

3. Problems to be Addressed and the Current Situation

3.1 Institutional Framework for the Sector

3.1.1 Organization of the Water Resources Sector

(1) MARD

Department of Planning, Department of Investment and Construction and Department of Water Resources of MARD are the government authorities in charge of the irrigation water management in Vietnam. In accordance with the Decree 86/ND CP issued in November 2002, the organization of MARD was restructured with 18 internal departments consisting of six policy-related departments, 10 project-related departments, and departments of audit and administration; and external establishments such as public service agencies, non-profit management units, and state enterprises.

(2) VIWRR

Vietnam Institute for Water Resources Research (VIWRR), the counterpart organization of the Project, is one of the three research institutes in the field of water resources under MARD. VIWRR consists of four administrative departments or divisions, 16 research departments or centers and one public enterprise. Major activities are; i) scientific research on the water resources, ii) technical transfer on the water resources engineering, iii) provision of post-graduate training, and iv) consulting services on the water resources management.

(3) DARD

Department of Agriculture and Rural Development (DARD) is one of the technical departments of Provincial People's Committee (PPC). DARD takes responsibility for construction of the irrigation and drainage systems with command areas of less than 150 ha, and technical guidance on the maintenance of the bigger irrigation and drainage systems which were undertaken by MARD.

(4) IMC

Irrigation Management Company (IMC) is responsible for the operation and maintenance of the main facilities of the irrigation and drainage systems that command more than one administrative unit or commune. There are 172 IMCs in the country. In general, IMCs are organized by province as "state-owned enterprise" under the supervision of provincial authorities. IMCs have branch offices in district called Irrigation Management Enterprise (IME). In most cases, IMCs receive financial support from the government.

(5) Water Users Association

In the northern region, agricultural production cooperatives (APC) generally play the roles of

water users association as one of their services. Main activities of APCs as "water users association" are; i) preparation of water distribution schedule, ii) maintenance of field irrigation and drainage facilities, and iii) collection of irrigation service fee (ISF). "Irrigation groups" are generally organized in APCs to perform the above services of APC on the water management.

(6) Irrigation Team

In case that APCs do not exist, local government, namely, Communes take responsibility for coordinating the water management at field level. In this case, irrigation teams are organized by village (hamlet) and the technical staffs of Communes give guidance to the teams. The team plays the same roles as APC within their command area.

3.1.2 Institutional Framework of the Water Resources Sector

(1) Application for the Project

Each Province formulates development master plan with reference to the requests from Districts and Communes and gives priority for implementation. Applications for rehabilitation and new construction are raised separately through Department of Water Resources and Department of Investment and Construction, respectively. Budget of MARD is determined through discussions of Ministry of Planning and Investment (MPI) and Ministry of Finance (MOF) on the basis of the request from MARD.

(2) Annual Budget for Operation and Maintenance

Irrigation and drainage systems constructed by the national budget are transferred from MARD to IMC through DARD immediately after completion of inspection. IMCs propose necessary annual O&M budget by the end of September every year. The O&M budget allocated by Provincial People's Committee (PPC) is generally less than 30 % of ISF, while MARD has its own standard that expenditure for O&M should be about 20 % of total expenditure for the irrigation and drainage improvement.

(3) Implementation of Operation and Maintenance

Once the annual O&M budget is approved, IMCs prioritize the proposed works and prepare implementation schedule. SARD is in charge of maintenance and repair works of the secondary and tertiary systems. Major repair works are handled by the engineering sections of IMC. District branches of IMC (IME) deal with construction contract, supervision and payment with approval of the headquarters. All the construction works have to be implemented on contract basis.

(4) Budget Allocation

In order to obtain the necessary budget for construction, a relevant province has to submit a list of rehabilitation and construction projects, respectively, to MARD with set priorities. Receiving the requests from the provinces, MARD determines its priority of implementation within the budget allocated by MPI and MOF. Big projects whose costs are over VND 20 billion are required to get approval of the government through MPI.

(5) O&M

Organization and management system of IMC differs from one to another. Financial status of IMC largely depends on ISF and its collection rate. In general, IMCs can not fulfill their responsibilities due to insufficient O&M machinery and budget. IMCs are supposed to distribute necessary irrigation water on time as scheduled. However, the water distribution is not properly conducted due to physical problems such as sedimentation in the canal, lack of regulating structures, deterioration of facilities and others.

In Vietnam, four major types of O&M systems cover the irrigation and drainage systems as shown in the following. In the region, Type 2 and 3 are predominant.

	<u>Main and Secondary</u>		<u>Tertiary and field system</u>
Type 1	IMC	+	Commune
Type 2	IMC	+	APC
Type 3	IMC	+	Water Users Association
Type 4	DARD	+	Commune

Figure O&M Type by Management Level

3.2 Analysis of the Current Situation and Problem

3.2.1 Present Situation and Problems of Institutions

(1) MARD

Even with 600 staffs and 18 departments, PIM promotion capacity of MARD has yet been improved so far. Most of the budget has been spent for the physical improvement of the irrigation and drainage systems and software or institutional improvement to sustain the function of the existing facilities has not been the main concern. MARD is the core organization for policy making. Awareness building on PIM in MARD itself is quite important.

(2) *VIWRR*

VIWRR has approximately 960 staffs consisting of 250 permanent staffs and other contract-base staffs. Out of technical centers and divisions, Center for Water Resources and Environment, Center for Irrigation, Drainage and Water Supply, Center for Water Resources Economic and Policy, Center for Water Resources Software and Centre for Participatory Irrigation Management will play major roles of the Project. Coordination for the Project will be managed by International Cooperation Division (ICD).

VIWRR's main activities are research, education and consulting services on water resources management and engineering, and PIM is among them. Capacity development for PIM promotion in the Project will improve sustainability of the existing irrigation and drainage facilities and to reduce O&M budget.

(3) *IMC*

One of the big problems of IMC is that a large part of ISF is used for operation of IMC itself but not for O&M of the irrigation and drainage systems. As a result, O&M is not properly done due to shortage of budget, and costs for driving electric pumps and major repair works of the facilities are actually supported or subsidized by the government. Moreover, design parameters of the facilities, for instance, capacity of the canals, irrigation area and others are not kept at IMC. Whereas, proper water distribution can not be planned without such basic information. The operation of the facilities is carried out based on claims of water users or experience of operators. Poor communication between water users and IMC also results in mutual misunderstanding. Although rationalization of IMC requires a time-consuming process, information disclosure, particularly on the usage of ISF, is one of the most effective measures for improvement of IMC, so that transparency and trustworthiness of IMC activities be secured.

(4) *APC*

The irrigation groups of APC generally take charge of the water management. Beside the water management service, APC also handles agricultural inputs, electricity, and agricultural extension services. APC generally has a chief manager and several board members, who manage operation of the organization and activities. Operational budget is allocated from the collected ISF and sales of electricity and agricultural inputs. A part of ISF is paid for the services of IMC, while the remaining is used for O&M of tertiary and other irrigation facilities and operation of APC itself. The balance sheet of the APC budget should also be transparent for better accountability.

One of the significant technical problems on O&M of the tertiary and field irrigation systems is that the water management is conducted within territory of APC, namely, administrative

boundary of the communes. Even in the same irrigation system, adjacent APCs do not coordinate with each other in water management and they count on IMC's arrangements. Moreover, APC's activities are subject to intervention by the communes concerned, and the independency of account as a water users association is not secured.

(5) *Local Authority (People's Committee)*

The water management organizations of Vietnam are established in accordance with the administrative boundaries. An IMC covers a province and an IME covers a district. An APC covers a commune. Technical support and budget allocation depend on the local authorities of the province, district and commune. Accordingly, financial arrangement and decisions are often affected by the intention of the local authorities. The biggest problem is the diversion of ISF for other purposes, which spoils transparency and trustworthiness of the water management organizations.

Thus, the existing problems on water management are not always caused by technical problems but often caused by institutional reasons. Therefore, capacity development on PIM should include not only technical or engineering aspect but also institutional and social aspects of water management.

3.2.2 *Present Situation and Problems of Water Resources Sector*

(1) *Irrigation and Drainage Facilities*

Characteristics of irrigation and drainage facilities of Vietnam are as follows:

1. Most of the facilities have deteriorated and require much O&M costs.
2. Large irrigation and drainage systems, in which water management is complicated, are predominant among the existing schemes.
3. Physical improvement of the existing facilities (hardware improvement) is the main interest of water management sector.

Under the regime of socialist republic, Vietnam had invested a lot in construction of irrigation and drainage facilities for accelerating food production. However, the efficiency and sustainability of the facilities have been low due to lack of proper maintenance. At present, the main concerns are how to prolong the life time of the existing facilities and how to replace and operate them efficiently. In order to secure economic viability of the investment, crop diversification should also be considered. To this end, the irrigation and drainage system itself should also be modified or modernized to achieve minute water management for the diversified crops. From the institutional aspect, involvement of water users in water management activities, namely PIM, is important for the better organization of the complicated water distribution and the sustainability of the facilities. Thus capacity development of water resources engineers and leading farmers that will extend PIM is

necessary for water resources sector of Vietnam.

(2) Water Management Institution (regulation, guidelines)

There are 14 regulations, decree or guidelines on the water resources management, responsibility of water management, ISF, O&M of the irrigation and drainage facilities, operation of water management organizations, administrative procedures. The Law on Water Resources enacted in 1998 is the basic law on the water resources management. As for PIM, the Water Resources Management Department of MARD and related government organizations have prepared guidelines on the project basis following the context of the Law on Water Resources. However, there is no "unified guidelines" on PIM. Therefore, procedures to introduce or apply PIM differ by project, which confuses the field staffs in charge of the water management. It is important to formulate unified guidelines on PIM and to train key personnel for extension of the PIM approach. To this end, the PIM Road Map which was determined and agreed by the Vietnamese government and supporting donors should be promoted for smooth implementation and extension of PIM.

(3) Roles of Organizations on Water Management (government, IMC, APC)

MARD is the policy maker of water resources management including PIM. Although basic laws and regulations on PIM have been enacted, their applications in the provinces and local areas are limited. MARD should give guidance to DARD on the concept of the existing regulations on water resources management. Moreover, MARD should determine the concept of PIM which is suitable for Vietnamese social and physical conditions in consultation with VNPIM and related donors.

DARD or SARD should formulate detailed rules and guidelines on PIM application according to the situations of the existing irrigation and drainage schemes in the province or district. DARD and SARD should supervise activities of IMC and IME on not only technical aspects but also administrative and financial aspects.

IMC and IME should reorganize and categorize their duties. Target and records of activities should be maintained every year and the financial balance sheet should be improved for the disclosure of information to the public. Accessibility to IMC and accountability of IMC should be improved through the Project.

APCs of Vietnam are "service provider" to which registered members pay ISF for the service. Activities of APCs are managed and supervised by several board members and the physical works such as repair and maintenance of irrigation canals are implemented on contract basis. ISF is paid as a consideration for the service of APC. Therefore, water users do not have sense of ownership on the irrigation facilities. This is one of the difficulties in motivating farmers to participate in water management.

(4) Human Resources

Actual operations of water management by IMC have been conducted according to the field conditions and intentions of water users. The operations are not always conducted with technical consideration but with experience and intuition. IMCs should first grasp the existing capacity of the facilities that they maintain and provide water users with accurate technical information.

Water management below the tertiary level is handled by APCs or communes. The biggest problem at this level is the shortage of irrigation water. However, the shortage is caused not only by physical problems but also by poor coordination on the water distribution. The main constraint at this management level is that APCs or communes are reluctant to discuss directly with neighboring APCs or communes on the problems. They try to entrust the problem solving to the upper administration such as district and/or IMC/IME. Problem solving by water users themselves must be one of the outputs of the Project.

(5) ISF

The ISF rate was drastically increased in 2003 by a government decree in accordance with the increase of rice yield through the physical improvement of the irrigation and drainage facilities. Needless to say, the government's main concern was to eradicate financial burden for O&M of irrigation and drainage systems.

ISF should basically be determined or agreed on by water users. Lack of transparency of financial situation of IMCs and APCs seems to amplify distrust and discontent of water users against IMC, APC and the government.

4. Project Strategies

4.1 Outline

(1) Priority among Development Approaches

Problems observed in the target area, namely the northern region, are categorized as follows with a focus on agriculture and rural development.

- High dependency on crop production, particularly on rice production (food security, income)
- Landholding size is small (particularly in Red River Delta)
- Low price of agricultural products (particularly rice)
- Low yield (in northern mountains)
- High production cost including ISF

Among the above problems, it is difficult to solve the problem of "land holding size". A

common concept to overcome the above problems is to increase the value of agricultural products which are generated from the available land through introduction of high value crops and reduction of production cost.

“Rice cultivation with large-scale pump irrigation” is a characteristic of agriculture in Vietnam. In general, pumping irrigation which requires high running cost is not practiced for paddy rice in monsoon countries because of low market price of rice. The pump irrigation schemes of Vietnam had been promoted under the socialist regime to secure food for the increasing population. However, many pump sets of the irrigation and drainage schemes have deteriorated and require replacement. Further investment for the pump irrigation of the rice cultivation is not considered economically viable. From a long-term view point, the pumping irrigation schemes with small land holding size should be shifted to diversified crop production area, and rice production will be concentrated and intensified in the gravity irrigation schemes with a larger land holding size.

In addition, industrialization is the core policy of CPRGS along with equal distribution of wealth to overcome poverty. To this end, improvement of agricultural productivity and efficiency of water use for agriculture are important approaches. As a result, labor force and water resources saved in the agricultural sector will be shifted and utilized for industrial development. With such background, the approach for improvement of the water management or efficient use of the water resources should be given higher priority among the alternative approaches identified in the target area.

Transfer of management of irrigation and drainage systems of IMCs to water users is also an alternative to reduce the management cost and improve the sustainability of the system. For instance, operation hours of pumps for irrigation are shorter in the system that the water users or ISF payers operate by themselves. However, in order to extend such effects of participatory irrigation management, it is important to increase number of skilled water management engineers who can identify the existing water management problems and motivate the stakeholders. A step-by-step approach is required to accelerate PIM extension. For the first stage, “PIM trainers” will be trained, then the trainers will disseminate the acquired skills to other engineers and staffs. Experience and know-how of the Land Improvement District (LID) of Japan can also be utilized for the establishment of PIM approach through the Project.

(2) Beneficiaries

The capacity development aspect of the Project will benefit the water resources engineers, the governmental staffs and the water management organizations at every administrative level. Therefore, farmers, as the end user of irrigation water, will also be benefited. The effect of the Project will be expanded to the whole country by the trained engineers and staffs even after

the Project period.

(3) *Collaboration with Other Donors*

The participatory irrigation management has been promoted by the government of Vietnam and donor agencies such as the World Bank, Asian Development Bank, DANIDA, and others. The PIM Road Map which was finalized in 2004 through a series of workshops with the agencies concerned set an action plan to promote PIM in Vietnam. JICA's technical cooperation program will also play important roles in the Road Map. Systematic promotion of PIM has just been started in Vietnam, and the role of each organization is well arranged and recognized.

(4) *Advantage of Japanese Technical Cooperation ~ Land Improvement District*

In Vietnam, IMC is handling water management and O&M of irrigation and drainage facilities. However, staffs of IMC are not basically water users of the systems. It means that IMC is not water users association. APC is not necessarily a water users association, either. Relations between IMC or APC and water users are formed with contracts on irrigation water supply. Therefore, the participation of water users in the activities of IMC or APC has not been considered a prerequisite.

Land Improvement Districts (LID) of Japan are O&M organizations of irrigation and drainage schemes. LID is operated with ISF and the government subsidies, but the leaders of LID are representatives of water users. The board members that make decisions of budget and activities of LID are also water users.

Although the systems of IMC or APC and LID are not similar, advantages of PIM is well displayed in LID operation and administration. Particularly, in terms of financial management, information disclosure, coordination on water distribution, water regulation techniques and problem solving, LID has long experience and lots of know-how that can be applied to the system improvement of IMC and APC. Such advanced techniques and institutions accumulated in LID should be utilized in the Project.

(5) *Availability of Inputs*

Long-term experts for the Project in the field of irrigation and drainage engineers, water management institution and training are highly available in Japan. Equipments and facilities for water management and training concerned will also be easily procured.

(6) *Experts*

Short-term experts on water management, O&M, and operation of water management

organization will be nominated from LID. Assignment of LID experts will be arranged by the Japanese government (Ministry of Agriculture, Forestry and Fisheries, MAFF). Short term experts for such specific technical fields as control devices, pumps, computer, system engineering, agriculture will also be available and assigned through ordinary recruitment procedures.

(7) *Benefit to the Poor*

Work load for the farming practices in Vietnam, particularly in the northern region, is high because of long cropping period and intensive farming practices in the small farm lands. In general, women play important roles in the farming practice, and their burdens are heavier in poor households. The Project will benefit the poor and women through improvement of the water management at field level. The Project will relieve the poor from the hard work of manual irrigation. PIM will involve the women in the management of the organization, which will increase opportunity of women's participation in social activities and capacity development programs.

(8) *Consideration on Economy and Administration*

Large irrigation and drainage systems have been constructed with an initiative of the government on the basis of planned economy. The primary objective of such intensive development was to achieve food self-sufficiency, and the efficiency of the irrigation and drainage systems is not high enough. Moreover, the economic viability of further investment in the pumping irrigation system will be low if the target crop is rice. However, rice cultivation is invaluable for the Vietnamese people whose society depends on it economically as well as spiritually. The main concern of water resources sector is how to improve efficiency of the existing irrigation and drainage systems so that the livelihood of rural households are maintained with higher income, and other water users, particularly industrial sector, can grow smoothly with sufficient water resources. Therefore, the Project will bring not only direct effect as income increase of the farm households but also indirect effects of stabilization of rural or rice-oriented livelihood and growth of industrial sector. To this end, it is quite important to implement the water management improvement which will realize rationalization of the irrigation and drainage systems, O&M improvement and effective replacement of facilities. Therefore, the priority of water management improvement approach is very high.

4.2 Implementation Structure

(1) Approaches to Sustain the Effects of the Project

In order to realize the overall goal of the project, the trained water resources engineers should continue their activities to extend PIM after the Project. VNPIIM, established in MARD, will support the PIM promotion from the stand point of the policy maker through close coordination with donor agencies. It can be said that Vietnamese side is making great efforts to establish a supporting system for the Project. Such institutional backup by own efforts of the Vietnamese side will secure the sustainability of the effects of the Project.

(2) Approaches to Maximize the Project Impact

The impacts expected from the Project are; i) promotion of participation of the people in public and social activities through strengthening of farmers' capacity and empowerment, ii) increase of the availability of water resources through improving the efficiency of water use for irrigation, iii) improvement of mutual understanding and coordination between the people, the local authorities and the central government. In order to maximize such impacts, an implementation structure which involves stakeholders at each administration level including the farmers should be established with a "joint coordinating committee" so that information on the Project activities and results are shared amongst the Project stakeholders. Furthermore, publicity activities such as organizing seminar and workshop, public hearing meeting with the local stakeholders and/or setting up project web-site should be carried out. Collaboration with other institutes and organizations on water resources management will also be effective to expand the impact through activities of other projects and programs.

(3) Approach to Enhance Efficiency of the Project

In order to realize the efficiency of the project, the existing facilities and organizations should be fully utilized. Smooth implementation requires close coordination between the stakeholders. For this purpose, Joint Coordinating Committee is proposed.

In Vietnam, PIM approach was adopted in some irrigation projects, but it was not always successful due to lack of involvement of the local authorities such as People's Committees. Most of the activities of official programs are somehow related with the local authorities, and they should be clearly involved in the implementation set up. Local people are also reluctant to join a foreign program without participation of the local authorities. Representatives of the local authorities should be members of the Joint Coordinating Committee. The water resources engineers of the local authorities such as DARD and SARD will also be designated as "trainees" of the Project. Roles and responsibilities of the local authorities should be

determined in the committee to ensure the efficient implementation of the Project.

(4) *Capacity of the Counterpart*

VIWRR has long and abundant experience of research on water resources engineering since 1959. The engineers of VIWRR are eager to absorb new knowledge and to practice it through research and field experiment. Since PIM is a field-oriented approach and VIWRR does not have staffs or offices in the provinces, it is expected to expand its activities at field level.

(5) *Consideration on Gender, Environment and the Weak*

Ultimate goal of the Project is "agricultural productivity is improved" which will likely lead to improvement of living conditions. Some studies show that the proportion of women below the poverty line is bigger than that of men. Influence of the Project on the weak and the pro-poor design of the Project should be duly considered. In selection of sample households for project evaluation, widow-headed and/or poor households should be properly included. Evaluation indicators should include not only income but also opportunity of participation in social activities and employment. Pollution of agro-chemical and fertilizers and damage by poor drainage and excessive irrigation on natural environment should be considered, while uneven distribution of the project benefit, conflicts which might arise in or between the water management organizations and other negative impacts on the local society should be monitored.

5. Project Design

5.1 Project Purpose

The project purpose is "*Participatory irrigation management (PIM) is promoted and agricultural productivity is improved in terms of both yield and cost through enhancement of the capacity of leading farmers and water resources engineers in the model site*".

The Project will train water resources engineers and leading farmers as main stakeholders in order to establish and extend systematic technology of PIM which is a new approach in water resources or irrigation and drainage sector of Vietnam.

Not only VIWRR and MARD engineers but also the water resources engineers of DARD and IMC in 25 provinces in the northern region will be trained together with the water management staffs of IME, APC and/or irrigation stations of IMC at the model sites in Hai Duong and Quang Ninh Provinces. In order to increase skilled PIM experts both in terms of knowledge and experience, the training will be conducted through lectures and on-the-job training at the model sites intensively during the five years of the Project duration.

Indicators of the Project purpose are; i) increase of cropping intensity and yields of non-paddy crops, and ii) reduction in irrigation / production cost. In total, 1,500 water resources engineers in the 25 provinces and 150 water management staffs at three model sites will acquire knowledge and experiences to promote PIM. The indicators will properly be reviewed and revised after the baseline survey which will be conducted at the initial stage of the Project. Continuous activities of these skilled water resources engineers will realize the overall goal of the Project.

5.2 Overall Goal

The overall goal is *"Agricultural productivity is improved in terms of both yield and cost through improved irrigation management in the area where participatory irrigation management (PIM) is promoted"*.

