

BIBLIOGRAPHIC DATA SHEET1. CONTROL NUMBER
PN-AAJ-1972. SUBJECT CLASSIFICATION (698)
AP12-0000-G662

3. TITLE AND SUBTITLE (240)

Methodology for making assessments of environmental impact of irrigation projects under the Sederhana Irrigation loan

4. PERSONAL AUTHORS (100)

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5. CORPORATE AUTHORS (101)

AID/SER/ENGR

6. DOCUMENT DATE (110)

1974

7. NUMBER OF PAGES (120)

23p.

8. ARC NUMBER (170)

ID627.52.N357

9. REFERENCE ORGANIZATION (130)

SER/ENGR

10. SUPPLEMENTARY NOTES (500)

11. ABSTRACT (950)

12. DESCRIPTORS (920)

Indonesia
Methodology
Irrigation
AssessmentsEnvironmental factros
Environmental tests
Irrigation canals

13. PROJECT NUMBER (150)

14. CONTRACT NO.(140)

SER/ENGR

15. CONTRACT TYPE (140)

16. TYPE OF DOCUMENT (160)

ID
627.52
N 357

PN-AAJ-197

Report on
Methodology for Making
Assessments of Environmental Impact
of
Irrigation Projects
under the
Sederhana Irrigation Loan.

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April 22, 1974

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Exhibit 1

1. Objective and Description of Overall Project:

A. Objective

The principal objective of the Government of Indonesia's (GOI) Sederhana (Simple) Irrigation Program is to rapidly increase rice production through expansion of both dependably irrigated and cultivable land. Secondary crops may also be grown in areas dependably irrigated as a result of the Program. The objective of the AID project is to support this Program nationwide through:

1) improving the institutional capability of GOI implementing agencies, and 2) financing a portion of the local currency cost to complete projects planned for completion in Indonesian FY's 1976 and 1977.

B. Description

1. Sederhana (Simple) Irrigation Program

The major characteristic which differentiates the Sederhana Program from other irrigation programs in Indonesia is the simple nature of the projects to be undertaken. Projects included in the Program are visualized as simple to design, simple to construct, capable of rapid execution and relatively inexpensive. These projects are expected to have a quick impact in terms of greater rice production.

Sederhana projects are planned as a transitional phase in the development of the water resources of a particular area. All projects will be gravity fed without provision for water storage. In most cases, diversion will be achieved through the use of less permanent structures such as gabion or other type run-of-the-river weirs. Permanent diversion structures will only be built where the capital cost

of such a structure is only somewhat higher than that of a less than permanent structure and the internal rate of return (IRR) is greater.

The majority of Sederhana projects involve the rehabilitation, improvement and/or extension of existing projects. GOI plans call for construction of projects with a total area of 550 thousand hectares under the Program during Repelita II (Indonesia's 2nd 5-year plan, extending from 1974 to 1979). The breakdown of this total by year of completion is shown below:

Project Area Planned for Completion
During Each Year of Repelita II

<u>Indonesian Fiscal Year</u>	<u>Area (Hectares)</u>	<u>Percent of Total</u>	<u>Cumulative Percent of Total</u>
1974-75	40226	7.3	7.3
1975-76 *	60319	11.0	18.3
1976-77 *	100169	18.2	36.4
1977-78	150000	27.2	63.7
1978-79	<u>200000</u>	<u>36.3</u>	<u>100.0</u>
Total	<u>550714</u>	<u>100.0</u>	

* Fiscal years for which AID support will be given.

On the basis of cost estimates submitted in response to a questionnaire circulated to the provinces, the total construction cost of the Sederhana Program will exceed \$75 million during Repelita II.

Most Sederhana projects range in size from 100 to 2000 hectares. However, a few projects of less than 100 hectares and of 2500 hectares are included in the Program.

Sederhana projects are located in 17 provinces, but about one-quarter of the area involved is in South Sulawesi and 10% each in the provinces of North Sumatra, Jambi, South Sumatra and Bengkulu.

