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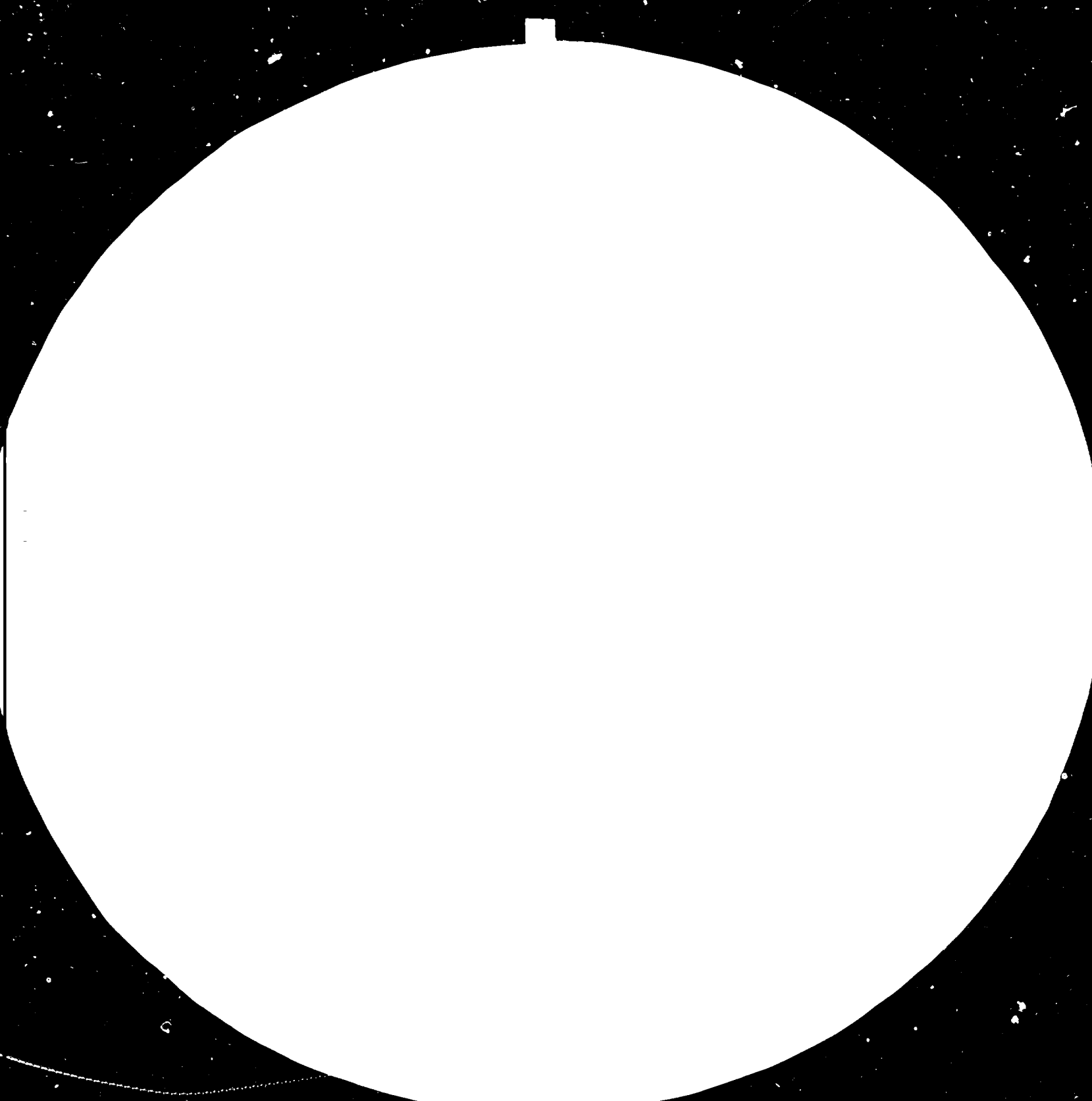

