
Development for Conservation: Monitoring and Evaluation

Submitted to
United States Agency for International Development
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Submitted from
Tropical Research and Development, Inc.
Gainesville, Florida U.S.A.

July 1995



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Monitoring and Evaluation Specialist

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Acronyms

APN	Agents for the Protection of Nature
ICDP	Integrated Conservations and Development Projects
SAVEM	Sustainable Approaches to Viable Environmental Management

Forward

Growing up, it seemed like a nature wonderland teeming with life. Amazing activity was constantly taking place as dry seasons gave way to rainy seasons and moved back again to dry. Insects: beautiful moths and butterflies beating themselves against window screens at night, odd-shaped and colored beetles and bug treasures for a young boy's insect collection; swarms of blister beetles, swarms of flying termites with the first rains, and sometimes swarms of locusts. The bush land around our home in the mornings and evenings was shrill with the chatter, cries, and breath-taking songs of birds. How I loved the flight of the Senegal Roller, the bouncing, chirping flights of the red or yellow bishop birds and the long-tailed Paradise whydahs, the trills of the sunbirds, or the riveting calls of the barbary shrike. Large and small animals of all kinds moved around us—the barking of harnessed antelope or wild dogs in the evening, or baboons during the day, the smell of a roving shrew, the chirping of dog-faced fruit bats in the mango and guava trees at night. Lions enjoyed the warmth of our cement veranda when we were gone for several weeks. Snakes, particularly spitting cobras and puff adders, were to be watched for, as were scorpions. How I used to look forward to the first months of every New Year when I would be awakened with the first rays of every dawn to the roar of bees gathering the oozing nectar from the shea and locust bean trees outside my bedroom windows. Fish, dozens of species in countless ponds and streams—where did they come from each year?

This was thirty years ago. Today, much of this has completely disappeared under the relentless struggle for a living amongst a growing population, hunting, clearing of the land.¹ This is an account which many can testify to in many parts of the world today. It is distressing to see because we all sense that something unimaginably precious and vital is being lost to our children; that somehow the very survival of our species may be at stake here. The rich tapestry of life has become very threadbare in many parts of our world.

In spite of the fact that in most countries of the world there have been attempts to sustain token patches of this tapestry of life, few approaches have proven successful against “human-caused” threats of one kind or another, particularly in the economically disadvantaged regions of the world. One of the principal reasons for this is the disregard given to the lives, interests, and socioeconomic well-being of the people most directly concerned with the resource being “preserved.” Traditional approaches have frequently been based on severe sanctions, with virtually no use of protected area resources by local populations permitted by national authorities. They are to be “kept out.” Fences are sometimes erected and armed guards sent out to patrol with instructions in some regions to shoot poachers if necessary.

How well I remember my Burkina Gourmantche farmer friends in a small village near Pama (1975), and near one of the few remaining regions of some wildlife diversity, telling me that no government official was going to tell them where they could or could not hunt and trap. These were lands their fathers and grandfathers before them had farmed, hunted and trapped. My friends would insist there were still “lots of animals,” in spite of the fact that they had to walk most of a day to find animals, that the herds were much smaller, and that they were using rifles/shotguns rather than bows and arrows. The ground around the few waterholes near our village during the worst of the dry season months was a virtual mine field of large, homemade, iron traps intended to snap on the leg of any thirsty roan antelope, waterbuck, or hartebeest desperate enough to approach the water. One man I knew had been given a 9 mm. rifle and ammunition by a relative from Ouagadougou. They were in the business of converting wildlife into cattle herds which they owned and managed. He would describe how he would enter a slow-moving herd of cape buffalo and

¹ The eastern portion of Burkina Faso, 7 kilometers from Fada N’Gourma.

shoot six or more before the animals could lumber off. These farmers/hunters saw no wrong in what they did—they were simply “making a living” as the buffalo hunters of the old American West had. A few years later, the Canadian government funded creation of the largest hydroelectric dam in Burkina Faso—with water covering much of this land. While it had been officially illegal to cut the valuable ronian palm trees which covered this fertile river basin in earlier years, the government sent in workers to harvest these thousands of trees before they would be covered by the water. Now both the animals and trees are gone, and the people displaced.

This is not unique to Africa, however. For many years, we have owned a cabin in Northern Minnesota, near Itaska National Park, and have gotten to know and appreciate many of the local residents. Unlike our Twin City urban friends, they remind us a great deal of our Burkinabe friends. Life is hard up there, jobs are few, money hard to come by. One has to live off the land as best as one can. Federal and State laws are often seen as a nuisance and obstacle to survival. Therefore, people will take as many deer from the woods or pike from the lakes as they need. In both these cases, the needs and aspirations of the local people were ignored by faraway bureaucrats intent on “preserving nature” for other people, primarily outsiders (i.e., urban tourists). Because little of the revenue brought in by tourists is observed to return to the local populations, it is certain that these populations will not, and have not, been particularly concerned or active in the continuity or preservation of such natural resources.

New approaches currently being tested in a number of countries seek to integrate conservation with socioeconomic development approaches in order to offer economic alternatives to local natural resource users and to include them in greater management of their resources. Recent experience in Madagascar is discussed below, particularly from the perspective of how the effectiveness of these approaches may be monitored and evaluated as objectively as possible. Examples are drawn from work initiated by the author, beginning in November 1993 within the Ranomafana National Park (Duke & Cornell Universities), and subsequently with a number of other integrated conservation and development projects, in Zahamena National Forest (Conservation International), the Amber Mountain complex (World Wild Life Fund for Nature & CARE), the Masoala protected area (CARE), the Andasibe/Mantadia park complex (VITA), and the Andohahela strict natural reserve (World Wide Fund for Nature, cf. map).

1. Madagascar Protected Area Program

One of the major donors to Madagascar's first environmental action program (1991–95) has been USAID through its Sustainable Approaches to Viable Environmental Management (SAVEM) project. The principal goal of the SAVEM project¹ is²

“To establish sustainable human and natural ecosystems in areas of Madagascar where biodiversity is threatened.”³

Its purpose is

“To identify and establish sustainable systems, including institutions, methods, and behavior for management of protected areas of Madagascar and their peripheral zones.”

The goal and purpose statements above imply that to be “sustainable,” new approaches to such management need to be considered and tested. Innovative approaches have centered on the primary pressures exerted on the natural resources through human pressures around these areas, and insist that the very people exerting these pressures must become directly involved in their management.

One of the novel aspects of the Madagascar SAVEM project is its orientation toward hypothesis testing: in both general and specific ways. Specific project activities must show hypothesis statements linking why potentially successful results of an activity would have positive effects on reducing human pressures upon protected area resources. Implementation of activities then seeks to test the validity of these statements. In a more general sense, the basic ICDP approach may be stated as a hypothesis to be tested:

General ICDP Hypothesis—Economic development activities, linked to the conservation objectives of protected areas, will produce benefits which attract and focus the productive forces of a local population into sustainable and environmentally sound activities.

Other ways of stating this general hypothesis are that by focusing appropriate socioeconomic

¹ The ANGAP institutional technical contractor is Tropical Research & Development, Inc., based in Gainesville, Florida. The grants management unit for the ICDP operators is managed by Private Agencies Cooperating Together.

² USAID donor support is for Integrated Conservation and Development projects (ICDP), with support to groups of nongovernmental organizations for implementation and institutional support to the newly created National Association for the Management of Protected Areas (ANGAP). ANGAP has been given authority for the coordination of efforts to protect these protected areas, of which there are presently 39, with an additional 11 areas to be created as part of the Madagascar Environmental Action Plan. The six ICDPs receiving major USAID Madagascar support are:

- (1) Amber Mountain Complex (Amber Mountain National Park and Special Reserve, Ankararana, Analamena)(WWF and CARE);
- (2) Zahamena Strict Natural Reserve (Conservation International);
- (3) Ranomafana National Park (Stony Brook University, Cornell U, Association Tefy Saina);
- (4) Andohahela Strict Natural Reserve (World Wildlife Fund);
- (5) Andasibe and Mantadia Complex (Andasibe Special Reserve, Mantadia National Park)(VITA, Clark U., SAF, TFMF);
- (6) Masoala Peninsula (CARE, NY Zoological Society, Wildlife Conservation Society).

³ SAVEM Project Document Logframe, p. A2:2, 1990.

development activities upon those people most responsible for the principal negative pressures upon protected areas, conservation objectives of such protected areas will be advanced; or, conservation and economic development can be mutually supportive; or, interactive development efforts in protected areas and peripheral zones involving the real participation and empowering of local residents in the rewards of sustaining these protected areas will lead to development of proven methodologies (and practices) for sustaining threatened ecosystems. Brown and Wyckoff-Baird summarized this approach well in their recent review of ICDP types projects.

“Unless people most directly impacted by conservation perceive their interests in the manner in which conservation is being promoted, it is unlikely that over the long-term any combination of electrified fencing and guarding will prevent unsustainable resource utilization in wildlands and protected areas.”
(Brown and Wyckoff-Baird 1991:3)

1.1. The SAVEM and ANGAP Integrated Conservation and Development Project Approach

The SAVEM project has benefitted from the experience of other ICDP projects in Africa and other parts of the world—particularly in trying to build upon what has been commonly perceived to be a major problem with such programs—the lack of any real linkage between conservation and development. Without such linkage, it would appear difficult to call such projects *integrated* conservation and development projects. Between 1992 and 1994, the SAVEM project had begun to develop a consensus on ICDP goals, objectives, and design steps. The key ICDP philosophy developed states that

“Development activities must be *defined* in terms of addressing *principal human pressures* upon a protected area, and *take place* where they best address human pressures and threats to the protected area, with the objective of diminishing such pressures to promote the long term sustainability of existing biodiversity.”

When a program-wide monitoring and evaluation system was being developed in late 1993 by the author, it became apparent that *none* of the six SAVEM protected area projects had started applying the methodology to be described below in any sufficient detail to permit the design of a monitoring and evaluation system that would permit verification of the general ICDP hypothesis being tested. To begin with, prior to 1994, there was little, if any, clear *linkage* between development activities and conservation activities—each project component was basically going its separate way. This tendency has been assisted by the fact that all Madagascar SAVEM ICDP projects have one operator responsible for conservation activities (e.g., Stony Brook University at Ranomafana) and another for development activities (e.g., Carolina State University⁴ at Ranomafana). Though some programs have provided some spatial identification of human pressures within peripheral zones upon adjacent protected areas, subsequent development activities did not appear to be related in any particular way to these areas of pressure. One might describe such development activities as the shotgun approach—many small activities, widely dispersed, hoping to have an impact. There was little prioritization of either human pressures or activities, little focus of efforts. It became necessary for the author to assist in more clearly laying out these design steps and to create a monitoring and evaluation system which would also support the approach. Much has been achieved during 1994 in this regard and this paper documents some of this experience.

⁴ Recently replaced by Cornell University. Duke University now leads the conservation component.

Because of the vital importance of sustaining the biodiversity of Madagascar's remaining protected areas, and because of the promise which many believe the "development for conservation" ICDP approach holds for linking a country or region's long-term economic health with its environmental health, it is critical that strategies be developed for monitoring the results of these ICDP efforts over time, permitting objective evaluation. The general goal is to identify what kind of development activities or approaches will in fact result in reducing human pressures upon given protected areas. Future programs should focus on proven activities or approaches. ICDP's are very expensive, so it is essential that lessons be learned that can be extended to the remaining protected areas not benefiting from such donor largess.

The general ICDP framework described below, with the subsequent monitoring and evaluation system to support it, is still in the process of evolving. It is a framework which, by its very nature, must permit considerable freedom for testing different approaches for linking conservation and development. It is the result of a team effort of many concerned individuals currently working within Madagascar.

2. The Role of Monitoring and Evaluation

The long-term purpose for monitoring and evaluation within Madagascar's National Association for the Management of Protected Areas (ANGAP) is to provide, first of all, the ICDP operators and secondly ANGAP, as the coordinating body, with the management tools necessary for determining whether or not program activities are, indeed, diminishing human pressures on the target protected areas. The system must also monitor program activity outputs and evaluate their short- and long-term impact on developing sustainable human and natural ecosystems in and around Madagascar's protected areas. Monitoring and evaluation is being used as a vehicle to also promote discipline in early, up-front identification of anticipated short- and long-term *results* of activities pursued in both conservation and development activities, and in assuring clear *hypothesis* statements⁵ exist linking them—hypotheses which must be *tested* for impact on reducing human pressures upon the protected areas. Monitored activities need to provide useful information in helping field operators make course corrections, as needed. Monitored information will ultimately also help in program self-evaluation.

To accomplish all this, a system is being developed which will attempt to outline the process toward identification of those indicators which will best measure such progress. Chosen indicators are expected to serve as a form of barometer to indicate some form of change (positive or negative) taking place—indicative of other more general changes not being actually measured. To be realistic, identification of some indicators must be project specific and developed with those most concerned (i.e., bottom up). At the same time, however, monitoring indicators common to all ICDP programs need to be developed that will provide some means of comparing progress of different areas in reference to each other—providing a means of integrating the entire system conceptually.

There is no limit to the kinds and amounts of data which *could* be collected. Field data collection, processing, and analysis are very costly in terms of both project human and material resources and must therefore be very selective. Data collection must therefore be carefully focused on the specific information required to monitor program indicators for the specific activities being implemented. Needless to say, the costs of such monitoring should certainly not approach the costs of the activities being monitored. What an acceptable cost would be must be determined by program management, but as such, should also be a transparent component of the monitoring and evaluation process.

Because ICDPs in Madagascar are based on a new approach to conservation, many activities are innovative. We do not really yet have the experience to know what kind of activities work best under which kind of conditions and environments. One of principal roles being developed within ANGAP is the capacity to monitor progress made within the country in biodiversity preservation and the identification of effective methodologies supporting this objective. ANGAP will need to be able to determine if, and how, ICDP activities being funded in fact result in the stated purpose of protecting the concerned protected areas. Among the important efforts of ANGAP is the creation of a spatially referenced biodiversity information system concerning protected areas, linking both biophysical and socioeconomic data to serve as a tool for monitoring the impact of SAVEM and other project interventions on the effective protection of parks and reserves.

⁵ By "hypothesis statements" we mean "if activity *x* is implemented, in this area, with this number of these people, we can expect a result *y*, which we believe will have an anticipated impact *z* on the reduction of human pressures upon the protected area."

The ICDP design process, followed by the supporting monitoring and evaluation system described below, was initially developed and tested with the ICDP of Ranomafana in the southeastern part of this island during November and December 1993. This work ended with a description of various indicators for program monitoring and evaluation. ANGAP will be implementing this ICDP design process and monitoring and evaluation system over the next few years. As the program evolves, modifications and improvements are expected within this approach as understanding of critical factors of success become better known. What is being attempted in Madagascar through the ICDP approach (*linking* development and conservation) is fairly new worldwide, and cost-effective means of monitoring and evaluating what are in fact a series of major applied social experiments itself is also evolving.

The goals and objectives of monitoring and evaluation for ICDPs should parallel the goals and objectives of ICDPs. For instance:

- ICDP goal—Better conserve protected area and its biodiversity and ecosystems.
- Monitoring and evaluation goal—To show whether ICDP is being effective in conserving the ecosystem and biodiversity of the protected area.
- ICDP objective—Diminish most important human pressures on the protected area by means of extending alternatives to destructive practices.
- Monitoring and evaluation objective:
 1. Socioeconomic component monitors the adoption of alternatives extended, behavioral changes, and socioeconomic impacts.
 2. Ecological component monitors:
 - (a) The evolution of the most important pressures targeted and their impacts on ecosystem.
 - (b) Monitors those aspects of the ecology of the protected area that need to be monitored properly to properly manage the protected area. Numbers 1 and 2 taken together will be the means of testing the hypothesis.

To accomplish this, the monitoring and evaluation system has developed three information pillars upon which to rest, representing three kinds of monitoring.

1. Indicators for implementation of the ICDP process (Y/N) (annual) (Table 13A and 13B).
2. Indicators for short and long-term impact of program activities (annual) (Table 1).
 - (a) Ecological monitoring of protected area (“flagship” species, stream water quality, increase in biodiversity knowledge, etc.) (impact on biodiversity).
 - (b) Socioeconomic surveys on key development activities targeted for the four top

priority pressures on the protected area in priority subzones⁶ (impact on human behavior—hypothesis testing—annual).

3. Output indicators (associated with annual work plan activities and achievements) (semiannual) (Tables 11 and 12).

ICDP program activities will be monitored to assess *impact* on

1. those groups or people most directly benefiting from project activities, among whom behavioral changes with regard to protected area natural resources are expected; and,
2. upon the protected area biodiversity.

This requires existence of specific linkage and hypothesis statements defining why implementing an activity among this many of this group of people, in this particular area, is expected to address a particular human (prioritized) pressure or cause and therefore reduce pressures upon the protected area—resulting in the sustainability of the biodiversity we are seeking. This is critical to permit ANGAP's focused monitoring and evaluation methodology to test hypotheses made and monitor progress toward attaining stated project objectives.

Discussion of the four major monitoring information sources above will be presented after the ICDP design process itself has been reviewed.

3. Methodology

In establishing an effective monitoring and evaluation system in collaboration with each ICDP, the following ICDP project design steps, outlined below, are considered essential. The various steps set the stage, so to speak, for successful monitoring. An ICDP, in its initial stages, needs a clear idea of where it is heading, where it hopes to end up, and what it hopes to achieve along the way before it can lay out a road map on how to reach its destination. In the same sense, a monitoring and evaluation system, when put into place early in the development of activities, helps to clarify what the signposts might be on the way to our common destination. Annual monitoring indicator tables for each ICDP have been created which summarize the results of each stage and will become a principal means for reporting program progress through ICDP semiannual and annual reports within ANGAP.

1. Identification of the limits of the protected area concerned.
2. Identification of the various stakeholder groups concerned with this protected area; living in the peripheral zone around the protected area. Identify limits of peripheral zone.
3. Identification of all existing (perceived) human pressures and threats to protected area, and prioritization of these pressures according to overall "threat" to protected area.

⁶ Defined in terms of the significance of human pressures a specific peripheral zone sub-zone exerts on the adjacent protected area.

