

Executive Director of NWRB has been designated as co-chairman of the Technical Working Group for SWIM.

(2) Bureau of Fisheries and Aquatic Resources (BFAR)

BFAR started in 1907 as a Division in the Bureau of Science. At present, BFAR is one of the staff offices under the Department of Agriculture by virtue of the Executive order No.116 dated January 30, 1987. BFAR has the following functions and responsibility:

- (1) to formulate plans for the proper management, accelerated development, and proper utilization of the country's fishery and aquatic resources, and
- (2) to recommend plans, programs, policies, rules and regulations to the Secretary for the Department of Agriculture and provide technical assistance in the implementation of the same.

3.5.5 SWIM Project Fund and Its Allocation

The total budget for the SWIM projects over the period of 1982-1988 was about ₱300.8 million or about ₱43.0 million per annum on an average as shown in Table 3.5.1. Actual expenditures for construction of the SWIM projects over the period of 1982-1988 was ₱227.7 million in total or 75.7% of the available budget as shown in Table 3.5.2. The SWIM project fund was allocated as follows:

Implementing Agency	Allocated Fund (₱ 1,000)	Percentage (%)
PMO-SWIM	103,387	45.4
NIA	24,765	10.9
BSWM	14,957	6.6
NEA	4,408	1.9
FMB	20,809	9.1
FSDC	59,418	26.1
Total	227,744	100.0

Annual budgets and expenditures for construction of each SWIM project over the period of 1982 - 1988 are given in Table 3.5.3.

3.6 Current Problems on SWIM Projects

As far as the current problems involved in implementation and management of the SWIM projects are concerned, the following findings are obtained from Phase-I studies:

- (1) The proposed projects are not always conformable to the definitions, purposes, and objectives of the SWIM projects which have been given by the SWIM Committee.

The SWIM Projects are conceived as an auxiliary line of defense against the recurrent floods and at the same time, act as multi-purpose mini-reservoirs involving irrigation, soil erosion control, mini-hydropower and fish culture. These projects are to be constructed generally on the upper reaches at the foothills of tributary creeks and streams. The SWIM Projects are currently defined in general by the SWIM Committee as those small scale water-impounding dams which have structural height of not more than 30 m and/or a volume of storage not exceeding 50MCM.

JICA Study Team has noticed, after reviewing the existing SWIM Projects, that the present SWIM projects have the wide variety of functions and scale of development. JICA Study Team has the opinion based on the findings that a simple definition will not always be applicable to the present SWIM projects and therefore a more clearer definitions together with realistic purposes and objectives be given separately for different categories of the SWIM projects to be undertaken by each Implementing Agency.

- (2) Each Implementing Agency has no clear guidelines for preparation of the feasibility study on the SWIM projects.

Very wide variety of the technical studies are observed in study items, methods and accuracy among the existing feasibility study reports. Difficulties are therefore involved in comparison or assessment of the projects under same criteria. In general, dam plans and designs are generally acceptable ; however, plans of water utilization and flood control are not very clear in most cases. The projects are planned and designed under different criteria, and the project costs are estimated in

different methods and categories. Therefore, it is quite difficult to confirm and/or assess the necessity and economic feasibility of the projects as a whole.

The post-evaluation study on the completed SWIM projects, identified some cases that the project returns had not been realized as planned before construction or that the dams and related structures were seriously damaged or washed out. JICA Study Team has the opinion that those cases can be attributable to the insufficient studies and/or lack of technical examination in every stage of surveys, plans, designs, and construction.

Based on these findings, JICA Study Team would like to propose that the feasibility study for the SWIM projects should be standardized under clear guidelines. The guidelines for the feasibility study should include most of important technical items and with sufficient details of the standards for each technical item. The proposed project, which would be realized in future, should be supported by the technical studies which would be prepared in accordance with the said guidelines. The proposed project must be thus verified to be economically viable and technically sound for implementation.

(3) Each implementing agency estimates the costs and benefits in the different ways and economic viability of the proposed projects can not be compared.

Economic evaluation criteria for the SWIM projects must be required, because of the present situations that each implementing agency estimates the costs and benefits in the different ways and economic viability of the proposed projects can not be compared.

In most cases except NIA Projects, the calculated IRR and B/C ratios show incredibly high values. These values are calculated under unrealistic assumptions such as low construction costs, low O & M costs, shorter construction period and high output at high market prices. This may be attributable to the fact that the priority will not be granted to such projects with low economic indices compared to the prevailing standard of IRR (15%). JICA Study Team therefore considers that the present standard of IRR be adjusted, considering the importance of the SWIM projects in rural areas. This may lead to more realistic planing and designs of the SWIM projects. The standards should be determined by the SWIM Committee.

- (4) No guidelines and criteria are available for operation and maintenance of the SWIM projects.

The completed SWIM projects are operated in the different ways and methods under different types of organizational set-up. In most of the projects implemented by DPWH and NIA, the dams and related structures are operated and maintained by the implementing agencies and other facilities for water utilization are by the farmers cooperatives. In most of the projects constructed by BSWM and NEA, all the facilities including dams and related structures are operated and maintained by the farmers cooperatives or electric cooperatives. The project returns which were planned before construction, had not been attained properly in most cases. JICA Study Team considers that adequate guidelines for operation and maintenance may be required for ensuring the project returns.

The project must be financially viable and the project beneficiaries can be afford to pay the charges for the operation and maintenance of the project after its completion. The amortization for the project implementation should not be shouldered by the beneficiaries. However, the recurrent cost for operation and maintenance may be collected as the project charges. The project charges after implementation should not exceed the expected "capacity to pay" of the beneficiaries. The financial analysis of the project as well as the budget analysis of the beneficiaries must be carefully made in this regard.

- (5) Most of the SWIM projects are implemented without prior consent of the local communities in the areas to be affected, and administrative steps and procedures for project implementation have not been clearly promulgated.

The SWIM projects are primarily geared to socio-economic development in the rural areas to accelerate rural economy and increase the employment opportunity. Furthermore, participation of rural people in the projects will be indispensable particularly for effective operation and maintenance of the projects after construction. In this sense, the proposed projects must be acceptable to the people of the areas to be influenced. Therefore, only the projects requested by the representatives of local communities or those confirmed that the local communities have agreed to implement, may be included in the SWIM Program. The Implementing Agency must provide the SWIM Committee with the evidence of the agreement between the representatives of local communities and the agency as one of the prerequisites for the Committee to examine its priority ranking.

JICA Study Team has the opinion that the standard steps and procedures of project implementation should be clearly determined.

CHAPTER IV GUIDELINES AND CRITERIA FOR SCREENING AND PRIORITY RANKING OF SWIM PROJECTS

4.1 Concept and Definition of SWIM Projects

The technical review under Phase-I indicates that the listed projects have a wide variety of functions and scale of development and are not always conforming to the present basic definition of SWIM Projects; i.e., those small scale water impounding dams with a structural height of not more than 30 m and/or a volume of storage not exceeding 50 MCM. The projects can be categorized/classified into the following three (3) Types i.e. Type-I with dam and reservoir and Type-II and III, without dam and reservoir:

Type-I (with storage dam and reservoir)

Basic Objective : Flood Control
Major Objectives : Multi-purpose water resources development on a small
 scale
Implementing Agency : DPWH, NIA and BSWM

Type-II (without storage dam and reservoir)

Basic Objective : Flood Control
Major Objectives : Soil erosion control and watershed protection and
 management
Implementing Agency : FMB

Type-III (without storage dam and reservoir)

Basic Objective : Flood Control
Major Objectives : Rural electrification
Implementing Agency : NEA

Based on the above, a meeting was held between SWIM-TWG and JICA Study Team on August 4, 1989, to discuss whether the present definition should be directly applied to the listed projects and then naturally some of those projects be disqualified or

the present definition be modified to qualify all of the listed projects as SWIM. As a result of discussions, the following was determined (see Attachment-10):

Definition of SWIM Projects:

The present definition of SWIM shall not be changed. Therefore, only one type (Type-I) shall be considered as SWIM, adhering to the basic definition of SWIM Projects given by the SWIM Committee. Type-II and Type-III projects, which are proposed by FMB and NEA, shall therefore be disqualified as SWIM and be withdrawn from the candidate projects for the Master Plan Study.

Implementing Guidelines

The following implementing guidelines shall be considered for qualifying the proposed projects:

- (1) The project shall preferably be a multi-purpose water resources development on a small scale and at the same time, provide a first line of defense against floods.
- (2) The project shall include small scale water-impounding dam which have structural height of not more than 30 m and/or a volume of storage not exceeding 50MCM.
- (3) The project shall include both engineering and vegetative protection works in the watershed area of the prospective dam and reservoir.
- (4) The watershed area to be protected shall not be more than 100 km².
- (5) The irrigation development area shall not be more than 500 ha.
- (6) The installed capacity of hydropower generation shall not be more than 5,000 KW.
- (7) The construction cost of dam and its appurtenant structures shall not exceed 50 million pesos (at 1989 constant price).

Note: In case of multi-purpose projects, the principal feature of the project should be properly identified in order to establish the priority of water utilization.

The above implementing guidelines shall be applied to those projects proposed by DPWH, NIA and BSWM. The projects that are not conformable to the above guidelines, shall not be qualified as SWIM, and those disqualified projects shall be withdrawn from the candidate projects for the Master Plan Study.

4.2 General Guidelines for Qualifying SWIM Projects

In addition to the above definition and implementing guidelines, other factors of the projects shall also have to be considered for screening or qualification of the SWIM Projects. The following guidelines are basic requirement for qualifying the proposed projects as SWIM:

- (1) The proposed project must be conformable to the definitions, purposes and objectives of the SWIM projects.
- (2) The proposed project must be conformable to the provisions of the "Philippines Water Code" regarding appropriation of water.
- (3) The proposed project should be supported by in depth technical studies which cover necessary study items, and must be verified to be technically sound for implementation.
- (4) The proposed project must show acceptable economic viability in terms of EIRR, B/C and NPV.
- (5) An environmental impact study must be carried out before the proposed project be implemented and must verify that the project should not give any serious environmental impacts to the surrounding areas.
- (6) The proposed project must be acceptable to the people of the areas to be influenced. In particular, the project should not have land acquisition problem.
- (7) The proposed project must be financially viable and the project beneficiaries can afford to pay the annual charges for operation and maintenance of the projects.
- (8) Any other projects that be considered necessary under special administrative requirement.

As far as the item (1) is concerned, the proposed projects must be conformable to the definition and implementing guidelines mentioned in Section 4.1. Other items must be considered in planning stage of the projects. Detailed guidelines on these aspects are given in the "Basic Planning Criteria (refer to Chapter V)".

In the master plan study, all of the projects that qualify based on the above definition and implementing guidelines, are considered as the candidate projects for formulation of 10 year action program. These candidate projects include those which do not meet the above basic requirements other than item (1) and will more or less require further review and studies. Those projects shall be placed in lower class of priority ranking and the required review and studies are considered in the implementation schedule

of the 10 year action program. With this in view, the criteria of priority ranking will be discussed in the Section 4.4.

4.3 Qualified SWIM Projects

In conclusion, 230 projects, among the proposed 501 projects, are selected as the qualified SWIM. These 230 projects are classified by implementing agencies and the present status of project as shown below:

Qualified SWIM Projects
(Candidate Projects for 10 Year Action Program)

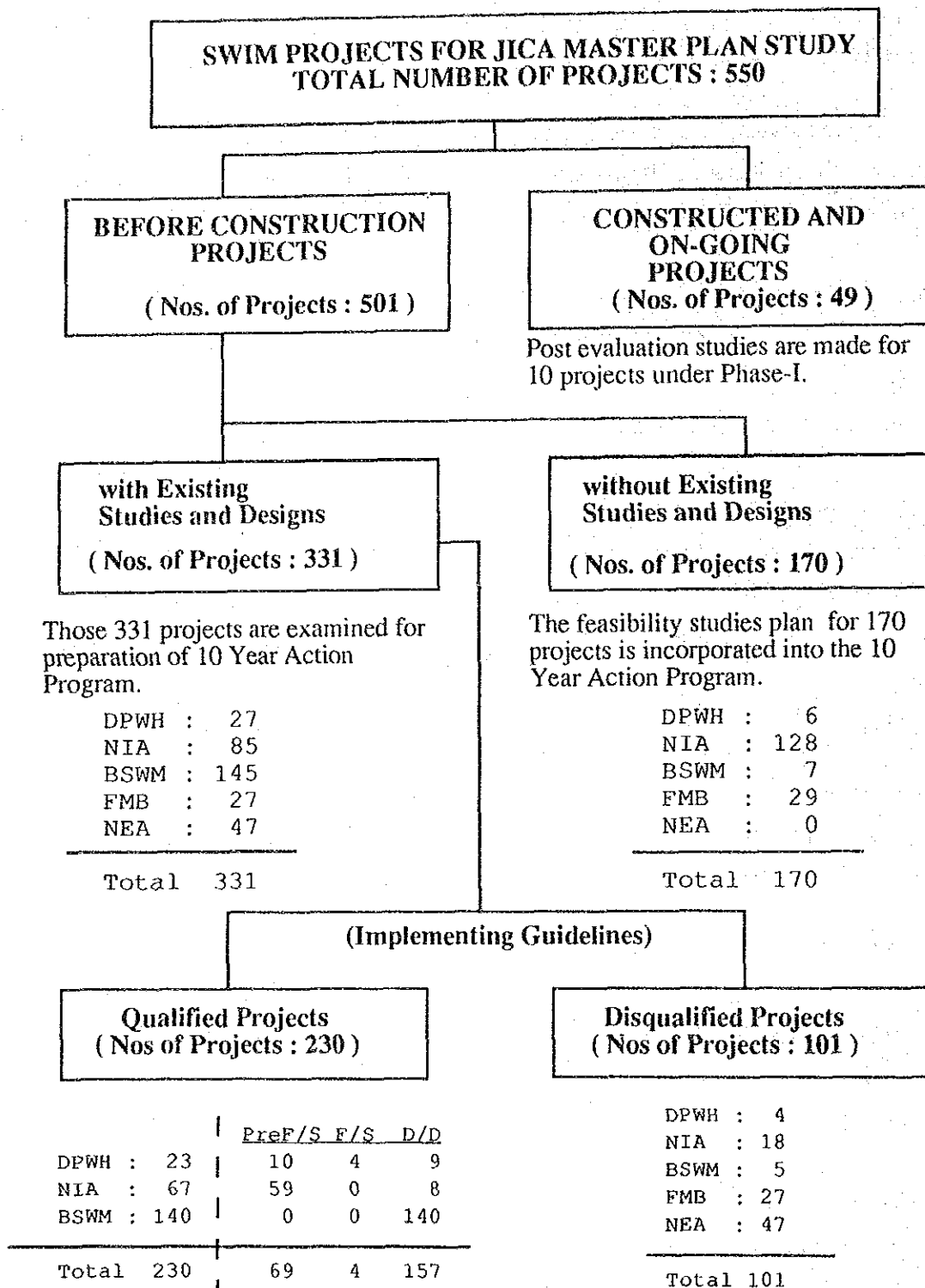
(Unit: Nos. of Projects)

Implementing Agency	Present Status of Projects			Total	(%)
	Pre F/S	F/S	D/D		
DPWH	10	4	9	23	(10)
NIA	59	0	8	67	(29)
BSWM	0	0	140	140	(61)
TOTAL	69	4	157	230	(100)
(%)	(30)	(2)	(68)	(100)	

The major features of these qualified projects are summarized in Table 4.3.1.

The screening/qualifying process of the SWIM projects is illustrated as in the following:

SCREENING/QUALIFYING PROCESS OF SWIM PROJECTS



4.4 Criteria of Priority Ranking

4.4.1 Work Flow of Priority Ranking

Under the Phase-I study, 501 projects were listed as the candidate projects for the master plan study. These 501 projects are classified under Phase-II study as follows:

(1) Projects with studies	<u>331</u>
(a) Qualified projects	230
(b) Disqualified projects	101
(2) Projects without studies	<u>170</u>
<hr/>	
Total	501

During the initial period of Phase-II, discussions were made between JICA Study Team and SWIM-TWG in order to determine the methods to be adopted for priority ranking of the above 230 qualified projects (see Attachment-10), and it has finally been agreed that the following steps shall be taken for priority ranking of the qualified projects (refer to the figure, PROCEDURES OF PRIORITY RANKING, shown in Chapter VI):

- (1) The evaluation factors for priority ranking shall be determined through discussions with SWIM-TWG. The factors shall be limited to those mentioned in the existing project reports. No additional data collection and/or investigations shall be made.
- (2) The scoring criteria of priority ranking shall be determined through discussions with SWIM-TWG. The scores of each project shall be calculated in accordance with the said scoring criteria. In the scoring criteria of priority ranking, a particular emphasis shall be laid on the economic viability of the projects; with this in view, the costs and benefits given in the existing reports shall be updated and the internal rates of return shall be re-calculated for all of the qualified 230 projects.
- (3) The projects shall be tentatively classified into "A" and "B" groups of prioritization by scores:

- Group "A" : First priority projects which will be implemented during the first five (5) year period of the 10 year action program
- Group "B" : Second priority projects which will be implemented during the second five (5) year period of the 10 year action program

- (4) The preliminary "A" and "B" grouping of the projects shall be adjusted, through discussions with SWIM-TWG, considering (1) total number of projects to be implemented during next 10 years, (2) reasonable allocation of projects among agencies by each agency and (3) Regional distribution of the projects over the country.

4.4.2 Factors for Evaluation of Priority Ranking

The following technical, economic/financial and social/ environmental items are selected as the evaluation factors for priority ranking.

Factors for Evaluation of Technical Soundness

All of the qualified projects are considered technically feasible, since the proposed project facilities are rather small compared to those of the large scale dam projects. The factors for evaluation of technical soundness are therefore limited to those indicating technical advantages or disadvantages which directly affect the project costs and thereby cost effectiveness and economic viability of the projects.

The economic internal rates of return (EIRR) indicated in the existing reports are calculated under different assumptions and methods; therefore, simple comparison of EIRR is not adequate for priority ranking, even if EIRR are re-calculated under same conditions (for example, there are many cases indicating high EIRR with simple technical studies, and on the contrary, rather low EIRR with detailed technical studies). Therefore, in addition to the economic comparison, further comparisons mainly in terms of technical soundness are needed in order to confirm the advantages or disadvantages of the projects. With this in view, the following factors are selected:

- (1) Water Resources Reliability Factor
(Drainage Area x Annual Rainfall) / Storage Capacity

- (2) Storage Efficiency of Reservoir
Effective Storage Capacity / Embankment Volume
- (3) Unit Construction Cost of Dam
Dam Construction Cost / Embankment Volume
- (4) Unit Cost of Reservoir Water
Dam Construction Cost / Storage Capacity
- (5) Effect of Flood Control
(Reservoir Area at full water level x Overflow Depth) / Drainage Area
- (6) Degree of Technical Difficulties for Construction

Factors for Evaluation of Economic/Financial Viability

EIRR will be re-calculated in order to ease an economic comparison among the qualified projects, and the costs and benefits will be updated/revised under same assumptions and methods. In addition to EIRR, scale of project benefits as well as financial aspects of the projects are also taken into consideration as shown below:

- (1) Economic Internal Rate of Return
(to be re-calculated based on updated costs and benefits)
- (2) Employment Opportunity
- (3) Number of Project Beneficiaries
- (4) Repayment Capability of Project Beneficiaries
- (5) Annual Fund Requirement

Factors for Evaluation of Social/Environmental Impacts

The guideline given by the SWIM Committee, indicates that the priority should be given to those projects in the economically depressed area. The Government has a policy that, in order to support the Comprehensive Agrarian Reform Program (CARP), the priority is also given to those projects in the priority provinces/areas under CARP. The Government has also emphasized the importance of measures against the environmental conservation and land acquisition problems in construction of dams and reservoirs. Following these government policies, the evaluation factors are selected as shown below:

- (1) Economic Level of Project Area
- (2) Relation with CARP
- (3) Degree of Land Acquisition Problem

(4) Environmental Impacts

4.4.3 Scoring System of Priority Ranking

The following scoring criteria are applied for rating the priority of the qualified projects. Details of the criteria are given in Table 4.4.1. The proposed formula for scoring are of empirical, based on the interviews with the government authorities. The proposed scoring criteria were prepared under Phase-II and finalized through the discussions with SWIM-TWG during the initial stage of Phase-III.

Formula for Project Rating

$$(1) \quad PR = 30\%TS + 40\%EV + 30\%SE$$

Where,

PR = Project Rating

TS = Merit Point of Technical Soundness

EV = Merit Point of Economic/Financial Viability

SE = Merit Point of Social/Environmental Impacts

$$(2) \quad TS = 20\%RF + 20\%SE + 10\%CD + 10\%CW + 20\%FC + 20\%TD$$

Where,

TS = Technical Soundness

RF = Water Resources Reliability Factor

SE = Storage Efficiency

CD = Unit Cost of Dam Construction

CW = Unit Cost of Reservoir Water

FC = Effect of Flood Control

TD = Degree of Technical Difficulties for Construction

$$(3) \quad EV = 40\%IR + 10\%EO + 10\%PB + 30\%RB + 10\%FR$$

Where,

EV = Economic/Financial Viability

IR = Economic Internal Rate of Return

EO = Increase of Employment Opportunity

PB = Number of Project Beneficiaries

RB = Repayment Capability of Beneficiaries

FR = Annual Fund Requirement

$$(4) \quad SE = 33\%DI + 33\%RC + 17\%LA + 17\%EP$$

Where,

SE = Social/Environmental Impacts

DI = Equitable Distribution of Income

RC = Relation with CARP

LA = Degree of Land Acquisition Problem

EP = Environmental Impacts

The scores of each of the qualified projects are calculated in accordance with the above formula, using the computerized data base which has been prepared under Phase-I. The procedures of scoring and the results of the priority ranking studies are described in the Chapter VI.

