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Problem identification of watershed

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Problem identification for watershed

Collecting existing data:

Collecting existing data is the first step toward comprehensive survey and planning of a watershed. In many countries, soil surveys, geology surveys, forest inventories and hydro-meteorologic studies may have already been carried out. Their reports, statistics and maps can be of great help in watershed survey and planning. Other government agencies may possess aerial photos, contour maps, ownership data and information of infrastructures. Spending a little time to search for them is usually worthwhile and rewarding. Avoiding a duplication of effort will save time and money. Also, historical data such as rainfall, streamflow, land use history, various development plans cannot be obtained just by field surveys, but must be extracted from the files of the appropriate government agencies.

A list of data sources should be prepared and related institutions contacted. A central file of relevant maps, reports and records should be created and routinely updated.

After the existing data have been collected and analysed, then a preliminary survey plan can be drawn up to check, add and update the existing information. By so doing, the overall survey time can be much shortened.

Quick identification of watershed problems:

Before starting formal survey, preparatory investigation is often needed. The main purpose is to identify major watershed problems and collect or check preliminary information. The usual activities may include:

- collecting first-hand information on the nature and extent of physical and social watershed problems to facilitate future detailed planning;
- using available photos, maps and other data to become familiar with watershed conditions;
- examining the number, reliability and condition of existing hydro-meteorological stations in the watershed;
- interviewing local agencies, institutions, communities and farmers to obtain their views, interests and concerns about the watershed;

- arranging for future survey work and estimating survey expenses.

Physical problems:

These problems are usually not difficult to detect or identify. Steep slopes, bad lands, slide-prone soils, weak geologic formations, etc. can be easily found by observation or with the assistance of existing maps. Problems such as heavy and intense rainfall, excessive run-off, torrential flows and strong winds should be identified from weather and hydrological data or by gathering information and evidence locally.

Resource use problems:

Problems such as shifting cultivation, forest destruction, fire, over-grazing, poor road construction and maintenance and uncontrolled mining should be identified and, if possible, the causes should be determined. Clear identification of these problems at the preliminary stage will benefit the follow-up surveys and planning as well as the formation of a realistic policy in the future.

End problems:

The final effects of watershed degradation - soil erosion, landslides, heavy sedimentation, water pollution, floods and droughts, etc. - must be identified as quickly as possible. This can be done partly by observation and spot checking and partly from data obtained from water resource agencies and local inhabitants. By reviewing or analysing existing information, the history, frequency and extent of these problems can also be determined.

Socio-economic and other problems:

Serious socio-economic problems can be major obstacles in carrying out watershed work in the developing countries. Any serious problems should be identified at the beginning of the planning stage. These may include land tenure, poverty, education, low acceptance of innovations, seasonal shortages of labour, etc.

Considering management possibilities:

Recognizing challenges:

It is not enough to simply identify watershed problems; possible challenges must also be considered when work is to be initiated. The major challenges facing watershed managers in developing countries are highlighted below:

- watershed projects usually deal with thousands of people and therefore have broad political implications, hence political interest. Sometimes, politicians' views may differ considerably from those of the technical experts regarding the types, priorities, and timing of watershed work;
- public goals may not always coincide with the interests of private people, farmers or watershed inhabitants. For example, farmers tend to maximize the returns from their lands as fast as possible whereas governments may wish to slow down the use rate in order to conserve resources and protect the watershed;
- a technically sound plan or the most effective treatment for watershed protection may not always be acceptable to the local communities for a variety of reasons, including requirements of high labour inputs or cost;
- many watershed projects may seem financially unattractive to government or international financing agencies due to difficulties in putting a monetary value on "intangible" benefits;
- bottom-up planning is a necessity but often difficult to do successfully, especially in watersheds populated by numerous small farmers.

There are no universal answers to these challenges. However, managers and/or planners should examine them carefully and derive proper counter measures in the context of given conditions.

Examples of effective work in the country:

If there are examples of successful and effective projects in watershed management, forestry or rural development in the country, a quick study should be made of their setup, administration, management techniques, accomplishments, etc. The lessons learned will aid in the planning, design, and future implementation of the proposed watershed project.

Level and kind of management expected:

Consideration should also be given to the appropriate level and kind of management a watershed will receive in the future. This will, of course, depend on the seriousness of the watershed problems, the urgency of the task, and the resources available to do the work.

Classically, watershed work can generally be divided into three categories: protection; improvement; and rehabilitation. Protection measures are employed to maintain the status quo. Improvement techniques are used to obtain water yield benefits. Watershed rehabilitation is applied to seriously deteriorated watersheds and usually requires more work, more time and more money. Unfortunately, watersheds in developing countries often require rehabilitation. Since the last decade or two, watershed development has become a new category of work. It emphasizes the development of all resources in a watershed including human resources.

These categories of work are sometimes all present in a single watershed; it is the responsibility of the planner to work out the right combinations according to the nature and extent of the problems identified.

Possible investment:

Finally, investment needs in a watershed must be considered against the possible sources and amounts of funding. The need for heavy and long-term investment should be brought to the immediate attention of the government. More avenues of possible investment should also be explored. For instance, investment in production and development type of activities in conjunction with watershed conservation may attract more sources of funding.

Determining main objectives and priorities:

Setting main objectives:

After collecting existing data, identifying major watershed problems and considering management possibilities, the main objectives of the proposed project should then be defined.

The objectives will vary from country to country and from watershed to watershed but the following are some of the most common ones:

- to rehabilitate the watershed through proper land use and protection/conservation measures in order to minimize erosion and simultaneously increase the productivity of the land and the income of the farmers;
- to protect, improve or manage the watershed for the benefit of water resources development (domestic water supply, irrigation, hydro-power, etc.);
- to manage the watershed in order to minimize natural disasters such as flood, drought and landslides, etc.;
- to develop rural areas in the watershed for the benefit of the people and the economies of the region;
- a combination of the above.

Different objectives call for different techniques, manpower, inputs and approaches in planning. The monitoring and evaluation criteria will also be different. Therefore, main objectives should be identified and defined as early as possible.

Establishing priorities:

Priority watersheds or sub-watersheds should be identified during the preparatory stage. As work cannot be carried out at the same time in all the sub-watersheds due to manpower and resource constraints, a priority list must be set.

Priorities are usually given to those sub-watersheds which are in critical condition and which are close to the main stream or to a public installation where protection is needed, e.g. a storage reservoir, water intakes or diversion dams. Many times, priority areas are also selected because of people: their enthusiasm, strategic locations, poverty or others.

Even in a priority sub-watershed, some efforts need to be started earlier than others. Therefore, a priority list of work should also be identified for future progressive planning and implementation.

Estimating survey budget:

As the final stage of the preparatory work, an estimate of the needed budget for detail surveys should be prepared. Although at the early planning stage, an exact estimation is impossible, the investigators or planners must not over-estimate or under-estimate too much the needed budget.