Government of Central Kalimantan

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Master Plan for the Rehabilitation and Revitalisation of the Ex-Mega Rice Project Area in Central Kalimantan






RURAL INFRASTRUCTURE DEVELOPMENT IN THE EX-MEGA RICE PROJECT AREA

Technical Report No. 14

OCTOBER 2008

Euroconsult Mott MacDonald and Deltares | Delft Hydraulics
in association with
DHV, Wageningen UR, Witteveen+Bos, PT MLD and PT INDEC

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Rural Infrastructure Development in the Ex-Mega Rice Project Area in Central Kalimantan

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Terms and abbreviations

ADB	Asian Development Bank
CDD	Community-driven development
CKPP	Centra Kalimantan Peatland Project
hh	Households
ISDP	World Bank supported Integrated Swamp Development Project (1995-2000)
JUT	*Jalan Usaha Tani*, farm roads
KK	*Kepala Keluarga*, family head
KSO	*Kerjasama operasional*, Cooperation in contract implementation
NGO	Non-government Organization
O&M	Operation and Maintenance
P3A	*Perkumpulan Petani pemakai Air*, water user association
Padat karya	Community implementation of works financed by ad-hoc or emergency government programmes
PDAM	*Perusahan Daerah Air Minum*, regional drinking water supply company
PLG	*Proyek Lahan Gambut*, Peatland Development Project of the mid 1990s in Central Kalimantan
PLN	*Perusahan Listrik Negara*, national electricity company
PNPM	*Program Nasional Pemberdayaan Masyarakat*, National programme for community empowerment
Potensi Desa	Statistics on socio-economic conditions per village
PU	*Pekerjaan Umum*, Public Works
SaRut	*Saringan Rumah Tangga*, household water treatment installation
SID	Surveys, investigations and designs
SIPAS	*Sistem Penyediaan Air Sederhana,* simple water treatment plant
SP3	*Surat Perjanjian Pemberian Pekerjaan*, Agreement on work implementation
Swakelola	Implementation of contracts by Force Account
TAM	*Tata Air Mikro*, on-farm water management system

Summary

As part of the Master Plan Study for the EMRP area, this report on rural infrastructure focuses on rural roads and village water supply, including contract mechanisms for implementation of works. An overview is given of existing facilities in the area based on statistical data and field investigations in selected sites. Designs standards and different options for improvement are reviewed. General recommendations are given on development of rural infrastructure in each of the nine Management Units identified in the area.

Regarding rural roads the report emphasizes that, while accessibility in general should be improved, access to conservation areas should be limited to avoid unwanted developments taking place there. Where road access is not (yet) feasible, water transport facilities should be improved. River transport may also have to be encouraged for transport of bulk goods which otherwise might damage roads built in the soft soil (peat) environment. The need is emphasized for proper access from housing areas to farm holdings by tractors and small trucks, if agricultural production is to be raised, both in the transmigration and in the local settlement areas. Even if such farm roads cannot be constructed yet in the short-term, infrastructure (re-) designs should already make provisions for their future implementation.

Regarding drinking water the report recommends a gradual extension of the PDAM supply facilities, now in (small) towns only, to rural areas. Using treated river water, this is considered the most sustainable option in the long term. Where such an extension is not yet possible, the Government could encourage and support local initiatives for the construction of deep-wells or other water supply and sanitation facilities.

A lack of community participation in identification, design and implementation of works is seen as a main reason for past failures. Therefore, the second part of the report explores how such participation could be increased. Different ways of cooperation between a government agency and the community in the preparation phase are compared, from an entirely community-driven to an entirely agency-driven approach. By law, construction is implemented either through contracting the work to a legally established company or by Force Account, i.e. by the agency itself. In both cases there are various options for the community to participate in the construction or even do the construction entirely themselves. Recommendations are given depending on the scope of work and examples of other projects are shown.

A tested guideline on establishing water user associations is added to the report which could well serve as an example for establishing also other user groups within the community.

1. Introduction

1.1 Purpose of this report

Rural infrastructure are small-scale public works and basic services at village level, such as village roads and farm roads with culverts and small bridges, domestic water supply and sanitation facilities, on-farm water management systems, etc. Some of these works are installed entirely by the villagers themselves, but in most cases the Government (or another outside organization like an NGO) plays a leading role. However, after completion the works are handed over to the community, and the community is then responsible for operation and maintenance of the works. This is one very important reason why the local people should always be involved in planning and implementation of rural infrastructure works in their area.

This report focuses on village roads and rural water supply systems in the ex-PLG area. The purpose of the report is to give an overview of the present situation regarding these aspects, to describe various options for further development, and to give recommendations especially on community involvement in the development and maintenance of rural infrastructure works. A guideline to set up local user groups is included in Annex V, using as ecample the water user association.

1.2 Importance of infrastructure for rural development

The importance of proper functioning rural infrastructure for economic and social development cannot be underestimated. Long walking or travel distances to basic services like drinking water supply, health centers, shops and government facilities, will reduce the time available for more productive activities. Farmers will only start market oriented production if the infrastructure is there to access these markets, including processing, storage and transport facilities.

Nationwide, a very strong correlation has been found between the percentage of household incomes derived from non-farm activities, and the reliability of infrastructure like electricity supply, access roads, and telephone connections (World Bank, 2006). Although no such data are available from the project area, there is no reason why it should be different here. Shops, restaurants, repair facilities etc. are usually all concentrated there where access is easiest, along main roads and/or river banks. Small enterprises can only compete with enterprises elsewhere if infrastructure facilities are in a similar state.

2. Project Activities

This chapter summarizes the activities undertaken by the Masterplan study in the field of rural infrastructure. As the emphasis in the Masterplan study was on hydrology, peatland management and agricultural development, the scope of activities related to rural infrastructure was limited.

2.1 Village Statistics

Overall statistics on rural infrastructure facilities per province or district are readily available from various publications of the Statistcs Bureau. However, data per desa are more difficult to access, and the best source here is the Potensi Desa of which the latest available version dates from 2005. This has been the main source for the information given below and in Tables 2.1 and 2.2.

It appears that only 28% of the villages have a proper access road, while more than half of the villages depend at least partly on water transport. Very few villages have a piped water distribution system, and for the majority of villages, river water, mostly untreated, is the main source of domestic water supply. Accessibility and domestic water supply will be further discussed in the following chapters.

The data also show that 64% of the villages receive electricity from the National Electricity Company, PLN, compared to nationwide 96% of all villages. Not all households are connected, however, 53%, while another 5% receive electricity from privately-operated generator sets, and 42% of the households have no electricity. The reliability of the electricity supply is low with frequent blackouts. Television signal reaches practically all villages. Telephone lines reach 21% of the villages, with only 4% of the households connected, but almost all villages are now within reach of cell phone networks and the use of handphones is increasing dramatically. Other facilities like banks, permanent markets, post offices etc. are available in a few of the larger villages only.

Especially in recent years the government has undertaken important efforts to improve the situation, and some of the above statistics, dating from 2005, may already be outdated. However, overall infrastructure and services are still poorly developed in most parts of the ex-PLG area although the situation is not much different from other parts of Kalimantan.

2.2 Conditions in selected sample villages

To gain more insight in the actual conditions beyond the statistics, the project selected six desas for in-depth consultations with the local people, see Figure 2.1. Desa workshops were held in January/February 2008 to discuss the general socio-economic conditions in each village. During follow-up visits in February and March, project staff reviewed and discussed in detail the situation with regards to rural

infrastructure. The results are summarized in Table 2.3 and are further described in the following chapters of this note.

The village workshops clearly showed the poor state of the rural infrastructure, and the high need for further investments. There was a broad willingness among the villagers to be more involved and to participate in the planning and construction of the works. Many villages do already carry out small works themselves, like repair or maintenance of roads, culverts or public buildings, but bigger investments depend on the Government.

After the village workshops, public consultations were also held at Kecamatan and Kabupaten level, focused on socio-economic conditions and government services.

Figure 2.1 – Location of sample villages

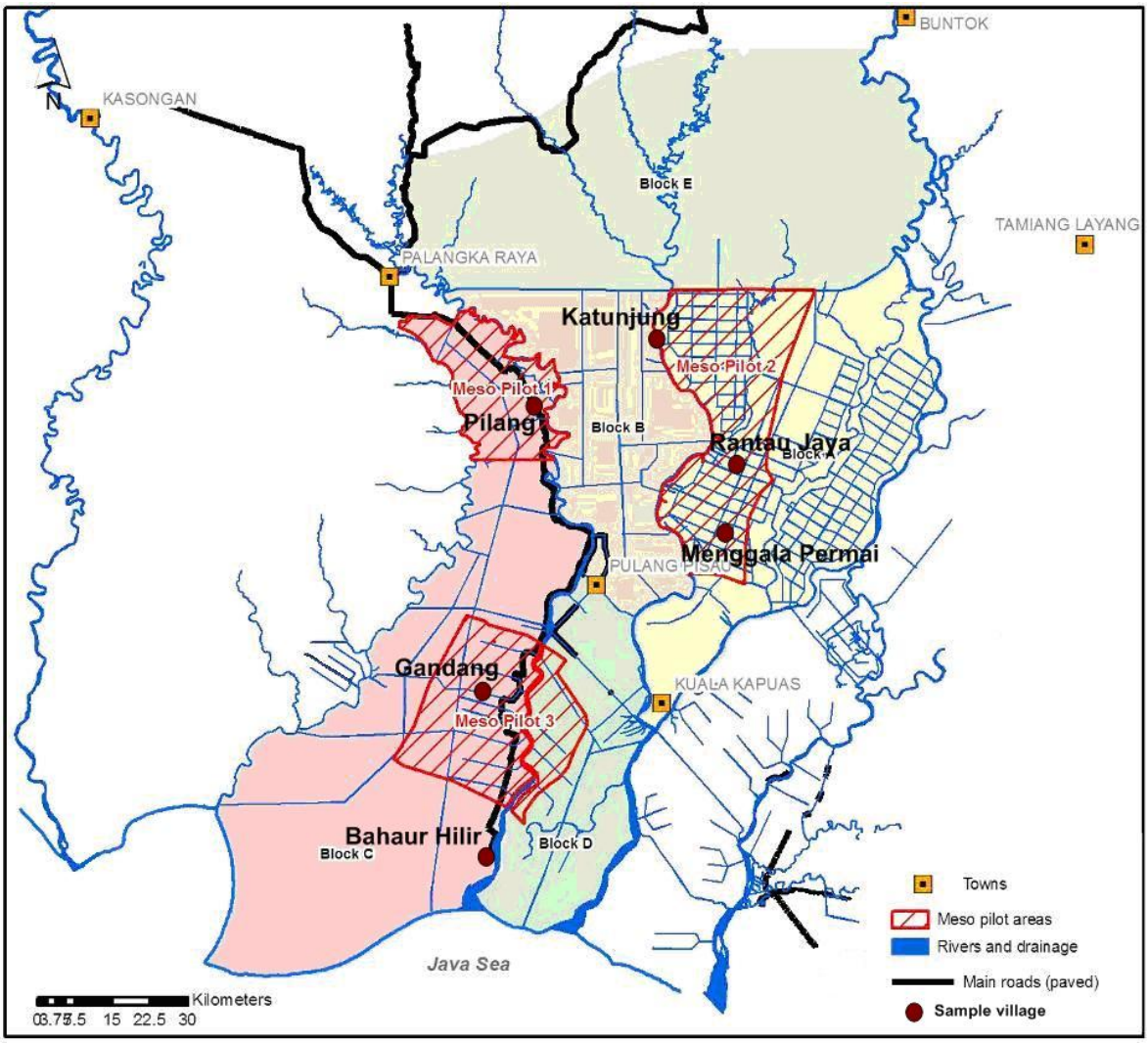


Table 2.1 – Main Rural Infrastructure Facilities

Total number of villages	232	100%	
Status perdesaan	221		
Status perkotaan	11		
Total number of households	113,342 hh		100%
Total population	455,918 persons		
Total area	2,675,259 ha		
Population density	17 p per km2		
Item	**Option**	**% of villages**	**% of households**
Access and transport			
Main access *	Over land Over water Over land and water	16% 26% 56%	23% * 18% * 59% *
Main access road	Alsphalt, beton Gravel Dirt road No road access	19% 9% 45% 26%	
River used for transportation *		88%	91% *
Public transport from village to outside *	Regular service Charter only	66% 34%	77% * 21% *
Water supply and sanitation			
Main source of drinking water *	Company (PDAM) Groundwater River water Rainfall	6% 10% 62% 23%	16% * 10% * 58% * 16% *
Households ever buying drinking water *		18%	29% *
Use of river/canal for washing and bathing *	Yes No No data	86% 6% 9%	91% * 4% * 5% *
Availability of toilets	Toilet near house Toilet on river/canal bank	37% 63%	
Household waste disposal *	Buried and/or burned River Other	48% 34% 19%	51% * 38% * 11% *
Fuel for cooking *	Kerosene, LPG Wood	21% 78%	35% * 65% *
Electricity and telephone			
Electricity supply		86%	58%
Source of electricity	PLN Private No electricity	64% 34% 14%	53% 5% 42%
Lighting in main street		24%	
Telephone connections	Cable Cellphone **	21% 80-90% **	4%

Source: Calculated from data Potensi Desa (2005) and other government statistics.

* Figures given in Potensi Desa apply to entire villages only, without stating to how many households it applies. Percentage of households in the above table is calculated from the number of households in the villages concerned compared to the total number of households in all 232 villages.

If for a particular item the % of households is clearly larger than the % of villages, the conclusion van be drawn that the item applies more to larger villages than to smaller villages and vice versa. For example, “mainly overland transport” applies to 16% of the villages but to 23% of the households, indicating that it applies more to large than to small villages.

** Estimated figure. The Podes data of 2005 show a figure of 59% but coverage has widely increased in recent years, and even in remote villages without electricity handphones are being used, with in the evening people flocking around a few privately-owned generators to recharge the batteries.

Table 2.2 – Other facilities

Facility		No. of facilities	No. of villages per facility (232 villages)	No. of households per facility (113,342 hh)
Market place *	(semi)permanent Non-permanent	27 70	8.6 3.3	4,198 1,619
Cooperatives	KUD Non KUD	48 45	4.8 5.2	2,361 2,519
Postal service	Post office Pos Keliling Small tel./post shop	15 22 49	15.5 10.5 4.7	7,556 5,152 2,313
Security	Police office Village security (Pos Hansip/Kamling)	40 225	5.8 1.0	2,836 504
Education	TK, Kindergarten SD, Primary school SMP, Junior secondary school SMU, Senior secondary school	148 621 106 44	1.6 0.4 2.2 5.3	765 183 1,069 2.576
Health care	Balai pengobatan (treatment centre) Puskesmas (health centre) Pustu (auxiliary health centre)	21 40 126	11.0 5.8 1.8	5,397 2,833 890
Small home enterprises	Wood work Metal work Others Total	118 95 194 407	 0.6	 278

2.3 Other investigations

Besides the six villages mentioned above, many other parts of the ex-PLG area have been visitied to assess the conditions regarding rural infrastruucture. Discussions were held with relevant authorities, both at desa, (sub)district and provincial level. Documents and experiences were reviewed from lowland areas in other provinces, as well as from other programmes or projects active in rural infrastructure development in Indonesia.

Table 2.3 – Infrastructure and facilities in sample villages

	Katunjung	Rantau Jaya	Menggala Permai
Main access Internal accessibility Means of transport	Kapuas River No public transport Concrete village road damaged by flood, small perahus for access to fields car none motorcycle none bicycle 15 persons perahu 50 persons	Road (poor condition) and river/canal Public transport over river only Internal roads muddy in wet season, many bridges missing car none motorcycle 7 persons bicycle 70 persons perahu 6 persons	Gravel road No public transport Internal roads muddy in wet season, many bridges missing car none motorcycle 90 persons bicycle 200 persons perahu 4 persons
Drinking water supply	From Kapuas River No wells 10% uses rainwater	100% uses rainwater 3 communal deep wells (36 m deep) 10 individual wells, 30-40 m deep Canal water unsuitable	100% uses rainwater 2 deep wells (150 m) with hand pump 1 deep well under construction Shallow wells poor quality In dry season collect water from Kapuas or Mengkatip River
Sanitation	0% WC near house 100% WC on river bank	100% WC near house 0% WC on river/canal bank	95% WC near house 5% WC on canal bank
Electricity	No PLN connection 40% of households own generator	No PLN connection\ 5% of households own generator	No PLN connection 13 families own generator, 8 hr per day
Telephone Hand phone	Not available 50 persons have handphone	Not available 30 persons have handphone	Not available 120 persons have handphone
Relative ranking of preferred interventions in infrastructure	Priority 1 No data Priority 2 Priority 3 Priority 4	Priority 1 Domestic water supply Priority 2 Access road Priority 3 Hydraulic infrastructure	Priority 1 Improve access road Priority 2 Domestic water supply Priority 3 Hydraulic infrastructure Priority 4 School building

Source: Village workshops early 2008 and follow-up visits

Table 1.3 continued – Infrastructure and facilities in sample villages

	Pilang	Gandang	Bahaur Hilir
Main access Internal accessibility Means of transport	Provincial road No public transport ??? Concrete village road 1500 m Small perahus for access to fields car 8 persons motorcycle 42 persons bicycle 70 persons perahu 210 persons	Road and river Public transport over river only Internal roads partly in poor condition Access to field over land only car none motorcycle 120 persons bicycle 1200 persons perahu 2 persons	Road and river (road being upgraded) Public transport over river only Several concrete village roads. Access to field over land and water car 6 persons motorcycle 300 persons bicycle 100 persons perahu 250 persons
Drinking water supply	20% uses rainwater 75% uses river water) with alum or 25% uses canal water) kaporit 7 groundwater wells (20 - 30 m deep) with hand pump, good quality water	90% uses rainwater 75% uses river water) with alum or 25% uses canal water) kaporit River/canal water brackish in dry season 1 groundwater well with pump, 15 m deep, acid water	100% uses rainwater In wet season water from Kahayan River, in dry season buy water from Pulang Pisau at Rp.15,000 per drum. Water from deep well (200 m) brackish Treatment plant under construction, using river water.
Sanitation	10% WC near house 90% WC on river bank	60% WC near house 40% WC in canal/river bank	10% WC near house 90% WC on river/canal bank
Electricity	75% connected to PLN	80% connected to PLN	85% connected to PLN
Telephone Handphone	Not available 200 persons have handphone	3 households (wireless connection) 50% of households have handphone	Not available 90% of households have handphone
Relative ranking of preferred interventions in infrastructure	Priority 1 Road from village to fields Priority 2 Domestic water supply Priority 3 Hydraulic infrastructure Priority 4 School building	Priority 1 Hydraulic infrastructure Priority 2 Improve main access road Priority 3 Domestic water supply Priority 4 School building	Priority 1 Access road Priority 2 Domestic water supply Priority 3 Rehabilitation shallow handils Priority 4 Extent electricity network

Source: Village workshops early 2008 and follow-up visits

3 Transport Infrastructure

3.1 Importance of transport infrastructure

The availability of an efficient transport and communication infrastructure is critical not only for agricultural production, but for any socio-economic development activity to take place. Prices at village level of construction materials, farm inputs and all other goods rise sharply if access is poor, while income received from the villagers' produce will decrease. Only if year-round access is available will merchants and government staff regularly visit the area to bring goods, materials, information and new ideas, and to buy any surplus produced by the villagers.

Internal village roads and farm roads to the fields are equally important. A good farm road can make the difference between farmers growing two crops and those who grow only one crop because handling and transporting the first crop's harvest takes too much time.

3.2 Present situation

External accessibility

Traditionally, villages in the area were situated close to a river and transport took place by boat. The vastness of the area and the swampy nature of the soils did not favour road construction. To date access to 26% of the villages, mostly smaller villages, still only have water transport, while 56% uses both land and water transport, but the road network is gradually being expanded.

Government sponsored transmigrant villages in the area are typically situated away from rivers and depend entirely on road access. Inspection roads along the main canals traversing the schemes connect the villages to the regional road network. The condition of the road network, however, is still rather poor, and overall only 19% of the desas have an asphalt or concrete access road, which is far below the nation-wide average of 74%.

Outside access to the area has greatly improved since the construction of bridges over the Kapuas and Kahayan rivers near Kuala Kapuas and Pulang Pisau respectively, with travel time from Palangkaraya to Banjarmasin now some 4 to 5 hours. At Mandomai a car ferry is available to cross the Kapuas River, connecting to a road northwards to the Lamunti area and Mantangai.

The main road network in the area is shown on Map X and summarized in Table 3.1. While the national road is in good condition, non-paved sections of provincial and district roads are often difficult to during the wet season.

Internal accessibility

In the traditional villages water transport was always far more important than transport over land, at least until recently, and village roads are often not more than foot-paths in between the houses. Also access to agricultural fields or forest sites was traditionally mostly by small perahu through the natural or excavated creeks and handils. The lack of any roads from the village to the fields is a constraint to agricultural development of these areas, as transport of seeds, fertilizer and the crop produce through the winding and shallow handils is often very cumbersome.

Table 3.1 – Roads within the EMRP area

Type of road	Stretch	Length km	Kind of surfacing
National	Palangkaraya – Banjarmasin	170 km (142km in EMRP)	Asphalt
Provincial	Kuala Kapuas – Palingkau	25 km	Asphalt
	Palingkau – Dadahup – Lamunti – Mentangai	89 km	Asphalt/gravel
	Gohong – Bahaur Hilir	80 km	Asphalt/gravel
District:			
- Pulang Pisau	Pulang Pisau – Mandomai	14 km	Asphalt
- Kuala Kapuas	Kuala Kapuas – Mandomai – Palingkau	45 km	Gravel
	Palingkau – Lamunti	40 km	Gravel
- Barito Selatan	-.-		
Desa:			
- Pulang Pisau		1,987 km	Earth/gravel
- Kuala Kapuas		2,513 km	Earth/gravel
- Barito Selatan		844 km	Earth/gravel
Inspection road PU	Along all main canals in transmigration areas		

Internal access within the transmigrant villages is generally better than in the traditional area. Villages have usually been laid out spaciously, with a rectangular grid of roads at least 3 to 5 m wide. Each house is surrounded by a 0.25 ha houselot and most of the houselots border on one side to a village road. Access from the village to the agricultural fields is provided by tracks on the embankments of the secondary and tertiary canals, Often, these tracks are adequate for pedestrians and if properly shaped also for (motor)bikes, but not wide enough for small trucks or tractors. Moreover, in many places the tracks are cut by (quaternary) ditches connecting the ricefields to the canals without a proper crossing structure (pipe or culvert). Even if the embankment itself would be wide enough, these ditch crossings still cause problems for tractors or mechanized transport.