4. Spatialization and zonification: identification of where these pressure are located within the peripheral zone, and prioritization of subzones according to relative importance of human pressures initiating from each area upon protected area. Zonification (zone, subzone) of peripheral zone.⁷
5. Identification (ranking) of known causes (direct or indirect) for these pressures and threats.
6. Prioritization of all these causes according to overall "threat" to protected area.
7. Identification of specific activities to address the pressures directly or indirectly the causes. For this, one must also identify peripheral zone groups most closely linked to concerned pressures.
8. Ranking and weighting of activities in terms of degree to which they address causes.
9. From among all identified possible activities, select among those ranked most important for program interventions and impact on objectives. These are then defined in the annual work plan.
10. Identify goals and results targeted for each activity by end of project and scales and volume of effort required to achieve intended impact (1994–96). These will be project activity outputs.
11. Define specific hypothesis statements for each activity⁸ to be undertaken ("if ___ then ___"). Doing this identifies how impact of activity will be measured in terms of prioritized pressure areas, the threats and/or causes addressed, the stakeholder groups targeted.
12. Monitoring of all activity outputs, and short- and long-term impact on people and protected area in identified selected priority subzones.
13. On-going program self-evaluation.

Each of the steps above will be discussed in the following sections, with examples drawn from various Madagascar ICDPs.

⁷ Pressures do not have to exist within the protected area for them to pose a threat. Unsustainable tavy slash and burn is a good example of such a pressure. Zonification is believed necessary to help focus awareness on possible focal areas of pressure upon a protected area, thereby helping to also identify population groups among whom the project should expect to intervene, targeting them for specific kinds of activities intended to reduce priority pressures which would have the most immediate effect on reducing pressures upon adjacent protected area. Such zoning also becomes particularly useful for long-term monitoring purposes (localizing of aerial photography and interpretation, location for more intensive biodiversity monitoring), and spatial digitization, using the Geographic Information System.

⁸ By "activity," we do not mean program areas (e.g., agroforestry, microenterprises, community development). Activity definition should be as specific as possible so that focus can be made on among whom and where they would be most effective.

4. The ANGAP ICDP Design Process

4.1. Protected Area Limits

Among the most important first steps which ICDP programs must deal with is coming to a common understanding between local populations, various government departments (particularly the Department Des Eaux et Foret), and project personnel on where the limits of a protected area actually are (or should be). In some cases, as with newly established national parks or extensions, boundaries must be put into place with the close involvement of resident populations. In other cases, where serious disputes have developed along old borders, or where old borders have been ignored and remaining forests are located at some distance, redelimitation is required—with new policies and approaches developed to hopefully protect from future encroachments.

Early on, an ICDP needs to create a base map, using the best topographic maps available (usually 1:50,000 scale in Madagascar) to represent where old protected area boundaries are located. Once digitized, this map becomes a spatial base-line reference for all future modifications. All village reference points, taken with Global Positioning System measurements, can be linked to this base map.

Future modifications to this base line map should only be done after the identification of pressures and threats to the protected area has been completed and prioritized, and peripheral zone subzones of human pressures been identified below.

4.2. Location of Peripheral Zone Stakeholders of Adjacent Protected Area

Without the base map showing the location of a protected area (or approximately where it is expected to be in the case of a new protected area), it is difficult for an ICDP to begin to deal with the human element of this process. At the same time, it has become evident that it is essential to distinguish a distinct peripheral zone around each protected area. ANGAP defines a peripheral zone in a functional way as the zone from which most human pressures are exerted upon the protected area. The need to define a peripheral zone is linked to the need to define the target populations with which the ICDP must work most closely, as well as in defining the population whose lives are most closely linked to the protected area and who would benefit directly from the 50 percent of tourist entry fees to be shared. The peripheral zone also becomes another kind of “buffer zone” in which the local population gains special status toward the protected area and its conservation.

The peripheral zone needs to be spatially located (and digitized) upon a similar cartographic base as the protected area boundary base map. All villages and hamlets located in or around the protected area need to be identified, coded, and digitized (using the Global Positioning System). Madagascar ICDPs have used different approaches to defining their peripheral zones. Some base them upon administrative boundaries (Firaisana, Fokotany)⁹ around the protected area (e.g., Andasibe). Ranomafana initially defined the peripheral zone as a perimeter of 5 kilometers around the protected area border, using administrative boundaries within this area for divisions. CARE is using major watersheds in Masoala for describing major “zones,” with subzones established within these.

⁹ Though, with current decentralization taking place within Madagascar, and the legal disappearance of the “fokotany” level, we have encouraged ICDPs to reinterpret the “firaisana” as “zones,” and “fokotany” as “subzones,” so as to avoid any legal boundary definitions when these zones are digitized.

ICDPs exist for the purpose of assisting in the process of assuring the conservation or preservation of Madagascar's protected areas and their biodiversity. To achieve this, the human factor in the ecosystems around such protected areas must be carefully assessed and provided with sustainable natural resource alternatives or other realistic socioeconomic support. One of the key linkages between development and conservation of the SAVEM ANGAP ICDP approach is that an ICDP should geographically target the bulk of its resources on those stakeholders who are the key authors of the major pressures on the protected area (Hagen 1994:3).

The basic philosophy of the approach to conservation and development being promoted by ANGAP is based on working together with those people who have a major stake in the natural resources of the protected area of concern. A first concern, once the general limits of a protected area are known,¹⁰ has been to identify the size of the peripheral zone in which the project will work, the number of people living within this peripheral zone, and who are the key stakeholder groups within this area concerned with exploiting the natural resources of the area. Each ICDP, with ANGAP assistance as needed, has had to identify the key natural resource interests of the major stakeholders concerning any given protected area. This has frequently been accomplished through a series of RRR and PRA surveys in which people in the villages surrounding the protected area are informally interviewed, either individually or in small groups, to discuss the protected areas and the nature of natural resource exploitation and human pressure upon them. One would need to investigate the claims, concerns, and issues raised by local stakeholders with reference to the protected area and how they might see resolution achieved.

The project will need to begin at this time to develop a shared concern for the use of peripheral zone natural resources and building upon the concept that the protected area has economic implications for them that they may not have considered. One would attempt to discuss with local residents how they would categorize area residents into various groups in terms of exploitation of resources coming from protected areas and peripheral area natural resources. As the project evolves, new stakeholders may very well be identified, and their relative importance vis-à-vis other stakeholders determined.

In the case of the Ranomafana ICDP, the late 1993 Phase II Ranomafana project document and Phase I reports reflected significant learning in this respect, though nowhere was a specific list of stakeholders developed. Such a list began to be developed with ANGAP assistance in late 1993 (cf. Table 1) and will need to be updated each year, as understanding of the peripheral zone increases. WWF efforts at the Amber Mountain complex have developed two pages of very detailed listings of stakeholders. It is important to track *who* is benefiting most from program interventions and activities in and around the protected area and peripheral zone, as well as *where* they are located (i.e., subzones). Such impact can have significant positive and negative long-term implications for program goals and purposes.

¹⁰ Even these boundaries may need to be shifted should, with input from local populations, such a need become a pragmatic move for the long-term sustainability of the protected area.

Table 1. Major Stakeholder Groups in Ranomafana ICDP

Peripheral Zone Residents

1. Various villages
2. Various lineages
3. Tanala (ethnic group)
4. Betsileo (ethnic group)(forest people)
5. Beekeepers
6. People gathering fern pots
7. People gathering fig sculptures
8. Women, men, children
9. Tavy slash and burn farmers
10. Paddy irrigated rice farmers
11. Cattle owners
12. Recent migrants
13. Newly established (young) households (without land)

Others

14. ICDP project personnel
15. ANGAP
16. Forestry agents
17. International community
18. Private-sector investors
19. Government of Madagascar (regional and national; ecotourism)
20. People of Madagascar

The list above is only meant to be illustrative for Ranomafana. There seems to be evidence that ethnic differences are less important than actual lineage relationships within specific villages around the protected area. Who among the resident populations have easy access to uncultivated land and who have more difficult access? Do most of those who have permanent access to paddy land represent a grouping of people who could be differentiated from those who practice tavy—in specific areas? ICDPs should acquire the assistance of anthropologists to look into human groupings around the peripheral zone and how elite groups outside the peripheral zone may have impact on their actions vis-a-vis the protected area and peripheral zone forest resources. It is important to assess the difference in resource exploitation between the sexes. In Andohahela National Park's peripheral zone, three key groups stand out above all others in terms of their negative impact upon the protected areas: the very poor, newly established households (without land), and recent migrants. Having identified these as priority groups, the ICDP needs to deal with the kind of activities which will address the needs of such groups if the kind of impacts we are searching for in decreasing pressures are to be realized.

It is very important that contact with local residents during these early stages of a program not give false impressions about what specific activities a project may be implementing within the peripheral zone as a whole—and with whom. Program resources will never begin to meet the wide range of real needs that will be encountered among the various groups of people encountered within the peripheral zone. As stated earlier, initial focusing is required on identifying where the most serious human pressure points are located in reference to the protected area. With this information, one can begin to spatially localize those stakeholder groups *with whom* the program will wish to develop alternative activities to reduce the priority pressures. These people must clearly realize that the benefits to be realized are linked to the existence of the protected area. Their future well being *must* be linked to the long-term sustainability of the protected area.

Successful efforts here may ultimately spread, or be used as methods, to benefit other areas as well.

For this reason, ANGAP has begun to speak of two types of development activities appropriate to ICDPs: those dealing directly with specific pressures within prioritized peripheral zone areas upon a protected area, and those referred to as "door openers." Health related and environmental education type activities appear more relevant as "door openers" to the broad population within the peripheral zone, while alternative targeted activities (combined with the "door openers") appear more appropriate to the prioritized areas. ICDP projects differ greatly in the relative importance they give to these two types of activities.

In Andohahela, for instance, peripheral zone residents have pointed to their need for health services as the most important activity for their linking the benefits of having the protected area nearby. The real and very urgent local needs beginning to be met by health programs are known to exist in the peripheral zone *because* of the presence of the Andohahela National Park program. A portion of park entrance fees might eventually and sustainably support community health programs, managed by the peripheral zone residents themselves—something that the Ministry of Health has not been able to provide. This ICDP hopes to build upon this good will to lead to more environmentally sound natural resource exploitation taken at the initiative of the peripheral zone residents themselves.

4.3. Human Pressures and Threats to Protected Area and Prioritization

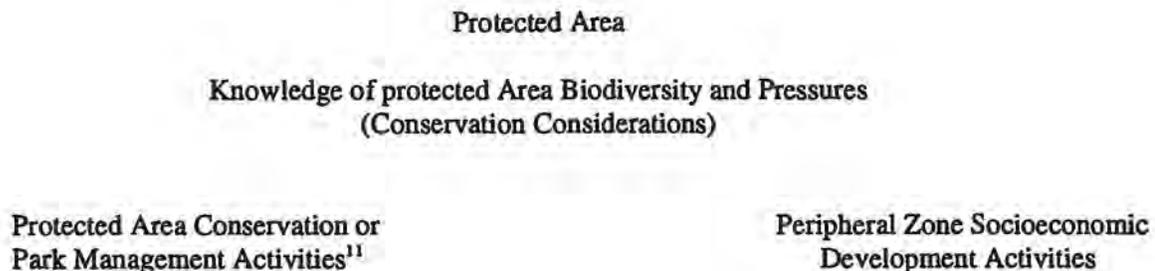
An important first task for each ICDP is the determination of all forms of pressure being exerted upon the protected area (e.g., destructive forces, threats, pressures). Some of these forces are beyond human control (e.g., cyclones, rainfall received, etc.), though even these are causes of different forms of human and animal behavior within and around the protected areas. A clear listing of these pressures and threats to the protected areas should be developed and annually updated, as understanding increases. Some of this information can be obtained through information contained in documents already existing concerning specific protected areas; additional information can be obtained through observation as well as dialogue with peripheral zone populations.

Within the Ranomafana National Park Phase II project paper (October 1993), one could find some of the information to be discussed below. However it shared a problem common to the other Madagascar ICDPs—*linkage between conservation and development was poorly defined or non-existent*. And if poorly defined, what hope could Stonybrook and its partners, ANGAP and donors, have of being able to eventually measure "impact" of ICDP efforts on the protected area program? What needed to be improved was a more clear outline of the various stages, to be discussed below, showing the chain of thought linking why specific activities are being planned and how these address specific threats to the protected areas. Prioritization of areas under human pressure needed to be made initially for the purpose of focusing *where* development related activities should be concentrated.

A program will want to be flexible enough to permit itself to refocus areas of activity as new information may become available about human pressures and threats on the protected area or as new pressures appear (e.g., the putting in of a new road into an area near the protected area). Priorities may need to be reconsidered. Figure 1 seeks to illustrate that in an ICDP type of project all activities need to be defined in terms of conservation considerations ("development for

conservation”). These are not rural development projects somehow attached to protected area conservation efforts.

Figure 1. Development activities of ICDPs *must* be defined in terms of conservation needs (pressures).



We worked with the Ranomafana ICDP staff in reviewing and ranking the various human pressures on this protected area (cf. Appendix 2). A list of the kinds of *direct* human pressures which were being exerted upon the protected area was initially developed. A matrix sheet was then provided to each participant in which each human pressure was ranked against each other pressure, so that each possible combination was compared and a decision made concerning which of each pair was “more important” as a pressure and threat to the protected area, as a whole (cf. Figure 2: matrix sheet). The results of the scores given for each pressure by each participant were then totaled, providing the group’s overall ranking for each pressure. This exercise was done with three different groups of people (rural development extension agents [animateurs], Agents for the Protection of Nature, and project management [Chefs de Volet, DIRNAT, CTP]).

The major group lacking in this exercise was the direct contribution of local population stakeholder groups and we strongly encourage ICDP field personnel to use this ranking sheet with peripheral zone populations with whom the project works—particularly in terms of ranking causes and activities for program consideration. It is essential that local populations be included as annual programs are designed.

¹¹ Institutionally ANGAP is evolving toward becoming the national parks service of Madagascar, and this part of the ICDP equation appears most directly within its long-term role. Development activities would be better operated and managed through association with nongovernmental organizations working with peripheral zone populations.

We only had two weeks to spend in the Ranomafana area and the ICDP program personnel initially believed that project personnel's earlier years of experience would be adequate for quickly initiating this process (of threats identification and prioritization). The Agents for the Protection of Nature and "animateurs" appeared to be more aware of the specific threats, as well as the related causes, than the various heads of the program subsections. This should not be surprising as both groups are much closer to the people of the peripheral zone, being themselves locals (Agents for the Protection of Nature) or residing in the various villages around the protected area.

It is important in future work to continue to obtain information from local populations and to increasingly use such people to fill key positions. This project will succeed only if local populations acquire a vision of their future which is grounded upon belief that the long-term economic health of their region is linked to the environmental health of their protected area and other natural resources.

Table 2 provides listings of what the three groups worked with that are considered to be the principal human pressures on the Ranomafana National Park. Each group was worked with separately, and each developed its own list of pressures separately. We did not coach the different groups about the lists the other groups had come up with. The lists are given in the order of priority established during these priority setting exercises. Project personnel were encouraged to discuss these results and to redo this exercise as a group in order to come to *one common prioritized list* with which to work. The purpose of doing this exercise in this manner, initially, was to indicate to project management the different perspectives that these three groups might have and the need for greater common understanding of the problems and issues with which the program would be dealing. It also showed that in spite of differences, there was common agreement about some of the most serious pressures (e.g., tavy slash and burn farming).

Table 3 provides the prioritized rankings for the six SAVEM projects, as presented in the 1994 annual work plans,¹² as a result of following this methodology.

¹² Programme Annuel de Travail (PAT)

Table 2: Direct Pressures on the Ranomafana National Park

Management	Nature Protection Agents ¹³	Extension Agents
1. Tavy agriculture	1. Forest gathering of honey	1. Tavy agriculture
2. Cutting fern trees ¹⁴	2. Lemur trapping and hunting	2. Forest exploitation
3. Crayfish gathering	3. Tavy agriculture	3. Forest gathering of honey
4. Cutting fig vine sculptures ¹⁵	4. Commercial forest exploitation	4. Cutting for fern trees pots
5. Forest gathering of honey	5. Crayfish gathering	5. Cutting for fig vine sculpt.
6. Brush fires	6. Brush fires	6. Cutting bamboo (garaba)
7. Cutting valuable trees	7. Bamboo cutting	7. Gathering medicinal plants
8. Cutting karaika (weaving)	8. Cutting fern trees for pots	8. Crayfish gathering
9. Cutting cyperus (weaving)	9. Bird hunting	9. Forest pasturing of cattle
10. Cutting vakoana (weaving)	10. Cutting for fig vine sculptures	10. Cutting fontsina for construction
11. Cutting trees for constr.mat.	11. Placing traditional beehives	11. Eel gathering
12. Lemur trapping and hunting	12. Cutting for construction materials	12. Gathering hafitra for rope
13. Bamboo cutting	13. Cutting varongy roots	13. Crab gathering
14. Bird hunting	14. Eel gathering	14. Cutting ravin-dalhasa (weaving)
15. Crab gathering	15. Forest pasturing of cattle	15. Cutting karaika (weaving)
16. Eel gathering	16. Human occupation	16. Cutting satrahana (rat barriers) ¹⁶
17. Cutting home fuelwood	17. Cutting vakoana (weaving)	17. Cutting sihara (palm frond container)
18. Forest pasturing of cattle	18. Wild pig hunting	18. Cutting herana (weaving)
19. Frog gathering	19. Bark collection	
	20. Cutting vanana roots and wood	
	21. Cutting rany wood	
	22. Tree cutting for tool manufacture	
	23. Cutting satrana for roofing material	
	24. Frog gathering	
	25. Cutting garefo (weaving)	
	26. Cutting ravin-dahasy (weaving)	
	27. Irrigation canals	

Other pressures, mentioned in the project document, but not referred to by the above participants, include charcoal production, uncontrolled tourism, and natural disasters (e.g., cyclone).

¹³ The "threats" or "human pressures" listed here are located by subzone by each Agent for the Protection of Nature, as shown Appendix 3. The rural development amateurs (extension agents) were also asked to rank threats. Their list was somewhat different, as was their prioritization.