The water resources engineers trained through the Project period will perform and extend their skills in their provinces and the PIM approach will be expanded there. Accordingly, skills of water management staffs will also be improved and the similar effects as the model sites will take place in 25 provinces. VIWRR will acquire know-how of extension of PIM approaches and perform consulting services which will sustain the Center itself with a firm financial background. As Vietnamese economy grows, non-agricultural water demands will increase. The Project will realize efficient use of the water resources and contribute saved water to the new demands, which will support growth and poverty reduction. In this sense, the overall goal of the Project is conformed to the national development strategy. PIM Roadmap, as a milestone of participatory irrigation management, should be monitored to clarify the process and approach to the overall goal.

5.3 Output and Activity

The following four outputs are expected to achieve the Project purpose.

- O1. The function of promoting PIM is strengthened in VIWRR.*
- O2. Engineers of irrigation management company (IMC) acquire knowledge, technology and experience on water management.*
- O3. Water management by farmers' organizations in the model sites is improved and crop diversification is promoted.*

Project activities to achieve the above outputs are as follows.

(1) *O1: The function of promoting PIM is strengthened in VIWRR*

- A1-1. To review PIM approaches which were conducted in the pilot projects of other donors.
- A1-2 To formulate guidelines, manuals and training programs for PIM promotion.
- A1-3 To implement training courses (water management method, training method) for VIWRR engineers as "PIM trainers".
- A1-4 To provide VIWRR engineers with practical experience as trainers at the model sites
- A1-5 To improve the guidelines, manuals and training programs based on the experiences acquired in the model sites

In order to achieve the project purpose, it is necessary to prepare guidelines which formulate approaches and procedures of PIM systematically. Training materials to disseminate the guidelines are also required. The guidelines and the training materials will be prepared jointly by the Japanese experts and counterpart personnel and utilized in the training program for about 1,500 water resources engineers and 150 water management staffs working for the model sites. During the training courses, the training program will be reviewed and improved according to the needs of the trainees. Indicator of "O1" will be "Completion of the guidelines, manuals and training programs" and "number of trained PIM trainers who acquired targeted knowledge, technology and experience".

PIM promotion function of VIWRR will also be strengthened through enhanced capacity of water resources engineers. Twenty-five (25) engineers which will be mainly nominated from VIWRR water resources engineers will be trained as "trainers of PIM". The training subjects are divided into three categories, namely, i) water management (software), ii) irrigation and drainage (hardware) and iii) management of organization. The training course will consist of lectures and field practices at the model sites. The training course will be started in the second half of the first year. The indicator of the output will be "Number of trained engineers who acquired targeted knowledge, technology and experience". The 25 trainees will be authorized as "trainers" with certificates.

(2) *O2: Engineers of irrigation management company (IMC) acquire knowledge, technology and experience on water management.*

- A2-1 To organize training courses by the trainers for IMC engineers in each province on the methods of water management, organization management, and instruction on PIM.
- A2-2 To organize seminars on PIM in the model sites for IMC engineers.

The PIM trainers will visit the provinces and train the water resources engineers of DARD

and IMC on irrigation and drainage, water management and management of organizations. They will also support the activities of the trainees in the provinces. In particular, practices of PIM promotion and know-how of strengthening of the water management organizations will be transferred through the practices at the model sites. Annual workshop will be held at the model sites where the water resources engineers (trainees) will present their activities in their provinces and share the outputs with each other. The indicator of "O2" will be "Number of trained engineers who acquired targeted knowledge, technology and experience".

(3) *O3: Water management by farmers' organizations in the model sites is improved and crop diversification is promoted.*

A3-1 To conduct base-line survey on the model sites (survey on water management, irrigated area, cropping pattern, farming practices, marketing)

A3-2 To organize training courses by IMC engineers for leading farmers (method for organizational cooperation in water management, method for operation and maintenance of canals, pumps, and other facilities)

A3-3 To promote PIM in the model site through farmers' organizations and IMC.

A3-4 To support improvement of farming practices by the farmers' organizations in the model site (Formulation of cropping plan, introduction of demonstration plot, introduction of good practices)

A3-5 To improve the water management through activities of farmers' organization in the model site in order to support crop diversification.

Water management staffs and leading farmers who are working for the management of the irrigation and drainage facilities below the tertiary level will be targeted. The trainers will visit the model sites and train the water management staffs and the leading farmers there. In Hai Duong, staffs of IMEs of Nam Sach and Gia Loc Districts, staffs of APCs and irrigation groups of Hop Tien and Gia Xuyen Communes and related water users will be involved in the activities.

In Quang Ninh, staffs of the third irrigation station of Yen Lap IMC, staffs of APCs and irrigation groups of Yen Dong APC and Yen Hai Commune will be targeted.

As for technical knowledge, procedures of water management below the tertiary levels, namely, O&M, water distribution, and management of organizations (regulation, finance, problem solving) will be transferred with specific guidelines and manuals for each model site. The irrigation and drainage conditions will be improved through the practices of PIM and proper management of the facilities and the water management organizations of the model sites will be activated. Mutual understanding between IMCs and water users will be improved

through better communication between IMCs, APCs and the water users. Accordingly, the functions of the water management organizations will be improved through strengthening of collaboration between the water management organizations and the water users.

The indicators of "O3" are; i) Number of trained leading farmers who acquired targeted knowledge, technology and experience, and ii) The level of improvement of water management in the model sites. Assumed points of improvement of the model sites will be increase of irrigated area, increase of crop yields, increase of income of farm households, rate of participation of the water users in the water management activities, and improvement of financial status of APCs.

5.4 Implementation Schedule

Implementation schedule of five years of the Project is given in Attachment 2 "Plan of Operation of the Project". Existing capacity and conditions of the water resources engineers, water management staffs and the model sites will be evaluated at the initial stage of the Project, and the activities or schedule will be modified accordingly. Outlines of the Project are summarized below.

Plan of Operation of the Project

Activities of the Project	2005	2006	2007	2008	2009	2009
(1) Preparation of Training Program	[Shaded]					
①Preparation of training materials	[Shaded]					
②Implementation of training and monitoring		[Shaded]				
③Review, feedback and finalizing of the training program			[Shaded]			
(2) Training of Trainers	[Shaded]					
①Training with the program of (1)		[Shaded]				
(3) Capacity Development of Water Resources Engineers		[Shaded]				
①Training by the trainers		[Shaded]				
(4) Capacity Development of Water Management Staff	[Shaded]					
①Procurement and installation of equipment	[Shaded]					
②Improvement of facilities at the model sites	[Shaded]					
③Training by the trainers		[Shaded]				
(5) Improvement of Water Management at the Model Sites	[Shaded]					
①Scheduling, announcement and implementation of water distribution led by IMC		[Shaded]				
②FIM promotion led by IMC		[Shaded]				
③Management of on-farm irrigation and drainage system through FIM		[Shaded]				

Important points in the implementation are as follows:

- Experiences and know-how of LID of Japan which has long experience in PIM should be utilized to establish PIM approaches suitable with the condition of Vietnam. Issues to be learnt from LID will be improvement and O&M of irrigation and drainage facilities for better water management, management of water users' organizations, process of determination and collection of ISF, financial arrangement and application for the projects.
- Approaches to strengthen capacity of VIWRR have also been expected from the Project. The capacity of VIWRR's routine activities, namely, water resources engineering and research should also be improved through the Project.
- The stakeholders of the model sites have an intention to improve the physical conditions of the irrigation and drainage facilities. Certain amount of budget is allocated for the physical improvement of the facilities of the model sites, and other schemes such as grass-root grant aid program of Japan and loan of the World Bank also include components of physical improvement. Such schemes should be utilized as incentives for promoting PIM in the model sites.
- Various donors and NGOs have started PIM according to the PIM Road Map. The Project should collaborate with these organizations so that the efficiency and advantage of the Project are secured.

5.5 Inputs

5.5.1 Japanese Side

(1) Long-term Expert

Long-term experts will consist of i) chief advisor, ii) irrigation and drainage expert, iii) water management and institutions, and iv) training expert cum coordinator.

(2) Short-term Expert

Short-term experts will be assigned for specific technical fields which can not be taken charge by the long-term experts. Assumed technical fields are; management of water users' organization (LID experts), control devices, information management, operation and maintenance of specific facilities or equipment, and agriculture (farming practice of rice and cash crops).

(3) *Equipment and Facilities*

Equipment for the Project will consist of; equipment for training, laboratory and research, model site activities (control devices, meteorological observation, hydrological investigation, survey, water quality analysis, communication), books and vehicles.

Although improvement or rehabilitation of the irrigation and drainage facilities is not included in the outputs of the Project, some civil works will be implemented for the model site activities. Facilities in which the project equipment will be installed, and canal structures for the water management will be constructed. On-farm development with the initiative of the water users will also be supported by the Project with necessary construction materials or equipment.

(4) *Local Cost*

Local cost will be used for the preparation of training materials, duty trips of the experts and trainers, baseline survey, workshops and seminars, model site operation and other administrative costs.

(5) *Acceptance of Trainees*

The counterpart personnel and the trainers will be sent to Japan or other countries for the training.

5.5.2 *Vietnamese Side*

(1) *Assignment of Counterpart Personnel*

Counterpart personnel will be assigned at VIWRR and the model sites in accordance with the expertise of the Japanese experts.

(2) *Office and Land*

The Vietnamese side will provide project offices at VIWRR and in the provinces of the model sites, namely, Hai Duong and Quang Ninh. Lands for the project facilities will also be arranged by the Vietnamese side.

(3) *Counter budget*

Employment cost of counterparts, operation, maintenance and repair cost of project office such as electricity service, water supply, etc.

5.6 Important Assumptions and Risk Analysis

Important assumptions and risks to be considered are summarized below:

Important Assumption and Risk Analysis

Category	Description	Assumption	Risk Analysis
Pre-condition	Important assumption which might affect the commencement of the project activities.	Functions of irrigation and drainage facilities of the model sites are not seriously damaged.	The model sites were selected from the schemes whose physical condition is good. Possibility of damages to the facilities by disasters is not considered high.
Assumption on Activities	Important assumption which might happen in the course of the activities and affect the realization of the outputs.	1) Target trainees are nominated and designated to attend to the training programs by the organizations concerned. 2) Improvement of irrigation and drainage facilities of the model sites by other resources is implemented as planned.	Candidates of the trainees will nominated as scheduled in accordance with the plan of operation Grass-root grant aid project of Japan and World Bank scheme are about to be implemented for betterment of the irrigation condition of the model sites.
Assumption on Outputs	Important assumption which might affect realization of the project purpose even with achievement of the expected outputs.	The trainees continue to attend and complete the training programs.	The Vietnamese side should nominate and assign the trainees exclusively for the training programs during the training period.
Assumption on Project Purpose	Important assumption which might affect realization of the overall goal even with achievement of the expected project purpose.	The certified trainees continue to work for promotion of PIM	The Vietnamese side should designate the certified water management engineers to work for the promotion of PIM continuously.
Assumption on Overall Goal	Important assumption that might affect realization of super goal even with achievement of the overall goal.	1) Government policy for promoting PIM is maintained. 2) Budget for promoting PIM is allocated by the government.	The policy of PIM promotion will be maintained so that sustainability of the irrigation and drainage facilities is maintained and the government budget for O&M is reduced. Investment for the PIM promotion will result in reduction of government budget for the irrigation and drainage schemes.

5.7 Implementation Set-up and Project Management

The implementation of the Project will be supervised and coordinated by a Joint Coordinating Committee (JCC) and Project Management Unit (PMU), which will consist of the stakeholders of the central government and the local authorities related to the model sites in Hai Duong and Quang Ninh Provinces.

Roles of JCC will be; i) authorizing an annual work plan of the Project based on the Plan of Operations within the framework of R/D, ii) monitoring and evaluating the progress of the Project and the results of the annual work plan, iii) discussing and advising on major issues that arise during the implementation period of the Project. PMU will play roles of; i) supervising the working progress and adjust the working schedule of the Project if necessary, ii) reviewing and exchanging views on major issues arising from or in connection with the Project, and iii) approving progress reports. The implementation set-up of the Project is given in Attachment-5.

6. Ex-ante Evaluation of the Project

6.1 Relevance

Participatory irrigation management aimed at sustainable development of agricultural sector on which a large proportion of the poor in Vietnam depends. So the Project's focus on PIM is consistent with the advocacy the national development plan, Comprehensive Poverty Reduction and Growth Strategy of Vietnam (CPRGS) and Country Assistance Plan of Japan.

Within the framework of the Project, Japan's technology and know how on irrigation, drainage and participatory water management will be applied in agricultural practices in Vietnam which has a lot of similarities with those of Japan.

In order to increase income of the farmers in northern region Vietnam, the target area of the Project, it is critical to maximize the benefits of narrow cultivation land and to promote farming diversification through the introduction of non-paddy crops such as vegetable, bean.

6.2 Effectiveness

The causal linkage between "Activities", "Output" and "Project Purpose" is clear and logical. The possibility that the important assumptions will be realized is high thanks to completed implementation mechanism in the relevant agency. Any changes in important assumption will be monitored during the implementation of project.

The engineers of IMC know well about farmers' needs, therefore are capable of properly controlling pump and water gate. Moreover, the farmers in the model site can take part in water management and maintain sufficient irrigation for the non-paddy crops, thereby capable of producing cash crops.

As the responsibility of IMC and water user group is clarified, efficient management of pump,

water intake is facilitated, facilities are upgraded, water management cost will be reduced.

Data and implementation system are accumulated through the activities carried out by WB, ADB and the Government of Vietnam in the targeted area and that can be utilized so that the project activities can be swiftly implemented. Moreover in certain model site (of Quang Ninh Province) irrigation facilities are equipped and upgraded by WB, the beneficiary effect of improving water management of this project is therefore remarkable.

The "output" of cooperation is not only to enhance the function of VIWRR, to improve knowledge and technology for engineers of IMC in all provinces but also to be an approach that sufficiently benefit farmers in the model site who are the final target group of the Project.

6.3 Efficiency

A step-wise training approach will be applied for central level water resource engineers, provincial water resource engineers and leading farmers which will accelerate expansion of the effects of the Project to the water management staff at field level.

The Project focuses on the development of capacity building system but not on the hardware development at specific location. Therefore the Project effects will be expanded efficiently.

Activities of the Project utilize existing facilities such as irrigation and drainage facilities of the model sites, organization of the water resources engineering. Thus, more inputs can be utilized capacity building.

6.4 Impact

The project contributes to the implementation of MARD's policy on "Participatory Water Management Promotion".

Improvement of water management and diversification of crops in the model site has demonstration effect for other irrigation schemes. Moreover, engineers trained in this project will contribute to the achievement of the Project overall goal while continue working in their provinces.

6.5 Sustainability

As shown in the following, the effects of this project promise to be continued by the partner government also after the Project ends.

- Experience and outputs of the Project can be utilized for other region with the training program and VIWRR engineers whose capacity is improved.
- The Vietnamese government has a policy to promote PIM which is also the main component of the project.
- The Project aims at involving farmers in the management and O&M of irrigation system. The farmers will have sense of ownership of the irrigation system and devote

themselves for the sustainable usage of agricultural infrastructures. Budgetary status of the government for maintaining irrigation system will also improved through encouraging farmer participation, which will ensure the Project sustainability.

6.6 Overall Conclusion

The Project was designed in accordance with development policy of Vietnam and needs of the stakeholders. The Project also reflects the aid policy of Japan to Vietnam and will utilize Japan's advanced technologies in irrigation and drainage management. In this sense, the Project is highly relevant.

In terms of effectiveness, which requires logic of the project framework and high possibility of achievement of the project purpose, process and relationship of the activities, the outputs, the project purposes, and the overall goal are clear and logically formulated. The Project aims at not only knowledge improvement of target engineers but also practical skills of PIM promotion through activities at the model sites. Such training procedure will enhance possibility of achieving the Project purpose and relevance of the project itself.

Although the indicators of the project purpose are clear with records of the training and issuance of certificates, it is quite important to get substantial outcome of the capacity development as awareness building of the stakeholders. It is necessary to maintain an evaluation system not only to issue the certificate but also to guarantee the capacity of the trainees.

Most of the inputs for the Project will be utilized for the capacity development itself. The inputs for improvement of the facilities are minimized so that the existing facilities will be optimized. If the capacity of the target engineers is substantially improved, those engineers will extend the effects of the Project to the whole country. Thus the efficiency of the Project is considered very high. Allocation of the inputs to the Japanese and Vietnamese sides should be clearly determined by the commencement of the Project.

The Project impact on accelerating Vietnamese strategies in water resources sector, namely PIM, will be large. The Project will take part in formulation of PIM guidelines and training programs. These outputs of the Project will be utilized for other projects. The engineers and staffs who will be trained by the Project will contribute to poverty alleviation and industrialization in rural areas through efficient use of water and eradication of heavy work load for the farming practices.

Engineers in VIWRR whose capacity will be strengthened by the Project will perform their improved capacity even after the Project. VNPIM whose engineers will also be strengthened through the training program of the Project will also support to promote the PIM strategy and policy. Thus the sustainability of the Project effects will also be secured.

The Project targets agriculture and rural areas where poor households concentrate. Therefore, the Project is expected to contribute to poverty alleviation. Involvement of stakeholders into the project activities should be carefully promoted so that gender balance should be maintained. Conflicts among the stakeholders on water distribution and management of organization should be carefully managed to avoid social disparity and disadvantage to the weak.

7. Monitoring and Evaluation

(1) *Identification of Need through Baseline Survey*

In order to evaluate the outcome of the Project, baseline survey will be carried out at the initial stage of the Project. Present conditions and needs of the Project targets will be identified through the survey. Items of the survey will include capacity of the water resources engineers and water management staffs, functions of irrigation and drainage facilities and water management organizations at the model sites, agricultural conditions (yield, crops cultivated, production, income) at the model sites and others. The targets of the survey will be regarded as "benchmarks" which will be monitored through the Project period to measure the effects of the Project.

A record of training will be maintained for each trainee to measure degree of improvement of their capacity. Items and standard of evaluation will be determined in accordance with the training program which will be prepared based on the needs identified through the baseline survey. The evaluation should be objective with quantitative scores.

(2) *Schedule of Evaluation*

The intermediate evaluation will be done in two years after commencement of the Project. The terminal evaluation will be held six months prior to the end of the Project. The ex-post evaluation will be done one or two years after the ending of the Project. The evaluation will be done on the basis of the evaluation of the benchmarks.

Attachments

- Attachment-1 Project Design Matrix (draft)
- Attachment-2 Plan of Operation (draft)
- Attachment-3 Terms of Reference of Long-term Experts
- Attachment-4 List of Equipment and Facilities
- Attachment-5 Project Implementation Set-up
- Attachment-6 Information on the Counterpart

Project title: Capacity Development of Participatory Irrigation Management System through Vietnam Institute for Water Resources Research (VIWRR)
Duration: June 2005 to June 2010

Project Area: 25 Provinces in the Red River basin Project counterpart: VIWRR Model site: Hai Duong Province (2), Quang Ninh Province (1)

Target Group: Water resources engineers of VIWRR, related MARD agencies, People's Committee, IMC/IME and water management staffs of water users' group, leading Farmers at the Model Sites,

Project Summary	Verifiable Indicators	Means of Verification	Important Assumptions
<p>Overall Goal</p> <p>Agricultural productivity is improved in terms of both yield and cost through improved irrigation management in the area where participatory irrigation management (PIM) is promoted</p>	<ul style="list-style-type: none"> - Increase of cropping intensity and yields of non-paddy crops - Reduction in irrigation / production cost 	<ul style="list-style-type: none"> - Record of activities of the trainers and water resources engineers. - Benchmark survey on the yields and planted areas of diversified crops around the model sites. 	<ul style="list-style-type: none"> - Number of qualified trainers is increased on the initiative of Vietnamese government. - Government policy on water resource management is supportive for promoting project outcome.
<p>Project Purpose</p> <p>Participatory irrigation management (PIM) is promoted and agricultural productivity is improved in terms of both yield and cost through enhancement of the capacity of leading farmers and water resources engineers in the model site</p>	<ul style="list-style-type: none"> - Increase of cropping intensity and yields of non-paddy crops - Reduction in irrigation / production cost 	<ul style="list-style-type: none"> - Evaluation record of the trainees. - Baseline survey (irrigated area, harvested area, yield, etc.) 	<ul style="list-style-type: none"> - Qualified water resources trainers and engineers are designated to perform their improved capacity in the irrigation schemes of poor provinces after the Project.
<p>Outputs</p> <ol style="list-style-type: none"> 1. The function of promoting PIM is strengthened in VIWRR. 2. Engineers of irrigation management company (IMC) acquire knowledge, technology and experience on water management. 3. Water management by farmers' organizations in the model sites is improved and crop diversification is promoted 	<ol style="list-style-type: none"> 1.1. Completion of the guidelines, manuals and training programs. 1.2. Number of trained PIM trainers who acquired targeted knowledge, technology and experience 2. Number of trained engineers who acquired targeted knowledge, technology and experience 3.1. Number of trained leading farmers who acquired targeted knowledge, technology and experience 3.2. The level of improvement of water management in the model sites 	<ul style="list-style-type: none"> - List and copy of guidelines, manuals and other training materials. - Evaluation record of the trainees. - Evaluation record of the trainees. - Evaluation record of the trainees - Evaluation record of the model site 	<ul style="list-style-type: none"> - Trainees of the Project are designated to participate in and complete the training program.

