Forestry
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# WORKING PAPER 2

## Linking Monitoring and Assessment To Sustainable Development

by

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# PREFACE

This is the second in a series of working papers produced for the Forestry For Sustainable Development (FFSD) Program at the College of Natural Resources, University of Minnesota. The purpose of these working papers is to stimulate discussion among individuals working in the field of interest. This paper was based on Working Paper 1 of the FFSD Program, for presentation at the international conference and workshop on "Global Natural Resource Monitoring and Assessments: Preparing For the 21st Century," 24-28 September 1989, Venice, Italy.

The major objectives of the FFSD Program are to:

1. Improve the availability and usefulness of existing technical knowledge related to forestry for sustainable development - translate state-of-the-art scientific and technical information into practical and easily usable management guides and training materials that can be used effectively in planning and implementing development projects that will contribute to sustainable development; and

2. Improve the policy and organizational environment to encourage application of sustainability strategies - identify and develop effective institutional mechanisms, both at the policy and project levels, for introducing sustainability strategies into the development planning process at an early enough stage to influence project or program design.

The focus of the Program is on social forestry and related strategies within a watershed management framework as an integrating mechanism for moving toward sustainability in land use and in natural resource-based development projects. It involves an interdisciplinary group of faculty from the University of Minnesota, and associates at the University of Arizona, Yale University, Oxford University, the InterAmerican Development Bank, and other development groups. The FFSD Program is part of the University of Minnesota's Center for Natural Resource Policy and Management in the College of Natural Resources.

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# LINKING MONITORING AND ASSESSMENT TO
# SUSTAINABLE DEVELOPMENT

## Hans Gregersen and Allen Lundgren

## INTRODUCTION

There is growing concern that much development activity currently underway threatens the long-term sustainability of important ecosystems and ultimately threatens the welfare of future generations. Clearly, people can act in the future to avoid some of their past mistakes that are leading to nonsustainable development. However, to do so they need to have the incentive and the resources to do so, and they need to understand clearly the implications of alternative development policies, strategies and activities. More informed choices can lead to fewer development failures.

To gain the information needed to make such informed choices, monitoring and assessment (M&A) systems are needed, to assess changes both in biophysical and in institutional variables associated with development. To insure that M&A programs provide useful information, they need to be linked closely to the perceived information needs of the people and institutions that determine the course of development. This paper provides an overview of the issues involved in linking M&A to planning and action for sustainable development.

The framework presented here derives from an on-going program in "Forestry for Sustainable Development" at the University of Minnesota, funded by the Pew Charitable Trusts.

## SUSTAINABLE DEVELOPMENT: DEFINITIONS AND CONCEPTS

We define sustainable development as development involving changes in the production and/or distribution of desired goods and services which result, for a given target population, in an increase in welfare that can be sustained over time.

The definition focuses on those increases in "desired goods and services" that lead to increases in "welfare." What do we mean by welfare in this context? We are talking about a very complex concept which really is not specifiable in quantitative terms. Welfare relates to level and distribution of income, physical and mental health, food, education, housing, clothing, recreational opportunities, and many other factors. "Welfare" is a term used loosely by most everyone. In practical terms, it is defined by each society through its laws and cultural traditions. In the simplest form, aggregate increases in welfare generally are equated to increases in GNP per capita or increases in the consumption of goods and services.

It is important to define adequately what the "target population" is in each case. In the ideal case, the whole world population should be the target. In this case, the welfare of at least some people would be increased on a sustainable basis without adversely affecting the welfare of any people. In the more realist case, given political and economic realities of the world, the target population becomes a more limited group, say the national population of a country, or the population of given project region.

When one reviews the literature on "sustainable development" it is obvious that the term seldom is defined specifically by people using it, and it is used in different contexts by different people, depending on their backgrounds, purposes and viewpoints (Brown et al. 1987).