¹⁴ One fern tree generally produces one fern pot, sold to urban populations as flower pots. Fern trees sufficiently large to yield such pots are probably over 100 years old, and could be used as an indicator species of human pressure.

¹⁵ Fig vines wrap themselves around another tree. When harvested, both the support tree and vines are cut down. The unusual shape of the vines provide "sculptured" looks when some tourists find interesting.

¹⁶ This species of large tree is cut down and the trunk is cut into round plate-shaped segments that are placed between granary structure and ground support to keep rats from climbing into granary.

Table 3: Prioritized Direct Pressures upon Madagascar Protected Areas

<p>Ranomafana National Park:</p> <ol style="list-style-type: none"> 1. Tavy slash and burn agriculture in protected area 2. Human habitations in protected area 3. Charcoal making (from protected area) 4. Firewood (from protected area) 5. Fire 6. Cattle grazing in protected area 7. Logging 8. Rosewood cutting 9. Lemur hunting 10. Honey gathering and tree cutting 11. Medicinal plant collection 	<p>Andohahela Strict Natural Reserve :</p> <ol style="list-style-type: none"> 1. Slash and burn farming, crop cultivation within protected area 2. Bush fires 3. Pasturing of cattle within the protected area 4. Wood cutting for peripheral zone house construction 5. Wood cutting for charcoal making 6. Hunting 7. Human settlements within the protected area 8. Harvesting of wild tubers within the protected area 9. Honey harvesting and collection of other forest products. 10. Fishing
<p>Amber Mountain Complex of Parks and Reserves:</p> <ol style="list-style-type: none"> 1. Commercial forest logging 2. Fire 3. Crop cultivation within the protected area 4. Wood cutting (for firewood, charcoal) 5. Human settlements within the protected area 6. Pasturing of cattle within the protected area 7. peripheral zone resident wood cutting within protected area (house construction, tools, etc.) 8. Live collection of animals for sale: lemurs, birds, etc. 9. Discontent among peripheral zone residents toward existence of protected area 10. Honey harvesting within protected area 11. Collection of wild tubers (yams) 12. Meat hunting (lemur, birds, etc.) 13. Medicinal plants 14. Fishing (fish, shrimp, eels, crabs) 14. Invasion of exotic plants (lantana) 	<p>Zahamena Strict Natural Reserve:</p> <ol style="list-style-type: none"> 1. Slash and burn farming 2. Bush fires 3. Harvesting of "kotofia" 4. Wood cutting for peripheral zone construction needs 5. Hunting of lemurs 6. Commercial forest logging 7. Collection of medicinal plants within the protected area 8. Pasturing of cattle within the protected area 9. Honey harvesting (cutting down large honey trees) 10. Trails within the protected area (leading to casual collection of various natural resources) 11. Mineral prospecting and exploitation

<p>Ranomafana National Park:</p> <ol style="list-style-type: none"> 1. Tavy slash and burn agriculture in protected area 2. Human habitations in protected area 3. Charcoal making (from protected area) 4. Firewood (from protected area) 5. Fire 6. Cattle grazing in protected area 7. Logging 8. Rosewood cutting 9. Lemur hunting 10. Honey gathering and tree cutting 11. Medicinal plant collection 	<p>Andohahela Strict Natural Reserve :</p> <ol style="list-style-type: none"> 1. Slash and burn farming, crop cultivation within protected area 2. Bush fires 3. Pasturing of cattle within the protected area 4. Wood cutting for peripheral zone house construction 5. Wood cutting for charcoal making 6. Hunting 7. Human settlements within the protected area 8. Harvesting of wild tubers within the protected area 9. Honey harvesting and collection of other forest products. 10. Fishing
<p>Masoala Peninsula Reserve:</p> <ol style="list-style-type: none"> 1. Slash and burn farming 2. Commercial forest logging 3. Cash crops (forest products) 4. Construction wood 5. Fishing 6. Secondary products harvested within protected area (plant products) 7. Pasturing of cattle within protected area 8. Hunting (lemur, crocodile, etc.) 9. Mineral prospecting 10. Freshwater harvest of eels, shrimp, crabs within protected area 	<p>Andasibe Special Reserve and Mantadia National Park</p> <ol style="list-style-type: none"> 1. Mineral exploitation within protected area 2. Road construction (within protected area) 3. Rate of tavy within peripheral zone of protected area 4. Illegal natural resource exploitation within protected area 5. Collection of various animal species in protected area (e.g., lemurs, chameleons,) 6. Tavy slash and burn agriculture within protected area 7. Hunting within protected area 8. Illegal circulation of peripheral zone residents within protected area 9. Establishments of settlements within protected area 10. Uncontrolled intrusions within the protected area 11. Illegal harvesting of construction wood and other plant material 12. Construction of worker's huts within protected area 13. Collection of fern pots 14. Collection of honey, fruit, etc. within AP 15. Collection of firewood within protected area 16. Collection of orchids 17. Collection of valuable wood for handicrafts, furniture, etc. 18. Fishing 19. Pasturing of animals within the protected area 20. Beekeeping within protected area (cutting down of trees) 21. Collection of medicinal plants 22. Collection of precious stones or rocks (sales to tourists) 23. Too many people within the national park

4.4. Spatialization of Human Pressures and Zonification

All activities to be developed by the consortium of organizations, national and international and referred to by ANGAP as “operators,” working within each of Madagascar’s ICDPs should relate directly to one or more of the pressure points and address specific direct pressures or indirect causes of these pressures on specific protected areas. To do this, it will be important to *spatially* localize these pressure points.

The Ranomafana ICDP is made up of five major components (rural development, conservation, health, education, and monitoring and evaluation). For each component, a series of activities were being planned, with a series of villages targeted for each. How each component decided on specific villages (as opposed to others) and why, in terms of some prioritization process, was not evident. Because program *impact* must be addressed, justification needs to be given regarding placement of activities with specific reference to what the program has learned about the major human pressure areas.

At the beginning of an ICDP program, one does not have the scientific or research basis one might like to have to make a fully informed decision of how to prioritize areas of pressures within the peripheral zone around a protected area. Therefore, the problem remains as to how to best spatially prioritize threats with the knowledge at hand?

The first project at Ranomafana (1991–93) did not create any specific zonification around the protected area nor did it prioritize human pressure areas. Also, there were no thematic maps of the protected area or peripheral zone produced, though a number of hand drawn maps do exist. Without some starting point of this kind, it is difficult to suggest *where* development activities would best be concentrated to have an *impact* on the pressures identified. This is essential for establishing appropriate output and impact indicators for the development activities. Each protected area should be classified into zones or subzones of high to low priority based on the relative priorities for biodiversity conservation. This zoning should complement the prioritization of pressures to better define priorities for *where* to intervene. Zoning activities of this kind, at the beginning of a program, should be done by those individuals possessing *the best general knowledge of the protected area, and peripheral zone, as a whole*. One might suggest a number of initial criteria to help determine subzone differentiation:

- Areas with heavy tavy cultivation (observation)
- Degrees of degradation (aerial photos)
- Locations of endangered lemur habitat (e.g., bamboo lemur)
- Population density (census)
- Roads (and products sold along it)
- Administrative boundaries
- General areas for known types of individual pressures (honey, shrimp, eel harvesting, wood cutting, fern pots)
- Areas where migrants are most likely to be found (census)

The manner in which we approached zonification, as initially developed with the Ranomafana ICDP, is discussed below.

At whatever stage of development an ICDP may be in, it must initially spatially prioritize areas of human pressure using the best information available at that point in time. And, as the program evolves, new information coming from ecological and other monitoring will permit better

definition, perhaps changes. During our visit to Ranomafana, we found that the head of the conservation component of the project, Mr. Ramahafaly, was the only person who had an overall perspective of the entire protected area. He was in charge of the Agents for the Protection of Nature, of which there were eighteen at the time. These agents were placed into 16 subzones around the Ranomafana National Park's peripheral zone, each responsible for a group of villages, and reported directly to Mr. Ramahafaly. Though it would have been preferable to have had a number of knowledgeable people make a first priority ranking, this was not possible at Ranomafana.¹⁷ And, in any case, our purpose at the time was to show the ICDP team a *methodology* to permit ranking.

Giving Mr. Ramahafaly the matrix form shown previously, but this time using the names of the sixteen subzones, we asked him to prioritize these in terms of the human pressures and threats being placed by peripheral zone residents living in them on the protected area. Each subzone was compared with each other one, and for each pair the question was asked, "Which subzone (of the two) exerts the greatest pressure on the protected area?"¹⁸ For example, between Ranomafana and Sahavodronana subzones below, "Which one is at greatest risk, under the greatest pressure?" He was able to rank these zones in the following manner.¹⁹

1. Ranomafana (16)
2. Sahavodronana (10)
3. Anbalakindresy (10)
4. Vohiparara (5)
5. Sahavanina (5)
6. Menarano (3)
7. Ambodivoahangy (2)
8. Antorotosy (4)
9. Manarinony (9)
10. Miarinony (6)
11. Tsarahonenana (7)
12. Ambohimiera (5)
13. Ambihanindranofotoaka (6)
14. Anjamba (7)
15. Ambohimilanaja (6)

In principal, definition of subzones around a protected area could take a number of geographic forms, though each should be relatively homogenous in terms of the nature and importance of the pressures its population exerts upon the protected area. They could be defined as subwatersheds, or all the lowest level administrative units touching the protected area boundary, or groupings of one or more villages in a 5 kilometer radius around the protected area, as described here. It is for

¹⁷ Each Agent for the Protection of Nature had detailed knowledge about their own specific subzone of responsibility, but did not have a general view of the entire area. At Ranomafana, at this time, only Mr. Ramahafaly had such knowledge.

¹⁸ This could be either a single very important pressure, or combination of pressures.

¹⁹ A "peripheral zone" extending 5 kilometers from the boundary of the protected area has been defined by this ICDP within which development activities are to be targeted. The numbers in (parenthesis) are the numbers of villages which fall within each of the 15 subzones. The list of the villages which fall within each subzone are presented in Appendix 1. Each Agent for the Protection of Nature at present is only responsible to work within 3 villages.

each ICDP operator to determine which subzone approach appears most appropriate. What is important is that this be done during early stages of a project's start-up.

ANGAP impact monitoring will focus on both short- and long-term impact monitoring of a number of these peripheral zone subzones and the adjacent protected area. The first four subzones listed above for Ranomafana turn out to also be those located along the major road. It would seem reasonable that such roads would indeed provide a means for channeling human pressures toward the park (people movement, sales of produce, rapid removal of products, higher prices, etc.). Establishment of subzones of this kind, however initially subjective they might appear, will provide the program with a spatial context within which to begin to monitor change of the various impact variables to be considered by the program.

Not all of the ten villages in subzone number 2, Sahavodronana, may be equally important for targeting specific program activities (and monitoring)—one may wish to consider special activities with those located closer to the protected area border. For example, *tavy* slash and burn farming on Ranomafana's mountain slopes appears high on the list of human pressures and threats. To have an impact on the "tavy issue" and its ultimate threat to the protected area, one might wish to concentrate activities oriented toward improving or modifying tavy systems in most, if not all, of the villages in a number of the prioritized subzones. The suggestion has also been made that focused program activities far away from the protected area (and peripheral zone as well), such as bringing grasslands back into agricultural production, would also reduce pressure of migration into the peripheral zone by people looking for new land to cultivate. This is certainly true and should be seriously considered, when appropriate.

A major concern for the Ranomafana project will be that people in the 5-kilometer radius of the protected area have had their expectations raised about what this ICDP and its development activities will do for them. And this without respect to whether or not these people or villages are located in an area of specific human pressure on the protected area or not. There is also the issue of sustainability. These are expensive projects and the level of "development funding" currently available cannot be expected to continue for more than a few more years. What happens when this level of funding suddenly ends?

This ICDP, in considering its overall program strategy, will have to consider which activities must be more focused in select target pressure areas, and which will be more general within the other subzones. Health and education activities are frequently seen as "door-openers" within a community and will probably need to be conducted throughout the peripheral zone. Because the social services currently available to these rural, and often very remote, populations is limited, if nonexistent, ICDP efforts in this area are particularly sought for and appreciated by peripheral zone residents. These activities, if properly presented, can be seen as a clear general public benefit from the existence of the protected area program. Other, more focused economic development activities might be more concentrated within priority subzones—in an effort to yield a measurable impact within the life of the project. How human and financial resources should be balanced between such activities will be part of the learning experience gained through activities and approaches being developed for the various ICDP programs.

4.5 Causes of Human Pressure

For each of the identified human pressures and threats to the protected area, the specific reasons or indirect causes which lead people to do these things need to be outlined and understood. Only by doing this can we take the step in determining, with the specific groups of stakeholders concerned, the kind of development activities which might best address these issues. In the meetings we held with Ranomafana program personnel, the Agents for the Protection of Nature seemed the most familiar with the causes of the pressures they had listed. Those they cited are provided below in Table 4 for the first fifteen ranked human pressures.²⁰

²⁰ This is not to say there are not 'other' causes, but they were not mentioned by the field staff, and we did not wish to put words in their mouths (ex. all these are caused by fact that people are not paying attention to the laws which regulate forest use or are unaware of them).

Table 4: The Causes for the Human Pressures upon Ranomafana National Park

<p>The Pressures (cf. Table 2, column 2: Agents for the Protection of Nature)</p> <p>1. Forest Harvesting of Honey:</p> <ul style="list-style-type: none"> - use of fire - cutting down of very large trees in which wild bee colony is found, falling tree destroys many other trees - people circulate widely and freely throughout the forest, leading to finding such bee trees and other harvestable items 	<p>The Associated Causes:</p> <ol style="list-style-type: none"> 1. Need for food, Improved Diet 2. Need for cash through sales of honey 3. Sale of beeswax (4000 MF/kg) and existence of market channels 4. Forest honey gathering is a longstanding tradition 5. Making of mead (honey wine) 6. Honey used in some traditional cures
<p>2. Lemur Trapping and Hunting</p> <ul style="list-style-type: none"> - lemurs are totally protected - an average household can kill between 6–8 lemurs/year 	<ol style="list-style-type: none"> 1. Need for food 2. Lack of understanding of their value (for other purposes) 3. Lack of knowledge of the existing laws concerning lemurs 4. Used to exist a very strong demand for live lemurs for pets, less now 5. One species of lemur (<i>hapalénuer griseus</i> -botreka) a pest in rice fields
<p>3. Slash and Burn Farming:</p> <ul style="list-style-type: none"> - causes great disturbance within the Park - fires within fields frequently escape into the surrounding forest - particularly serious along roads and around villages within the boundaries of the protected area 	<ol style="list-style-type: none"> 1. Easier to work in new tavy fields—than old ones (weeds) 2. Inability to maintain soil fertility, need to change fields frequently 3. Lack of enough paddy rice lands or other land to cultivate 4. Yields from paddy rice lands insufficient to produce enough food/family 5. Greatly increasing population and not enough tavy land for everyone in peripheral zone 6. Crop production technology exceeded by increasing number of mouths to feed 7. Tavy farming permits producing a wider range of crops (brèdes, manioc, corn, rice, etc.) permitting diversification of risk 8. Tavy farming is a longstanding cultural tradition

<p>4. Commercial Forest Lumber Exploitation:</p> <ul style="list-style-type: none"> - cutting and harvest of lumber within protected area is against Madagascar forest laws 	<ol style="list-style-type: none"> 1. Most or all of similar good hardwood gone from peripheral zone forests 2. Forest service gives cutting permits (in peripheral zone) too close to borders of the protected area, resulting in intentional poaching into the protected area for lumber 3. Not enough forestry agents to patrol protected area, and not taking the roles of the existing Agents for the Protection of Natures seriously enough (say they are too young, no experience, etc.) 4. Frustration among peripheral zone residents, particularly along rivers, with forest agents: belief that forest is protected for others (outsiders) 5. Selling lumber a means of making money 6. Lumber used in local or regional construction programs
<p>5. Gathering of Crayfish within the National Park</p> <ul style="list-style-type: none"> - free circulation within the National Park by people living along streams as well as people outside of the peripheral zone - Sale of crayfish against customs of some groups in area - Fire is frequently used in preparation of gathered crayfish and escapes into surrounding forest causing damage 	<ol style="list-style-type: none"> 1. Need for food 2. Need for cash (people experienced in capture and sales exist along the roads near protected area, and sales are good)
<p>6. Brush Fires</p> <ul style="list-style-type: none"> - A great deal of uncontrolled circulation through the the National Park by local residents (hunting and gathering activities), frequently using fire which destroys parts of the forest in its passage. 	<ol style="list-style-type: none"> 1. Occurs during taking of honey from wild bees, gathering of crayfish, clearing slash and burn fields, pasturing of cattle within the protected area forests 2. Intentional burning of forest by cattle thieves (as distraction) 3. Use of the "tenina" grass for yearly roofing needs frequently causes fires 4. Ignorance of damage caused, or simple carelessness 5. Spite (against the protected area—which they aren't supposed to use)
<p>7. Cutting down of Bamboo</p> <ul style="list-style-type: none"> - bamboo hard to find in some parts of the peripheral zone (construction) - bamboo grows very slowing in relationship to demands upon it - an important source of food for some lemur species 	<ol style="list-style-type: none"> 1. Used for home construction, roofing, enclosures, as a traditional method 2. Used in the weaving of baskets 3. Increases household income through sales of raw materials or baskets