5.1 Objectives and Framework of "Basic Planning Criteria"

The "Basic Planning Criteria" (the Criteria) are prepared primarily for technical assessment of the candidate projects in order to prepare a 10-year action program in the Study. The Criteria deal with only basic technical items required for the feasibility study and are not intended to provide comprehensive criteria covering all the items to be studied at the feasibility study stage. It is however expected that the Criteria will be used as a basic guidelines for the feasibility studies of the SWIM projects and further be developed in near future for general use for planning of the SWIM projects.

The Criteria are attached to this Report as ANNEX-E and consists of the following five (5) guidelines:

- (1) General Guideline
- (2) Guideline for Survey and Investigation
- (3) Guideline for Project Planning
- (4) Guideline for Design of Major Structures
- (5) Guideline for Operation and Maintenance (O&M) of Major Structures

The Criteria consisting of the above guidelines are prepared based on the following concept:

- (1) The guidelines for survey and investigation, and project planning cover all technical and socio-economic items relating to the SWIM Projects. While, the guidelines for design and O&M of major structures deal with only dam and its appurtenant structures.
- (2) The study/design standards, procedures, methods and parameters adopted in the Criteria basically follow the existing studies of the SWIM projects which have been reviewed under Phase-I Study.
- (3) In case that the existing standards, procedures and methods are different by each agency, they are reconciled as much as possible in order to unify the study level.

- (4) The existing standards, procedures and methods reviewed under Phase-I are attached to the Criteria for reference.
- (5) Since all of the water impounding dams of the qualified projects are of fill type, the Criteria deal with only fill type dam.
- (6) The guidelines relating to dam, give different standards, procedures and methods separately to two (2) groups of dam in terms of dam height ; those with dam height more than 15 m and those less than 15 m.

5.2 Outline of "Basic Planning Criteria"

5.2.1 Guideline for Survey and Investigation

The guideline for survey and investigation shows basic data to be collected, and survey and investigation methods to be applied for feasibility study of the SWIM projects. The survey and investigation shall be carried out in proper way and appropriate depth to provide enough data for plan formulation of the project. The guideline for survey and investigation deals with the following items:

(1) Dam

In the SWIM projects, investigation on dam and reservoir is important to ensure realization of dam construction and to estimate dam cost. The guideline indicates standard methods and requirement for the following investigations:

- Meteorological and hydrological investigation
- Investigation on river condition
- Investigation on water rights
- Topographic survey
- Geological investigation
- Investigation on construction material
- Investigation on right of way, land acquisition and compensation

(2) Agriculture and Irrigation

Most of the SWIM projects have the irrigation development component as a main purpose. In order to formulate the irrigation development plan, the guideline gives standard methods and requirement for the following investigations:

- Investigation on present condition of agriculture and related fields
- Investigation on agricultural infrastructures

(3) Mini-hydropower

In some of DPWH and NIA projects, mini-hydropower development is included as secondary purpose. The guideline gives standard methods and requirement for the following investigations for making the mini-hydropower development plan:

- Power market survey
- Investigation on alternative power plant

(4) Water Supply

The guideline indicates standard methods and requirement for the investigations on water supply condition and water quality for water supply development component.

(5) Inland Fishery

Inland fishery development is included in most of the projects as secondary development purpose. The guideline indicates standard methods and requirement for the investigations on the present fishery activities and water quality.

(6) Flood Control

Flood control is regarded as incidental purpose in the SWIM projects. However, the guideline indicates standard methods and requirement for the investigations on past flooding conditions and flood damages in order to discuss the socio-economic impacts of the project on flood control.

(7) Environmental Conservation

In order to prepare environmental conservation plan, the guideline gives standard methods and requirement for the investigations on the present environmental condition.

(8) Watershed Management

In order to ensure project life of dam and reservoir and conserve soil and water resource, watershed management is indispensable. The guideline indicates standard methods and requirement for the investigations on the present watershed condition.

5.2.2 Guideline for Project Planning

The guideline shows the basic methods and procedures for project planning on the feasibility level on the various fields relating to the SWIM projects. Outline of the guideline for project planning is as follows:

(1) Dam

Dam and reservoir shall be formulated to ensure the dam safety and effective use of water resource. The guideline indicates standard methods and procedures for analysis and planning of the following:

- Run-off analysis
- Flood analysis
- Sediment analysis
- Determination of storage capacity
- Selection of dam site
- Selection of dam type

(2) Agriculture and Irrigation

In most of the SWIM projects, agricultural and irrigation development plan is formulated as main purpose of the project. However, its development plan has not been fully studied. The guideline gives standard methods and requirement for analysis and planning of the following items, in order to clarify the current agricultural constraints and ensure the project benefits:

- Formulation of agricultural development plan
- Formulation of irrigation development plan
- Estimation of agricultural benefit

(3) Mini-hydropower

The guideline indicates standard methods and requirement for analysis and planning of rural electrification plan which comprises the following studies:

- Formulation of mini-hydropower development plan
- Determination of scale of mini-hydropower
- Facility design of mini-hydropower
- Estimation of mini-hydropower benefit

(4) Water Supply

The guideline shows standard methods and requirement for analysis and planning of rural water supply plan which includes the following items:

- Determination of beneficiaries
- Estimation of future water demand
- Determination of water supply system
- Calculation of benefit

(5) Inland Fishery

Although inland fishery development is of secondary purpose in the SWIM projects, the guideline indicates standard methods and requirement for analysis and planning of inland fisheries development plan which will be formulated through:

- Selection of species and determination of scale
- Stocking method, fingerings, and feed and feeding
- Harvesting, processing and marketing
- Calculation of benefit

(6) Flood Control

The SWIM projects have an incidental effect against flood and their flood control benefits are generally nominal. However, in the guideline, a peak-cut volume of design flood is discussed to evaluate the flood mitigation effect by the project.

(7) Environmental Conservation

The guideline indicates standard methods and requirement for analysis and planning of appropriate environmental conservation plan which shall be formulated before construction of dam and reservoir considering adverse effect of its construction to neighboring environment.

(8) Watershed Management

The guideline shows standard methods and requirement for analysis and planning of watershed management plan which shall be formulated on the following items:

- Basic strategy on watershed management
- Soil erosion control plan
- Forestry function reinforcement plan
- Participation of local people on afforestation
- Countermeasure to forest fire
- Nursery preparation plan

(9) Construction plan and Implementation Schedule

The guideline indicates standard methods and requirement for construction planning which shall be formulated, considering the scale of construction, meteo-hydrological condition and site condition.

(10) Cost Estimate

The cost estimates of the SWIM projects have been made in different way by each agency. The guideline gives standard methods and requirement for cost estimate which shall be made in the same manner based on a local competitive bidding basis.

(11) Project Evaluation

In the previous studies, project evaluation have been made in terms of only internal rate of return in most of the projects. The guideline indicates standard methods and requirement for the following items:

- Economic evaluation
- Financial evaluation
- Socio-economic impacts

5.2.3 Guideline for Design of Major Structures

The guideline presents basic design concepts to be applied for preliminary design of fill type dam and its appurtenant structures which will be conducted as a part of the feasibility study. The guideline for design deals with the following items:

(1) Main Feature of Dam and Reservoir

In line with unification of the design standard, definition of terms relating to dam and reservoir is given in the guideline.

(2) Dam Foundation

Dam foundation is the important technical item in dam design considering dam safety. The guideline gives standard methods and requirement for design of dam foundation which includes the following items:

- Required condition of dam foundation
- Foundation treatment

(3) Design of Dam Embankment

Fill type dam shall possess necessary water tightness and strength, and be sufficiently safe against sliding failure or seepage failure. The guideline gives standard methods and requirement for design of dam embankment which includes the following items:

- Zoning of embankment
- Design of core zone
- Design of random zone
- Design of rock zone
- Filter and drain
- Embankment slopes and berms
- Protection works for embankment

(4) Stability Analysis

Stability of dam body and foundation shall be analyzed against sliding failure. The guideline gives standard methods and requirement for stability analysis which includes the following items:

- Study case of sliding failure
- Seismic coefficient

(5) Spillway

Spillway shall be designed so as to release surplus water or design flood discharge without giving any damage to dam and reservoir, and appurtenant structures. Spillway shall be of un-gated type and the guideline gives standard methods and requirement for design of spillway which includes the following items:

- Design discharge
- Alignment of spillway
- Selection of spillway type
- Hydraulics

(6) Outlet Works

Outlet works shall have necessary function to intake/release any discharge ranging the maximum and minimum design discharges. The guideline gives standard methods and requirement for design of outlet works.

(7) Diversion Works during Construction

The guideline gives standard methods and requirement for design of diversion works during construction which shall be designed considering the following items:

- Design diversion flood
- Diversion method
- Size of conduit

(8) O&M Facilities

The guideline shows standard requirement for O&M facilities of dam and its appurtenant structures in order to efficiently use storage water.

(9) Preparation of Drawings

The guideline indicates standard requirement for drawings which shall be prepared and incorporated in the feasibility report.

5.2.4 Guideline for Operation and Maintenance of Major Structures

The guideline indicates basic concepts for O&M works of fill type dam and its appurtenant structures, which will be applied to O&M study for dam at the feasibility level. The guideline includes the following items:

(1) Organization for O&M

For successful implementation of the project, the guideline indicates standard requirement for organizational set-up and responsibilities on O&M works which shall be studied at the feasibility study stage.

(2) Operation and Maintenance

The guideline gives standard requirement for the following O&M works :

- Documents and data to be filed
- Division of O&M period
- Initial ponding
- Measurement
- Inspection
- Detailed investigation
- Maintenance
- Operation

(3) Articles of Beneficiaries' Cooperatives

In O&M of the SWIM projects, beneficiaries' cooperatives will have to be organized, because all the project facilities and/or a part of project facilities will be turned over to them and the beneficiaries' cooperatives will become responsible for O&M. The guideline gives standard articles of the beneficiaries' cooperatives.

(4) Share of O&M Cost

The O&M cost of dam will be shouldered by the implementing agency and beneficiaries' cooperatives. The guideline gives standard concept and requirement for sharing of O&M cost which shall be studied considering "capacity to pay" of the beneficiaries.

(5) Collection of O&M cost

Upon determination of the share of O&M cost, collection method of O&M cost will have to be determined. The guideline gives standard concept for collection of O&M cost which may be made in the form of "O&M bill" through the beneficiaries' cooperatives every after harvest season.

5.3 Technical Assessment of Qualified Projects

5.3.1 Objectives

The existing studies and designs of the qualified 230 projects are reviewed and evaluated, making reference to the "Basic Planning Criteria", for preparation of 10 Year action program which in particular comprises the construction time schedule and annual fund requirements for each of the qualified project. The technical review and assessment of the existing studies and designs have the following specific objectives:

- (1) to assess the depth, methods and adequacy of the existing studies/designs, and thereby to clarify the additional requirements for pre-construction activities such as detailed technical review of the existing studies/designs, additional survey and investigation, and if necessary, modification of development plans and designs.
- (2) to estimate the required time and costs for such pre-construction activities.
- (3) to revise/update the construction costs of the qualified projects.

5.3.2 Overall Review of Existing Studies and Designs

The existing studies and designs are reviewed and evaluated, making reference to the technical requirements specified in the "Basic Planning Criteria", and the technical items which has not met the requirements, are identified for each of the qualified projects. The data and information obtained through this overall review are utilized for preparation of construction time schedule and cost estimates.

The items for technical review and evaluation are limited to those which are included in the existing studies/designs and directly connected with the following important aspects of the SWIM projects:

- (1) Stability and safety of dam
- (2) Reliability of study on water resources development
- (3) Adequacy of water utilization plan

The items selected for technical assessment are as follows:

Field	Assessment Items
1. Survey and Investigation	
1.1 Dam	
(1) Meteorology and hydrology	Rainfall and run-off
(2) Topographic survey	Scale of map
(3) Geological investigation	Number and depth of boring
(4) Construction material survey	Survey of borrow area
1.2 Agriculture and Irrigation	
(1) Agriculture production	Copping pattern and yield
2. Study and Planning	
2.1 Dam	
(1) Run-off analysis	Method and analyzed period
(2) Flood analysis	Method and magnitude
(3) Reservoir capacity	Method and analyzed period
2.2 Agriculture and Irrigation	
(1) Agriculture development plan	Proposed crop and yield
(2) Irrigation development plan	Irrigation water requirement
(3) Agriculture benefit	Unit benefit per hectare
2.3 Mini-hydropower	
(1) Scale of mini-hydropower	Installed capacity
(2) Mini-hydropower benefit	Method of estimation
2.4 Water Supply	
(1) Development plan	Method of formulation
2.5 Inland Fishery	
(1) Development plan	Proposed production
2.6 Environmental Conservation	
(1) Plan	Presence of the plan
2.7 Watershed Management	
(1) Plan	Presence of the plan
2.8 Construction Plan	
(1) Construction plan and period	Construction period
2.9 Cost Estimate	
(1) Cost estimate	Original and revised costs
2.10 Project Evaluation	
(1) Economic evaluation	Calculation method of EIRR
3. Design of Dam and its Appurtenant Structures	
3.1 Dam Foundation	
(1) Required condition	Water tightness and bearing
(2) Foundation treatment	Treatment method
3.2 Dam Design	
(1) Embankment	Zoning
(1) Slopes and berm	Upstream/downstream slopes
3.3 Spillway	
(1) Design flood	Magnitude of flood
(2) Layout	Location of spillway
3.4 Outlet Works	
(1) Layout	Layout and alignment
3.5 Diversion Works	
(1) Design flood	Magnitude of flood
4. O&M of Major Structures	
4.1 Study on O&M	Presence of the study

The existing studies and designs are evaluated for each of the above items, referring the corresponding part of the "Basic Planning Criteria", and the evaluation results for each item are expressed in three (3) grades; Grade A: adequate, Grade B: marginally adequate, and Grade C: not enough or not studied and require further studies (results are given in ANNEX-I: Technical Assessment of Qualified SWIM Projects). Based on these results, the costs and time required for pre-construction activities are determined. The technical items evaluated as Grade C are further studied on a preliminary basis. The study results including comments and suggestions are described in the "Project Profiles" which are given in DATABOOK.

In the "Project Profiles", major features of the qualified 230 projects are also summarized together with their dam designs and project layouts. The location maps of the qualified projects are also included in DATABOOK.

5.3.3 Results of Technical Assessment

(1) Review of Dam Design and Dam Cost

Dam designs of the F/S and/or D/D completed projects are reviewed and evaluated on the basis of the "Basic Planning Criteria", in order to clarify the deficits and/or faults involved in the original designs and the required extent of modification in original designs for implementation and to update/revise the dam costs for preparation of 10 year action program.

For the Pre-F/S completed projects which have no feasibility designs, the review of dam designs is not conducted. It is expected that dam designs of the Pre-F/S projects will be reviewed during the course of the forthcoming feasibility studies which will be made under 10 year action program.

The review is focussed on the items which affect the project cost: namely, (1) required condition of dam foundation and its treatment, (2) dam height considering the necessary freeboard against the appropriate design floods and (3) adequacy of appurtenant structures such as spillway, outlet works and diversion works. The results indicate that among the qualified 230 projects, a total of 46 projects needs some modification in dam design as shown below (These projects are shown in Table 5.3.1.):

(Unit: Nos. of Projects)

Present Status of Projects	Review of Original Dam Design			Total
	not reviewed	acceptable.	to be modified.	
Pre-F/S completed	69	-	-	69
F/S completed	0	3	1	4
D/D completed	0	112	45	157
Total	69	115	46	230

The original dam designs of 46 projects are modified due to various reasons. These 46 projects that will require further review, are classified by reasons of modification as follows (Details are described in ANNEX-E):

(Unit: Nos. of Projects)

(1) Modification shall be needed for:	
(a) foundation treatment	6
(b) dam zoning	1
(c) dam height	34
(d) diversion works	2
(e) spillway	1
-----	-----
sub-total	44
(2) No drawings available	2
Total	46

The original project costs are revised and updated, based on the review of dam designs mentioned above. The project cost estimates are discussed in Chapter IX.

(2) Status of Existing Studies/Designs and Required Review Work

For preparation of implementation schedule of the qualified 230 projects, the projects are categorized into following groups, referring to the results of the technical assessment of the existing studies and designs:

D/D completed project

Group	Status	Description
D-1:	Ready to construction:	EIRR \geq 10% and adequate project planning and dam design
D-2:	Review of D/D:	EIRR \geq 10% and adequate project planning, but need modification of dam design
D-3:	Review of F/S:	EIRR $<$ 10% and adequate dam design, but need modification of project planning
D-4:	Review of F/S and D/D:	EIRR $<$ 10%, need modification of project planning and dam design

F/S completed project

Group	Status	Description
F-1:	Ready to D/D:	EIRR \geq 10% and adequate project planning
F-2:	Review of F/S:	EIRR $<$ 10%, need modification of project planning
F-3:	Repeat of F/S:	Not enough studied, need complete feasibility study

Pre-F/S completed project

Group	Status	Description
P-1:	Ready to F/S:	EIRR \geq 10% and adequate preliminary project planning
P-2:	Review of Pre-F/S:	EIRR $<$ 10%, need modification of preliminary project planning

The qualified 230 projects are categorized, in accordance with the afore-mentioned grouping, as follows (present status of the existing studies/designs and the required review work are summarized in Table 5.3.1.):

D/D Completed Project

(Unit: Nos. of Projects)

Group	Status	DPWH	NIA	BSWM	Total
D-1	Ready to Construction	4	3	3	100
D-2	Review of D/D	1	2	29	32
D-3	Review of F/S	2	0	10	12
D-4	Review of F/S & D/D	2	3	8	13
Sub-Total		9	8	40	157

F/S Completed Project

(Unit: Nos. of Projects)

Group	Status	DPWH	NIA	BSWM	Total
F-1	Ready to D/D	2	0	0	2
F-2	Review of F/S	1	0	0	1
F-3	Repeat of F/S	1	0	0	1
Sub-Total		4	0	0	4

Pre-F/S Completed Project

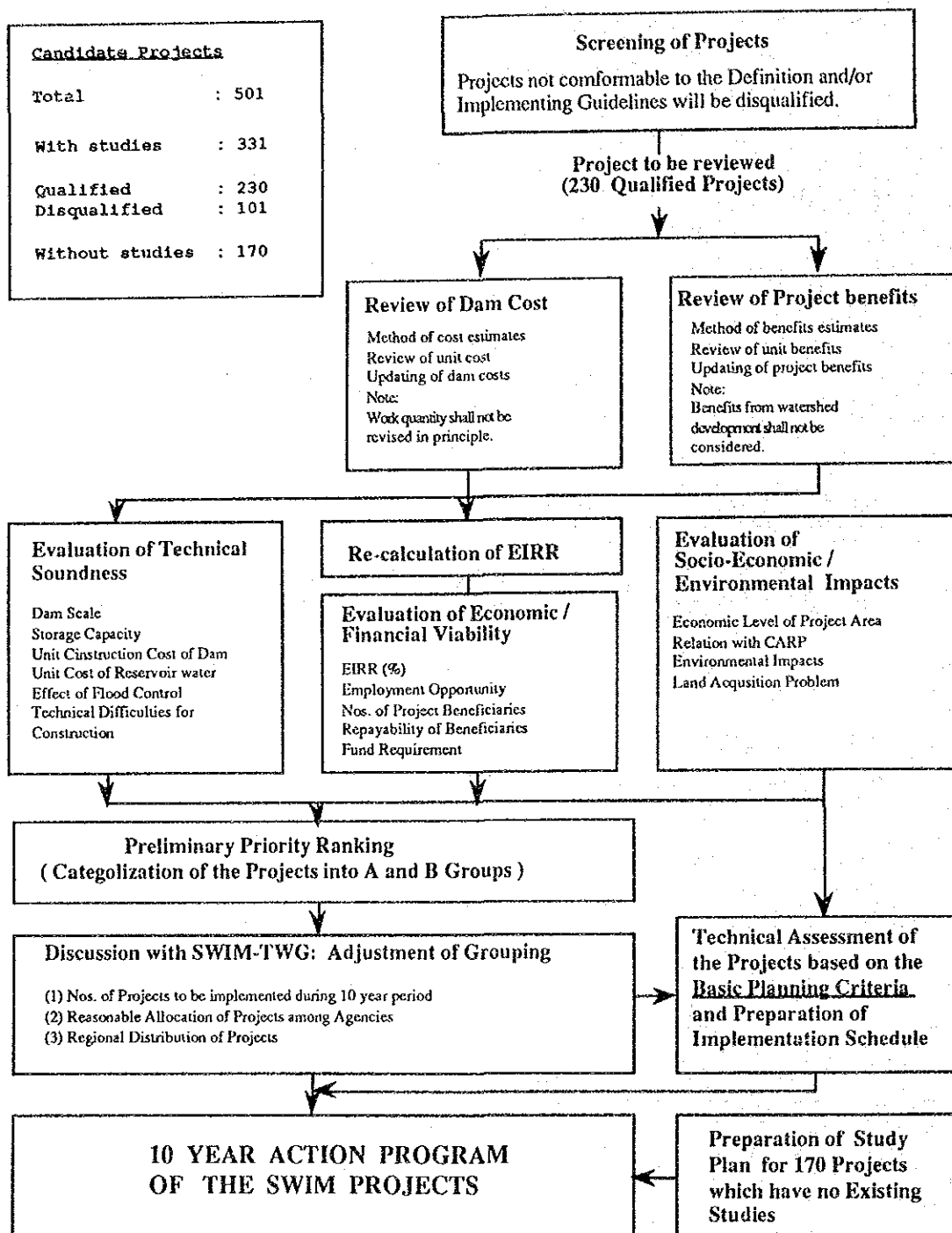
(Unit: Nos. of Projects)

Group	Status	DPWH	NIA	BSWM	Total
P-1	Ready to F/S	7	48	0	55
P-2	Review of Pre-F/S	3	11	0	14
Sub-Total		10	59	0	69
Total		23	67	140	230

CHAPTER VI PRIORITY RANKING OF SWIM PROJECTS

6.1 Procedures of Priority Ranking

The agreed procedures of priority ranking are as follows:



The priority ranking for the 230 qualified projects was made under Phase-III, according to the above procedures, specifically in the following four (4) steps:

- (1) Review of costs and benefits,
- (2) Recalculation of "internal rate of return",
- (3) Preliminary priority ranking of the projects (by application of "Criteria for Priority Ranking"), and
- (4) Classification/Categorization of the projects into priority groups "A" and "B".