General criteria applicable to all new irrigation projects to be implemented in Repelita II and special criteria applicable only to the Sederhana (Simple) Irrigation Program are as follows:

General criteria:

1. Suitable soil
2. Suitable quality and quantity of water
3. Adequate manpower (farmers and construction workers available in area)
4. No land status problems
5. Proximity to market
6. Physical accessibility

Special criteria for the Sederhana Program:

1. Simple to design and construct, including low equipment requirements
2. Capable of rapid execution
3. Relatively inexpensive
4. Area 2000 hectares or less

An additional criterion, cost less than Rp. 100 thousand (\$241) per hectare, was used to choose projects for implementation during the first two years of the Program.

2. AID-financed Sederhana (Simple) Irrigation Project

The Project consists of engineering services, including consultants and training, required to improve the institutional capability of primarily the Ministry of Public Works, Directorate General Water Resource Development (DGWRD), in Jakarta and various Provincial Public Works offices to implement primarily the GOI's Sederhana Irrigation Program, but also including other small- and medium-scale irrigation programs. The Project also includes AID reimbursement of a portion of the local currency cost to complete projects in the Sederhana Irrigation Program scheduled for completion in the second and third years of the Program. In addition, survey, hydrology and maintenance equipment would be provided to various Provincial Public Works offices.

Although AID reimbursement of local currency cost to complete irrigation projects will not be tied to any specific list of projects, such reimbursement is scheduled to cover Sederhana projects planned for completion in Indonesian FYs 1976 and 1977 (1 April 1975 to 31 March 1977). GOI plans call for 441 projects covering a total of 160,488 hectares to be completed during this period. This total is broken down into 224 one-year projects covering 60,319 hectares in IFY 1976, 102 one-year projects covering 34,404 hectares in IFY 1977 and 115 two-year projects covering 65,765 hectares also in IFY 1977.

The total cost to complete these projects, based on preliminary cost estimates submitted in response to a questionnaire, is \$22.8 million. USAID estimate of total cost of these projects

including items left out, engineering services, equipment and contingency is \$41.9 million.

About 15% of the 441 projects included in the Sederhana Program for IFYs 1976 and 1977 have an area of 700 hectares or more. Another 30% encompass an area of 300 to 699 hectares. The remaining 55% include an area of 299 hectares or less.

Sederhana projects scheduled for completion in IFYs 1976 and 1977 are located in 17 provinces. The distribution of these projects by province is not very different from the distribution of the Repelita II Program as a whole. Almost one-third of the projects are located in South Sulawesi and about 10% each in Bengkulu, Lampung and Jambi. The following table shows the percentage of the total area scheduled for completion in FYs 1976 and 1977 which is located in the ten provinces which have the greatest project area:

Area Included in Sederhana (Simple) Irrigation Program
by Province - IFYs 1976 and 1977 (percent)

<u>Province</u>	<u>Area (Thou. hectares)</u>	<u>Percent of Total</u>	<u>Cululative Percent of Total</u>
1. South Sulawesi	52.9	33.0%	33.0%
2. Bengkulu	14.5	9.0%	42.0%
3. Lampung	13.4	8.4%	50.3%
4. Jambi	13.0	8.1%	58.4%
5. South Sumatra	9.7	6.0%	64.5%
6. South Kalimantan	9.3	5.8%	70.3%
7. Southeast Sulawesi	9.1	5.7%	76.0%
8. West Sumatra	7.6	4.7%	80.7%
9. North Sumatra	7.2	4.5%	85.1%
10. West Java	6.4	4.0%	89.1%

Projects in these 10 provinces account for almost 90% of Sederhana projects for these two years. The top 9 provinces for the Repelita II Program are the same as the top 10 provinces for the Program in IFYs 1976 and 1977 with the exception that South Kalimantan is included in the latter group.

2. Proposed Project Identification and Approval Procedure:

A. General

a. GOI Organization

The Directorate General Water Resource Development (DGWRD) of the GOI Ministry of Public Works is responsible for overall planning, organization and coordination of the Sederhana Program. A new division is being formed in the Directorate General Irrigation of the DGWRD specifically to handle the Sederhana Program. This division is called Irrigation Development II and will be headed by an experienced irrigation engineer.