<p>8. Cutting down of Fern Trees</p> <ul style="list-style-type: none"> - Existence of an active market (collecting and sales) of the fern pots - The kind of fern trees sought for this trade come from trees which are around 100 years old. - Once cut, the plant dies; have observed the disappearance of this species in some areas (young plants however are not in danger) 	<p>1. Sales to increase household income</p>
<p>9. Bird Hunting (usually for food)</p> <ul style="list-style-type: none"> - Because of widespread circulation within Park by local residents with their bows and arrows and blowguns, such hunting has become an important problem 	<p>1. Need for food, additional source of meat 2. Sale of birds along the paved road</p>
<p>10. Cutting down of Fig Vine Sculptures</p> <ul style="list-style-type: none"> - This product is considered as a symbol of wealth within some segments of Malagasy population and purchased for placement in homes; - Results in destruction of trees around which vines grow (and from which vines get their “form”) - Merchants are permitted to sell these along the roads 	<p>1. Sale in order to earn some money (5000 –20,000 Fmg/each)</p>
<p>11. Placing of Traditional Bee Hives within Forest</p> <ul style="list-style-type: none"> - Large (hollow) trees are cut down for such hives - Placement and management of such hives within forest increases circulation within forest (resulting in other hunting and gathering problems) - Includes use of fire, which sometimes spreads in forest 	<p>1. Sale of honey 2. Sale of beeswax (even more valuable than honey) 3. Additional source of household food</p>
<p>12. Cutting down of Park trees for Local Construction Purposes</p> <ul style="list-style-type: none"> - Yearly construction of temporary shelters in forest near slash and burn fields - Rarity of the kind of tree species (lanona,rotra,manduitra) good for such construction around populated areas 	<p>1. Household everyday needs for construction 2. Sales of wood to other local residents to obtain some cash 3. Not enough supervision within Park to control this problem 4. No monitoring of cutting permits issued to peripheral zone residents (of what and where and how much they actually cut)</p>

<p>13. Gathering of Varongy roots from National Park - Caused by widespread circulation of peripheral zone residents in protected area - Rarity of tree species from which such roots are sought</p>	<ol style="list-style-type: none"> 1. Sold to furniture makers 2. A rat deterrent
<p>14. Gathering of eels from Park streams - Families install themselves during a period of time within the forest while this activity is taking place: while there, they cause other damage (looking for firewood, cutting down trees for shelters, the use of fire, hunting)</p>	<ol style="list-style-type: none"> 1. Good source of cash (sold for 2500 MF/Kg) 2. Ease of gathering these within the Park (daily catch about 15-30 per family)
<p>15. Pasturing of Cattle within the Park - Periodic visits by cattle owners within park leads to some destructive practices - Cattle sometimes become wild and aggressive - A residence within Park for up to 10 days for cattle owners looking for their animals (leading to wood cutting, eel harvesting, honey hunting, hunting of lemurs and birds, also use of fire.</p>	<ol style="list-style-type: none"> 1. Placed in forest to avoid competition with field crops 2. Lack of land for pasturing cattle outside protected area 3. Cattle eat plant material good for their health (especially against "douve") 4. Ignorance of the laws concerning cattle in the protected area 5. Doing this is a long standing cultural tradition 6. One strategy to prevent theft of one's cattle (harder to find)

4.5.1. Indirect Causes for Human Pressures

The various causes for the identified human pressures and threats listed in Table 4 may be summarized into what we might call the “indirect” causes for this behavior. These are the indirect causes which lead people to do the things they do that are perceived to have direct (negative) effects on the protected area. A clear statement of such indirect causes should be made in this way by each ICDP. By this we mean that a specific listing of “indirect causes” should be made at the program development stage. Normally, these should be established in collaboration between all the stakeholders concerned with the protected area of interest. As a program evolves, new objectives may be identified with the stakeholder. A guiding principal should be that all program activities need to be justified and explained in terms of their relationship to overall program goals and purpose and the secondary objectives developed from these “indirect causes,” which are essentially the *means* to reach program goals and purpose ends.

Prioritization of project activities should be based on their linkage to the prioritized “indirect causes” responsible to these human pressures. These indirect causes are listed in Table 5. These indirect causes were then ranked by three groups of the Ranomafana project personnel in the manner tallied in Table 6. When specific project activities are developed, it will become apparent that some activities will address in a most direct fashion certain pressures upon the protected area (e.g., beekeeping for forest honey gatherers), as well as a number of indirect causes for pressures. Other activities will not directly address *any* pressures, but will clearly address one or more of the indirect causes for such pressures (e.g., family planning and population growth). The objectives for ICDP program activities might follow a process like that given below:

ACTIVITY (RESOURCE ALLOCATION)

addresses:

INDIRECT CAUSES

DIRECT and SPECIFIC PRESSURES OR THREATS

in order to:

REDUCE HUMAN PRESSURES

SUSTAIN NATURAL RESOURCES and BIODIVERSITY (END)

Table 5: Forms of Indirect Human Pressure Exerted on the Ranomafana National Park

Indirect Human Pressure

1. Growth of the peripheral zone Population (through reproduction, better health and hygiene)
2. Growth of the peripheral zone Population (through in-migration)
3. Household Needs for Diversification (of sources of income—reduce risk)
4. Household Needs for Food
5. Household Needs for Cash (socioeconomic level of peripheral zone residents very low)
6. Lack of Information and Appreciation or Understanding by peripheral zone Residents on Value of protected area Resources (to them)
7. Lack of enough Crop Land or Pastures in peripheral zone for peripheral zone resident needs, and what exists is deteriorating
8. Forest resources rapidly disappearing within the peripheral zone—increasing pressure on
9. protected area
10. Poor management of cutting permits (particularly location given for cutting)
Perception by peripheral zone residents that the Park is (traditionally), their own Resource to exploit, but that it is being protected for the exploitation of outsiders
11. Lack of understanding of the existing laws concerning National Park forest use
12. Lack of sufficient direct surveillance within the Park by forestry agents
13. Discontent by peripheral zone residents concerning (existence) the National Park
14. Tradition, long-standing ancestral cultural practices
15. Problems with regard to land tenure
16. Circulation of peripheral zone population through the National Park

Table 6: Ranked Listing of Indirect Causes of Human Pressures on Ranomafana National Park

Section Chiefs	APNs ²¹	Animateurs ²²	
1	1	1	Household Needs for Food
2	4	11	Growth of Population (reproduction)
3	2	3	Lack of Enough Crop Lands and Pastures in peripheral zone
4	6	5	Household Need for Diversification (of Risk)
5	5	4	Household Need for Cash (poverty, low socio-econ. levels)
6	3	2	Tradition, Customs
7	9	6	Insufficient direct Park surveillance
8	7	12	Perception by peripheral zone residents that their Resources Protected for Outsiders
9	8	7	Basic peripheral zone Forest Resources Disappearing, Insufficient for peripheral zone Needs so look to protected area
10	10	10	Lack of Understanding and Appreciation by peripheral zone Residents of Value of protected area (to them)
11	13	16	Growth of Population (through migration)
12	11	14	Circulation of peripheral zone population through the protected area
13	15	13	Poor management of the Cutting Permits—especially <i>where</i> location of cutting is
14	12	8	Lack of knowledge of the existing National Park Forest laws
15	14	9	Land Tenure Problems
16	16	15	Discontent of peripheral zone residents concerning (existence) of protected area

²¹ Agents pour la Protection de la Nature of the Ranomafana National Park.

²² Personnel used for the extension of development activities in the Peripheral Zone Villages.

Study of Table 5 reveals broad agreement about which are the most important indirect causes of the human threats to the protected area (although the animateurs ranking of population growth in eleventh place is surprising). Eight of the first prioritized ten for the Chefs de Volet appear in the top ten of the other two groups, while two groups share all top ten. The relative scores for each of these groups may be found in Appendix 3. These scores are important in that they provide a relative scale of how *much more* important some of these causes were, when compared to each other (e.g., the top ranked "need for food" factor received a score from the animateur of 117 when compared to "need for diversification" receiving a score of 89 or "movement of population" with a score of 32).

Table 7 provides a listing of the prioritized indirect causes given by the six SAVEM ICDPs in the 1994 annual work plans, following this methodology.

Table 7: Indirect Causes for Human Pressures upon Protected Areas
(Given in order of priority as prioritized)

These indirect causes were developed by ICDPs after consideration of the direct human pressures upon each protected area, after which consideration was given to explain what were the causes which led peripheral zone populations to do this.

Ranomafana National Park

1. Growth of the peripheral zone population through reproduction, better health and hygiene, etc.
2. Growth of the peripheral zone population through in-migration.
3. Household needs for diversification (of sources of income—reduce risk)
4. Household needs for food.
5. Household needs for cash (socioeconomic level of peripheral zone residents very low)
6. Lack of information and appreciation or understanding by peripheral zone residents on value of protected area resources (to them).
7. Lack of enough crop land or pastures within the peripheral zone for peripheral zone resident needs, and what have is deteriorating.
8. Forest resources rapidly disappearing within the peripheral zone—increasing pressure on the protected area.
9. Poor management of cutting permits (particularly location given for cutting by the Department des Eaux et Foret).
10. Perception by peripheral zone residents that the protected area is (traditionally) their own resource to exploit, but that it is being protected for the exploitation of outsiders.
11. Lack of understanding of the existing laws concerning national park forest use.
12. Lack of sufficient direct surveillance within the protected area by forestry agents.
13. Discontent by peripheral zone residents concerning the existence of the protected area.
14. Tradition, long-standing ancestral cultural practices.
15. Problems with regard to land tenure.
16. Circulation (unrestrained) of peripheral zone population through the protected area.

Amber Mountain Complex

1. Poverty; sources of revenue very low
2. The need of surrounding villages for forest products.
3. Lack of respect for existing legislation (concerning nonexploitation of Protected Areas).
4. Lack of control (direct surveillance of protected area by forestry agents).

5. Protected area boundaries are not sufficiently clear or well known to many peripheral zone residents.
6. Lack of understanding or knowledge by peripheral zone residents for need for protected area.
7. Lack of enough cultivatable (good) land within the peripheral zone—therefore pressure upon protected areas.
8. Need for water (for irrigation).
9. Growing population within peripheral zone (reproduction).
10. Land tenure problems or orientations.
11. In-migration of people toward the protected area.
12. Lack of community organization for management of their resources.
13. The strong demand for “khat” (plant product).
14. Need for new pastures.
15. Low agricultural yield within the peripheral zone.
16. Destruction of the savanna.
17. Need for commercial outlets for local products.
18. Poor control and management of streams and water channels (for irrigation).
19. Existence of a “black market” for live lemurs.
20. Need for wood materials for construction of farm implements.
21. Need for credit.
22. Invasion of the protected area by exotic species of plants.
23. Lack of soil fertility in the peripheral zones (due to over-cultivation).
24. Traditions and customs (leading to unsustainable natural resource utilization).

Masoala

1. Demographic Pressure (migration and reproductive growth).
2. Lack of community structures and impossibility of protecting local natural resources.
3. Need to satisfy food needs.
4. The traditional land tenure system.
5. The tradition and custom of slash and burn agriculture, combined with the lack of knowledge or a desire to practice irrigated agriculture.
6. Lack of sufficient protected area surveillance and patrols.
7. The need for income by peripheral zone residents (thus leading to exploitation of protected area resources).
8. Lack of sufficient suitable low-lands for cultivation (intensive rice cultivation).
9. The traditional system of raising livestock (where they are permitted to graze freely within forests).
10. Over-exploitation of certain types of plant material in areas around existing villages (leading to need to search for these within the protected areas where they can still be found).

Andasibe

1. Lack of education or information.
2. Lack of sufficient surveillance and control.
3. Limits of protected area unknown or ignored.
4. Lack of sufficient material means for park surveillance and control.
5. National development.
6. Need for money (or insufficient salary).
7. Lack of productive employment, use of time, for the young.
8. Desire for a better life.

9. Difficulty of adapting (by local residents) to new activities.
10. Lack of alternative activities.
11. Lack of coordination between ministries.
12. Population growth high.
13. Isolation of the peripheral zone.
14. Poor soils for cultivation.
15. Local traditions.
16. In-migration .
17. Lack of extension assistance.
18. Lack of community organization.
19. Lack of sufficient land for cultivation.
20. Poor distribution of lands for different purposes.
21. Peripheral zone populations not benefiting from ecotourism.
22. Lack of forests around (some portions of) the protected area.
23. Usurious behavior of local merchants.
24. Inefficient practices of local industries.
25. Lack of confidence or respect for government authorities.
26. Poor state of the trails and roads within the park.

Andohalela

1. Lack of sufficient land (for cultivation).
2. Rapidly increasing population (reproduction and in-migration).
3. Decrease in soil fertility within the peripheral zones.
4. Lack of security within the peripheral zone.
5. Strong demand by peripheral zone residents for protected area forest products.
6. Need for money.
7. Traditional livestock (cattle) production system.
8. Social conflicts.
9. Need for food.
10. Lack of sufficiently developed commercialization structures.
11. Insufficient number of forest agents and surveillance of protected area.
12. Lack of any kind of forest management plans for peripheral zone forests.
13. Need to survey crops within the protected area.
14. Human habitations within the protected area boundaries.
15. Poor (initial) delimitation of the protected area boundaries.

Zahamena

1. Lack of sufficient land (for cultivation), lack of sufficient base funds.
2. Poor system of attributing forest harvesting permits, lack of sufficient protected area surveillance or systems for control (of encroachment and illicit exploitation).
3. Population growth (reproduction), combined with migration.
4. Need for money.
5. Low (crop) productivity.
6. Traditional land tenure system.
7. Low investment in work.
8. Lack of appreciation for the national park.
9. Need for additional sources of food.
10. Tradition.

11. Isolation, poor health infrastructure.
12. Confusion on exact limits of the protected area.
13. There no longer exists sufficient construction lumber within the peripheral zone.
14. There no longer exists any "kotofia" in within the peripheral zone.
15. Free (uncontrolled) circulation of peripheral zone residents within the protected area (resulting in illicit exploitation of natural resources).
16. Uncontrolled fires (lack of control by peripheral zone farmers).

4.6. Project Activities—Biophysical and Development

A list should be prepared with input from all major stakeholder groups within the peripheral zone concerning those activities that address the direct threats and indirect causes of human pressure upon the protected area. This linkage of program activities needs to be made in the minds of the peripheral zone residents. Particular emphasis should be placed on involving the peripheral zone residents in those areas ("subzones") exerting the greatest human pressures upon the protected area, and who are the most directly concerned. Program activities will fall within one of two broad areas: development orientated within the peripheral zone, or conservation orientated within the protected area itself.

ALL PROGRAM ACTIVITIES

DEVELOPMENT
(FOR CONSERVATION)

PARK MANAGEMENT and INFORMATION
MANAGEMENT

4.6.1. Program Activities

During our visit at Ranomafana, we prepared the following list of activities from the different subcomponents of the project—representing current thinking for Phase 2. Our initial results of this exercise are given in Appendix 4. Many more activities were outlined than given here, with subactivities, but we have attempted to list the major categories of activities proposed. At this point, we can only hope that these activities were developed by the operator with adequate involvement of the interests of the local population. This is the first step for activity development for any ICDP program. The listing (Table 8) was that used in a day workshop in which twelve members of the Ranomafana management structure, representing each subcomponent, each ranked all these activities in terms of their own perceived linkage to addressing the indirect causes of human pressures upon the protected area.

The activities in Table 8 below were purposely not categorized in terms of project "subcomponents" to initially place all activities on the same level before prioritization.

Table 8: Potential 1994 Activities for Ranomafana (not ranked)

1. Applied research on crayfish
2. Management of protected area entry fees (50 percent) for peripheral zone residents
3. Applied research on forest regeneration and harvesting
4. Basic research on the protected area's biodiversity (inventories of fauna and flora, collection and classification, establishment of information data banks on these)
5. Ecosystem monitoring on the health of protected area forests
6. Ecosystem monitoring on the health of the peripheral zone forests
7. Applied research on lemur habitat
8. Applied research on the habitats/range/niche of other species (tiger beetles, bamboo, etc.)
9. Museum activities (work center, cultural center, etc.)
10. Sale of goods produced by the residents of the peripheral zone
11. Ethno-tourism (tourist visits to peripheral zone villages, camping in the villages, folklore, etc.)
12. Development of new tourist trails and paths through protected area for bio-diversity viewing
13. Public relation materials on the protected area's biodiversity (videos, books, brochures, etc.)
14. Protected area surveillance and inspection (for protection and maintenance)
15. Improved management of the peripheral zone's forests
16. Increasing the involvement and awareness of peripheral zone residents about the protected area
17. Development and implementation of a protected area management plan
18. Rice agriculture: extension of improved paddy rice varieties
19. Improving the productivity and sustainability of agricultural production in the *jinja* and *ala* forests, *applied research and extension of soil conservation farming methods for hillside slopes*,
20. Extension of vegetable gardening
21. Extension of appropriate agroforestry methods in the peripheral zone
22. Rabbit raising
23. Poultry raising
24. Intensification of cattle farming (improved pastures, vaccinations, milk production, etc.)
25. Hog farming
26. Beekeeping
27. Fish farming (royal carp, etc.)
28. Extension of methods for crayfish farming
29. Environmental education for children (through school programs)
30. Creation of village "forest reserves" for their children's educational purposes
31. Small farm production activities within school programs (fish farming, nurseries, chickens raising, etc.)
32. Refresher training for teachers in peripheral zone rural schools
33. Training of the Agents for the Protection of Nature, technicians, forest guides, extension agents
34. Rural literacy programs for adults and adolescents
35. Establishment of rural libraries
36. Promotion communication concerning small project and farmer training opportunities within peripheral zone
37. Health education for peripheral zone residents
38. Creation of village level pharmacies
39. Pollution control, creation of latrines, and potable water fountains
40. Creation and/or improvement of rural health clinics
41. Primary health programs for peripheral zone residents
42. Immunization and vaccination programs
43. Family planning information and assistance
44. Marketing of protected area and peripheral zone attractions, improving of tourist infrastructure to

- attract more tourists (hotels, literature, videos, etc.)
- 45. Training of local midwives
- 46. Improved nutrition for peripheral zone infants
- 47. Training of rural health extension personnel
- 48. Extension of appropriate forestry and nursery techniques
- 49. Establishment and engineering assistance in improving rice field productivity through fish-rice farming associations

4.6.2. Prioritization of Activities for Socioeconomic Development

ANGAP should assist each ICDP, or partner nongovernmental organization, in developing a participatory approach to prioritization of activities through a process which would include representatives of principal stakeholders in and around the protected area. From among the list of potential activities should come, through this participatory process, a ranking of priorities which should be addressed by the operator charged with "development" activities. Prioritization of activities should be subject to annual review as new information becomes available. An initial assessment should be made, as part of this process, of the costs of such an activity if it were to have a meaningful impact on project objectives.