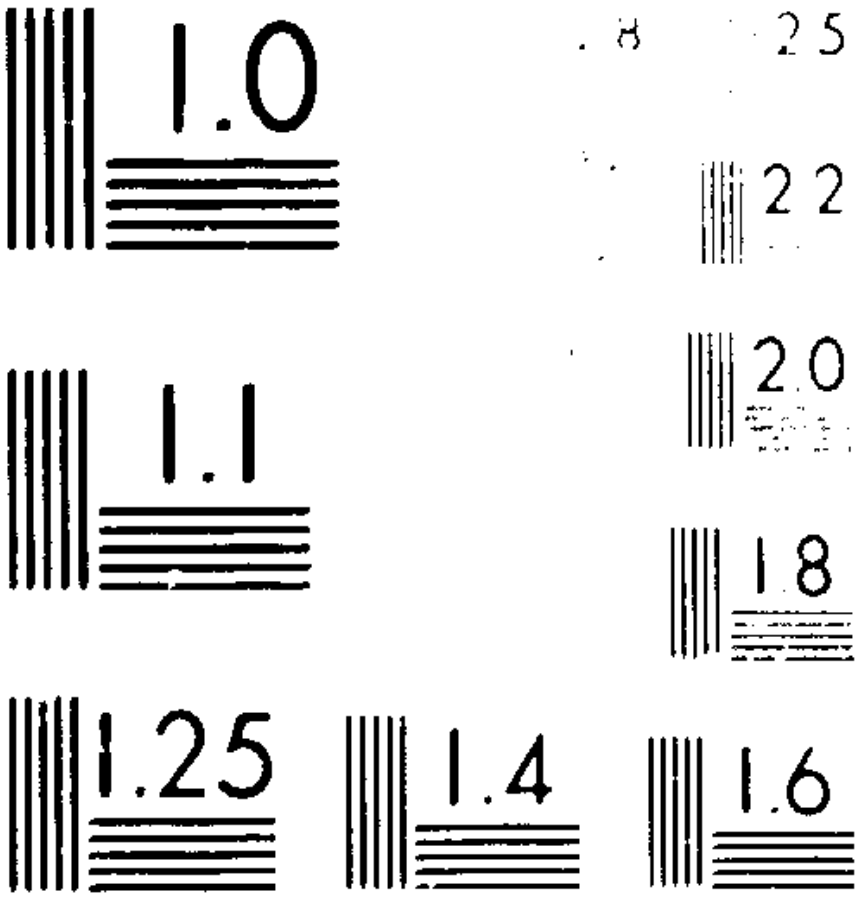
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CENTRALIZED VERSUS DECENTRALIZED SYSTEM OF PROJECT PLANNING AND IMPLEMENTATION OF MINI-HYDRO POWER DEVELOPMENT

THE INDONESIAN CASE*

by

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* This document has been reproduced without formal editing.

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INTRODUCTION

1. Although the history of mini-hydro power (MHP) development in Indonesia was dated back long before the pre-war period, when one of the first mini-hydro power plant with an installed capacity of 2 x 122 kW was introduced and put into operation in 1923 at Cijedil, West Java, the number and capacity of mini-hydro power stations in operation at present are still relatively small as compared to the available mini-hydro power potential.

The total installed capacity of MHP stations in Indonesia in existence at the end of 1982 is 24370 kW located at 44 sites scattered throughout the country. A list of these existing MHP stations appears in Annex 1.

ORGANIZATION

2. Perusahaan Umum Listrik Negara (PLN), the State Electricity Corporation which reports to the Minister of Mines and Energy; is endowed with the major responsibility for generating, transmitting and distributing electric power throughout Indonesia.

This responsibility covers practically the whole range of activities of the Indonesian power sector such as planning and construction, including that of mini-hydro power development.

MINI-HYDRO POWER DEVELOPMENT

3. The policy for planning, and development of MHP Projects lies in the Head Office of PLN. Project preparation activities such as preliminary survey, site identification and selection, reconnaissance survey, feasibility study and engineering design are carried out under the responsibility of a Central Project Office an executing unit of PLN. In carrying out these activities, assistance are often required from engineering consulting firms and /or the Electric Power Research Centre of PLN.