The DGWRD will develop (1) standards, (2) specifications, (3) procedures, (4) design manuals, and (5) typical designs for small- and medium-scale irrigation projects. They will also provide (1) survey, (2) planning, (3) design, (4) construction and (5) operation and maintenance assistance to Provincial Public Works Offices to deal with difficult, complex and/or unusual problems which arise during implementation of individual projects. Specialists and/or specific services in the areas of (1) survey, (2) mapping, (3) hydrology, (4) geology, (5) soils analysis, (6) water quality, (7) agronomy, (8) economics, and (9) operation and maintenance will be provided to Provincial Public Works offices as required.

b. Consulting Services

The AID loan would finance a team of 18 consultants. The Central Consultant Team would be made up of 6 members located at the DGWRD in Jakarta. The Central Team would be made up of a team leader and individual consultants qualified in: (1) design/construction of small/medium irrigation systems, (2) irrigation training, (3) agronomy/land use/soils, (4) economic/financial analysis, (5) operation and maintenance.

Multi-Disciplinary

Four regional consultant teams of three members each would be located at Ujung Pandang, Palembang, Madan and Bandung. The regional team leader would be qualified in design/construction of small/medium irrigation systems. An irrigation/drainage engineer and a land use/on farm water management planner would also be included on each regional team. Either the design/construction engineer or the irrigation/drainage engineer would be qualified in operation and maintenance. The composition of these regional teams could be varied to meet the particular needs of the provinces within the region.

B. Project Identification

In response to President Suharto's initiative, the DGWRD requested Provincial Public Works offices to submit lists of small- and medium-scale irrigation projects in their areas suitable for implementation during Repelita II. Information requested included a short project description, a sketch map of the area and answers to a short questionnaire. Individual projects having potential for implementation were identified from the response to DGWRD's request.

The primary implementing organizations for Sederhana projects will be the Provincial and Section (kabupaten) Public Works offices. They will carry out the (1) survey, (2) planning, (3) design, (4) construction including contracting and supervision, and (5) operation and maintenance of individual projects. The Chief of Provincial Public Works reports directly both to the Provincial Governor and the Central Minister of Public Works. The Chief of the Irrigation Department of Provincial Public Works and the Section Public Works offices report directly to him.

Provincial Public Works offices are only responsible for irrigation systems from the source of water down to the end of the secondary canals plus the first 50 meters of tertiary canals downstream of tertiary outlet structures. The primary responsibility for construction, operation and maintenance of tertiary systems rests with village officials who are responsible ultimately to the Ministry of Internal Affairs through the subdistrict (kecamatan), district (kabupaten) and provincial governments.

Any help on this?

The Ministry of Agriculture is responsible for organizing farmer water user groups and providing extension services in on-farm water management.

C. Project Approval Procedure

Project approval will be exercised through a reimbursement procedure for reimbursement of a percentage of local construction costs.

As indicated in the previous section, the project is designed to support the GOI's entire Sederhana Program, not a specific list of individual projects. Since there will be no list of projects designed in advance for possible AID reimbursement, AID involvement in and/or approval of the process of selection of individual projects in the Sederhana Program will not be necessary.

Reimbursement is planned to be made for Sederhana projects constructed after the loan is authorized which meet AID reimbursement criteria until loan funds allocated for this purpose were exhausted. If, for various reasons, the GOI wanted to include projects in the Sederhana Program which did not meet these criteria, AID would not reimburse the cost to complete these projects.

AID reimbursement criteria would be embodied in a series of nine short, simple checklists. Reimbursement for individual projects would require certification/approval of all of these checklists. No checklist would be more than a page or two long. Each one would be written in simple English, so that it could be easily translated into Indonesian and understood by junior professional personnel in Provincial/Section Public Works offices. The Central Team would develop these checklists during the early stages of their work in developing (1) standards, (2) specifications, (3) procedures, (4) design manuals and (5) typical designs for small- medium-scale irrigation projects generally. All checklists would be subject to approval by both the DGWRD and AID. Checklists would be developed covering (1) economic analysis, (2) technical soundness, (3) survey, (4) planning, (5) design, (6) final cost estimate, (7) environmental effects, (8) project completion and (9) operation and maintenance plan.

More detailed discussion of the content and application of the checklists will be contained in the IRR to be submitted to AID/W.