However, in all cases, the term seems to embrace the concept of "production with environmental protection" rather than environmental protection alone.[1] This is why, in contrast to many other terms used in the past by environmentalists, sustainable development has been embraced as an important concept by the development community at large.

In the broad interpretation of sustainable development, the focus is on sustaining an increased level of welfare rather than merely sustaining (protecting) the resource base on which welfare partly depends. Resource sustainability is only one concern. Ultimately, the concern is with the welfare-sustaining capacity of a development system. Accepting this welfare-sustaining interpretation in forestry, for example, means that the focus is not on "sustained yield forest development," but rather on "forestry for sustainable development," or tree growing, management and use strategies to increase human welfare on a sustainable basis.

The physical input-output concept of natural resource sustainability has been in use for many decades, for example, in the forester's use of the principle of "sustained yield" forestry and in the management and control of some fishery resources. This is an important partial measure of sustainability and it has a practical, though limited use in planning and managing development involving use of renewable natural resources. The limitations are due to the lack of consideration in this model of the fact that technology, institutions, society's wants, and its definition of welfare are changing over time, which means that the relative importance of different resources changes over time. Sustainable increases in welfare depend on more than the stocks and yields of any specific renewable resource.

Given the broad concept of sustaining welfare, it follows that depletion of a specific natural resource asset, i.e., nonsustainability in terms of the supply of that resource, can still be part of a broader welfare sustaining development system. It all depends on where, when, and how the depletion occurs and what replaces the depleted resource. An example would be a progressive depletion of an abundant forest resource to provide land for sustainable agriculture, or to provide the capital for other development, such as in the case of the early forest clearing in the midwest of the United States or in Sweden. In terms of our definition, this depletion of forest capital would be part of a welfare-sustaining development. In other cases (depending on location and agroclimatic conditions) clearing and burning of forests leads to creation of desert and barren lands and a reduction in welfare, i.e., the (deforestation) activity contributes to nonsustainable development.

Thus, the same type of activity--deforestation in the above case--may or may not contribute to the welfare-sustaining ability of a development system. Given resource availability, technology, institutions and desired output (the components of development activity) sustainability depends on specific surrounding conditions (location), on scale (extent, intensity, duration), and on timing of the activity in relation to other activities. Thus, we need to analyze the role of each of these dimensions before passing judgement on the contribution of a given development activity to the sustainability of a development system and resulting increases in welfare. The context of development does make a difference in assessing the contribution of an activity to sustainable development. This point is critical to consider when designing effective M&A systems.

Changes in the demand for resources are also caused by development of new technologies. For example, the development of pulp and paper technology and then structural particleboard

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[1]Sustainable development in this sense is close in meaning to Gifford Pinchot's concept of "conservation," which involves production with protection (cf., Pinchot, G. 1947. Breaking New Ground).

technology has increased drastically the demand for the aspen resource in the midwest of the United States. Aspen, which used to be considered a "weed species" and an unimportant component of the sustainable forest resource base, is now a valuable resource. With structural particleboard replacing structural plywood, and with the introduction of technology to produce veneer from small logs, the demand for larger sized peeler logs of coniferous species declines. Such shifts in resource demands—due mainly to the development of technology and to institutional change which leads to acceptance of the substitution—change our ideas concerning the size of the capital stock of given resources which should be sustained, and the value of that resource in terms of its contribution to human welfare.

In some cases, demand for a resource can totally disappear. This was the case with the gum from the *Acras zapote* tree, a main ingredient in chewing gum before artificial gums (new technologies) were introduced.[2] There are many other examples of evolving technology changing the desirability of sustaining a given resource base from short and intermediate term economic and social (human welfare) points of view.

In general, the implicit assumption underlying the resource-sustaining model is that sustaining a resource is good and depleting it is bad. This view of the world is unfortunately not always appropriate, as discussed and illustrated earlier. Thus, we need to consider other dimensions.

