius (m)	Estimated Number of wells/km ²
0.5 - 1.5	500	80	45
1.5 - 3.0	1,000	120	20
3.0 - 4.5	2,000	160	11
4.5 - 6.0	2,500	200	7
> 6.0	>2,500	> 200	> 7