3. Recommended Environmental Assessment Procedure:

After project identification, and during the period project documentation is being prepared (i.e., description, economic analysis, preliminary design, cost estimates, etc.) such documentation should also include a check list to insure that considerations of environmental impact normally associated with irrigation systems and water-related ecosystems are assessed. The checklist should be reasonably simple, such that a field investigator at the Kabupaten level or even the Kecamatan level could fill it out with sufficient accuracy to indicate the items of principal environmental concern in that particular project. The purpose of the checklist would be to give project managers at the provincial level sufficient information to evaluate environmental consequences of the project, if any, and to determine those cases that would warrant a more comprehensive investigation by an investigator more knowledgeable in assessing environmental consequences of irrigation and/or development projects.

No project should be approved until the environmental checklist is submitted and reviewed.

A sample checklist is attached as Exhibit 1. As project development continues and the advisory group (presently envisioned as a BuRec PASA team) becomes active in project selection and review procedures, some modification and perhaps simplification of the checklist may prove necessary or desirable.

The above procedure will be applicable to all irrigation projects considered for inclusion under the Sederhana Irrigation Loan. For irrigation projects located on the island of Sulawesi which will be considered for inclusion under the Sederhana Irrigation Loan, additional studies and procedures will be necessary, and these are explained and outlined in the following two sections.

4. Special Conditions Peculiar to Sulawesi.

Oriental schistosomiasis (*Schistosoma japonicum*) was first reported in the Lake Lindu Valley in Central Sulawesi in 1937, and since 1971 has been extensively investigated by the US Naval Medical Research Unit No. 2 (NAMRU-2) in cooperation with the National Institute for Medical Research (IRKN) and the Center for Disease Control, Ministry of Health, Jakarta, Indonesia. This research finally identified the molluscan intermediate host (the Sulawesi geographical strain of *Oncomelania hupensis*), identified additional snail foci in the Lindu valley, and identified eight species of indigenous mammals (domestic and wild) as reservoir hosts in the Lindu valley. (1,3)

Lake Lindu is located in a highland area of Central Sulawesi at an elevation above 3,000 feet. An associated study in the Gumbasa Valley, a lowland area through which the river outlet from Lake Lindu flows, failed to reveal schistosomes in the small mammal population of the valley; hence without the schistosomes appearing in the potential wild mammal reservoir, it may be presumed that schistosomiasis was not present in the Gumbasa Valley. Between Lake Lindu and the Gumbasa Valley, the river descends in a series of falls and cascades nearly 3,000 feet within a distance of about nine kilometers. This may, in part, explain the presence of the snail host in Lake Lindu but not in Gumbasa Valley - no snail has yet managed to survive the turbulent trip to the lowlands.

Another associated study, (3) however, indicated the presence of Oriental Schistosomiasis in the Napu valley of Central Sulawesi with infection rates varying from 17% to 69% in the villages studied. The exposed population in the Napu valley is large (5,500 residents) in comparison to the exposed population in the Lindu valley (1,500 residents).

At the time of this writing, additional studies and surveys are underway or planned for other areas where indications of the presence of schistosomiasis has been reported or is suspected.

Foci of schistosomiasis has so far been in isolated areas of Sulawesi, Lake Lindu perhaps being the most inaccessible, requiring a six-hour walk from the nearest road, and an extremely difficult road to the walk-in point. While the apparent isolation of schistosomiasis in remote regions of Sulawesi has been called "one peculiar aspect" of this disease, the very remoteness of foci is believed to be a contributing factor in the disease not spreading to other areas.

However, with Sulawesi now one of the principal acceptor areas of the transmigration program of the GOI, which channels unemployed (and underemployed) farmers from the more populated islands of Java, Madura and Bali to new settlements in the underpopulated Outer Islands, Sulawesi is the object of intensive and extensive development. While the main development thrust is agricultural development, associated development works such as roads, airports, irrigation systems, and communications systems are being installed and upgraded. At least one

nickel ore extraction project is under development. With such development, the isolated areas now infected with schistosomiasis may soon no longer be isolated; and with such development, the risk of spreading schistosomiasis to other areas of Sulawesi becomes greater and greater.