6.2 Review of Project Costs and Benefits

The costs and benefits of 230 qualified projects were reviewed and updated on the following conditions (for details, see ANNEX-H):

(1) Costs

- (a) The work volumes of the project will not be revised in principle. However, in case that a project has apparent technical faults (e.g. cost for foundation treatment is not included, despite of its necessity), necessary works will be added on the top of the original work volumes and the required costs will be estimated.
- (b) The same method will be applied for all of the qualified projects in cost estimates which includes unification of cost items and calculation method.
- (c) Unit cost of each work item will be estimated at 1989 current price,
- (d) Cost estimates will be made on a local competitive bidding basis using the prevailing local prices, and
- (e) Costs will be estimated in local currency (pesos).

(2) Benefits

- (a) Only direct benefits which will be derived from irrigation, mini-hydropower, domestic water supply and inland fisheries, will be estimated and counted as the project benefits in calculation of EIRR.
- (b) These benefits will be estimated at 1989 current price,
- (c) In the calculation of irrigation benefit, the proposed cropping pattern under with project condition will be assumed to be double cropping of paddy and the cropping intensity mentioned in the existing reports will not be changed, and

- further the estimated standard benefits per ha will be applied to all of the projects which have an irrigation component,
- (d) In the calculation of mini-hydropower benefit, the proposed installed capacity of power generation will not be revised. The estimated standard power benefit per kW and kWh will be applied to all of the projects which have a mini-hydropower component,
 - (e) In the calculation of domestic water supply benefit, costs for alternative deep well development will be considered,
 - (f) In calculation of inland fisheries benefit, the estimated standard benefit per unit area (ha) of the reservoir area will be applied to all of 230 projects, and
 - (e) The production foregone which will be counted as negative benefits, will be estimated on the basis of the existing agricultural land use in the prospective reservoir areas.

6.3 Re-calculation of "Economic Internal Rate of Return (EIRR)"

In order to make relative comparison of economic viability among the qualified projects, the economic internal rates of return (EIRR) are re-calculated, in consultation with NEDA, on the following assumptions (for details, see ANNEX-H):

- (1) Projects life:
25 years after completion of construction.
- (2) Economic Cost:
The price contingencies, taxes and other transfer payments are excluded from the estimated financial project costs and the financial costs are further shadow-priced at 1.2 for foreign currency portion and 0.6 for unskilled labor.
- (3) Economic Benefits:
Although the SWIM Projects have manifold types of benefits, only those accrued from irrigation, mini-hydro-power, inland fisheries and rural water supplies, are calculated as economic benefits. Other indirect and intangible benefits are not included in calculation of EIRR. The estimated production losses in the agricultural lands in the prospective reservoir areas are deducted from the project benefits.

6.4 Priority Ranking of Qualified SWIM Projects

The agreed "Criteria of Priority Ranking" which comprise the evaluation items of (1) technical, (2) economical / financial and (3) social / environmental factors, were applied to make the preliminary priority ranking of the qualified 230 projects. Results of the preliminary priority ranking were discussed at the 7th Monthly Progress Meeting held on November 6, 1989 (see Attachment-13), and it was decided that the priority grouping of the projects would be made on the following conditions and/or procedures:

- (1) The 230 qualified projects include a total of 39 candidate projects for OECF-SWIM under 14th Yen Loan, comprising:

DPWH	3
NIA	5
BSWM	31

Total	39

These OECF-SWIM candidate projects shall be included in the priority group of "A". These projects shall be again reviewed and evaluated under OECF program.

- (2) The projects showing less than 10% of EIRR shall be placed in the priority group of "B", irrespective of the points each project gains in accordance with the "Criteria". Such projects shall be re-studied during the initial stage of the 10 year-period.
- (3) The remaining projects showing more than 10% of EIRR shall be divided into two (2) groups, "A" and "B", according to the total score calculated using the scoring system and half of the higher scored projects be grouped as "A" and other half be grouped as "B".

The 230 qualified projects are classified into priority groups of "A" and "B", in accordance with the agreed scoring system mentioned in Chapter IV and the above grouping procedures. Results of the revised priority grouping were presented in the "Field Note on Phase-III" and discussed at the 8th Monthly Progress Meeting held on November 27, 1989 (see Attachment-14).

The final results of priority ranking studies were agreed between the JICA Study Team and SWIM-TWG as shown below (for details, see ANNEX-D):

Priority Grouping of Projects by Implementing Agencies

(Unit: Nos.of Projects)

Implementing Agency	Priority Groups		Total
	Group "A"	Group "B"	
DPWH	9	14	23
NIA	30	37	67
BSWM	79	61	140
Total	118	112	230

Priority Grouping of Projects by Categories

(Unit: Nos.of Projects)

Implementing Agency	Priority Groups		Total
	Group "A"	Group "B"	
(1) <u>OECE-SWIM</u>			
DPWH	3	-	3
NIA	5	-	5
BSWM	31	-	31
Sub-total	39	-	39
(2) <u>Less than 10% of EIRR</u>			
DPWH	-	8	8
NIA	-	12	12
BSWM	-	14	14
Sub-total	-	34	34
(3) <u>More than 10% of EIRR</u>			
DPWH	6	6	12
NIA	25	25	50
BSWM	48	47	95
Sub-total	79	78	157
Total	118	112	230

Regional Distribution of Projects by Priority Grouping

(Unit: Nos.of Projects)

Region	Group "A"				Group "B"				Total
	DPWH	NIA	BSWM	Total	DPWH	NIA	BSWM	Total	
I	4	2	9	15	2	8	15	25	40
II	2	0	15	17	1	0	13	14	31
CAR	1	0	0	1	0	0	3	3	4
III	0	3	14	17	1	6	3	10	27
IV	1	1	3	5	4	1	1	6	11
V	0	8	3	11	1	6	2	9	20
VI	0	0	4	4	1	0	4	5	9
VII	0	15	7	22	0	11	2	13	35
VIII	0	0	4	4	1	5	4	10	14
IX	0	1	2	3	0	0	5	5	8
X	0	0	6	6	0	0	4	4	10
XI	0	0	6	6	1	0	3	4	10
XII	1	0	6	7	2	0	2	4	11
Total	9	30	79	118	14	37	61	112	230

The following were also confirmed during the discussions at the 8th Monthly Progress Meeting:

- (1) All of 230 qualified projects are to be scheduled to be implemented and completed within 10 year period.
- (2) In preparation of the implementation program, due consideration should be made to achieve balanced distribution of projects so that construction works could progress not only in a particular region but simultaneously all over the country.

CHAPTER VII INSTITUTIONAL DEVELOPMENT FOR SWIM PROJECTS

7.1 General

The institutional study consists of analysis of the present situation and on that basis, developing an institutional plan for implementation and management of SWIM Projects. While impediments to project implementation are numerous, the study is confined to its own constraints and limitations. The study encompassed among others, procedures of implementation from project identification to operation and maintenance, organizational features of the program, and the procedural aspects of financing the SWIM projects.

7.2 Present Institutional Set-up and Financial Situations

The SWIM Program, as the name implies, deals with the development of small water impounding dams primarily for flood control as well as rural utilization of storage water. With the issuance of Presidential Letter of Instruction NO. 898 in July 1979, the SWIM Program was institutionalized. The Letter of Instruction provided for the creation of the SWIM Committee as the highest regulating and administrative body. It formulates policies and adopts annual program. Also provided, is the creation of the Technical Working Group (SWIM-TWG) to serve as the technical and executive arm of the SWIM Committee. In 1982, the Project Management Office was established at DPWH to serve as the technical staff of the Committee and SWIM-TWG. With the multipurpose nature of the SWIM projects, the organizational set-up also include seven implementing and coordinating agencies; DPWH (through PMO-MFC/SWIM), NIA, BSWM, FMB, NEA, BFAR and NWRB. Each agency participates in the implementation of projects as designated by the SWIM Committee.

The present implementing procedures of SWIM Program are divided into three (3) major stages: (1) pre-construction, (2) construction and (3) operation and maintenance. The pre-construction stage includes the identification of projects by the agencies. Lists of the identified projects are submitted to PMO-MFC/SWIM which become the basis of the annual program adopted by the SWIM Committee. Construction stage is started by the implementing agency upon receipt of funding for the programmed projects. The progress of construction of a project is being reported to PMO-MFC/SWIM. Monitoring and evaluation of this activities are seen to be insufficient due to lack of standardized

management tools. There are projects turned-over to the beneficiaries' organizations for operation and maintenance, while a number are left untended; hence, the early deterioration of the same. Moreover, this stage of project implementation is not monitored by the Committee, TWG, nor PMO-MFC/SWIM.

The SWIM projects are funded from the annual budget of DPWH. The annual program adopted by the SWIM Committee is the same program that is submitted to the Government for approval and eventually for funding. The whole process takes 14 to 15 months. With the considerable economic depression of the country, the SWIM program mete out a very scrawny portion of the national budget. This, and the lack of appropriate procedures are the perceived critical constraints of project execution.

The present institutional framework for implementation of the SWIM projects is described in more detail in Section 3.5 of Chapter III and ANNEX-F

7.3 Institutional Development Plan

7.3.1 Basic Concept of Institutional Development

The institutional development plan is conceived in the light of the present condition of the SWIM Projects. Basically, it is founded on the idea of:

- (1) simplicity and clarity of institutional procedures for project implementation and responsibility areas of the Committee, SWIM-TWG, PMO-MFC/SWIM and participating agencies,
- (2) faith in capability of the participating agencies for implementation of their respective areas such as irrigation, watershed protection, mini-hydropower and inland fisheries,
- (3) conformance to the existing policies which are defined and limited by previous issuance of the Government,
- (4) necessity of the participative approach to project implementation by beneficiaries' organization for ensuring smooth implementation of the projects as well as the proper operation and maintenance, and
- (5) establishment of monitoring system which provides a suitable feedback mechanism for future improvement of planning, implementation and operation and maintenance.

7.3.2 Authorities and Responsibilities

The authorities and responsibilities of each organization involved in implementing the SWIM Program shall be as follows:

(1) SWIM Committee

- (a) to formulate operational policies and targets,
- (b) to designate the implementing and cooperating agencies,
- (c) to decide on the implementation of projects,
- (d) to review and adopt annual programs and budget, and
- (e) to review and evaluate the completion and O&M reports.

(2) SWIM-TWG

- (a) to evaluate the reconnaissance, F/S and D/D reports under the category of SWIM submitted by different implementing agencies,
- (b) to recommend the implementing/cooperating agencies for each of the proposed project,
- (c) to conduct the prioritization of projects according to budgetary ceiling set by DPWH,
- (d) to make project listing proposed for implementation and select priority projects,
- (e) to review the annual SWIM Program prepared by PMO-MFC/SWIM, and
- (f) to review and evaluate the completion and O&M reports.

(3) PMO-MFC/SWIM

- (a) to conduct preparatory work for preliminary selection of the proposed projects (reconnaissance level) submitted by the implementing agencies,
- (b) to conduct screening/qualification and technical evaluation of the proposed projects (F/S level),
- (c) to conduct preparatory work for selection of priority projects (F/S level) and preparation of the annual SWIM Program,
- (d) to evaluate the D/D and conditions for commencement of construction,
- (e) to coordinate the implementation of the SWIM projects,
- (f) to make arrangement for budgetary request of SWIM fund,
- (g) to evaluate the progress, completion and O&M reports, and

- (h) to develop standards, criteria and guidelines for all technical activities involved in planning, design, construction, utilization, and operation and maintenance of the project facilities.

(4) Implementing Agencies (DPWH, NIA, BSWM)

- (a) to make a reconnaissance and identify proposed projects,
- (b) to submit project proposals to PMO-MFC/SWIM for possible funding under the SWIM Program,
- (c) to obtain beneficiaries' consent for project implementation and acquisition of land required for construction of the project facilities,
- (d) to prepare feasibility studies and detailed designs,
- (e) to provide the funds for the project components which are not funded by SWIM Program,
- (f) to acquire land for construction of facilities,
- (g) to implement projects duly programmed and funded by the SWIM Program either contract or force account,
- (h) to prepare and submit periodic financial and physical progress reports to PMO-MFC/SWIM, and
- (i) to liquidate funds released and to submit reports and pertinent financial documents.

(5) Cooperating Agencies

- (a) to participate in reconnaissance,
- (b) to participate in project identification, feasibility studies and detailed designs,
- (c) to assist the O&M of beneficiaries' associations,
- (d) to implement the non-infrastructure components of the projects, and
- (e) to prepare and submit periodic progress reports to the lead implementing agency.

7.3.3 Release of SWIM Fund

The SWIM fund shall be released in the following cost items:

Items	Dams & Reservoir	Irrigation	Mini-hydropower	Water Supply	Watershed Protection
I. Direct Costs	SWIM	Non	Non	Non	SWIM
II. Indirect Costs					
1. Land Acquisition	SWIM	Non	Non	Non	Non
2. General Administration	SWIM	Non	Non	Non	SWIM
3. Engineering Services					
(1) Feasibility Study	SWIM	SWIM	SWIM	SWIM	SWIM
(2) Detailed Design	SWIM	SWIM	SWIM	SWIM	SWIM
(3) Construction Supervision	SWIM	Non	Non	Non	SWIM
4. Contingencies	SWIM	Non	Non	Non	SWIM

The watershed protection portion of the SWIM fund will be used under the responsibility of FMB, and the fund for planning and design of the mini-hydropower will be used under NEA.

7.3.4 Institutional Procedures for Implementation

The proposal for project implementation shall consist of three (3) stages; (1) planning which include project identification, feasibility study and detailed engineering design, (2) implementation which include preparatory works and construction and (3) operation and maintenance.

Planning Stage

(1) Project Identification

Project identification shall be undertaken by participating agencies through reconnaissance survey. Pertinent report on this shall be submitted to the PMO-MFC/SWIM for tabulation. The projects shall undergo preliminary selection which shall be conducted by the SWIM-TWG. The SWIM Committee shall have the power to approve or reject the proposed project. It shall also designate the lead implementing and coordinating agencies of the project upon recommendation of the TWG.

(2) Feasibility Study

The feasibility study shall be conducted under the SWIM program by the agencies designated by the Committee. The feasibility study shall include all the necessary items mentioned in the Basic Planning Criteria (see ANNEX-E). In the report, the agencies shall propose the executing body of "Operation and Maintenance (O&M)". Should the O&M be undertaken by the beneficiaries' association, the agencies shall clear the possibility of its establishment, and its technical and financial capabilities for O&M. The agencies shall provide for the easement of right of way problems especially land acquisition for project use. Furthermore, environmental studies shall be made in accordance with the Basic Planning Criteria, and the agencies shall obtain approval of DENR (Department of Environment and Natural Resources) to the project proposal, before the report is submitted to PMO-MFC/SWIM.

(3) Evaluation of Feasibility Study

The PMO-MFC/SWIM shall technically evaluate the feasibility study reports. The projects that meet the Criteria shall be considered for priority ranking. The PMO-MFC/SWIM shall set the conference of SWIM-TWG, where the project prioritization shall be reviewed based on the documents which shall be prepared by the PMO-MFC/SWIM. The SWIM-TWG shall select the priority projects for implementation and shall submit the result to the SWIM Committee. The Committee shall review the priority projects, and shall name the projects that shall be implemented (i.e. D/D and construction) and the corresponding implementing agencies. Funding shall be released for D/D of the approved projects.

(4) Detailed Engineering Design

Detailed design (D/D) of the infrastructure component shall be undertaken by the lead implementing agency concurrently with that of the non-infra components by the cooperating agencies. By the end of D/D stage, right of way negotiations shall be started and land acquisition for construction of project facilities shall be settled with the land owners. The beneficiaries association shall also be established and it shall arrange the agreement on land transfer or compensation. The D/D of the proposed projects must meet the minimum requirement stated in the Basic Planning Criteria.

(5) Evaluation of Detailed Engineering Design

After the detailed designs, PMO-MFC/SWIM shall review and evaluate the D/D reports. The development plan and design of project facilities are often revised through the D/D work. Should there be drastic changes in plans and designs, the D/D shall be returned to the originating agency for revision. The agency shall again obtain the approval of DENR for implementation of the project, before the revised D/D reports shall be submitted to PMO-MFC/SWIM for re-evaluation.

Implementation Stage

(1) Budgetary Request

The draft of the annual SWIM Program shall be prepared by the PMO-MFC/SWIM, based on the D/D reports and the results of priority ranking mentioned earlier. The annual SWIM Program shall include the projects at the project proposal level for execution of F/S, F/S level for D/D and D/D level for construction. The draft program shall include the (1) implementation schedule of priority projects, (2) projects costs and (3) funding schedule. This shall be the basis of request for funding and shall be subject to review of SWIM-TWG and approval of the SWIM Committee.

(2) Conditions for Commencement of Construction

The SWIM funds for implementation shall be released to DPWH by DBM (Department of Budget and Management), after 14-15 months from the time budgetary requests are prepared. Prior to the release of funds from PMO-MFC/SWIM of DPWH to the implementing/cooperating agencies, the conditions required for the start of construction shall be evaluated and confirmed by the PMO-MFC/SWIM. The SWIM fund shall be released for the projects which shall meet all the conditions. The conditions are listed below:

- 1) Project components whose funding is to be provided by the implementing agencies, should be assured and made available to ensure continuity of project implementation.
- 2) All right of way problems and land acquisition should have been settled.

- 3) Beneficiaries' associations should have been organized with duly executed Articles of Incorporation and By-Laws, and duly registered with the Secretaries and Exchange Commission.
- 4) Memorandum of Agreement and Certificate for Project Construction should have been accomplished, signed and concluded between the beneficiaries' association and the implementing agency.
- 5) In case of mini-hydropower, loan contract between the cooperative and NEA should have been executed.
- 6) Detailed plan for O&M of dam should have been established.

(3) Monitoring and Evaluation System for Construction

The Regional/District office of the lead implementing agency shall be responsible for monitoring. The office shall submit to their central offices the periodic reports which shall include various administrative and technical information such as financial status, construction progress and the status of beneficiaries' institutionalization. In the same manner, the cooperating agencies who are implementing the non-infrastructure components of the project, shall submit its progress reports to the lead implementing agency. The lead implementing agency shall consolidate the various reports and come up with a single status progress report for a project being implemented. This shall be submitted to PMO-MFC/SWIM periodically. These progress reports shall be discussed at the SWIM-TWG meetings.

(4) Final Inspection and Completion Report

After completion of the construction works, the lead implementing agencies shall carry out the final inspection, and shall prepare the completion report. Inspection of the dam shall be made after the initial pounding. The SWIM-TWG shall review the completion report.

(5) Turn Over of Project Facilities

The lead implementing agencies shall turn over the project facilities to the executing body of O&M. Should the O&M executing body be the beneficiaries' association, it shall be necessary to contract a turn over agreement between the association and the agency. The lead implementing agency shall prepare the Operation and Maintenance Manual.

Operation and Maintenance Stage

(1) Executing Body of Operation and Maintenance (O&M)

The implementing agency shall decide on the O&M executing body of the dam, either the beneficiaries' association or implementing agency. The irrigation and water supply facilities shall be operated and maintained by the beneficiaries' association, and mini-hydropower facilities shall be by the Electric Supply Cooperatives.

(2) O&M Costs and Amortization Fees

All the costs required for operation and maintenance of the project facilities shall be borne by the beneficiaries' association or the Electric Supply Cooperatives. FMB shall bear the maintenance costs of the watershed area developed under the SWIM Program. While the SWIM-funded components of the project are dole-outs, the cost funded by the implementing agencies are not and shall be amortized by the beneficiaries.

(3) Assistance to Beneficiaries' Associations

The implementing/cooperating agencies shall assist the beneficiaries associations/cooperatives for ensuring proper O&M. Assistance shall include dispatch of engineers/technician for training of farmers for O&M, technical assistance for repair of structures, and assistance for financial management.

(4) Monitoring and Evaluation System for Operation and Maintenance

The completed projects shall be monitored and evaluated by the implementing agencies through their Regional/District offices. The monitoring and evaluation reports shall be submitted periodically to the SWIM-TWG and the Committee through PMO-MFC/SWIM from which the TWG and the Committee shall formulate or revise the operational policies and targets. Through monitoring and evaluation, various information shall be accumulated for future improvement of O&M.

7.3.5 Role of Participative Approach

The participative approach to project implementation is a milestone in the realization of rural development goals. The beneficiaries' organizations are effective channel of information dissemination, an avenue for gathering beneficiaries' consensus, plays significant role in the easement of right of way problems and land acquisition, and are the source of labor during construction. Recognizing this, the implementation of SWIM projects shall utilize the organizations as partners of goal achievement. The irrigation components of the project shall have irrigators' associations; the hydro-power components, an electric cooperative; the water supply, a beneficiaries' association called the Barangay Water Supply Association being initiated by the Rural Water Supply of the DPWH. These organizations do not only expedite implementation, they also share in the financial burden of the project.