Tendering and contract negotiations of civil works are carried out by the individual projects concerned or by the Main Project Offices in charge of hydro-power development in the region, the so-called Main Hydro Projects

Tendering and contract negotiations of electro-mechanical works are carried out by the Central Project Office.
The responsibility for construction supervision of MHP projects in the past lied with the Central Project Office and assisted by the projects concerned, while at present it is the reverse where the major responsibility lies with the project and assisted by the Central Project Office.
Where necessary, in some regions Main Hydro Power Projects are established, which are given the task and responsibility for the construction of medium and large hydro power projects in the region. With this arrangement there is the possibility that the Main Hydro Projects may perform the same activities which normally comes under the responsibility of the Central Project Office. Such possibility of overlapping activities could be avoided by having a good coordination from the Head Office.
The initiative of proposing a MHP project may also come from other institutions such as the Department of Public Works. This is the case of irrigation/ multi purpose projects (flood protection irrigation, water supply, power generation, etc.), where coordination efforts among the implementing organizations involved with the projects are always necessary.
For projects of this kind, the project implementation are carried out as a combined effort using integrated approach, where the civil works are usually done under the responsibility of the Public Works, while that of the power generating facilities stays under the responsibility of PLN.

4. The above, explains how MHP development are basically implemented in Indonesia in the past as well as at present.Here,a centralised system of planning, programming and implementation is mainly adopted, without leaving the possibility of following a decentralised system and mixed or combined system such in the case of multi-purpose projects. It is true that in a centralised system, the development criteria tends to concentrate on power generation only and neglecting the benefits which may be derived from other sectors.
It can also be noted that in some regions there is the capability to develop their own micro-hydro projects (with capacity up to 100 kW), for instance within the Cooperatives and Regional Development Offices, in most cases in co-operation with local universities or technological institutions.

ACHIEVEMENTS OF MHP DEVELOPMENT AND PROBLEMS FACED IN ITS IMPLEMENTATION

5. As mentioned earlier, the total installed capacity of MHP stations in Indonesia at the end of 1982 is 24370 kW, which almost practically all of them were centrally planned and developed.

This centralised system of development is merely based on the authority system in the electric power of Indonesia in the past, which was close to monopoly given to PLN.

Less attention were given in the past for the development of MHP due to several reasons, mainly because of the cheap energy price era, relatively high investment cost per unit capacity and lack of experience in MHP. However, plans were also made to include the development of MHP in some areas where they are considered still attractive as compared to other alternative solutions, with the aim of gaining additional knowledge and experience in the development of MHP, besides the primary objective of generating electricity. The results and experiences gained from MHP development can be mentioned as follows :

- Electrification of rural areas which are far from the existing grid.
- Develop in-house design capabilities.
- Use of local consultants as well as foreign
- Use of local contractors in an isolated/remote area
- Use of locally manufactured turbines as well as foreign made equipments
- Operation and maintenance of MHP stations.

6. Despite the achievements and experiences gained in the development of MHP, some of the difficulties and problems faced during its implementation were among others :

- transportation and communication problem due to remoteness of sites
- lack of skilled workers
- lack of expertise
- weak constructors
- poor quality of survey works and feasibility study
- inferior design and engineering works
- lack of funds

In addition, some operational and maintenance problems were also faced such as

- lack of qualified operators
- insufficient annual continuous discharge
- landslides and foundation failures
- speed governor trouble

CENTRALISED VERSUS DESENTRALISED SYSTEMS

7. In a centralised system of MHP development, the responsibility of planning, programming and implementation of the individual projects rest upon one central authority.

The works involved in the planning stage can be divided into the following activities :

- data collection
- preliminary survey
- site identification and selection
- reconnaissance survey
- feasibility study
- engineering design
- tendering
- contract negotiation

Whereas in the implementation stage, where physical works are mostly involved, the activities consist of preliminary construction, manufacturing, main civil construction, erection and installation of electro-mechanical works, and commissioning.
Considering the broad range of activities, and if the authority in charge of MHP development has to undertake all of the works by itself, the number and required manpower and expertise must be sufficiently provided to carry out these jobs.
This is not only difficult but also very costly.
Therefore in most cases engineering consulting and contracting firms are engaged to help solving the problem.