This obviously has implications for M&A activities. They have to go beyond a straightforward assessment of data on physical/biological change in order to be useful in monitoring the sustainability of development. The institutional and environmental contexts within which those changes take place also should be considered in reaching any conclusions concerning the sustainability (and desirability) of a given physical/biological change.

## DEALING WITH SUSTAINABLE DEVELOPMENT IN PRACTICE

The concept of sustainable development has great political and philosophical appeal, and it is useful as a concept on which to base debates on the fundamental directions in which society should be going with development programs. However, for practicing development professionals, it provides little guidance in terms of creating effective development policies, programs and projects and in terms of developing useful M&A systems. It is difficult to know whether what one is observing in the real world represents a "sustainable" development activity or not. Just because a development activity has been functioning satisfactorily to date, is no guarantee that it will lead to sustainable development.

### Focusing on the means for avoiding nonsustainable development

It is difficult to prescribe all of the conditions required for sustainable development to take place. Thus, instead of trying to give operational meaning to the concept of sustainable development, a more useful operational goal may be to avoid nonsustainable development, focusing what can be done to avoid potentially nonsustainable developments. This is something which can be dealt with in a concrete and practical way by interdisciplinary teams working at the project and program levels and by decision makers setting the directions for development at the policy level.

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[2] It should be noted that the same fate affected the "Jelutong" tree (*Dyera costulata*) which produced gum for chewing gum in Malaysia. However, use of the tree for lumber became popular. Further, there now are indications of a renewed interest in use of the gum from the "Jelutong." (Personal communication, Harry Chea, Director of Planning and Evaluation, FRIM, Malaysia, Oct. 2, 1987).

## The role of monitoring and assessment

M&A activity is a critical element in the project development and policy processes associated with avoiding nonsustainable development. Managers and policy-makers need early warning indicators of potential problems that could lead to nonsustainability; and they need them in time to take corrective action. Key indicators can be monitored and assessed to provide information needed by project managers and by policy makers in setting the directions for future development.

## M&A information requirements at the project and policy levels

Projects are basic building blocks of development. Sustainability issues need to be considered in designing, choosing among, and implementing projects. However, most of the major sustainability issues facing the world will not be resolved merely by working to improve development projects. Development projects are only a small part of the total human activity affecting the sustainability of development. Fundamental policy changes also are needed to encourage people to think about sustainability issues as they go about their everyday activities quite outside a project context. Thus, we need to consider sustainability issues both in terms of project interventions and in terms of policy interventions.

The distinction between project and policy level considerations also relates to the need to deal with sustainability at different scales of human and ecological activity. Thus, some people are involved with issues related to "global sustainability" or "global change," whereas others focus on sustainability issues associated with a village, small watershed region, or a specific project. Sustainability is of concern at all levels, and there are strong interactions between the different levels of concern. An aggregation of local level actions can lead to broader and eventually global effects. Global level concerns must lead to policy changes. Local level concerns are most often translated into concrete project level action, supported by the broader policy environment in which such action takes place.

M&A systems need to be comprehensive enough to identify warning signs at different levels of aggregation. If M&A is highly disaggregated, it can miss identifying critical linkages and the changes which are occurring in them. Thus, in dealing with sustainability issues, it is important to deal both at the project and the macro or policy levels, and to do so in a coordinated fashion.

## LINKING M&A TO ORGANIZATIONS INVOLVED IN DEVELOPMENT

Many different types of organizations have an interest in sustainable development related to natural resources. They include: governments (agencies, elected bodies), academic/research organizations (universities, research centers), local NGO's, and international agencies (UN organizations, bilateral donor agencies, international NGO's). These different organizations have different purposes and have different policy impacts on sustainable development. Different types of sustainability issues are associated with different purposes and actions to accomplish them. To deal with each issue, one must have information that is specifically related to that issue. Thus, different types of M&A are needed by different organizations to provide indicators of actions and policies that may lead to nonsustainable development.

Yet despite these differences, all organizations face several similar, important considerations in designing M&A systems to provide early warning signs of nonsustainable development.