7.3.6 Implementation of Institutional Development Plan

It is recommended that for the furtherance of efficiency and effectiveness of the proposed institutional development plan, the following shall be considered by the SWIM-TWG and PMO-MFC/SWIM:

- (1) An information drive should be formulated to present the goals of SWIM Program to the public.
- (2) With the wider scope of responsibilities to be laid on the PMO-MFC/SWIM by the proposed institutional development plan, the PMO-MFC/SWIM should be strengthened by way of re-organization, additional manpower, and provision of adequate equipment and other office facilities.
- (3) Training programs should be formulated to attain a better quality of work force both at the PMO-MFC/SWIM and implementing agencies.
- (4) A more comprehensive and encompassing system of monitoring and evaluation should be devised to facilitate support and management from the top level management of the SWIM Program.
- (5) Possibilities of establishing beneficiaries' organizations should always take prime consideration in project proposals.

CHAPTER VIII IMPLEMENTATION SCHEDULE

8.1 Basic Concept for Preparation of Implementation Schedule

The 230 qualified projects will be implemented during either range of the first or second five years of the 10 Year Action Program (1991-2000). The implementation schedule is prepared under the following basic considerations:

- (1) Implementation schedule is prepared on half yearly basis.
- (2) The required time for implementation of project is determined by adding construction period of 0.5 to 2 years and the required time for pre-construction activities including execution of the feasibility studies, review of the existing studies and designs, detailed engineering designs, and/or re-studies of the development plans, if necessary.
- (3) The pre-construction activities from execution of feasibility study up to commencement of construction will be continuously made without any delay for administrative procedures, because all the projects are already qualified to be implemented under the 10 Year Action Program.
- (4) Implementation of the first priority projects will be commenced from the first year of the 10 Year Action Program, assuming that the necessary budget arrangement for the first year shall be made before commencement of the 10 Year Action Program.
- (5) Due consideration will be made to achieve balanced regional distribution of projects so that construction works could progress not only in a particular region but simultaneously all over the country.
- (6) Equitable distribution of work volume throughout the 10 Year period will be considered so that annual fund requirement will gradually increase and the each agency can afford to implement the projects in accordance with the Program.

8.2 Framework of 10 Year Action Program

The 10 Year Action Program is formulated within the following framework:

- (1) The 230 qualified projects will be implemented and completed within 10 year period of 1991 - 2000.
- (2) A total of 118 projects, including 39 candidate projects for OECF-SWIM, which has been categorized into the priority group of "A", based on the results of priority ranking study, will be implemented during the first five years of the 10 Year Action Program (Chapter VI, to be referred).

Implementing Agency	Nos. of Projects
DPWH	9 (3)
NIA	30 (5)
BSWM	79 (31)
Total	118 (39)

Remarks : Figures in parenthesis show the number of OECF projects.

- (3) The OECF-SWIM projects will be basically implemented during the first five years. However, selection of project for implementation is subject to further review under the OECF SWIM program.
- (4) The following Group "B" projects (112 nos.) will be implemented during the second five years:

Implementing Agency	Nos. of Projects
DPWH	14 (8)
NIA	37 (12)
BSWM	61 (14)
Total	112 (34)

Remarks : Figures in the parenthesis show the number of projects with less than 10% of EIRR.

- (5) Re-studies of 34 projects, which show less than 10% of EIRR, will be made during the first three years.

- (6) The projects with the completed detailed designs and without any deficits and faults in their studies and designs, will be implemented in earlier stage of the 10 year action program. There are 59 such projects in "A" group and 41 projects in "B" group.
- (7) The SWIM Projects will not be completed under the 10 Year Action Program and continuously be implemented in the next 10 years (2001 - 2010). If about 230 projects will be implemented in the next 10 years, the feasibility studies of approximately 300 projects will be required. These 300 projects shall include 170 projects which are categorized as "projects without studies". These feasibility studies will be conducted under the present 10 Year Action Program. Selection of the projects for the feasibility studies will be made by SWIM-TWG.
- (8) Implementation schedule of second 5 year period will be revised in the fourth year of the 10 Year Action Program, considering the results of review work for the projects with less than 10% of EIRR and of feasibility studies for projects without existing data. That is: Re-studies of 34 projects which show less than 10% of EIRR, will be made during the first 3 years of the 10 Year Action Program and only economically viable projects will be included in the second 5 year program. Besides, since some feasibility studies on new projects shall be made during the first 5 years, some of such new projects which are economically viable shall be included in the implementation schedule of the second 5 year program.
- (9) The next 10 year action program for 2001 - 2010 will be prepared in the 8th year, based on the results of feasibility studies on approximately 300 projects.

FRAMEWORK OF 10-YEAR ACTION PROGRAM

Item	10-Year Period									
	1st Five Year					2nd Five Year				
	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1. Implementation of Qualified Project (230 Projects)										
(1) Group "A" Projects (118 Projects)										
EIRR ≥ 10% (79 Projects)										
- D/D Completed Projects (49)										
- Ready to construction 36	Construction									
- Review of D/D 13	Rev. of D/D and Const.									
- F/S Completed Projects (0)										
- Pre-F/S Completed Projects (30)										
- Ready to F/S 30	F/S, D/D and Const.									
OECF Projects (39 Projects) *1										
- Projects to be implemented	Construction									
- Projects to be not implemented	Review of F/S									
(2) Group "B" Projects (112 Projects)										
EIRR ≥ 10% (78 Projects)										
- D/D Completed Projects (50)										
- Ready to construction 41						Construction				
- Review of D/D 9						Review of D/D and Const.				
- F/S Completed Projects (3)										
- Ready to D/D 2						D/D and Construction				
- Repeat from F/S 1						F/S, D/D and Const.				
- Pre-F/S Completed Projects (25)										
- Ready to F/S 25						F/S, D/D and Const.				
EIRR ≤ 10% (34 Projects)										
- D/D Completed Projects (19)										
- Review of F/S 11	Review of F/S					Construction				
- Review of F/S & D/D 8	Review of F/S & D/D					Construction				
- F/S Completed Projects (1)										
- Review of F/S 1	Review of F/S					Review of D/D and Const.				
- Pre-F/S Completed Projects (14)										
- Review of Pre-F/S 14	Review of Pre-F/S					F/S, D/D and Const.				
2. Preparation of Implementation Schedule for 2nd Five Year										
3. Preparation of Feasibility Study for Projects not supported with data (300 Projects) *2	F/S					F/S				
4. Preparation of Next 10 Year Action Program										

Note: *1: Subject to further review under the OECF SWIM Projects financed by 14th OECF Loan.

- *2: (1) Approximate required number of projects for Next 10 Year Action Program.
 (2) Including 170 projects categorized as "projects which have no existing data".
 (3) Some of projects will be scheduled to be implemented in the 2nd Five Year.

8.3 Implementation Schedule

The required period for implementation of each project is first determined for preparation of implementation schedule under 10 Year Action Program, based on the estimated period of construction works including the pre-construction activities.

8.3.1 Pre-construction Period

The pre-construction period of each project is determined on the basis of the following considerations:

- (1) The pre-construction activities to be completed before commencement of the construction works, will be orderly conducted within the following period:

Pre-construction Works	Period
(1) Feasibility study	6 months
(2) Detailed design	6 months
(3) Preparatory works including land acquisition and contract administration works, etc.	6 months

- (2) In addition to the above pre-construction activities, the projects with less than 10% of EIRR will be re-studied, and the dam designs which have some faults, will be modified prior to the preparatory works for construction, based on the results of the technical assessment as mentioned in Chapter V.
- (3) The studies and designs on watershed protection works for each of the qualified project will be made by FMB, prior to commencement of the construction works, possibly in parallel with the above mentioned pre-construction activities such as feasibility studies, detailed designs and preparatory works.

- (4) The work flow of necessary pre-construction activities are as follows:

Pre-F/S Completed	F/S Completed	D/D Completed
(Review Works)	(Review Works)	(Review Works)
Feasibility Study (Study on Watershed Protection Works)		
Detailed Design	Detailed Design (Study on Watershed Protection Works)	
Preparatory Works	Preparatory Works	Preparatory Works (Study on Watershed Protection Works)
(Construction)	(Construction)	(Construction)

8.3.2 Construction Period

Construction period for each project is determined based on the following assumptions:

- (1) Mobilization and construction of access road and river diversion works will be made within two (2) months from commencement of construction.
- (2) Stripping of top soil of foundation for dam and appurtenant structures will be completed within 10% period of the required period for dam embankment.
- (3) Daily operation rate of dam embankment is fixed at :

Average Monthly Rainfall	Operation Rate
0 - 150 mm	: 800 m ³ /day
150 - 300 mm	: 400 m ³ /day
more than 300 mm	: 200 m ³ /day

- (4) Spillway will be constructed in parallel with dam embankment; therefore special time allowance will not be considered for construction of spillway.

(5) Construction period for outlet works will be:

for DPWH and NIA projects : 2 months

for BSWM projects : 1 month

(6) The above periods are accumulated and rounded up on half yearly basis. Construction period for specific facilities such as irrigation canals, mini-hydropower plant and water supply pipes will not be added to the above period, because those facilities will be constructed in parallel with dam construction.

8.3.3 Overall Implementing Schedule of 230 Qualified Projects

The implementation schedule of 230 qualified projects within framework of 10 Year Action Program is prepared as a whole through trial and error in the following steps:

- (1) The periods for pre-construction activities and construction works are determined, project by project, considering the present status of project, result of technical review and evaluation, development scale and technical difficulties involved in construction works. Construction schedule of each project is then prepared based on the total required period thus estimated.
- (2) The annual fund requirement for implementation of each project is calculated based on the construction schedule mentioned above and the financial cost estimates of each project which are discussed in Chapter IX.
- (3) The construction time schedule of each project is collectively summarized in a time table of 10 year period in accordance with the framework of 10 Year Action Program mentioned in Section 8.2 of this Chapter.
- (4) The total annual fund requirement in each year is calculated on the basis of the collective construction time schedule mentioned above.
- (5) The collective construction time schedule of 230 projects is adjusted within framework of 10 Year Action Program so that the annual fund requirement will gradually increase year by year over the period of 10 years

- (6) Adjustment is also made within framework of 10 year action program to achieve balanced regional distribution of projects over the country.

The implementation schedule of 230 qualified projects within framework of 10 Year Action Program is shown in Table 8.3.1.

CHAPTER IX PROJECT COST ESTIMATES

9.1 Condition of Cost Estimates

The 230 qualified projects will be implemented and completed within 10 year period. The proposed 10 Year Action Program includes (1) construction of all the qualified projects and (2) studies and designs of the candidate projects for next 10 years (because the SWIM projects shall be continuously implemented even after completion of the present 10 year program).

The costs required for implementation of the 10 Year Action Program comprise:

- (1) construction costs of the 230 qualified projects, which comprise (a) dam and appurtenant structures to be financed from the SWIM fund, and (b) the works to serve the specific purposes such as irrigation and mini-hydropower to be funded by the respective implementing agencies.
- (2) costs of watershed protection works for 230 projects, which shall be financed from the SWIM fund and executed under responsibility of FMB.
- (3) costs for technical review of the projects before construction and re-studies of the projects showing less than 10% of EIRR to be borne by the respective implementing agencies.
- (4) costs for studies and designs of the candidate projects for next 10 year program to be financed from the SWIM fund.

The cost estimates given in the existing studies are made at different time, by applying different methods, and therefore these costs are updated and revised for preparation of 10 Year Action Program. The methods applied for cost estimates are basically same as those for the priority ranking study mentioned in Section 6.2.

The cost estimates are made at 1989 current price in pesos on a local competitive bidding (LCB) basis, and project by project for the following items:

-
- I. Cost for Dam and Other Facilities
 1. Direct Cost of Dam and Other Facilities
 - (a) Dam
 - (b) Irrigation
 - (c) Mini-hydropower
 - (d) Water supply
 - (e) Contractor's tax
 2. Indirect Cost
 - (a) Land acquisition and compensation
 - (b) General administration cost
 - (c) Engineering services
 - (d) Physical contingency
 - II. Cost for Watershed Management
 - (a) Engineering services
 - (b) Cost for Engineering Measures
 - (c) Cost for Vegetative Measures
 - III. Cost for Review Work of Project
-

9.2 Estimates of Financial Costs

The costs required for implementation of 10 Year Action Program are estimated on a financial basis, based on the procedures and assumptions described hereunder.

9.2.1 Direct Cost

Direct construction costs are estimated as follows:

- (1) The original financial construction costs estimated in the existing studies are converted to those at 1989 current price, applying the average price escalation rates of local and foreign portions from study year to present.
- (2) Cost of dam is reviewed as follows:
 - (a) Cost of dam body is reviewed referring to the latest bid prices and average unit cost of embankment works for the SWIM projects.

- DPWH & NIA : Cost in the range of US\$3.0 - 5.0/m³ is appropriate, if not, US\$4.0/m³ is applied.
- BSWM : Cost of more than US\$2.5/m³ is appropriate, if less than that, US\$ 3.0/m³ is applied.

- (b) In case that additional foundation treatment is required, its necessary cost is added to the original cost estimate.
- (c) In case that freeboard is not enough, dam height is raised and its required cost for embankment is added to the original cost estimate.
- (d) Costs of appurtenant structures are updated.
- (3) Cost for irrigation facilities is revised considering unit cost per hectare applied by NIA for communal irrigation projects. In case that unit cost of irrigation facilities per hectare in the previous studies is in the range from ₱17,000 to 25,000/ha, the cost is not revised. In case that unit cost is lower than ₱17,000/ha, the cost for irrigation facilities is revised on the basis of unit cost of ₱17,000/ha. In case that unit cost is higher than ₱25,000/ha, the cost is revised on the basis of ₱25,000/ha except for a few cases.
- (4) Cost for mini-hydropower generation is revised considering the average unit cost per kW applied by NEA for the SWIM projects. In case that unit cost of power facilities per kW is in the range from US\$900 to 1,100/kW, the cost is not revised. If the unit cost is out of the above range, the cost is revised based on the unit cost of US\$1,000/kW.
- (5) Cost of rural water supply facilities is updated by applying price escalation rates.
- (6) Contractors' profit and overhead are included in the direct cost. Contractors' tax is estimated at 5% of the direct cost.

9.2.2 Indirect Cost

Indirect costs are estimated as follows:

- (1) Land acquisition and compensation cost is revised by multiplying reservoir area by average unit price of ₱15,000/ha.

(2) General administration cost is assumed to be 3% of the direct cost.

(3) Cost for engineering service is estimated at:

for feasibility study	:	3% of the direct cost
for detailed design	:	6% of the direct cost
for construction supervision	:	10% of the direct cost

(d) Physical contingency is estimated, considering present status of project preparation, at the following percentages to the sum of direct cost, land acquisition cost, general administration cost and engineering services cost:

for Pre-F/S project	:	20%
for F/S project	:	15%
for D/D project	:	10%

9.2.3 Cost for Watershed Protection Works

In the existing studies, no data and information on present condition of the watersheds of the qualified projects are available except those projects identified by BSWM. Therefore, after discussions with SWIM-TWG, the JICA Study Team asked FMB to estimate the required costs for watershed protection for 230 qualified projects on a preliminary basis, provided the Team indicates the exact locations of the proposed damsites. FMB estimated the costs of watershed protection, project by project, on the basis of their resources such as nationwide forest/vegetation maps and standard unit cost per ha for watershed rehabilitation and protection works. The estimated costs are considered appropriate, and are included as they are in the total project costs.

9.2.4 Cost for Review and Re-studies

All of the qualified projects will be reviewed before commencement of the construction works. In particular, those projects showing less than 10% of EIRR will need re-formulation of development plans. The cost required for such review is estimated, by applying the following rates:

Project Status	Review	Cost
<u>EIRR\geq10%</u>		
D/D completed	-Design	1% of direct cost
<u>EIRR$<$10%</u>		
D/D completed	-Plan	1% of direct cost
	-Plan & Design	2% of direct cost
F/S completed	-Plan	1% of direct cost
Pre-F/S completed	-Plan	0.5% of direct cost

9.2.5 Price Contingency

Price contingencies are not estimated in the existing studies. In order to estimate the total fund requirements for implementation of 10 Year Action Program, the price contingencies are however estimated in accordance with the implementation schedule. For estimation of the price contingencies, the following rates are applied in consultation with NEDA:

Currency	Proportion	Escalation Rate
Local portion (pesos)	: 60%	7% per annum
Foreign portion	: 40%	3% per annum

9.2.6 Cost for Feasibility Studies

The feasibility studies and designs of the SWIM projects will be continuously carried out even during the present 10 year program period for continuous construction of SWIM projects. The costs required for the feasibility studies for next 10 year program are estimated at ₱450,000/project, based on the past experiences of DPWH and NIA. Since about 300 candidate projects are considered necessary for formulation of next 10 year program, the costs for these feasibility studies are estimated to be ₱135 million in total.

9.3 Fund Requirement for 10 Year Action Program

9.3.1 Total Fund Requirement

The total fund requirements for implementation of the 10 Year Action Program which comprises construction of 230 qualified projects, watershed protection works, review and re-studies for the qualified projects, feasibility studies for candidate projects for next 10 year program and price contingencies, are estimated at approximately ₱6.1 billion in total, comprising ₱2.3 billion for the first five years (118 projects) and ₱3.8 billion for the second five years (112 projects). The estimates are summarized as follows (Details of financial cost estimates are shown in Table 9.2.1 and those for each project are given in Table 9.2.2):

Items	Total Fund (₱ million)				Total	
	1st Five Years		2nd Five Years			
DPWH	250	(149)	596	(0)	846	(149)
NIA	977	(275)	1,264	(0)	2,241	(275)
BSWM	569	(209)	393	(0)	962	(209)
<u>Sub-total</u>	<u>1,796</u>	<u>(633)</u>	<u>2,253</u>	<u>(0)</u>	<u>4,049</u>	<u>(633)</u>
F/S for 300 projects	85	(0)	50	(0)	135	(0)
Price Contingency	483	(153)	1,466	(0)	1,949	(153)
Total	2,364	(786)	3,769	(0)	6,133	(786)

Remark: Figures in parentheses show the costs for OECF-SWIM projects.

9.3.2 SWIM Fund Requirement

The SWIM fund requirement consists of the following four (4) portions:

- (1) construction cost for dam and its appurtenant structures,
- (2) cost for watershed protection works,
- (3) cost for feasibility studies and detailed designs of the qualified projects, and
- (4) cost for feasibility study for 300 candidate projects for next 10 year program.

The total SWIM fund requirement amounts to approximately ₱4.9 billion, of which ₱1.8 billion is scheduled to be disbursed in the first five years and the remaining ₱3.1 billion in the second five years as shown below:

Items	SWIM Fund (₱ million)				Total	
	1st Five Years		2nd Five Years			
DPWH	192	(113)	477	(0)	669	(113)
NIA	768	(200)	1,066	(0)	1,834	(200)
BSWM	412	(149)	307	(0)	719	(149)
<u>Sub-total</u>	<u>1,372</u>	<u>(462)</u>	<u>1,850</u>	<u>(0)</u>	<u>3,222</u>	<u>(462)</u>
F/S for 300 projects	85	(0)	50	(0)	135	(0)
Price Contingency	377	(111)	1,206	(0)	1,583	(111)
Total	1,834	(573)	3,106	(0)	4,940	(573)

Remark: Figures in parentheses show the costs for OECF-SWIM projects.

(1) Dams and Appurtenant Structures

The construction costs for dam and its appurtenant structures require ₱3.5 billion or 70% of the total SWIM fund requirement as follows:

Items	Dam Costs (₱ million)				Total	
	1st Five Years		2nd Five Years			
DPWH	154	(108)	370	(0)	524	(108)
NIA	541	(173)	761	(0)	1,302	(173)
BSWM	278	(107)	236	(0)	514	(107)
<u>Sub-total</u>	<u>973</u>	<u>(388)</u>	<u>1,367</u>	<u>(0)</u>	<u>2,340</u>	<u>(388)</u>
Price Contingency	251	(93)	879	(0)	1,130	(93)
Total	2,364	(481)	2,246	(0)	3,470	(481)

Remark: Figures in parentheses show the costs for OECF-SWIM projects.

(2) Watershed Protection Works

The costs for watershed protection works are estimated at ₱1.1 billion or 22% of the total SWIM fund requirement as follows:

Items	Watershed Protection (₱ million)				Total	
	1st Five Years		2nd Five Years			
DPWH	26	(5)	90	(0)	116	(5)
NIA	159	(25)	255	(0)	414	(25)
BSWM	128	(40)	68	(0)	196	(40)
<u>Sub-total</u>	<u>313</u>	<u>(70)</u>	<u>413</u>	<u>(0)</u>	<u>726</u>	<u>(70)</u>
Price Contingency	82	(17)	262	(0)	344	(17)
Total	395	(87)	675	(0)	1,070	(87)

Remark: Figures in parentheses show the costs for OECF-SWIM projects.

(3) Studies and Designs

The costs for studies and designs to be disbursed from the SWIM fund are ₱0.4 billion or 8% of the total SWIM fund requirement as shown below:

Items	Studies/Designs (₱ million)				Total	
	1st Five Years		2nd Five Years			
DPWH	13	(0)	16	(0)	29	(0)
NIA	68	(1)	50	(0)	118	(1)
BSWM	6	(2)	3	(0)	9	(2)
<u>Sub-total</u>	<u>87</u>	<u>(3)</u>	<u>69</u>	<u>(0)</u>	<u>156</u>	<u>(3)</u>
F/S for 300 projects	85	(0)	50	(0)	135	(0)
Price Contingency	43	(1)	65	(0)	108	(1)
Total	215	(4)	184	(0)	399	(4)

Remark: Figures in parentheses show the costs for OECF-SWIM projects.