Figure 3.1 shows two typical examples of settlement layout in transmigrant villages, both with the standard 0.25 ha houselots and 2.0 ha farm fields:

(a) Lamunti, settled in mid 1990s, with the village area stretched along the secondary canal:

- not all houselots border a village road
- due to the 600 m wide spacing of the tertiary canals, farm roads are also spaced every 600 m, and many farmers' fields have no direct access to a farm road
- Maximum walking distance from house to field is 2500 m farm road plus 300 m field.

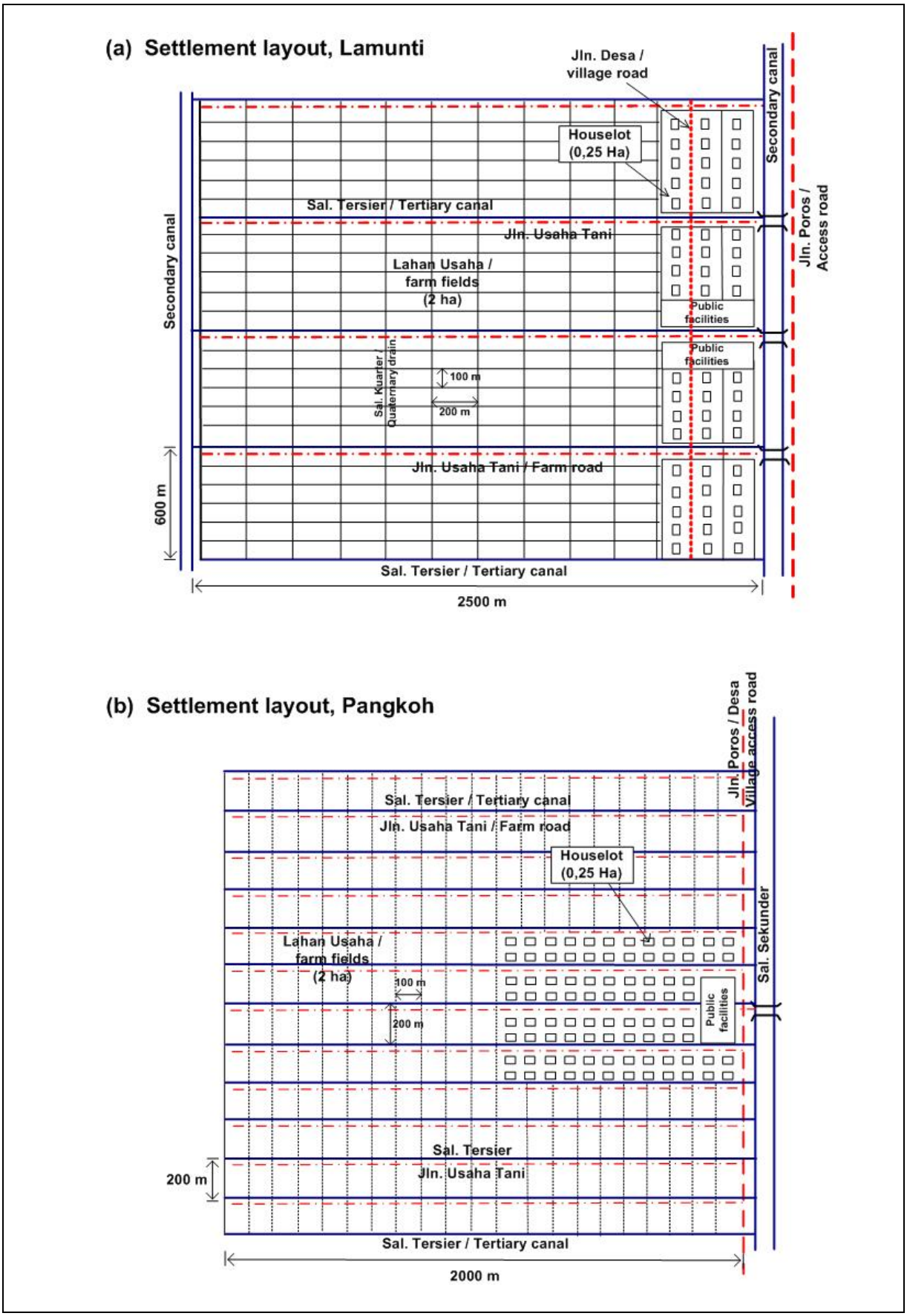


Figure 3.1 – Typical settlement layout in transmigration villages

To improve water management in Lamunti, a program is now planned for installation of 2 to 3 m wide quaternary ditsches perpendicular to the tertiaries. These would then cut through the farm roads, and crossing structures would be needed, adding considerably to the construction costs.

(b) Pangkoh, settled in early 1980s, with more concentrated village areas:

- all houselots borders a village road
- tertiary canals and farm roads spaced every 200 m and each farmers' field has direct access to a farm road
- Maximum walking distance is 2600 m over access and farm road.

It will be clear that the Pangkoh layout gives better access to the field, even though the concentrated village layout slightly increases the distances to fields along tertiaries which do not pass through the village area.

Figure 3.2 – Canal embankment shaped into farm road for motorcycles and small carts.

3.3 Options for improvement

Land or water transport?

The original system of water transport is in many places being replaced by road transport. Advantages of road transport are:

- no loading and unloading of vessels required
- generally cheaper
- "door-to-door" traveling, while traveling over water always involves walking or traveling by other means to and from a jetty
- independent of shallow waters in rivers or canals during low tide

However, for bulk goods, and especially those which are shipped by boat to or from outside the region, water transport may still be preferable, also inside the region to the harbours at Kapuas, Pulang Pisau, and Kereng Bangkirai. Another reason to

maintain or even stimulate water transport is the destructive effect of heavy lorries on roads in soft-soil environments. Besides the three harbours, there are 22 jetties in the area, one on the Sebangau, 6 on the Kahayan and 8 each on the Kapuas and Barito rivers.

Also for coastal and riverine villages in remote areas water transport is likely to remain the only option for the near future. Road construction to coastal areas is notoriously difficult because of soft soils and regular tidal flooding, while roads to remote, sparsely populated areas may economically not be justified, especially if more densely populated areas still lack proper road access as well. To compensate for lack of road access to these villages, and to avoid jealousy and the development here lagging behind, measures should be considered to facilitate water transport: adequate jetties, and regular, if necessary subsidized, public boat services to these villages from the Kecamatan center or other places with road access.

Village roads

Most villages in the area will ultimately have to be provided with year-round road access. Priority should be given to Kecamatan centers and other larger villages. While external access roads are primarily the responsibility of the government, for internal village roads and farm roads the local inhabitants could well be asked to contribute to the construction by providing labour and/or materials. Larger entities, organizations or companies operating in the area could also be asked to contribute financially. Local initiatives to improve accessibility should be strongly encouraged and supported. For different implementation options see Chapter 5.

Access to conservation areas

Within the EMRP there are sizable areas earmarked for conservation, which raises the question whether or not roads should be constructed at all in these areas. Roads have a direct impact on the hydrology of the area as the road embankment will block surface runoff and the compacted road body will reduce groundwater flows. Incorporating a great number of culverts or bridges in the road design may to a certain extent mitigate these effects, but will of course considerably raise the construction costs.

But possibly more damaging is the fact that roads invariably attract people to venture into the area for collection of forest products, tree cutting, opening plots for agriculture, and for settling and building houses along the road. Such activities are of course not compatible with the conservation objective of the area. Although in principle they could be prohibited by government regulations, in practice such activities are very difficult to control and the best option might be not to build the road in the first place. On the other hand, some means of access are needed for guards and managers of the conservation areas, fire brigades etc. In each case, a careful assessment needs to be made of advantages and disadvantages of a proposed road, alternative road alignments and/or transport options, and the risks posed to the conservation value of the area. Remote villages in these areas may have to rely on water access for some time to come.

3.4 Design aspects

Planning and development of the regional road network is beyond the scope of this note on rural infrastructure and will not be dealt with here. Notes and huidelines on design of rural infrastructure are available from central (PU, Pertanian) and regional government services (websites see references). Below a few remarks are made regarding planning and designs of (improvement of) villages roads and farm tracks (jalan usaha tani).

Alignment of the roads

Improvement of village roads usually involves the upgrading of existing roads or paths, while development of farm tracks often involves improvement and widening of (tertiary) canal embankments and/or the planning of new alignments. Most often the preferred alignment is already indicated by the local government or the villagers themselves. For the design, the normally for road construction required surveys on traffic densities, transport requirements, socio-economic, hydrological and soil mechanical conditions, can usually be omitted and use can be made of standard designs. Nevertheless, due attention should be paid to the following.

Socio-economic aspects

- Is the alignment the most economical one in terms of the shortest alignment serving the most houselots or fields, while crossing the least number of canals and streams?
- Is the choice of the alignment really supported by the majority of the people and not influenced by one or two important families or businesses along the alignment?
- Does the alignment fits well into the overall road plan of the village or area?
- Will other traffic use the road besides direct traffic to houses or fields along it? If so, the road dimensions and type of construction may have to be adjusted.
- Are there any claims on the land followed by the alignment? This is especially important in case an existing road has to be widened or a new alignment is followed.

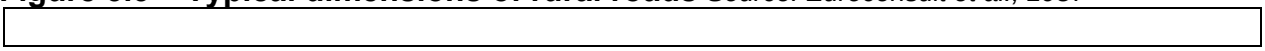
Technical aspects

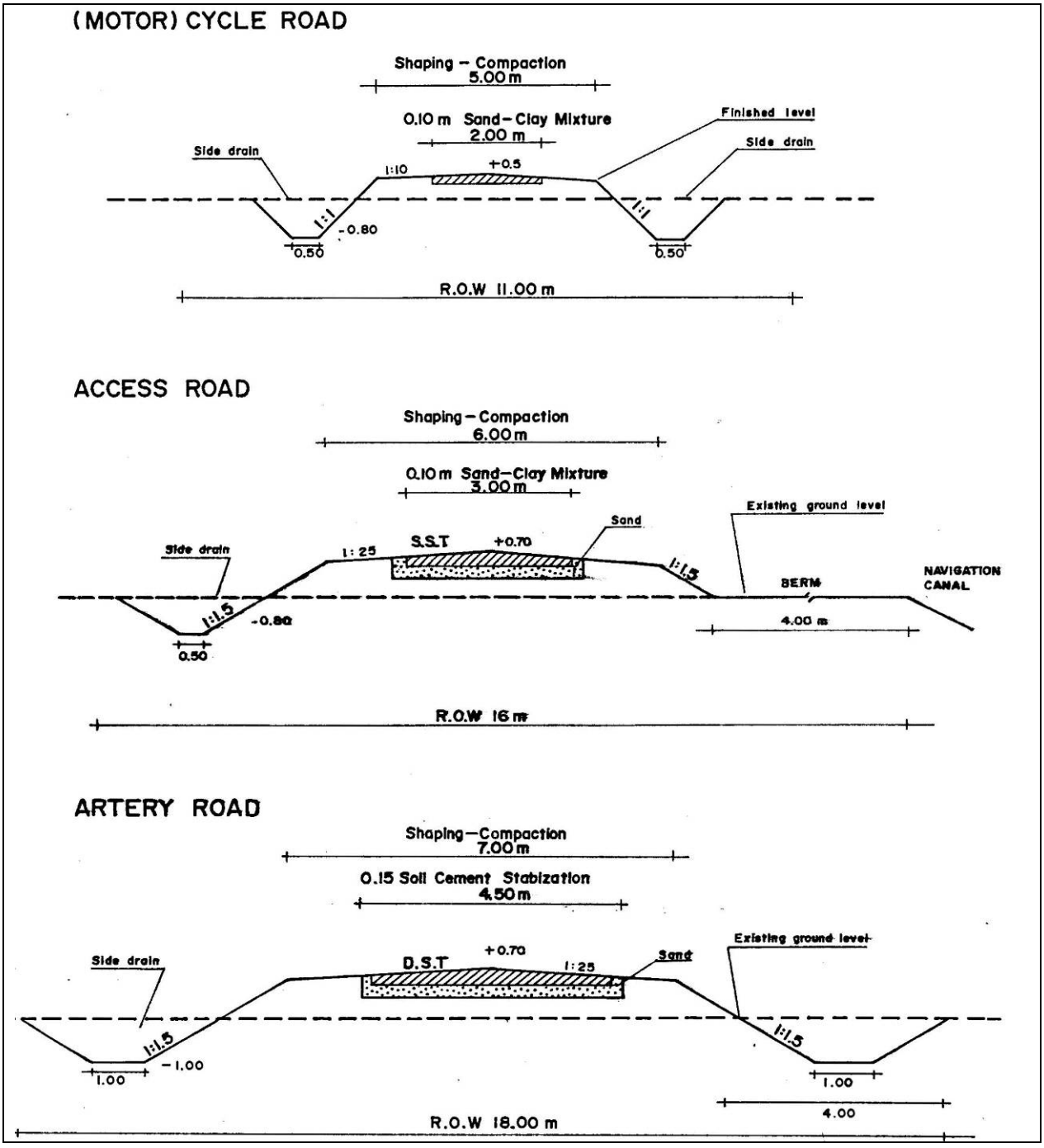
- Type of vehicles likely to use the road, now and in the future
- Sufficient wide right-of-way to allow for future upgrading of the road
- Number, type and width of canals or streams to be crossed
- In case navigable canals are crossed, type of vessels using the canal and required height of the bridge above the (tidal) high water-level
- If the alignment is subject to flooding, what is the maximum flood depth and the required height of the road embankment to avoid overtopping. Are additional culverts required to avoid building up of water pressure by different water depth on either side of the road embankment?
- Distance of (widened) road to nearest canal, and risk of soil sliding into the canal
- Sources and transport routes of materials and equipment required for the road construction

Width of the road

With limited motorized traffic on village roads, road width is typically minimized with only a cheap pavement in order to reduce costs. However, in many cases this might be the wrong decision as future traffic will increase, especially when external access has been improved, and even for farm roads sooner or later people will want to transport goods by small truck. Decisions on road widths should anticipate these developments - widening a narrow road or path later may be more complicated and more costly as people will have put claims on the land. A minimum top width of the road embankments of 5 m is recommended, for small farm roads this might be reduced to 3 m. Figure 3.3 shows typical dimensions of rural roads in lowland areas.

Figure 3.3 – Typical dimensions of rural roads *Source: Euroconsult et al., 1987*





Drainage

Soils with a high groundwater table have a low bearing capacity and traffic will have a destructive effect on the road surface and road body. Drainage is essential, and can be provided either by side drains along the road or by an elevated road body (e. g. a canal embankment) of at least some 50 cm height. Drains, at least 50 cm deep and a top width of 1 to 2 m will evidently increase the space needed for the road, and will require simple culverts or wooden planks to cross the drain for access the houselots and farm lands along the road. At regular distances the road drains should have outfalls to larger drains, canals, or streams.

In peat soils with high groundwater tables the drains will locally lower the groundwater table and hence cause increased subsidence of the soil. This will further be stimulated by an elevated road body of sand or other imported material,

and by heavy vehicles using the road. To keep the road free of flooding after subsidence, either the drains have to be deepened or the road body has to be raised by adding another layer of soil. Deepening the drains will cause further subsidence because of lower drainage, and after a while the drains may have to be deepened again. However, increasing the weight of the road body by adding soil will make it sink faster into the peat and after a while another layer of soil needs to be added. For a road on deep peat soils in Western Johore, Malaysia, after 20 years a subsidence of 2.0 m was reported while subsidence of the surrounding area was only 60 cm (Department of Irrigation and Drainage, 2001, p.101).

Subgrade or road body

In normal soil conditions, the subgrade or road body will be built from locally available soil on top of the existing land surface after removal of topsoil material rich in organic material. The soil is then compacted to form the sub-base of the road. In swamp areas with very soft clay or peat soils, two major problems are encountered:

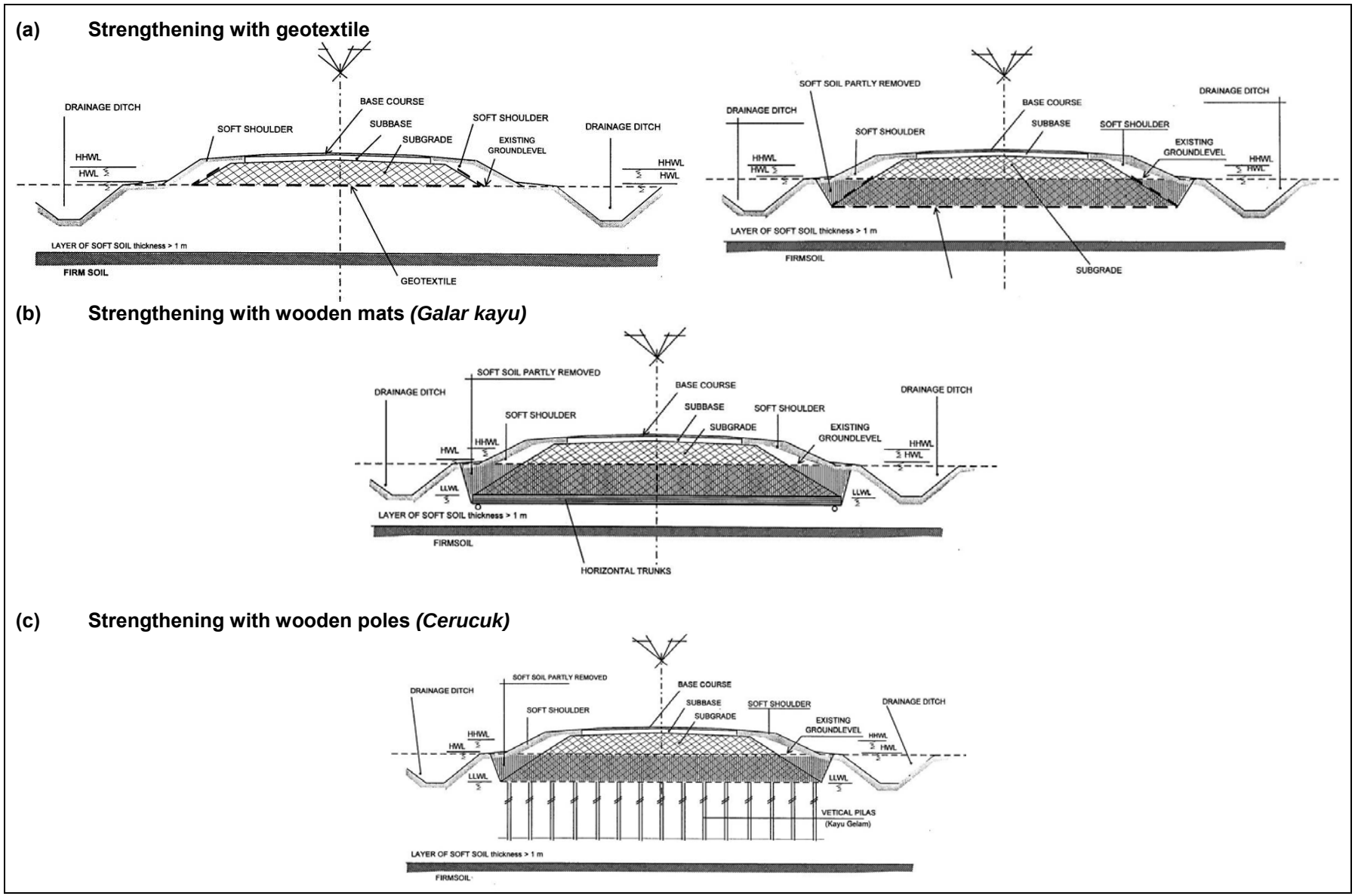
- The road body should be sufficiently high to keep the road free from flooding, but locally available soil material to built the road body is of poor quality;
- The weight of the road body and traffic will cause subsidence of the underlying soil.

Methods to address these problems include:

- *Galar kayu*: after removal of the topsoil one or two layer of small trees or poles (diameter 8 to 10 cm) is installed to spread the weight of the road body and traffic;
- *Cerucuk*: vertical wooden poles, usually 4 m long and spaced at intervals 3 to 4 times the diameter of the poles. Even if not reaching a firm subsoil, the effect of the poles will be a considerable reduction of subsidence.
- A layer of geotextile, often in combination with *galar kayu*, to protect the road body against upward moving water or mud following traffic pressure;
- Removal of peat soil and/or building up the road body from better soil material imported from elsewhere. This could be an option for areas with shallow peat soils. Light-weight granular fill is preferred to avoid rapid subsidence, but not too light as the material then might start floating in case of high groundwater levels.

Typical cross sections are shown in Figure 3.4. In spite of such measures in deep peat areas subsidence of the road body cannot be avoided, and the road will have to be raised from time to time with a new soil layer to avoid flooding of the road.

Figure 3.4 – Road cross section with subgrade strengthening *(Source: PU/ISDP, 1995)*



Pavement

Types of pavements include:

- Compacted, locally available earth
- Pavement of a layer of gravel and sand (Sirtu)
- Asphalt (Buras)
- Lapen (lapisan penetrasi)
- Concrete

In selecting which type of pavement to apply, one should consider the 'whole life' costs of the road, i.e. not only the initial construction costs but also the annual maintenance costs. Routine maintenance costs tend to be considerably lower for well-constructed asphalt and concrete roads than for earth and gravel roads. Therefore, although initial costs are much higher, the 'whole life' costs of a paved road might be cheaper than an unpaved road. Faster, safer and more convenient transport over a paved road will of course also contribute to their economic advantage over unpaved roads.

The width of the pavement does not necessarily have to follow the width of the road embankment (minus shoulders). One might consider a narrow motorcycle lane only which in the future, as needs arises, could be widened for use by cars.

Example of gravel-paved roads, the most common type of pavement used presently for upgrading of rural roads in the ex-PLG area, are shown in Figure 3.5.

Figure 3.5 – Examples of gravel paved roads

Properly constructed, with suffieciently sides
wide shoulders

No shoulders, gravel will be pushed to the

by traffic and will be washed away by rainfall.