Some key considerations related to sustainability that all organizations need to deal with include the following:

Dealing with externalities. Externalities are effects of an action (project or policy) that are outside the decision context or concern of those taking the action. These effects may be known but disregarded by the project planners or other authorities, or they may be unknown, unexpected, and unintended effects. For example, a pulp mill manager may be aware that dumping waste into a river can create negative externalities in the form of pollution that affects downstream populations. But the manager may ignore the problem because it is cheaper than alternative disposal methods and there are no regulations which require the mill to stop dumping or pay fines for dumping. On the other hand, the manager may not be aware of the problems created downstream by such dumping.

It is evident that negative externalities can lead to problems of nonsustainability for: i) people outside the project area (spatial externalities); ii) people living in some future period of time beyond the project life (temporal externalities); and iii) sectors of the economy or individuals outside the context, or defined jurisdictional boundaries, of the project.

In watershed management projects, externalities often relate to the upstream-downstream relationships: land and water uses upstream affect those who live downstream, for example, through pollution of water, increased sediment loads, changes in quantity and timing of water flows, etc. Thus, project planners have to be aware that what may be a move toward more sustainable development in the uplands may turn out to contribute to nonsustainable development downstream. As another example, the building of a road in a project area to provide access to a multipurpose dam may result in an unplanned influx of new settlers on upland watersheds, which in turn may lead to increased downstream problems.

In the policy realm, policymakers dealing with the agricultural sector may establish high price supports for certain agricultural commodities. In the process, farmers may move onto otherwise economically marginal lands and clear them for crop production. Often these lands may be steep and perhaps critical in terms of watershed protection. With watershed protection decreased, erosion increases, creating problems downstream through loss of storage capacity in the regional dam reservoir, eventually leading to a decline in irrigation capacity downstream. The agricultural price support policy has produced a negative externality that can lead to declines in welfare and nonsustainability of development downstream.

Appropriate monitoring and assessment activities can uncover many of the potentially significant negative externalities associated with projects and policies. However, to do so in an effective manner, M&A activity will have to extend beyond the boundaries of a particular project or policy, since, by definition, an externality affects people outside the project or policy boundaries.

Even if M&A activity uncovers the potentially significant externalities associated with given projects or policies, there is no reason why such information will be acted on unless:

    * incentives exist within the responsible organizations to take action; and

    * authority and responsibilities are coordinated and distributed in such a way that the externalities are internalized and become of concern to decision makers.

Institutional arrangements need to reflect the realities of the physical/biological environments within which they will operate. If upstream activities can have significant impacts downstream, then some institutional means--supported by appropriate policies--needs to be found to connect upstream and downstream populations and activities.

Japan has had some success in dealing with this issue (Kumazaki 1982). Morocco is dealing with the issue of decentralized authority among government agencies by requiring the minister of public works (dams and downstream structures) and the minister of agriculture (upland management) to work closely together in an overall watershed management context. Other countries, such as Colombia, have tried, though not successfully, to develop institutional arrangements for improving cooperation and coordination among government agencies. A number of developed countries have instituted approaches which seem to work fairly well, in some cases between countries. The issues involved are discussed in greater detail by The Working Group on Watershed Management (1988).

Dealing with continuity beyond project termination. Most projects have impacts that go beyond their formal lives. Yet most monitoring and assessment activity ceases when the project terminates. If sustainability is of concern, continuity of positive project activities beyond the lives of projects must become an objective, and adjustments in the M&A process need to be made accordingly.

For example, oftentimes there is a tendency to choose the cheapest tool or piece of equipment to get a job done within the project lifetime. A common cause of nonsustainability is the inability of local project populations to carry the recurrent costs that occur after project termination due to need for the maintenance, repair, and replacement of equipment and facilities. Buildings, roads, and equipment need maintenance, or they begin to deteriorate and performance suffers. Equipment breaks down and must be replaced. Maintenance and replacement expenditures need to be built into project plans so such costs can be met when the project formally terminates, but the activities which it introduced continue on.