9.3.3 Cost to be Borne by Implementing Agencies

The following costs will be borne by respective implementing agencies:

- (a) Cost for irrigation facilities
- (b) Cost for mini-hydropower facilities
- (c) Cost for water supply facilities
- (d) Cost for review and re-studies

These costs are estimated to be ₱1.2 billion in total, or 20% of the total fund requirement (₱6.1 billion). Out of ₱1.2 billion, ₱0.5 billion will be disbursed in the first five years and ₱0.7 billion in the second five years. The total costs to be borne by the implementing agencies are summarized below.

Items	Specific Costs (₱ million)				Total	
	1st Five Years		2nd Five Years			
DPWH	58	(37)	119	(0)	177	(37)
NIA	208	(76)	198	(0)	406	(76)
BSWM	157	(59)	86	(0)	243	(59)
<u>Sub-total</u>	<u>423</u>	<u>(172)</u>	<u>403</u>	<u>(0)</u>	<u>826</u>	<u>(172)</u>
Price Contingency	107	(41)	260	(0)	367	(41)
Total	530	(213)	663	(0)	1,193	(213)

Remark: Figures in parentheses show the costs for OECF-SWIM projects.

The above specific costs include a total of ₱147 million of fund requirement, inclusive of price contingencies, for construction of mini-hydropower facilities which are included as a major component in 13 projects proposed by DPWH/NIA. These costs will be borne by either DPWH/NIA as the lead implementing agencies or NEA, depending upon the nature of the respective projects and agreement between DPWH/NIA and NEA

9.4 Annual Fund Requirements

The annual fund requirement is estimated based on the framework of 10 Year Action Program as described hereunder. Since the implementation schedule under OECF-SWIM program has not been determined yet, the annual fund requirement for the OECF-SWIM projects is estimated on the assumption that the costs will be equally disbursed within the first five years.

9.4.1 Total Fund Requirement

The annual fund requirement of total project cost is summarized as follows (for details, see Table 9.4.1):

(Unit: ₱million)

Year	SWIM Fund						Specific Costs		Total	
	Dam & Appurtenant Structures		Watershed Protection Works		Studies & Designs					
1991	129	(86)	43	(17)	31	(0)	65	(38)	268	(141)
1992	223	(91)	73	(17)	30	(0)	101	(40)	427	(148)
1993	260	(96)	94	(18)	38	(0)	113	(43)	505	(157)
1994	300	(101)	98	(19)	30	(0)	119	(45)	547	(165)
1995	311	(107)	115	(21)	59	(0)	132	(47)	617	(175)
1996	339	(0)	116	(0)	53	(0)	104	(0)	612	(0)
1997	400	(0)	135	(0)	47	(0)	119	(0)	701	(0)
1998	450	(0)	141	(0)	55	(0)	111	(0)	757	(0)
1999	485	(0)	160	(0)	8	(0)	150	(0)	803	(0)
2000	573	(0)	144	(0)	0	(0)	179	(0)	896	(0)
Total	3,470	(481)	1,119	(92)	351	(0)	1,193	(213)	6,133	(786)

Remark: Figures in the parentheses show the costs for OECF-SWIM projects.

The annual disbursement schedule of individual projects is shown in Table 9.4.5

9.4.2 Annual Fund Requirement of Implementing Agencies

The annual fund requirements from the viewpoint of implementing agencies comprise (1) allocation from the SWIM fund and (2) specific costs to be funded by the agencies. The allocation from the SWIM fund will be disbursed for construction of dam and appurtenant structures, watershed protection works, and studies and designs of new projects. Specific cost to be borne by the agencies, on the other, will be disbursed for the works to serve the specific purposes such as irrigation and mini-hydropower, and for review and re-studies of the qualified projects.

Costs of feasibility studies for approximately 300 projects for the next 10 years including 170 projects which are not supported with data and reports, will be disbursed from the SWIM fund. Since the candidate projects for the feasibility studies have not been determined yet, the required costs are tentatively included in the DPWH portion. The estimated budget for the feasibility studies will be allocated to the implementing agencies prior to commencement of the actual studies through the SWIM-TWG meetings.

The fund requirements of each implementing agency are tabulated as follow (for details, see Tables 9.4.2 to 9.4.4):

(1) DPWH

(Unit: ₱million)

Year	SWIM Fund						Specific Costs	Total
	Dam & Appurtenant Structures		Watershed Protection Works		Studies & Designs			
1991	24	(24)	2	(1)	20	(0)	9 (8)	55 (33)
1992	32	(25)	1	(1)	21	(0)	12 (9)	66 (35)
1993	38	(27)	10	(1)	24	(0)	15 (9)	87 (37)
1994	43	(28)	14	(1)	24	(0)	15 (10)	96 (39)
1995	57	(29)	10	(2)	29	(0)	21 (10)	117 (41)
1996	74	(0)	24	(0)	35	(0)	29 (0)	162 (0)
1997	97	(0)	32	(0)	34	(0)	35 (0)	198 (0)
1998	131	(0)	26	(0)	27	(0)	29 (0)	213 (0)
1999	139	(0)	40	(0)	2	(0)	42 (0)	223 (0)
2000	172	(0)	29	(0)	0	(0)	63 (0)	264 (0)
Total	807	(133)	188	(6)	216	(0)	270 (46)	1,481 (185)

Remark: Figures in the parentheses show the costs for OECF-SWIM projects.

(2) NIA

(Unit: ₱million)

Year	SWIM Fund						Specific Costs	Total
	Dam & Appurtenant Structures		Watershed Protection Works		Studies & Designs			
1991	54	(38)	12	(6)	11	(0)	22 (17)	99 (61)
1992	130	(41)	41	(6)	9	(0)	48 (18)	228 (65)
1993	151	(43)	54	(7)	15	(0)	59 (18)	279 (68)
1994	182	(45)	45	(7)	6	(0)	70 (20)	303 (72)
1995	166	(48)	64	(7)	30	(0)	65 (21)	325 (76)
1996	206	(0)	72	(0)	18	(0)	50 (0)	346 (0)
1997	241	(0)	79	(0)	13	(0)	54 (0)	387 (0)
1998	248	(0)	88	(0)	27	(0)	51 (0)	414 (0)
1999	259	(0)	99	(0)	7	(0)	76 (0)	441 (0)
2000	289	(0)	93	(0)	0	(0)	95 (0)	477 (0)
Total	1,926	(215)	647	(33)	136	(0)	590 (94)	3,299 (342)

Remark: Figures in the parentheses show the costs for OECF-SWIM projects.

(3) BSWM

(Unit: ₱million)

Year	SWIM Fund						Specific Costs	Total		
	Dam & Appurtenant Structures		Watershed Protection Works		Studies & Designs					
1991	52	(24)	28	(9)	0	(0)	34	(13)	114	(46)
1992	62	(25)	31	(10)	0	(0)	40	(14)	133	(49)
1993	70	(27)	30	(10)	0	(0)	40	(15)	140	(52)
1994	75	(28)	39	(11)	0	(0)	34	(16)	148	(55)
1995	88	(29)	40	(12)	0	(0)	46	(16)	174	(57)
1996	58	(0)	20	(0)	0	(0)	26	(0)	104	(0)
1997	62	(0)	24	(0)	0	(0)	30	(0)	116	(0)
1998	71	(0)	28	(0)	0	(0)	31	(0)	130	(0)
1999	87	(0)	21	(0)	0	(0)	31	(0)	139	(0)
2000	112	(0)	22	(0)	0	(0)	21	(0)	155	(0)
Total	737	(133)	283	(52)	0	(0)	333	(74)	1,353	(259)

Remark: Figures in the parentheses show the costs for OECF-SWIM projects.

In the above tables, the costs for watershed protection are included in the annual fund requirement of each implementing agency as allocation of SWIM fund. However, these funds are actually put under responsibility of FMB for execution of watershed protection works. The costs required for construction of mini-hydropower facilities (₱147 million in total) are also included in the annual fund requirements of DPWH/NIA; however, as mentioned before, these costs will be borne by either DPWH/NIA as the lead implementing agencies or NEA, depending upon the nature of the respective projects and agreement between DPWH/NIA and NEA.

9.5 Regional Distribution of Fund

The regional distribution of fund requirement is as follows (for details, see Table 9.5.1):

(Unit: ₱ million)

Region	DPWH	NIA	BSWM	Total
I	123	331	159	613
II	64	0	193	257
CAR	48	0	18	66
III	27	102	144	273
IV	263	106	24	393
V	75	453	26	554
VI	64	0	38	102
VII	0	991	56	1,047
VIII	23	195	47	265
IX	0	62	42	104
X	0	0	73	73
XI	12	0	82	94
XII	147	0	60	207
Total	846	2,240	962	4,048

Remarks: Price contingency and costs for F/S are not included in these costs.

9.6 Operation and Maintenance Costs

The annual operation and maintenance (O&M) costs of the qualified projects are estimated on a financial basis, by applying the following rate:

for dam portion	:	0.5% of direct construction cost
for water utilization facilities	:	2.5% of direct construction cost

The total financial O&M costs of 230 qualified projects at full development stage is ₱23.5 million as shown below:

(Unit: ₱ million)

Agency	Number of Project	O&M Cost
DPWH	23	5.2
NIA	67	11.8
BSWM	140	6.5
Total	230	23.5

Beneficiaries shall shoulder all of the above O&M costs. Shall also shoulder the beneficiaries the costs for irrigation facilities. Based on the amortization system for construction cost of irrigation facilities adopted by NIA, annual amount to be amortized by the beneficiaries is about ₱19 million (refer to Table 9.6.1). The annual total amount to be paid by the beneficiaries, however, accounts only for 11% of the expected incremental revenue of about ₱383 million. It is, therefore, judged that the beneficiaries can pay the amount.

10.1 General

All of the 230 qualified projects are scheduled to be implemented and completed under the proposed 10 Year Action Program. In this Chapter, the SWIM Projects are evaluated as a whole in accordance with the implementation schedule under 10 Year Action Program. The evaluation is made through an assessment of feasibility of the SWIM Projects as a whole in view of economic viability and socio-economic impacts. The economic feasibility is evaluated on the basis of the revised costs and benefits, by calculating the economic internal rate of return (EIRR). The methods applied for economic evaluation are basically same as those for the priority ranking study mentioned in Section 6.2. The socio-economic impacts to be induced by implementation of the SWIM Project are also briefly studied.

The 230 qualified projects are evaluated in terms of the economic internal rate of return (EIRR) for priority ranking study as discussed in Chapter VI. The 230 qualified projects are classified into three (3) groups of EIRR as follows:

<u>EIRR of SWIM Projects</u>					(Unit: Nos. of Projects)			
Range of EIRR	DPWH		NIA		BSWM		Total	
EIRR<10%	8	(0)	14	(2)	18	(4)	40	(6)
10%≤EIRR<20%	12	(3)	30	(3)	66	(15)	108	(21)
20≤EIRR	3	(0)	23	(0)	56	(12)	82	(12)
Total	23	(3)	67	(5)	140	(31)	230	(39)

Remarks: Figures in parentheses show the number of OECF-SWIM projects.

Result of economic evaluation for priority ranking indicates that 34 projects, exclusive of OECF-SWIM projects, show less than 10% of EIRR. These projects are placed in the priority group of "B" and scheduled to be implemented during later five (5) year period under 10 Year Action Program after their economic viability will be confirmed through review and re-studies. The candidate projects for OECF-SWIM program are placed in the priority group of "A", irrespective of their EIRR, because these projects will be reviewed again under their program.

10.2 Economic Evaluation

10.2.1 Basic Assumptions

The economic evaluation was made on the following basic assumptions:

- (1) The construction period will vary from two (2) to four (4) years including the period of pre-construction activities.
- (2) The economic useful life of the individual projects will be 25 years after completion of construction.
- (3) All prices will be expressed in constant mid-1989 prices. The exchange rate of US\$1.00 = ₪21.8 = ¥140 as of mid-1989 will be used throughout.
- (3) For estimation of the economic costs, the price contingencies, taxes and other transfer payments will be excluded from the estimated financial costs, and the financial costs will further be shadow-priced at 1.2 for currency portion, 0.6 for unskilled labor and 1.0 for other local costs.
- (4) Although the SWIM Projects have manifold types of benefits, only those accrued from irrigation, mini-hydropower, domestic water supply, and inland fishery will be calculated as economic benefits. Other indirect and intangible benefits are not included in the calculation of EIRR. The estimated production losses in the prospective reservoir areas will be deducted from the project benefits.

10.2.2 Economic Benefits

The economic benefits of the 230 "Qualified Projects" are estimated as follows:

Annual Economic Benefits

(Unit: ₱ 1,000)

Implementing Agencies	Benefit Components				Production Foregone	Total
	Irrigation	Hydropower	Fisheries	Water supply		
DPWH	70,000	16,900	6,800	2,200	- 100	95,800
NIA	249,600	5,600	71,300	0	- 900	325,600
BSWM	151,400	0	16,100	0	- 100	167,400
Total	471,000	22,500	94,200	2,200	- 1,100	588,800

The economic benefits are calculated as explained hereunder.

- (1) The irrigation benefits are primarily derived from the increased crop production attributable to a stable irrigation water supplies. These benefits are estimated as the difference of the annual net crop production values under with and without project conditions. The net crop production value is defined as the difference between the gross production value and crop production cost. The net production values under future with and without project conditions. The irrigation benefits are calculated on the following assumption:
 - (a) The envisaged irrigation areas given in the existing studies will be used without any changes. The cropping pattern will be double cropping of paddy.
 - (c) Anticipated unit yield of paddy under with project condition will be 4.5 tons/ha for the wet season crop and 5.0 tons/ha for the dry season crop. The crop yield under without project condition are estimated to be 2.0 tons/ha for rainfed areas, and 3.0 tons/ha for semi-irrigated areas and no yield for the newly reclaimed land.
 - (c) The economic price of rice is fixed at ₱3,690/ton, in due consideration of current farm gate price of ₱3,000/ton and the conversion factor of 1.23. The production cost is assumed to be 35% of gross production values on both without and with project conditions.
 - (d) It is assumed that the irrigation benefit will gradually increase during the build-up period of 3 years after completion of the projects from 60% in the first year to 100% in third year.

- (2) In the calculation of mini-hydropower benefit, the installed capacity of power generation proposed in the existing studies will not be revised. The estimated standard power benefit per kW and kWh will be applied to all of the projects which have a mini-hydropower component. Unit benefits of kW value and kWh value are revised as follows:
- (a) kW Value is estimated at ₱4,270/kW/year by multiplying the estimated annual equivalent costs of the alternative Diesel plant per kW (₱3,680/kW/year) by the adjustment factor of 1.16. The annual equivalent costs are estimated under the assumptions that (1) initial investment cost of alternative diesel power plant is ₱17,440/kW; (2) annual equivalent cost of initial investment discounted at 15% per annum for 15 years of useful life is ₱2,982/kW/year; (3) annual cost for operation, maintenance and replacement is 4% of investment cost (₱698/kW/year); (4) total annual equivalent cost will therefore be ₱3,680/kW/year.
- (b) kWh Value of the alternative Diesel plant is calculated to be ₱1.63/kWh, by multiplying the average fuel costs per kWh by adjustment factor of 1.01. The average fuel costs (₱1.61/kWh) are estimated under the assumptions that (1) the projected FOB price of crude oil is US\$27.5 per barrel; (2) the cost for refinery and inland transportation is US\$5.5 per barrel, assuming 20% of FOB price; (3) the converted average price of Diesel is US\$0.2075/liter; (4) average fuel consumption by diesel power plant is 0.357 liter per kWh; (5) the average fuel costs per kWh is therefore ₱1.61/kWh at the exchange rate of US\$1.0 = ₱21.8 (US\$0.2075/lit x 0.357 lit/kWh x ₱21.8/US\$).
- (3) Inland fishery benefits are counted for all the projects, by applying unit benefits per ha of the prospective reservoir areas. In the prospective reservoirs, "Tilapia" will be cultured by spawning method. The expected annual production of fish is 1.6 tons per year per ha. The economic price of fish is estimated at ₱20,000 per ton. The unit benefits per ha of the prospective reservoir areas are therefore estimated to be ₱24,000 per year per ha, assuming that production costs will be 25% of the gross production value.
- (4) Water supply benefit is regarded as the construction cost and annual operation and maintenance cost of alternative water supply facilities such as deep well. The water supply benefit is estimated for only DPWH-3, Sacrifice Valley SWIP.

The benefit estimated in the feasibility report is updated by applying price escalation rate.

- (5) The production foregone which shall be counted as negative benefits, is estimated on the basis of the existing agricultural land use in the prospective reservoir areas and the net production values per ha under present condition.

10.2.3 Economic Costs

The financial costs for implementation of 10 Year Action Program which are described in Chapter IX, are converted to the economic costs, by deducting the costs for feasibility studies for the candidate projects for next 10 year program, the price contingencies, taxes and other transfer payments from the estimated financial costs and further applying shadow price rates of 1.2 for currency portion, 0.6 for unskilled labor and 1.0 for other local costs.

Economic Costs for Implementation of 10 Year Action Program

(Unit: ₱ 1,000)

Implementing Agencies	Project Costs	Annual O&M Costs
DPWH	692,900	4,700
NIA	1,689,300	10,700
BSWM	716,500	6,000
Total	3,098,700	21,400

10.2.4 Economic Internal Rate of Return (EIRR)

Based on the economic costs and benefits mentioned above, the economic viability of 230 SWIM Projects is evaluated as a whole through calculation of the economic internal rate of return (EIRR). The EIRR are calculated on the basis of the flows of economic benefits and costs given in Tables 10.2.1 to 10.2.3.

The calculated result is:

<u>10 Year Action Program</u>	:	<u>17.5% (230 projects)</u>
first five (5) years	:	20.0% (118 projects)
second five (5) years	:	12.8% (112 projects)

10.3 Socio-Economic Impacts

SWIM Projects are planned firstly to protect rural people from floods by constructing dam and reservoir and by conserving watershed area, and secondly to improve their living standard through the increase of food production and employment opportunities and thereby to improve income level of rural people

In general, the proposed 10 Year Action Program of the SWIM projects will have the following socio-economic impacts:

(1) Flood Control Effect

Since the flood control effect of the SWIM projects has not been studied in the existing reports, the Study Team estimated flood control effect using peak-cut volume which is considered as a flood control indicator. The results are shown below:

Agency	Total Catchment Area (km ²)	Total Design Flood Discharge (m ³ /s) (A)	Total Peak-cut Discharge (m ³ /s) (B)	Peak-cut Ratio (%) (A)/(B)x100
DPWH	281	2,820	510	18
NIA	715	10,630	3,600	34
BSWM	145	2,300	790	34
Total	1,141	15,750	4,900	31

From the above table, some flood control effect can be expected considering proper peak-cut ratio.

(2) Irrigation Development and Increase of Food Production:

The 10 Year Action Program will create new irrigation area as follows:

<u>10 Year Action Program</u>	:	<u>28,000 ha (230 projects)</u>
first five (5) years	:	16,000 ha (118 projects)
second five (5) years	:	12,000 ha (112 projects)

After completion of 230 projects, cropped areas under irrigated condition will be increased up to 28,000 ha in the wet season and 22,600 ha in the dry season with an average cropping intensity of 181%.

Increase of Cultivated Areas under Irrigated Condition

(Unit: ha)

Agency	wet season		dry season		Total	
	present condition	with project	present condition	with project	present condition	with project
DPWH	3,606	4,286	659	3,743	4,265	8,029
NIA	5,790	13,170	1,157	12,169	6,947	25,339
BSWM	7,084	10,581	2,052	6,678	9,136	17,259
Total	16,480	28,037	3,868	22,590	20,348	50,627

With the increase of irrigation development area, paddy production will increase from about 43,000 tons under present condition to about 240,000 tons per annum under future with-project condition as shown below:

Increase of Annual Rice Production

(Unit: ton)

Agency	wet season		dry season		Total	
	present condition	with project	present condition	with project	present condition	with project
DPWH	7,418	19,287	1,398	18,715	8,816	38,002
NIA	13,110	59,265	2,924	60,845	16,034	120,110
BSWM	14,175	47,390	4,112	33,510	18,287	80,900
Total	34,703	125,942	8,434	113,070	43,137	239,012

Incremental annual paddy production is approximately 196,000 tons. This amount correspond to total annual consumption of 1.6 million person, assuming that per capita consumption rate of rice is 125kg.

(3) Improvement of Economically Depressed Rural Area

As discussed in Chapter VI, priority of early implementation is given to those projects located in the economically depressed areas. The SWIM projects will surely contribute to up-lifting of the living standard in the rural areas through mitigation of flood damages and economic development by use of impounding water for irrigation and mini-hydropower generation. The annual incremental revenue borne from the implementation of the SWIM projects is expected at ₱383 million, which is equivalent to the annual incremental revenue of approximately ₱14,000 per household. The SWIM Projects will also contribute to the Support Services under the Comprehensive Agrarian Reform Program (CARP) by providing the SWIM dams in the priority provinces of CARP support service program.

The SWIM projects will produce financial benefits amounting to ₱383 million per annum. This will also accelerate the rural economy and surely create the secondary effects on economic activities in rural areas.

(4) Increase of Employment Opportunity

The 230 SWIM projects will provide new employment opportunity of 3.5 million man-days only for construction, which are valued at about ₱350 million in total assuming that the labour wage is ₱100 per man-day. This will surely contribute to improvement of rural economy. The SWIM projects will also create new job opportunity, even after completion of the construction works, for O&M works as well as food production in new irrigation areas.

(5) Mini-hydropower Development

There are only 13 projects which have mini-hydropower development component, of which two (2) put its component as a main purpose. Total planned installed capacity is 2,848kW. Although the proposed total installed capacity is very small, those projects having mini-hydropower component is expected to contribute to rural electrification in remote areas.