Having followed such a prioritization process should be an indicator of progress to be monitored for each ICDP. Though there are many methodologies for establishing priorities, a very simple approach is recommended here which emphasizes the need for various stakeholders to participate. Examples of the rating sheets and matrices used can be reviewed in Appendices 1 through 3. The activities given in Table 8 above were ranked by Ranomafana program management²³ using a simple rating sheet. Only the top ranked fifteen activities are provided below in Table 9 (in order of ranking); the rest may be seen in Appendix 5. ICDP operators were asked to provide, in their 1994 annual work plans, by major project component, the ranking given for each of their program activities.

Table 9: Ranomafana Priority Order for Project Activities (Ranked)

1. Tavy slash and burn farming: Improving the productivity and sustainability of agricultural production on "jinja" and "ala" land through careful applied research and extension on tavy fields (soil conservation, vegetative barriers, new crop varieties, variety testing for adaptability, fertilizers, etc.).
2. Extension of appropriate agroforestry methods in the peripheral zones for diversifying peripheral zone incomes.
3. Rice farming—extension of improved paddy rice varieties, improvement in the productivity of the paddy farming system in general (e.g., water management).
4. Extension of vegetable gardening.

²³ Thirteen people participated in this. They included the CTP, national director, biodiversity monitoring advisor, and two members of each project subcomponent (health, education, rural development, conservation, monitoring and evaluation). The fact that "family planning" ranked so low (No. 32) perhaps shows a need, at the project level, of better training of the field staff about the importance of this activity to long-term sustainability of the protected area.

5. Improving beekeeping methods, productivity, commercialization.
6. Extension of improved forestry management and nursery techniques.
7. Improved management of the peripheral zone's forests (by peripheral zone residents).
8. Familiarizing peripheral zone residents of various small projects the program can assist them with for increasing and diversifying incomes and household activities, including farmer training.
9. Increased awareness and involvement of peripheral zone residents in protected area value and management needs.
10. Training of Agents for the Protection of Natures, extension agents, project technicians and staff members, forest guides, etc.
11. Fish farming and commercialization.
12. Development of more intensive cattle management programs (improved pastures, vaccinations, better use of milk products, etc.).
13. Poultry raising and commercialization.
14. Agro-fishery production systems within paddy rice fields.
15. Applied research on farm crayfish production systems.

Interestingly enough, all the proposed activities dealing directly with the "conservation" program *research* agenda fell within the last 25 percent of the ranking (cf. Appendix 5). Yet, in terms of resources expended, "conservation activities" were those with the highest funding levels. Nor was any priority given to establishing a park management plan—an activity which was lacking in most ICDP programs—yet considered as a required first step in prioritizing protected area conservation activities.

This ranked listing does not, in itself, establish the priorities, but serves as a baseline for decisions makers to use in deciding among competing alternatives and in establishing resource allocations.

Ultimately an established set of priorities, such as the list above, can only be used as an *objective benchmark or standard* against which future actions and decisions can be measured. Establishing a ranking of human pressures and threats, indirect causes, and activities, provides a "line in the sand," so to speak, against which an ICDP will agree to refer to in all actions. When there is an evident conflict or seeming divergence from this ranking, *what is important is that a rational reason be given for the action proposed*. The standard is recognized, but an explanation is given for modification under specified conditions. Confusion can take place when activities undertaken are not consistent with stated goals and objectives—and no justification given for this.

Research funding is often limited, and management must make funding choices among many good programs. When information about program priorities, and even details about subcomponents of such programs are lacking, it is often impossible for a manager to assess their merits and impact of reduced funding, or rejection. In many cases, rather than cutting funding to an entire program or

subcomponent for instance, it might be possible to limit specific activities within such programs—but this can only be done rationally if some prioritization is also provided. Therefore, priority setting exercises have implications for many aspects of ICDP programs.

The priority setting methodology used at Ranomafana represents a simple method for ranking a group of indicators or activities by including many of those directly involved in the concerned programs of research, extension, management, and administration. Not only can this activity help in establishing priorities, but it can also increase awareness among researchers, managers, and administrators about the importance of priority setting and of its use to improve the quality and management of research.

4.7. Hypothesis Testing

At the beginning of this paper, reference was made to the unique approach that ANGAP, and more specifically the SAVEM project component, has taken toward the concept of hypothesis testing. The very ICDP approach itself has been stated as a hypothesis, subject to testing and verification (cf. p.4). Over the past year we have defined such testing at two levels. At a program level, we speak of various ICDP programs developing “strategic or unifying approaches” to linking development with conservation. Protected area operators in Andasibe may believe that support to the peripheral zone private sector through ecotourism development will best accomplish the long-term objectives of the program, and therefore develop activities in line with this approach. Another protected area operator may believe that a watershed management approach best defines their strategy, and that all activities will be orientated in this way. These “strategic approaches” are in fact high-level hypotheses being posited and in the process of being tested.

The strategic level hypothesis, however, cannot be tested without concrete field activities. These activities themselves can be framed into hypothesis statements which clarify the perceived *linkage* being made between development and conservation. We refer to these as the *activity level hypotheses*. The discussion below focuses on defining these activity-level hypotheses and how they will be used.

Each of the indirect causes of human pressure listed for the Ranomafana National Park peripheral zone residents (Table 5), as well as the pressures themselves (Table 2), becomes the focus against which specific activities are developed by the project. These activities are justified by project personnel providing a hypothesis statement showing how linkage is perceived to program goals and objectives. A number of various examples are given in Table 10 below for such hypothesis statements. Annual work plans for each ICDP need to subsequently develop very specific hypothesis statements which clearly lay out the expected impact of particular activities, either on a specific pressure or group of pressures, or on one or more indirect causes for such pressures upon the protected area. Monitoring of project activities therefore leads a program to testing the validity of these hypothesis statements. Activities supported by tested and validated hypotheses are of particular significance to Madagascar’s protected area program and its use of the ICDP concept.

Table 10: Sample Hypothesis Statements Concerning Program Responses to Indirect Causes of Human Pressure

1. Intensification of production systems in agricultural (rice, vegetable gardens, other crops) and livestock (cattle, fish, crayfish) will directly impact the highest ranked indirect cause

of human pressure on the protected area: "the need for food." Production intensification systems also address the third ranked indirect cause: "the fact that the resource base for agriculture and livestock systems are rapidly disappearing in the peripheral zone" or are unsustainable.

2. Family planning programs and programs (e.g., in nutrition) to improve the general health (and life expectancy) targeted to adult and child populations in the peripheral zone will directly address the second ranked indirect cause of human pressure on the protected area: "increasing population through reproduction." This will be a long-term process encompassing at least two generations before significant impact should be evident. Some behavioral changes will be evidenced among households receiving direct family planning assistance during first generation. Family planning (development) programs can affect short-term conservation goals by both reducing the birth rate *and freeing the time of women* to pursue new activities for household income and well-being.
3. Diversification of food and income sources for peripheral zone residents directly addresses the fourth highest ranked indirect cause of human pressure: "the need to diversify." People need and desire to minimize risk. Diversification is a strategy to reduce risk. Examples of diversifying activities include fish farming, vegetable gardening, rabbit and chicken raising, etc.
4. Improving socioeconomic levels and alleviation of poverty among residents of the peripheral zone residents will directly address the fifth ranked indirect cause of human pressure: "the need for money." Many of the threats listed bring in very small amounts of cash to those doing it; providing them alternative and better sources of income will reduce their need for less economical ventures.²⁴
5. Increased educational opportunities, including environmental education, to the residents of the peripheral zone, both its children and adults, will directly address some of the concerns expressed by indirect causes No. 6 "traditional ways of doing things" and No. 10 "lack of understanding, information, and appreciation by peripheral zone residents of the value of the adjacent protected area.
6. Improved protected area monitoring, surveillance, and enforcement by the Agents for the Protection of Nature will address indirect cause No. 7.
7. Establishing procedures whereby peripheral zone residents may have more direct involvement in decision making and management of peripheral zone resources, as well as possibly certain protected area resources, will address indirect cause No. 8 "perception of residents that the protected area, though once their resource to exploit, is now being 'protected from them' for the benefit of others" (particularly foreigners).

²⁴ We know intuitively that increasing the socioeconomic levels of peripheral zone residents, in itself, will not reduce human pressure on the protected area. Examples: (1) Well-off people in some communities use their resources to hire laborers to clear new forest tavi because by doing so they gain the land tenure rights to previously "unowned" land—and then turn around and either sell or share-crop this land to others (usually poor migrants); (2) or increased income permits greater diversification, which can mean increased exploitation of the "free resources" of the protected area (if one can get away with it). Justification for such assistance must be found elsewhere (e.g., concern for basic human concerns, concern for image of program in the region, etc.). Other measures must be planned to anticipate the resulting expanded human pressure from this source (e.g., increased protected area monitoring, fines, etc.), while increasing local public awareness and concepts of collective ownership of an important economic resource (the protected area) from which they can all benefit.

8. Improving agro-forestry methods for peripheral zone residents, including more sustainable and productive tavy and paddy agricultural practices will have a direct impact on indirect cause of human pressure No. 9 “basic forestry resources are in process of disappearing within the peripheral zone. This in turn increases the threat to the adjacent protected area.
9. Program activities to improve local management of bush fires will result in a reduction of pastures within the protected area, an improvement upon the traditional system of livestock management, and will help in reducing the need for more land for farming.
10. By helping peripheral zone farmers establish vegetable gardens, there will be a reduction in the need for these people to gather vegetative food material from the protected area, there will be an increase in household income, and an improvement in household nutrition.
11. By redefining the limits of the protected area, there will be better understanding by the peripheral zone population of where these limits actually are, it will be easier to patrol the boundaries, there will be a reduction in the number of illicit fields within the borders of the protected area, a reduction of the number of newly established households living within the protected area and, therefore, a reduction of pressure upon the protected area.
12. By establishing household level woodlots, there will be within a few years a reduction in collection of firewood from the protected area, a reduction in the need to find construction wood within the protected area, and a reduction of bush fires.
13. If rural credit can be made available to peripheral zone residents, we will observe the development of small-scale livestock activities (chickens, rabbits, beekeeping, etc.), the development of local artistry products, the development of vegetable gardening, increased investments in improving irrigated rice agriculture, and other diversified activities—all of which will help reduce the pressure on natural resources coming from the protected area.
14. Improving the infrastructure of the national park will improve the quality of the stay of ecotourists, thereby ultimately increasing the number of visitors and fees collected by the park, which will finance microprojects for the benefit of the peripheral zone population as well as help in the better management of the protected area itself.
15. Specific research studies within the protected area will give a better understanding of the biodiversity existing within the protected area; this will facilitate the means of better conserving it.
16. Environmental education of children in peripheral zone schools will increase the knowledge of these children about the protected area and the natural resources of the region, giving them a better appreciation for nature. This increased understanding will be of long-term importance as these children grow up, and will also be of short-term importance as they communicate their knowledge to their families at home.

Activities to be proposed by the project will address one or more of the indirect causes of human pressure on the protected area. This is also why it is important for there to be some concentration of such activities in the identified highest pressure areas if impact is to be measured.

Measuring impact of program activities will be difficult in and of itself. Clustering of prioritized activities near identified high-pressure areas will, we believe, have a *synergistic* effect, significantly increasing our chances of being able to measure an impact. Some activities require the presence of other activities to be effective.²⁵

If an ICDP program activity is proposed, therefore, it must relate to program goals and purposes. This relationship, or *linkage*, must be clearly stated as a hypothesis. The key question is, "How do we test these hypotheses?" This becomes a principal role of monitoring and evaluation within the program. Each hypothesis must be tied very specifically to one or a few direct pressures or indirect causes of pressures upon the protected area. The program will then have to monitor the pressures upon the protected area independently, a step which justifies the monitoring activity described below as long-term impact indicators. The program will also have to monitor the acceptance and adoption of the alternatives being extended by the project, the monitoring step referred to below as short-term impact indicators of behavioral change among those benefiting from each activity. If alternatives are not adopted, the activity has failed. If alternatives are adopted *and* the pressures cited continue to increase, the hypothesis was invalid: it has not reduced the human pressure or led to the sustainability of the protected area.

It is further assumed that simply the fact that a causal relationship could be posed, linking activity and conservation goals, does not in itself justify project resources being expended in this direction. As part of the initial RRR survey mentioned above, discussion of each potential activity should be held with the representatives of each stakeholder group mentioned to initially discern the feasibility of linking this activity to potential changes in behavior by one or more segments of the population.

4.8. The Activity Matrix and the Issue of Scale

The next stage indicator of monitoring and evaluation progress will be the existence, for each ICDP, of a table such as Table 11, which addresses linkage relationships and sets out, in summary form, the various assumptions being made concerning specific activities to be undertaken. Of particular importance is the careful need to address properly the issue of scale. By this we mean the number of households, or hectares of trees planted, or applied research trail plots, or expected *outputs*, etc., that will be necessary for any particular activity to address within a particular area to have the *impact* desired within a designated period of time (life of project or beyond). Monitoring efforts will then be orientated to testing these assumptions.

A number of implicit hypothesis are developed for the activity "extension of fish farming in ponds and paddy rice fields" (cf. No. 2 in Table 11) to show where short-term impact monitoring can focus efforts to measure impact:

1. Paddy farmers are among the population causing the threats listed.
2. This activity will increase incomes of the target households.

²⁵ For example, because of their serious need for cash (indirect cause No. 5), farmers almost always sell a major portion of their harvests just after harvest—when prices are lowest. They later are forced to buy food (indirect cause No. 4) later when prices are at their highest—and so go looking in the forest for sources of income (the direct threats). Before one would want to improve storage systems of farmers (very important in itself), they must have something to store. By providing an alternative source of income (indirect cause No. 3) during the period of scarcity (e.g., vegetable gardening, poultry, bee-keeping, fish raising, etc.), farmers may be able to sell these, store their rice harvests, and perhaps sell some when prices are high— *this time making money!*

3. Increased income will decrease these households' need for less productive and remunerative hunting and gathering activities in the protected area.
4. Adoption of this activity among this number of households will be enough to result in an impact.
5. This impact will help promote the conservation and sustainability of the protected area.

Monitoring of impact of this activity of fish farming in ponds and paddy rice fields would include selecting a subsample of farmers benefiting from this activity. A survey would seek to establish whether or not these farmers were in fact exerting the kind of pressure on the protected area identified (e.g., gathering shrimp, eels, etc., in the forest). Is the new activity actually increasing household income and has this reduced in any way the pressures identified? Have the households simply diversified and continue to exert pressure on the protected area, while also benefiting from increased income? If the activity *was* having a positive effect on minimizing some form of behavior negative to the protected area, has this actually made any impact on the pressure itself? Perhaps other people have taken up this activity? Perhaps not enough people are being involved in this kind of activity to significantly create a noticeable change in this specific pressure and threat upon the adjacent protected area. It could be that the *scale* of the activity needs to be corrected. Such information would help the project to reoriented its efforts in the coming year—an essential objective for such monitoring.

Table 11 has been used as an appendix to ICDP annual work plans to show the various linkages between conservation and development. Each column states an assumption of one kind or another about the intended activity, all important for monitoring and ultimate evaluation of the activity's success toward supporting the stated objectives of the project.

Table 11: Ranomafana ICDP Linkage of Activities Addressing Specific Pressures and Threats or Indirect Causes of Pressures

Project Annual Work Plan of Activities Matrix (Very Specific)	Threats Addressed (APNs)	Stakeholder Groups Concerned	Indirect Causes	Scale of Potential Impact²⁶	Location (Subzone village)	Hypothesis²⁷
1. Biodiversity Monitoring	General ²⁸	Nos. 5, 6, 8, 10, and 11	Nos. 6 and 10	Basic Knowledge	Three elevations in protected area, Middle Canopy, by Transects to Identify Endangered Species and Ecosystems	Without specific knowledge of existing biodiversity, we cannot adequately define the nature of the protection required for sustainability. Such knowledge will lead to decisions which will impact long-term sustainability.
2. Extension of fish farming in ponds and paddy rice fields.	Nos. 1, 2, 4, and 11	Nos. 1-4	Nos. 3, 4, and 5	50 percent of 800 households adopting by 1996 ²⁹	Six priority subzones	Increased number of persons making a living from fish-farming will both raise incomes of peripheral zone residents and diminish pressures on protected area harvesting.
3. Etc.						

²⁶ For each activity, an estimation must be made as to the potential client community in the peripheral zone and how many of these will be targeted for activities. This number should be enough, in the project's judgement, to result in an "impact" on the AP.

²⁷ Impact monitoring should be focused toward testing these hypotheses for the activities being implemented, among the stakeholder groups concerned. This would be in terms of rates of adoption of alternative practices from threats addressed.

²⁸ It is evident that this activity addresses none of the listed threats. In fact it reinforced the local belief that the protected area is for outsiders, even foreigners. A threat not mentioned in Table 1 but present nevertheless is the potentially negative feelings directed toward the park because this land, once a resource for local exploitation, is no longer available. It is therefore critical that efforts in including local populations in all aspects of the continuity of the protected area be actively pursued so that the protected area will indeed be considered an asset to the area.

²⁹ There are an estimated 26,000 people living in the peripheral zone, or about 4000 households. Of these, as estimated 800 households in the six top ranked pressure areas are paddy farmers. (Illustrative figures only).

It is important that the logic behind each activity be spelled out because this is the only way possible to realistically identify the target population to monitor during the life of the project through focused socioeconomic surveys. This also points out the importance that the project should place on focusing its development activities on identified pressure areas at a scale that may produce results.

The final decision on *which activities will in fact will be carried out* must remain the responsibility of the ICDP concerned (program management), but their decisions will have to be justified in terms of the results which will flow from the prioritization process.

5. Identification of Monitoring Indicators

ANGAP will wish to monitor, along with the concerned ICDP, both output and (short- and long-term) impact indicators that will help it appreciate the progress being made among all the various ICDPs. To accomplish this, ANGAP staff and monitoring and evaluation ICDP field personnel should agree at the very onset of a project on a set of indicators to monitor the activities to be supported. Program plans for each new year may need to reconsider some activities, based on past monitoring, or add new ones.

Four standardized types of tables are proposed below which ANGAP and ICDPs will use in their monitoring activities. Such monitoring will simplify both annual self-monitoring and periodic formal program evaluations.