3.5 Culverts and bridges

Where a road crosses canals or natural streams, culverts or bridges need to be constructed. The shape and size of the required opening depends on the maximum discharge which can be expected in the water course with allowable hydraulic head losses, and on the minimum drainage dpeth required in the area. The maximum

discharge, allowable head losses and required minimum drainage depth of canals follows from the hydraulic design of the canal. The maximum discharge in natural streams depends on the size, shape and slope of the catchment area and on expected peak rainfall, and a first assessment can be made with standard hydrological formulas such as the Ratoional Method. However, in flat areas with practically zero terrain slope the results may be ambiguous and should always be checked with carefull on-site observations of flows and flood marks, and by interviewing local inhabitants. The same holds for tidal areas, where the daily tidal in- and outflow may far exceed the theoretical drainage requirements.

Structural designs follow standard procedures and are not dealt with in this note. In soft soils normally a foundation of *cerucuk*, or vertical wooden *gelam* poles is used. In peat soils, the design should take into account future subsidence of the surrounding area which will require a lower bottom level of the culvert than presently is needed for minimum drainage. Future subsidence of the road embankment will affect the culvert or bridge approaches, which therefore may also need to be designed on a foundation of wooden piles.

Farm roads or paths are frequently crossed by small ditches made by the farmers to connect their lands to the tertiary canal. The village government and leaders of farmer groups or P3As should always insist that the farmer uses bamboo or plastic pipes for the crossings, well covered with soil to allow safe passage of motorcycles and small carts.

3.6 Jetties

Where water- and land-transport meet, jetties are required for loading and unloading of people and goods. Size, shape and structural requirements of the jetty depend on the kind of vessels and cars to make use of the jetty, expected transport flows, conditions of the canal or river bed and embankment, direction and strength of currents, and space on the river bank for access, parking, apron etc.

In principle two types of jetties are distnguished:

- Wharf type, close to and parallel to the river bank
- Jetty type, either T-shaped, L-shaped of I-shaped, usually consisting pof a platform in the river connected to the river bank by a bridge or extension of the jetty.

The required dimensions are mainly determined by the size of ships and the number of vessels to make simultaneous use of the jetty. Structural design should take into account both the vertical loads to be supported (goods, cars, people) and horizontal pressure caused by mooring of ships (maximum weight, velocity and angle of approach) as well as pull forces caused by winds and currents pulling on ships already moored to the jetty. The calculation methods are fairly standard and are not dealt with in this note.

3.7 Costs of rural roads

Main factors influencing the costs of road construction in lowlands include the height of the required embankment, the kind of pavement used, and whether or not special measures (e.g. foundation poles or *cerucuk*, geotextile) are needed. Some general cost figures are given below, excluding bridges, culverts and other special items which may be needed.

Table 3.2 – Construction costs of gravel roads

Width of road	Height of embankment	Pavement	Costs in million Rp. per 1,000 m				
			Road body	Geotextile	Pavement	Others	Total
2 m	0	20 cm gravel	11	0	71	7	90
	0.50 m	20 cm gravel	70	106	71	10	257
4 m	0	20 cm gravel	12	0	136	13	161
	0.50 m	20 cm gravel	114	175	136	16	441

4 Drinking Water and Sanitation

4.1 Introduction

Though abundant in water, good quality water for domestic use is scarce in the area. Villages along the rivers upstream of the zone of sea water intrusion use river water, either directly or after simple treatment. Canal water and shallow groundwater are often strongly acid and polluted by organic substances, and therefore not fit for human consumption unless following a much more elaborate treatment. Deep groundwater (below 100 m) has been tapped in several places and mostly found suitable, but the high installation and operation costs are a drawback. Rainwater collection and storage is practiced almost everywhere, but cannot cover needs during the dry season.

The District capitals and some of the Kecamatan capitals have piped water distribution systems using treated river water. The systems are operated by semi-government water supply companies (PDAM). However, the large majority of the villages in the area still depend on untreated river water or rainwater using their own individual facilities. Health problems related to poor water supply are frequently reported, such as diarrhea and other intestinal diseases, skin irritations, etc.

This chapter reviews the experience so far in the ex-PLG area, and describes various options available for improving the water supply and sanitation facilities.

4.2 Present situation, water supply

Statistical information

Statistical information on water supply is given for the entire ex-PLG area in Chapter 2, Table 2.1. Some additional information per district is given in Table 4.1. In 62% of the villages river water is the main source of drinking water, while 23% of the villages depend mainly on rain water collection. The remainder either use water from deep wells, or are connected to one of the PDAM systems. In 18% of the villages the people at some time during the year have to buy water from outside the area.

Table 4.1 – Drinking water supply facilities per District

Water supply facilities	Pulang Pisau District		Kapuas District		Barito Selatan District	
	No. of HH (total 30,480)	%	No. of HH (total 86,912)	%	No. of HH (total 29,232)	%
Individual water facilities	14,875	49%	34,882	40%	11,616	40%
Communal facilities	2,754	9%	10,793	12%	4,857	17%
Public facilities	6,775	22%	3,614	4%	6,003	21%
No facilities	6,076	20%	37,623	43%	6,756	23%
Families ever buying water	811	3%	12,173	14%	8,811	30%

Source: BPS Central Kalimantan

Drinking water supply is still especially problematic in the ex-PLG transmigration sites, with villages situated far from the main rivers, and surface water strongly polluted by soil acidity. Various technical solutions have been implemented over the years, but many of the constructed systems stopped functioning after a while due to insufficient attention to management after construction, and a lack of budget and expertise among the communities for operation and repairs after breakdowns.

Results of village workshops

The main results of the village workshops organized by the project in early 2008 are summarized in Chapter 2, Table 2.3. The results are largely in line with the statistical information given above, i.e. close to the rivers river water is the main source of drinking water, while villages further away largely depend on rainwater. In the latter villages groundwater from deep wells is increasingly being exploited. Among preferred interventions in infrastructure development, domestic water supply overall ranks second only after improvement of accessibility.

Some additional information from the workshops on past and presents efforts to improve the water supply are given below.

Desa Manggala Permai (UPT Dadahup G5)

- The government ever assisted with provision of individual treatment systems (SaRut) but people lacked the means and capabilitis to maintain the systems. All are out of order.
- During the wet season rainwater is used without treatment. Many fibreglass collection tanks provided by the Government 10 years ago are at the end of their lifetime.
- In the dry season water is collected from the Kapuas or Mengkatib River by perahu or small truck.
- Two deep wells (over 100 m) with hand pump serve 277 households (943 persons), a third well is under construction. Shallow groundwater proved to be of unusable.

Gandang

- Assistance by the Social Affairs Department (Dinsos) to install of 25 individual treatment systems (SaRut) was rejected by the people because all other families would not receive assistance. The installations have now been distributed to each group of households (Rukun Tetangga, RT) for communal use.
- There is one deep well with hand pump for communal use.
- During the wet season canal water is used, and treated with alum or kaporit, but the water becomes brackish in the dry season. People then queu to get water from the deep well.
- Shallow wells (10-15 m) give reasonable clear, though acid, water in some places, but elsewhere the water is as turbid as the canal water.

Desa Bahaur Hilir

- In 2005 two deep wells till 200 m were installed, but water quality was poor.
- In 2007 a communal treatment system (SIPAS) was installed using river water, but the plant is not yet in operation.

- During the wet season rainwater is used as well as river water.
- During the dry season the river water becomes saline and people buy drinking water from Pulang Pisau at Rp. 15,000 per drum.

Desa Pilang

- Assistance by the Government to install individual treatment systems (SaRut) for poor families was rejected as unfair, because all families would need such a system.
- Although there are wells with a good water supply, people prefer river water because they are used to it, and they consider getting water from the river more convenient.
- For drinking purposes the water is often treated with alum or kaporit.

Desa Katunjung

- Most families use untreated river water.
- All families have rainwater collection tanks made from various material (iron drums, fibreglass, plastic tanks), but the collected water is frequently infested with mosquito larvae, while insecticides like Abate are not available in the village.

Desa Rantau Jaya (Lamunti A5)

- At the start in 1998 each family received 5 fibreglass tanks for rainwater collection, but having reached the end of their lifetime most tanks are out of order and the families now do with one or two tanks only.
- The Bethel Foundation (Yayasan Betel) built 3 wells with a depth of 36 m, and some more wells are now being constructed by the people themselves.

4.3 Present situation, sanitation

The vast majority of the population uses rivers and canals for so-called MCK: Mandi, Cuci, Kakhus, or bathing, washing and toilet. Small wooden, fixed or floating platforms are built on the bank of the water course to access the water, together with a simple shed, often without roof, to serve as toilet. If at the same location river or canal water is fetched for drinking purposes or kitchen use, there is an obvious health risk. In the large rivers with a continuous water flow the risk may be relatively small, but not so in small canals with stagnant water. Here the use of proper toilets near the houses should be strongly promoted. So far, some 40% of the households have their own toilet, mostly above a soil pit. Use of sceptic tanks is still very limited.

Waste is often either thrown into a river or canal, or dumped somewhere on land without further attention (burying and/or burning). As long as quantities are small this may not be too serious, but in the long run it poses serious health risks. Waste thrrown in the river will cause water quality deterioration, and in smaller rivers or canals may block the flow of the water which in turn also has detrimental effects on water quality. Thrown away on land it will form breeding places for flys, mosquitos, rats etc.

Statistical information on sanitation aspects is given for the entire ex-PLG area in Chapter 2, Table 2.1. Table 4.2 gives some figures per district, while Table 2.3 summarizes the survey results in the six selected sample villages.

Table 4.2 – Sanitation data per District

	Pulang Pisau District		Kapuas District		Barito Selatan District	
	No. of HH (total 30,480)	%	No. of HH (total 86,912)	%	No. of HH (total 29,232)	%
Sceptic tank	856	3%	12,868	3%	8,667	30%
Pond, sawah	50	0.2%	1,251	0.2%	93	0.3%
River, canal	16,203	53%	60,013	53%	15,327	52%
Soil pit	13,221	43%	12,333	43%	4,920	17%
Garden, shore	100	0.3%	139	0.3%	45	0.1%
Others	50	0.2%	308	0.2%	180	0.6%

Source: BPS Central Kalimantan

4.4 Potential water sources

There are in principle three sources of water for domestic use: surface water (rivers and canals), groundwater, to be distinguished in shallow and deep groundwater, and rain water.

Surface water

The area is traversed or bordered by four main rivers, from east to west the Barito, Kapuas, Kahayan and Sebangau rivers, with a few important tributaries like the Mantangai and Mengkatib rivers. The rivers are at several places connected to each other by natural or man-made (anjir) channels. With an abundant flow, the rivers and anjirs are widely used for domestic water supply. The quality of the river water is monitored at several locations by the Department of Environment (Badan Pengelola dan Pelestarian Lingkungan Hidup), see Table 4.3. Outside the coastal zone with saline water intrusion, the water of the main rivers, Barito, Kapuas and Kahayan, is of sufficient quality to serve as raw water source for drinking water supply, but the water of the Sebangau and other smaller rivers is too heavily polluted by drainage water from extensive peat lands and strongly acid soils in their basin areas.

Table 4.3 – Water quality of major rivers (dry season 2007)

Characteristic	Unit	Barito River Buntok	Kapuas River Mantangai	Kahayan River Jabiren	Sebangau River Bantanan	Saluran Induk Ex-PLG	Quality standard
Conductivity	µmhos/cm	16.7	16.8	16.5	46.8	3.7	
TDS	mg/l	61	62	42	80		1000
pH	-	6.9	7.1	6.9	4.0	4.0	6.0 – 9.0
Iron	mg/l	0.6		1.1			0.3
COD	mg/l	18.1	44.9	30	143	76	25
Dissolved O_2	mg/l	4.5	3.9	3.8	3.6	4.6	min. 4
Nitrate	mg/l	0.23	2.3	2.38	1.47	0.60	10
Sulphate	mg/l	2.21	6.8	13.2	0.77		-

Notes:

- Date of samples: Saluran Induk data from 2003, all other data from Sept./Oct. 2007, iron content August 2006.
- Quality standard from PP 28/2001, Class II

Source: Laporan Hasil Analisa Sample Air Tahun 2007, Badan Pengelola dan Pelestarian Lingkungan Hidup Daerah Propinsi Kalimantan Tengah. Data of Saluran Induk from UNPAR, 2003.

The same applies to the water of the drainage canals in the transmigration settlement areas, and to many of the small traditional canals or handils extending from the river into the peaty or acid soils of the interior. The water is characteristically clear and free of sediments but dark brown or black coloured, with a high organic matter content (reflected in a high COD value, or chemical oxygen demand), and strongly acid with pH values around 4.0. An example of the ex-PLG main canal is Table 4.3, further examples of peat water quality are shown in Annex IV.

Groundwater

Shallow groundwater is found everywhere at a depth of a few decimeters to a few meters below the surface. Almost everywhere, however, the water is heavily influenced by the peat and acid soil conditions, probably to a depth of at least 10 to 15 m, and is in most places unsuitable for drinking water purposes. Various treatment methods have been tested in the past but even with relatively sophisticated processes the resulting water quality rarely meets the standards for drinking water, while the installations require complex operation and are sensitive to breakdowns in the typical conditions of lowland transmigration sites. For further details on peat water characteristics and treatment see Annex IV.

Deep groundwater offers better prospects. The water is present in confined to semi-confined aquifers of the Dahor formation, consisting of sand/gravel layers of variable thickness separated by layers of more loamy material (PT Dekama Sekata, 2006). Project staff visited several villages with deep wells in the area, and many had relatively good quality water with the exception of two wells in Bahaur Hilir which were affected by sea water intrusion. See Table 4.4. Water from deep wells constructed in the recently established transmigration site of Anjir Pulang Pisau is unsuitable for drinking purposes due to smell and a high iron content.

Fourteen deep wells were constructed in 2005 by the Swampland Development Project of PU (Proyek Pengembangan Daerah Rawa, P2DR) and equipped with storage tank and public stand. Many of these wells are still in good condition and functioning well, see Table 4.6. Some water quality figures of the Dadahup area are given in Table 4.5

Table 4.4 – Observations on groundwater quality

Desa	Quality of groundwater		
	< 15 m	15 m – 50 m	> 100 m
Menggala Permai	Turbid	Turbid	3 wells: clear, slightly smelly
Gandang	Clear, acid	Clear	-
Bahaur Hilir	-	-	2 wells: brackish, smelly
Pilang	Turbid, dark coloured	Clear, acid	-
Katunjung	Turbid, dark coloured	Clear, acid	-
Rantau Jaya	-	Clear	-

Source: Field visits, 22 – 24 April 2008

Table 4.5 – Water quality of wells in Dadahup, A1, A2 and A5

No.	Parameter	A1	A2	A5	Quality standard for drinking water
1	Colour,TCU	25	40	30	15
2	pH	5,6	5,6	5,8	6,5 – 8,5
3	Iron, mg/l	0,8	1,5	0,9	0,3
4	Organic matter, mg/l $KMnO_4$	65	70	85	-

Sumber :- Isnaniawardhana, jurnal Teknik Lingkungan ITB,2006(Final report Evaluasi Sistem penyediaan air Minum di Wilayah PLG) dan - Baku Mutu Air Minum Kepmenkes No.907/2002

No geo-hydrological maps are available from the area which might help to determine future sites for well construction. Geo-electrical surveys could be carried out in selected areas, but will not give absolute answers. The present trial and error approach has proven that suitable groundwater is available in many places and that there is likely to be ample scope for expansion and installation of more wells. No information is available on reliable yields of the wells, but nowhere complaints were heard about inadequate quantitative supplies.

Table 4.6 – Location of deep wells in the ex-PLG schemes (Kabupaten Kapuas)

	Kecamatan	Blok	Desa	Condition of installed equipment	No. of stands served	Operation
1	Kapuas Murung	UPT Dadahup A1	Bina Jaya	Good	3	In operation
2	Kapuas Murung	UPT Dadahup A2	Petak Batuah	Good	2	In operation
3	Kapuas Murung	UPT Dadahup A4	Harapan Baru			In operation
4	Kapuas Murung	UPT Dadahup A5	Harapan Jaya	Good		In operation
5	Kapuas Murung	UPT Dadahup B1	Manuntung			In operation
6	Kapuas Murung	UPT Dadahup B2	Sumber Agung			In operation
7	Kapuas Murung	UPT Dadahup G1	Sumber Alaska	Poor?		Not in operation
8	Kapuas Murung	UPT Dadahup C3	Rawa Subur			In operation
9	Mantangai	UPT Lamunti A1	Lamunti Permai	Good	-	Not in operation
10	Mantangai	UPT Lamunti C3	Sari Makmur	Poor	-	Not in operation
11	Mantangai	UPT Lamunti A2	Manyahe	Good	1	In operation
12	Mantangai	UPT Lamunti B1	Warga Mulya	Good	-	Not in operation
13	Mantangai	UPT Lamunti A4	Keladan Jaya	Good	-	Not in operation
14	Mantangai	UPT Lamunti B2	Lamunti Baru	Poor	-	Not in operation

Source :- Final Report Evaluasi Sistem Penyediaan Air Minum di Wilayah PLG, PT Dekama Sekata, 2006

Rain water collection

Rainfall is abundant in the area but unevenly distributed over the year, see Figure 4.1. There is moreover a significant rainfall gradient, with the north of the EMRP area receiving higher rainfal (2300-2700 mm/year) than the south where annual rainfall is likely to be well below 2000 mm/year.

Rain water collected from house roofs is widely used throughout the area as source of domestic water. With well-installed gutters and downpipes and sufficient storage capacity, the annual rainfall in the area is in theory more than sufficient to satisfy the annual drinking water needs of an average family.
For example, for a roof area of 40 m^2, a collection efficiency of 90% and rainfall of 2,200 mm per year, the amount of water that could be collected is 40 x 0.9 x 2.2 x 1000 = 80,000 liter, or 44 liter per person per day for a family of five.

However, to overcome the dry season, big storage tanks would be required. Even if the collected water would be used only for drinking and cooking needs of some 5 l/person/day, still a storage capacity of 1.5 to 2.5 m3 per family would be needed for a 1-in-5 dry year. A simple calculation method to determine the required storage capacity from daily rainfall figures is given in Annex II.

In practice, however, as long as the tanks are more or less full, consumption will exceed the 5 l/person/day, while moreover during long storage water quality is likely deteriorate. Therefore, although rainwater collection is a very important source of drinking water during the wet season it cannot be relied upon to satisfy dry season demand.

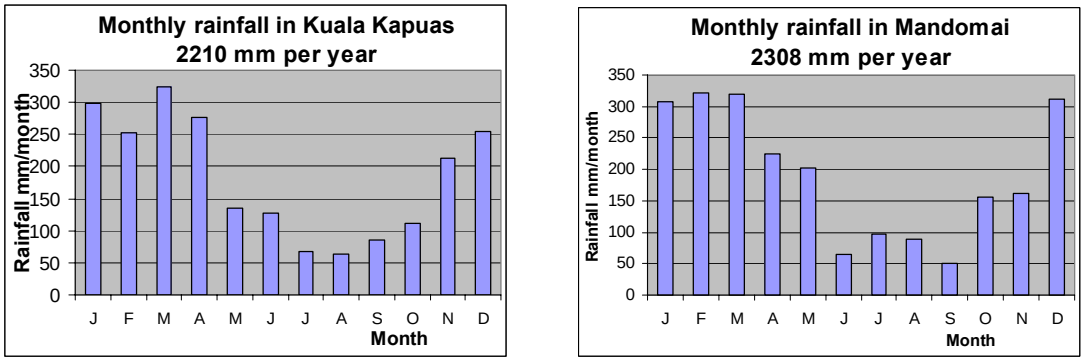


Figure 4.1 – Monthly rainfall

4.5 Water treatment options

Simple household treatment system, SaRut (Saringan Rumah Tangga)

Simple treatment for individual households can be done in any water tank or container. After the raw water is entered, lime (kapur) is added, and if necessary chlorine (kaporit), stirred, and left for a couple of hours. Calcium compounds are formed which settle as a sludge near the bottom of the tank. The clean upper water is then removed and passed through a sand filter, after which it can be used. The bottom sludge is discarded, the tank is cleaned, and the process can be repeated.

The process is suitable to raise the pH of the raw water and to remove sediments or other larger particles, but is not adequate to improve colour or taste, or to reduce the iron content.

For the Dadahup/Lamunti area this system has reportedly been widely applied in the late 1990s, with every family receiving a installation from the Department of Public

Works, in total 14,000 units. However, none was in use anymore by the year 2006, according to findings by PT Dekama Sekata (Laporan Akhir Evaluasi Sistem Penyediaan Air Minum Lokasi ex-PLG, 2006).

Simple communal treatment system (Sistem Penyediaan Air Sederhana, SIPAS)

Water is pumped from a river, canal or deep well into an elevated tank. From there the water flows by gravity through an aerator (especially needed for groundwater), a sand filter, and an active carbon filter. Finally chlorine (kaporit) is added. The water is then distributed by gravity or with the use of a pump to one or more distribution points or hydrants, each equipped with a storage tank of a few m3.

Figure 4.2 – Communal treatment plant (SIPAS), Lamunti

Quality of the treated water is generally good; capacity of the system depends on the size of the tanks and filters. The system requires a skilled and responsible operator to run the pump and generator, to mix trhe chemicals, to regular clean the tanks and filter material, and to do any repairs and replacement of broken parts when needed. This operator should receive a decent remuneration for his efforts, either subsidized by the local government or from a levied water use fee.

Insufficient attention to management of the systems and the role of the operators may well have been a main reason why many systems built in the Lamunti/Dadahup area stopped functioning after some time. Reportedly 41 systems were constructed

by the Department of Public Works in the late 1990s, each with a capacity of 1 liter per second, but by the year 2006 only one (in desa Harapan Jaya, UPT Lamunti C1) was still operational (PT Dekama Sekata, Laporan Akhir Evaluasi Sistem Penyediaan Air Minum Lokasi ex-PLG, 2006).

Full-scale Water treatment plant

The raw water goes though various treatments including passing a membrane which removes most of the turbidity, colour, iron content and dissolved organic matter. The membrane is sensitive to solid particles, and is not effective in removing dissolved gasses and oil, so it should be combined with other treatments, including an active carbon filter.

The plant requires a highly skilled operator, and should be operaetd only by a professional organization. Recently, two such plants have been constructed and are in operation in the ex-PLG schemes, one in Lamunti C2 managed by PDAM, and one in Dadahup G2, managed by a cooperation (Koperasi Karyawan Tirta Mulia). A third plant, built in Bahaur Hilir with assistance from the Health Department, was not yet operational at the time of reporting..