(6) Inland Fisheries Development

Total estimated amount of fish production is 6,300 tons annually: This will be produced in remote areas of the whole Philippines and this is expected to contribute to improve the nutritional situation in rural areas by providing animal protein source as well as to generate additional income by selling the excess products to areas nearby. Fishing activity also has recreational function, which may contribute to enhance social welfare.

(7) Watershed Protection and Management

With the implementation of the SWIM projects, some 45,000 ha of watershed area will be protected by afforestation. This protection works to be made by FMB will enable the useful life of dam and reservoir to extend by reducing soil erosion in the upstream area. And also the watershed protection will help national afforestation program to recover the forest area.

10.4 Environmental Impacts Assessment

Environmental impacts of SWIM projects are assessed from the following four (4) parameters:

- (1) Physical effects
- (2) Ecological effects
- (3) Socio-economic effects
- (4) Compensation

The environmental impacts to be affected by the proposed SWIM projects have not sufficiently been studied yet. Although environmental impacts and their countermeasures shall be considered in the course of the project implementation, the impacts are anticipated with the knowledge obtained from the existing reports.

(1) Physical effects

Physical effects to be considered are effects of dams on surface water, groundwater and sedimentation. Generally construction of impoundments increases water level in the upstream area and decreases water level as well as water quantity in the downstream of the dam. However, in the case of the SWIM projects, since the scale of dams and reservoirs is small, such effects are considered to be small.

As a results of storage of water in the reservoir, the potential of groundwater in the downstream area of the proposed dam site may increase. Effect of this on the downstream area in the case of SWIM projects is, however, unknown.

Sedimentation problem may arise in the reservoir considering the long term. This issue will be loosen by the measure of afforestation activity in the watershed area.

(2) Ecological effects

Considering rather small scale of proposed dam and reservoir, the effect of SWIM projects on ecological aspects may be small. However, precise evaluation of the effect is very hard since the present condition of ecological environment have not been studied so far. Some study in this field such as inventory of fauna/flora in the proposed submerged area is required.

(3) Socio-economic effects

Socio-economic effects of dams on the life of local people will be land use change, public health, lifestyles, etc. Land use change will be very small in the SWIM projects due to their rather small development scale.

Effect of dam and reservoir on public health should be carefully examined. In one sense, nutritional condition, particularly protein of people will improve as a result of introduction of fishery activity in the reservoir. In other sense, water-related diseases may increase if there is. However, as no such diseases have not been reported in the existing reports, effect of public health will be negligible.

Lifestyle of local people may also change by utilizing reservoirs as recreational sites for fishing, swimming, picnic, etc.

(4) Compensation

Resettlement is considered most serious problem in general, because it will force people to change their life drastically. Almost all dam sites in SWIM projects, however, are planned on national land, and no conflict between implementator and land owner have been reported so far. Agricultural land in the proposed reservoirs is estimated at 510 ha in total. Negotiation with land owner on compensation of land shall be done in good faith.

CHAPTER XI RECOMMENDATIONS

(1) Early Implementation of Qualified Projects

The SWIM projects, especially those to be implemented within first five (5) years of 10 Years Action Program, are verified to be technically sound and economically feasible with overall EIRR of 20% for 118 projects. Those projects are also expected to improve living standards as well as social welfare of people in rural areas. It is, therefore, highly recommended that the necessary arrangement for early implementation of the projects be taken as soon as possible.

The economic performance in the rural areas has been stagnant. The situation is likely to get worse with increasing population and decreasing per capita production level unless corrective measures are urgently taken. With such pressing needs for rural economic development, the SWIM Projects are rather urgently required.

(2) Institutional Development for SWIM Projects

It is recommended that the following measures be taken for institutional development for smooth and efficient implementation and management of the SWIM Projects:

- (a) The promotion of the SWIM program by media such as radio, local newspaper, television, handbills and posters, so as to let the local people know about the program and to avoid conflicts between project implementors and beneficiaries.
- (b) Strengthening of the PMO-MFC/SWIM to be able to cover all the required responsibilities proposed under the Study (for detail, refer to Chapter VII) by means of re-organization, additional manpower inputs and provision of adequate office facilities and equipment.
- (c) Periodic training of the staff who will be involved in the project planning, designs and implementation to maintain a high quality performance in every aspect of the SWIM projects.

- (d) Establishment of more comprehensive and encompassing system of monitoring and evaluation to facilitate support and management from the top level management of the SWIM program.

(3) Design Criteria of SWIM Projects

The "Basic Planning Criteria" is prepared as a part of the master plan study as attached to this Report as ANNEX-E. The Criteria is primarily prepared for technical review and evaluation of the existing studies and design. It is hoped that the criteria will be further developed for ensuring the effective planning, designs and implementation of the SWIM projects.

In addition to the further development of the "Basic Planning Criteria", the following technical and management tools will be required for effective implementation, management and operation of the SWIM projects:

- (a) detailed design criteria for SWIM dam and appurtenant structures
- (b) inspection manual for construction works
- (c) Operation and maintenance manual for SWIM dam and appurtenant structures
- (d) Monitoring and evaluation manual for completed projects

(4) Rehabilitation of Completed Projects

There are 32 completed SWIM projects as of November 1989, of which five (5) projects are reported to be not functioning because their dams have been damaged or washed out. The post-evaluation study on the completed project, under Phase-I, also indicates that in some more projects, the dams and their appurtenant structures are damaged or not well-maintained due to rather poor practices for operation and maintenance. As for most of the completed projects, very scarce information on the present condition after construction is available.

It is recommended that all of the completed projects be investigated and the necessary countermeasures be identified as soon as possible, and based on this, the necessary rehabilitation works be commenced, in parallel with the 10 Year Action Program. Priority for rehabilitation works should be given to those supported with detailed data and information on the present conditions which will be enough to confirm

the technical soundness and economic viability of the rehabilitation works. It is also recommended that the SWIM projects be periodically monitored after completion of construction works if they are properly functioning or to be rehabilitated or need the guidance for O&M, and necessary measures be taken accordingly.

Budget for rehabilitation works of the SWIM projects has not been regularized yet. It is recommended however, that considering the urgent needs and importance of rehabilitation works, necessary budget for these be included in the regular program.

(5) Environmental Impact Assessment

It is pointed out that only a few existing studies have made environmental impact studies based on the guidelines on environmental impact assessment provided by the National Environmental Protection Council (NEPC). Even such studies with environmental impact studies, measures to the environmental impacts are not considered. It is due to lack of detailed procedures for environmental impact study and of evaluation criteria for environmental impact assessment. It is recommended, with this in view, that measures for environmental impact be examined so that environmental aspects of all the SWIM projects can be evaluated on unified condition.

(6) Feasibility Studies of 170 Projects

Under Phase-I, 501 projects were listed for master plan study of which only 331 projects were recognized as the candidate projects for the Study, and remaining 170 projects were withdrawn from the project lists due to lack of the existing studies.

The proposed 10 Year Action Program consists of two sub-programs; first 5 year program and second 5 year program. While first 5 year program is rather definite, second 5 year program will be revised in 4th year, because about half of the scheduled projects have technical and economic difficulties for immediate implementation. For continuous implementation of the SWIM Projects according to the 10 Year Action Program, therefore, feasibility studies of these 170 projects should be made to supplement the candidate projects for second 5 year program. It has been agreed among SWIM-TWG that the feasibility studies for new candidate projects will be made by the respective implementing agencies with financial assistance of the SWIM fund.

It is proposed in the Study that for continuous implementation of the SWIM projects, next 10 year action program (2001-2010) shall be prepared in 9th year under the 10 Year Action Program. The said 170 projects will not be enough in number for next 10 year program; therefore, it is recommended that more candidate projects be identified and their feasibility studies be executed continuously. It is considered that at least 300 candidate projects with the studies and designs, will be needed for preparation of next 10 year program.

(7) Necessary arrangement for the project implementation

Issues on land compensation often cause the conflict between implementing agencies and land owners. It is therefore recommended that necessary arrangements for the project implementation including establishment of beneficiaries cooperatives and solutions to issues of land compensation, etc., be confirmed prior to commencement of the implementation.

(8) Review and Modification of the 10 Year Action Program

It is recommended that the proposed 10 Year Action Program be reviewed and modified periodically; say every 5 years, to reflect changes in water demand, hydrological conditions and the country's ability to conduct and finance projects.

TABLES

Table 2.2.1 Historical Background of the SWIM Projects

May 1976

Pursuant to Presidential Letter of Instruction (LOI) No.408, the study on development of catchment basins or impounding reservoirs was commenced.

August 1977 - March 1978

The NWRC conducted the nationwide inventory survey on the water impounding reservoirs. In this survey, some 861 water impounding reservoirs were identified.

July 1979

Following LOI No.898, the SWIM Committee was established. The SWIM Committee consisted of the Ministry of Public Works as Chairman, the Ministry of Human Settlements as Co-Chairman, the Ministry of Energy, the Ministry of Natural Resources, the Ministry of Agriculture and Ministry of the Budget. The Technical Working Group was also organized with the Task Force for Flood Control and Related Activities as Chairman, the National Water Resources Council as Co-Chairman, NIA, FSDC, NEA, BS, MPW, BFD, MHS and other agencies concerned.

July 1982

With the merger of the MPW and MPH, the PMO-SWIM was established under the MPWH to chair the TWG in place of the TFFCRA.

July 1987

The SWIM Steering Committee was established instead of the SWIM Committee. The Committee was composed of the DPWH as Chairman, DENR, DA and DBM. The TWG was organized with the PMO-SWIM as Chairman, NIA, NWRB, FMB, NEA, BFAR, BSWM and FSDC (FSDC was abolished in January 1988 and replaced by the PMO-SWIM of DA).

December 1987

The I/A for the JICA SWIM Master Plan Study was agreed between DPWH and JICA.

August 1988

The JICA SWIM Master Plan Study was commenced.

Table 3.1.1 List of 501 Candidate Projects for Master Plan Study (1/10)

o : data available

x : not available

Agency No.	No.	Project Name	Region	Province Name	Municipality Name	Present Status		
						Pre-F/S	F/S	D/D
1	DPWH-1	Saytan Dam & Reservoir SWIP	I	La Union	Saytan, Pugo		o	
2	DPWH-2	Bolo Dam & Reservoir SWIP	CAR	Kalinga-Apayao	Tabuk		o	x
3	DPWH-3	Sacrifice Valley Dam & Reservoir	III	Bataan	Hermosa		o	x
4	DPWH-4	Bulu Dam & Reservoir SWIP	III	Bulacan	Malibay, San Miguel		o	x
5	DPWH-5	Aulo River Multi-Purpose SWIP	III	Nueva Ecija	Palayan City		o	x
6	DPWH-6	Tulariquin Dam & Reservoir SWIP	IV	Palawan	Roxas		o	
7	DPWH-7	Burdeos River SWIP	IV	Quezon	Burdeos, Polillo Is.		o	x
8	DPWH-8	San Jose Dam & Reservoir SWIP	IV	Rizal	Morong		o	o
9	DPWH-9	Cubacub Dam & Reservoir SWIP	IV	Rizal	Pililla		o	x
10	DPWH-10	Nabua Dam & Reservoir SWIP	V	Camarines Sur	Iriga City		o	o
11	DPWH-11	Debsmac Dam & Reservoir SWIP	V	Masbate	Mandaon		o	
12	DPWH-12	Macagtas Dam & Reservoir SWIP	VIII	Northern Samar	Catarman		o	o
13	DPWH-13	San Juan Dam & Reservoir SWIP	VIII	Northern Samar	Mondragon		o	o
14	DPWH-14	Guimba Dam & Reservoir SWIP	XII	Lanao del Sur	Guimba, Marawi City		o	o
15	DPWH-15	Magpet Dam & Reservoir SWIP	XII	North Cotabato	Magpet		o	o
16	DPWH-16	Banayal Dam & Reservoir SWIP	XII	North Cotabato	Tulunán		o	
17	DPWH-17	Acop Dam & Reservoir	I	Pangasinan	Acop, Rosales		o	
18	DPWH-18	Calitiltan Dam & Reservoir	I	Pangasinan	Calitiltan, Umingan		o	
19	DPWH-19	Kita-Kita Dam & Reservoir	I	Pangasinan	Kita-Kita, Balungao		o	
20	DPWH-20	Salvacion Dam & Reservoir	I	Pangasinan	Salvacion, Rosales		o	
21	DPWH-21	San Angel Dam & Reservoir	I	Pangasinan	San Angel, Rosales		o	
22	DPWH-22	Ligtos SWIP	VI	Iloilo	Ligtos, Igaras		o	
23	DPWH-23	Santor Dam	II	Isabela	Santa Maria		x	
24	DPWH-24	Carmencita Dam	II	Isabela	Mageaysay		x	
25	DPWH-25	Abian SWIP (FSDC)	II	Nueva Viscaya	Bambang		o	
26	DPWH-26	Cattabagan SWIP (FSDC)	II	Isabela	Anig, Delfin Albano		o	
27	DPWH-27	Malalinta SWIP (FSDC)	II	Isabela	San Manuel		o	
28	DPWH-28	Calubayan SWIP (FSDC)	IV	Oriental Mindoro	Calubayan, Socorro		o	
29	DPWH-29	San Rafael SWIP (FSDC)	VI	Antique	San Remigio		x	
30	DPWH-30	Consolacion SWIP (FSDC)	VII	Cebu	Cansaga			x o
31	DPWH-31	Lantawan SWIP (FSDC)	IX	Zamboanga del Sur	Mahayag		x	
32	DPWH-32	Bankerohan SWIP (FSDC)	XI	Davao del Norte	Montevista		x	
33	DPWH-33	Libasan SWIP (FSDC)	XI	Davao del Norte	Nabunturan		o	x
34	NIA-1	Banila SWIP	I	Pangasinan	Umingan		o	o
35	NIA-2	Cabacanan SWIP	I	Ilocos Norte	Pagudpud		o	x
36	NIA-3	San Clemente SWIP	III	Tarlac	San Clemente		o	x
37	NIA-4	Parpagaja SWIP	IV	Romblon	San Andres		o	x
38	NIA-5	Tagum-Angas SWIP	IV	Marinduque	Sta. Cruz		o	x
39	NIA-6	Potot SWIP	V	Masbate	Milagros		o	x
40	NIA-7	Caramoan SWIP	V	Camarines Sur	Caramoan		o	x
41	NIA-8	Alapasco SWIP	VI	Iloilo	Batad		o	x
42	NIA-9	Nasig-id SWIP	VII	Negros Oriental	Zamboanguita		o	x
43	NIA-10	Dumanjug Ronda SWIP	VII	Cebu	Dumanjug and Ronda		x	x
44	NIA-11	Tugas SWIP	VII	Bohol	Candijay		o	x
45	NIA-12	Ilaya SWIP	VII	Bohol	Ubay		o	x
46	NIA-13	Hibulangan SWIP	VIII	Northern Leyte	Matagob		o	x
47	NIA-14	Sagdeuron SWIP	VIII	Northern Samar	Catubig		o	x
48	NIA-15	Bucacao SWIP	IX	Zamboanga del Sur	Alicia		o	x
49	NIA-16	Dongdongla SWIP	I	Ilocos Norte	Bangui		x	
50	NIA-17	Bucong Balingaoan SWIP	I	Ilocos Sur	Candon		x	
51	NIA-18	Comillas Extension SWIP	I	Ilocos Sur	Gervantes		x	
52	NIA-19	Silag Pacang SWIP	I	Ilocos Sur	Sta. Maria		x	

Table 3.1.1 List of 501 Candidate Projects for Master Plan Study (2/10)

o : data available

x : not available

Agency No.	No.	Project Name	Region	Province	Municipality	Present Status		
				Name	Name	Pre-F/S	F/S	D/D
53	NIA-20	Maloyo SWIP	I	La Union	Balaoan		o	
54	NIA-21	Magsiping SWIP	I	La Union	Luna		o	
55	NIA-22	San Felipe SWIP	I	La Union	Rosario		o	
56	NIA-23	Macabato SWIP	I	La Union	Tubao		o	
57	NIA-24	Bayoas SWIP	I	Pangasinan	Aguilar		o	
58	NIA-25	Masidem SWIP	I	Pangasinan	Bani		o	
59	NIA-26	Oboy-Oboy SWIP	I	Pangasinan	Bani		o	
60	NIA-27	Vega SWIP	I	Pangasinan	Dasol		o	
61	NIA-28	Toboy SWIP	I	Pangasinan	San Manuel		o	
62	NIA-29	Alibeng SWIP	I	Pangasinan	Sison		o	
63	NIA-30	Labayug SWIP	I	Pangasinan	Sison		o	
64	NIA-31	Digap SWIP	I	Pangasinan	Umingan		o	
65	NIA-32	Diket SWIP	I	Pangasinan	Umingan		o	
66	NIA-33	Nagtupacan SWIP	CAR	Abra	Bucay		x	
67	NIA-34	Nagtipulan SWIP	CAR	Abra	Lagangilang		x	
68	NIA-35	Palsiguan SWIP	CAR	Abra	Lagayan		x	
69	NIA-36	Atok Central SWIP	CAR	Benguet	Atok		x	
70	NIA-37	Kapangan SWIP	CAR	Benguet	Kapangan		x	
71	NIA-38	Sagubo SWIP	CAR	Benguet	Kapangan		x	
72	NIA-39	Tublay Central SWIP	CAR	Benguet	Tublay		x	
73	NIA-40	Panday SWIP	CAR	Mt. Province	Dagnen, Bauko		x	
74	NIA-41	Lake Danum SWIP	CAR	Mt. Province	Besao		x	
75	NIA-42	Burayok SWIP	CAR	Mt. Province	Palitud, Paracelis		x	
76	NIA-43	Bayangaoan SWIP	CAR	Mt. Province	Suyo, Sagada		x	
77	NIA-44	Labangan River SWIP	III	Bataan	Abucay		x	
78	NIA-45	Tangilad River SWIP	III	Bataan	Samal		x	
79	NIA-46	Capalangan-Mahipon CIS	III	Nueva Ecija	Gapan		x	
80	NIA-47	Mayamot SWIP	III	Nueva Ecija	Guimba		o	
81	NIA-48	San Felipe SWIP	III	Nueva Ecija	Guimba		o	
82	NIA-49	Bayog SWIP	III	Nueva Ecija	Laur		o	
83	NIA-50	Agupalo Este CIP	III	Nueva Ecija	Lupao		x	
84	NIA-51	San Roque CIP	III	Nueva Ecija	Lupao		x	
85	NIA-52	Sta. Nino III CIP	III	Nueva Ecija	Lupao		x	
86	NIA-53	Mantedted SWIP	III	Nueva Ecija	San Jose City		o	
87	NIA-54	Cabu CIP	III	Nueva Ecija	Sta. Rosa		x	
88	NIA-55	Dalayap SWIP	III	Pampanga	Arayat		o	
89	NIA-56	Bliss II SWIP	III	Pampanga	Magalang		o	
90	NIA-57	Bigbiga SWIP	III	Tarlac	Mayantoc		o	
91	NIA-58	Tangcarang SWIP	III	Tarlac	Mayantoc		o	
92	NIA-59	Lawacumulag SWIP	III	Tarlac	Tarlac		o	
93	NIA-60	Western Barrios Impound.Irri.Proj.	III	Tarlac	Tarlac		x	
94	NIA-61	Pamalasan Creek SWIP	III	Zambales	Botolan		x	
95	NIA-62	Tutolanum Creek SWIP	III	Zambales	Botolan		x	
96	NIA-63	Nannel River SWIP	III	Zambales	Cabangan		x	
97	NIA-64	Tabao-Tabao River SWIP	III	Zambales	Cabangan		x	
98	NIA-65	Baculi Creek SWIP	III	Zambales	Iba		x	
99	NIA-66	Tagaleg Creek SWIP	III	Zambales	Iba		x	
100	NIA-67	Batang Creek SWIP	III	Zambales	Masinloc		x	
101	NIA-68	Bato Creek SWIP	III	Zambales	Palauig		x	
102	NIA-69	Naglabusan Creek SWIP	III	Zambales	San Antonio		x	
103	NIA-70	Patogo River & Nayom River SWIP	III	Zambales	Sta. Cruz		x	
104	NIA-71	Mapanaw Creek SWIP	III	Zambales	Subic		x	