Table 1: Annual Overview of ANGAP Institutional and ICDP Program Progress

Table 2: Annual ICDP Monitoring Long-term and Biodiversity Short-term Impact Indicators

Table 3: Semiannual Monitoring of ICDP Outputs for all Activities³⁰

Table 4: Activity Impact, Hypothesis Testing Analysis³¹

As seen above, we differentiate between two types of impact indicators:

1. Those that impact the protected area in a general sense and therefore are long term in nature.
2. Those that impact specific stakeholder groups, recipients of specific activities³², and are more short term in nature.

³⁰ Output tables will follow format prepared in annual work plans on intended outputs, following part of the format presented in Table 11 (name of activity—hypothesis—outputs achieved in past six months—observations).

³¹ Impact indicators here will be specifically focused on measuring changed *behavior* among a sample of recipient households of the most important activity (in judgment of ICDP personnel) developed for each of the top three prioritized pressures upon the protected area of each ICDP (focus on activity). Twenty households have been suggested as the preferred sample size for each of these, to be dispersed among the top four prioritized subzones of the peripheral zone. Besides a control sample of twenty households in an area with little or no project activity (within peripheral zone), another twenty households will be monitored in terms of a mix of activities thought to have a potential impact on the most important pressure (focus on pressure). A total of about 100 households will be monitored in each ICDPs with the financial resources to do so.

³² E.g., those groups which receive beehives for improved beekeeping, those who receive fish and fish pond management training, those who receive an improved variety of rice with improved water management, etc. We want to try to evaluate if these activities have produced any form of *changed behavior* which would impact their relationship with the protected area or peripheral zone natural resources.

Monitoring and evaluation of long-term impact on protected areas will depend heavily upon the interpretation of a timed series of aerial photography and appropriate remote sensing materials. Biological indicators will need to be identified for monitoring that relate directly to project identified and prioritized threats and pressures upon specific protected areas. ANGAP will test and evaluate with ICDPs the most cost-effective means to measure long-term impact changes on protected areas. It has been correctly pointed out that "there is a question as to the availability of proven and cost-effective methods for measuring the change in an ecosystem over time (positive and negative) resulting from rural development interventions outside of a protected area ecosystem (Booth 1993:50)." An attempt will be made to monitor biodiversity by focusing on high-impact areas and comparing these to lower-impact areas.

Species and habitat mapping work to be conducted will help to better understand taxonomic richness of specific plant and animal communities. Special attention will be given to folk taxonomic classification (traditional knowledge systems) for each ICDP in particular, creating an initial database developed from local names and taxa which will permit more rapid appreciation of the taxonomic richness of each particular ICDP. This will also provide researchers assistance in locating areas of taxonomic richness in which scientific classification may be particularly needed. Spatial mapping of this information, using the Geographic Information System, will eventually help in judging the seriousness of human pressures on these resources, or whether or not there is adequate habitat for specific species.

One will need to identify those habitats and communities that are of the highest priority for protection. Some species may be considered "more valuable" in terms of some secondary objectives than others, and priority given to habitat mapping for these. If lemurs are a major attraction on a protected area for ecotourism³³, a secondary impact objective, then their habitat needs to be closely monitored. This work has all yet to be done.

Monitoring and evaluation of population behavioral changes as a result of program development activities will be focused toward targeted socioeconomic surveys of the impacted populations—with emphasis on being activity specific.

Once specific activities have been identified which will be implemented, the ICDP operator will create a table similar to Table 12, following on from the annual work plan matrix of Table 11, in which targeted output realizations during the past six months are summarized. The ICDP monitoring and evaluation unit will coordinate with various subcomponents to furnish updates on progress in updating this output table every six months. The table should be held as a computer file within the monitoring and evaluation database for updating, thus considerably lessening the labor required to provide ANGAP with timely reporting.

³³ Something which still needs to be learned from exit interviews from various groups visiting the PAs.

Table 12: Output Indicators³⁴

Activities	Hypotheses and Justifications for Activities	1994 Actual Outputs
<p>1. Fish farming in association with paddy rice cultivation.</p> <p>2. Applied research on vegetative barriers on hillside tavy fields (banana, sugarcane, fertilizers, and rice).</p> <p>3. Biodiversity monitoring at three elevations within the protected area.</p> <p>4. Ecotourism development within the protected area and peripheral zone will be linked to microprojects developed with communities within peripheral zone from proceeds of park entrance fee revenue sharing.</p>	<p>This activity will reduce pressure on fishing activities within the protected area, as well as provide added income to households decreasing their need to seek alternate sources of income during key periods of the year (from protected area).</p> <p>The period of time in which a tavy field can be cultivated will be extended because of soil conservation practices and added inputs, thereby lessening pressure of new tavy in the protected area.</p> <p>Without specific knowledge of existing biodiversity, we cannot adequately define the nature of the protection required for sustainability. Such knowledge will lead to decisions which will impact long-term sustainability.</p> <p>Ecotourism will be able to help provide the socioeconomic incentives needed for peripheral zone inhabitants to conserve these protected areas. Receiving socioeconomic benefits from adjacent park entrance fees will greatly increase peripheral zone inhabitants' appreciation for the protected area, leading to behavioral changes consistent with protected area conservation and resource management.</p>	<p>Twenty households in each of the four priority subzones have functioning fish and rice associations. No sales of fish yet.</p> <p>Ten applied research plots in each of six priority subzones completed and analyzed.</p> <p>Three transects of 1 km. each were put into place and monitored weekly during last seven months of 1994. Biodiversity data input into database completed.</p> <p>A survey will be taken in subzones receiving such microprojects to ascertain degree of linkage being made between benefits received and protected area, with focus on assessing nature of positive changed behavior, in any.</p>

³⁴ This output table will be drawn directly from the Annual Work Plan tables created that show the linkage between project activities, hypotheses, threats and causes of human pressures addressed, scales of activity required for impact, anticipated impact, methodology, and time-table.

Socioeconomic information for Table 12 output information will be sought for a subsample of the priority activities, in the priority subzones, among specific population groupings, cited in the work plan matrix Table 11. The ICDP monitoring and evaluation unit, with assistance from ANGAP as needed, will be responsible for design and implementation of these targeted surveys—which would be conducted toward the end of each year. The purpose will be to evaluate the *impact of these activities* on the behavior of the recipients and to assess if the activities are having the proposed impacts on the indirect causes and various human pressures being addressed. A question which will be asked will be, “To what extent are the various hypothesis statements made in the work plan matrix valid?”

6. Program Monitoring Indicators

Indicators presented in Tables 14 and 15 were initially developed with the participation of all six SAVEM ICDPs and ANGAP staff. In October 1994 at a workshop in which the six SAVEM ICDPs and representatives from all other active protected area programs attended, these indicators were reviewed, modified, and agreed upon, as presented below. These indicators will serve as a reference for the data collection necessary for monitoring within the protected area program. The data collected will be combined at ANGAP's central headquarters in Antananarivo for the production of an annual report on the overall progress being made by the program. It also serves as an interface with Madagascar's monitoring of the environmental action program and an information system on the environment based at the National Office on the Environment (ONE). It also generates the information needed by the USAID funded SAVEM project for monitoring of its strategic program objectives.

The second column of each table is reserved for data to be collected by either ANGAP or the specific protected area concerned. One will note in this column the frequent appearance of “M.” This is to indicate that the information contained in this row is considered to be part of the minimum data set needed for each protected area. Where the “M” does not appear, this row will only be filled out depending on the resources and specific goals of the operator managing this protected area.

Certain indicators refer only to the four prioritized subzones found within the peripheral zone of each protected area; three such subzones are considered the minimum, with one control subzone. Subzones were prioritized in terms of their importance as a source of human pressures upon the protected area. Choice of the subzones is left to each protected area operator, though ANGAP will assist in the selection should it be requested to do so.

6.1. ANGAP Institutional Development and ICDP Program Development

Table 13A concerns the institutional development of ANGAP. Additional indicators will be added to this, as yet, incomplete set. Table 13B indicators seek to monitor the different stages through which we believe an ICDP should develop. Only yes or no answers are given in this table. This table will become an annual annex to each protected area's annual report, due at the end of each January.

Table 13A: Institutional Development of ANGAP

Financial and Administrative Capacity	
1. Cash (FMG) collected from park entrance fees	M
• 1992	
• 1993	
• 1994	
• 1995	
• 1996	
2. Percentage (50 percent) of park entrance fees collected returned to peripheral zone communities:	M
• 1994	
• 1995	
• 1996	
3. Number of Integrated Conservation and Development Projects under ANGAP's coordination:	M
4. Percent of these ICDPs having submitted their quarterly financial reports within the month following the end of the quarter.	M
5. Total budget of combined ICDPs (in \$US) under the coordination of ANGAP:	M
6. Total budget (in \$US) mobilized for the protected area program under ANGAP direct management:	M
7. Number of professional staff employed by ANGAP (at end of year):	M
8. Ratio of Total Financial Budget (cf.5) / professional ANGAP staff:	M
Monitoring and Evaluation	
1. Number of field visits made by ANGAP professional staff:	M
2. Number of ICDPs having followed, in their annual work plan, the methodology agreed upon (prioritization of pressures, causes, spatialization, scale, hypothesis development):	M
3. Number of ICDPs having submitted by end of January the completed indicator tables required as part of their annual report.	M
4. The existence within ANGAP of a system of data management of relevant ICDP data:	M
5. Existence of ANGAP annual report publishing key indicator data on the ICDP program activities:	M

6. Percentage (50 percent) of park entrance fees collected returned to peripheral zone communities:	M
-----------------------------------------------------------------------------------------------------	---

Training	
1. Number of requests for support and training made by field operators/ICDPs to ANGAP:	M
2. Number of training sessions held by ANGAP during the year for ICDPs:	M
3. Number of ICDP personnel trained during the year in ANGAP sponsored training programs:	M

Public Relations and Communications	
1. Percent of peripheral zone residents knowing of the reason for the existence of the adjacent protected area (survey data to be collected in each protected area)(biodiversity conservation and why this is important):	M
2. Number of videos and films on Madagascar's protected areas available at ANGAP:	M
3. Number of videos and films created by ANGAP or ICDP operators on protected areas during year:	M
4. Funds (in FMG) obtained during the year by ANGAP through the sale of products to tourists (over cost of production):	M
5. Funds (in US\$) obtained during the year by ANGAP contributing to financial sustainability (trust funds, ecotourism, etc.):	M
6. Number of television broadcasts during the year running ANGAP Protected Area videos and films:	M

Table 13B: Annual Overview of ICDP Program Progress

35

ICDP Program Phases and Stages

Program Development

- | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| 1. Existence of Threats Analysis List and Prioritization of this list: | M |
| 2. Existence of List of Causes for Pressures upon protected area, and their prioritization: | M |
| 3. Existence of Spatial Analysis of Threats and Subzone identification and prioritization: | M |
| 4. ICDP strategic approach formulated providing methodological context for all activities: | M |
| 5. Existence of a prioritized list of activities, organized by project component: | M |
| 6. Existence of a peripheral zone stakeholder list (among whom ICDP might work): | M |
| 7. Existence of Linkage (Dev/Cons) and Hypothesis Statements for all program activities: | M |
| 8. Existence of completed AWP with activities justified in terms scale to realize impact: ¹ | M |
| 9. Plan for transfer of responsibilities from expatriate to national personnel exists: | M |
| 10. Existence of a plan for protected area sustainable management, including a means of assuring nongovernmental organization and peripheral zone population participation: | M |

Protected Area Management Plan

- | | |
|---------------------------------------------------------------------------------------------------|---|
| 1. Clearly defined protected area boundaries (including buffer zones): | M |
| 2. Protected area boundary limits physically defined: ² | M |
| 3. Existence of enforcement and monitoring for illegal protected area activities: | M |
| 4. Relationships clearly defined between peripheral zone populations and protected area managers: | M |
| 5. Existence of the required infrastructure for management of the protected area: | M |
| 6. Existence of an ecotourism development plan: | M |
| 7. System for the management and distribution of park entrance fees (50 percent) in place: | M |
| 8. Existence of a biodiversity monitoring plan: | M |
| 9. Existence of a park management plan, and being implemented in protected area (Manual): | M |

Peripheral Zone Development Plan

- | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| 1. Peripheral zone well defined (with proposed boundaries): ³ | M |
| 2. Peripheral zone development plan created and implemented: | M |
| 3. Development strategy exists for sustainable peripheral zone use which includes community participation. | M |
| 4. Peripheral zone forest and other ecosystem management strategy exists which includes participation of peripheral zone residents and the Department Des Eaux et Foret | M |
| 5. Community-Based Land Tenure Boundaries Defined: ⁴ | M |
| 6. System for assisting community-defined activities in place: | M |
| 7. Assistance provided to peripheral zone communities for tourist opportunities (eco/ethno-tourism): | M |

³⁵ Responses: Y = yes; N = no; P = Planned; NA = Non-applicable

Spatial Database Development in Each ICDP⁵

- | | |
|--------------------------------------------------------------------------------------------------------------------------|---|
| 1. Existence of a need analysis for spatial data: | M |
| 2. Existence of basic cartographic data showing limits of protected area, peripheral zone, zones, subzones: ⁶ | M |
| 3. Existence of cartographic data showing vegetative cover, including location of tavy: | M |
| 4. Zones of pressures located in and around protected area, and cartographically mapped: | M |

Development of a Digitized Spatial Data Base (for Geographic Information System use)

- | | |
|--------------------------------------------------------------------------------------------------------------------------------------------|---|
| | 7 |
| 1. Digitization of the limits of the protected area completed: | 7 |
| 2. All villages in peripheral zone identified, given unique coding, localized with Global Positioning System: | 7 |
| 3. peripheral zone delimitation digitized: | 7 |
| 4. Boundaries of zones and subzones digitized: | 7 |
| 5. Buffer zone digitized (if there is one): | 7 |
| 6. Digitization of location of key human pressure areas upon protected area: | |
| 7. Elevation data digitized for four priority peripheral zone subzones (20 m or <): | |
| 8. Elevation data digitized for peripheral zone and protected area (every 100 m): | |
| 9. Roads and trails digitized within protected area and roads in peripheral zone (use the Global Positioning System when possible): | |
| 10. Digitization of rivers and streams within peripheral zone and protected area completed: | |
| 11. Cartographic data (1991) for tavy in four priority subzones digitized: ⁷ | |
| 12. Cartographic data (1991) for pady in four priority subzones digitized: ⁷ | |
| 13. Mapping forest cover classes and habitats in protected area and peripheral zone digitized for Base Year 1991 (percent/ha) ⁷ | |

6.2. General ICDP Impact Monitoring Indicators

The general ICDP focused indicators intended to monitor program impact below are almost all of a quantitative nature. There is clearly a need for more qualitative indicators, providing an assessment of the quality of the work being done. The program expects to accomplish this through special focused surveys and rapid rural reconnaissance type surveys within the peripheral zones.

The indicators in Table 14 are expected to be filled out by each protected area operator and sent to ANGAP by the end of January as part of the prior year's annual report. The indicators are intended to provide an overview of the progress being made within each protected area, and to permit comparison, at ANGAP's level, of the various protected areas as a network. Because of the different approaches and funding levels inherent to different protected areas programs, this monitoring system permits one way of systematically comparing all protected area within a common framework.

**Table 14: Short- and Long-term ICDP Impact Indicators (Annual)
Comparative Indicators by ICDP**

(Due 1/95; 1/96; 1/97)

Item/ICDP

Table 14.1: Financial Inputs

1. Total Annual Budget: (US \$)	M
2. Total Actual Annual Expenditure (US\$):	M
3. Percent of total expenditure for parks management and conservation (of protected area):	M
4. Percent of total expenditure for development activities in peripheral zone of protected area:	M
5. Percent of total expenditure for (all) training:	M
6. Percent of total expenditures for community education, animation, communication:	M
7. Percent of total expenditures for monitoring and evaluation:	M
8. Percent of total expenditures for research activities:	M
9. Percent of total expenditures for local project management and coordination (ICDP level):	M
10: Percent of total expenditures for central and home office coordination:	M
11. Percent of expenditures from foreign donors:	M
12. Percent of total expenditures from the Government of Madagascar:	M
13: Percent of total expenditures for functioning of ICDP:	M
14. Total annual cost of Malagasy ICDP project personnel (\$US):	
15: Total annual cost of expatriate project personnel (\$US):	
16: Total annual cost of consultants (local and international) at ICDP level:	

Table 14.2: Human Resource Inputs:

1. Number of km2 of protected area by Agents for the Protection of Nature/ACD	M
2. Number of km2 of protected area perimeter by Agents for the Protection of Nature/ACD	M
3. Number of km2 of peripheral zone by professional staff (w/long term formal training)	M
4. Number of km2 of peripheral zone by local ICDP animators/extension agents	M
5. Number of peripheral zone people by local ICDP animators/extension agents	M
6. Number of government, nongovernmental organizations, and other project partner personnel sponsored for long-term training (> 3 months)	M
7. Number of government, nongovernmental organization, and other project partner personnel completed short-term training (< 3 months)	M
8. Percent of total protected area and peripheral zone extension staff and Agents for the Protection of Nature/ACD from the defined peripheral zone (Total Number= _____)	M
9. Percent of total project Malagasy professional staff living in the peripheral zone:	M
10. Percent of total project Malagasy staff coming from the peripheral zone: ⁸	M
11. Percent of total project Malagasy staff female	
12. Number of nongovernmental organization and other institutions working together with ICDP in this peripheral zone	
13. Number of man months of outside consulting (national and international) to ICDP:	

Table 14.3: Material Resource Inputs⁹

1. Vehicles (4WD, 2WD) operational (annual average)
2. Motorbikes operational (annual average)
3. Bicycles operational (annual average)
4. \$/yr/field agent invested in basic field equipment (boots, camping eqpt. etc.)
5. \$/yr/vehicle expended on operation and maintenance
6. \$/yr expended on office supplies (paper, pens, toner, etc.)