Figure 4.3 – Water treatment plant, Bahaur

Other plants and water distribution systems operated by PDAM include those for the District (Kabupaten) capitals of Pulang Pisau and Kuala Kapuas, and for five Sub-diustrict (Kecamatan) capitals: Mandomai, Palingkau, Mantangai, Basarang and Dadahup. The Dadahup plant, located near the old Dadahup village not far from the Dadahup transmigration area, has a capacity of 2.5 l/s, and is managed by 5 persons. Besides most of desa Dadahup it also serves several desas of the transmigration area. The water use fee is said to be Rp. 32,000 per family per month.

The effectiveness of various water treatment processes is compared in Table 4.7. It should be noted that the table applies to general conditions, and not specifically to treatment of peat water. More information on peat water charateristics and treatment is given in Annex IV.

Table 4.7 – Effectiveness of different water treatment processes

Water quality aspect	Treatment process					
	Aeration	Chemical coagulation, flocculation	Sedimentation	Rapid filtration	Slow sand filtration	Chlorination
Dissolved oxygen	+	o	o	–	——	+
CO2 removal	–	o	o	+	++	+
Turbidity reduction	o	+++	+	+++	++++	o
Colour reduction	o	++	+	+	++	++
Smell reduction	++	+	+	++	++	+
Bacteria removal	o	+	++	++	++++	++++
Fe and Mn removal	++	+	+	++++	++++	o
Organic matter removal	+	+	++	+++	++++	+++

Note: – Negative effect o no effect +, ++, +++ increasingly positive effect
Source:'Small Community Water Supplies', IRC Technical Paper Series 18, The Hague, 1981. Page 192.

4.6 Distribution systems

Compared to communal supply, individual water supply systems evidently have the advantage that no water distribution network is needed.

For communal or public water supply a piped distribution system to individual houses is only feasible in urban areas but is too costly for rural areas with widely scattered houses. The only option then is supply to public standposts and people coming to fetch the water from there with jerrycans. In case of deep wells or communal treatment plants, the standpost will normally be combined with the well or plant. If equipped with a handpump, the people will get the water directly from the pump, otherwise the water will be pumped to a storage tank equipped with tabs. The facility should always be provided with a concrete platform sloping away to a proper outflow point for any excess water, and a open shelter or roof. An operator has to be appointed to look after the facility and keep the place tidy.

For villages lacking any suitable water sources, water has to be brought to the area from outside, either through a pipeline or by water trucks. Again, the water will be distributed to public standposts at strategic locations in the village from where people can fetch the water with jerrycans.

4.7 Costs

A cost comparison of various drinking water supply options (water for drinking and food preparation only) is given in Table 4.8. The estimated costs take into account the entire lifetime costs including operation and maintenance costs. The table does not include costs of training and guidance which should accompany most op the options. It appears that in the long-term deep wells and PDAM operated plants are relatively cheap solutions, although initial investments, especially of PDAM plants, are high.

Table 4.8 – Cost comparison of drinking water supply options

(a) Rainwater collection from houseroofs (without treatment)

Item	Costs	Expected lifetime	Costs per year	Comments
Installation Roof gutters, down pipes and fittings, storage tanks (1.5 m3), stand for storage tanks Operation Maintenance, repairs (5% per year)	4,500,000	10	450,000 -- 225,000	
Total annual costs			675,000	
No. of households served			1	
Costs per household per year **Costs per household per month**			675,000 56,000	

(b) Individual treatment plant (SaRut), manual water input

Item	Costs	Expected lifetime	Costs per year	Comments
Installation Tanks, pipes, fittings, stand for tanks, buckets, tools Operation: chemicals Maintenance, repairs (5% per year)	4,000,000	7	570,000 120,000 200,000	
Total annual costs			890,000	
No. of households served			1	
Costs per household per year **Costs per household per month**			890,000 74,000	

(c) Communal treatment plant (SIPAS), pumped water input

Item	Costs	Expected lifetime	Costs per year	Comments
Installation Tanks, pipes, fittings, stand, pump, generator, pipelines, standposts Operation Chemicals, operator's salry, fuel for pump Maintenance, repairs (5% per year)	300,000,000	15	20,000,000 35,000,000 15,000,000	Capacity 1 l/s, 6 hours per day
Total annual costs			70,000,000	
No. of households served			40 – 80	
Costs per household per year **Costs per household per month**			875,000 – 1, 750,000 73,000 – 146,000	

(d) Deep well with platform, shelter and hand pump (no treatment)

Item	Costs	Expected lifetime	Costs per year	Comments
Installation Well with filter and casing, hand pump, platform and shelter Operation Watchman's salary Maintenance, repairs (5% per year)	50,000,000	15	3,300,000 9,600,000 2,500,000	Assuming no treatment needed
Total annual costs			15,400,000	
No. of households served			40 – 80	
Costs per household per year **Costs per household per month**		192,500 – 385,000 16,000 – 32,000		

(e) PDAM operated plant, water distribution by motorized transport

	Costs (Rp million)	Expected lifetime	Costs per year	Comments
Construction costs • Installation • Distribution network (Tosa) (1) Total construction costs	 1,500 150 1,650	 20 10	 75,000,000 15,000,000 90,000,000	
Operation and maintnance costs • Salaries etc. of operators • Fuel • Chemicals • Maintenance, repairs (5%) • Distribution costs TOSSA at Rp. 6.25 million /month (1)			 60,000,000 24,000,000 80,000,000 82,500,000 75,000,000	
Total annual costs			411,500,000	
No. of households served			1,000	
Costs per household per year **Costs per household per month**			411,500 34,000	

(1) based on calculations by PT Dekama Sekata, 2006

4.8 Conclusions

Water supply conditions are still far from optimal in many parts of the ex-EMRP area. Past efforts to improve the situation have been partly successful but in other cases suffered from disappointing water quality. Insufficient attention to operation and maintenance lead to problems as well. The choice of technologies like SaRut and SIPAS might have been appropriate if sufficient attention had been given to training of operators, creating the institutional set-up for O&M of the systems, and support with repairs and replcements of broken parts. Without such support many of the systems stopped functioning a short while after construction. Also, the fact that at least four different departments are involved in construction of water supply facilities is unlikely to boost efficiency.

In poor villages farmers face great difficulty to invest in water supply facilities or to pay for their operation, and here, besides construction, also the O&M of the systems will have to be supported by the Government for years to come. In view of the required government support, centralized supply, treatment and distribution systems would be easier to manage than numerous individual or communal water supply and treatment facilities. A gradual expansion of the PDAM subsidiaries could be considered using either river water or deep ground water. Another option might be government support for the installation and operation of deep wells, constructed and managed by groups of households. The operators, selected by the villagers themselves, should be well trained, while sufficient spareparts and clear instructions or manuals for O&M should be available, and in poor villages the remuneration of the operator may have to come at least partly from the government.

Based on the experiences described above for the ex-MRP area, as well as from experience in other lowland development schemes, an evaluation of the different options for village water supply is shown in Table 4.9. The only option which gives a reliable and good quality water supply would be PDAM managed tretament plants. However, as long as farm incomes are low, villagers cannot substantially share in the costs and the government will have to subsidize the supply. Second best would be deep wells which could be managed by groups of families, but again in many cases government support will be required for installation. However, the water quality of deep wells is of some concern, and adding a treatment plant would considerably raise the costs while O&M may be difficult to organzie at village level. Individual as well as communal treatment plants require careful attention, are tme-consuming to operate, while quantity of water supply is limited. Unles a community would have a clear preference for these installations, they are unlikely to offer a sustainable solution to the drinking water issue.

Table 4.9 – Qualitative Comparison of Various Drinking Water Supply Options

	Rainwater collection	Individual treatment plant (manual water input)	Communal treatment plant (pumped water input)	Deep wells (hand pump, no treatment)	PDAM
Water quality	+++	++	++	+	+++
Quantity of supply	++	+	+	++	+++
Reliability of supply	–	++	++	+++	+++
Ease of operation	+	–	–	+	+/–
Proximity to houses	+++	+++	–	–	+/–
Ease of maintenance	++	–	–	+	+/–
Suitability for construction by local community	+++	++	+	++	–
Construction costs	+++	++	++	+	–
Operation and maintenance costs	+++	+	–	++	+

Note: – Poor, negative +, ++, +++ increasingly positive

5 Implementation of Rural Infrastructure Works

5.1 Introduction

In the past, rural infrastructure works were often planned, designed and built entirely by government without adequate feedback from the community. As a result the works were not adjusted to the local situation and to the preferences of the users. Nevertheless, after completion, the local community was supposed to operate and maintain the works but proper guidance and a set of tools and spareparts were rarely provided. Consequently, many works quickly stopped functioning after breakdowns, while the community felt that because the government had planned, designed and built the system the government should also take care of maintenance and repairs.

To avoid the above situation a community driven approach to rural infrastructure development is propagated. Community driven development or CDD "is the process by which community groups assume control and authority over decisions and resources in development projects which affect their lives" (World Bank, ESSD website). In other words, the community decides what kind of works are needed, and takes a decisive role in design and implementation of the works, with the agency playing a supportive role.

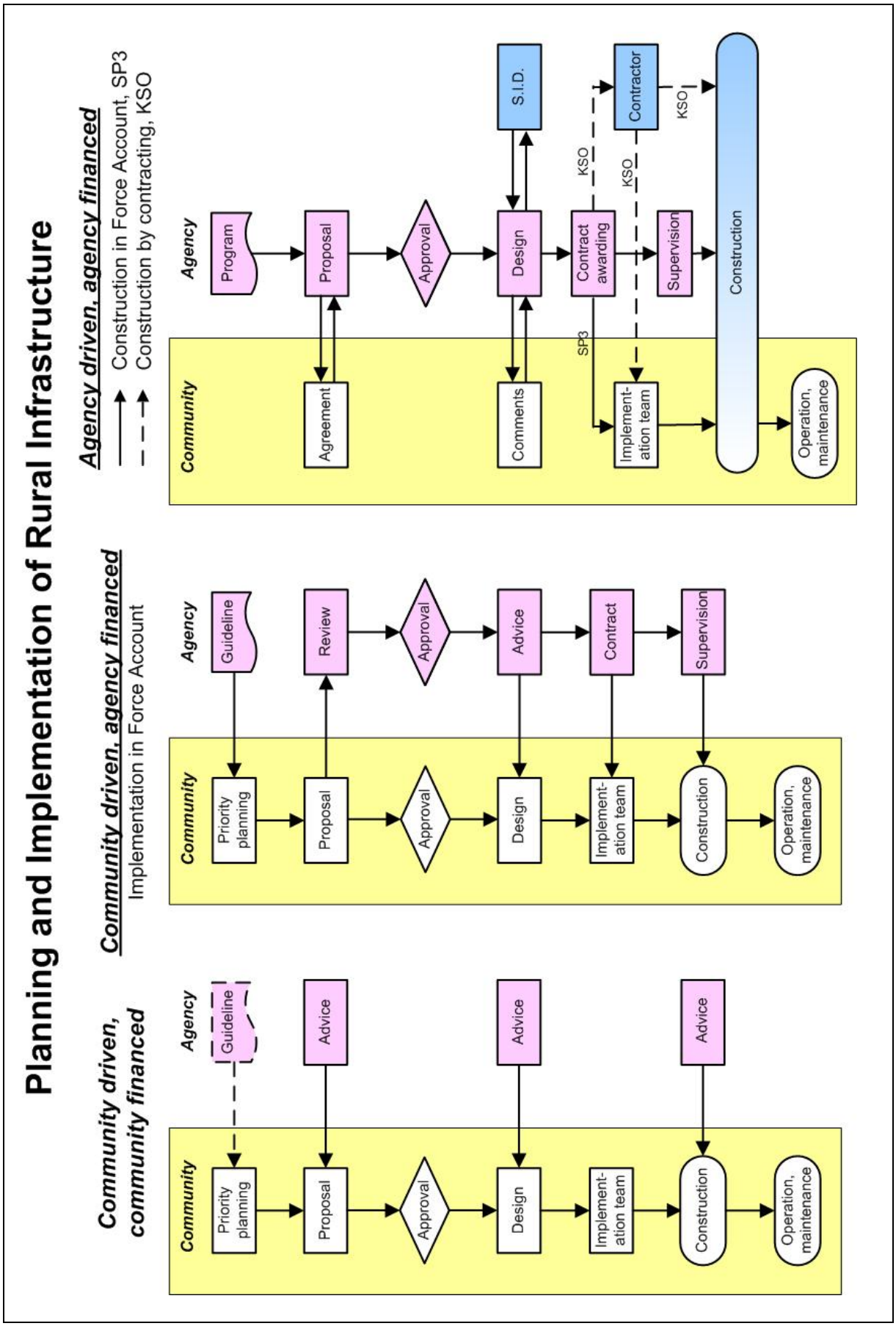
In recent years much experience has been gained in Indonesia with giving the community a greater voice in prioritizing and implementing rural infrastructure works. The experience is described in many guidelines and reports of e.g. the KDP/PNPM programme, the Aceh reconstruction programme, other donor assisted projects as well as in manuals of various government agencies (see the references and list of websites at the end of this report). Also within the ex-PLG areas various approaches to community involvement have been implemented and guidelines produced, among others a programme for transmigrants' house renovation by the Department of Transmigration, the development of Tata Air Mikro by the Department of Agriculture, and others.

The present report will not replicate these guidelines, but will highlight some of the most important aspects of community involvement in rural infrastructure development considered of crucial importance to development of the ex-PLG area.

5.2 Community driven versus agency driven development

Rural infrastructure will normally be developed in cooperation between an agency, either government or non-government, and the community. Figure 5.1 shows the main differences between (a) an entirely community-driven approach to rural infrastructure development, (b) an agency-driven and (c) a mixed approach:

Figure 5.1 – Planning and implementation of rural infrastructure works



(a) *Fully community driven approach*

The community decides what is needed and implements the works with its own means. The agency's role is purely supportive: initiating and facilitating the process, and providing technical guidance on design and implementation. This approach is suitable for simple, labour-intensive works requiring only limited expenses, although there are also examples of communities making considerable investments for works urgently needed.

(b) *Agency-driven approach*

The agency decides the kind of works to be implemented (mostly the kind of works the agency is specialized in) as well as implementation modalities and provides (most of) the inputs. The community discusses the proposed works, does or does not agree with their implementation, but normally has little influence over the designs and other aspects. Implementation of simple works can be entirely by the community, but in most cases a contractor will be involved as well.

(c) *Community driven, agency financed approach*

The agency initiates the process, but community decides what is needed. Besides facilitation and guidance, the agency also provides (most of) the required inputs (funds and/or materials). This is the approach adopted by the KDP and the PNPM. Implementation of the work is mostly by the community itself but for complicated works or those requiring heavy equipment a contractor can be employed.

In practice, there are many variations in between these three approaches. Much depends on the community and its leadership on the one hand, the expertise and experience of the agencies involved, and the complexity of the works. Works involving simple, labour-based technologies are more suited to implementation by the community than those requiring heavy machinery.

Why involve the community? from the agency's point of view	
Positive	*Negative*
- Create employment opportunities - Strengthen local capacity - Create sense of ownership - Work adjusted to local preferences - Better quality of work - Cheaper (no overhead, profit margin of contractor) - Maintenance will be better	- Time needed for consultations - Facilitators required - Training to be organized - People have insufficient skills.

This chapter focuses on options (b) and (c). Like all civil works, also community infrastructure works go through a process called SIDCOM: Survey, Investigation, Design, Construction, Operation and Maintenance. This guideline will follow those steps. However, prior to this, the most important step is the identification of the works.

5.3 Identification of works

Identification of works in the community-driven approach

In the community-driven approach, like Musrenbang, the community, with or without assistance of an outside facilitator, determines what kind of work it needs. The idea is then submitted to the government (or an NGO) for technical and financial review, and for a decision whether or not support can be given to implement the work.

Strengths of this approach are that only works will be implemented for which there is a true need perceived at village level, and that the scope and layout of the proposed works is in accordance with the community's preferences.

A weakness is the uncertainty whether or not the proposal will be supported, especially if the process like Musrenbang generates many more proposals then can be supported. Proposals being turned down will demotivate the community to participate in similar programmes in the future. There may also be a long time gap in between proposal formulation and the decision whether the proposal will be supported or not. Another weakness is that works may be proposed by the community which do not address the underlying problem, or for which there would be better (technical) alternatives. The proposals therefore should always be reviewed by technically qualified staff, who are often not available at village or Kecamatan level. At a very early stage in the process close cooperation is required with the line agency concerned where such expertise is available.

Competition Among Proposals

It is sometimes argued that introducing competition among communities putting forward proposals for government support might improve the proposal formulation. It would increase the cost effectiveness of the proposals (cheaper proposals having a greater chance of being accepted), and focus the attention on the most needed works. In practice this may not work. Cost effectiveness is difficult to assess before any surveys or designs are made, and the selection has to consider other socio-political criteria as well. Competition may moreover risk to change the proposals from "the most needed" to "the most likely to be accepted" ones. Also, a situation should be avoided of many proposals being formulated of which only a few can be accepted.

Important criteria to judge whether a community proposal should receive agency support:

- Number of beneficiary families
- Are any land right or property issues involved?
- Is there overlap with other proposals or ongoing programmes?
- Was the proposal submitted previously, reasons for rejection?
- Technical feasibility, are there alternatives?
- Financial feasibility, would alternatives be cheaper?
- Capacity of the community to implement the work
- Capacity of the community to operate and maintain the work

Identification of works in the agency-driven approach

The agency has developed a programme for implementing certain infrastructure works, and based on their experience and/or consultations with local governments

the agency selects communities where to implement the programme. Field staff will explain the programme, options, and implementation modalities. The community then will decide whether to agree with the proposed works, and what modifications would be desired.

Advantages of this approach are that from the start an appropriate technical agency is involved with experience in the kind of works being proposed, and which often has already standard designs or a range of designs available which are well thought-through, which are technically and financially feasible based on the overall conditions in the area. Designs may of course still have to be adjusted in each case to the particular site conditions.

A risk of this approach is that, under time and budget constraints, visits by the agency staff to the community are reduced to a minimum, the community has little time to reflect on the proposal, and the consultation becomes a mere "agree or not" question. Afraid to loose the investment, the community usually agrees (better something than nothing) even though the work does not fully respond to their needs or preferences. Their commitment to operation and maintenance of the system after completion will evidently be low. To avoid such a situation, consultations should of course be held properly and preferably in more than one round to give the community time to reflect on and discuss the proposal. The programme of the agency should be as flexible as possible to accommodate proposed changes, even though this may take more time and effort from the agency's staff.

How to improve project formulation

- More than one round of consultations to give the community time to reflect on the proposal
- Seek advice and involvement of local resource persons *(tokoh masyarakat)*
- Review of community proposed changes by technically competent staff
- Agency staff to identify the real problem, there may be alternative solutions
- Agency's programme as flexible as possible, open to changes in designs and implementation methods.
- Use of simplified design drawings or scale models to explain technical aspects
- Complete transparency on costs, local contribution, implementation procedures, and O&M responsibilities
- Visits by community members to nearby areas where similar works have been implemented
- Avoid meetings with too many officials where people may be reluctant to speak their mind

5.4 Appointment of implementation teams

Agency

Preferably as early as possible, the agency assigns one or more persons to be in charge of the project. At least two persons are recommended:

- Community worker or facilitator. He/she will stay in contact with the community, will facilitate consultations, and will assist with organization of the work and monitor progress;
- Technical expert. He/she will be in charge of technical review, surveys and design (if needed), give technical advice, and supervise the implementation.

It may be decided to recruit such staff from outside if the right expertise is not available within the organization. Facilitators are often recruited from an NGO experienced in community development work and who may be more trusted by the community in case of conflicts than government staff. If persons with the right skills are avialable, it may have advantages to recruit the facilitator from among the villagers themselves: he/she will have inside knowledge of the local situation, sensitivities or conflicts within the community, and available resources and resource persons in the village.

The technical staff will usually be someone from the relevant government department. Only in case of very simple works, and works for which detailed standard designs are already available, the two positions could be combined into one person.

Community

At the community side, the desa administration will appoint a small ad-hoc group to be in charge of the work. This team will maintain regular contact with the facilitator and the technical expert. The community may decide to pay a compensation for their efforts out of the desa resources or from collected individual contributions.

The team will organize the community's contribution to the works, will fix the date to start the work, inform the people, make sure that tools and materials are available, keep proper records of funds received and disbursed, attendance lists, minutes of meetings, correspondence etc.

For more continuous or recurring infrastructure activities like operation, routine and periodic maintenance and repairs, a permanent organization of all the beneficiaries is called for. For agricultural activities this is the *Kelompok Tani* (KT, farmers group), for the hydraulic infrastructure this is the P3A or water user association, and for roads this could be a KPPJ (*Kelompok Pemanfaat dan Pemelihara Jalan*, road beneficiaries and maintenance group). The leadership of such a group will have the same role as the implementation team mentioned above, but on a permanent basis. A guideline for setting up and strengthening such groups is given in Annex V for the example of a P3A, but could easily be adapted to suit other users groups at village level.

5.5 Surveys, Investigations and Designs (SID)

For non-standard and more complicated works, field surveys have to be carried out and designs prepared. For relatively simple works this can be done by the agency's staff, but usually a design consultant is hired. Scope of field surveys and data to be collected depend on the kind of work, some indications are given in the box below. The field surveys offer another opportunity for the community to get acquainted with the scope and layout of the works, and to voice suggestions based on their detailed knowledge of the area. Survey crews, however, are normally more interested to follow their instructions and quickly finish the job, than to consider alternative ideas and suggestions. The same applies to consultants' design staff, with the risk that the final designs will not be appropriate for the situation. Requirements for community

consultations at various stages in the survey and design process, with preparation of detailed minutes of the consultations, should therefore be clearly spelled out in any SID contract. The agency's staff should participate in the consultations.

From the community side, the implementation team (or village head if no team has been appointed yet) participates in the consultations, and occasionally the entire community should be involved. Important decisions regarding the location, scope and implementation of the work should be made at formal meetings with duly kept meeting minutes. The results should also be discussed with the sub-district and if necessary district government.