Table 3.1.1 List of 501 Candidate Projects for Master Plan Study (3/10)

o : data available
x : not available

Agency		Project Name	Region	Province		Municipality	Present Status		
No.	No.			Name	Name	Name	Pre-F/S	F/S	D/D
105	NIA-72	Matikid SWIP	IV	Laguna		Pakil			o
106	NIA-73	Bahi CIP	IV	Marinduque		Gasan			x
107	NIA-74	Quinlogan River SWIP	IV	Palawan		Quezon			x
108	NIA-75	Singalong SWIP	IV	Rizal		Antipolo			x
109	NIA-76	Carolina SWIP	IV	Romblon		Looc			x
110	NIA-77	Gabawan SWIP	IV	Romblon		Odiangan			x
111	NIA-78	Inogma-Inaracting CIP	V	Albay		Libon			x
112	NIA-79	Allang CIP	V	Albay		Ligao			x
113	NIA-80	Nahulugan Pasig SWIP	V	Camarines Sur		Garchitorena			x
114	NIA-81	Rangas SWIP	V	Camarines Sur		Goa			x
115	NIA-82	Anib SWIP	V	Camarines Sur		Sipocot			x
116	NIA-83	Tinawagan SWIP	V	Camarines Sur		Tigaon			x
117	NIA-84	Guinobatan CIP	V	Catanduanes		Bato			x
118	NIA-85	Comacaycay CIP	V	Catanduanes		Calolbon			x
119	NIA-86	Paturuc CIP	V	Catanduanes		Calolbon			x
120	NIA-87	Cauburo CIP	V	Catanduanes		Pandan			x
121	NIA-88	Palawig CIP	V	Catanduanes		San Andres			x
122	NIA-89	Binalwaan CIP	V	Catanduanes		Viga			x
123	NIA-90	Casuocan CIP	V	Catanduanes		Virac			x
124	NIA-91	Hawan CIP	V	Catanduanes		Virac			x
125	NIA-92	Marilima CIP	V	Catanduanes		Virac			x
126	NIA-93	Palta SWIP	V	Catanduanes		Virac			x
127	NIA-94	Patabig CIP	V	Catanduanes		Virac			x
128	NIA-95	Sinamla CIP	V	Catanduanes		Virac			x
129	NIA-96	Inbanuhan CIP	V	Masbate		Balud			x
130	NIA-97	Domorog SWIP	V	Masbate		Cataingan			o
131	NIA-98	Batongan SWIP	V	Masbate		Mandaon			o
132	NIA-99	Jamorawon SWIP	V	Masbate		Milagros			o
133	NIA-100	Cabangcaian SWIP	V	Masbate		Placer			o
134	NIA-101	Posiagon SWIP	V	Masbate		Placer			o
135	NIA-102	Pili SWIP	V	Masbate		Placer			o
136	NIA-103	Bito SWIP	V	Masbate		San Fernando			o
137	NIA-104	Rizal SWIP	V	Masbate		San Fernando			o
138	NIA-105	Tigao SWIP	V	Masbate		San Fernando			x
139	NIA-106	Bontolan SWIP	V	Masbate		Uson			o
140	NIA-107	Boracan SWIP	V	Masbate		Uson			o
141	NIA-108	Pinangakogan SWIP	V	Masbate		Uson			o
142	NIA-109	Tibu SWIP	III	Paupanga		Porac			o
143	NIA-110	Botong CIP	V	Sorsogon		Prieto-Diaz			x
144	NIA-111	Ibingan SWIP	V	Sorsogon		Prieto-Diaz			o
145	NIA-112	Bagasico SWIP	VII	Bohol		Untaga, Alicia			o
146	NIA-113	Cabatang SWIP	VII	Bohol		Alicia			x
147	NIA-114	Camba-ol SWIP	VII	Bohol		Alicia			x
148	NIA-115	Cayacay SWIP	VII	Bohol		Cayacay, Alicia			x
149	NIA-116	Junas SWIP	VII	Bohol		Alicia			x
150	NIA-117	Progreso SWIP	VII	Bohol		Alicia			x
151	NIA-118	Untaga SWIP	VII	Bohol		Alicia			x
152	NIA-119	Bonot-Bonot SWIP	VII	Bohol		Buenavista			o
153	NIA-120	Calunasan SWIP	VII	Bohol		Calape			o
154	NIA-121	Mandaug SWIP	VII	Bohol		Calapa			o
155	NIA-122	Abejilan SWIP	VII	Bohol		Candijay			o
156	NIA-123	Boyo-an SWIP	VII	Bohol		Candijay			x

Table 3.1.1 List of 501 Candidate Projects for Master Plan Study (4/10)

o : data available
x : not available

Agency		Project Name	Region	Province Name	Municipality Name	Present Status		
No.	No.					Pre-F/S	F/S	D/D
157	NIA-124	Calamingaw SWIP	VII	Bohol	Candijay		x	
158	NIA-125	Cambane SWIP	VII	Bohol	Candijay		x	
159	NIA-126	Candijay SWIP	VII	Bohol	Candijay		x	
160	NIA-127	Gabayan SWIP	VII	Bohol	Canana, Candijay		x	
161	NIA-128	Lungsoda-an SWIP	VII	Bohol	Candijay		o	
162	NIA-129	Tubod SWIP	VII	Bohol	Candijay		x	
163	NIA-130	Catungawan SWIP	VII	Bohol	Guindulman		o	
164	NIA-131	Lapacan SWIP	VII	Bohol	Inabanga		o	
165	NIA-132	Taytay SWIP	VII	Bohol	Jetafe		o	
166	NIA-133	Abaca SWIP	VII	Bohol	Mabini		o	
167	NIA-134	Cabidian SWIP	VII	Bohol	Mabini		x	
168	NIA-135	Cabulao SWIP	VII	Bohol	Mabini		x	
169	NIA-136	Ondol SWIP	VII	Bohol	Mabini		o	
170	NIA-137	Talibon SWIP	VII	Bohol	Zamora, Talibon		o	
171	NIA-138	San Isidro Banlasan SWIP	VII	Bohol	Trinidad		o	
172	NIA-139	Banlasan SWIP	VII	Bohol	Tubigon		o	
173	NIA-140	Cabulihan SWIP	VII	Bohol	Tubigon		x	
174	NIA-141	Biabas SWIP	VII	Bohol	Ubay		o	
175	NIA-142	Benlin SWIP	VII	Bohol	Benlin, Ubay		x	
176	NIA-143	Bongbong SWIP	VII	Bohol	Ubay		x	
177	NIA-144	Dita SWIP	VII	Bohol	Ubay		x	
178	NIA-145	Lumangog SWIP	VII	Bohol	Ubay		x	
179	NIA-146	Tipolo SWIP	VII	Bohol	Ubay		x	
180	NIA-147	Kanasuhan SWIP	VII	Cebu	Carcar		o	
181	NIA-148	Luyang SWIP	VII	Cebu	Carmen		o	
182	NIA-149	Danao SWIP	VII	Cebu	Danao City		o	
183	NIA-150	Tungkod SWIP	VII	Cebu	Minglanilla		o	
184	NIA-151	Bayawan SWIP	VII	Negros Oriental	Bayawan		o	
185	NIA-152	Maayog-Tubig SWIP	VII	Negros Oriental	Dauin		o	
186	NIA-153	Mabinay SWIP	VII	Negros Oriental	Mabinay		o	
187	NIA-154	Lipayo SWIP	VII	Negros Oriental	Dauin		o	
188	NIA-155	Guihulngan SWIP	VII	Negros Oriental	Guihulngan		o	
189	NIA-156	Hibaiyo SWIP	VII	Negros Oriental	Guihulngan		o	
190	NIA-157	Naga-Mantuyop SWIP	VII	Negros Oriental	Siaton		o	
191	NIA-158	San Antonio SWIP	VII	Negros Oriental	Sibulan		o	
192	NIA-159	Tambolan SWIP	VII	Negros Oriental	Tayasan		o	
193	NIA-160	Valencia SWIP	VII	Negros Oriental	Valencia		o	
194	NIA-161	Senora SWIP	VII	Siquijor	Lazi		o	
195	NIA-162	Simacolong CIP	VII	Siquijor	Lazi		x	
196	NIA-163	Tigbao SWIP	VII	Siquijor	Lazi		o	
197	NIA-164	Lotlotan SWIP	VII	Siquijor	Maria		x	
198	NIA-165	Domanjog SWIP	VII	Siquijor	Siquijor		x	
199	NIA-166	Songcolan CIP	VII	Siquijor	Siquijor		x	
200	NIA-167	Balacdas CIP	VIII	Eastern Samar	Borongan		x	
201	NIA-168	Cati-an CIP	VIII	Eastern Samar	Borongan		x	
202	NIA-169	Sta. Fe SWIP	VIII	Eastern Samar	Borongan		x	
203	NIA-170	Guibuangan CIP	VIII	Eastern Samar	Can-Avid		x	
204	NIA-171	Cantunco SWIP	VIII	Eastern Samar	Llorente		x	
205	NIA-172	Capatagan SWIP	VIII	Eastern Samar	Llorente		x	
206	NIA-173	Layog-Casoroy CIP	VIII	Eastern Samar	San Julian		x	
207	NIA-174	Surok-Nena CIP	VIII	Eastern Samar	San Julian		x	
208	NIA-175	Sta. Tomas SWIP	VIII	Eastern Samar	Sulat		x	

Table 3.1.1 List of 501 Candidate Projects for Master Plan Study (5/10)

o : data available
x : not available

Agency		Project Name	Region	Province Name	Municipality Name	Present Status		
No.	No.					Pre-F/S	F/S	D/D
209	NIA-176	Nato CIP	VIII	Eastern Samar	Taft		x	
210	NIA-177	San Luis CIP	VIII	Eastern Samar	Taft		x	
211	NIA-178	Taft CIP	VIII	Eastern Samar	Taft		x	
212	NIA-179	Macagtas SWIP	VIII	Northern Samar	Catarman		x	
213	NIA-180	Galutan SWIP	VIII	Northern Samar	Mondragon		x	
214	NIA-181	Jazmines CIP	VIII	Samar	Gandara		x	
215	NIA-182	Nacobi CIP	VIII	Samar	Gandara		x	
216	NIA-183	Rawis CIP	VIII	Samar	Gandara		x	
217	NIA-184	Blanca Aurora SWIP	VIII	Samar	San Jorge		x	
218	NIA-185	Sta. Rita CIP	VIII	Samar	Sta. Rita		x	
219	NIA-186	Mahayahay SWIP	VIII	Southern Leyte	Bontoc		o	
220	NIA-187	Bogo-Dongon SWIP	VIII	Southern Leyte	Maasin		o	
221	NIA-188	Lan-Agan SWIP	VIII	Southern Leyte	Maasin		o	
222	NIA-189	Pasanon SWIP	VIII	Southern Leyte	San Francisco		x	
223	NIA-190	Kamansi-Rizal SWIP	VIII	Southern Leyte	Tomas Oppus		o	
224	NIA-191	Mercedes CIP	IX	Zamboanga City			x	
225	NIA-192	Basag CIS	X	Agusan del Norte	Basag Creek		x	
226	NIA-193	Bombon CIS	X	Agusan del Norte	Bombon Creek		x	
227	NIA-194	Amontay CIS	X	Agusan del Norte	Tagub Creek		x	
228	NIA-195	Kitcharao CIS	X	Agusan del Norte	Taytay-Oyos Creek		x	
229	NIA-196	Cabanglasan CIP	X	Bukidnon	Cabanglasan		x	
230	NIA-197	Dela Paz CIS	X	Misamis Occidental	Mohon Creek		x	
231	NIA-198	Tangub CIS	X	Misamis Occidental	Tangub River		x	
232	NIA-199	Balingasag CIP	X	Misamis Oriental	Balatucan River		x	
233	NIA-200	Banglay CIP	X	Misamis Oriental	Banglay Creek		x	
234	NIA-201	Honopolan CIP	X	Misamis Oriental	Honopolan Creek		x	
235	NIA-202	Gumaod CIP	X	Misamis Oriental	Gumaod Lake		x	
236	NIA-203	Sta. Ana CIP	X	Misamis Oriental	Sta. Ana Creek		x	
237	NIA-204	Solana CIP	X	Misamis Oriental	Solana River		x	
238	NIA-205	Bulod SWIP	XII	Lanao del Norte			x	
239	NIA-206	Salug SWIP	XII	Lanao del Norte			x	
240	NIA-207	Busok SWIP	XII	Sultan Kudarat	Bagumbayan		x	
241	NIA-208	Marbol SWIP	XII	Sultan Kudarat	Bagumbayan		x	
242	NIA-209	Muno SWIP	XII	Sultan Kudarat	Bagumbayan		x	
243	NIA-210	Bila SWIP	XII	Sultan Kudarat	Colombio		x	
244	NIA-211	Cadedang SWIP	XII	Sultan Kudarat	Lutawan		x	
245	NIA-212	Kalandagan SWIP	XII	Sultan Kudarat	Tacurong		x	
246	NIA-213	Puti SWIP	XII	Sultan Kudarat	Tacurong		x	
247	FMB-1	Amburayan River Watershed Rehab.	I	Ilocos Sur, Benguet & La Union			o	
248	FMB-2	Lacag River Watershed Rehab.	I	Ilocos Norte	Espiritu, Nueva Era & Piddig		o	
249	FMB-3	Ilocos Norte Metropolitan Forest	I	Ilocos Norte	Pasuquin		o	
250	FMB-4	Lidlidda Watershed Forest Reserve	I	Ilocos Sur	Banayoyo, Lidlidda		o	
251	FMB-5	Naguilian River Watershed Rehab.	I	La Union	Naguilian		o	
252	FMB-6	Lower Agno River Watershed Rehab.	I	Benguet Pangasinan	Tuba San Nicolas & San Manuel		x	
253	FMB-7	Alaminos Watershed Rehabilitation	I	Pangasinan	Alaminos		x	
254	FMB-8	Mangatarem Sub-Watershed Rehab.	I	Pangasinan	Mangatarem		x	
255	FMB-9	Dammun River Watershed Rehab.	II	Cagayan	Gattaran		x	
256	FMB-10	Diadi River Watershed Rehab.	II	Cagayan Isabela	San Luis Cordon		x	

Table 3.1.1 List of 501 Candidate Projects for Master Plan Study (6/10)

o : data available

x : not available

Agency		Project Name	Region	Province	Municipality	Present Status		
No.	No.			Name	Name	Pre-F/S	F/S	D/D
				Nueva Vizcaya	Bagabag			
257	FMB-11	Kasibu River Watershed Rehab.	II	Nueva Vizcaya	Kasibu			o
258	FMB-12	Bawa and Wangag Watershed Rehab.	II	Cagayan	Gonzaga			o
259	FMB-13	Kilkiling Watershed Forest Reserve	II	Cagayan	Claveria			x
260	FMB-14	Barobbob Spring Watershed Rehab.	II	Nueva Vizcaya	Barobbob			o
261	FMB-15	Sta. Praxedes Watershed Rehab.	II	Cagayan	Sta. Praxedes			o
262	FMB-16	Casacnan Watershed Rehabilitation	II	Nueva Vizcaya	Dupax			x
263	FMB-17	Sinapaoan Sub-Watershed Rehab.	II	Nueva Vizcaya	Sta. Fe			x
264	FMB-18	Manga River Watershed Rehab.	II	Nueva Vizcaya	Dupax del Norte			x
265	FMB-19	Mariweles Watershed Rehabilitation	III	Bataan	Orion, Bagac, Limay			x
266	FMB-20	Pasig-Timbu Potrero River Waterdhed	III	Pampanga	Porac, Bacolor			x
267	FMB-21	Tangbao Sub-Watershed Rehab.	III	Tarlac	Mayantoc			x
268	FMB-22	O'Donnel River Watershed Rehab.	III	Tarlac	Capas, Mayantoc, Tarlac			o
269	FMB-23	Balog-Balog Watershed Rehab.	III	Tarlac	Tarlac			o
270	FMB-24	Masinloc Watershed Rehabilitation	III	Zambales	Candelaria			o
271	FMB-25	Talavera Watershed Rehabilitation	III	Nueva Ecija	Carranglaan			o
272	FMB-26	Laguna de Bay Watershed Rehab.	IV	Laguna, Cavite				o
				Rizal, Batangas				
273	FMB-27	Agos River Watershed Rehabilitation	IV	Quezon	Infanta			x
274	FMB-28	Atimonan Watershed Forest Reserve	IV	Quezon	Atimonan			x
275	FMB-29	Kaliwa River Watershed Rehab.	IV	Quezon	Infanta			o
				Rizal	Montalban-Teresa			
276	FMB-30	Kanan River Watershed Rehab.	IV	Quezon	Gen. Nakar-Infanta			o
277	FMB-31	Lake Buhi-Barit River Watershed	V	Camarines Sur	Buhi			x
278	FMB-32	Baco-Ducayao Watershed	IV	Oriental Mindoro	Puerto Galera, Baco			o
					San Teodoro, Naujan			
279	FMB-33	Alabat Watershed Rehabilitation	IV	Quezon	Alabat			x
280	FMB-34	Calatrava-San Andres-San Agustin Watershed Forest Reserve	IV	Romblon	San Agustin-San Andrea			x
281	FMB-35	Dipaculao Watershed Rehabilitation	IV	Quezon	Dipaculao			x
282	FMB-36	Dulangan Sub-Watershed Erosion Con.	IV	Oriental Mindoro	Baco			x
283	FMB-37	Sablayan Watershed Pilot Project	IV	Occidental Mindoro	Sablayan			x
284	FMB-38	Malvar Naujan Watershed Rehab.	IV	Oriental Mindoro	Naujan			o
285	FMB-39	Binasagan Yabo River Watershed	V	Camarines Sur	Pili			o
286	FMB-40	Ilog-Nivarangan River Watershed	VII	Negros Oriental	Ilog			x
287	FMB-41	Panay-Mambusao River Watershed	VI	Capiz	Panay			o
288	FMB-42	San Pedro Ilaya & Cansohay River	VII	Bohol	Duero			x
289	FMB-43	Candijay Watershed Rehabilitation	VII	Bohol	Candijay-Guindulman			o
290	FMB-44	Catubig River Watershed Rehab.	VIII	Northern Samar	Palapag, Laoang, Catubig			x
291	FMB-45	Gandacan-Tinane-Ulot River	VIII	Eastern-Western Samar	Wright, Can-Avid			x
292	FMB-46	Palompon Watershed Forest Reserve	VIII	Leyte	Palompon			o
293	FMB-47	Curuan Watershed Rehabilitation	IX	Zamboanga del Sur	Curuan, Zamboanga City			x
294	FMB-48	Siocon Watershed Rehabilitation	IX	Zamboanga del Norte	Siocon			x
295	FMB-49	Pasonanca Watershed Forest Reserve	IX	Zamboanga del Sur	Zamboanga City			o
296	FMB-50	Ubungan River Watershed Rehab.	XII	North Cotabato	Midsayap			x
297	FMB-51	Kulawan River Water. Forest Reserve	XII	North Cotabato	Kidapawan			o
298	FMB-52	Labangan Watershed Rehab.	IX	Zamboanga del Sur	Labangan, Pagadian City			x
299	FMB-53	Upper Salug watershed Rehab.	X	Misamis Occidental	Manayog, Molave,			x
300	FMB-54	Kinabjangan Watershed Rehab.	X	Agusan del Norte	Carmen			o
301	FMB-55	Digos Riparan River Watershed	XI	Davao del Sur	Digos			o
302	FMB-56	Batuto Watershed	XI	Davao del Norte	New Bataan, Compostela			o

Table 3.1.1 List of 501 Candidate Projects for Master Plan Study (7/10)

o : data available

x : not available

Agency No.	Project Name	Region	Province Name	Municipality Name	Present Status		
					Pre-F/S	F/S	D/D
303	NEA-1 Baracbac River	I	Pangasinan	Mangatarem			x
304	NEA-2 Cabalisan River	I	Pangasinan	San Nicolas			
305	NEA-3 San Gabriel River	I	La Union	San Gabriel			
306	NEA-4 Pogo River	I	La Union	Pogo			
307	NEA-5 Pansian River	I	Ilocos Norte	Pagudpud			x
308	NEA-6 Salaza River	III	Zambales	Palauig			
309	NEA-7 Cabaluan River	III	Zambales	Sta. Cruz			
310	NEA-8 Usulan River	III	Nueva Ecija	Bongabon			x
311	NEA-9 Udiawan Falls	II	Nueva Vizcaya	Solano			x
312	NEA-10 Bagsit River	III	Zambales	Palauig			
313	NEA-11 Bancal River	III	Zambales	Iba			
314	NEA-12 Maapon River	IV	Quezon	Sampaloc			
315	NEA-13 Cagayocay River	V	Camarines Sur	Goa			
316	NEA-14 Tigman River	V	Camarines Sur	Calabanga			
317	NEA-15 Osiao River	V	Sorsogon	Bacon			x
318	NEA-16 Itbog Falls	V	Camarines Sur	Buhi			
319	NEA-17 Sowong River	V	Camarines Sur	Buhi			
320	NEA-18 Binahugan River	V	Camarines Sur	Buhi			x
321	NEA-19 Inarihan River	V	Camarines Sur	Naga City			
322	NEA-20 Ranggas River	V	Sorsogon	Sorsogon			
323	NEA-21 Ranggas River	V	Camarines Sur	Goa			
324	NEA-22 Manitohan River	V	Albay	Manito			
325	NEA-23 Sibulan River	V	Sorsogon	Bacon			x
326	NEA-24 Maragandang River	VI	Negros Occidental	Bago			x
327	NEA-25 Dalanas River	VI	Antique	Barbaza			x
328	NEA-26 Tibiao River	VI	Antique	Tibiao			x
329	NEA-27 Silab #2 (Amlan River)	VII	Negros Oriental	Amlan			
330	NEA-28 Anulod River II	VII	Negros Oriental	Bindoy			
331	NEA-29 Balanan Lake	VII	Negros Oriental	Siaton			
332	NEA-30 Calo River #1	VII	Negros Oriental	San Jose			
333	NEA-31 Calo River #2	VII	Negros Oriental	San Jose			
334	NEA-32 Calo River #3	VII	Negros Oriental	San Jose			
335	NEA-33 Bugtong Falls	VIII	Samar	Calbayog City			x
336	NEA-34 Cantingas River SWIP	IV	Romblon	San Fernando			
337	NEA-35 Calabgan River SWIP	IV	Aurora	Casiguran			
338	NEA-36 Estrella Falls SWIP	IV	Palawan	Narra			
339	NEA-37 Manalili River SWIP	IV	Palawan	Narra			
340	NEA-38 Tarabanan River SWIP	IV	Palawan	Puerto Princesa City			
341	NEA-39 Magcasa Falls SWIP	VIII	Southern Leyte	San Juan			
342	NEA-40 Mauo River SWIP	VIII	Northern Samar	San Isidro			
343	NEA-41 Tinuy-an Falls SWIP	XI	Surigao del Sur	Bislig			
344	NEA-42 Hubo River SWIP	XI	Surigao del Sur	San Agustin			
345	NEA-43 Kanapnapan Falls SWIP	XII	Lanao del Sur	Malabang			
346	NEA-44 Matling River SWIP	XII	Lanao del Sur	Malabang			
347	NEA-45 Bongabon River SWIP	IV	Oriental Mindoro	Hagan, Bongabon			
348	NEA-46 Ditumabo River SWIP	IV	Aurora	Ma. Aurora			
349	NEA-47 Batalan River SWIP	III	Bataan	Morong			
350	BSWM-1 Succuguen SWIP	I	Ilocos Norte	Piddig			
351	BSWM-2 Olo-olo I SWIP	I	Ilocos Sur	Santiago			
352	BSWM-3 Olo-Olo II SWIP	I	Ilocos Sur	Santiago			
353	BSWM-4 Balingoan SWIP	I	Ilocos Sur	Candon			
354	BSWM-5 San Cristobal SWIP	I	Ilocos Norte	Sarrat			