<p>Activities</p> <p>1.1. To review PIM approaches which were conducted in the pilot projects of other donors.</p> <p>1.2. To formulate guidelines, manuals and training programs for PIM promotion.</p> <p>1.3. To implement training courses (water management method, training method) for VIWRER engineers as "PIM trainers".</p> <p>1.4. To provide VIWRER engineers with practical experience as trainers at the model sites.</p> <p>1.5. To improve the guidelines, manuals and training programs based on the experiences acquired in the model sites.</p> <p>2.1. To organize training courses by the trainers for IMC engineers in each province on the methods of water management, organization management, and instruction on PIM.</p> <p>2.2. To organize seminars on PIM in the model sites for IMC engineers.</p> <p>3.1. To conduct base-line survey on the model sites (survey on water management, irrigated area, cropping pattern, farming practices, marketing).</p> <p>3.2. To organize training courses by IMC engineers for leading farmers (method for organizational cooperation in water management, method for operation and maintenance of canals, pumps, and other facilities).</p> <p>3.3. To promote PIM in the model site through farmers' organizations and IMC.</p> <p>3.4. To support improvement of farming practices by the farmers' organizations in the model site (Formulation of cropping plan, introduction of demonstration plot, introduction of good practices)</p> <p>3.5. To improve the water management through activities of farmers' organization in the model site in order to support crop diversification</p>	<p>Input</p> <p>1. Japanese side</p> <p>a) Expert dispatch</p> <ul style="list-style-type: none"> - Long-term experts (Chief adviser, irrigation and drainage, water management / institution, training/coordination)) 4 persons x 5 years - Short-term experts: Approximately 1 or 2 experts (as required), 9 experts/project period <p>b) Training</p> <ul style="list-style-type: none"> - Training in Japan: about 5 men months per year (PIM, organization management, and others as required) - Counterpart training: about 2 men months per year (third country training) <p>c) Equipment and facilities</p> <p>Equipment: Equipment for making training materials, laboratory equipment, audio-visual equipment, books, vehicles, equipment for model site activities: (meteorological and hydrological observations, survey, analysis, regulators, etc.)</p> <p>Facilities: Facilities for installation of equipment, irrigation and drainage facilities at the model sites, construction materials, etc.</p> <p>d) Local cost</p> <p>Baseline survey by local consultants (conditions of markets and diversified crops in/around the model sites), workshop, seminar, etc.</p> <p>2. Vietnamese side</p> <p>a) Counterpart</p> <ul style="list-style-type: none"> - 7 persons in the central government, 8 persons in the provinces <p>b) Office space and facilities</p> <ul style="list-style-type: none"> - Project office space in Hanoi and provinces of the model sites, facilities for operation of model sites <p>c) Counter budget</p> <ul style="list-style-type: none"> - Employment cost of counterparts, operation, maintenance and repair cost of project office such as electricity service, water supply, etc. 	<p>- Trainees of the Project are nominated for the training course properly by the Vietnamese side.</p> <p>- Improvement of irrigation and drainage facilities of the model sites that is planned in other projects is implemented as scheduled.</p> <p style="text-align: center;">Pre-condition</p> <p>Function of irrigation and drainage facilities of the model sites is not damaged drastically</p>
--	--	---

Attachment-2 Plan of Operation

Activities	Schedule						Phase in charge		Target to Achieve
	2005	2006	2007	2008	2009	2010	Supervisor	Implementer	Person
1. Training Programming Approach 1.1 Training tool preparation 1.1.1 Baseline survey - Training needs identification 1.1.2 Training material (manual, guidelines, textbook, audio visual) preparation 1.1.3 Training programming (identification of venues, arrangement of training, scheduling) 1.2 Training Practice (monitoring and evaluation) 1.2.1 Pre-training evaluation 1.2.2 Training course 1.2.3 Qualification and registration 1.3 Training review and feedback 1.3.1 Post-training evaluation 1.3.2 Feedback to training program 1.3.3 Support for ex-trainees (WRE)							Chief Ad. Training Ex.	Experts Experts Training Ex. Experts, TRNs	TRNs, WRE, WMS WRE
2. Trainees' Training Approach 2.1 Knowledge improvement 2.1.1 Lectures Irrigation and Drainage (planning) Irrigation and Drainage (design) On-farm development (construction) Water management (main & 2nd system) Participatory irrigation management (PIM) Operation and maintenance (O&M) Legal framework / institution Administration of organization Finance / accounting Information management (database)(common for A,B,C) Training and capacity building (common for A,B,C) 2.1.2 Field investigation 2.1.3 Workshop/seminar 2.1.4 Study tour Japan 3rd countries 2.2 Experience improvement 2.2.1 Activities as lecturer for Water Resources Engineer (WRE) 2.2.2 Activities as lecturer for Water Management Staff (WMS) 2.2.3 Activities as OJT facilitator							Chief Ad.	Experts I&D Ex., ST Ex. WM Ex. I&D Ex., ST Ex. WM Ex. WM Ex., ST Ex. Training Ex., ST Ex. Training Ex. I&D Ex. Training Ex. JICA HO Training Ex. Experts	TRNs, CIP
3. Water Resources Engineers (WRE) Training Approach 3.1 Knowledge improvement Irrigation/Drainage System planning of irrigation and drainage Design of pump facilities Design of canal and regulating structures Information management (database) Water distribution planning Under current situation With control and measuring devices PIM Participatory irrigation management (PIM) Operation and maintenance (O&M) Participatory construction management Socio-economic survey Administration of organization Finance / accounting							Experts	TRNs TRNs, ST Ex. TRNs	WRE
3.2 On the job training 3.2.1 Field survey and investigation Survey for design Hydro-hydrological analysis Water management devices (operation, data management) Laboratory analysis 3.2.2 Field practice on O&M, WM, PIM Community development O&M organizing and practice Practice of water distribution schedule Facilitating PIM Accounting supervision for WMS 3.3 Policy Making and Institutional Improvement 3.3.1 Training of policy makers Lecture on the legal framework on PIM 3.3.2 Training of managers / administrators Lecture on the management							Chief Ad.	Chief Ad., WM Ex. ST Ex., WM Ex.	
4. Pilot Project Approach 4.1 Knowledge improvement & feedback O&M Accounting Communication and involvement of users Construction management 4.2 On the job training Application of water distribution schedule and guidelines Application of O&M guidelines Application of administration guidelines 4.3 Participatory Irrigation Management (Participatory construction) Participatory water scheduling Participatory O&M Public announcement of activities, accounting, etc Demonstration / field workshop							Experts Experts, WRE Training Ex.	TRNs WMS (model site) WRE (model site)	WMS (model sites)

Attachment-3 TOR of Japanese Long-term Experts

(1) *Chief Advisor*

Activity details:

- 1 To supervise Japanese experts as a responsible person
- 2 To provide recommendations and advice to the Project Director, the Project Manager and relevant authorities on all matters pertaining to the Project
- 3 To assist planning of strategy / institutional framework / relevant activities comprehensively
- 4 To coordinate Japanese experts and related organizations from managerial and technical aspects
- 5 To monitor project progress and present progress reports both in English and Japanese to the responsible authorities

(2) *Irrigation and Drainage*

Activity details:

- 1 To prepare training program and materials on technical aspect of irrigation and drainage
- 2 To provide technical advice and training on planning and design of irrigation and drainage facilities
- 3 To provide technical advice and training on appropriate technology on design and planning of irrigation and drainage system
- 4 To provide technical advice and training on construction of on-farm irrigation and drainage facilities

(3) *Water Management / Institution*

Activity details:

- 1 To prepare training program and materials on technical aspect of water management and institution concerned
- 2 To provide technical advice and training on water management institution
- 3 To provide technical advice and training on water management at each level of irrigation system (main, secondary, on-farm)
- 4 To provide technical advice and training on participatory irrigation management

(4) *Training/ Project Coordination*

Activity details:

- 1 To coordinate on administrative and managerial matters of the Project activities assisting the Chief Advisor to ensure smooth operations
- 2 To promote the solution of the problems, to manage the Japanese budget, to make necessary contacts and coordination for implementing the Project

- 3 To coordinate among Japanese experts and related organizations from administrative aspects
- 4 To provide technical advice for conducting training in the field of water management and water resources engineering

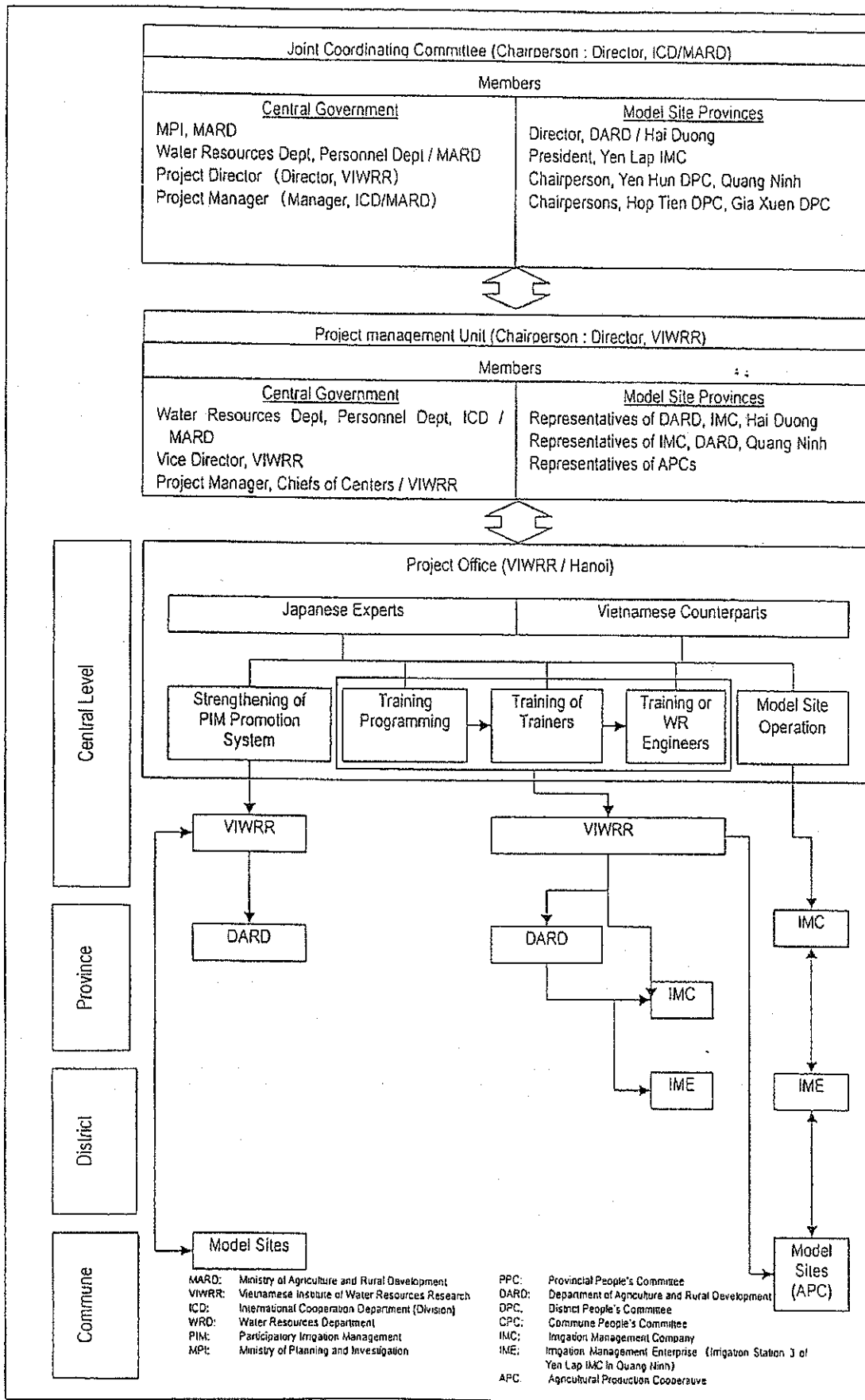
Attachment-4 List of Equipment

No	Item	Related Activities (Refer to Attachment-2)	Unit	Qty.	Remarks
	1. Common				
	1.1 Transport				
	Vehicles (4WD)	all	nos.	2	
	Vehicles (pick up truck)	all	nos.	1	
	Vehicles (van)	All	Nos.	1	
	1.2 Office in Hanoi				
	Copy machine with scanning function	all	nos.	1	
	PC desktop	all	nos.	4	for experts and counterparts
	PC Notebook	all	nos.	4	for experts and counterparts
	Printer	all	nos.	1	color A3 size
	Printer	all	nos.	2	inkjet
	Tools for book binding	all	LS	1	
	Fax	all	nos.	1	
	Mobile phone	all	set	5	
	Map cabinet	all	set	1	
	Furniture and office fixtures	all	LS	1	
	Instruments	all	LS	1	planimeter, drafter, etc.
	Miscellaneous	all	LS	1	
	1.3 Office in provinces	all	nos.		
	Fax/copy/scanner	all	nos.	2	
	PC desktop	all	nos.	2	for experts and counterparts
	Furniture and office fixtures	all	LS	2	
	Miscellaneous	all	LS	2	
	1.4 Field work equipment (general)				
	Digital camera	all	nos.	3	
	GPS	all	nos.	2	
	Miscellaneous	all	LS	1	helmet, safety shoes, etc.
	Sub-total				

2. Training equipment				
Television set	1.1.2	set	1	
Video recorder	1.1.2, 1.2.2	set	1	
Video camera	1.1.2, 1.2.2	set	1	
PC for editing with capture board	1.1.2, 1.2.2	set	1	
Software	1.1.2, 1.2.2	set	1	
LCD projector	1.2.2	set	2	
Screen	1.2.2	set	2	
Notebook computer	1.2.2	set	5	
Printer	1.1.2	set	1	
Sub-total				
3. Field investigation & laboratory equipment				
Theodolite with mirror, tripod	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	set	2	
Auto level with tripod	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	nos.	2	
Staff for levelling survey	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	nos.	4	
Pole for survey	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	nos.	10	
Total station with mirror, tripod	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	set	2	
Plate table set	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	set	2	
Digital camera with GPS	2.1.1, 2.1.2, 3.1, 3.2.1	nos.	1	
PC for data management system	2.1, 3.1	set	3	
Software for data management system	2.1, 3.1	set	2	
Software (auto CAD)	2.1, 3.1	set	1	
A2 scanner	2.1, 3.1	set	1	
A0 plotter	2.1, 3.1	set	1	
A0 digitizer	2.1, 3.1	set	1	
Meteorological station	2.1, 3.1	set	2	
Current meter (river)	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	set	5	
Current meter (canal)	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	set	5	
EC meter	2.1.1, 2.1.2, 3.1,	set	5	

		3.2.1, 4.3			
	pH meter	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	set	5	
	Water level sensor	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	set	10	
	Water quality sensor (salinity)	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	set	3	
	Data logger	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	set	3	
	I/O unit	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	set	3	
	Data communication	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	set	3	
	Water quality checker (6 items)	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	set	5	
	motor cycle	4.3	set	6	
	Sub-total				
	4. Model site equipment				
	movable engine pump (20 m3/hour)	4.3	set	15	
	grass cutter	4.3	set	10	
	radio communication (station)	4.3	set	3	
	radio communication (mobile)	4.3	set	6	
	hand tools	4.3	set	60	
	Construction material	4.3	LS	1	

Attachment-5 Implementation Set-up



MARD: Ministry of Agriculture and Rural Development
 VIWRR: Vietnamese Institute of Water Resources Research
 ICD: International Cooperation Department (Division)
 WRD: Water Resources Department
 PIM: Participatory Irrigation Management
 MPI: Ministry of Planning and Investigation

PPC: Provincial People's Committee
 DARD: Department of Agriculture and Rural Development
 DPC: District People's Committee
 CPC: Commune People's Committee
 IMC: Irrigation Management Company
 IME: Irrigation Management Enterprise (Irrigation Station 3 of Yen Lap IMC in Quang Ninh)
 APC: Agricultural Production Cooperative

Attachment-6 Information on the Counterpart Organization

Vietnamese Institute for Water Resources Research (VIWRR) is one of the three institutes in the field of water resources in MARD. VIWRR covers regions, namely, North East, North West, Red River Delta, Central North Coast, Central South Coast and Central Highlands, while Southern Institute for Water Resources Research (SIWRR) covers the regions of South East and Mekong Delta.

VIWRR conducts; i) scientific research on the water resources: ii) technical transfer of construction engineering: iii) post-graduate training or education: and iv) technical advice on the water resources engineering; by four administrative divisions, 17 research centers and departments, and one company.

Out of 960 staffs, 90% are engineers who graduated from universities. Operational budget of the fiscal year 2004 was about VND 2,289 million, which consisted of wages and administrative cost.

VIWRR as of the Year 2004

Department / Division / Center	Number of Staffs	Number of Engineers	Monthly Budget (1,000VN D)	Remarks
Personnel and Admin. Div.	23	5	15,103	
Planning and General Affairs Div.	11	5	6,559	
Finance and Equipment Div.	10	2	8,015	
International Cooperation Div.	17	13	5,399	PIC
Dept. of Engineering Hydraulics	20	17	11,701	
Dept. of Building Materials	17	12	6,467	
Dept. of Automation of Hydraulic Works	20	20	6,206	
Dept. of Geo-techniques and Foundation Treatment	17	15	8,137	
Centre for Hydraulic Structure	34	27	9,248	
Centre for Hydropower	96	68	5,394	
Centre for Pump and Construction Machine	28	17	7,084	
Centre for Termite Control	28	4	9,045	
Centre for Water Resources Economy	19	9	14,534	PIC
Station for Research and Development of Land and Water Resources in Coastal Areas	20	9	4,944	
Centre for Hydraulic Software Technology	15	13	7,241	PIC
Centre for Central Highland and Central Part of Vietnam	25	14	6,052	
Centre for Irrigation, Drainage, Land Reclamation and Water Supply	50	43	20,041	PIC
Centre for Water Resources and Water Environment	49	38	19,227	PIC
Centre for Estuary and Coastal Engineering	21	13	8,294	
Centre for River Engineering	23	18	12,061	
Company for Construction and Technology Transfer	58	24		
Center for Participatory Irrigation Management	Project in charge / to be established in 2005			
Total	601	386	190,759	

Source : Personnel Division of VIWRR (December 2004)

Note; PIC=Organization to be involved closely in JICA Project

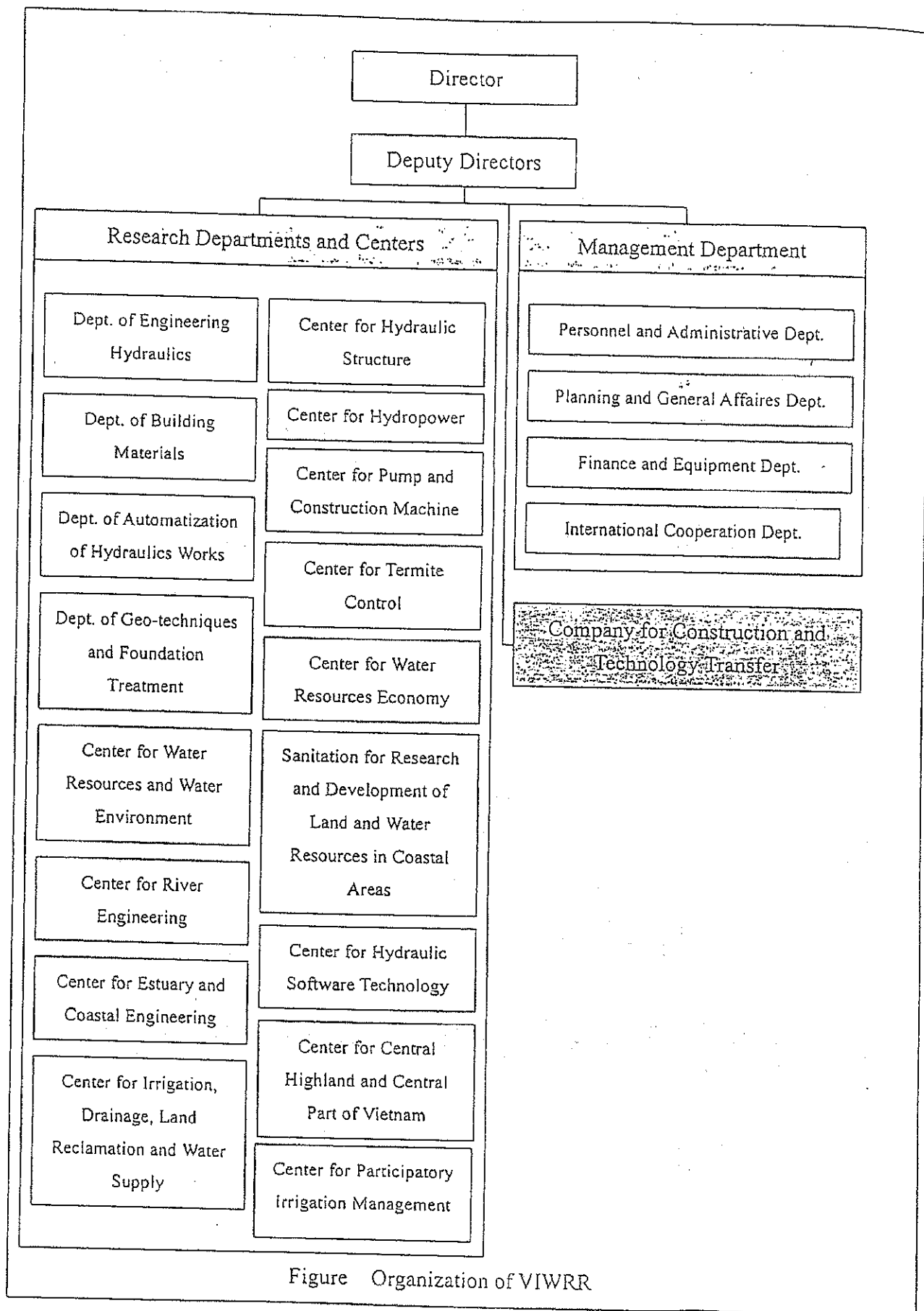


Figure Organization of VIWRR

表 1 ベトナム国農民参加型水管理体制改革強化計画 PDMo

PDMo

プロジェクト名： 農民参加型水管理体制強化計画
 プロジェクト期間： 2005 年～2010 年（5 年間）
 プロジェクト地域： 紅河流域
 ターゲットグループ： 水利研究所、農業農村開発省関連組織、地方人民委員会、灌漑管理会社、水利技術者及びモデルサイトに関連する水管理スタッフ