Table 14.4: Protected Area Management

1. Person-days of Agents for the Protection of Nature/ACD patrol in protected area M
2. Person-days of Agents for the Protection of Nature/ACD spent in community work and animation M
3. Km. of reserve boundary (re)delimited? M
4. Km. of reserve boundary (re)delimited with community assistance? M
5. Km. of new trails established within protected area:
(In year one, give number of km begun with: _____): M
6. Km. of roads established within protected area: M
7. Km. of trails maintained within protected area: M
8. number of illegal activities observed by Agents for the Protection of Nature/ACD¹⁰: M
9. percent of these illegal activities sanctioned by local village authorities: M
10. percent of these illegal activities reported to the Forest Service (CIREF, etc.): M
11. percent of these illegal activities acted on by the Forest Service (CIREF, etc.): M
12. Number of person/days agents of the Department Des Eaux Foret passed within the AP/peripheral zone:¹¹

Table 14.5: Development Activities within the peripheral zone of protected area

1. Person days of field work by extension agents and animators:
2. Number of village groups, local nongovernmental organizations or associations worked with in peripheral zone by project:
3. Number of activities defined and formally proposed by community to project:
4. Number of these activities financed by project and implemented by the communities:
5. Value in \$US of these activities (don't include DAEP activities):
6. Percentage of value of these directly linked to reducing pressures on protected area:
7. Percentage of value of these indirectly linked to pressures:
8. Percentage of value of these without any clear linkage to pressures:
9. Women as percent of total population directly implicated in project activities?

Table 14.6: Relationships with Other Institutions

1. Number of person days of visits from ANGAP during year:
2. Number of person days of visits from donors during year:
3. Number of person days of visits from ICDP partner central and home office personnel:
4. Number of person days of other visits:
5. Number of person days of field personnel time spent managing these visits:

Socioeconomic Indicators

These indicators will help the program monitor the medium-term effects of the project's activities. Some of the indicators concern rice, which is the basic staple food of the Malagasy population. However, it is left to the ICDP concerned to select another crop (e.g., sorghum) in those areas where rice may be a secondary crop, or where another activity (e.g., livestock) may be predominant. These indicators concern a minimum of three priority subzones and one control subzone area with little or no project activities.

Table 14.7: Baseline Demographic Data (Actual number and density)

1. Population within the peripheral zone (from last official census):
2. Number of villages found within the defined peripheral zone:
3. Project surveyed population in three priority areas (subzones) + 1 control in 1994:
 - Priority area No. 1:¹² (percent of migrants = _____)
 - Priority area No. 2: (percent of migrants = _____)
 - Priority area No. 3: (percent of migrants = _____)
 - Control area No. 4: (percent of migrants = _____)
4. Density of the population in these four subzones in 1994 (pop/km²)
 - Priority area No. 1:
 - Priority area No. 2:
 - Priority area No. 3:
 - Control area No. 4:
5. Population in the 4 subzones in 1996 (project survey)
 - Priority area No. 1: (percent of migrants = _____)
 - Priority area No. 2: (percent of migrants = _____)
 - Priority area No. 3: (percent of migrants = _____)
 - Control area No. 4: (percent of migrants = _____)
6. Density of the population in these four subzones in 1996 (pop/km²)
 - Priority area No. 1:
 - Priority area No. 2:
 - Priority area No. 3:
 - Control area No. 4:

Table 14.8: General Data concerning Rice Farming and Consumption¹³

1. Land sale: Paddy: (FMG/ha)
2. Land rent: Paddy: (FMG/ha)
3. Share-cropping Fee and Portion: Paddy: (1 ha): Percent of yield:
4. Land sale: Tavi: (FMG/ha)
5. Land rent: Tavi: (FMG/ha)
6. Land sharecropping fee and portion: Tavi (1 ha): Percent of yield:
7. Average Daily Cost for salaried labor for paddy land preparation for planting (FMG/day):
8. Average Daily Salaried Labor Rate for a tavy field preparation for planting (FMG/day)
9. Peripheral Zone Average Cost of 1 kg. of Rice:
 - During the period of soudure: (two months average FMG):
 - During the period right after harvest: two months average FMG):¹⁴
10. Per Capita Consumption of rice (number kapoaka/day)¹⁵:
11. Average length of period of soudure (in months):
12. Rice paddy yields (Kg/Ha)(Twenty samples each)
13. Rice and tavy yields (Kg/Ha) (Twenty samples each)^{16 17}:
14. Average number of years of tavy and jinja cultivation before leaving to fallow:
15. Average number of years of fallow before a tavy and jinja field is once again cleared:

Table 14.9: Ecotourism, Ethnotourism¹⁸

1. Amount in FMG from previous year(s) collected DEAP destined for peripheral zone populations:
2. Percent of this amount actually used during the year for peripheral zone populations:
3. Amount in FMG of the 50 percent DEAP spent for:¹⁹
 - first major type of activity:
 - second major type of activity:
 - third major type of activity:
4. Number of DEAP micro-projects financed by ICDP during year:
5. Amount earned by guide association from guiding tourists during year:
6. Number of tourist visits of the following groups:
 - children:
 - student groups:
 - Malagasy adults:
 - Resident expatriates:
 - Nonresident expatriates:
 - Researchers and Professional film makers:
7. Administrative level for managing DEAP within peripheral zone (fokontany, village, other):
8. Number of hotels available within zone: (with number of beds):
 - 4 stars/ravinala: (beds: _____)
 - 3 stars/ravinala: (beds: _____)
 - 2 stars/ravinala: (beds: _____)
 - 1 star/ravinala or others: (beds: _____)
9. Number of kms. of tourist trails created within the protected area:
10. Number of camping sites existing within the protected area:
11. Number of camping sites existing in the peripheral zone:
12. Number of tour operators bringing in tourists to protected area²⁰
13. Does a hard currency exchange site exist in the zone? (Yes or No)
14. Quality of access into the area of the protected area²¹:
15. Number of information points and centers created for park and reserve visitors:
16. Number of video cassettes produced for the promotion of the protected area or peripheral zone.
17. Number of poster and brochure editions available for at the PA/ICDP?
18. Number of different types of products created by population for sale to tourists²²

ICDP Biodiversity Indicators

These ecological indicators are intended to serve as an summary of the biological and taxonomic richness found with in the protected area, and a monitor on the growth of knowledge at this site. All SAVEM-funded ICDPs are required to furnish this information. A number of ICDP-specific ecological indicators have been developed based on flagship species or other criteria (e.g., water quality, insect communities, etc.).

Table 14:10: Biodiversity and Taxonomic Richness within Protected Area ²³

1. Number of species of pteridophytes known:
 - percent Endemic
 - number of species at risk of extinction
 - number of species of economic use to peripheral zone populations
2. Number of species of dicotyledons known:
 - percent Endemic
 - number of species at risk of extinction
 - number of species of economic use to peripheral zone populations
3. Number of species of monocotyledons known:
 - percent Endemic
 - number of species at risk of extinction
 - number of species of economic use to peripheral zone populations
4. Number of species of “inferior plants” known:
 - percent Endemic
 - number of species at risk of extinction
 - number of species of economic use to peripheral zone populations
5. Number of Known Mammal Species
 - percent Endemic
 - number of species at risk of extinction
 - number of species of economic use to peripheral zone populations
6. Number of Known Bird Species
 - percent Endemic
 - number of species at risk of extinction
 - number of species of economic use to peripheral zone populations
7. Number of Known Reptile Species
 - percent Endemic
 - number of species at risk of extinction
 - number of species of economic use to peripheral zone populations
8. Number of Known Amphibian Species
 - percent Endemic
 - number of species at risk of extinction
 - number of species of economic use to peripheral zone populations
9. Number of Known Insect Species
 - percent Endemic
 - number of species at risk of extinction
 - number of species of economic use to peripheral zone populations
10. Number of Known Fish Species
 - percent Endemic
 - number of species at risk of extinction
 - number of species of economic use to peripheral zone populations
11. Number of Known Crustacean Species
 - percent Endemic
 - number of species at risk of extinction
 - number of species of economic use to peripheral zone populations
12. Percent of Known Myriapodes Species
 - percent Endemic
 - number of species at risk of extinction

Table 14.11: Forest Resources within the Protected Area and Priority Subzones

1. Number of species of trees/hectare in:
 - plots of mature and primary forest (age=>20 years) within protected area:
 - * in 1994
 - * in 1996
 - plots of secondary forest (age=<20 years) within the protected area:
 - * in 1994
 - * in 1996
 - plots of secondary forest in priority subzone No. 1:
 - * in 1994
 - * in 1996
 - plots of secondary forest in priority subzone No. 2:
 - * in 1994
 - * in 1996
 - plots of secondary forest in priority subzone No. 3:
 - * in 1994
 - * in 1996
 - plots of secondary forest in priority subzone No. 4:
 - * in 1994
 - * in 1996

2. Number of trees/hectare with a diameter greater than 10 cm. (at chest height) in:
 - plots of mature and primary forest (age=>20 years) within protected area:
 - * in 1994
 - * in 1996
 - plots of secondary forest (age=<20 years) within the protected area:
 - * in 1994
 - * in 1996
 - plots of secondary forest in priority subzone No. 1:
 - * in 1994
 - * in 1996
 - plots of secondary forest in priority subzone No. 2:
 - * in 1994
 - * in 1996
 - plots of secondary forest in priority subzone No. 3:
 - * in 1994
 - * in 1996
 - plots of secondary forest in priority subzone No. 4:
 - * in 1994
 - * in 1996

Table 14.12 Hydrological Resources of Protected Area and Peripheral Zone

1. Number of streams and rivers flowing out of the protected area:	
2. Number of streams and rivers which flow out of the protected throughout past year:	M
3. Number of streams and rivers from protected area of major importance to irrigation in peripheral zone?	M
4. Number of hectares of rice in peripheral zone irrigated by water from protected area?	M
	M

Table 14.13 Biological and chemical-physical indicators defined by ICDP²⁴

1. Population baseline data for 1994:
 -
 -
 -
 -
 -
2. Rate of variation at the end of 1996:
 -
 -
 -
 -

Indicators for Monitoring the Management of Natural Resources

This section concerns the monitoring of the management and use of various natural resources (primary and secondary forest products) by peripheral zone populations. In the case of secondary forest products, an initial field survey is required by the ICDP in the defined peripheral zone to determine the list of products (e.g., charcoal, heating wood, weaving fibers, etc.) that are the most used or exploited and the impact of their use on the local ecology. The monitoring itself, described here, concerns the four secondary forest products, whose exploitation is considered of greatest risk or threat to local biodiversity sustainability in both protected area and peripheral zone.

Table 14.14: Use of Secondary Forest Products by Peripheral Zone Populations

<p>1. Secondary Forest Product No. 1:</p> <ul style="list-style-type: none"> • Average distance (in kms) between household residence and primary collection points: • Average quantity (in units or kgs./year/person) of this product collected: • Index of the difficulty to find this product within the peripheral zone:²⁵ • Percent of the requirements of the peripheral zone population met by a new means of managing this product: • Average density of this product in its natural protected area state: • Average density of this product within the first 1 km. inside protected area border: • Average density of this product within areas it should be found within peripheral zone: 	<p>M</p>
<p>2. Secondary Forest Product No. 2:</p> <ul style="list-style-type: none"> • Average distance (in kms) between household residence and primary collection points: • Average quantity (in units or kgs./year/person) of this product collected: • Index of the difficulty to find this product within the peripheral zone:²⁶ • Percent of the requirements of the peripheral zone population met by a new means of managing this product: • Average density of this product in its natural protected area state: • Average density of this product within the first 1 km. inside protected area border: • Average density of this product within areas it should be found within peripheral zone: 	<p>M</p>
<p>3. Secondary Forest Product No. 3:</p> <ul style="list-style-type: none"> • Average distance (in kms) between household residence and primary collection points: • Average quantity (in units or kgs./year/person) of this product collected: • Index of the difficulty to find this product within the peripheral zone:²⁷ • Percent of the requirements of the peripheral zone population met by a new means of managing this product: • Average density of this product in its natural protected area state: • Average density of this product within the first 1 km. inside protected area border: • Average density of this product within areas it should be found within peripheral zone: 	<p>M</p>
<p>4. Secondary Forest Product No. 4:</p> <ul style="list-style-type: none"> • Average distance (in kms) between household residence and primary collection points: • Average quantity (in units or kgs./year/person) of this product collected: • Index of the difficulty to find this product within the peripheral zone:^{28,28} • Percent of the requirements of the peripheral zone population met by a new means of managing this product: • Average density of this product in its natural protected area state: • Average density of this product within the first 1 km. inside protected area border: • Average density of this product within areas it should be found within peripheral zone. 	

Forest Management within the Peripheral Zone

1. Number of permits granted for cutting forest areas (permit d'exploitation):²⁹
 - 1990
 - 1991
 - 1992
 - 1993
 - 1994
 - 1995
 - 1996
2. Number of cutting permits (permit de coup) given:
 - 1990
 - 1991
 - 1992
 - 1993
 - 1994
 - 1995
 - 1996
3. Number of clearing permits (permits defrichement) given:
 - 1990
 - 1991
 - 1992
 - 1993
 - 1994
 - 1995
 - 1996
4. Number of "use rights" permits (permits droit d'usage) given:
 - 1990
 - 1991
 - 1992
 - 1993
 - 1994
 - 1995
 - 1996
5. Number of hectares of open land given to reforestation:
 - 1994
 - 1995
 - 1996
6. Number of community and village-level forest management plans defined and implemented:³⁰

Indicators to Monitor the Evolution of Major Vegetative Cover Classes of Protected Areas and their Peripheral Zone Priority SubZones

Change over time in the vegetative cover of both peripheral zones and the protected areas is closely linked to the natural resource exploitation of local communities. Monitoring such change permits a means to objectively measure the potential effects or impact of ICDP activities directed toward sustainable management and reduction of pressures. The rationale is that if ICDP "development for conservation" activities designed to reduce pressures and increase sustainable use in the program's priority subzones do not lead to improved or sustained vegetative cover, then

these activities are not having their intended impact. Such change is of a long-term nature and change should not be expected within a period of only one or two years.

The monitoring of this change will take place over the entire protected area and a minimum of four priority subzones within the peripheral zone. The base documents to permit such monitoring will be ortho photographs at 1:20,000 scale, established from 1:40,000 scale 1991 aerial photography. Landsat and SPOT images, when available, will be useful tools as well for the larger protected area. The documents to be used will depend on the size of the subzones selected by the project, availability and cost. ANGAP's DIVB will be of direct assistance to all ICDPs in choice of the best available documents for the base line information and historical record. Following the establishment of the baseline cartographic documents, ANGAP, with its ICDP partners, will use relatively low cost videographic over-flights to up-date every two years to follow changes taking place.

Table 14.15: Evolution of Vegetative Cover

Totality of the protected area:

1. Number of hectares of primary and mature forest (age=>20 years)
 - pre '91 if available
 - 1991
 - 1994
 - 1996
2. Number of hectares of secondary forest (age=<20 years)
 - pre '91 if available
 - 1991
 - 1994
 - 1996
3. Number of hectares of savannah or pasture land
 - pre '91 if available
 - 1991
 - 1994
 - 1996
4. Number of hectares of cultivated area (tavy, irrigated rice, other)
 - pre '91 if available
 - 1991
 - 1994
 - 1996
5. Number of hectares of other types of vegetation (mangroves, marsh, etc.)
 - pre '91 if available
 - 1991
 - 1994
 - 1996

Peripheral Zone Priority subzone No. 1:

1. Number of hectares of primary and mature forest (age \geq 20 years)
 - pre '91 if available
 - 1991
 - 1994
 - 1996
2. Number of hectares of secondary forest (age \leq 20 years)
 - pre '91 if available
 - 1991
 - 1994
 - 1996
3. Number of hectares of savannah and pasture land
 - pre '91 if available
 - 1991
 - 1994
 - 1996
4. Number of hectares of irrigated rice (padi) cultivation
 - pre '91 if available
 - 1991
 - 1994
 - 1996
5. Number of hectares of crop land (tavy rice and other crops)
 - pre '91 if available
 - 1991
 - 1994
 - 1996
6. Number of hectares of other types of vegetation (mangroves, marsh, etc.)
 - pre '91 if available
 - 1991
 - 1994
 - 1996

Peripheral Zone Priority subzone No. 2:

1. Number of hectares of primary and mature forest (age \geq 20 years)
 - pre '91 if available
 - 1991
 - 1994
 - 1996
2. Number of hectares of secondary forest (age \leq 20 years)
 - pre '91 if available
 - 1991
 - 1994
 - 1996
3. Number of hectares of savannah and pasture land
 - pre '91 if available
 - 1991
 - 1994
 - 1996
4. Number of hectares of irrigated rice (padi) cultivation
 - pre '91 if available
 - 1991
 - 1994
 - 1996
5. Number of hectares of crop land (tavy rice and other crops)
 - pre '91 if available
 - 1991
 - 1994
 - 1996
6. Number of hectares of other types of vegetation (mangroves, marsh, etc.)
 - pre '91 if available
 - 1991
 - 1994
 - 1996

Peripheral Zone Priority subzone No. 3:

1. Number of hectares of primary and mature forest (age=>20 years)
 - pre '91 if available
 - 1991
 - 1994
 - 1996
2. Number of hectares of secondary forest (age=<20 years)
 - pre '91 if available
 - 1991
 - 1994
 - 1996
3. Number of hectares of savannah and pasture land
 - pre '91 if available
 - 1991
 - 1994
 - 1996
4. Number of hectares of irrigated rice (padi) cultivation
 - pre '91 if available
 - 1991
 - 1994
 - 1996
5. Number of hectares of crop land (tavy rice and other crops)
 - pre '91 if available
 - 1991
 - 1994
 - 1996
6. Number of hectares of other types of vegetation (mangroves, marsh, etc.)
 - pre '91 if available
 - 1991
 - 1994
 - 1996

Peripheral Zone Priority subzone No. 4:

1. Number of hectares of primary and mature forest (age=>20 years)
 - pre '91 if available
 - 1991
 - 1994
 - 1996
2. Number of hectares of secondary forest (age=<20 years)
 - pre '91 if available
 - 1991
 - 1994
 - 1996
3. Number of hectares of savannah and pasture land
 - pre '91 if available
 - 1991
 - 1994
 - 1996
4. Number of hectares of irrigated rice (padi) cultivation
 - pre '91 if available
 - 1991
 - 1994
 - 1996
5. Number of hectares of crop land (tavy rice and other crops)
 - pre '91 if available
 - 1991
 - 1994
 - 1996
6. Number of hectares of other types of vegetation (mangroves, marsh, etc.)
 - pre '91 if available
 - 1991
 - 1994
 - 1996