The survey results are used to agree upon a rough draft design or pre-design. The technical staff or design consultant will then proceed with the detailed design. Once this has been discussed and approved, final designs, bill of quantities and cost estimates will be prepared. If during the design process important changes have to be made compared with the pre-design, these changes need again to be explained to and approved by the community.

Checklist of important survey data

General
- Site suitability
- Topography
- Flood hazards
- Soil (mechanical) conditions
- Present land use
- Availability of construction materials
- Condition of the existing infrastructure
- Land ownership
- No. of beneficiaries, poor or non-poor
- Availability of (skilled) labour
- Site accessibility for equipment, materials

Roads
- Road alignment survey
- No. of canal/river crossings
- Sub-soil conditions
- Maximum flooding depth
- No. of people served
- Transport requirements

Hydraulic infrastructure
- Minimum and maximum water-levels
- Seasonal fluctuations
- Flow velocities
- Water quality (acidity, salinity)
- Hydrotopography, tidal flooding
- Drainability
- Arrea served by the works

On-farm infrastructure
- Cropping patterns
- Land suitability
- Layout of farm lands, property boundaries

Water supply and sanitation
- Water source and reliable yield
- Water quality
- Seasonal variations
- Location of public standposts
- Distribution method
- Alignment survey of pipelines (if any)
- Population to be served

5.6 Construction contracts

Implementation and contracting of construction works should adhere to the government Regulations on Construction, Keppres 80/2003 and subsequent amendments. According to this regulation, he works can be implemented either in Force Account (*Swakelola*), i.e., by the sponsoring agency itself, or by a contractor hired by the agency. In special and incidental cases simpler ad-hoc arrangements can be made, known variously as Padat Karya, Bantuan Sosial, and others.

(1) Force Account, Swakelola

Certain works for which tendering would be impractical or inefficient (pilot projects, projects with a capacity strengthening purpose, small projects of little interest to the private sector) can be implemented by the agency itself in Force Account. The agency will establish a working group or SKP (*Satuan Kerja Pemerintah*). This working group can enter into agreements with other legal parties to implement (part of) the works, e.g. a cooperative or P3A with legal status.

The local community can in various ways be involved in implementation of Force Account works, ranging from working directly for the agency as paid labourers, to working in a team to which implementation of the work has been entrusted by the agency through an official contract, usually called an SP3 (*Surat Perjanjian Pemberian Perkerjaan*) agreement. The various options for involving the community in Force Account works are illustrated in Figure 5.2 (A).

(2) By contract, Kontraktual

The work is directly assigned to a contractor or construction company, small contracts by direct appointment (below Rp. 50 million), bigger works after tendering. For rural infrastructure works the contractor is usually obliged by the agency to explain and discuss the scope of the work with the community prior to the start of construction, and to offer the community the possibility to participate with labour and/or supply of materials in the work.

The agency can also oblige the contractor to negotiate a subcontract agreement for part of the work with the community. Often called a KSO agreement (*Kerjasama Operasional*, or Operational Cooperation), the agreement is signed by the contractor and the community's representative or head of the implementation team, and acknowledged by the village head and other relevant government agencies. Normally, the contractor remains responsible for the quality of the work. See Figure 5.2 (B). Usually the agency will play a facilitating role in establishing the KSO agreement.

(3) Padat Karya

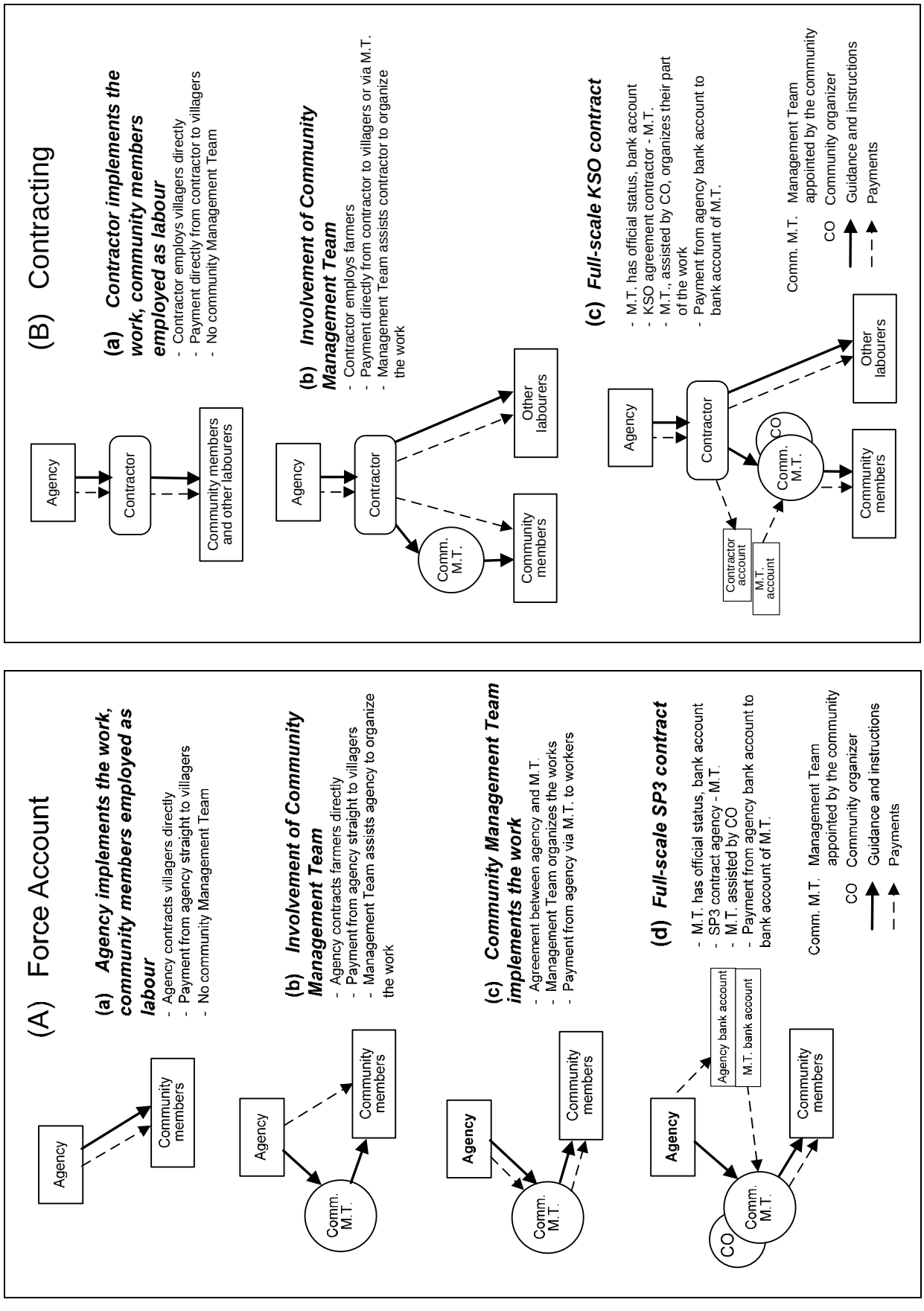
This refers to Force Account works implemented in special cases, e.g. after natural disasters, failed harvests, or for social safety net purposes. The works are implemented together with the community. Usually materials are provided by the agency and labour by the community paid by the government. Padat Karya is often used for programmes aiming at poverty reduction, and while legally it falls under Force Account work, ad-hoc financial regulations are often made to guide implementation of the programme.

Provided the community has the required technical expertise to implement the work and is willing to do so, implementation by the community through the Force Account or Padat Karya programmes has many advantages above implementation by contractor:

- Overall costs are lower (contractor's overhead costs and profit margin are avoided), even though more costs may be needed for technical guidance and facilitation
- Quality of the work is often better
- The community can adjust certain items during construction to suit their preferences and/or specific local conditions
- A sense of ownership is created

- Income is generated for the community
- Construction will take place with minimal disturbance to other (farming) activities

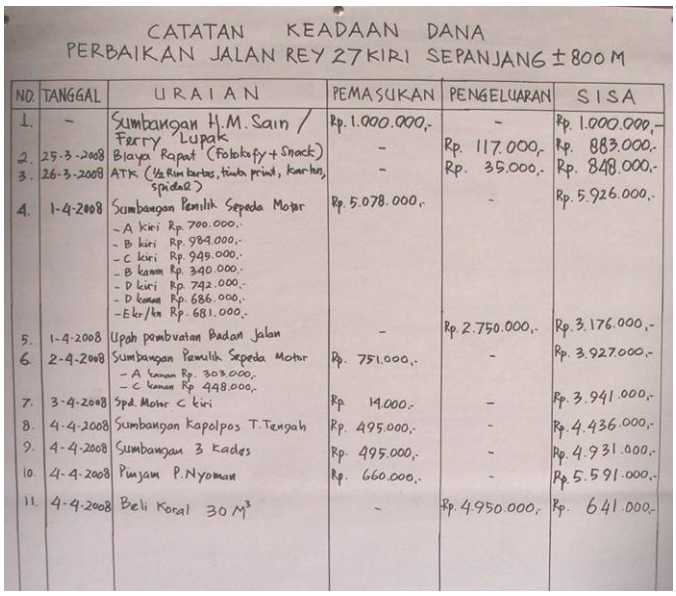
Figure 5.2 – Cooperation between agency and community in implementation of works



On the other hand, advantages of working through a contractor are that the right technical expertise is available and, for mechanical jobs, the right tools and equipment. Depending on the kind of works to be constructed, a combination may be the best option, with the more complicated parts of the work carried out by a contractor, and others by the community either independently (SP3, Padat Karya), or under guidance of the contractor (KSO).

Budget flows and disbursement procedures will often depend on the agency's accounting system and established practices. The exact procedures together with copies of all forms and documents required, should be included in a comprehensive manual for implementation of the programme. An example of a budget flow charts is shown in Figures 5.4.

The community's implementation team should also keep a proper administration, and one of the task of the facilitator is to assist the team with this. All financial documents should be open for inspection by any member of the community. A simple list of receipts and expenses could be displayed on a public information board in the village.



CATATAN KEADAAN DANA
PERBAIKAN JALAN REY 27 KIRI SEPANJANG ± 800 M

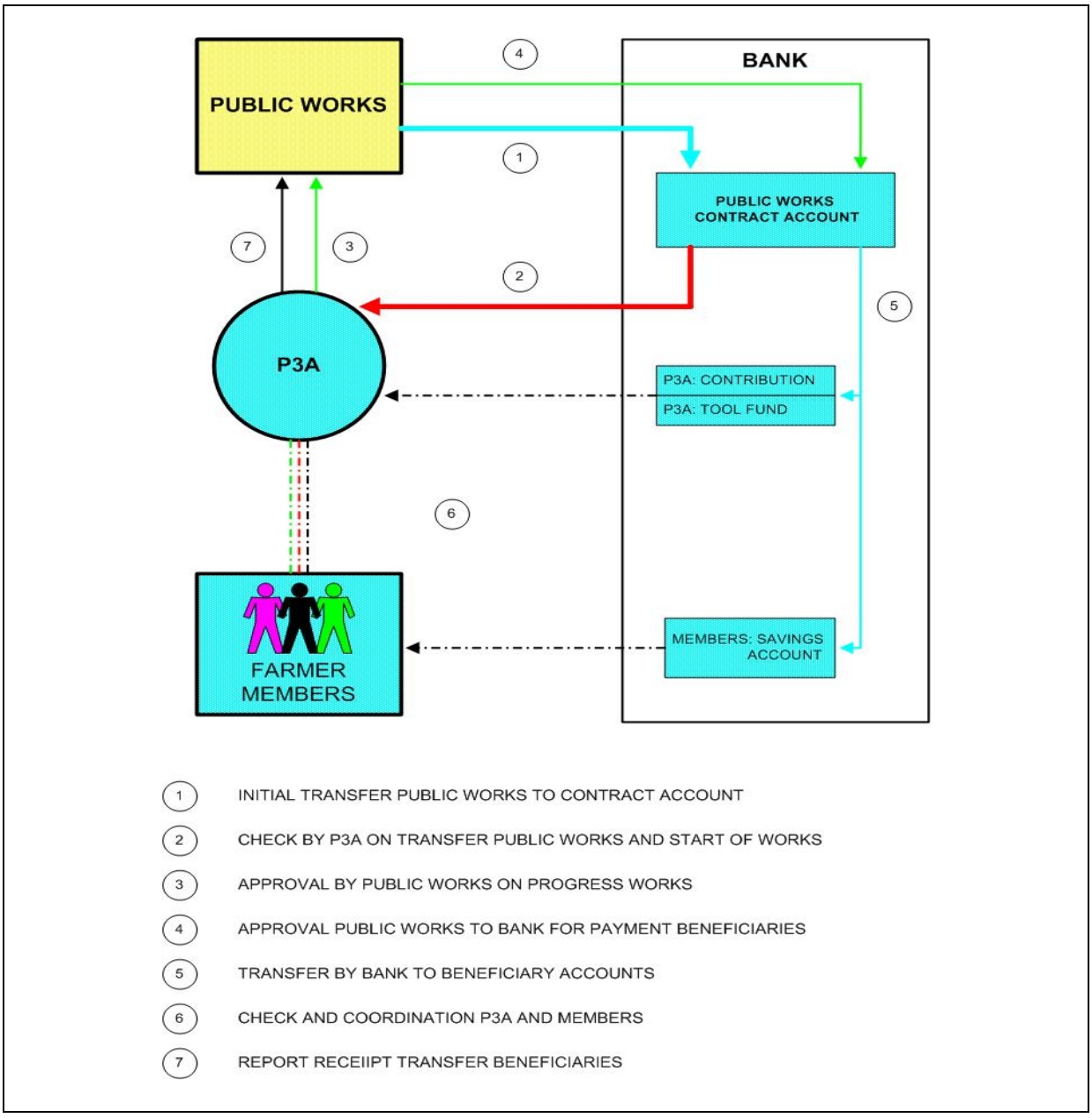
NO.	TANGGAL	URAIAN	PEMASUKAN	PENGELUARAN	SISA
1.	-	Sumbangan H.M. Sain / Ferry Lupak	Rp. 1.000.000,-	-	Rp. 1.000.000,-
2.	25-3-2008	Biaya Rapat (Fotokopy + Snack)	-	Rp. 117.000,-	Rp. 883.000,-
3.	26-3-2008	ATK (½ Rim kertas, tinta print, kertas, spidol)	-	Rp. 35.000,-	Rp. 848.000,-
4.	1-4-2008	Sumbangan Pemilik Sepeda Motor - A kiri Rp. 700.000,- - B kiri Rp. 984.000,- - C kiri Rp. 945.000,- - B kanan Rp. 340.000,- - D kiri Rp. 742.000,- - D kanan Rp. 686.000,- - Ekor/ka Rp. 681.000,-	Rp. 5.078.000,-	-	Rp. 5.926.000,-
5.	1-4-2008	Upah pembuatan Badan Jalan	-	Rp. 2.750.000,-	Rp. 3.176.000,-
6.	2-4-2008	Sumbangan Pemilik Sepeda Motor - A kanan Rp. 303.000,- - C kanan Rp. 448.000,-	Rp. 751.000,-	-	Rp. 3.927.000,-
7.	3-4-2008	Spd. Motor C kiri	Rp. 14.000,-	-	Rp. 3.941.000,-
8.	4-4-2008	Sumbangan Kapolpos T. Tengah	Rp. 495.000,-	-	Rp. 4.436.000,-
9.	4-4-2008	Sumbangan 3 Kades	Rp. 495.000,-	-	Rp. 4.931.000,-
10.	4-4-2008	Pinjam P. Nyoman	Rp. 660.000,-	-	Rp. 5.591.000,-
11.	4-4-2008	Beli Koral 30 M^3	-	Rp. 4.950.000,-	Rp. 641.000,-

Figure 5.3 – Community financing of road improvement
(desa Terusan Karya, April 2008)

5.8 Operation and maintenance

In most cases after completion of construction the role of the agency is finished, and operation and maintenance of the work is the task of the community. In many poor communities this leads to problems, because of weak village institutions to organize the work, unavailability of the required know-how and spare parts, and lack of budget to buy the latter. Moreover, routine, preventive maintenance is never considered an urgent need and often neglected. Therefore, it is strongly recommended that in poor communities the organization stays involved in the O&M of the works, or at least monitors the situation and if necessary reminds the village organization of its responsibility. The annual costs will be small compared to the loss of the investment in case of breakdowns that cannot be repaired by the community.

Figure 5.4 – Eample of budget flow chart (ISDP, 2000)



Labour-intensive maintenance work for which in principle the government is responsible, offers good opportunities for additional income generation if contracted out to the community. Type of work could include routine maintenance of canals, roads, and other public facilities, e.g. weed removal from drains, grass cutting and reshaping of berms and embankments, filling up potholes, cleaning and painting of bridges and structures, etc. Contracts and other procedures would be the same as those for construction work in Force Account.

5.9 Other considerations

(a) Local contribution

In many programmes a local contribution from the community is required. The aim is not only to economize on the agency's spending, but also to increase the sense of ownership by the community and hence the chances of sustainability after completion of construction. A risk is, however, that people will regard the local contribution as just another way by the bureaucracy to save money for other purposes. They will accept the requirement reluctantly in order to receive the project. A very clear distinction between the agency's and the community's responsibility is called for, and a local contribution could well be asked for works which are not normally the government's responsibility (like the house upgrading programme of the Transmigration Department), but one should be very careful in asking a local contribution for works which are generally considered to be the task of the government.

(b) Supervision of the construction

The agency normally has its own staff to supervise the work of both the community and the contractor, if any. The persons may or may not be the same as the facilitators or technical staff mentioned earlier. In case of construction work by a contractor, it is strongly recommended that the agency involves the community in monitoring the contractor's performance. In this way, disappointments over the quality of the work later on can be avoided.

(c) Handing over of completed works

After completion of the work, the part of the works provided by the agency will be officially handed over to the community. At the same time, the community is required to appoint a team for O&M of the work (which may or may not be the same as the construction team). If this team, like a P3A, has legal status, both the ownership and the management responsibility are handed over to the team. Otherwise, the two can be separated, with the ownership handed over to the village government, and the management responsibility to the O&M team.

(d) On-budget and off-budget financing

In case of external donors, project financing might take place "off-budget", i.e. outside the regular government budget and financing procedures. Advantages of off-budget financing would be a speedier and more transparent funds allocation and disbursement than on-budget financing. However, this is not always the case, as some external donors also have lengthy and complicated approval and disbursement procedures.
On the other hand, the advantage of following the regular government on-budget financing procedures is that it significantly strengthens local capacity building and sustainability of programs. Gaining experience with the government financing rules and regulations is valuable for future programmes and projects, while following "off-budget" procedures of donor projects is mostly a one-time event only.

5.10 Examples of community involvement in infrastructure development

In the boxes below some examples are given of current practices with community involvement in infrastructure works, both inside and outside the EMRP.

Wetland International Indonesia, Central Kalimantan

Construction of canal blocks

Because canal blocking is a new concept and not always in line with preferences of community members who use the canals to access the hinterland, a lot of time and effort is spent on socializing the idea of canal blocking and convincing the community of its benefits. Construction is carried out by the organization together with the villagers. Labourers are remunerated by the organization.

Department of Manpower and Transmigration, Cenral Kalimantan

Assistance for house rehabilitation to transmigrants in Lamunti/Dadahup

Groups of 20-25 households are formed (KSM) and combined into larger groups (BKM), with one BKM per village (UPT). Kind and quantity of materials is determined by the Department which subsequently contracts a contractor to supply the materials on site. The materials are distributed to the groups, and the group members implement the work themselves without remuneration. Outside facilitators/supervisors are employed to guide the process and assist the groups. The programme appears to be highly appreciated by the communities and is described in a detailed guideline, *Petunjuk Operasional Pelaksanaan Bantuan Ramuan Rumah Pola Pemberdayaan* (operational guideline for house rehabilitation in a capacity strengthening approach).

Participatory Irrigation Sector Project, PISP

Irrigation system improvement works

The PISP is a large ADB-funded irrigation improvement project implemented in several provinces.

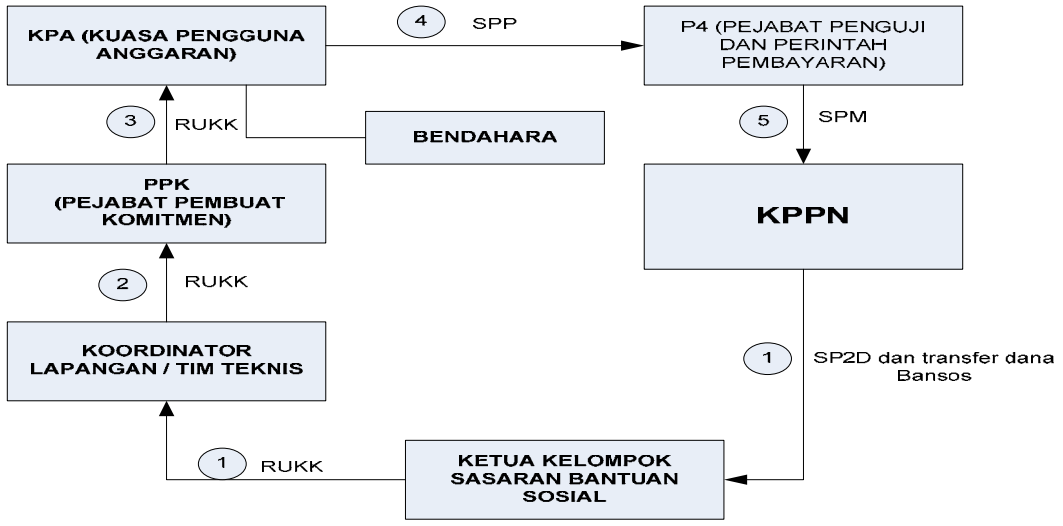
Works below US$ 25,000 are implemented by Force Account and assigned directly to a P3A through a Surat Perjanjian Pemberian pekerjaan, SP3. The P3A has to have legal status and a proven capability to implement the work. The P3A appoints is own implementation team, supervision team, and team for O&M.

Works above US$ 25,000 are assigned to a contractor after tendering. The contractor is obliged to employ the services of the P3A concerned through a KSO agreement for part of the works. The contractor provides guidance, materials and equipment to the P3A as required, the P3A implements their part of the project, but the contractor remains responsible for the quality of the work.

Department of Agriculture

Various programmes from the Directorate General of Land and Water Management for assisting farmer groups with improvement of on-farm field conditions: TAM (on-farm water management systems), JUT (on-farm roads), Optimalisasi Lahan (Land improvement), etc.