プロジェクトの要約	指 標	人 手 段	外 部 条 件
<p>農民参加型水管理 (PIM) 体制が幅広く展開される。</p>	<p>プロジェクトで研修を受けた水利技術者がその担当省の灌漑地区で参加型水管理活動強化を実施する (約 3,000 人の水管理スタッフが指導を受け現場で実践する)。</p>	<p>研修教官及び研修を受けた水利技術者の業務記録。</p>	<p>- ベトナム国政府の自助努力により、研修教官が更に養成される。 - 政府方針がプロジェクトのアウトカムを推進する政策 (参加型水管理推進政策) を継続する。</p>
<p>プロジェクト目標 水利研究所 (VIWRR) 技術者の能力向上を通じて、農民参加型水管理 (PIM) を推進する体制が強化される。</p>	<p>- プロジェクトで研修を受けた技術者及びスタッフの技術改善度 (それぞれ数値評価) が満点に対し平均 60%以上 (→修了証の基準とする) - 研修後評価、モデルサイトの改善度各項目の評価 (それぞれ数値評価) が満点に対し平均 60%以上)</p>	<p>- 研修員の評価記録 - ベースライン調査 (灌漑面積、收穫面積、収量等)</p>	<p>- 研修修了者 (C/P 含む) が継続的に水管理に関する指導業務に従事する</p>
<p>成 果 1 各水管理レベルに応じた研修プログラムが作成される。 2 水利研究所の技術者が「研修教官」としての水利技術を習得する。 3 水利技術者が「研修教官」による研修コースを通じて水利技術を取得する。 4 (モデルサイトの) 水管理スタッフが「研修教官」による研修コースを通じて水利技術を取得する。</p>	<p>1.1. 全ての研修プログラムに対する研修ツールが作成・利用され、改善・完成される。 1.2. 所定の対象者 25 名が全てのプログラムを修了し、評価結果 (数値) で平均 60% 以上の評価を得る (→修了証の基準とする)。 1.3. 所定の対象者 1,800 名が全てのプログラムを修了し、評価結果 (数値) で平均 60% 以上の評価を得る (→修了証の基準とする)。 1.4. ①所定の対象者 150 名が全てのプログラムを修了し、評価結果 (数値) で平均 60% 以上の評価を得る (→修了証の基準とする)。 ②モデルサイトの機能改善度項目の評価 (数値評価) が満点に対し平均 60% 以上。</p>	<p>1.1 研修教材リスト、配布先リスト 1.2 研修員の評価記録 1.3 研修員の評価記録 1.4 研修員の評価記録/ モデルサイトの評価記録</p>	<p>- 研修対象者 (C/P 含む) が継続的に研修に参加しプログラムを修了する。</p>
<p>活 動 1.1 研修ツール (マニュアル、視聴覚教材等) 及び実施計画が作成される。 1.2 上記研修ツールが実際に使われ、内容がモニタリングされる。 1.3 モニタリング結果がツールにフィードバックされ、ツール及び実施計画が見直される。 2.1 水利研究所 (VIWRR) の水利技術者が必要な技術知識を習得する。 2.2 水利研究所 (VIWRR) の水利技術者が習得した技術を用いて実践経験を積む。 3.1 対象水利技術者が必要な技術知識を習得する。 3.2 対象水利技術者が習得した技術を用いて実践経験を積む。 3.3 対象水利技術者が水管理組織機能強化に関するノウハウを学ぶ。 4.1 (モデルサイトの) 水管理スタッフが必要な技術知識を習得する。 4.2 (モデルサイトの) 水管理スタッフが習得した技術を用いて実践経験を積む。 4.3 (モデルサイトに関連する) 灌漑管理会社及び農協の水利グループの機能が強化される。</p>	<p>投 入 投入 (インプット) ① 日本国側 (総額 597.0 百万円) ・ 専門家派遣 (総額 373.5 百万円) 長期： 4 名 (チーフアドバイザー、灌漑排水、水管理制度、研修/業務調整) 短期： 下記の分野を予定 組織運営 (土地改良区) 毎年 1 名、制御機器、情報管理、施設保守管理、管農 (稲作、裏作) 各 1 名、計 9 名。 ・ 供与機材 (総額 約 60 百万円) 教材作成用機材、実験用資機材、視聴覚機器、モデルサイト関連機器 (水管理制御機器、気象観測機器、水文観測機器、測量機器、分析機器、通信機器)、書籍、車両等 ・ 施設整備・モデルサイト運営 (総額 約 40 百万円) モデルサイト整備・運営 (研修施設、観測機器設置小屋、観測小屋、ゲート、量水施設、現地ワークショップ開催等) ・ 研修員受け入れ (総額 約 73.5 百万円) 7 名/年 (各 1 カ月間うち C/P 2 名) ・ プロジェクト運営費 (総額 約 50 百万円) ② ベトナム国側 (プロジェクト総経費の 3~5% (年間 4~5 百万円相当)) ・ C/P 人件費 (中央 8 名、モデルサイト関連 8 名) ・ 施設、土地手配等 事務所スペース (ハノイ、ハイズン省、クアンニン省) 及び光熱費、モデルサイトの灌漑施設及びプロジェクトで使用する施設用地 ・ プロジェクト活動費 研修費、光熱費、管理費等</p>	<p>- 関係機関が研修対象者 (C/P 含む) を選抜し研修に参加させる。 - モデルサイトに関連する灌漑排水施設整備が予定通り進められる。 - モデルサイトの灌漑排水施設の機能が大きく損なわれない。</p>	<p>前 提 条 件 - 関係機関が研修対象者 (C/P 含む) を選抜し研修に参加させる。 - モデルサイトに関連する灌漑排水施設整備が予定通り進められる。 - モデルサイトの灌漑排水施設の機能が大きく損なわれない。</p>

図1 (1/3) ハイズン省ザ・スエン地区問題系図

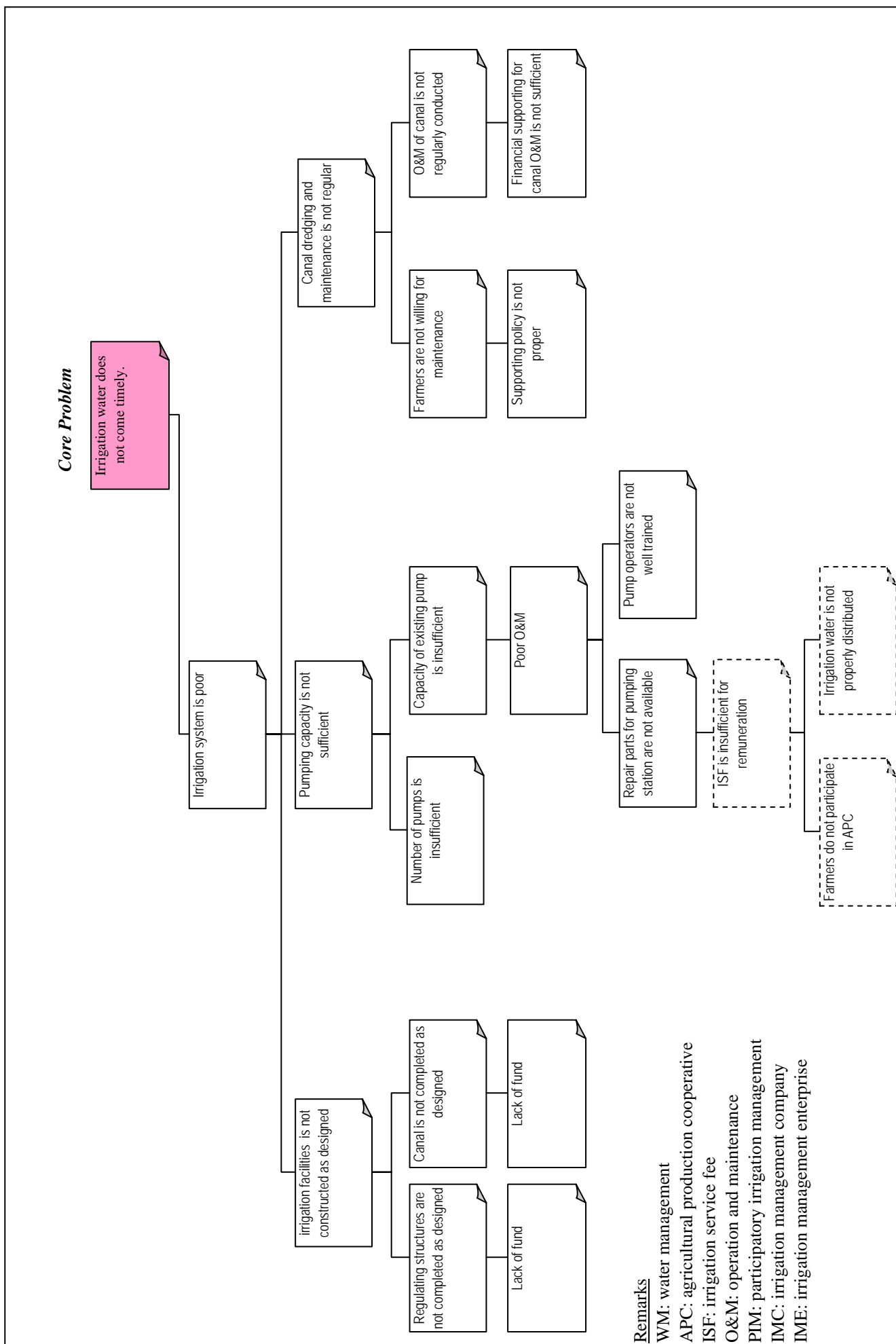
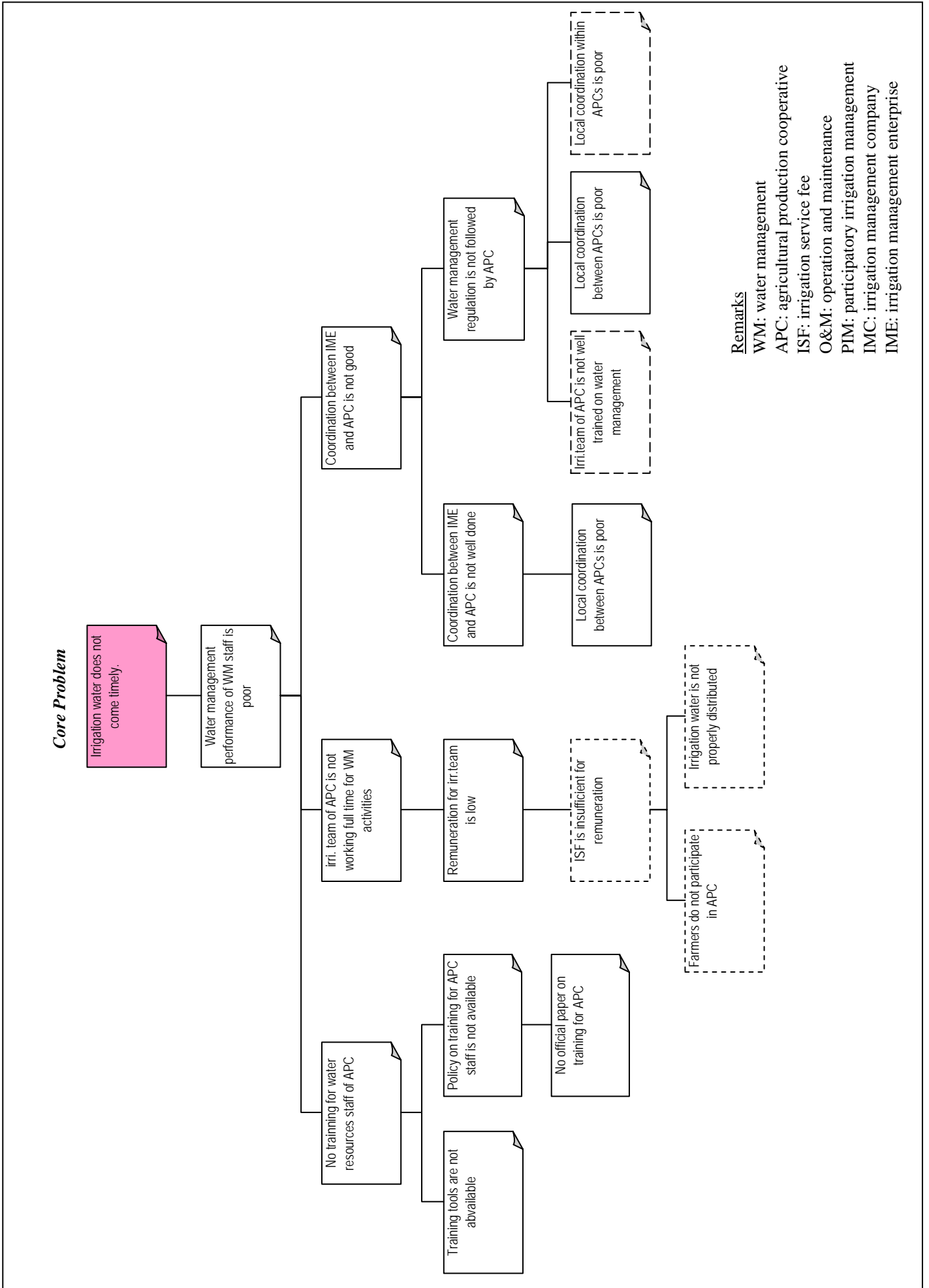