Table 3.1.1 List of 501 Candidate Projects for Master Plan Study (8/10)

o : data available

x : not available

Agency		Project Name	Region	Province	Municipality	Present Status		
No.	No.			Name	Name	Pre-F/S	F/S	D/D
355	BSWM-6	San Agustin SWIP	I	Ilocos Norte	San Nicolas	o	o	
356	BSWM-7	Bingao II SWIP	I	Ilocos Norte	San Nicolas	o	o	
357	BSWM-8	Oda SWIP	I	Pangasinan	Agno	o	o	
358	BSWM-9	Pugaro SWIP	I	Pangasinan	Manaoag	o	o	
359	BSWM-10	Pamaraanum SWIP	I	Pangasinan	Malasiqui	o	o	
360	BSWM-11	Caparispisan SWIP	I	Ilocos Norte	Pagudpud	o	o	
361	BSWM-12	Patong SWIP	I	Ilocos Sur	Magsingal	o	o	
362	BSWM-13	Samac SWIP	I	Ilocos Norte	San Nicolas	o	o	
363	BSWM-14	Mabini SWIP	I	Pangasinan	Balungao	o	o	
364	BSWM-15	San Gonzalo SWIP	I	Pangasinan	Labrador	o	x	
365	BSWM-16	Camagsingalan SWIP	I	Pangasinan	Sual	o	o	
366	BSWM-17	Patar SWIP	I	Pangasinan	Mabini	o	o	
367	BSWM-18	Malimpin SWIP	I	Pangasinan	Dasol	o	x	
368	BSWM-19	Viga SWIP	I	Pangasinan	Dasol	o	x	
369	BSWM-20	Cabuosan SWIP	I	Ilocos Norte	Currimao	o	o	
370	BSWM-21	Magnuang SWIP	I	Ilocos Norte	Batac	o	o	
371	BSWM-22	Camagsingalan #2 SWIP	I	Pangasinan	Sual	x	x	
372	BSWM-23	Daquioag II SWIP	I	Ilocos Norte	Marcos	o	o	
373	BSWM-24	San Andres SWIP	I	Ilocos Norte	Sarrat	o	o	
374	BSWM-25	Paninaan SWIP	I	Ilocos Norte	Bacarra	o	o	
375	BSWM-26	San Juan I SWIP	CAR	Abra	Pilar	o	o	
376	BSWM-27	San Juan II SWIP	CAR	Abra	Pilar	o	o	
377	BSWM-28	Macaracarmay SWIP	CAR	Abra	Bangued	o	o	
378	BSWM-29	Pata SWIP	II	Cagayan	Claveria	o	o	
379	BSWM-30	Balacuit SWIP	II	Nueva Vizcaya	Villaverde	o	o	
380	BSWM-31	Cabannungan SWIP	II	Isabela	Ilagan	o	o	
381	BSWM-32	Marana SWIP	II	Isabela	Ilagan	o	o	
382	BSWM-33	Cabuluan SWIP	II	Cagayan	Alcala	o	o	
383	BSWM-34	Diadi SWIP	II	Nueva Vizcaya	Diadi	o	o	
384	BSWM-35	Naganacan SWIP	II	Isabela	Sta. Maria	o	o	
385	BSWM-36	Balete SWIP	II	Nueva Vizcaya	Diadi	o	o	
386	BSWM-37	Minagbag SWIP	II	Isabela	Quezon	o	o	
387	BSWM-38	Kirang SWIP	II	Nueva Vizcaya	Aritao	o	o	
388	BSWM-39	Laneg SWIP	II	Cagayan	Solana	o	o	
389	BSWM-40	San Antonio SWIP	II	Nueva Vizcaya	Bambang	o	o	
390	BSWM-41	Abian SWIP	II	Nueva Vizcaya	Bambang	o	o	
391	BSWM-42	Trinidad SWIP	II	Isabela	Mallig	o	o	
392	BSWM-43	Malalam SWIP	II	Isabela	Ilagan	o	o	
393	BSWM-44	Apang SWIP	II	Cagayan	Claveria	o	o	
394	BSWM-45	Anneg SWIP	II	Isabela	Magsaysay	o	o	
395	BSWM-46	Victoria SWIP	II	Quirino	Aglipay	o	o	
396	BSWM-47	San Marcos SWIP	II	Quirino	Cabarroguis	o	o	
397	BSWM-48	San Francisco SWIP	II	Quirino	Aglipay	o	o	
398	BSWM-49	Sta. Filomena SWIP	II	Isabela	San Mariano	o	o	
399	BSWM-50	Old San Mariano SWIP	II	Isabela	San Mariano	o	o	
400	BSWM-51	Yeban SWIP	II	Isabela	Benito Soliven	o	o	
401	BSWM-52	Minallo SWIP	II	Isabela	Naguilian	o	o	
402	BSWM-53	Baguinge SWIP	CAR	Ifugao	Kiangan	o	o	
403	BSWM-54	Halog SWIP	CAR	Ifugao	Nayon, Lamut	o	o	
404	BSWM-55	Paku SWIP	CAR	Ifugao	Nayon, Lamut	o	o	
405	BSWM-56	Afueing Daga SWIP	II	Cagayan	Alcala	o	o	
406	BSWM-57	Maasin SWIP	II	Cagayan	Alcala	o	o	

Table 3.1.1 List of 501 Candidate Projects for Master Plan Study (9/10)

o : data available

x : not available

No.	Agency		Region	Province Name	Municipality Name	Present Status		
	No.	Project Name				Pre-F/S	F/S	D/D
407	BSWM-58	Carallangan SWIP	II	Cagayan	Alcala		o	o
408	BSWM-59	Ganzano SWIP	II	Cagayan	Gattaran		o	o
409	BSWM-60	Sampaloc SWIP	III	Nueva Ecija	Talugtug		o	o
410	BSWM-61	Sto. Domingo SWIP	III	Nueva Ecija	Lupao		o	o
411	BSWM-62	Masalipit SWIP	III	Bulacan	San Miguel		o	o
412	BSWM-63	Villa Boado SWIP	III	Nueva Ecija	Talugtug		o	o
413	BSWM-64	Butid SWIP	III	Nueva Ecija	Talugtug		o	o
414	BSWM-65	Maniniog SWIP	III	Tarlac	Mayantoc		o	o
415	BSWM-66	Villa Isla SWIP	III	Nueva Ecija	Munoz		o	o
416	BSWM-67	Sta. Catalina SWIP	III	Nueva Ecija	Talugtug		o	o
417	BSWM-68	Pulo SWIP	III	Bulacan	San Rafael		o	o
418	BSWM-69	Sto. Domingo II SWIP	III	Nueva Ecija	Talugtug		o	o
419	BSWM-70	Bitungol SWIP	III	Bulacan	Norzagaray		o	o
420	BSWM-71	Maasin SWIP	III	Nueva Ecija	Talugtug		o	o
421	BSWM-72	Sto. Domingo I SWIP	III	Nueva Ecija	Talugtug		o	o
422	BSWM-73	Mangandingay SWIP	III	Nueva Ecija	Munoz		o	o
423	BSWM-74	Namulandayan SWIP	III	Nueva Ecija	Lupao		o	o
424	BSWM-75	Parista SWIP	III	Nueva Ecija	Lupao		o	o
425	BSWM-76	Balbalungao SWIP	III	Nueva Ecija	Lupao		o	o
426	BSWM-77	Lagunlong SWIP	IV	Oriental Mindoro	Baco		o	o
427	BSWM-78	Pakala II SWIP	IV	Oriental Mindoro	Baco		o	o
428	BSWM-79	Bayuin SWIP	IV	Oriental Mindoro	Secorro		o	o
429	BSWM-80	Camburay SWIP	IV	Occidental Mindoro	San Jose		o	o
430	BSWM-81	Sayab SWIP	IV	Palawan	Bataraza		x	x
431	BSWM-82	Buenasuerte SWIP	V	Masbate	Uson		o	o
432	BSWM-83	Bulhao SWIP	V	Camarines Norte	Labo		o	o
433	BSWM-84	Dalnac SWIP	V	Camarines Norte	Paracale		o	o
434	BSWM-85	Gabawan SWIP	V	Albay	Daraga		o	o
435	BSWM-86	Burgos SWIP	V	Catanduanes	Viga		o	o
436	BSWM-87	F. Arcangel SWIP	VI	Aklan	Balete		o	o
437	BSWM-88	Pinonoy SWIP	VI	Aklan	Libacao		o	o
438	BSWM-89	Sibaliw SWIP	VI	Aklan	Toralba, Banga		o	o
439	BSWM-90	Panlagangan SWIP	VI	Antique	Sibalom		o	o
440	BSWM-91	Traciano SWIP	VI	Capiz	Dumarao		o	o
441	BSWM-92	San Roque SWIP	VI	Aklan	Malinao		o	o
442	BSWM-93	Aranao SWIP	VI	Aklan	Balete		o	o
443	BSWM-94	Buenavista SWIP	VI	Antique	Belison		o	o
444	BSWM-95	Dita I SWIP	VII	Bohol	Ubay		o	o
445	BSWM-96	Dita II SWIP	VII	Bohol	Ubay		o	o
446	BSWM-97	San Jose SWIP	VII	Bohol	Mabini		o	o
447	BSWM-98	Sto. Nino SWIP	VII	Bohol	Talibon		o	o
448	BSWM-99	Nangka SWIP	VII	Negros Oriental	Bayawan		o	o
449	BSWM-100	Bagtic SWIP	VII	Negros Oriental	Mabinay		o	o
450	BSWM-101	Nabilog SWIP	VII	Negros Oriental	Ayungon		o	o
451	BSWM-102	Bong-Bong I SWIP	VII	Bohol	Ubay		o	o
452	BSWM-103	Bong-Bong II SWIP	VII	Bohol	Ubay		o	o
453	BSWM-104	Calanggaman I SWIP	VII	Bohol	Ubay		x	x
454	BSWM-105	Katipunan SWIP	VII	Bohol	Carmen		x	x
455	BSWM-106	Buyog SWIP	VII	Bohol	Valencia		x	x
456	BSWM-107	Calinganay SWIP	VII	Bohol	Alicia		x	x
457	BSWM-108	Jubasan SWIP	VIII	Northern Samar	Allen		o	o
458	BSWM-109	Casabahan SWIP	VIII	Western Samar	Gandara		o	o

Table 3.1.1 List of 501 Candidate Projects for Master Plan Study (10/10)

o : data available
x : not available

Agency		Project Name	Region	Province Name	Municipality Name	Present Status		
No.	No.					Pre-F/S	F/S	D/D
459	BSWM-110	Inamburacay SWIP	VIII	Northern Samar	Bobon		o	o
460	BSWM-111	Sta. Fe SWIP	VIII	Western Samar	Borongan		o	o
461	BSWM-112	Campin SWIP	VIII	Leyte	Mahaplag		o	o
462	BSWM-113	Laboon SWIP	VIII	Southern Leyte	Maasin		o	o
463	BSWM-114	Polanqui SWIP	VIII	Eastern Samar	Taft		o	o
464	BSWM-115	Tabawan SWIP	VIII	Western Samar	Tabawan, Calbayog City		o	o
465	BSWM-116	Dau-Oras SWIP	VIII	Eastern Samar	Oras		x	x
466	BSWM-117	Woodland SWIP	IX	Zamboanga del Sur	Begong, Dumalinao		o	o
467	BSWM-118	Sumadat SWIP	IX	Zamboanga del Sur	Dumalinao		o	o
468	BSWM-119	Lungnot SWIP	IX	Zamboanga del Sur	Dumalinao		o	o
469	BSWM-120	Lamare I SWIP	IX	Zamboanga del Sur	Bayog		o	o
470	BSWM-121	Lamare II SWIP	IX	Zamboanga del Sur	Bayog		o	o
471	BSWM-122	Buenavista SWIP	IX	Zamboanga del Sur	Curuan		o	o
472	BSWM-123	Goling SWIP	IX	Zamboanga del sur	Diplahan		o	o
473	BSWM-124	Lubuandong SWIP	X	Bukidnon	Kibawa		o	o
474	BSWM-125	Alubijid SWIP	X	Agusan del Norte	Buenavista		o	o
475	BSWM-126	Balibayon SWIP	X	Surigao del Norte	Brgy. Rizal, Surigao		o	o
476	BSWM-127	Apulang SWIP	X	Bukidnon	Kibawa		o	o
477	BSWM-128	Talao-ao SWIP	X	Agusan del Norte	Buenavista		o	o
478	BSWM-129	Dumalagan SWIP	X	Agusan del Norte	Butuan City		o	o
479	BSWM-130	Mintu-od SWIP	X	Agusan del Norte	Buenavista		o	o
480	BSWM-131	Malapong SWIP	X	Agusan del Norte	Buenavista		o	o
481	BSWM-132	Talaganahao SWIP	X	Agusan del Norte	Buenavista		o	o
482	BSWM-133	Kitao- tao SWIP	X	Bukidnon	Kitao- tao		o	o
483	BSWM-134	San Rafael	XI	Davao Oriental	Cateel		o	o
484	BSWM-135	Bukay-pait SWIP	XI	South Cotabato	Tantangan		o	o
485	BSWM-136	Libudon SWIP	XI	Davao Oriental	Mati		o	o
486	BSWM-137	Dumadilig SWIP	XI	South Cotabato	Tantangan		o	o
487	BSWM-138	Libasan SWIP	XI	Davao del Norte	Nabunturau		o	o
488	BSWM-139	Florida SWIP	XI	Davao del Norte	Capalong		o	o
489	BSWM-140	Dauman SWIP	XI	Davao del Norte	Montevista		o	o
490	BSWM-141	San Nicolas SWIP	XI	Davao del Sur	Digos		o	o
491	BSWM-142	Bolton SWIP	XI	Davao del Sur	Malalag		o	o
492	BSWM-143	Pedtap SWIP	XII	North Cotabato	Cabacan		o	o
493	BSWM-144	Looy SWIP	XII	Maguindnao	South Upi		o	o
494	BSWM-145	Dalingawan SWIP	XII	North Cotabato	Pikit		o	o
495	BSWM-146	Tinibtiban SWIP	XII	North Cotabato	Pikit		o	o
496	BSWM-147	Busok SWIP	XII	Sultan Kudarat	Bagumbayan		o	o
497	BSWM-148	Kalandagan SWIP	XII	Sultan Kudarat	Tacurong		o	o
498	BSWM-149	Lancheta SWIP	XII	Sultan Kudarat	Tacurong		o	o
499	BSWM-150	New Carmen SWIP	XII	Sultan Kudarat	Tacurong		o	o
500	BSWM-151	Malagakit SWIP	XII	North Cotabato	Pigcawayan		o	o
501	BSWM-152	San Juan Overflow Dam	VIII	Southern Leyte	San Juan			o

Table 3.1.2 Major Features of Completed/On-going SWIM projects (1/2)

No.	Agency	Name of Project	Region	Type of Dam	Height (m)	Dam Crest Length (m)	Dam Volume (cu.m)	Reserv. Area (ha)	Storage Capacity (cu.m)	Irrig. Area (ha)	Const. Cost (Peso T.)	Dates Started	Date Complete	Period (Month)	Remarks
1	FSDC	Kabareng	III	Adobe Stone Masonry	3.5	200	7	3.5	37,400	109	200	Jul-76	Aug-77	13	No information is available on present condition
2	FSDC	Pagundao	I	Homogeneous Earthfill	21.5	120	80,000	3.8	200,000	60	1,300	Apr-77	Apr-78	12	No information is available on present condition
3	FSDC	Patituk	III	Adobe Stone Masonry	3.3	170	7	0.5	56,600	125	500	Jan-79	Jun-80	12	No information is available on present condition
4	FSDC	Sta. Cruz	III	Homogeneous Earthfill	13.0	206	40,111	4.3	120,500	140	1,902	Jan-79	Mar-80	9	Functioning
5	DPWH	Nabintangan	II	?	?	?	?	?	?	?	2,140	?	1981	?	Available information is very limited
6	FSDC	San Roque	VII	Zoned Earthfill	14.0	120	53,100	9.9	1,300,000	108	5,499	Oct-80	Sep-81	11	No information is available on present condition
7	BSM	Pamulutan	IX	Check dam	2.1	3.5	9,418	?	?	200	332	Jul-81	Sep-81	2	Functioning (F/S & D/D reports are available)
8	BSM	Calapan	IX	Check dam	1.0	3.6	7	?	?	87	164	Sep-81	Nov-81	2	Functioning (F/S & D/D reports are available)
9-1	FSDC	Fort Magsaysay #3	III	Zoned Earthfill	7.0	145	77,900	1.3	133,500	?	4,039	Dec-81	Oct-82	10	No information is available on present condition
9-2	FSDC	Fort Magsaysay #4	III	Zoned Earthfill	15.0	92	77,900	11.9	369,000	?	4,039	Nov-81	Sep-83	22	No information is available on present condition
9-3	FSDC	Fort Magsaysay #5	III	Zoned Earthfill	15.0	92	24,500	11.9	369,000	?	3,676	Jan-82	Jan-83	12	No information is available on present condition
10	NIA	Tilhan *	VII	Zoned Earthfill	25.0	145	95,000	22.0	775,000	150	13,379	Jan-80	Jan-83	37	Functioning (detailed designs are available)
11	DPWH	Palacol	III	Boulder filled	1.5	?	?	?	?	76	1,500	?	Mar-83	?	Damaged and not functioning (No report is available)
12	FSDC	Marsyen	I	Zoned Earthfill	10.0	100	21,200	8.0	100,000	80	2,850	Dec-81	Jun-83	18	No information is available on present condition
13	FSDC	Sta. Barbara	I	Overflow Concrete	4.5	40	15,300	11.0	330,000	130	3,325	Dec-81	Dec-81	24	No information is available on present condition
14	FSDC	SI-Utan	V	Zoned Earthfill	15.0	68	25,500	1.8	?	33	7,461	Nov-82	Nov-83	12	No information is available on present condition
15	BSM	Nagsabaran	II	Earthfill	7.0	180	31,695	2.6	60,320	70	1,994	Mar-83	Dec-83	9	Functioning (F/S & D/D reports are available)
16	BSM	Darapidap *	II	Earthfill	12.9	130	70,237	2.1	90,090	30	1,805	Feb-84	Feb-85	10	Functioning (F/S & D/D reports are available)
17	DPWH	Bandao	V	Concrete Masonry	4.0	25	?	-	-	-	797	Feb-84	Feb-85	12	Damaged and not functioning (No report is available)
18	BSM	Hallirao *	VIII	Earthfill	9.0	174	45,144	2.6	76,800	4	2,228	Feb-83	Oct-84	20	Functioning (F/S & D/D reports are available)
19	FMS	Abugula-Ringa	CAK	Check Dams	-	-	-	-	-	-	4,320	Apr-81	Dec-84	45	Functioning (D/D report is available)
20	FMS	Sta. Fe	II	Check Dams	-	-	-	-	-	-	2,091	Apr-82	Dec-84	33	Functioning (D/D report is available)
21	DPWH	Porac *	III	Zoned Earthfill	25.0	168	106,600	12.8	672,500	?	11,813	Jun-83	-	?	Washed away in 1984-86
22	FMS	Pasig-Timba *	III	Check Dams	-	-	-	-	-	-	1,447	Apr-82	Dec-84	33	Functioning (partly damaged)
23	NEA	Manayunan *	VII	Concrete	2.0	15	?	-	-	-	12,593	Aug-82	Nov-84	27	Functioning (F/S & D/D reports are available)
24	FSDC	Bumotan *	I	Zoned Earthfill	24.0	100	180,800	18.0	1,570,000	155	7,400	Oct-80	Mar-86	66	Functioning well (No report is available)
25	DPWH	Caulaman	III	Concrete Diversion	?	?	?	?	?	?	720	Dec-84	Feb-85	2	Washed out in 1986 (No report is available)
26	DPWH	Kilrong *	III	Concrete Diversion	?	?	?	?	?	?	1,181	Dec-84	Jan-87	25	Damaged and not functioning (No report is available)
27	NEA	Basak	VII	Concrete rubble	3.0	15	?	-	-	-	14,138	Jun-82	Jul-85	38	Functioning (F/S & D/D reports are available)
28	DPWH	Dacupong	I	Homogeneous Earthfill	11.8	70	15,500	1.8	105,000	30	1,854	Feb-87	Apr-87	2	Functioning (F/S report is available)
29	DPWH	San Ramon *	III	Homogeneous Earthfill	13.0	196	22,000	5.0	91,000	0	3,886	Jun-87	Jun-87	5	Completed but not developed yet for irrigation
30	DPWH	Calaragunan *	VII	Zoned Earthfill	17.5	140	?	?	390,500	100	6,700	May-87	Aug-88	15	Not yet completed in actual sense due to delayed fund release
31	DPWH	Katipunan	VII	Earthfill	7.5	72	?	?	?	20	500	May-88	Aug-88	3	Functioning (No report is available)
32	BSM	Aurby	XI	Earthfill	6.5	196	28,346	3.5	75,833	70	2,109	Jul-84	May-88	47	Functioning (F/S & D/D reports are available)

Note: ? : no data available.
 - : not applicable.
 * : projects for post-evaluation study.