According to recently published guidelines on Social Assistance and Padat Karya works, farmer groups can propose for financing by the Department a wide range of activities related to on-farm land and water management improvement. The farmer group's status and the proposal should be approved by the head of the District's Agriculture Department. After approval, a cooperation agreement is signed by the head of the group and the department staff in charge of implementation. A joint bank account is opened by the head of the group and the head of the District Agriculture Department and withdrawals can be made only with the approval of both.
A flow chart of the procedures for release of funds is shown below.
Guidelines on manpower needs per ha and daily labour rates are given for various kind of works.



Source: Pedoman Pengelolaan Dana Bantuan Sosial, Direktorat Jenderal Pengelolaan Lahan dan Air, Department of Agriculture, 2008.

PNPM, Program Nasional Pemberdayakan Masyarakat,National Programme for .....

Various small-scale rural infrastructure works selected by the community

The programme is a national up-scaling of the World Bank financed Kecamatan Development Project and its urban sister programme, aimed at financing community development projects at desa level which can be implemented by the community themselves. Projects are identified by the community and should have a focus on improving the livelihood of especially the poor. A savings and loan component is geared especially towards strengthening the position of women.
Detailed information and implementation guidelines are available from the programme's website and the provincial offices.

The agency most dealing with infrastructure works is the Department of Public Works. Most work in Central Kalimantan is carried out by contractors. Routine maintenance of tertiary canals is sometimes delegated to the local community based on a lump sum per km of canal length without written agreement or contract.

6 Recommendations

6.1 General recommendations

In recent years the Government has accelerated its efforts to extend basic services like electricity, water supply, road access, health care etc. to more and more villages in the ex-PLG area. These efforts should be continued and where possible intensified.

Community participation in planning, construction and management of facilities at village level is essential and local initiatives should be encouraged and supported. The Musrenbang process is in principle well geared towards a bottom-up planning process, but its implementation is still weak and needs to be strengthened by inputs and reviews of village proposals by competent staff from technical departments.

The communities could be more involved in paid routine maintenance work of canals, roads and other infrastructure to improve quality of the work, to generate local income, as well as to strengthen local organizations.

All-weather road access is important but it is not realistic to extend the road network to all villages in remote and/or coastal areas. To compensate for lack of road access there, public water transport facilities could be improved. Access to conservation areas should be limited or strictly controlled to prevent people starting activities in these areas contrary to the conservation objectives.

Below a few more specific recommendations are given on access and domestic water supply in each of the nine Management Units. Recommendations on improvement of the water management and drainage infrastructure are given in a separate report.

6.2 Recommendations per Management Unit

Management Unit I (peat dome in Block A and adjacent lands)

- Reconsider the need for a road north of Mantangai and means how to avoid negative impacts of such a road on conservation of the peat lands.
- To compensate for the lack of road access, improve public water transport facilities to existing villages along the Kapuas river.
- Support community development of water supply, sanitation and other small-scale infrastructure works depending on livelihood strategies.
- Rehabilitation or improvement of the hydraulic infrastructure (handils) in the adapted management zone should be combined with improvement of access to agricultural fields by shaping and compacting embankments to become trafficable for (motor)bikes and carts.

Management Unit II (peat dome in Block B and adjacent lands)

- Improve car access to villages north of the Anjir Kelampan.

- Gradually plan improved road access to villages along the Kapuas River in the south of the Management Unit.
- To compensate for the lack of road access to remote villages, improve public water transport facilities.
- Gradually expand the PDAM operated water supply systems in the south of the unit to include adjacent villages where water supply is problematic.
- Support community development of water supply, sanitation and other small-scale infrastructure works.
- Rehabilitation or improvement of the hydraulic infrastructure (handils) in the adapted management zone should be combined with improvement of on-farm access by shaping and compacting embankments to become trafficable for (motor)bikes and carts.

Management Unit III (peat dome in Block C and adjacent lands between Kahayan and Sebangau rivers)

- Improve facilities for water transport to villages in the conservation zone (Sebangau), possibly starting from the end of an east-west road between Kahayan and Sebangau rivers.
- Gradually extend all-weather car access to all villages in the adapted management zone.
- Expand PDAM operated water supply systems to the larger and more concentrated villages (Kecamatan centers).
- Support community development of water supply, sanitation and other small-scale infrastructure works.
- Rehabilitation or improvement of the hydraulic infrastructure in the adapted management zone (handils as well as government built canals) should be combined with improvement of on-farm access by shaping and compacting embankments to become trafficable for (motor)bikes and carts.

Management Unit IV (coastal areas)

Soft soils and tidal flooding make road construction especially difficult here. With a low population density, water transport remains the best option for the time being, with due attention paid to provision of jetties and boat services to the few scattered settlements. Supply of drinking water is notoriously difficult in this zone because of sea water intrusion. Although a recently constructed deep well down in Bahaur Hilir yielded brackish water in the dry season, this should not necessarily discredit all groundwater resources in the area. Further away from the river, and below sand ridges existing in the area, the situation might be different and further test drilling is recommended.

Management Unit V (Jenamas area between Barito and Mengkatib rivers)

Prolonged, deep flooding makes this area unsuitable for agricultural settlements. Other land use options (fisheries, kerbau rawa, community forestry) have to be considered together with their infrastructural requirements. Road construction is unlikely to be feasible here and water transport facilities may have to be improved. Villages should be supported to improve their water supply and sanitation facilities as well as other infrastructure works as needed.

Management Unit VI (Dadahup transmigration area)
Improving the accessibility is important and is relatively easy in the area as roads have already been constructed on many canal embankments but most of the roads are not passable during the wet season. Due attention should also be paid to on-farm access over the embankments of tertiary canals with proper crossing structures over quaternary or other drains. Improvement of drinking water supply is needed, and the best option might be extension of the PDAM operations already ongoing in part of the area. Government support to groups of families constructing and operating their own water supply systems (groundwater wells) should also be considered.

Management Unit VII (Lamunti transmigration area)
Improving the accessibility is important and is relatively easy in the area as roads have already been constructed on many canal embankments but most of the roads are not passable during the wet season. Due attention should also be paid to on-farm access over the embankments of tertiary canals with proper crossing structures over quaternary or other drains. Improvement of drinking water supply is needed, and the best option might be extension of the PDAM operations already ongoing in part of the area. Government support to groups of families constructing and operating their own water supply systems (groundwater wells) should also be considered.

Management Unit VIII (Palingkau local and transmigration settlement area)
Although overall in a more favourable position than the areas discussed above, development needs are still large and should be addressed on a village by village basis. Special attention should be given to improving village and farm roads in the traditional settlements, while drinking water needs are highest in the more inland located transmigration villages. Gradual extension of the PDAM operations already ongoing in Palingkau and Kuala Kapuas to adjacent villages could be considered, as well as government support to groups of families constructing and operating their own water supply and sanitation systems.

Management Unit IX (Block D, between Kahayan and Kapuas rivers)
Infrastructure in the northern part, with older settlements, is clearly better developed than in the southern part. Road access to the southern part is made difficult by frequent tidal flooding and the presence of the Terusan River and numerous canals. In the short term, access to the south could be improved by east-west roads from the settlements to the Kahayan in the west or the Kapuas in the east, and, after a ferry crossing over the river, connecting to existing roads on the opposite river bank. The existing east-west and north-south PLG canals could in principle serve to improve water management as well as water transport in the area.
Drinking water needs are also more urgent in the south where surface water becomes brackish during part of the year. The potential of using groundwater should be investigated and becomes even more urgent if present plans for new transmigration settlements in the southern part are implemented.

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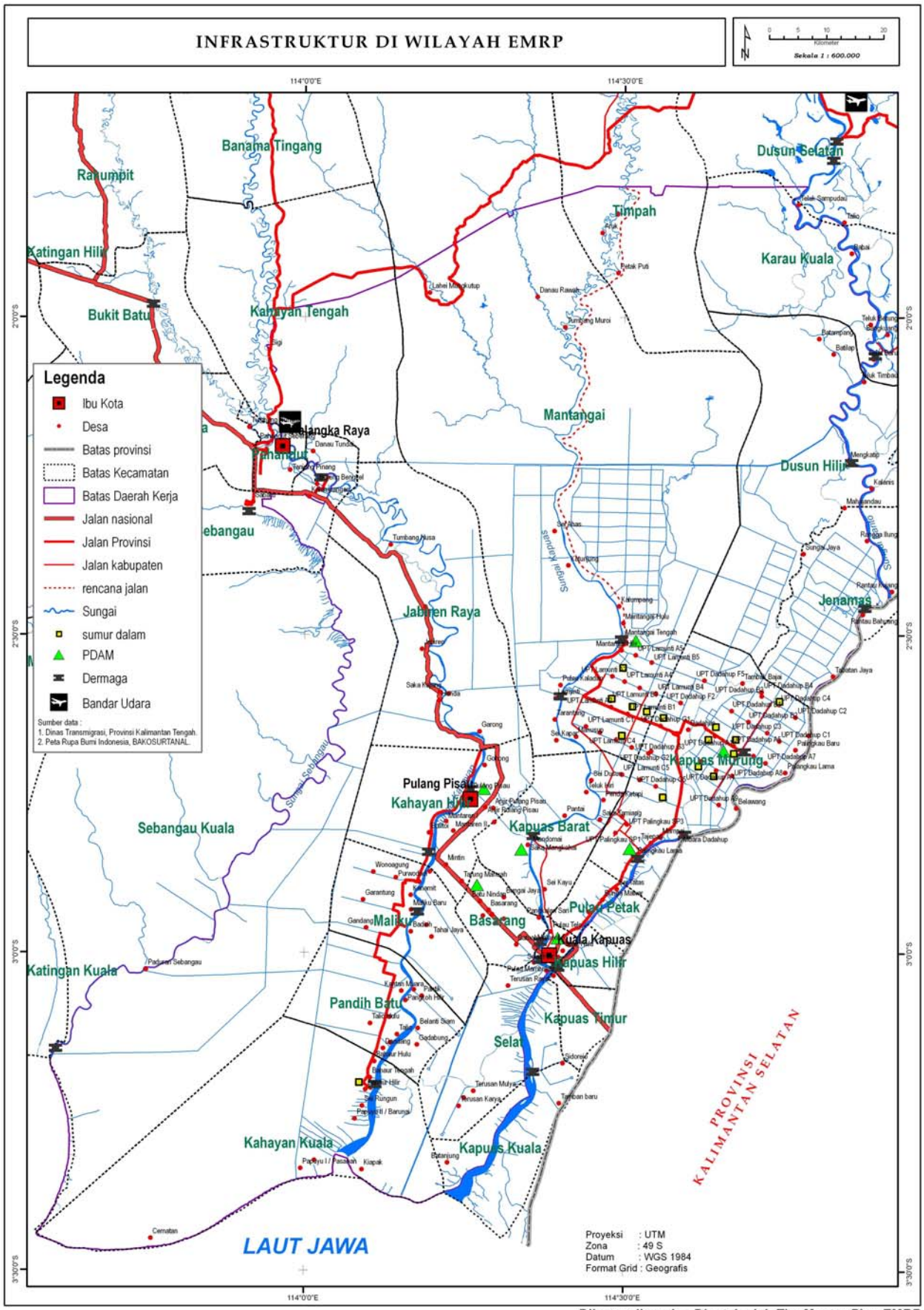
www.ampl.or.id	Sekretariat Pokja Air Minum dan Penyehatan Lingkungan. Site with latest news, information, publications, links etc. regarding all aspects of drinking water and sanitation.
www.ckpp.org	Central Kalimantan Peatland Project, implemented by various NGOs in cooperation with Palangakaraya University to protect and restore (damaged) peatlands in Central Kalimantan.
www.pla.deptan.go.id	Direktorat Jenderal Pengelolaan Lahan dan Air, Ministry of Agriculture. Includes many guidelines on agricultural land and water management.
www.pu.go.id/balitbang/	Badan Penelitian dan Pengembangan PU (Development Research Organization of Public Works Department). Many technical standards and guidelines, including guidelines on community involvement in development of drinking water supply systems: www.pu.go.id/balitbang/sni/pdf/Pd%20T-05-2005-C.pdf.
http://sda.pu.go.id	Information on water resources, irrigation and swamp schemes. Site still under development.
http://www.kalteng.go.id	Website of the Central Kalimantan provincial government, with among others infomation about the Mamangun dan Mahaga Lewu village development program, and links to the Kabupaten websites.
www.kdp.or.id www.pnpm-mandiri.org	Kecamatan Development Programme, information about the programme and its upscaling towards the Program Nasional Pemberdayaan Masyarakat, National Programme for Community Empowerment.
www.worldbank.org	World Bank, with links to information on programmes per country, to publications (many of which downloadable), and other development related data.
www.eelaart.com	Website on experience with development of Indonedsian tidal lowlands for agriculture.
www.restorpeat.alterra.wur.nl	Website of the Strapeat project and its successor the Restorpeat project (2004 to 2007) aimed at wise use of peat lands.
www.wetlands.or.id	Information on projects implemented by Wetlands International, Indonesia programme.

Map of Infrastructure in the Ex-PLG area



Dikumpulkan dan Dicetak oleh Tim Master Plan EMRP

List of Annexes

ANNEX I Standards for Drinking Water Supply

Table I.1 – Quantity standards for drinking water

Organization	Water use	Water demand	
		Critical situation	Normal situation
WHO	Drinking Cooking Total	2 litres/person/day 3 litres/person/day 5 litres/person/day	2 litres/person/day 3 litres/person/day 5 litres/person/day
Ministry of Health	Drinking Cooking Total	2.5 litres/person/day 7.5 litres/person/day 10.0 litres/person/day	5 litres/person/day 10 litres/person/day 15 litres/person/day
LAPI / ITB	Minimum requirement for subsistence	3 litres/person/day	5 litres/person/day
PU Cipta Karya	Basic needs assess-ment		30 litres/person/day

Table I.2 - Quality standards for drinking water

Criteria		Unit	Recommended maximum level for drinking water		
			W.H.O.	Ministry of Health	Ministry of Environment (KLH)
Total solids		mg/l	1,500	1,500	1,500
Colour		Pt-Co scale	50	50	-
Taste, odour		-	unobjectionable	unobjectionable	unobjectionable
Turbidity		mg/l SiO_2	25	5 - 25	6
pH		-	6.5 - 9.0	6.5 - 9.0	5 - 9
Hardness		mg/l $CaCO_3$	500 - 1.000		
Organic matter		mg/l $KMnO_4$	10	10	5 - 10
Iron	Fe	mg/l	0.3 - 1.0	1.0	1 - 5
Magnesium	Mg	mg/l	50 - 150	30 - 50	600
Copper	Cu	mg/l	1.0 - 1.5	0.05 - 1.5	-
Zinc	Zn	mg/l	5 - 15	5 - 15	-
Manganese	Mn	mg/l	0.1 - 0.5	0.05 - 0.50	10
Calcium	Ca	mg/l	75 - 200	75 - 200	150
Sulfur	S	mg/l	-	0	-
Chloride	Cl	mg/l	200 - 600	200 - 600	150
Fluoride	F	mg/l	1.0	1.5	1.5
Nitrate	NO_3	mg/l	40	10	10
Nitrite	NO_2	mg/l	-	1.0	1.0
Sulphate	SO_4	mg/l	200 - 400	200 - 400	400
Ammonia	NH**4**	mg/l	-	0	-
Phenolic substances		mg/l	0.001 - 0.002	0.001 - 0.002	-
Aggressive	CO_2	mg/l	-	0.0	-
Plumbum	Pb	mg/l	0.1	0.1	-
Arsenic	As	mg/l	0.2	0.05	-
Selenium	Sc	mg/l	0.05	0.01	-
Chromium	Cr	mg/l	0.05	0.05	-
Cyanide	CN	mg/l	0.01	0.01	-

Source: Technical Guidelines on Swamp Land Development, Volum II: Surveys, Investigations and Designs, ISDP 2000

ANNEX II Rain-water Collection

1. Required Storage Capacity

The required capacity of rain water storage tanks can be determined from an analysis of long-term daily rainfall data. For each year on record, periods with low rainfall are analysed and the maximum deficit is determined between cumulative rainfall collected from the roof catchment during the dry period ($0.85 \times R_n \times$ Area) and the demand for drinking water during the same period (n x Cons), or:

Annual Maximum Deficit = $Max_n \{0.85 \times R_n \times \text{Area} - n \times \text{Cons}\}$

with n = length of period which gives the maximum deficit (in days)
R_n = total rainfall during the n-day period
0.85 = factor to account for evaporation and other losses
Area = roof catchment area in m^2
Cons = drinking water need per household per day

The annual maximum deficits are ranked, and the maximum deficit exceeded only once in 10 years (or other return period as desired) gives the required capacity for the storage tank, in other words the storage capacity which will be sufficient to cover dry periods in nine out of ten years.

Usually in the coastal areas of Sumatra and Kalimantan the thius calculated capacity is 15 to 2.5 m^3 per family, assuming a daily per capita consumption of 10 l, a family size of 5 persons, and a roof catchment of 40 m^2. It should be noted that the calculation assumes at all times an economical use of the water, also in the beginning of the dry period when the tank is still full.

The above calculation can also be carried out graphically, see Figure II.1. The cumulative amount of collected rainfall as well as the cumulative assumed amount of water consumption are plotted in one graph on the y-axis versus the time on the x-axis. The rainfall will appear as an irregular curved rising line (horizontal during periods of no rainfall) and the consumption as a straight line under a certain slope. By moving the consumption line in a parallel way (i.e. without changing its slope) from below the rainfall curve upwards until it just touches but not crosses that curve, and repeating this from above the rainfall curve by moving the consumption line downwards again until it touches the rainfall curve, the distance between these two position of the consumption line (measured along the y-axis) give the maximum deficit.

2.1 Example of rainwater ollection system

Figure II.2 gives an example of a roof catchment system. The cost of such a system will be about Rp. 4 to 5 million Rp, including roof gutters and down pipes.

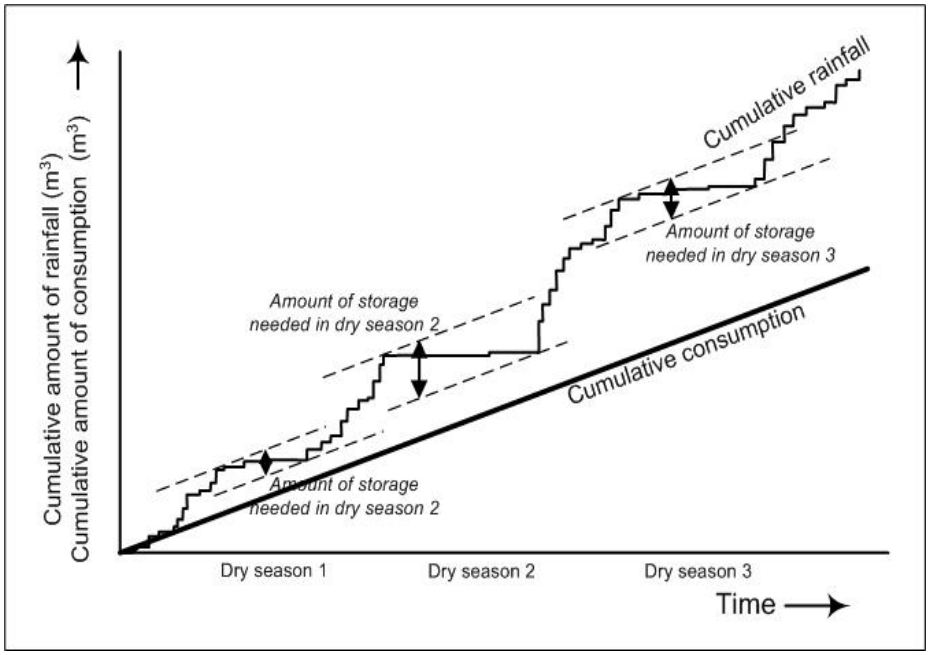


Figure II.1 - Determination of required storage capacity for drinking water collection from roof catchments

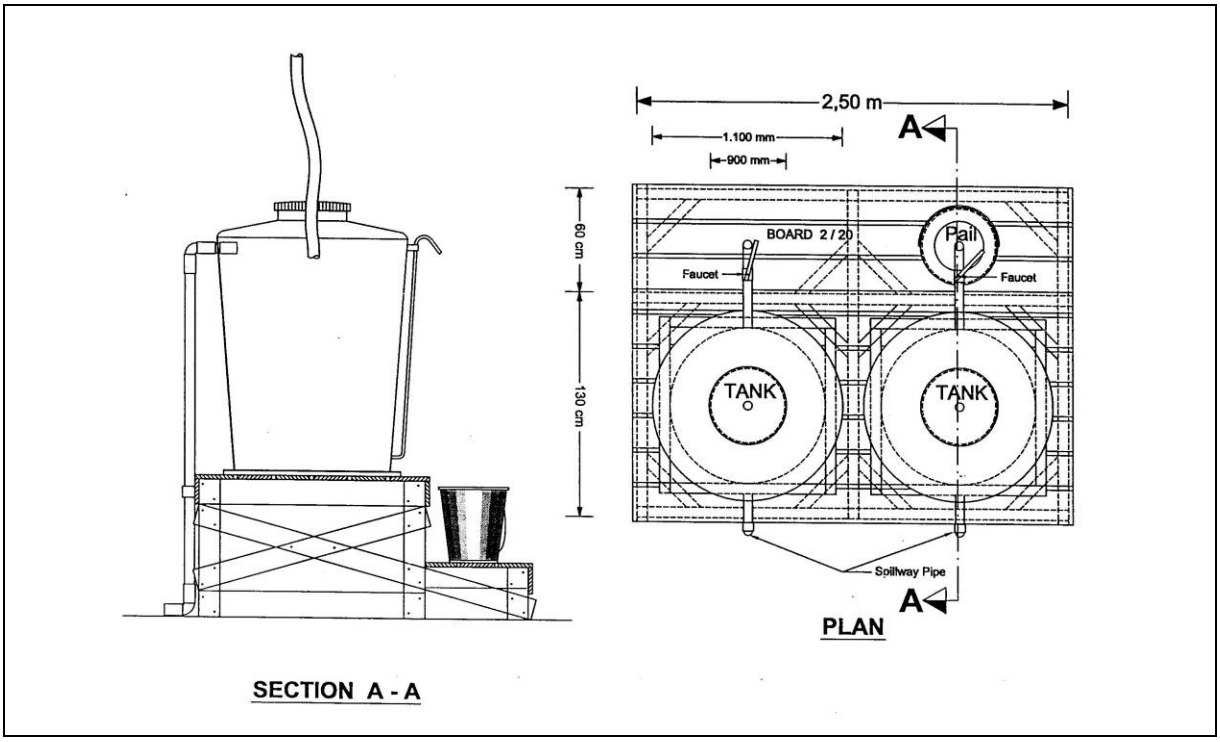


Figure II.2 - Rainfall collection from roof catchment, tank installation
Source: PU/ISDP, 2000