8. From the point of view of works involved in MHP development, the same situation as mentioned above holds true in a decentralised system of MHP development if similar pattern is to be followed, such in the case of full transfer of authority and responsibility.
One way of avoiding these difficulties is to have a combined effort and taking into account the institutional capabilities of the implementing bodies involved
Apart from the pros and cons for a centralised or decentralised system of MHP development, the important thing is how one can achieve the goal of developing mini hydro in developing countries with the maximum use of indigeneous resources and to develop local capabilities.

9. MHP development can be of a single purpose i.e. generate electricity, or multi-purpose aspect where in most cases are of dual purpose combined with irrigation. In the latter case, the most preferable method to follow is to take the integrated approach, where all parties having their major concern and interest in a particular aspect are invoived in the project. In following this approach, a good coordinating effort should be established to assure a smooth implementation of the project.

For MHP development with a dual-purpose, the problem becomes less complicated since only two parties are involved, i.e. the one responsible for power generation and the other having the responsibility in irrigation.
There are quite a number of MHP stations of this kind, most of them were developed on the basic of an existing irrigation system.
The investment cost of such a MHP station, in particular the cost of civil works is relatively low, because it required only a simpler intake and outlet structure to build the plant.
Most of the existing MHP stations were built on the basis of a single purpose, which is to generate electricity and thereby involving a relatively high investment cost as compared to other small conventional power generating units such as diesel generators, which made it less attractive for them to develop.

10. In a multi-purpose MHP development where power generation is one of the main objectives, the integrated approach is considered as the most advantageous way for the electric power utility to develop a MHP station.
The various advantages which can be drawn from this approach are :

- minimise cost of investment to the most essential part for the construction of the power component only, such as powerhouse and power generating equipment.
- minimise cost of engineering
- reduce scope of works and responsibility
- sharing of expertise

To assure successful implementation of a project developed on the basis of an integrated approach, it requires a well coordinated effort and good preparation and understanding among the parties involved, which is sometimes not easy to establish.

11. Back to the question of centralised versus decentralised system of project planning and implementation of MHP development, there is no single answer as to which is the most appropriate way to follow.
In the Indonesian case, although the former, which is the centralised system, has been practically followed in almost any MHP development in the past, it does not necessarily mean that this is the most suitable method of developing a MHP station, since some MHP stations which have been developed on a decentralised manner have also shown the same good result as the other plants which have been developed otherwise. This means that both centralised and decentralised system as well, have been applied without any major problems.

12. Some of the advantages and disadvantages of [illegible] as well as

desentralised system of project planning and implementation of MHP development can be mentioned as follows

Advantages of a centralised system

- the total number of experts, staff and other personnel required by the project are much less than for a decentralised system
- establishment of a MHP station does not depend on the capability of the region

Disadvantages of a centralised system

- due to remoteness of sites, and availability of manpower, it is difficult to implement several MHP projects located at different sites at the same time in view of the geographical condition of the country and the poor infrastructure of the sites.

Advantages of a decentralised system

- MHP development can be implemented in a more accelerated manner, if the required manpower and expertise can be made available in the regions
- creation of new job opportunities.

Disadvantages of a decentralised system

- the need to establish regional capability requires considerable effort, such as institutional set up, manpower recruitment and training, etc.
- justification of a MHP development is merely based on a micro (regional) - level, which may not be the optimum solution.

To obtain the optimum result of MHP development, it is best to combine both system in such a way without creating new constraints and trying to avoid the disadvantages resulting from either system. This can be started first with having an overall evaluation of the problem by preparing a good inventory of all data and information available on MHP making an assessment of MHP development capabilities at all levels.

In order to have a well coordinated efforts in MHP development and to make the maximum use of available resources, it is desirable that the overall responsibility for planning and programming be given to a central body which is also responsible forcoordination purposes and to act as an advisory body for MHP development.

There is also the need to formulate a national strategy and policy for the development of MHP.