Because the first habitat of the Sulawesi host in Lindu Valley was discovered in a plain in an area associated with cultivation and irrigation, expansion of irrigation works on Sulawesi must be undertaken under the premise that as development proceeds, schistosomiasis may spread. In addition, new irrigation works may be developed in areas where there are no human inhabitants at present, but where there well may be schistosomiasis present in small resident mammals. In that case, any inflow of human inhabitants would be at risk.

Filariasis is endemic in Indonesia, and is reported to be particularly severe on Sulawesi. Filariasis in Indonesia has been known since 1889 and its distribution, prevalence and mosquito vectors are well documented. In recent transmigration settlements surveyed, *Brugia malayi*, utilizing *Anopheles barbirostris* and *mansonia* species as principal vectors, are the responsible agents for filariasis in transmigration settlements throughout Indonesia with prevalences ranging up to 33 percent.⁽³⁾ Filariasis, since it severely decreases the working capacity of farmers, is considered an important health problem.

In the course of investigations and studies in the Lake Lindu area, parasitic and protozoan diseases in addition to schistosomiasis were routinely identified.⁽²⁾ Many of these were due to less than

adequate sanitation, and practices involving cultural or economic roots. While this discussion will not delve into these other diseases, they should be noted as present on Sulawesi, and the interested reader is referred to Reference (2).

Malaria is endemic to Sulawesi, as it is to all of Indonesia. Because it is so well known it will not be redocumented here, but it should be noted that malaria incidence on Sulawesi is higher, in general, than on the islands from which the transmigrants will come (i.e., Java, Bali, Madura, etc.). It remains, therefore, a serious health disease. AID is assisting the Ministry of Health, GOI, with an FY74 loan for a five-year program for malaria control. Concentrating on the most populous islands at first, the malaria control program will, within the 5-year period, reach the Outer Islands with the objective of reducing malarial endemicity to a level at which it is no longer a major public health problem.

5. Additional Special Environmental Assessment Procedures for Projects on Sulawesi:

It is recommended that a special Health Impact Study be performed for each irrigation project or sub-project to be constructed on Sulawesi under the Sederhana Irrigation Loan, the Health Impact Study to be performed concurrently with other project investigations and documentation, and the results of the Health Impact Study to accompany other project documentation for review prior to final approval of the project.

The Health Impact Study, while identified as a necessity based on potential endemicity of schistosomiasis and filariasis, should be a complete study of all potential parasitic and protozoan vectors in the area under consideration for an irrigation project.

It is further recommended that the Health Impact Study be performed by the National Institute for Medical Research, Ministry of Health, GOI.

The National Institute for Medical Research (IRKN) is presently involved with the schistosomiasis survey and research work on Sulawesi, and has one resident biologist and eight resident sanitarians trained and experienced in the work on Sulawesi. These field personnel are backed up by additional staff in Jakarta, including personnel and laboratory facilities of NAMRU-2. At present the field staff collects samples only and transmits them to the NAMRU-2 laboratory in Jakarta for analysis and diagnosis. Clinical field studies are performed by teams from IRKN and NAMRU-2 that travel to Sulawesi as required. NAMRU-2's

present contract has approximately seven more years to run, and it is understood that an extension of the contract will be available if requested. NAMRU-2 is also involved with training LRKN personnel both in the field and in laboratory procedures. Discussions with Dr. J. Sulianti Saroso, Director, LRKN, indicated her willingness to cooperate on such studies. In addition, her appreciation of the fact that USAID was now beginning to consider health impact and the health consequences of development before-the-act instead of after-the-act was also noted.

In addition to the assistance given to LRKN by NAMRU-2, the World Health Organization (WHO) is assisting the Center for Disease Control (CDC), Ministry of Health, GOI, (also under the directorship of Dr. J. Sulianti Sarosa) on a pilot control project in the Lindu Valley. The control project is just getting started, and will run for a period of two years. Presently planned control measures to be practiced include molluscan host control through molluscides, with auxiliary control measures to be studied during the two-year course of the pilot project.