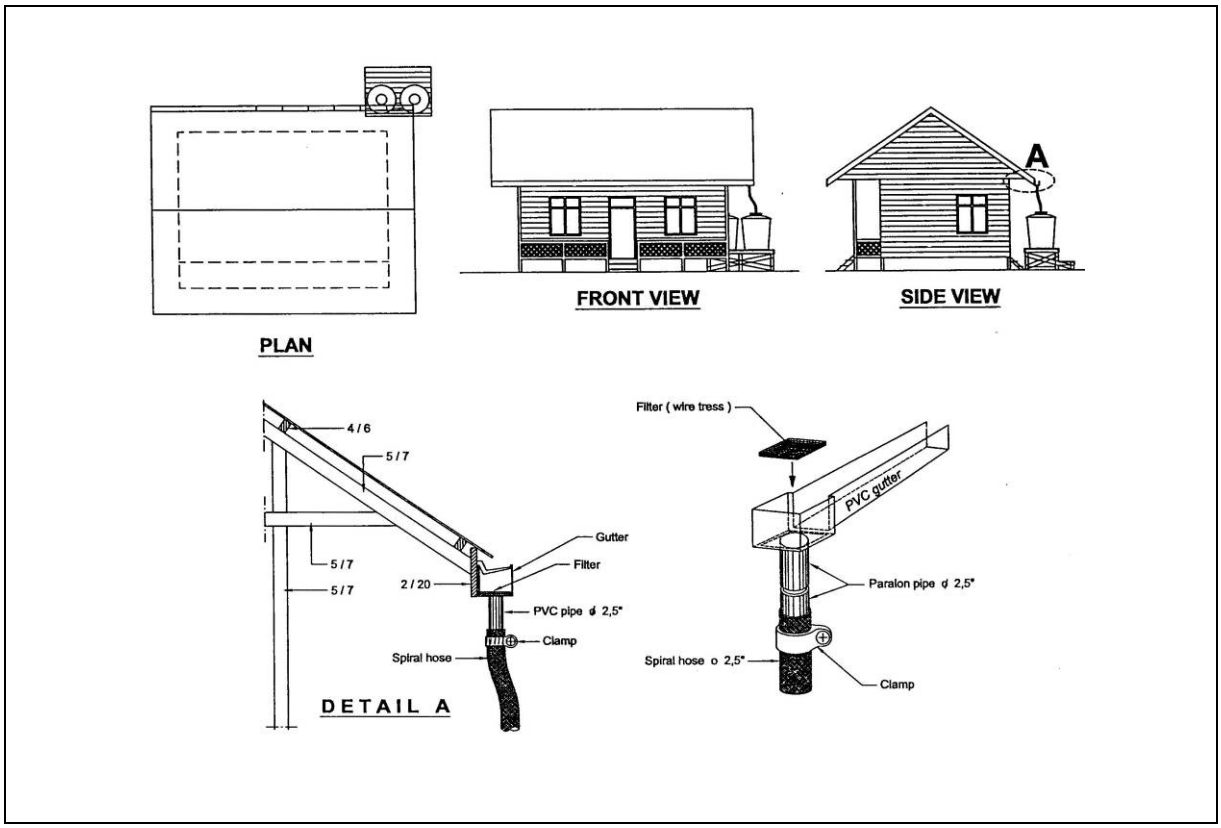


Figure II.3 - Rainfall collection from roof catchment, gutter installation
Source: PU/ISDP, 2000

ANNEX III Simple Water Treatment Installations

for individual (SaRut) or communal (SIPAS) supply

Figure III.1 – Simple water treatment plant: aeration, sedimentation, and filtration

Source: PU/ISDP, 2000

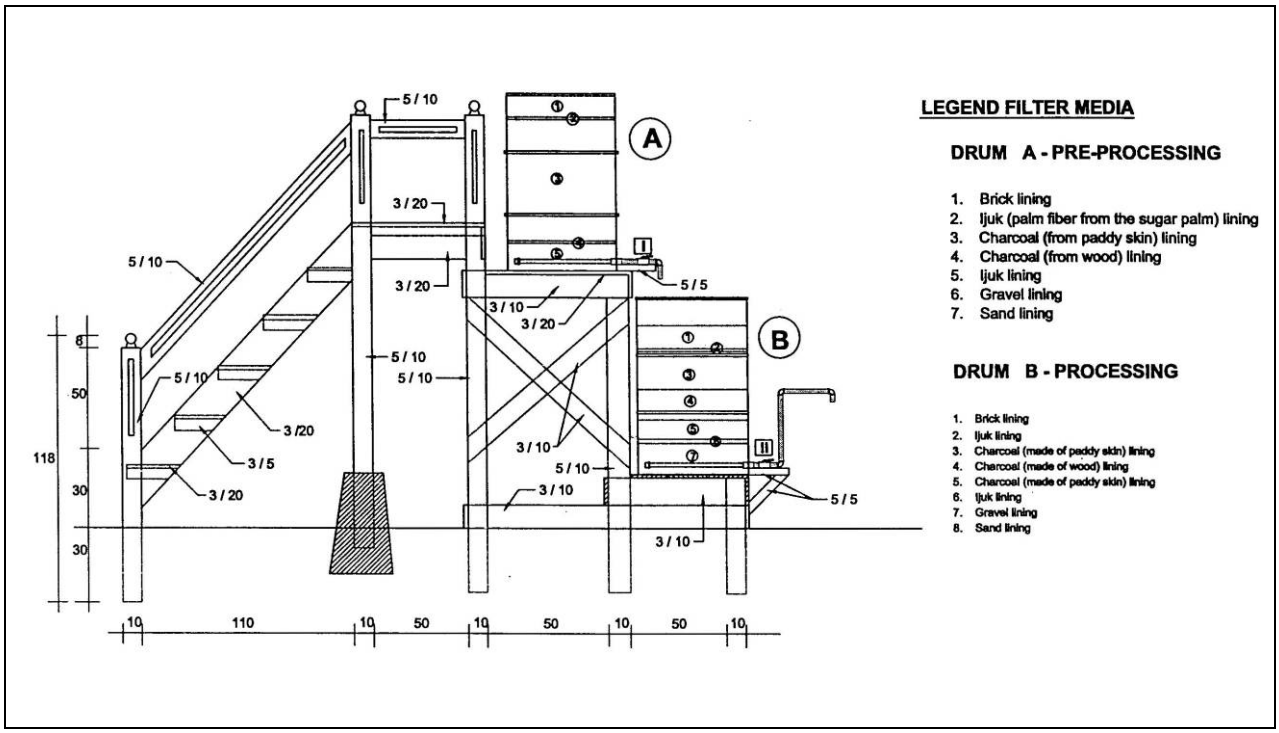
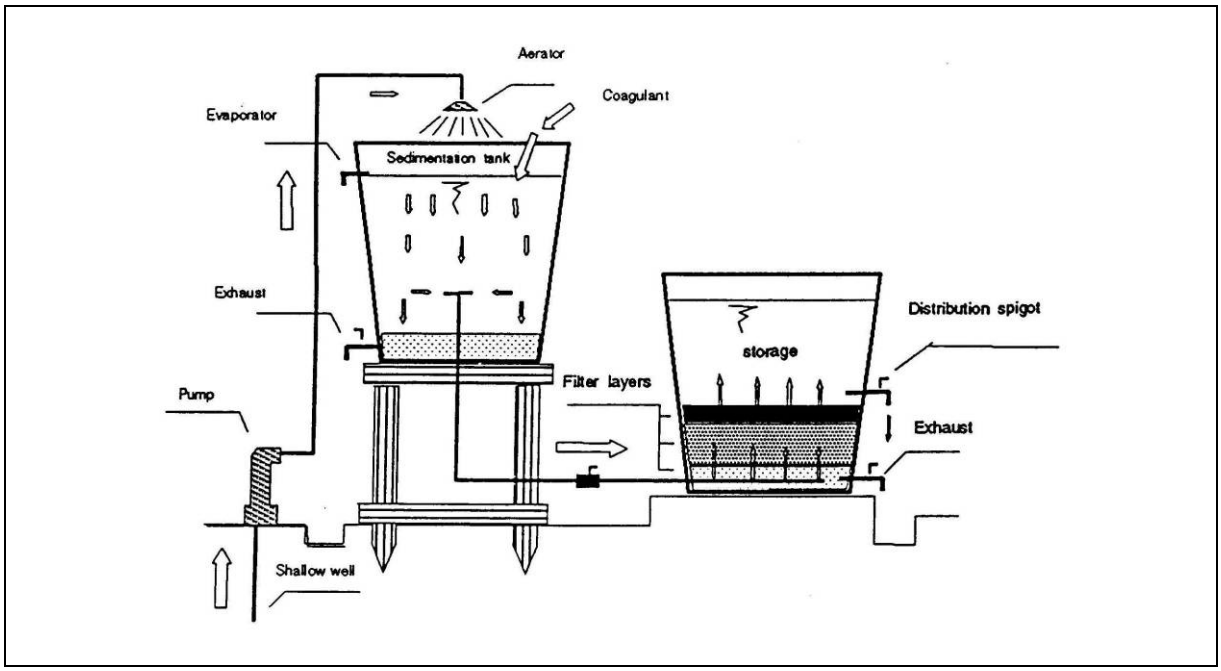


Figure III.1 – Simple water treatment plant: aeration, sedimentation, and filtration

Source: PU



ANNEX IV Treatment of Peat Water

Adapted from Zabier, 1986

Characteristics of peat water:

- External characteristics: lucidity: high
  colour : red-brown to black
  taste: acid
- Chemical characteristics organic matter content: high
  CO_2 organic content: high
  pH: low
  hardness: low

Representative analysis results of peat water are given in Table IV.1. For reasons of comparison results of river water analyses from the EMRP area are shown in Table IV.2.

The treatment of peat water will normally include the following steps:

(1) Supply of raw peat water
(2) Addition of coagulent and stirring
(3) Flocculation and sedimentation
(4) Filtration
(5) Exraction and storage (if required) of the treated water

The dark colour of the peat water is caused by colloid suspended particles, which don't settle because of the "Brown's" random molecular motion. These particles do not stick together to sedimentable aggregates because of their negative electrical charge. By adding positive ions as Fe^{3+} or Al^{3+} the electric charge of the particles decreases which enables them to stick together (coagulation). Salts like $FeCl_3$, $FeSO_4$ and $Al(SO_4)_3$ are often used as coagulent, and after stirring the flocs settle down near the bottom of the tank or container. In case of acid water lime (CaO) is added.The quality of the water above the sedimentation layer can be further improved by filtering.

A disadvantage of chemical coagulation is the increase of the salt content of the water. Occurring chemical reactions are mainly:

$$FeCl_3 + 6\ H_2O \longrightarrow Fe(OH)_3 + 3\ H_3O^+ + 3\ Cl^-$$

$$Al_2(SO_4)_3 + 12\ H_2O \longrightarrow 2\ Al(OH)_3 + 6\ H_3O^+ + 3\ SO_4^{2-}$$

$$CO_3^{2-} + 2\ H_3O^+ \longleftrightarrow CO_2 + 3\ H_20$$

This means an increase of the chloride or sulphate content and an increase of the CO_2 content which can be lowered again by adding lime.

Tests in the past with various coagulents have shown that normally a combination of alum $Al_2(SO_4)_3$ and lime CaO gives the best results. For treatment of 1 m^3 water 100 gr lime and 200 gr alum are required. A disadvantage is that these materials are not

available locally and have be bought from elsewhere. Claims that locally found clay soil material can be used instead have not been substantiated.

Sand and anthracite are the best filter materials to be used. The flter should from time to time be cleaned by reverse flow. In case of a high iron content the water may need to be aerated to oxidize and separate some of the iron. However, aeration may not always be effective, the lower the pH of the water, the more soluble the iron is and the less effective the aeration will be.

Table IV.1 – Peat water characteristics

Source: Sahat Mulia Ritonga, 1986

Characteristic	Unit	I	II	III	IV	Standard Min. of Health
Colour	Unit PtCo	753	527	752	-	50
Turbidity	mg/l SiO2	32	0	0.5	-	5 – 25
Electric conductivity	mhos/cm	-	30	50	44	
pH	-	4.1	3.9	3.6	4.3	6.5 – 9.0
Organic matter content	mg/l KMnO4	287	194	172		10
Agressive CO2	mg/l	-	neg.	30.99		0.0
Hardness	D	2.05	0.48	-		
Calcium	mg/l	neg.	neg.	-	5.0	75 – 200
Magnesium	mg/l	8.83	2.06	-	1.4	30 – 50
Iron	mg/l	neg.	neg.	neg.	-	1.0
Manganese	mg/l	neg.	neg.	neg.	0.02	0.05 – 0.50
Chloride	mg/l	11.1	5.5	-	6.8	200 – 600
Sulphate	mg/l			5.1	7.9	

I = Peat water from South Kalimantan
II = Peat water from West Kalimantan
III = Peat water from Central Kalimantan
IV = Sebangau River Central Kalimanatan

Table IV.2 – River water characteristics, March 1985

Source: DPMA, 1985

Characteristic	Unit	I	II	III	IV	Standard Min. of Health
Colour	Unit PtCo	160	180	180	180	50
Turbidity	mg/l SiO2	7.5	9.5	11	20	5 – 25
Electric conductivity	mhos/cm	38	32	33	258	
pH	-	6.5	6.6	6.6	6.5	6.5 – 9.0
Organic matter content	mg/l KMnO4	51	54	61	79	10
Agressive CO2	mg/l					0.0
Hardness	D					
Calcium	mg/l	3.1	2.5	2.5	3.4	75 – 200
Magnesium	mg/l	1.8	1.5	1.6	5.4	30 – 50
Iron	mg/l	0.4	0.5	0.6	1.0	1.0
Manganese	mg/l	0.02	0.02	0.03	0.03	0.05 – 0.50
Chloride	mg/l	2.8	2.0	2.5	57	200 – 600
Sulphate	mg/l	1.0	1.0	1.0	1.0	

I Barito near Dadahup area
II Barito near Mengkatib
III Kapuas Murung near Palingkau
IV Kapuas near Lupak Dalam

ANNEX V Guideline on P3A development in lowlands

Petunjuk Pelaksanaan Pembentukan/Pembinaan P3A di daerah rawa

DAFTAR ISI

PETUNJUK PELAKSANAAN
PEMBENTUKAN DAN PEMBINAAN P3A
DI DAERAH RAWA

I. PEMBENTUKAN P3A

1. Maksud dan tujuan

Sambil melanjutkan pembangunan prasarana yang belum selesai, perhatian kita perlu diarahkan pula pada masalah O&P dari prasarana yang telah dibangun selama ini agar :

- dapat dipelihara fungsi dan kelestariannya
- dapat memberi manfaat yang sebesar-besarnya bagi seluruh masyarakat.

Untuk menunjang hal tersebut diatas diperlukan pembentukan dan pembinaan P3A, dengan terbentuk dan terbinanya P3A sampai dapat berfungsi dengan baik maka diharapkan :

- Pemeliharaan prasarana pengairan rawa dapat berjalan dengan baik, sehingga fungsi dan kondisi jaringan prasarana dapat dipertahankan.
- Penggunaan/pengelolaan air air lebih efektif dan efisien hingga dapat meningkatkan produksi pangan.
- Rasa ikut memiliki, rasa bertanggungjawab dan rasa untuk berpartisipasi dari petani terhadap keberadaan jaringan dapat didorong/ditumbuhkan melalui pemberian kesempatan kepada P3A yang sudah maju untuk ikut serta dalam melaksanakan pekerjaan pemeliharaan jaringan yang sifatnya ringan.

Agar kelak dapat diperoleh P3A yang berfungsi dengan baik, terlebih dahulu harus dimulai dari pembentukan dengan tata cara yang baik**,** aspirasi masyarakat harus menyadari akan pentingnya keberadaan organisasi P3A, pembentukan P3A harus “Bottom Up” dan bukan “Top Down”.

2. Usaha-usaha melalui Peraturan Pemerintah

- Peraturan Pemerintah no.12 tahun 1982 tentang Irigasi.
- Instruksi Presiden no.2 tahun 1984 tentang Pembinaan P3A
- Peraturan Pemerintah no.14 tahun 1987 yang antara lain meliputi penyerahan sebagian urusan Pemerintahan dibidang Pengairan kepada Dati II, yakni urusan Pembentukan dan Pengembangan P3A
- Peraturan Pemerintah no 27 tahun 1991 tentang rawa.
- Peraturan Menteri Dalam Negeri no.12 tahun 1992 mengenai Pembentukan dan Pembinaan P3A.
- Instruksi Mendagri tahun 1995 tentang Petunjuk Pelaksanaan Permendagri no 12 Tahun 1992.
- PP Irigasi ……..
- ……

3. Pelaksanaan Dilapangan

Tahapan Kegiatan dapat diuraikan seperti berikut :

Tahap I Penyebaran informasi ditingkat propinsi, tingkat kabupaten, tingkat kecamatan dan tingkat desa. Dengan informasi ini diharapkan pejabat instansi terkait akan mempunyai pengertian dan bahasa yang sama, tentang perlunya wadah P3A sebagai pengelola pengairan dipetak tersier.Pada masa ini pula diadakan identifikasi/inventarisasi.

Tahap II Pelatihan dan penyuluhan pembentukan P3A kepada masyarakat dilokasi proyek, yang terdiri dari petani, tokoh-tokoh masyarakat, pengurus organisasi masyarakat (seperti kelompok tani dll.) dengan memakai data profil sosio tehnis yang dilaksanakan instansi terkait beberapa waktu lalu atau pada saat pelaksanaan SID oleh Konsultan Desain. Melalui pelatihan/penyuluhan ini diharapkan petani mendapat motivasi dan mampu membentuk organisasi P3A atau paling tidak terbentuk embrio P3A.

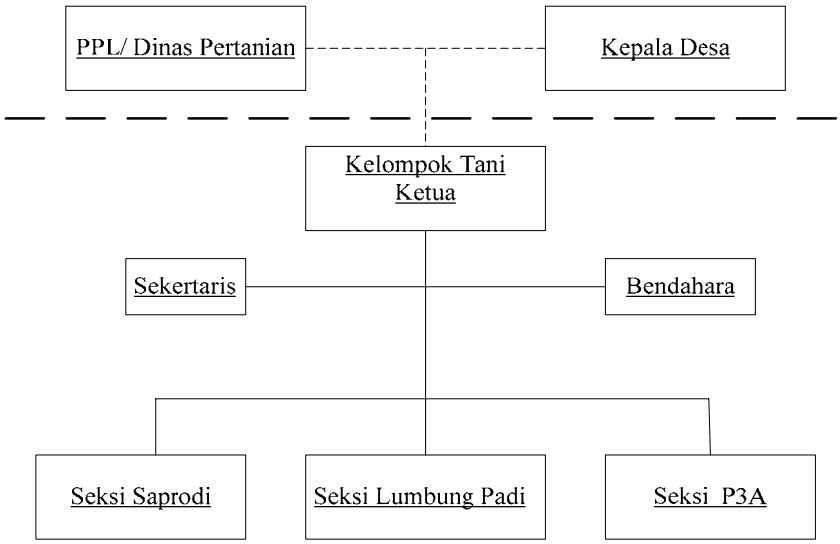
Tahap III Pelatihan untuk P3A yang telah terbentuk, tentang Tata Guna Air berupa aspek organisasi, aspek pengairan, aspek pertanian dan lain lain.

Tahap IV Pelatihan Kegiatan Tindak Lanjut (KTL) yang berkesinambungan kepada P3A yang telah terbentuk termasuk pemberian pekerjaan pemeliharaan yang sifatnya ringan dan mampu dilaksanakan oleh P3A.

Untuk jaringan irigasi rawa pada umumnya P3A dibentuk melalui Kelompok Tani karena mempunyai wilayah hidrologis serta kepemilikan lahan yang sama dengan P3A.dan agar tidak terlalu banyak organisasi yang berada di masyarakat.