図1 (2/3) ハイズン省ザ・スェン地区問題系図



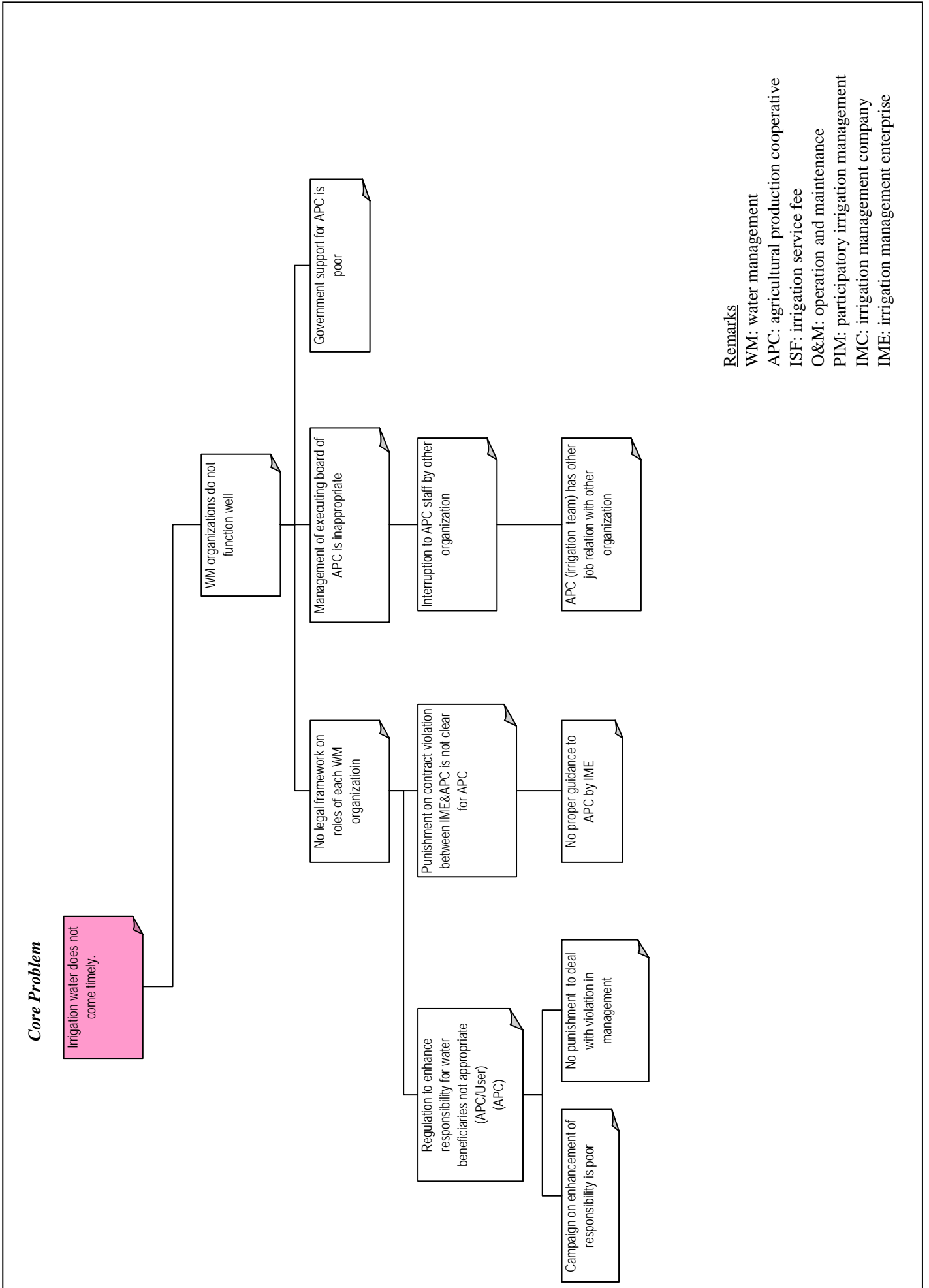


図2 (1/3) ハイズン省ザ・スエン地区目的系図

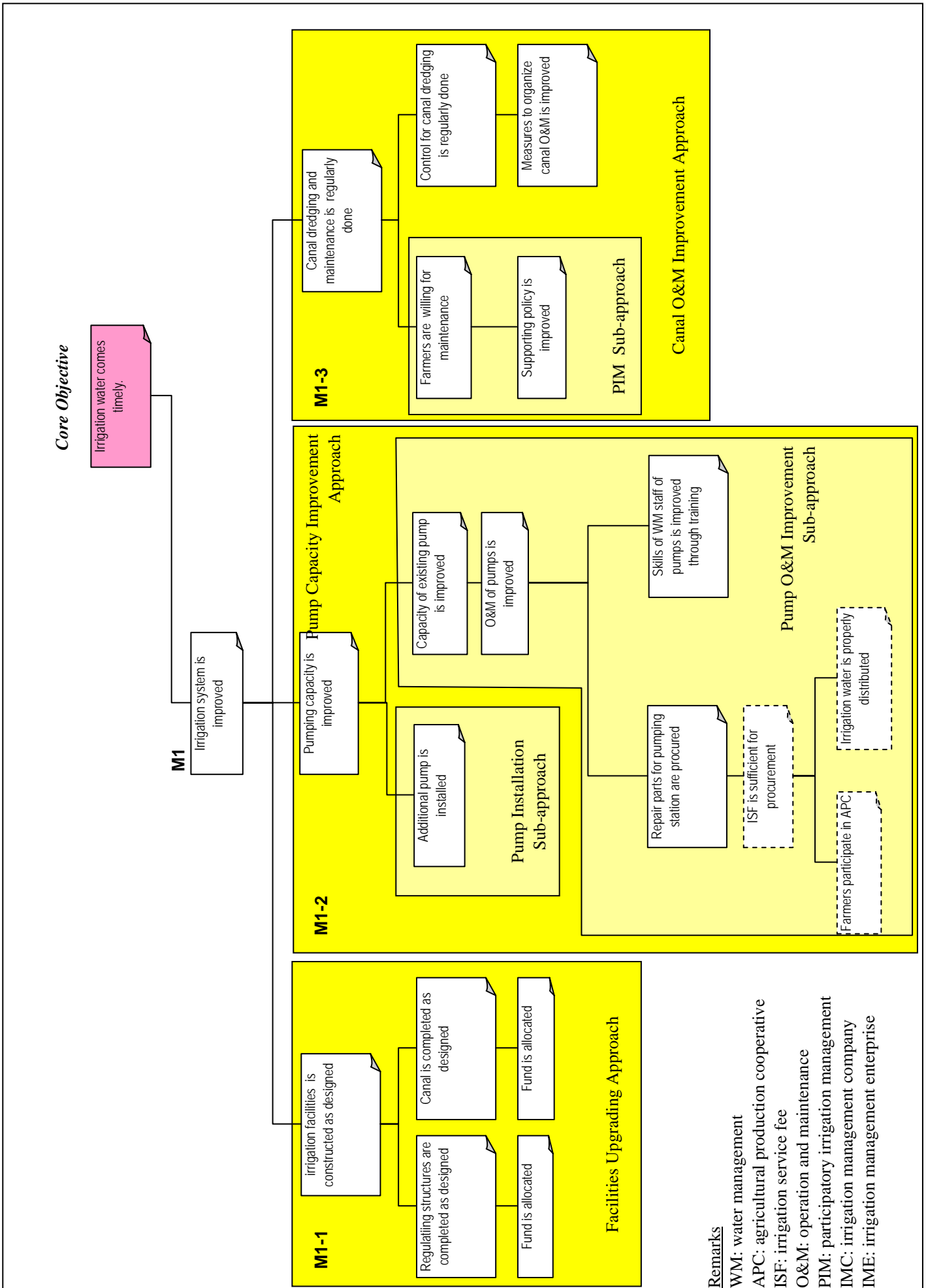


図2 (2/3) ハイズン省ザ・スエン地区目的系図

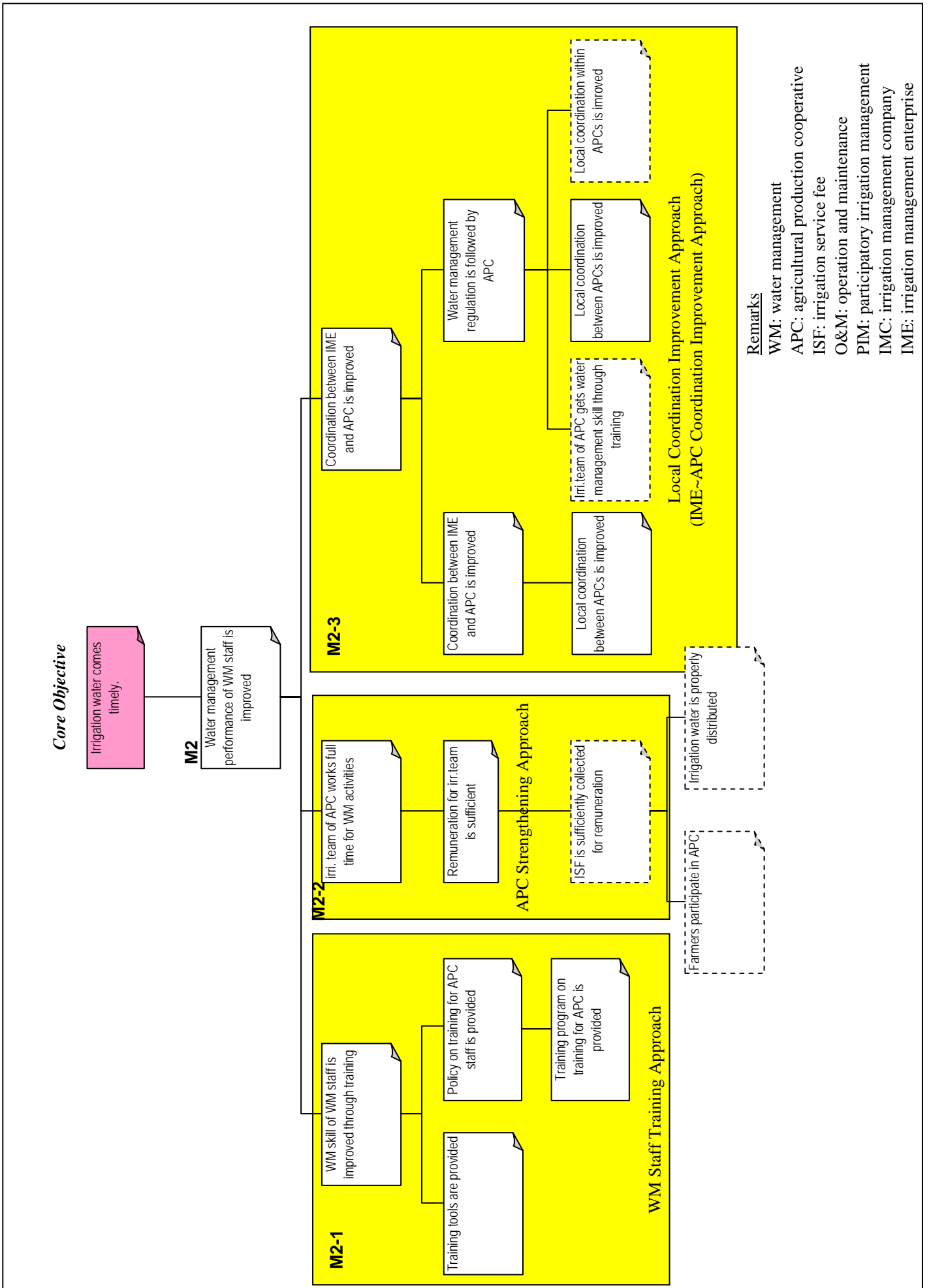


図2 (3/3) ハイズン省ザ・スエン地区目的系図

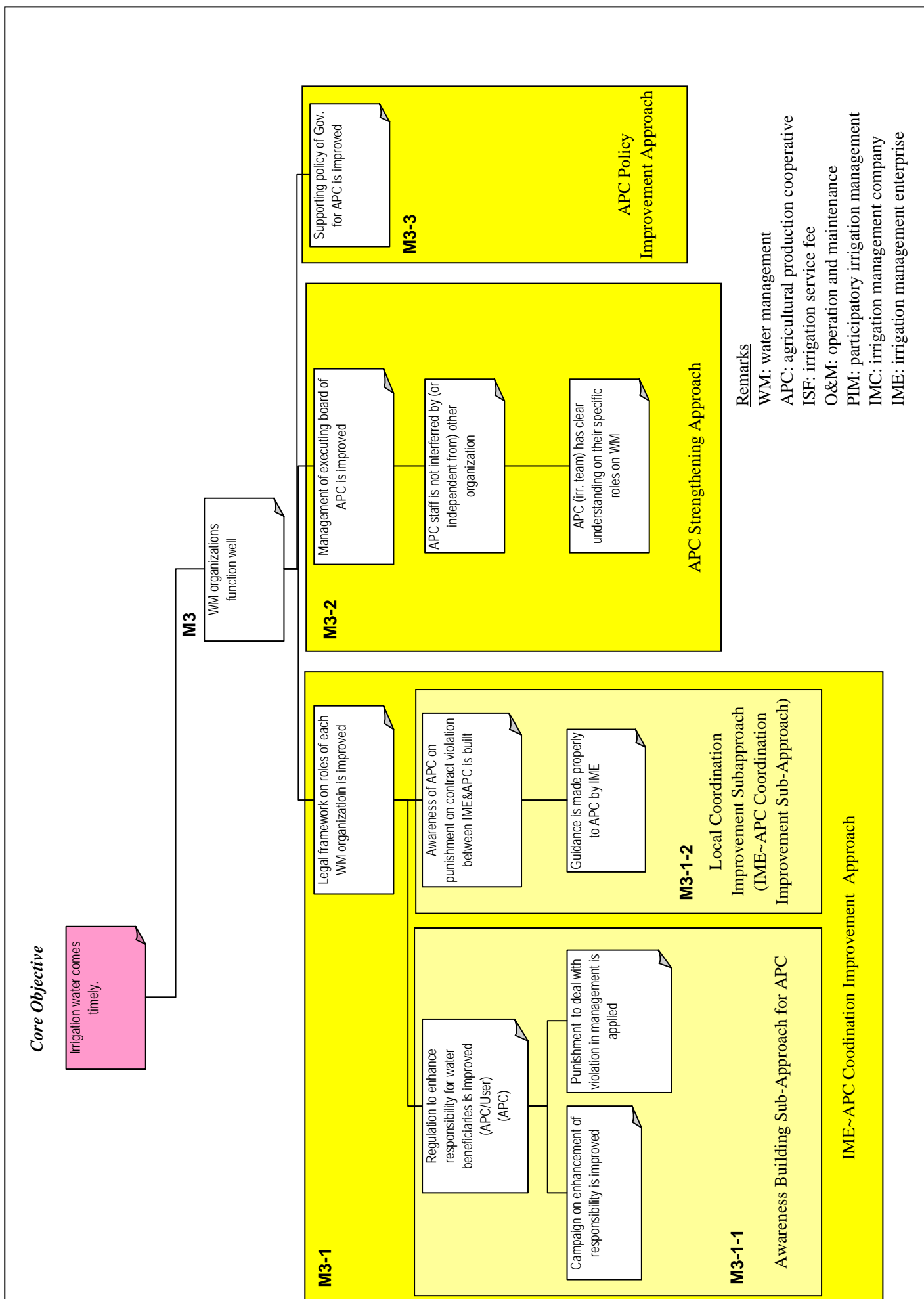
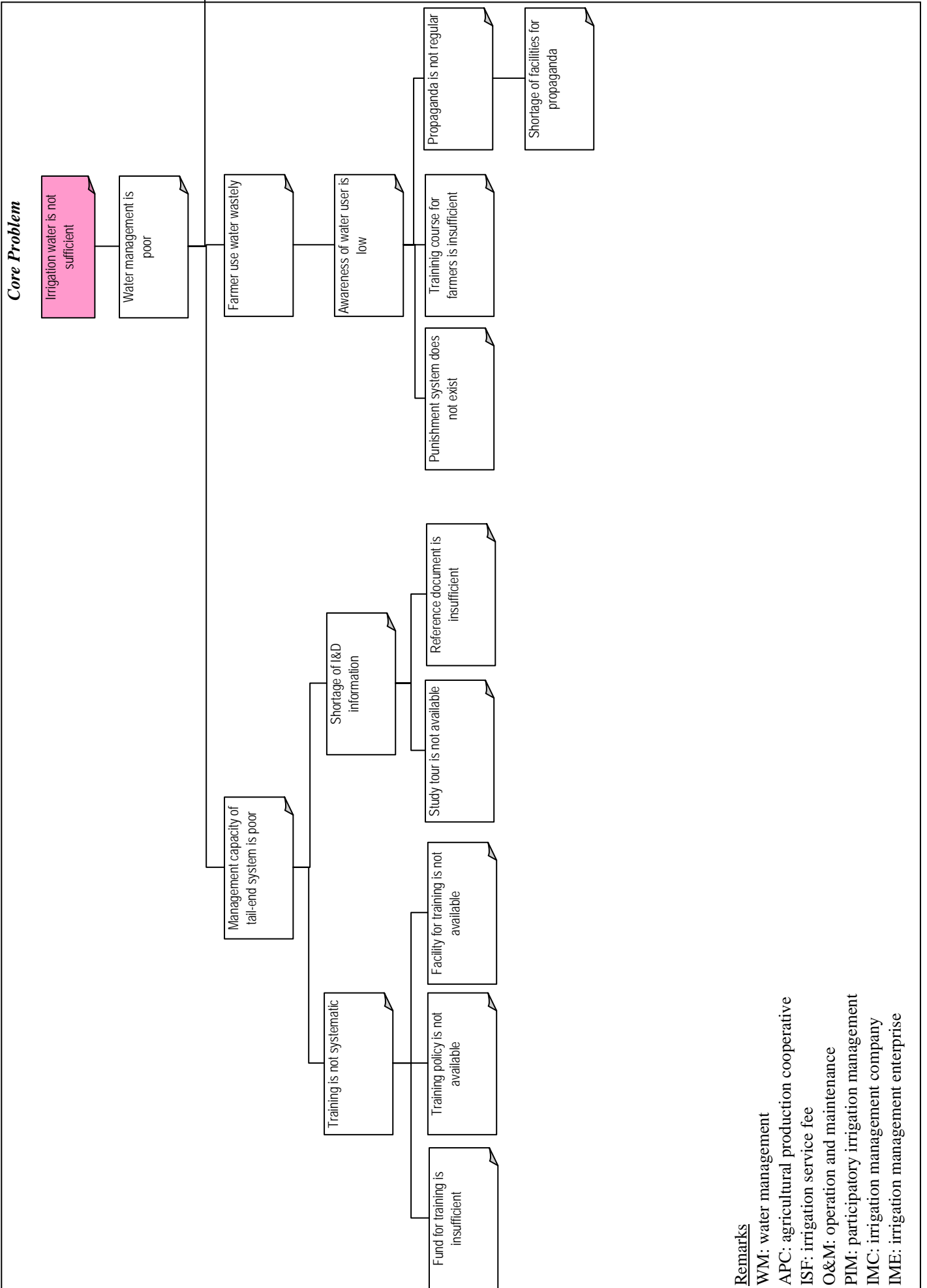


図3 ハイズン省ザ・スェン地区開発アプローチと優先度

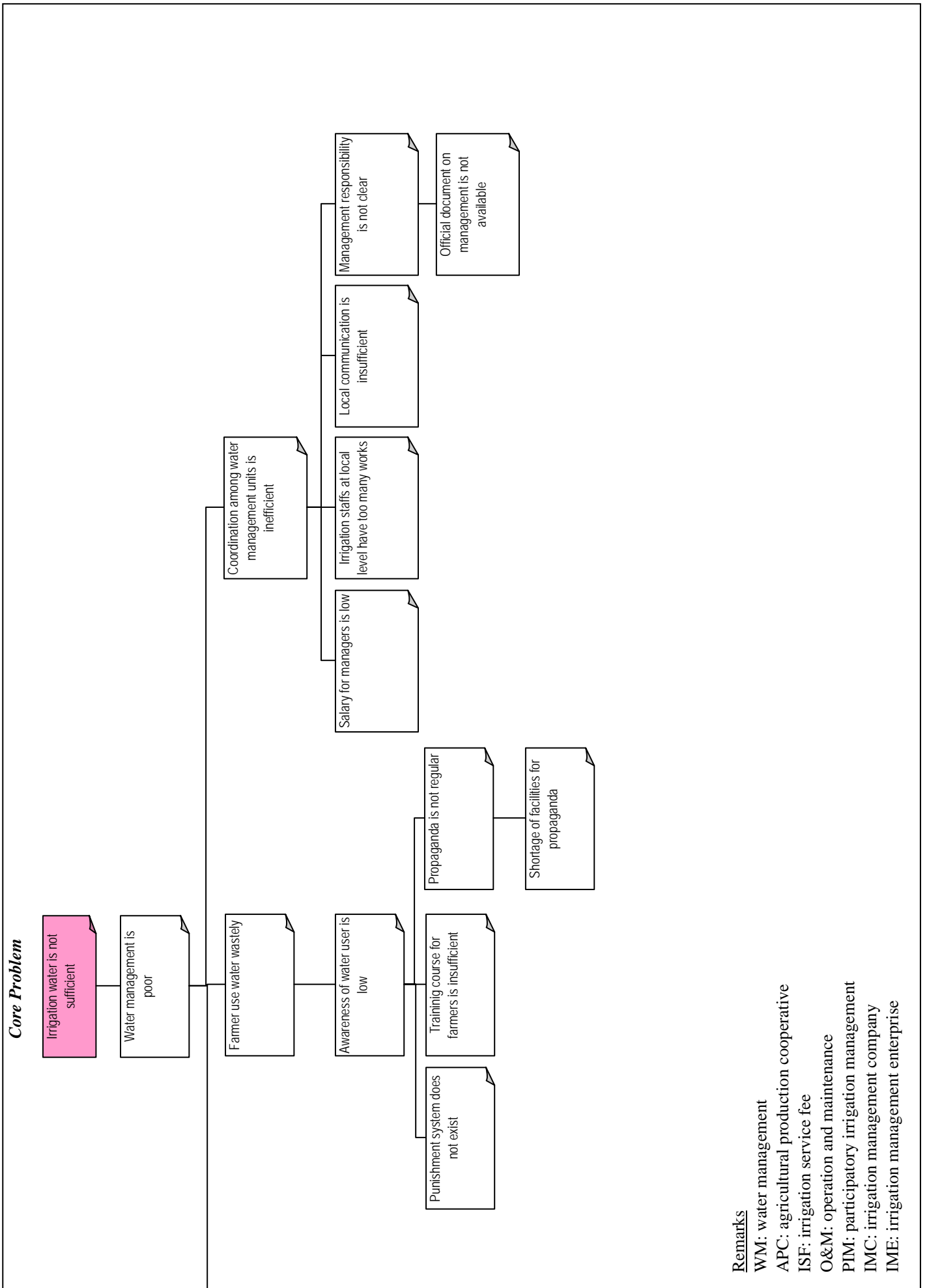
No.	Title of Approaches	Priority-1	Priority-2	Implement Agency	Resource
M1	Facility Upgrading Approach (App. for canal lining and reinforcement of canal structures)	1	10	IME/Com	IO/DARD/ IMC/BN
	Pump Capacity Improvement Approach (Pump Capacity Improvement Approach)	1	5	IME/APC	IO/DARD/ IMC/BN/DPC
	Canal O&M Improvement Approach (App. for regularization of maintenance for canal system)	3	1	IME / APC	DARD /IMC /BN
M2	WM Staff Training Approach (App. for providing training program for WM staff)	4	8	DARD / IMC	DARD /BN
	APC Strengthening Approach (App. For making WM organization more completely for better water supply for farming households)	6	3	Com/ APC	Com / APC
	IME~APC Coordination Improvement Approach App. For strengthening responsibility and coordination between pump station operator (IME) and water distributor (APC)	5	7	IMC /IME /APC	IMC /IME /APC
M3-1	Awareness Building Sub-approach for APC (PIM Approach)	8	2	Com/ APC/BN	IO/Com/ APC
	IME~APC Coordination Improvement Sub-pproach (App. for improvement of policy on APC)	8	6	Gov./ DARD	Gov./ DARD
M3-2 (M2-2)	APC Strengthening Approach (App. For making WM organization more completely for better water supply for farming households)	6	3	Com/APC	Com/APC
M3-3	APC Policy Improvement Approach (App. for improvement of supporting policy for APC)	10	9	Gov./ DARD/DPC	Gov./ DARD/DPC

Note:	IME: irrigation management enterprise ISF: irrigation service fee APC: agricultural production cooperative WM: water management IO: International donor BN: Beneficiaries (water user) Com: Commune O&M: operation and maintenance				
Code of App.	Title of approach by the facilitator (Title of approach by the participants)				
App.:					
Priority 1 : Approach					
Priority 2: Priority if they can get government support					
PIM: partic					
Priority if they can not get government support					
IMC: irrigation management company					
M3-1	IME-APC Coordination Improvement Approach (App. For making policy on WM completely)	8			



Remarks

- WM: water management
- APC: agricultural production cooperative
- ISF: irrigation service fee
- O&M: operation and maintenance
- PIM: participatory irrigation management
- IMC: irrigation management company
- IME: irrigation management enterprise



Remarks

- WM: water management
- APC: agricultural production cooperative
- ISF: irrigation service fee
- O&M: operation and maintenance
- PIM: participatory irrigation management
- IMC: irrigation management company
- IME: irrigation management enterprise

図4 (3/4) クアンニン省イェンドン地区問題系図

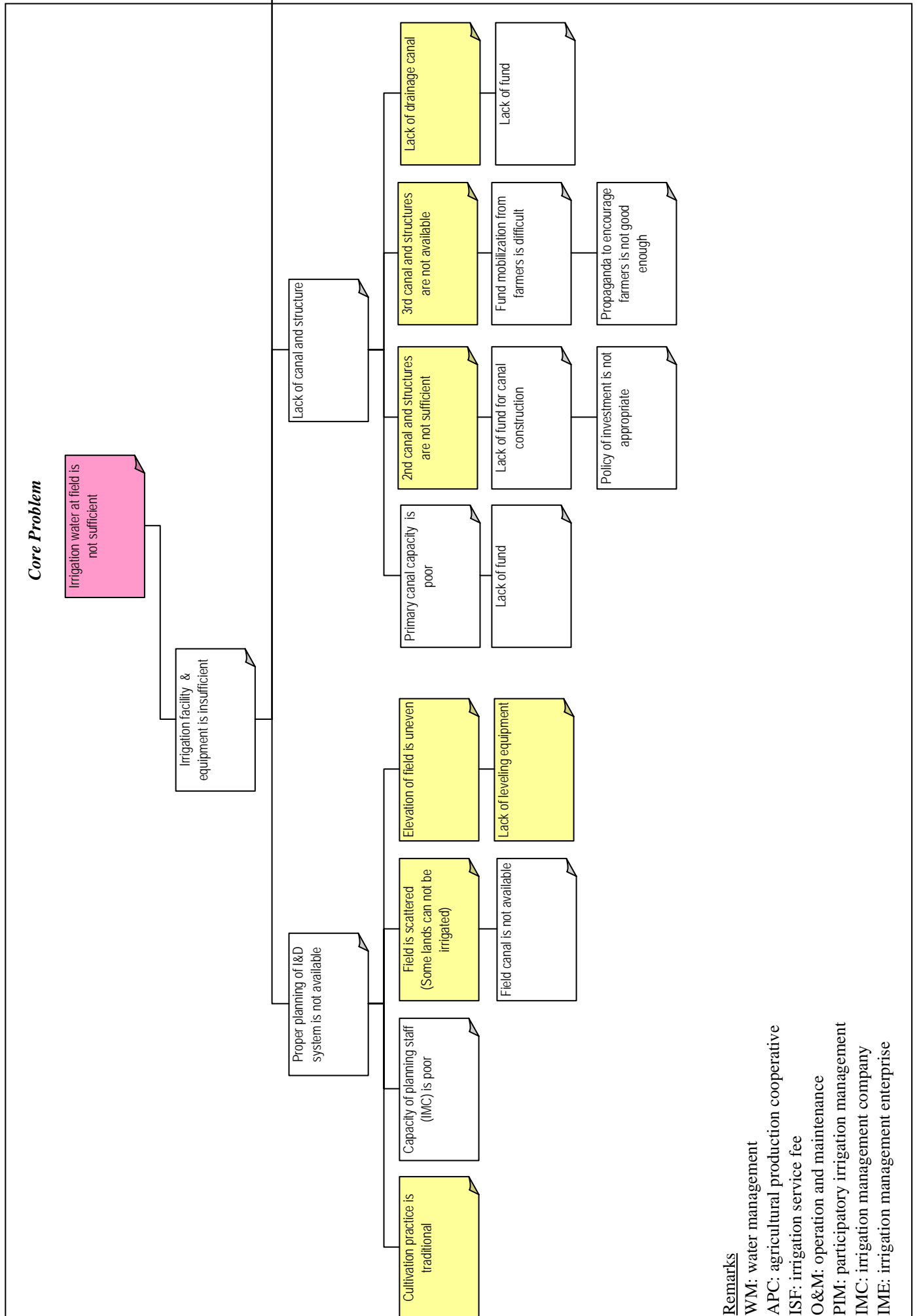
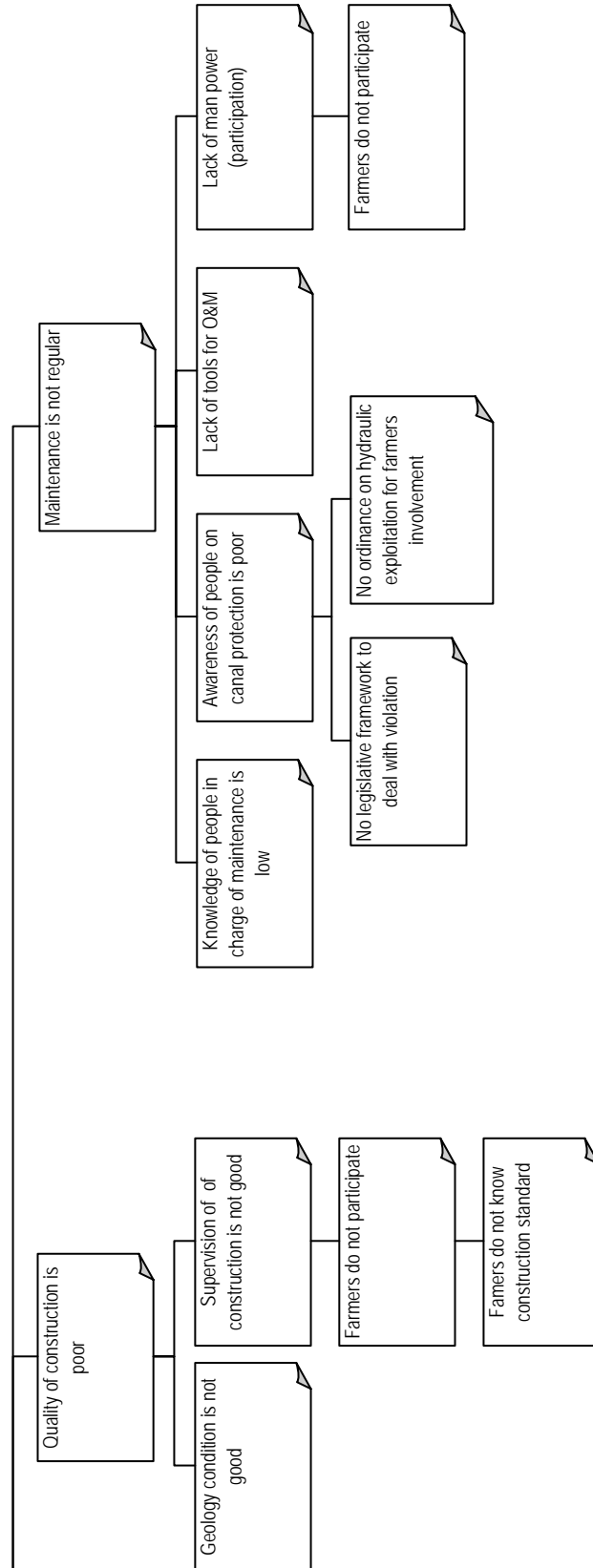