The budget of the LRKN is of such small size that they cannot absorb the cost of the Health Impact Studies recommended above. The LRKN will require reimbursement for the costs of the studies, but as a legitimate cost of investigation and design of the irrigation systems, this should pose no problems. The reimbursement could be easily channeled to the LRKN through the Ministry or Department of the GOI that has implementing authority for the Sederhana Irrigation Loan.

Further, before irrigation works are undertaken on the island of Sulawesi, there should be assurance given by the GOI that a continuing surveillance program, if not already existing, will be established under the auspices of the CDC such that the inhabitants and/or animal population of each irrigation system area be monitored at least at yearly intervals (preferably six-month intervals) to guard against the possible spread of schistosomiasis. Should the surveillance program indicate the spread of *S. japonicum*, control measures could be inaugurated far in advance of the time they otherwise would be started if identification of the need for controls relied only on clinical manifestations becoming apparent in the population.

Further, the team of technical advisors to be supplied by A.I.D. through PASA arrangements with the BuRec should be fully briefed on the schistosomiasis problem on Sulawesi and should stress the importance of engineering measures for control of schistosomiasis⁽⁵⁾ in their work with the technical divisions of the Department of Irrigation, GOI.

REFERENCES

1. Carney, W. P., et al; Oncomelania hupensis from the Schistosomiasis Focus in Central Sulawesi (Celebes), Indonesia; Journal of Parasitology, vol. 59, no. 1, February 1973; p. 210-211.
2. Hadidjaja, P., et al; Schistosoma japonicum and Intestinal Parasites of the Inhabitants of Lake Lindu, Sulawesi (Celebes); A Preliminary Report; The Southeast Asian Journal of Tropical Medicine and Public Health, vol. 3, no. 4, December 1972.
3. NAMRU-2; Abstracts of Papers Presented by Staff of NAMRU-2; Ninth International Congress of Tropical Medicine and Malaria; Athens, Greece, October 14-21, 1973.
4. Davis, George M., and Carney, W. Patrick; Description of Oncomelania hupensis lindoensis, First Intermediate Host of Schistosoma japonicum in Sulawesi (Celebes); Proceedings of the Academy of Natural Sciences of Philadelphia, vol. 125, no. 1, June 27, 1973; p. 1-34.
5. McJunkin, F. E.; Engineering Measures for Control of Schistosomiasis; A Report for the Office of Health, Bureau of Technical Assistance, A.I.D.; University of North Carolina, September 1970; (Contract No. AID/csd - 2487).

SEDERHANA IRRIGATION
ENVIRONMENTAL ASSESSMENT CHECKLIST

Project No.: _____

Project Location: * _____

1. Is irrigation system compatible with long-range development of area?

yes no no long range development plan made

2. New area or previously rain-dependent cultivated area

3. If new area, is the area dry moist swampy

forest or grassland ?

4. Will project involve draining swampland? yes no

If yes, what wetland resources will be affected? _____

5. Will construction of the diversion disrupt fishing or fish migration,

in the river? yes no unknown

If yes, to what extent? _____

6. Will diversion of water for irrigation restrict or preclude present

downstream use of water? yes no unknown

If yes, list water uses and users affected: _____

7. Are anticipated sediment levels from irrigation water source

expected to give canal maintenance problems? yes no unknown

8. Location of nearest health clinic: name _____ kms. _____

* If located on Sulawesi, has Health Impact Study been made? yes no

9. Have discussions with local health officials revealed any special health problems in the area? yes no unknown

If yes, list: _____

10. Approximate malaria incidence in the area: < 1% ; 1-5% ; 5-10% ; > 10%
11. Approx. filariasis incidence in area: 0 ; < 1% ; 1-5% ; > 5%
12. Proximity of village to proposed irrigated area: kms _____
Village on higher ground or same level ground
13. Source of drinking water for village: independent source
or expected to be taken from irrigation canals
If independent source: wells ; spring ; river -
above diversion or below diversion
14. Washing, bathing and excreta disposal facilities for village:
independent facilities or expected use of irrigation canals
15. Will use of fertilizers, pesticides, fungicides, rodenticides, etc.,
be introduced and used in the irrigated area? yes
no unknown

If yes, briefly outline chemicals to be used, method of application and safety precautions planned for storage, handling and application.