Kelompok Tani berada dibawah naungan Dinas Pertanian dan mempunyai organisasi sebagai berikut :

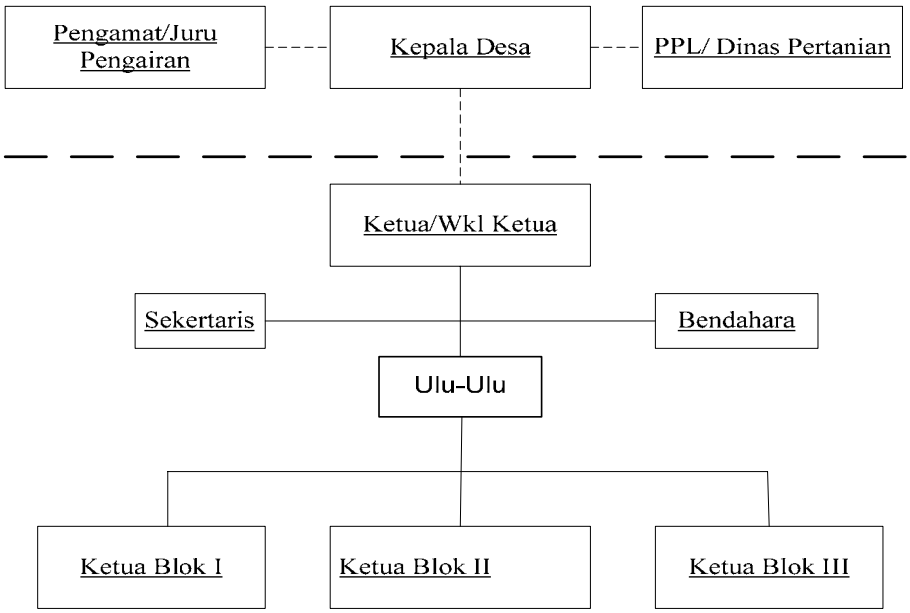
Organisasi Kelompok Tani



Berdasarkan hal tersebut diatas maka Pembentukan P3A dapat diatur sebagai berikut :

- P3A dibentuk berdasarkan gabungan kelompok tani yang sudah ada.
- Kelompok Tani yang ada tetap keberadaannya serta keaktipannya.
- Kelompok Tani diasumsikan identik dengan blok tersier, yang berarti Ketua Kelompok Tani dapat merangkap Ketua Blok Tersier.
- Kelompok-kelompok Tani yang tergabung menjadi satu P3A, harus mempunyai kepentingan yang sama, tidak ada sengketa antar kelompok, dan mempunyai satu hamparan unit lahan serta wilayah pengelolaan air (WMZ)

Organisasi P3A (standar)



Catatan :

- Ketua P3A dapat diambil dari salah satu Ketua Blok atau Tokoh masyarakat yang aktif dan disegani oleh para Ketua Blok.
- Ketua Blok merangkap Ketua Kelompok Tani
- Ulu-ulu bisa dirangkap Ketua P3A atau ditiadakan
- 1 P3A dapat terdiri dari 3 – 4 Kelompok Tani

4. Petugas Pelaksana Lapangan

4.1 Uraian Tugas

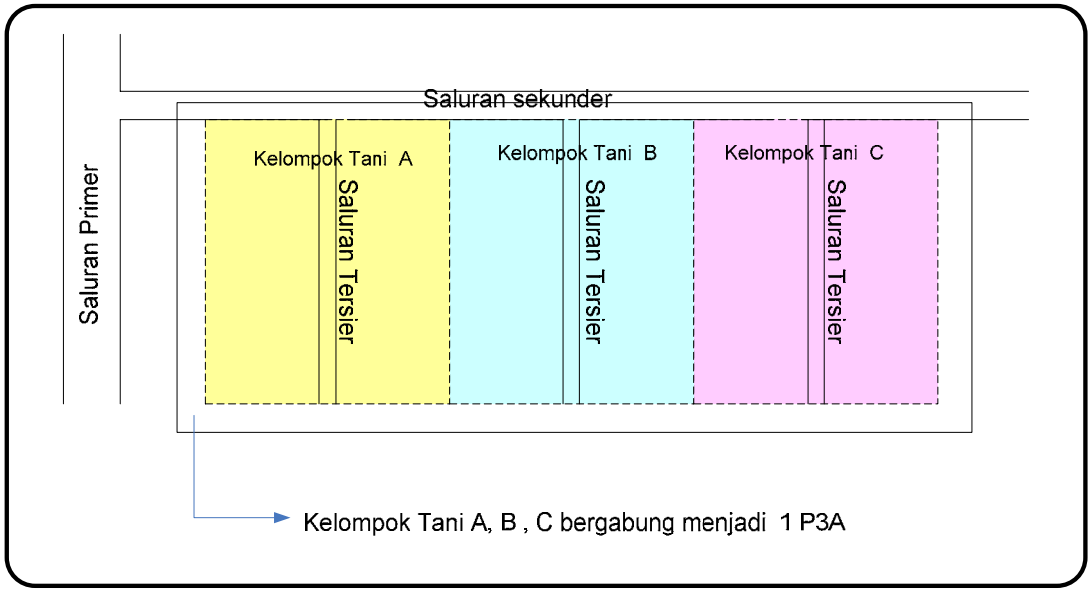
Petugas Pelaksana Lapangan terdiri dari aparat Pemda (Camat, Kepala Desa,/LKMD), Dinas Pertanian (PPL, Kacabdis) dan PU (Juru/Pengamat). Kepada para petugas lapangan tersebut diatas diberikan

penyuluhan/pelatihan intensif agar mereka dapat menerima persepsi yang sama mengenai pentingnya /manfaat dari organisasi P3A

Rincian tugas masing-masing :

Kepala Desa/BMD	PPL/Kacabdis Pertanian	Pengamat/ juru
Mengumpulkan data tokoh masyarakat dan petani didesa, instansi pemerintah desa , lengkap dengan nama, alamat tempat tinggal serta pekerjaannya/skill.	Data Kelompok Tani, jumlah petani penggarap, status kepemilikan dan luas tanah garapan berikut alamat , tempat tinggal ditiap jaringan tersier dan sekunder	Menyediakan peta scheme lengkap dengan jaringan utama, tersier, batas desa, dusun dan RT

Data yang dibuat PPL mengenai Kelompok Tani dikoordinasikan dengan Juru Pengairan/Pengamat dan diplot dipeta menjadi seperti contoh gambar dibawah ini.



4.2 Rapat Koordinasi

Dengan berbekal data-data tersebut diatas dibahas bersama-sama antara Kepala Desa (hadir juga Kepala Dusun dan RT), PPL/KaCabDis Pertanian, Juru Pengairan /Pengamat , Staf dari Balai Wilayah Sungai II (Kalsel dan Kalteng), Para Pengurus Kelompok Tani serta Tokoh-Tokoh Masyarakat.
Dalam pertemuan tersebut dapat disepakati bersama antara lain :

- Beberapa Kelompok Tani bergabung menjadi satu P3A
- Diusulkan oleh Pengurus Kelompok Tani, bakal calon Pengurus P3A yang diambil dari Kelompok Tani atau Tokoh Masyarakat setempat.
- Diakhir pertemuan disampaikan agar susunan calon Pengurus P3A diinformasikan kepada anggota masing-masing Kelompok Tani untuk diketahui dan selanjutnya diberi kesempatan selama satu-dua minggu untuk mengajukan keberatan atas usulan calon Pengurus P3A tersebut.
- Setelah tersusun Pengurus P3A yang merupakan gabungan darpada Kelompok Tani, dibuatkan Berita Acara Kesepakatan mengenai

terbentuknya Pengurus P3A yang ditandatangani oleh Ketua Terpilih, Sekertaris Terpilih dan disetujui/diketahui oleh Kepala Desa dan Camat. Terlampir pula daftar anggota dari Kelompok Tani lengkap dengan biodata Pengurus P3A.

- Pertemuan berikutnya adalah penyusunan Anggaran Dasar dan Anggaran Rumah Tangga (AD/ART).
- Seluruh kegiatan ini difasilitasi dan dikordinasikan oleh Dinas PU Kabupaten serta Balai Wilayah Sungai II Kalsel/Kalteng selaku Penyandang Dana.

5. Proses Pembentukan

Pembentukan P3A dengan cara yang baik perlu melalui suatu prosedur yang meliputi :

- tahapan inventarisasi,
- tahapan penyuluhan
- tahapan pembentukan.
- tahapan pembinaan

5.1 Tahapan Inventarisasi

Dalam tahapan inventarisasi dikumpulkan berbagai bahan dan data yang diperlukan untuk melaksanakan pembentukan P3A yang baik. Tahapan ini dilaksanakan oleh Tim Pembina tingkat Desa seperti Kepala Desa, Juru Pengairan dan PPL; atau jika sedang dilakukan pada tahapan desain maka Konsultan desain melakukan inventarisasi bersama-sama.

Bahan dan data tersebut antara lain meliputi :
- aspek tehnis
- aspek social

Sehingga didapat data- data **profil sosio-tehnis** dari masyarakat setempat

5.1.1. Aspek Tehnis :

a. Identifikasi batas-batas petak tersier, peta petak tersier di perlukan untuk mengetahui batas areal peta tersier yang bersangkutan, sehingga memudahkan mengetahui petani mana yang akan masuk sebagai anggota P3A. Disamping itu dengan adanya peta tersebut diperoleh informasi lainnya mengenai luas areal petak tersier yang bersangkutan, jumlah petak kwarter letak saluran dan bangunan dll.
b. Bila peta petak tersier belum ada, perlu dibuatkan sketsa tersier.
c. Kondisi saluran dan bangunan.

5.1.2 Aspek Sosial

a. Data mengenai organisasi desa, meliputi Kepala Desa beserta aparatnya

b. Identifikasi tokoh petani/masyarakat ialah petani yang dikenal berwibawa/disegani diantara petani lainnya dalam suatu petak tersier untuk memudahkan pembinaan para petani.

   Data tokoh petani/masyarakat yang dibutuhkan :
   - Nama.
   - Alamat (dusun/desa tempat tinggal).
     Makin banyak jumlah petani yang berstatus pemilik penggarap umumnya makin mudah pembinaannya.
   - Jumlah (disarankan untuk mengidentifikasi/mengenal 5 – 15 orang tokoh petani yang paling disegani/berwibawa).

c. Data petani dalam petak tersier merupakan data terpenting untuk diketahui, karena merekalah yang akan menjadi subyek/pelaku pembentukan P3A.
   Data petani yang dibutuhkan :
   - Nama.
   - Alamat (dusun/desa tempat tinggal).
     Makin terpencar tempat tinggal petani makin sulit pembinaannya.
   - Status petani (pemilik penggarap, pemilik bukan penggarap, penggarap).
     Makin banyak jumlah petani yang berstatus pemilik penggarap, umumnya makin mudah pembinaannya.
   - Jumlah, makin sedikit jumlah petani, umumnya makin mudah pembinaannya.

d. Data mengenai jumlah tenaga kerja yang ada/tersedia seperti tukang gali, tukang batu dll.

5.2. Tahap penyuluhan

Sesudah selesai tahap inventarisasi, dilanjutkan dengan tahap penyuluhan sebagai berikut :

5.2.1 Penyuluhan tokoh petani

a. Penyuluhan tentang P3A terlebih dahulu harus ditujukan kepada tokoh petani/masyarakat yang telah diinventarisasi, baik secara sendiri maupun secara bersama.

b. Penyuluhan dapat diadakan berulang kali sampai semua atau sebagian besar tokoh petani memahami dan menyadari manfaat P3A, serta mendukung rencana pembentukan P3A.

5.2.2 Penyuluhan petani secara keseluruhan

a. Sesudah penyuluhan kepada para tokoh petani berhasil baru disusul dengan penyuluhan tentang P3A kepada seluruh petani petak tersier baik melalui forum pertemuan yang khusus diadakan untuk

keperluan tersebut, maupun forum umum lainnya (kelompok tani, rembug desa, forum mesjid., dll).

b. Tokoh petani yang telah diberikan penyuluhan sebelumnya, perlu diikut sertakan untuk memberikan penyuluhan kepada petani lainnya.

5.3 Tahap pembentukan

Sesudah selesai tahap penyuluhan, baru disusul dengan tahap pembentukan.

5.3.1 Pemilihan pengurus P3A

a. Upaya menghadirkan 2/3 jumlah petani petak tersier.

b. Bimbing petani untuk mengajukan sendiri calon anggota pengurus dan hindari penunjukan oleh aparat instansi pembina.

c. Adakan pemilihan pengurus sedemokratis mungkin

.

5.3.2 Penetapan Anggaran Dasar dan Anggaran Rumah Tangga (AD/ART)

a. Rapat pengurus P3A.
Upayakan penyelenggaraan rapat pengurus P3A dan berikan bimbingan untuk menyusun konsep AD dan ART atau memperbaiki/menyesuaikan/ melengkapi konsep AD dan ART yang telah ada.

b. Rapat Anggota P3A.
Upayakan penyelenggaraan Rapat Anggota yang dihadiri 2/3 anggota.
Bimbing pengurus mengadakan diskusi dengan anggota tentang isi konsep Anggaran Dasar dan Anggaran Rumah Tangga sampai terdapat kesepakatan bersama mengenai hal tersebut.

5.3.3 Kelengkapan Anggota P3A

a. Buatkan Berita Acara Pembentukan P3A, yang meliputi pemilihan pengurus P3A dan penetapan AD/ART.

b. Buatkan Surat Keputusan Bupati/Walikotamadya Kepala Daerah Tingkat II tentang Penetapan Pembentukan P3A.

II. PEMBINAAN P3A

P3A yang telah dibentuk dengan tata cara yang baik, hanya dapat bertumbuh dan berfungsi dengan baik, bila disusul dengan kegiatan-kegiatan pembinaan. Kegiatan pembinaan terhadap P3A meliputi kegiatan sebagai berikut :

1 Kursus dan Pelatihan P3A

a. Bagi pengurus P3A yang baru dibentuk, perlu diberi pengetahuan dasar dan keterampilan dasar tentang berbagai aspek organisasi P3A, Operasi dan Pemeliharaan prasarana pengairan, dll.

b. Pengetahuan dasar dan keterampilan dasar tersebut diberikan melalui kursus dan pelatihan singkat selama beberapa hari.

c. Materi Pelatihan :

Aspek	Materi	Instruktur dari Instansi Terkait
Umum	- Pengenalan daerah rawa - Keterkaitan tanah/air dan tanaman	Dinas PU
Organisasi P3A	- P3A dan Instansi terkait - Dasar hukum dan kaitannya dengan O&P rawa - Pengetahuan dasar organisasi dan AD/ART - Penyelenggaraan P3A (Administrasi, peran tugas dan rencana kerja) - Pembuatan laporan dan rapat-rapat	Dinas PU Dinas PU Dinas PU Dinas PU Dinas PU
Pengairan	- Wilayah Pengelolaan Air (WMZ) - Pembagian Air, kebutuhan air, Pola Tanam - Rencana Tata Tanam Tahunan - Pemeliharaan saluran dan bangunan dipetak tersier	Dinas PU Dinas Pertanian Dinas Pertanian Dinas PU
Pertanian	- Kebutuhan air tanaman - Wawasan Lingkungan hidup - Pasca Panen - Mekanisasi Pertanian	Dinas Pertanian Dinas Pertanian Dinas Pertanian Dinas Pertanian
Perkebunan	- Budi Daya Kelapa sawit	Dinas Perkebunan
Peragaan	- Kunjungan lapangan tentang cara bercocok tanam yang baik, pemeliharaan saluran dan bangunan	Instansi terkait

2 Temu Karya

Pembentukan P3A dan kursus dan Pelatihan Pengurus P3A, harus ditindak lanjuti dengan program jangka panjang berupa Temu Karya yang teratur dan berkelanjutan antara Pembina P3A dan pengurus P3A sebagai berikut :

2.1 Temu Karya Awal Musim Tanam

a. Diadakan setiap awal Musim tanam disetiap Desa. Tujuan untuk usulan Rencana tanam ditiap petak tersier untuk Musim Tanam yang dihadapi.

b. Diadakan oleh Pembina P3A tingkat Desa dan dihadiri oleh para Pengurus P3A.

2.2 Temu Karya Bulanan

a. Diadakan 1 x / bulan ditiap Desa dengan tujuan :

- Memantau dan mengevaluasi laporan perkembangan pertanian, pengolahan air dan lain-lain dari tiap P3A.
- Membahas permasalahan-permasalahan yang dihadapi tiap P3A.
- Memberi bimbingan atau petunjuk bagi pengurus P3A dalam pelaksanaan tugasnya.

Bila keadaan belum memungkinkan untuk dilaksanakan 1 x / bulan atau 1 x / 3 bulan namun perlu dilaksanakan secara teratur dan berkelanjutan.

b. Diadakan oleh pembina tingkat Desa dan dihadiri oleh para pengurus P3A.

2.3 Perlombaan P3A

a. Perlombaan P3A diadakan dengan tujuan untuk mempercepat pemasyarakatan P3A dan merangsang peningkatan prestasi setiap P3A.

b. Perlombaan dapat diadakan disetiap Desa, kecamatan dan Kabupaten untuk jangka waktu tertentu.

III. DUKUNGAN BIAYA.

Sebaiknya usulan biaya O&P harus sudah dimasukan permintaan dana mengenai program pembentukan P3A, Pembinaan P3A serta penyuluhan/pelatihan, karena dalam setiap pertemuan/rapat – rapat koordinasi, diperlukan biaya antara lain untuk :

- Insentip/perjalanan Tim Pembina TK. Desa,

- Honor instruktur dan peserta pelatihan
- Konsumsi ringan pertemuan petani,
- Alat peraga/tulis menulis
- dll.

Pembentukan P3A dengan prosedur yang baik memerlukan waktu, tenaga, pikiran dari petugas Pembina serta dukungan dana yang memadai melalui dana APBD Kabupaten, Propinsi serta APBN Pusat.

PROPOSAL KEGIATAN

Kepada Yth.
Pejabat Pembuat Komitmen .....
u.p. Sdr. .....
(selaku Pengamat Pengairan pada Daerah Rawa .....)
di tempat .....

Sehubungan dengan adanya kegiatan Operasi dan Pemeliharaan Jaringan Reklamasi Rawa (OP. JASIRA). Dengan ini kami mengajukan usulan kegiatan untuk mendapatkan pendanaan lebih lanjut. Usulan kegiatan dimaksud dalam rangka OP JASIRA :

Lokasi	:	Daerah Rawa .....
Desa	:	.....
Kecamatan	:	.....
Kabupaten	:	.....
Panjang Saluran	:	.....
Luas Area	:	.....
Masa pemeliharaan	:	Selama ..... (..... dengan huruf .....)

Dengan perincian sebagai berikut :

No.	Jenis Pekerjaan	Satuan	Volume	Satuan Hitung	Nilai Pekerjaan
1					
2					
3					
4					
dst					
	T O T A L				

Rincian secara detail untuk masing-masing Jenis Pengeluaran sebagaimana daftar terlampir. Adapun penyaluran dana dapat dilaksanakan melalui Rekening Nomor ..... pada Bank ..... Atas nama P3A .....

Demikian usulan kegiatan OP JASIRA ini diajukan. Terima kasih.

Telah meneliti kebenarannya : ....., ...
CO P3A ..... Ketua P3A .....

(_____) (_____)

Mengetahui :
Kepala Desa .....

(_____)

Lampiran
1. Surat Pernyataan Kesanggupan Kerja;
2. Daftar kuantitas dan Harga;
3. Perhitungan Harga Satuan;
4. Sketsa Lokasi OP JASIRA Daerah Rawa .....

DAFTAR KUANTITAS, HARGA
DAN ANALISA HARGA SATUAN PEKERJAAN

Nama Pekerjaan : Operasi dan Pemeliharaan
Darah Rawa .....

Lokasi : .....
Proyek/Bagian Proyek : .....

No.	Uraian Pekerjaan	Satuan	Kuantitas	Analisa Harga Satuan (Rp)		Harga Satuan Disepakati (Rp)	Jumlah Harga (Rp.000)	
				P3A	FE*	P3A + FE*	P3A	P3A + FE*
1								
1.1								
1.2								
1.3								
1.4								
2								
2.1								
2.2								
2.3								
2.4								
3								
3.1								
3.2								
3.3								
3.4								
dst.								

*) Diisi pada saat pembahasan, dan hasil pembahasan dipakai sebagai harga satuan yang disepakati bersama antara P3A dan Pengamat

Meneliti kebenarannya : ....., ...
CO Daerah Rawa Kepala P3A .....

(_____) (_____)

Telah mensertifikasi secara bersama-sama dengan sepenuhnya
Tanggal :
Pengamat Daerah Rawa :……

(_____)

CO Daerah Rawa ..... Ketua P3A .....

(_____) (_____)

BERITA ACARA PEMBAHASAN
PROPOSAL KEGIATAN OP JASIRA

Pada hari ini ..... Tanggal ..... Bulan ..... Tahun ..... kami yang bertanda tangan di bawah ini :

1. Nama : .....
   Jabatan : .....
   Alamat : .....
   Berdasarkan Surat Keputusan ..... nomor ..... selanjutnya disebut sebagai pihak pertama.

2. Nama : .....
   Jabatan : .....
   Alamat : .....
   Berdasarkan Surat Keputusan ..... nomor ..... selanjutnya disebut sebagai pihak kedua.

Dengan ini menyatakan bahwa sesuai dengan usulan kegiatan OP JASIRA oleh P3A ....., maka pihak pertama dan pihak kedua menyatakan kesepakatan bahwa pelaksanaan OP JASIRA untuk :

Lokasi : Daerah Rawa .....
Desa : .....
Kecamatan : .....
Kabupaten : .....
Panjang Saluran : ..... KM (.....dengan huruf .....)
Luas Area : ..... Ha (..... dengan huruf .....)
Masa Pemeliharaan : Selama ..... Hari (.....dengan huruf .....)

Dengan rincian sebagai berikut

No.	Jenis Pekerjaan	Harga Satuan	Volume	Satuan Hitung	Nilai Pekerjaan
1					
2					
3					
dst.					
	T O T A L				

Demikian kesepakatan ini dibuat untuk selanjutnya dipergunakan sebagai dasar pembuatan SP3 antara Pejabat Pembuat Komitmen *Jasira ISDP* dengan P3A .....

....., ...

Pihak Pertama
Pengamat Daerah JASIRA .....

(_____)

Pihak Kedua
Ketua P3A .....

(_____)

Menyetujui dan Mengetahui
CO P3A : .....

(_____)

SURAT PERNYATAAN
KESANGGUPAN KERJA

Sehubungan dengan pengajuan proposal kegiatan OP Jasira yang berlokasi di Daerah ..... Desa ....., kami yang bertanda tangan dibawah ini :

Nama:
.....
.....

Alamat:
.....
.....

Jabatan:
.....
.....

Dasar Hukum :SK Bupati Kepala Daerah Tingkat II.....

Dengan ini menyatakan bahwa :

1. Perkumpulan Petani Pemakai Air (P3A) ..... telah dinyatakan sebagai P3A yang sah di Kabupaten/Daerah Tingkat II ..... sesuai dengan SK Bupati Kepala Daerah Tingkat II ..... tanggal ..... nomor .....
2. Anggota P3A ..... sebanyak ..... orang, sebagaimana daftar dibawah ini :

No	Nama Anggota	Jabatan	Tanda Tangan
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
dst			

3. Kesanggupan untuk melaksanakan OP Jasira dengan melibatkan seluruh anggota dan kemampuan yang dimiliki, sesuai dengan aturan para Petunjuk teknis yang selalu dijelaskan di Tingkat Kecamatan ..... Pada tanggal ..... dan di Desa ..... pada tanggal .....

4. Berusaha secara sungguh-sungguh untuk melaksanakan kegiatan sehingga penyelesaian dapat tepat waktu dan sesuai dengan Surat Perjanjian Pemberian Dana;

   Demikian Surat Pernyataan ini dibuat dan merupakan bagian yang tidak terpisahkan dari Proposal Kegiatan Op Jasira tanggal .....

Meneliti kebenarannya :	....., ...
CO P3A	Ketua P3A .....
(_____)	(_____)

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