図4 (4/4) クアンニン省イェンドン地区問題系図



Remarks

- WM: water management
- APC: agricultural production cooperative
- ISF: irrigation service fee
- O&M: operation and maintenance
- PIM: participatory irrigation management
- IMC: irrigation management company
- IME: irrigation management enterprise

図5 (1/4) クアンニン省イェンドン地区目的系図

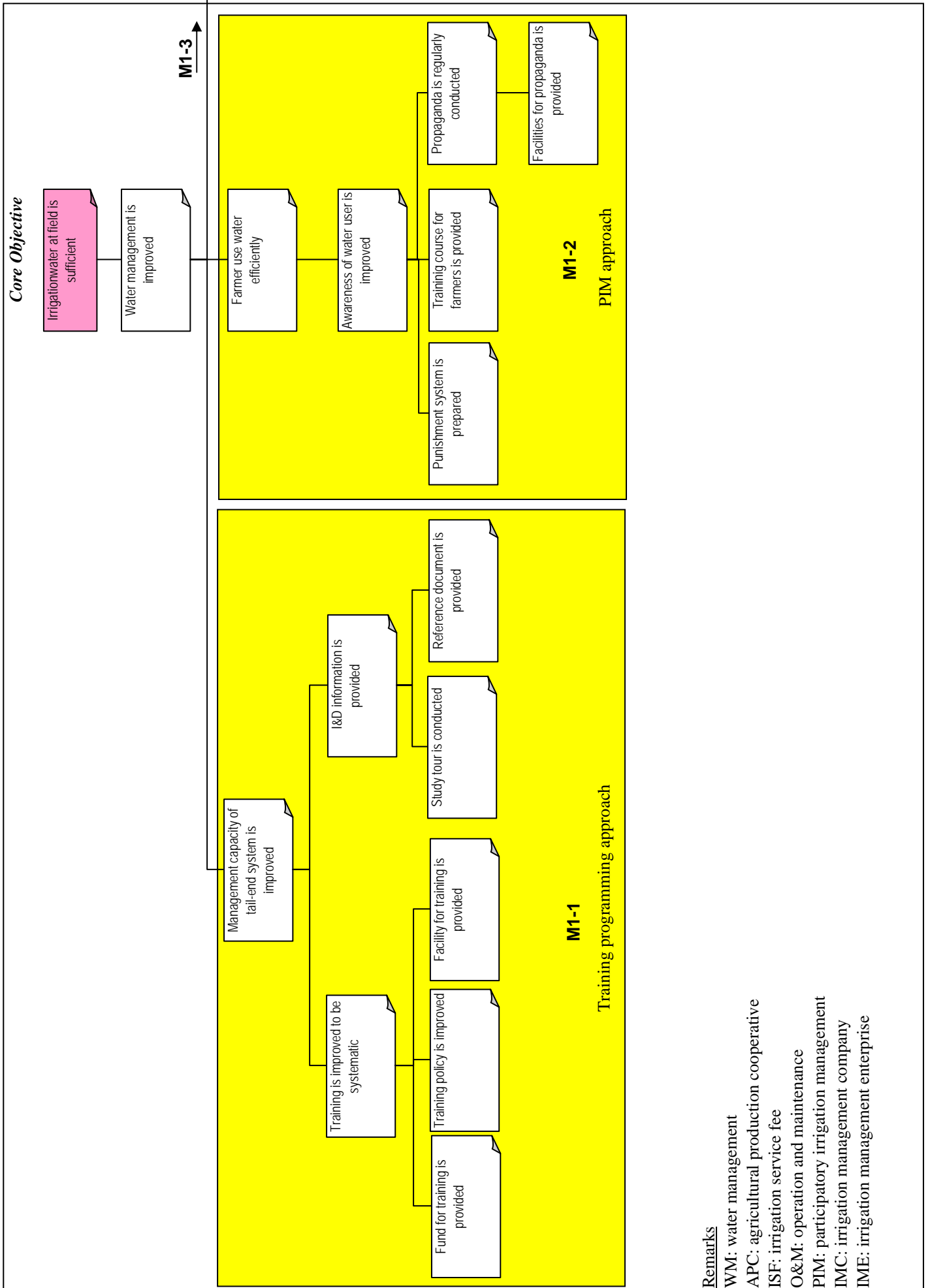


図5 (2/4) クアンニン省イェンドン地区目的系図

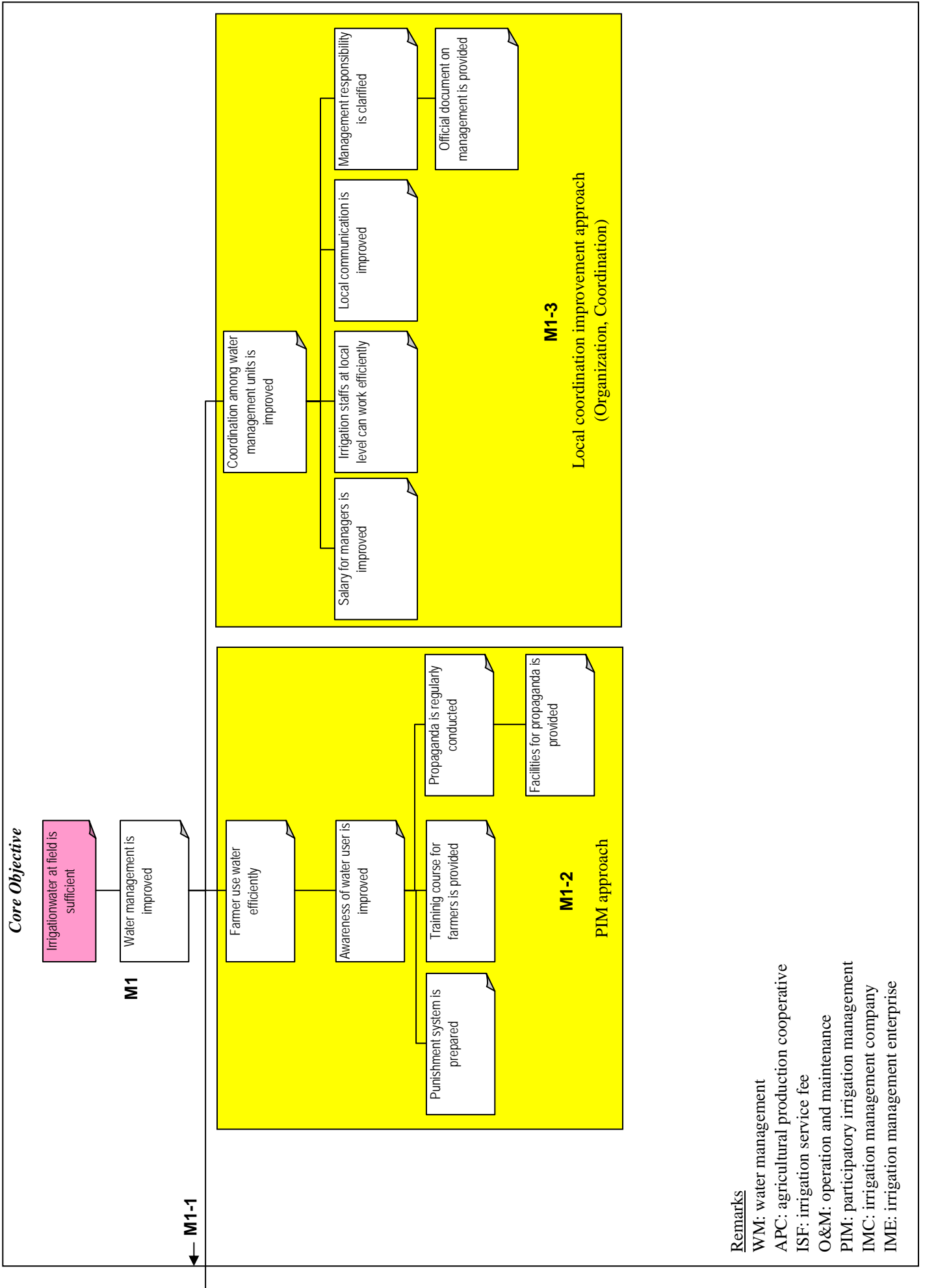


図5 (3/4) クアンニン省イェンドン地区目的系図

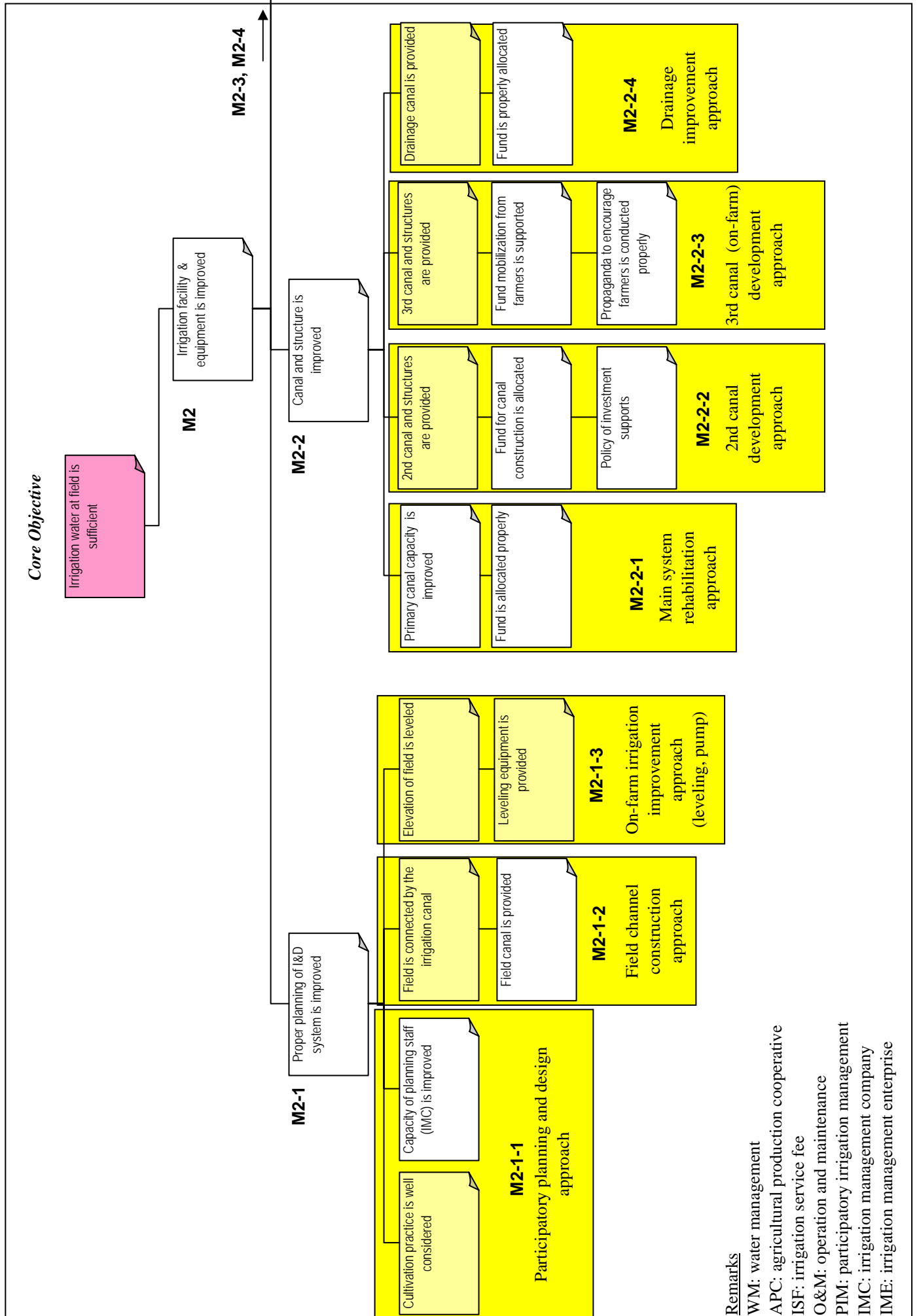


図5 (4/4) クアンニン省イェンドン地区目的系図

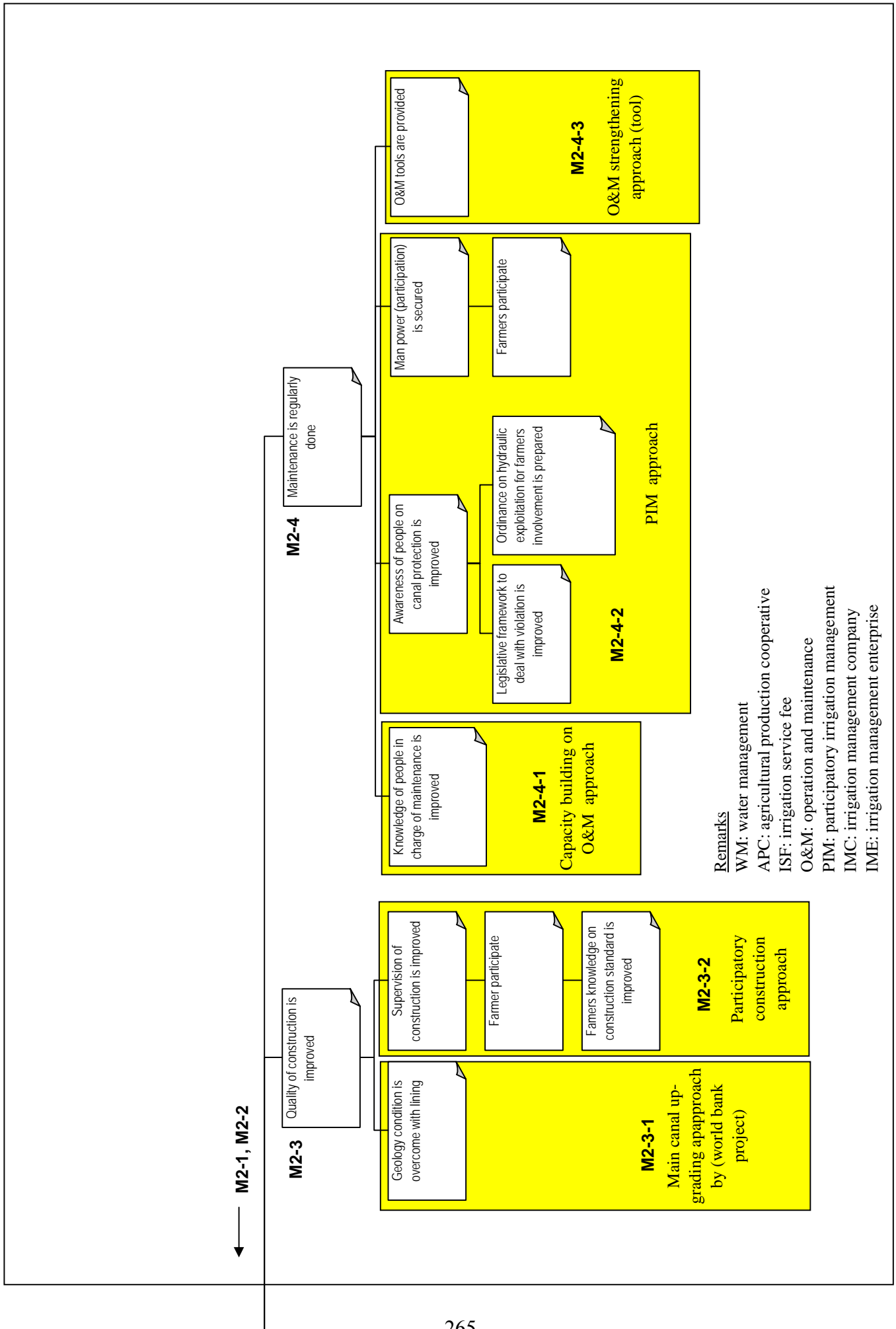


図6 クアンニン省イェンドン地区開発アプローチと優先度

No.	Title of Approaches	Priority-1	Priority-2	Implement Agency	Resource
M1	M1-1 Training programming approach (Training programming and knowledge enrichment)	13	9	PPC/DPC/Com /IMC/APC	IO/District/Province/Com
	M1-2 PIM approach (Awareness enhancement of water users)	12	10	DPC/Com/IMC /APC	IMC/IO/DPC/Com/APC
	M1-3 Local coordination improvement approach Enforcement of coordination among water management agencies	14	11	IMC/DPC/Com /APC	IMC/DPC
M2-1	M2-1-1 Participatory planning and design approach (Planning and design capacity improvement)	1	1	MARD/IMC/District	IO/Gov.
	M2-1-2 Construction of on-farm system (Field channel construction approach)	5	13	DPC/CPC/APC /BN	IO/DPC/CPC/APC/BN
	M2-1-3 On-farm irrigation improvement approach (Leveling and pump)	4	12	DPC/CPC/APC	IO/DPC/CPC/APC
M2-2	M2-2-1 Main canal rehabilitation approach (by world bank project) (Improvement of main canal)	2	14	MARD/PPC	WB loan/Gov
	M2-2-2 2nd canal development approach (by Japan's grass-root grant project) (Construction of 2nd canal)	6	2	DPC/CPC/APC	IO/Dist/Prov/Com/BN
	M2-2-3 Participatory tertiary canal development approach (Construction of tertiary canal)	7	3	CPC/APC/BN	IO/Com/APC/BN
M2-3	M2-2-4 Drainage improvement approach (Construction of drainage canal)	8	4	CPC/APC/District/BN	IO/Com/APC/BN
	M2-3-1 Main canal up-grading approach (by world bank project) (Improvement of geological condition)	2	14	MARD/PPC	WB loan/Gov
	M2-3-2 Participatory construction approach (Increase of farmers' participation in construction)	9	5	CPC/APC/BN	IO/CPC/APC
M2.4	M2-4-1 Capacity building on O&M approach (Capacity building on O&M)	10	6	IMC/CPC/APC	IO/IMC/CPC/APC
	M2-4-2 PIM policy approach (Increase of participation in O&M)	11	7	CPC/APC	IO/CPC/APC
	M2-4-3 O&M strengthening approach (O&M tool supply approach)	15	8	IO	IO

Code of App.	Title of approach by the facilitator (Title of approach by the participants)
--------------	---

Note:

IME: irrigation management enterprise
 ISF: irrigation service fee
 APC: agricultural production cooperative
 WM: water management
 IO: International donor
 BN: Beneficiaries (water user)
 Com: Commune
 O&M: operation and maintenance

App.:
 Priority 1 :
 Priority 2: Approach
 PIM: partic Priority if they can get government support
 IMC: irriga Priority if they can not get government support

図7 (1/5) プロジェクト全体の問題系図 (直接原因)

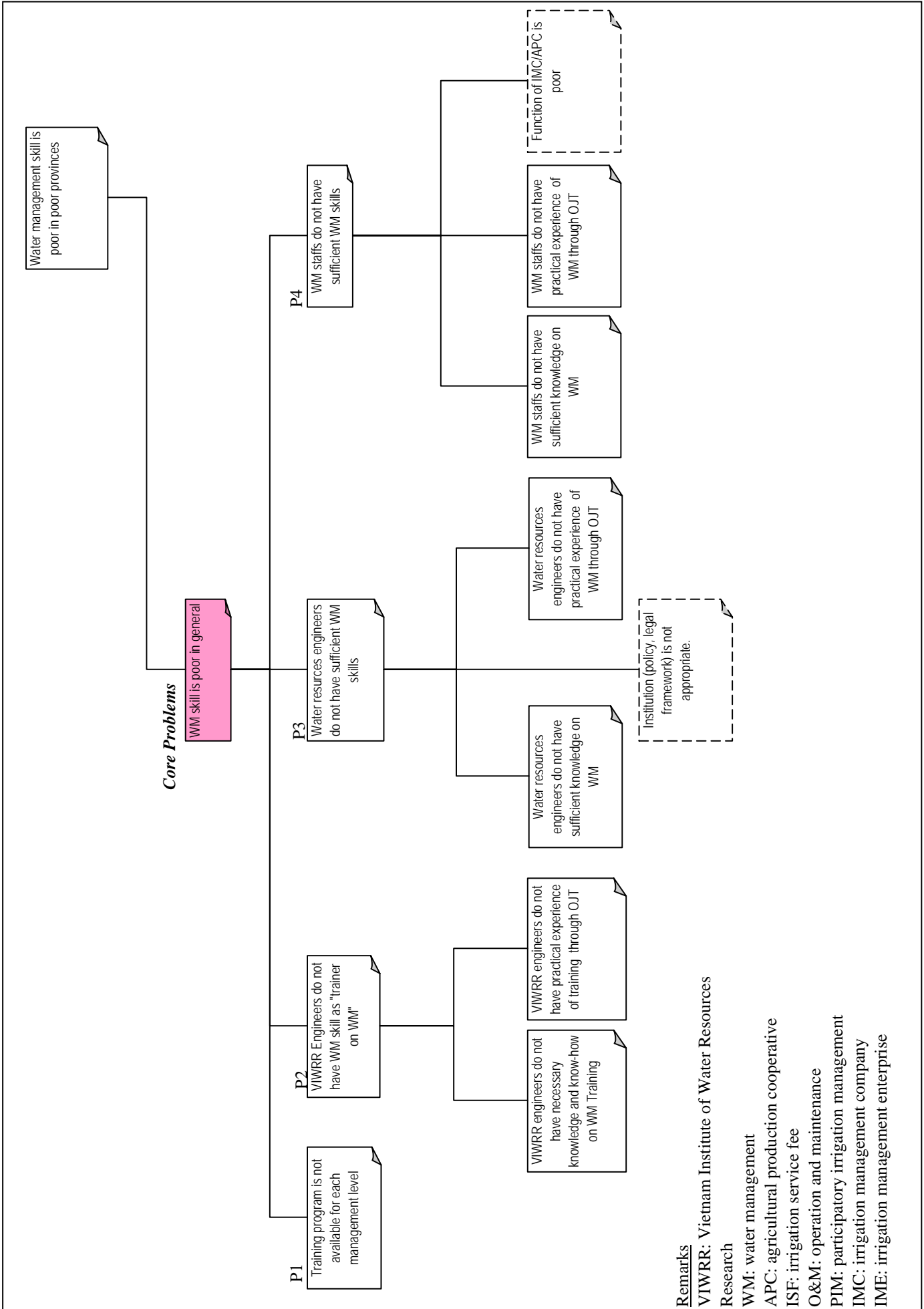
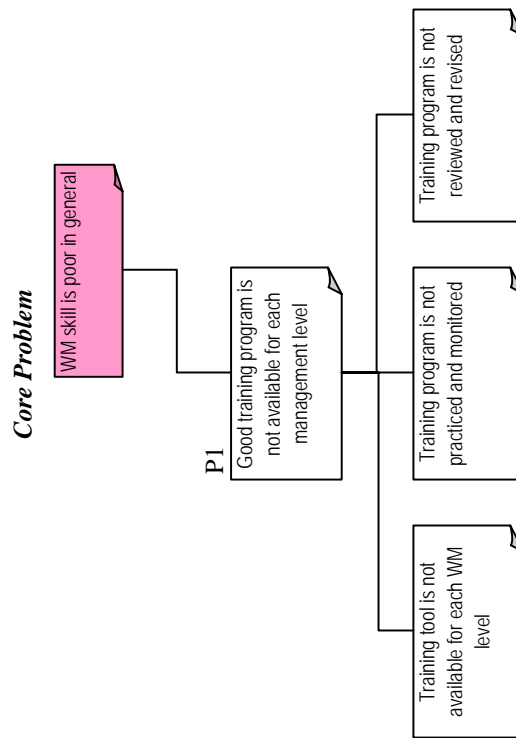