On the basis of this national strategy and policy, a development plan can be further defined together with its implementation programmes which should be based on certain priorities.

After the establishment of all the basic policies and plans, then come the implementation stage of the individual projects where the regional development units may be involved.

The more regional development units can participate in the project implementation, a brighter prospect can be expected in the decentralised system of MHP development in the future.

ANNEX 1

I N D O N E S I A

LIST OF EXISTING MINI-HYDRO POWER STATIONS

AS OF 31 DECEMBER 1982

No.	Name of Plants (Sites)	Province	Installed Capacity (kW)	Head (m)	Discharge per Unit (l/sec)	Year in Service	Remarks
1	2	3	4	5	6	7	8
1.	Tarutung	North Sumatera	2 x 60	30	270	1925	
2.	Munthe	North Sumatera	80	9	1100	1976	
3.	Sungai Puar	West Sumatera	75	115	100	1974	
4.	Koto Anau	West Sumatera	160	23	1000	1978	
5.	Sungai Penuh	Jambi	70	32	300	1957	
6.	Lempur	Jambi	90	26	500	1979	
7.	Kota Agung	Lampung	60	12	720	1972	
8.	Tes	Bengkulu	2 x 660	43.5	1875	1959	
9.	Sido Urip	Bengkulu	100	13.7	1040	1976	
10.	Haruyan	South Kalimantan	172	5	5000	1979	
11.	Tenga	North Sulawesi	180	24	1070	1979	
12.	Pontak	North Sulawesi	60	5	1700	1979	
13.	Sawito	South Sulawesi	3 x 540	6,8	10000	1942	
14.	Takala (Sopeng)	South Sulawesi	98	8	900	1974	
15.	Wamena I	Irian Jaya	120	5	3500	1977	
16.	Karang Asem I	Bali	30	27	170	1969	
17.	Karang Asem II	Bali	80	14	800	1973	
18.	Narmada	W.Nusa Tenggara	100	15	950	1978	
19.	Rutteng	E.Nusa Tenggara	120	16	1070	1974	
20.	Bajawa	E.Nusa Tenggara	160	52	550	1981	
21.	Klonciny	East Java	52	80	100	1927	
22.	Giringan	East Java	1400	101	1130	1937	
			2 x 900	101	1280	1955	
23.	Golang	East Java	3 x 900	85	1370	1959	
24.	Ngebel	East Java	2200	183.5	1500	1968	
25.	Maron	East Java	80	9.5	1200	1972	
26.	Selorejo	East Java	4800	37.1	14700	1973	
27.	Tanggul	East Java	60	4.5	1400	1976	
28.	Wonosobo	Central Java	120	13	1566	1943	
29.	Banjarnegara	Central Java	256	19	2200	1949	
30.	Balapusuh	Central Java	16	6	100	1969	

I N D O N E S I A

LIST OF EXISTING MINI-HYDRO POWER STATIONS

AS OF 31 DECEMBER 1982

(continued)

No.	Name of Plants (Sites)	Province	Installed Capacity (kW)	Head (m)	Discharge per Unit (l/sec)	Year in Operation	Remarks
1	2	3	4	5	6	7	8
31.	Ngargoyoso	Central Java	60	30	300	1973	
32.	Tonjong	Central Java	200	18.7	1200	1977	
33.	Pakisbaru	Central Java	100	130	110	1978	
34.	Wonodadi	Central Java	210	3.8	7200	1979	
35.	Mejagong	Central Java	575	16.3	4050	1979	
36.	Sempor	Central Java	1000	44.2	2930	1981	
37.	Kalikuning	Central Java	85	5	2500	1982	
38.	Bengkok	West Java	3 x 1050	105	1400	1923	
39.	Dago	West Java	700	45	2250	1923	
40.	Cijedil	West Java	2 x 122	36	523	1923	
			2 x 154	36	556	1923	
41.	Cibinong	West Java	20	5	570	1962	
42.	Talaga I	West Java	200	27	600	1970	
43.	Laboratorium Cipayung	West Java	400	45	1300	1974	
44.	Maja	West Java	75	10.6	650	1979