During project implementation, M&A activity, if properly designed, might pick up early warning signs of nonsustainability (lack of continuity beyond project termination) such as: inadequate local participation (of those who will have to sustain the project activities and ideas after outside project personnel leave); too much imported technology, materials and personnel; an accelerating drawdown of local resources or productive capacity; or a lack of buildup of funding mechanisms to support recurrent costs beyond official project lives.

Again, there is no guarantee that indicators picked up by the M&A activity will be acted on unless the organizational incentives are there to do so, and the institutional mechanisms exist to facilitate acting on the information produced by the M&A activity.

Dealing with uncertainty. Quite often, nonsustainability is associated with an overly rigid system that does not provide the flexibility to adjust to the unexpected. The occurrence of unforeseen events or changes should be treated as the rule rather than exception. M&A systems need to be designed to provide warning signs as early as possible of unforeseen/unplanned changes. It is possible plan for the detection of unanticipated nonsustainable development and for changing plans in response to new, unanticipated developments.

M&A systems need to track the resiliency of a development, i.e., the ability of the system to bounce back after temporary setbacks, for example, due to an unusually dry year, a hurricane,

or occurrence of some disease or pest damage. Resiliency is critical to sustainability. Thus, developing and tracking indicators of resiliency is critical in a M&A system that is providing information for decision makers concerned with sustainability.

Dealing with differences between individual and aggregate impacts. When designing and implementing M&A activities it is important to take into account aggregation issues for each impact which is being considered. There are four important aspects to what we call the "aggregation issue."

First, "small may be beautiful" when we think of individuals. However, when we consider the aggregate actions of many individuals, we often find that summing up all the smalls can make beauty fade. Warford (1987) has pointed out that much of the environmental damage that takes place in the world is caused by multitudes of individuals acting quite outside any large development project. Taken individually, they look harmless, but added together, they can create a major force (e.g., the single harmless grasshopper vs. the locust swarm). Consider the goal of a program and then consider whether an aggregation of "smalls" (e.g., many small, independent loggers) is better or worse than a "large" (e.g., a large modern logging firm) in terms of the relative impacts which result from meeting the same output objective using different approaches.

Second, a small development enclave, with its heavy inputs of external materials, human capital, etc. may look "beautiful." However, looked at in the context of the broader picture of a nation's development, it may not be so beautiful; it may represent an unwarranted overinvestment in one small area at the expense of a broader, but less intensive investment over a larger area/population.

Third, there is the question of distribution of costs and benefits among individuals. The common measure of development--an increase in average per capita income or consumption--can mask a decrease in welfare for a large portion of the population, with a major increase for a smaller portion. Thus, we come back to the question of "development for whom?"

Finally, there is the question of how best to spread positive project ideas and technologies outside the project boundaries. In a more global sense, sustainable development requires spread of appropriate technologies and ideas on how better to balance production with protection of the environment and natural resource base on which, ultimately, all production depends. While an isolated small project population may move towards more sustainable practices, this will mean little in the long run unless the whole population in a watershed system or country starts adopting more effective practices. Thus, decision makers, project planners and implementors need to be concerned with diffusion issues by encouraging communication linkages, broader policy formation which encourages diffusion, etc. It is important how projects fit in a program context and how national and international policies support local developments.

For all four of these "aggregation" related issues, there are corresponding implications for M&A system design. For example, intensive monitoring of the small project enclave will perhaps provide useful information for assessing progress in the enclave, but it will not provide the information needed for comparative analysis and for broader planning. The M&A system has to be designed to answer the relevant questions related to sustainability and to the identify potentially nonsustainable developments both within a project area, and within the larger environment in which the project fits.