図7 (2/5) プロジェクト全体の問題系図 (直接原因-1)



- Remarks**
 VIWRR: Vietnam Institute of Water Resources
Research
 WM: water management
 APC: agricultural production cooperative
 ISF: irrigation service fee
 O&M: operation and maintenance
 PIM: participatory irrigation management
 IMC: irrigation management company
 IME: irrigation management enterprise

図7 (3/5) プロジェクト全体の問題系図 (直接原因-2)

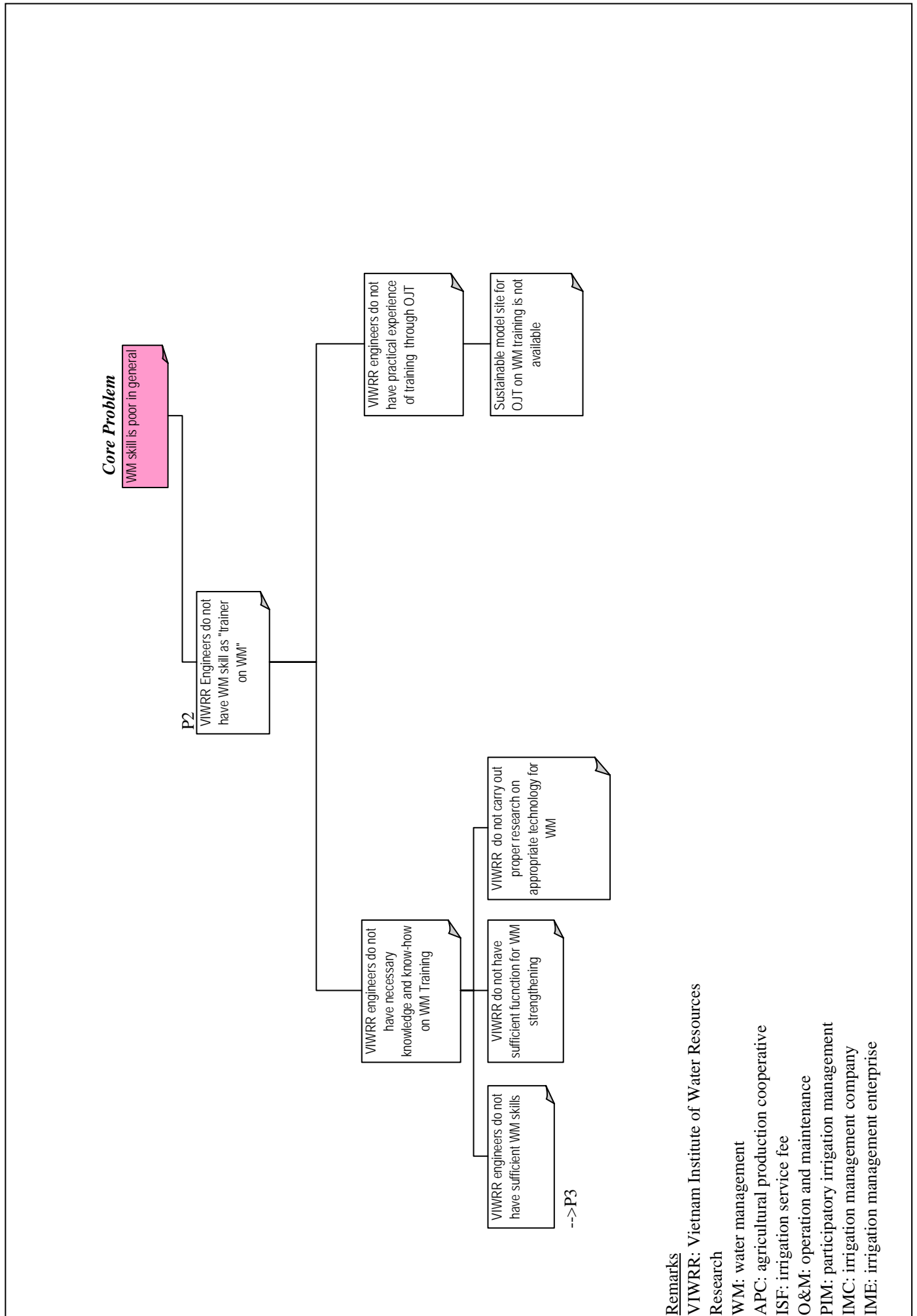
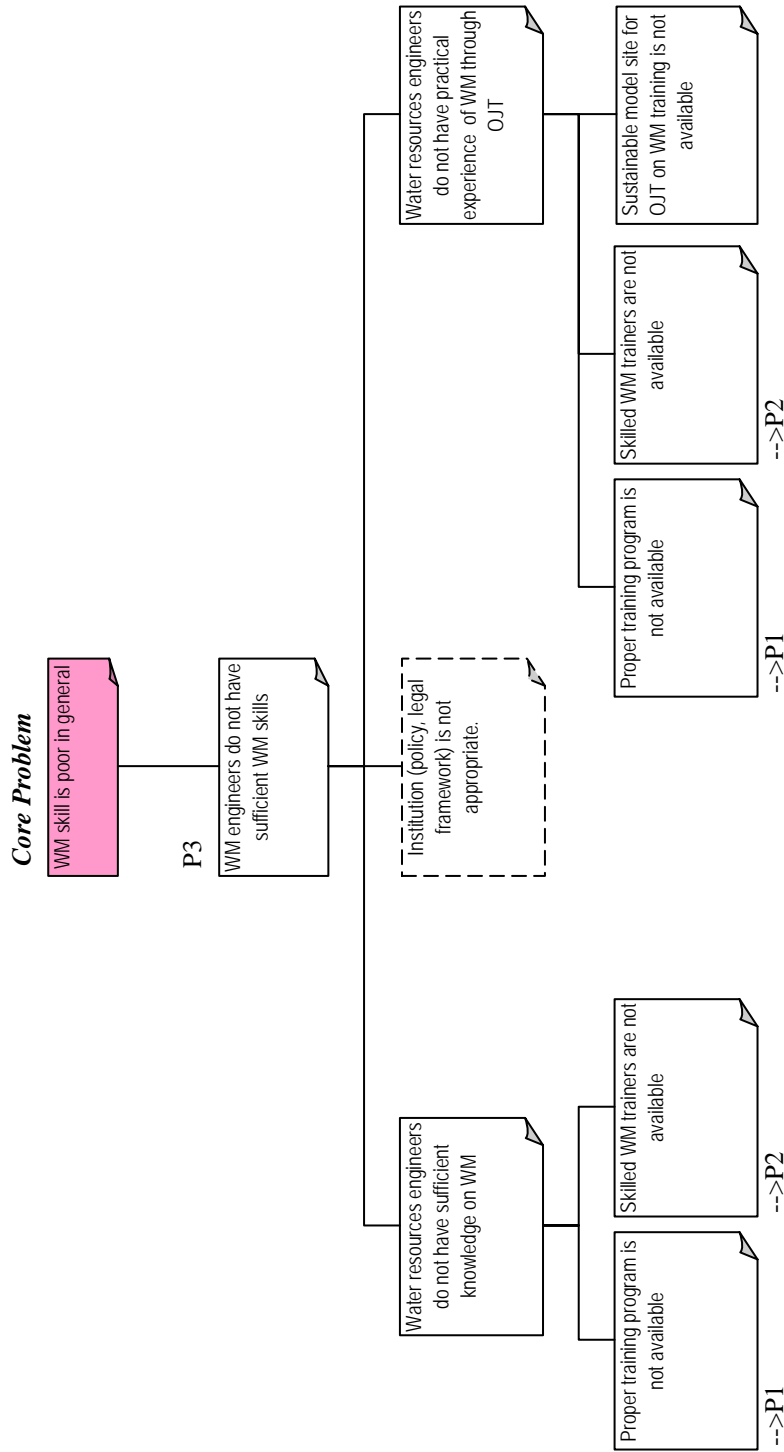


図7(4/5) プロジェクト全体の問題系図(直接原因-3)



- Remarks**
- VIWRR: Vietnam Institute of Water Resources
 - Research
 - WM: water management
 - APC: agricultural production cooperative
 - ISF: irrigation service fee
 - O&M: operation and maintenance
 - PIM: participatory irrigation management
 - IMC: irrigation management company
 - IME: irrigation management enterprise

図7 (5/5) プロジェクト全体の問題系図 (直接原因-4)

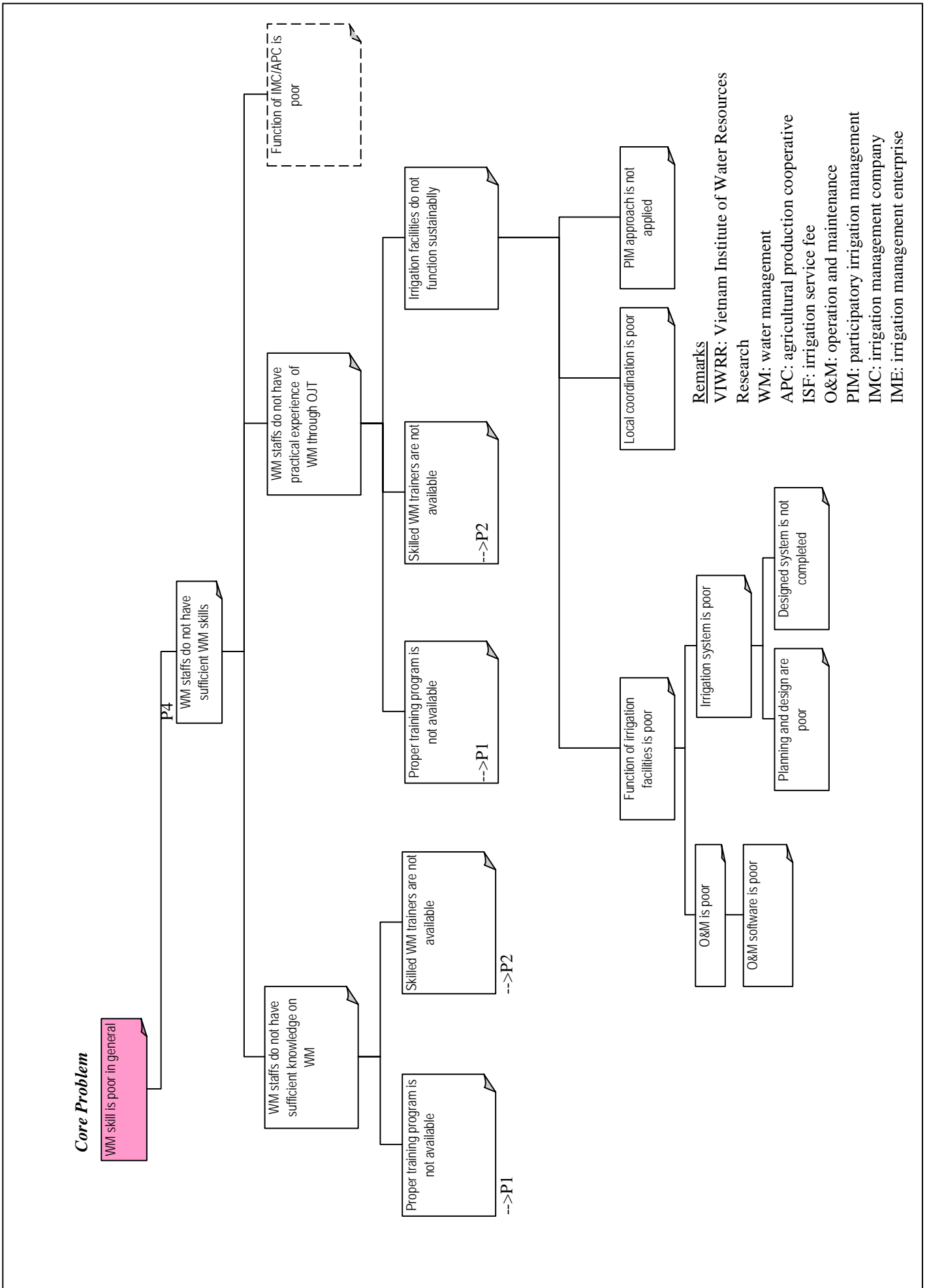


図8 (1/5) プロジェクト全体の目的系図 (直接結果)

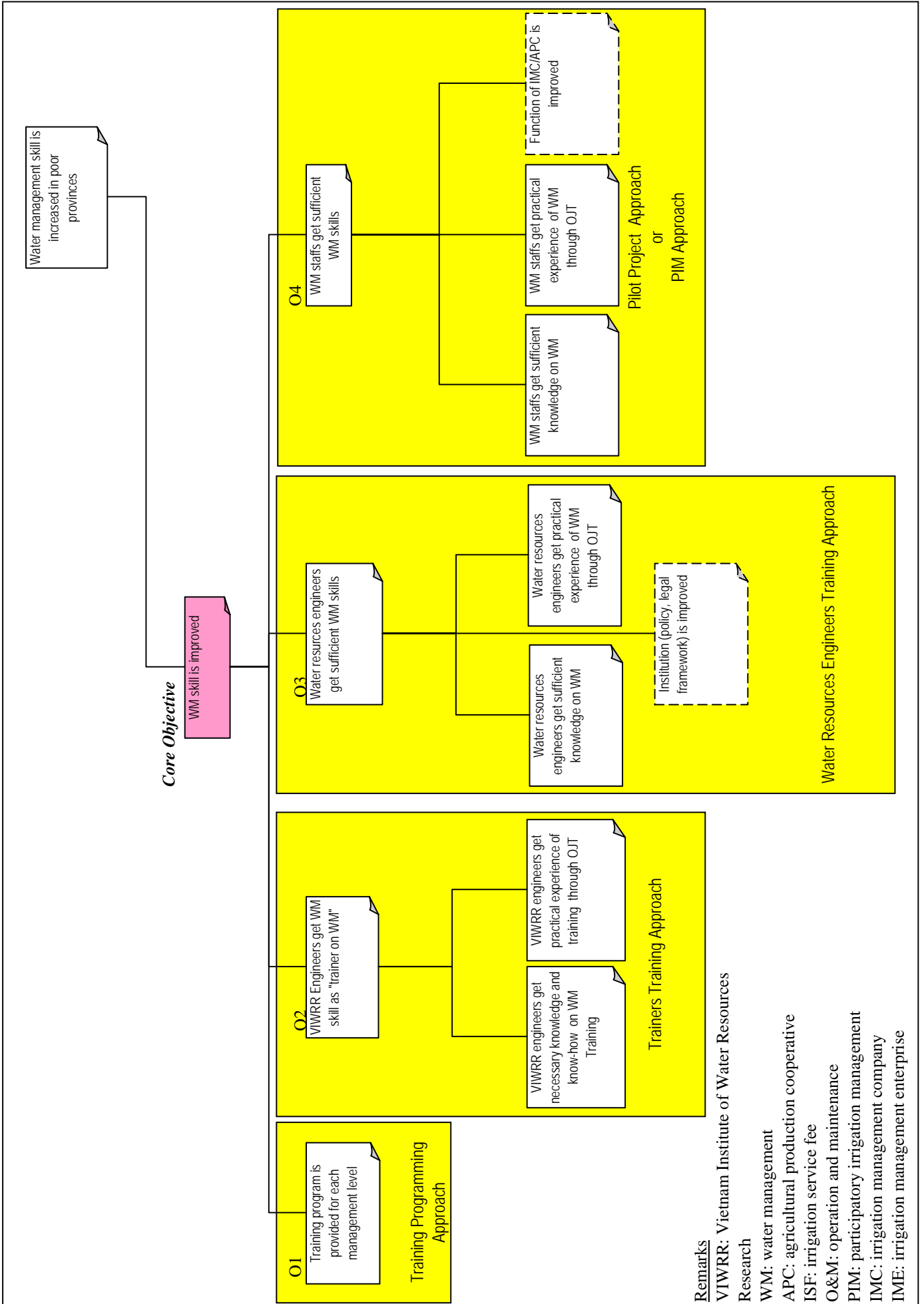
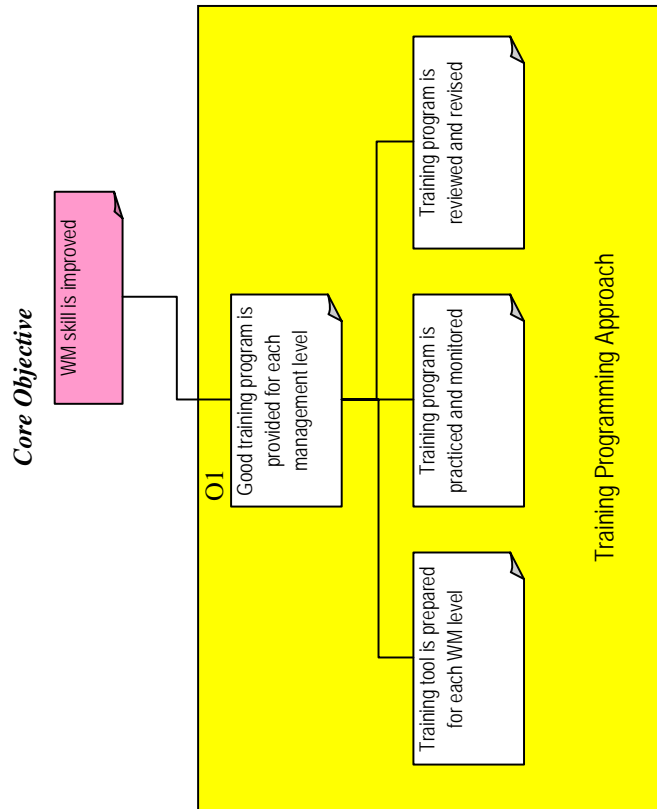


図8 (2/5) プロジェクト全体の目的系図 (直接結果-1)



Remarks
 VIWRR: Vietnam Institute of Water Resources
 Research
 WM: water management
 APC: agricultural production cooperative
 ISF: irrigation service fee
 O&M: operation and maintenance
 PIM: participatory irrigation management
 IMC: irrigation management company
 IME: irrigation management enterprise

図8 (3/5) プロジェクト全体の目的系図 (直接結果-2)

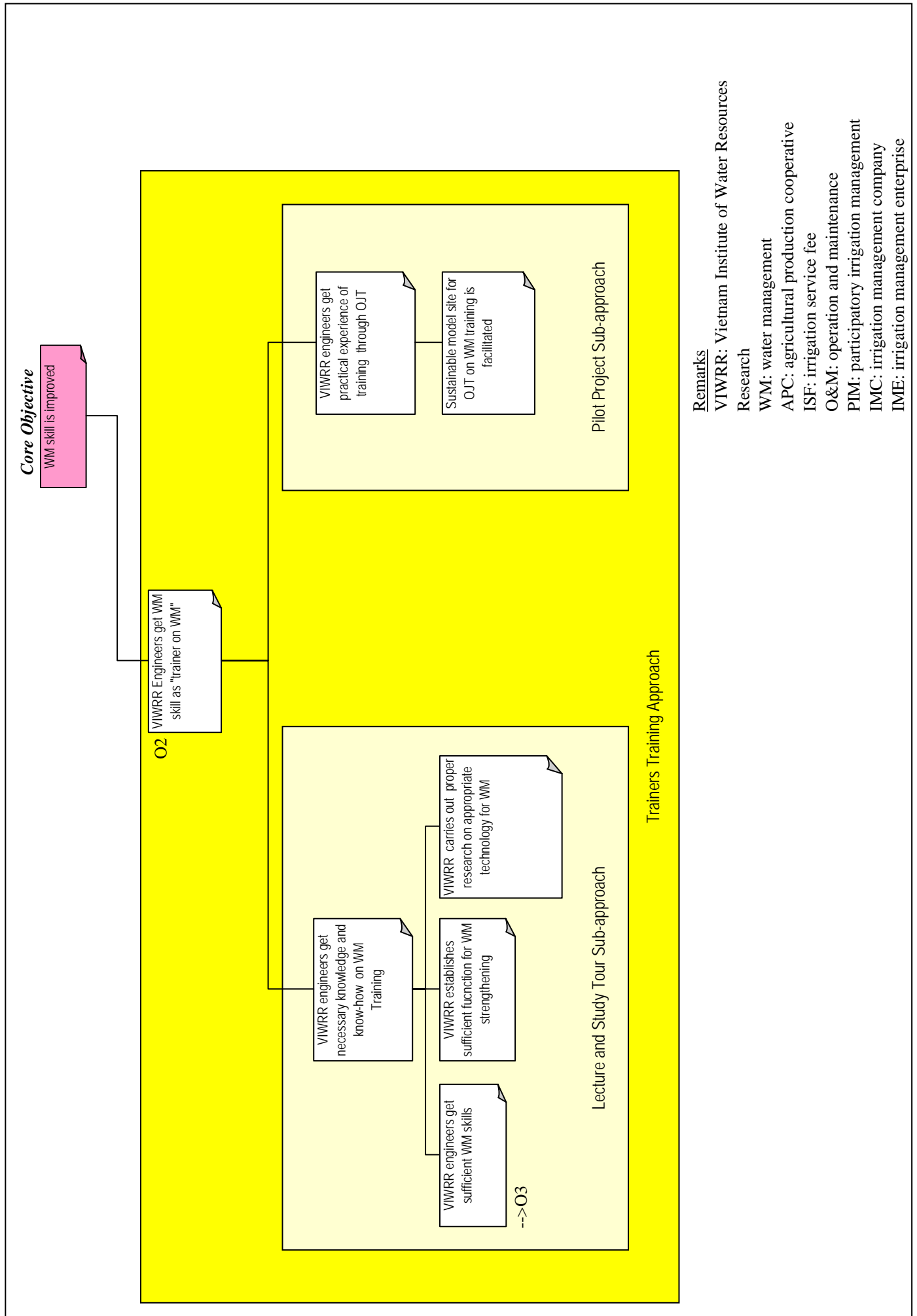


図8 (4/5) プロジェクト全体の目的系図 (直接結果-3)

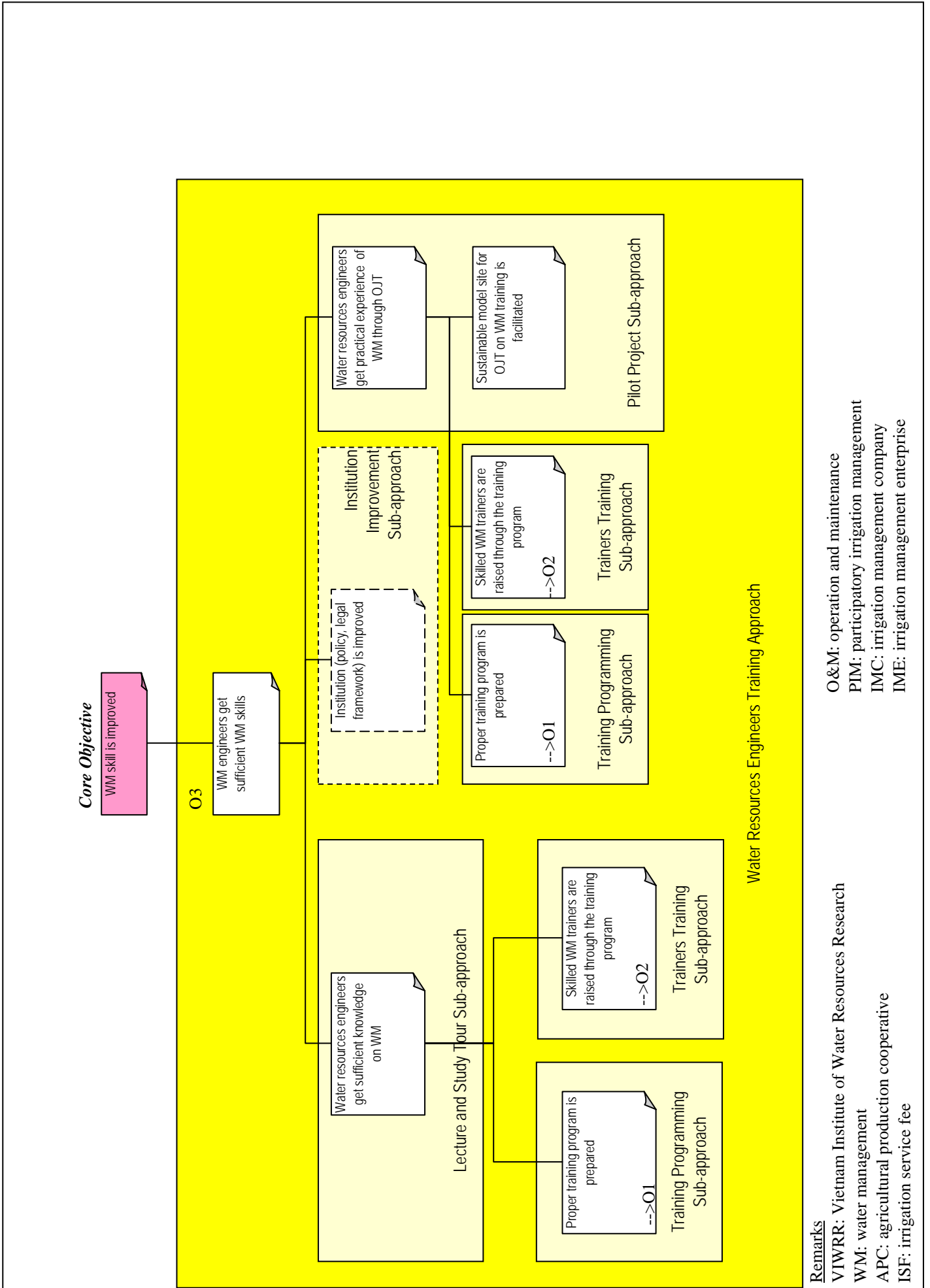
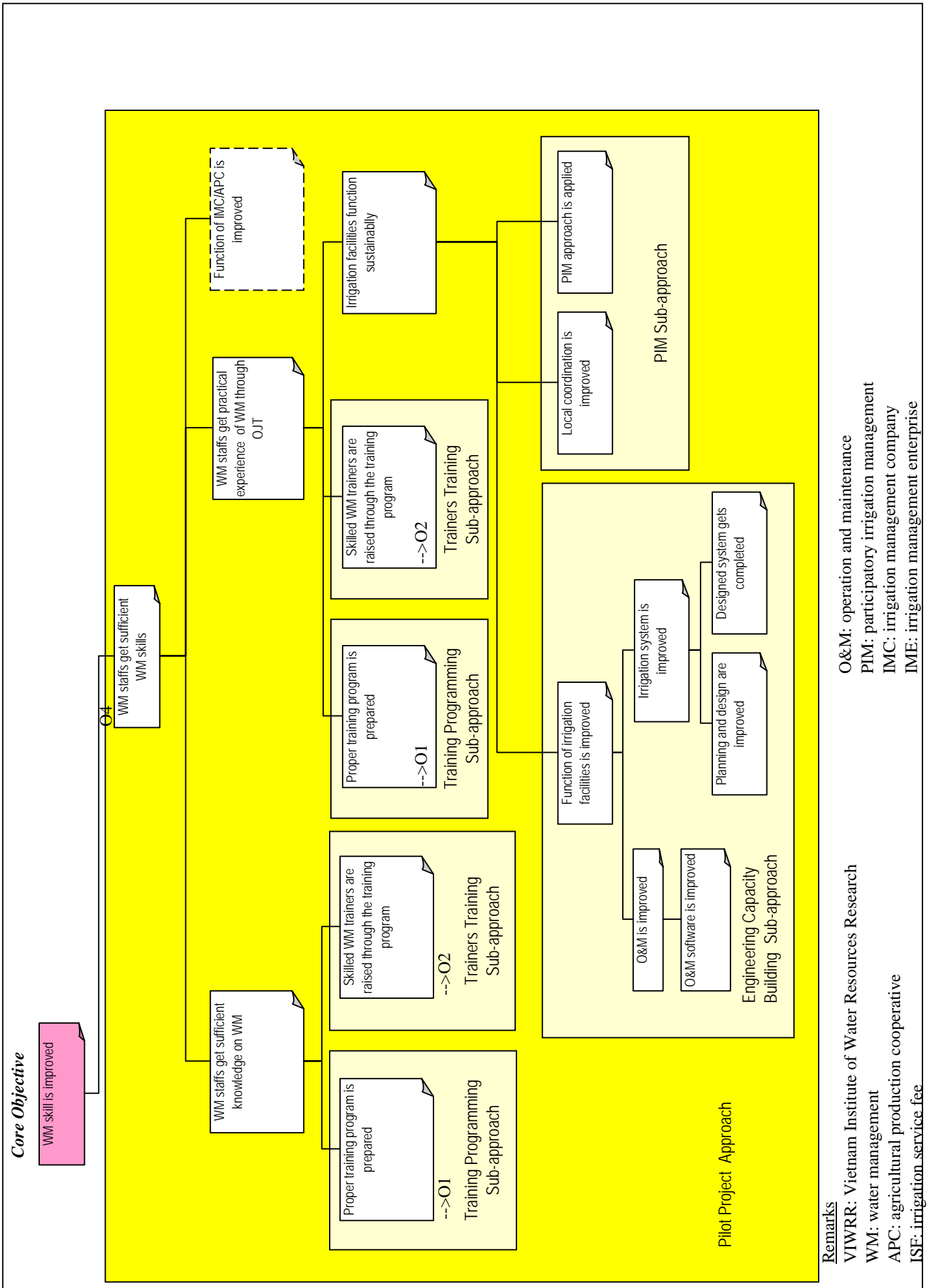
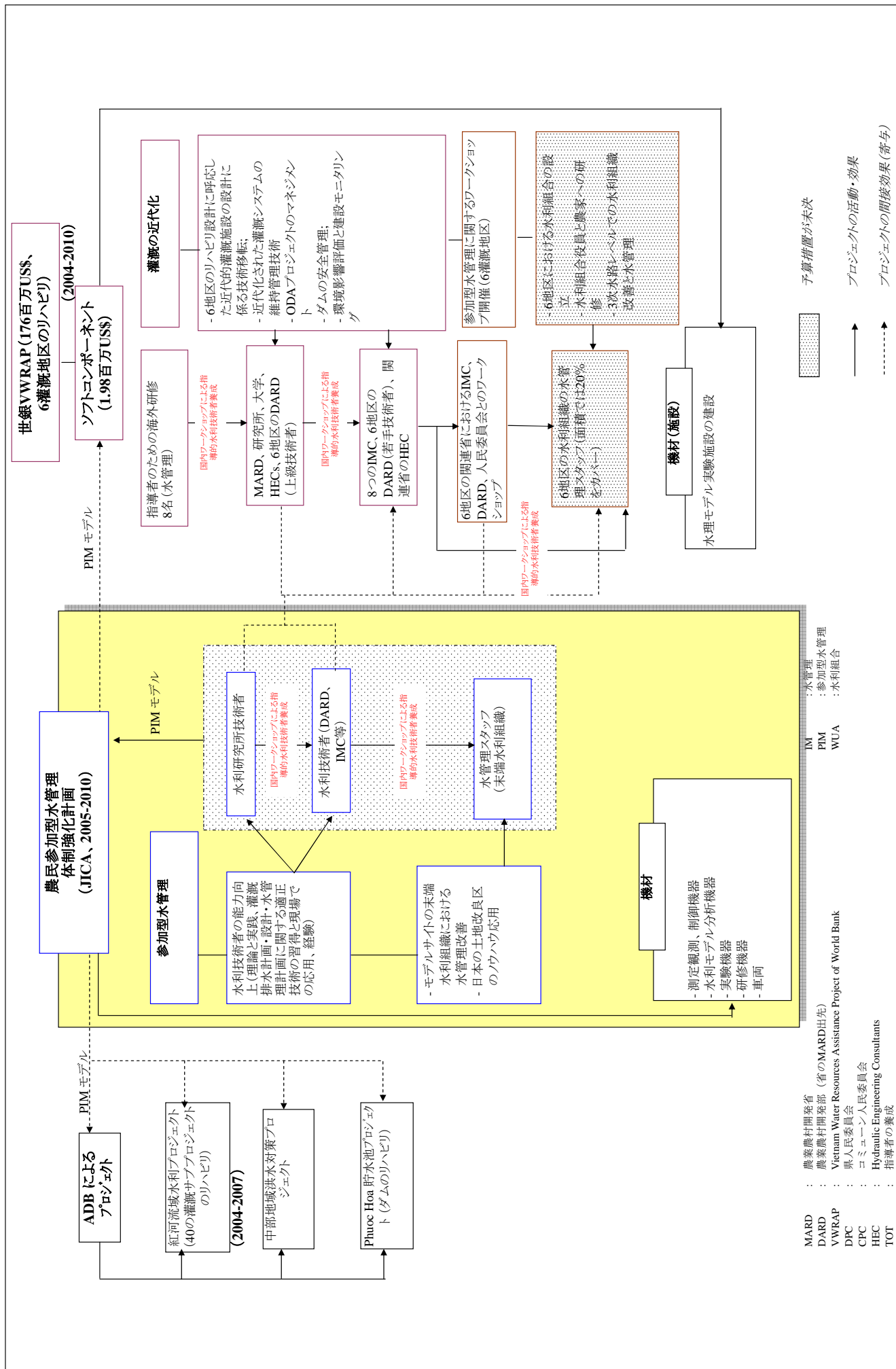


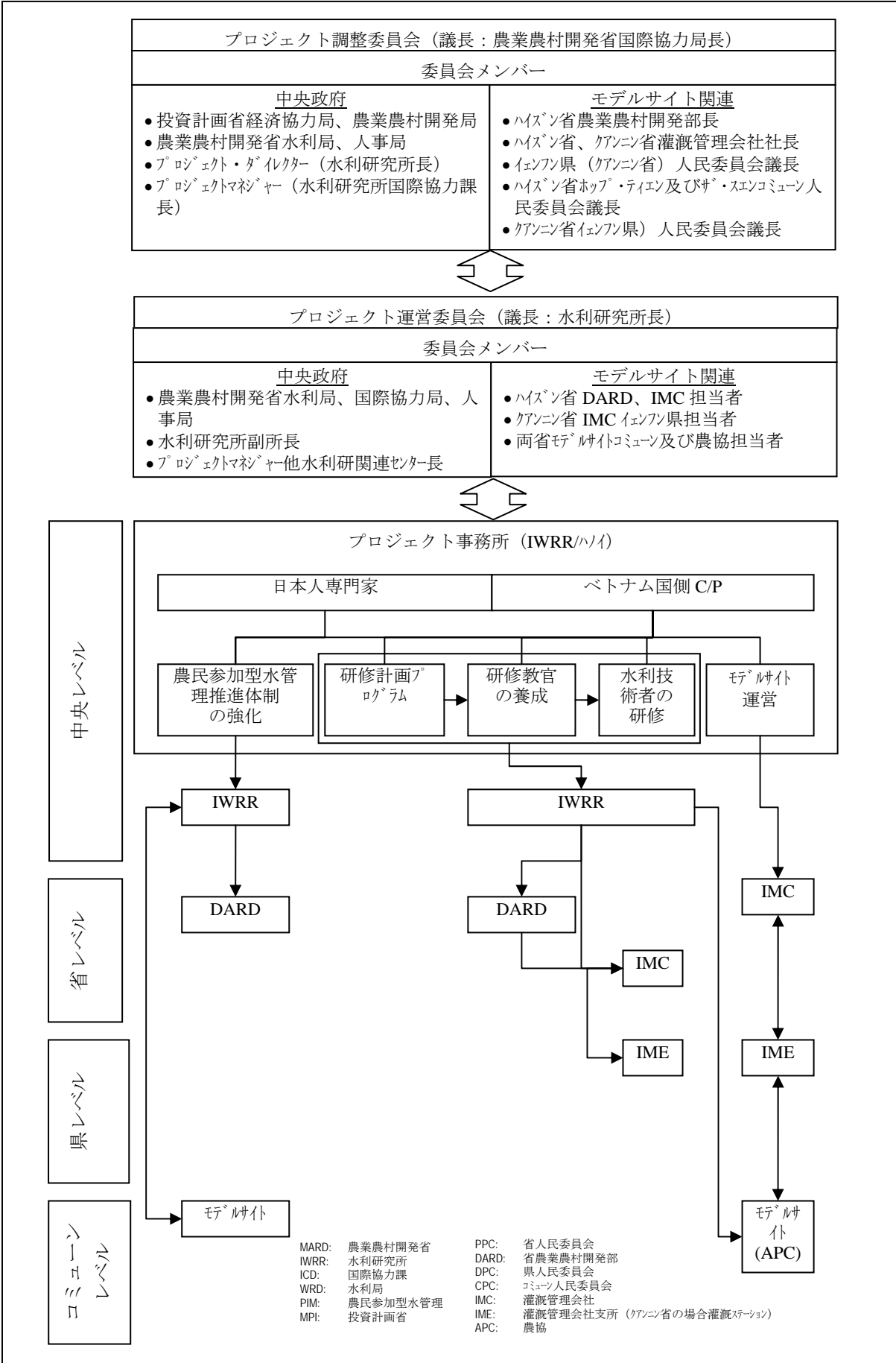
図8 (5/5) プロジェクト全体の目的系図 (直接結果-4)



付属資料6 他援助機関実施プロジェクトと本プロジェクトの関係



プロジェクト実施体制



機材リスト (案)

List of Equipment and Relevant Activities

Equipment	Relevant activities	Unit	Qty	Unit cost ('000 Yen)	Cost ('000 Yen)	Remarks
1. Common						
1.1 Transport						
Vehicles (4WD)	all	nos.	2	3,500	7,000	
Vehicles (pick up truck)	all	nos.	2	2,000	4,000	
1.2 Office in Hanoi						
Copy machine with scanning function	all	nos.	1	1,000	1,000	
PC desktop	all	nos.	4	150	600	for experts and counterparts
PC Notebook	all	nos.	4	200	800	for experts and counterparts
Printer	all	nos.	1	200	200	color A3 size
Printer	all	nos.	2	50	100	inkjet
Tools for book binding	all	LS	1	500	500	
Fax	all	nos.	1	50	50	
Mobile phone	all	set	5	20	100	
Map cabinet	all	set	1	200	200	
Furniture and office fixtures	all	LS	1	500	500	
Instruments	all	LS	1	500	500	planimeter, drafter, etc.
Miscellaneous	all	LS	1	1,000	1,000	
1.3 Office in provinces						
Fax/copy/scanner	all	nos.	2	100	200	
PC desktop	all	nos.	2	150	300	for experts and counterparts
Furniture and office fixtures	all	LS	2	200	400	
Miscellaneous	all	LS	2	500	600	
1.4 Field work equipment (general)						
Digital camera	all	nos.	3	50	150	
GPS	all	nos.	2	30	60	
Miscellaneous	all	LS	1	300	300	helmet, safety shoes, etc.
Sub-total					18,560	
2. Training equipment						
Television set	1.1.2	set	1	50	50	
Video recorder	1.1.2, 1,2,2	set	1	30	30	
Video camera	1.1.2, 1,2,2	set	1	200	200	
PC for editing with capture board	1.1.2, 1,2,2	set	1	400	400	
Software	1.1.2, 1,2,2	set	1	200	200	
LCD projector	1,2,2	set	1	300	300	
Screen	1,2,2	set	1	50	50	
Notebook computer	1,2,2	set	5	200	1,000	
Printer	1.1.2	set	1	100	100	
Sub-total					2,330	

3. Field investigation & laboratory equipment						
Theodolite with mirror, tripod	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	set	2	500	1,000	
Auto level with tripod	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	nos.	2	150	300	
Staff for levelling survey	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	nos.	4	40	160	
Pole for survey	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	nos.	10	15	150	
Total station with mirror, tripod	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	set	2	1,200	2,400	
Plate table set	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	set	2	40	80	
Digital camera with GPS	2.1.1, 2.1.2, 3.1, 3.2.1	nos.	1	100	100	
PC for data management system	2.1, 3.1	set	3	200	600	
Software for data management system	2.1, 3.1	set	2	1,000	2,000	
Software (auto CAD)	2.1, 3.1	set	1	500	500	
A2 scanner	2.1, 3.1	set	1	1,000	1,000	
A0 plotter	2.1, 3.1	set	1	1,500	1,500	
A0 digitizer	2.1, 3.1	set	1	1,000	1,000	
Meteorological station	2.1, 3.1	set	2	3,000	6,000	
Current meter (river)	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	set	5	300	1,500	
Current meter (canal)	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	set	5	300	1,500	
EC meter	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	set	5	50	250	
pH meter	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	set	5	50	250	
Water level sensor	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	set	10	200	2,000	
Water quality sensor (salinity)	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	set	3	100	300	
Data logger	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	set	3	500	1,500	
I/O unit	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	set	3	1,000	3,000	
Data communication	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	set	3	1,000	3,000	
Water quality checker (6 items)	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	set	5	100	500	
Sub-total					30,590	
4. Model site equipment						
motor cycle	4.3	set	6	150	900	
portable engine pump (20 m ³ /hour)	4.3	set	15	200	3,000	
grass cutter	4.3	set	10	30	300	
radio communication (station)	4.3	set	3	300	900	
radio communication (mobile)	4.3	set	6	30	180	
hand tools	4.3	set	60	3	180	
Construction material	4.3	LS	1	3,000	3,000	
					8,460	
				Total	59,940	

List of Facilities and Relevant Activities

Equipment	Relevant activities	Unit	Qty	Unit cost (‘000 Yen)	Cost (‘000 Yen)
1. Model site					
1.1 Hai Duong (Nam Sach, Gia Loc)					
Regulating structure on 2nd system (gate)	4.2, 4.3	unit	6	500	3,000
Regulating structure on 3rd system (gate)	4.2, 4.3	unit	10	250	2,500
Repair of structure	4.2, 4.3	LS	2	2,000	4,000
Repair of pump	4.2, 4.3	LS	2	1,000	2,000
1.2 Quang Ninh (Yen Dong)					
On-farm facilities (support or credit)	4.2, 4.3	LS	1	3,000	3,000
Regulating structure on 3rd system (gate)	4.2, 4.3	unit	10	250	2,500
Repair of structure	4.2, 4.3	LS	2	2,000	4,000
Repair of pump	4.2, 4.3	LS	2	1,000	2,000
1.3 Miscellaneous	4.2, 4.3	LS	1	1,000	1,000
Sub-total					24,000
2. Field experiment					
2.1 Hai Duong (Nam Sach, Gia Loc)					
Installation of sensors and datalogger	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	LS	2	2,000	4,000
Installation of meteorological station	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	LS	1	500	500
Measuring structures (frume, etc.)	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	LS	2	1,000	2,000
2.2 Quang Ninh (Yen Dong)					
Installation of sensors and datalogger	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	LS	1	2,000	2,000
Installation of meteorological station	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	LS	1	500	500
Measuring structures (frume, etc.)	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	LS	1	1,000	1,000
2.3 Miscellaneous	2.1.1, 2.1.2, 3.1, 3.2.1, 4.3	LS	1	2,000	2,000
Sub-total					12,000
				Total	36,000