<u>Dealing with both the demand and the supply side of developments</u>. In most M&A activity, both at the global and the local levels, the emphasis has tended to be on monitoring the supply side--hectares deforested, changes in greenhouse gases, changes in water supplies, etc. If one accepts our earlier definition of sustainable development as involving welfare improvements, not just changes in resource stocks and flows, then it is evident that monitoring and assessing changes in demand or consumption patterns are just as important in developing strategies to cope with nonsustainability issues.

The implications of the above considerations are that M&A systems need to focus on a broad set of variables or impacts, including those that go beyond the narrow boundaries of a project or the specific focus of a given policy.

As a final point, it should be emphasized again that policies and procedures of many organizations discourage, or at least don't encourage, action that takes sustainability issues into account.    Some organizations do not provide proper incentives for avoiding nonsustainable developments and increasing efficiency in production.  Training programs and management guides which stress such approaches will be ineffective if participants cannot go back to their respective jobs and actually be encouraged to apply what they have learned. Similarly, M&A activities will provide information of only academic interest if the mechanisms for incorporating such information into development activities have not been developed and accepted by decision makers in key organizations.  To assure that such mechanisms are developed and that M&A activity provides information that is perceived to be relevant by decision makers, it is necessary to have a much closer interaction between the technical personnel who develop and manage M&A systems and activities and the decision makers who ultimately should be using the results from such activities.

## SUMMING UP

Sustainable development is an elusive concept, broad and vague enough in its current interpretation to be politically appealing, but of little use in a practical, operational context for the different groups that are involved in development. Thus, most groups seldom deal in operational terms with sustainability issues. If they do, then they tend to focus on alternatives for avoiding <u>non</u>sustainable development, something which can be dealt with in a concrete and useful way.

In order to deal with problems of nonsustainability in development projects, decision makers and managers need early warning signs of project impacts that may lead to nonsustainability. This is a key role of M&A systems related to project and program implementation. Monitoring and assessment systems need to be developed to identify early warning signs of negative impacts of projects and policies on the sustainability of development.    To be effective, such systems must be developing information on the issues and concerns important to the users of M&A results. Therefore, users should be closely involved in the planning and design of M&A systems to meet their needs.

Based on the experience accumulated through the Forestry for Sustainable Development Program, it appears that the effectiveness of a M&A system can be increased from the potential user's point of view by taking following points into consideration:

   * <u>Most projects and policies create externalities</u>, i.e., have impacts which reach outside the decision contexts of the projects or policies being considered. The M&A system has to be designed so that it effectively can identify the externalities which are negative in the sense

of contributing to nonsustainability or welfare declines outside the project or policy boundaries (spatial, temporal and sectoral).

* Most projects have impacts that go beyond their formal lives. Yet most monitoring and assessment activity ceases when the project terminates. If sustainability is of concern, then adjustments in the M&A process need to be made. Continuity of positive project activities beyond the lives of projects must be internalized as a criterion for success.

* Uncertainty is the rule rather than the exception in human activity (projects and policies). Design of M&A systems need to take this into account by building in flexibility and contingency plans to deal with the unexpected and, hopefully, to identify indicators of the unexpected early enough so it can be incorporated or controlled before it gets serious.

* Thinking in aggregate or average terms is not the same as thinking about individuals within a population. There are distributional issues to be considered in looking at project impacts on sustainability of development. That is, we need to answer the questions, impacts on whom? where? when? This means that an effective M&A system needs to be sensitive enough to identify changes in specific groups within a population. The problem becomes one of tradeoffs between sensitivity of the system and cost.

* Most sustainability issues have both a demand side and a supply side. Don't get caught in the trap of monitoring only the supply side of an issue. Sustainable development depends just as much on changes on the demand side, and M&A systems need to be designed accordingly to monitor shifts in demands for resources, new technologies and institutional innovations.

Keeping the above points in mind, the decision maker can more effectively identify the likely severity of impacts of projects or policies and can start to deal with alternative courses of action for avoiding the key impacts which likely will lead to nonsustainable development.

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