1. Provides activity working hypotheses, scale of activity to be pursued, defines threat focus and direct or indirect causes addressed.
2. The establishment of the limits of buffer zones, if there are any, is left to the initiative of the ICDP concerned. Buffer zones are defined as falling within the limits of the protected area, as an area of limited sustainable natural resource exploitation.
3. The peripheral zone (peripheral zone) is located adjacent to the protected area boundary and conceptually is linked to the increasing the awareness and responsibility of people living within this area toward biodiversity conservation and sustainable resource management. People within this zone are the recipients of the 50 percent of park entrance fees. They are generally most directly responsible for the human pressures upon the protected area and in best position to take action in reducing such pressures. Outside the peripheral zone one may identify an influence zone (IZ), which indirectly causes many of the human pressures upon the protected area.
4. In some regions of Madagascar, major chunks of land are held by extended family groups (as under the npanjaka of Ranomafana), which can comprise the collective areas of many villages. The npanjaka know the boundaries of this ancestral land, which include primary forests both in the protected area and peripheral zones.
5. These are considered the minimum data set needed, for monitoring and evaluation purposes. Other layers of data will be identified by each ICDP for other applications, in both monitoring and program management purposes.
6. Basic cartography would include villages, paths and roads, rivers and streams, and elevation data.
7. This cartography will be realized through analysis and digitization of ortho-photographs available between the periods 1989–93).
7. These indicators are considered minimum for SAVEM project ICDPs.
8. Region is defined as those various faritany falling within the peripheral zone of the ICDP's activities.
9. Each ICDP is free to add those indicators it believes better reflects its specific circumstances (e.g., average annual investment costs of computer equipment, boats, construction, maintenance costs).
10. The type of illicit activities observed can be classified and reported elsewhere in annual report.
11. Includes Debt for Nature Agents for the Protection of Nature.
12. Each ICDP will define a series of subzones around the protected area. ANGAP will give particular monitoring and evaluation attention to between four and six of these (depending on size), which will have been prioritized based on human pressure and threats to the protected area. The ICDP will be responsible to estimate the area involved in each of their subzones and report this to ANGAP. Total population figures will be taken for a subsample of villages (births, deaths, in-migration + selected other data).
13. These figures should represent the average values obtained from a minimum of 20 samples/plots taken from the 34 priority subzones. In all such data collection efforts, ANGAP will assist the ICDP monitoring and evaluation unit as needed in preparing data collection sheets. All data input will be done at the ICDP level.
14. Prices should be tracked for a number of key commodities, monthly, throughout the year—led by the monitoring and evaluation section. Key markets in each of the priority subzones as well as a sampling of others in other area should be followed. The responsibility for this task may be shared with other subcomponents of the project if they have a presence in the communities selected. Determination of the two

months to average (after harvest) and during soudure (lack) period (usually just before harvest) to be determined by each ICDP.

15. Suggest two short surveys, in only priority subzones, with about 20 households: once during month after harvest, once during soudure. Average to be calculated per subzone.
16. When taking this data, one may wish to ask a few questions, particularly about tavy (is this first, second, or third year of continuous rice cultivation on this field? etc.). Suggest that portion of farmer plots be staked out (and string tied around it) before harvest period (5X5 m), and the farmer given a large sack into which he will be instructed to place the harvest rice panicles from within the yield plot). This way farmer can harvest when he wants to, agent doesn't need to be present). Agent will need to check weekly among farmers who have harvested, and will need to himself be responsible for removing rice, drying, and weighing yields of nondecorticated rice.
17. This figure will be developed from consideration of annual population data to be taken in the priority subzones as well as the aerial photograph analysis of these areas for paddy production.
18. Rural development personnel will, during time of harvest, randomly take at least six yield plot measurements in each of the target subzones. This should be in addition to any measurement of yields of extension efforts taken.
19. These data must be obtained for all national parks and special reserves.
20. ICDP should group its DAEP activities (e.g., health, education support, agriculture development, ecotourism orientated, etc.) and the total amount financed in each principal group.
21. A list of these should be kept in project files.
22. Excellent, good, average, poor.
23. Project should keep a inventory of these. When sold by the project (purchased from population for sale to tourists), a detailed inventory should be kept for further information.
24. Establish a base year, and annually after this provide new knowledge gained.
25. These indicators are defined separately by each ICDP, in order to take account of the unique characteristics of various sites (e.g., serpent eagle, water quality, tiger beetle, etc.). The baseline should be established for each in 1994 and variation checked each two years thereafter (1996, 1998, etc.). Each ICDP is expected to follow at least 4 such indicators, and report on what they are in the space given.
26. Indice = low, medium, high in terms of the difficulty to find this product.
27. Indice = low, medium, high in terms of the difficulty to find this product.
28. Indice = low, medium, high in terms of the difficulty to find this product.
29. Indice = low, medium, high in terms of the difficulty to find this product.
30. An appendix should break this out by subzones and specify, if possible, what percentage of them are within 1 kilometer of the protected area boundary. The ICDP should seek a letter from DEF Tana to all the decentralized forest agents concerned to facilitate obtaining these data.
31. These management plans will be jointly defined by the concerned ICDP and the decentralized forest service of DEF.

There will be opportunities for ANGAP and its ICDP partners to evaluate the indicators outlined above and to add or delete as justified. This would take place during the annual ecological and socioeconomic monitoring and evaluation workshop. We would like to identify a number of other ecological indicators. One set that is currently under consideration would analyze cartographic baseline data for forest islands within the protected area and the priority subzones, measuring both their number, area, and total perimeter. Specific forest corridors linking larger forest areas may also be monitored.

6. Conclusions

Implementing the process described above over the past eighteen months has not been without difficulty. With at least two institutions involved in each of the protected areas with ICDP programs, it has been a challenge for ANGAP as the coordinating body to communicate the need for an over-arching monitoring system where results can be compared across regions and programs. Every institution comes with its own particular approach or orientation. While it is clear that each program must obtain information unique to its situation, these needs must be balanced (personnel, budget) with the need for system-wide monitoring. Every effort has been made to include the input of each ICDP program toward the establishment of the indicators needed to monitor impact toward achieving objectives. An October 1994 workshop resulted in agreement to the first set of system-wide indicators to be monitored (cf. Tables 13 and 14). As of early 1995, progress has been encouraging as we see programs approaching their development of priorities and programs in a more systematic manner.

It was clearly a strategic error on the part of the SAVEM project not to have established a monitoring program from the beginning of the project. Because most field operators only began, by the middle of the project cycle (1994), to put into place the base line information needed to monitor socio-economic and biodiversity impact, it is not realistic to expect that, in the remaining two years, we will be able to measure project impact of most activities—in order to prove or disprove various hypotheses posed. Yet, the biological and socioeconomic monitoring taking place, and being digitized and spatially referenced, will provide the base line for future evaluation of program impact. This is significant because some level of donor funding is anticipated beyond 1997.

More importantly perhaps is that ANGAP has been prioritizing within the protected area program with the objective of developing the long-term sustainability of the program. It was never an objective of donor funding to continue funding the peripheral zone development activities at their current level. Rather, we have sought to test those hypothesis concerning those activities of most promise toward reducing pressures upon the protected biodiversity we are seeking to conserve. In this regard, there has been progress. ANGAP, in reviewing the experience of its field operations, has identified four "development" areas of particular promise which should be able to enjoy some level of sustainability as ANGAP moves toward becoming a national park service. These are as follows:

1. *Park Entrance Fees.* Fifty percent of these fees are returned in the form of microprojects to the populations in defined peripheral zones around protected areas. This source of income has been increasing dramatically over the past three years and is expected to continue its rapid growth. Where already operating, local populations have responded very positively in linking this sustainable source of income to their economic well-being. ANGAP believes that all protected area operators must give high priority to developing

community relationships in the management of these funds.

2. *Ecotourism.* Conservation must begin to pay for itself in Madagascar. Tourism is the world's fastest growing industry and Madagascar must also benefit by the increase in international travel. We have observed, even with the lack of adequate infrastructure, a doubling each year for the past three years in tourist visits. ANGAP, in improving national park and reserve infrastructure and services and working with peripheral zone communities in providing quality services and products for tourist consumption, expects to promote ecotourism as one of the means for sustaining the services needed to protect these parks and reserves while at the same time improving the economic well-being of local populations. The link between this form of development and conservation is self-evident. Efforts in this entire sector are a priority.
3. *Environmental Education.* All means available must be employed to increase the awareness of both local and urban Malagasy populations concerning the unique and rich biodiversity and value of the national treasures represented in their system of parks and reserves. The Malagasy people must come to take pride and joy in this, and have a strong desire to protect this. This is a long-term educational process which must target the youth of the nation's schools, as well as adults, and in which ANGAP and its operators must be increasingly engaged. The response of the Malagasy to current activities of this kind have been very positive.
4. *Partnerships with Local Populations.* The front line agents for protection must include the populations living immediately around the protected areas. Sustainable relationships must be developed between protected areas and these people for mutual economic benefits and conservation. Community and village peripheral zone land and forest systems need to be developed in which greater control is given to such communities for sustainable natural resource management practices. Local populations have been very positive about initiatives of this kind.

Whether or not these areas for concerted effort, linked with other activities around the peripheral zones of protected areas, will in fact lead to the biodiversity conservation being sought still remains to be demonstrated. The principal biodiversity and socioeconomic indicators have been identified and put into place to monitor this. Only time and future evaluation of these indicators will provide the answer.

Appendices

Appendix 1: Ranomafana Peripheral Zone Villages

Codes: Poste deAnimateur: *

1. RANOMAFANA Education:

Matsinjorano Sante: +
Morafeno -
Analafotsy
Matavirano +
Ambodiaviavy *,+,-
Ankevohevo
Ampasimpotsy -
Ambohimahavelona
Soatanana
Masomanga
Ranomafana (ville) -, *
Ambodiriana
Tsararano
Ambodikimba -
Ambatolahy +
Ambodamontana

2. SAHAVODRONANA *,+,-

Analamaintso
Antetezamanana
Ankevolhevo
Ambatovaky *, -
Ambalavao (nord)
Andriamena
Ambozontany -
Analavory
Sahaniaka
Ambohinambia
Morafeno -

3. ANBALAKINDRESY *, -

Antisiho
Ambalapaiso
Ambohitrava
Antsaha
Ambalakinana
Tanantsoha
Balakira
Ampitandroa
Amboditanana
Besora *
Ampitanombifotsy -

4. VOHIPARARA +

Amboditanimena *,+,-
Andranomakoko
Ambalakindresy (sud)
Ialatsara +
Maromoko

Amboasary Toapinga -

5. SAHAVANANA +

Sahavoemba *,+
Tsaramandroso
Sahavanima
Marojano -
Mangevo

6. MENARANO +,-

Sambovinany +
Ambatovory
Ranovao *,+,-

7. AMBODIVOAHANGY +,-

Fanolafana
Amboenana

8. ANTOROTOSY *,+,-

Bevoahazo +
Foabe
Ampitavanana +
Berenty
Beremby +

9. MANARINONY +,-

Fiadanana
Vohimena +,-
Ambodiharana
Kianjanomby +,-
Soanerana
Soamanga
MahaTsiotsio
Sahasomangany -
Namahoaka *

10. MIARINONY

Ambohimila *,+
Ambohipo +,-
Vohitrarivo +,-
Vatofotsy -
Betampona
Antaralava
Tsaratanana -
Ambodigoany -

11. TSARAHONENANA +

Ambodimanga I
Ambodimanga II
Maromandia I
Maromandia II

12. AMBOHIMIERA *

Ampozasaha
Ambalahotsy
Ambohimahatsara
Morondava
Tsinjorano

13.

AMBIHANINDRANOFOTAKA +

Ambatoharanana
Sahandrazana
Tanambao
Anarabe
Sahataitoaka
Amindrabe -

14. ANJAMBA

Ambalatsinaina
Morarano
Analalava
Ambatovory
Anahipisaka
Ambohipo

15. AMBOHIMILANJA

Vohibato
Ambohimandrono
Ankirano
Ambodiriana
Manamboarivo
Andemaka
Sahanimaintso -

Appendix 2: Prioritization of Direct Pressures

RATING SHEET

**** We encourage use of the "matrix sheets" rather than "rating sheets" whenever possible. This leads to much more accurate and discerning choices on the part of the person doing the rating.**

MATRIX TO DETERMINE CRITERIA WEIGHTING

CRITERIA	1 Tavy	2 Human Habitation	3 Mineral Exploitation	4 Exotic Plants	5 Bush Fires	6 Cattle Grazing	7 Commercial Logging	8 Wood Cutting	9 Hunting	10 Honey Gathering	11 Med.Plant Collection	12 Fishing	Total
1. Tavy slash and burn agriculture in PA													
2. Human Habitations in PA													
3. Mineral prospecting/exploitation within PA													
4. Invasion of exotic plants into PA													
5. Bush fires													
6. Cattle grazing in Protected Area													
7. Commercial Logging within PA													
8. Wood Cutting (from PA) for Household Construction tool making, firewood, charcoal													
9. Hunting (lemur, birds)													
10. Honey gathering/tree cutting in PA													
11. Medicinal Plant Collection in PA													
12. Fishing (eels, fish, shrimp) in PA													
Name of participant	_____ (optional)												TOTAL
Commodity specialist	_____												
Discipline	_____												

Listes des Pression

Pressions Sur Aires Protege Ranomafana (Chefs de volet)										Score	Variation	Rank
1	Tavy	5	5	5	4	5	5	5	3	37	0.484375	1
2	Feux de Brousse	3	2	4	4	5	3	5	2	28	1.25	6
3	Kararika	3	3	3	3	3	3	4	5	27	0.484375	8
4	Bamboos	5	1	3	3	2	3	4	3	24	1.25	13
5	Miel	4	3	2	4	5	3	5	4	30	0.9375	5
6	Ecrivises	4	5	4	4	5	3	3	5	33	0.609375	3
7	Bois Precieux	2	3	4	5	2	5	5	2	28	1.75	7
8	Valcoana	3	4	2	3	2	3	4	5	26	0.9375	10
9	Fougioun	5	4	3	5	5	4	5	5	36	0.5	2
10	Fucus	5	4	4	5	5	3	5	2	33	1.109375	4
11	Crabes	1	4	3	3	3	2	3	3	22	0.6875	15
12	Anguilles	1	4	2	4	3	3	2	3	22	0.9375	16
13	Grenouilles	1	4	3	2	2	2	2	2	18	0.6875	19
14	Oiseaux	3	3	4	1	3	3	5	1	23	1.609375	14
15	Lemur	3		4	3	5	3	5	1	24	1.6734694	12
16	Bois de Chauffage	3	4	3	2	1	5	1	2	21	1.734375	17
17	Bois de Construction	4	4	3	3	2	5	3	2	26	0.9375	11
18	Cyperus	3	3	4	5	3	3	3	3	27	0.484375	9
19	Zebus	1	2	5	4	2	3	1	1	19	1.984375	18
Total										504		
Score:												

RATING SHEET

Degré de Liaison/Association Entre Activité et Réponse au Pressions Indirecte Indique

L'Activité : _____

Nom de Participant : _____

- 1: Degré/Liaison tres bas, indirecte, difficile a voir
 5: Degré/Liaison tres haut, tres evident, impacte importante

CRITERE D'IMPACTS: PRESSIONS DIRECTE	SCORE
1. TAVY	5
2. FEUX DE BROUSSE	5
3. KARAIKA	5
4. BAMBOOS	2
5. MIEL	5
6. ECRIVISES	5
7. BOIS PRECIEUX	2
8. VALCOANA	2
9. FOUGIOUN	5
10. FUCUS	5
11. CRABES	3
12. ANGUILLES	3
13. GRENOUILLES	2
14. OISEAUX	5
15. LEMUR	5
16. BOIS DE CHAUFFAGE	1
17. BOIS DE CONSTRUCTION	2
18. CYPERUS	3
19. ZEBUS	2

Table A2-3. Prioritization of direct human pressures on the protected area (Table 1) by extension agents, Ranomafana, Nov. 1993

#	Participants										Total	Variance	Rank order by total
	1	2	3	4	5	6	7	8	9	10			
1	3	3	4	1	4	4	3	3	3	4	32	0.76	8
2	3	2	4	1	1	4	3	1	3	3	25	1.25	18
3	4	4	4	3	5	4	3	5	3	4	39	0.49	3
4	4	1	3	4	1	3	2	2	3	3	25	1.05	16+17
5	2	1	2	4	1	3	2	2	3	1	21	0.89	20
6	2	1	2	4	1	3	2	2	3	3	23	0.81	19
7	2	5	2	4	3	4	3	5	2	3	33	1.21	7
8	1	4	2	2	2	4	2	5	3	2	27	1.41	13
9	5	5	5	5	5	5	5	5	5	5	50	0	1
10	3	3	4	2	3	4	3	1	3	3	29	0.69	9
11	5	3	5	5	4	5	5	5	5	5	47	0.41	2
12	3	4	4	2	4	3	2	5	4	4	35	0.85	6
13	4	1	3	3	1	1	4	5	3	4	29	1.89	11
14	1	2	2	2	3	3	2	3	4	3	25	0.65	14
15	1	2	4	2	3	4	2	4	4	3	29	1.09	10
16	2	2	3	2	3	4	1	4	3	3	27	0.81	12
17	3	1	2	2	1	4	2	4	3	3	25	1.05	16+17
18	4	2	3	4	5	4	2	5	4	4	37	1.01	4
19	4	3	2	3	5	4	2	5	4	4	36	1.04	5
20	2	3	3	2	1	3	1	4	3	3	25	0.85	15
											619		

(cont.)

Table A2-2. Prioritization of direct human pressures on the protected area by APNs, Ranomafana, November 1993

	Participants																Total	Variance	Rank order by total	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16				
Irrigation canals	1	2	1	1	1	1	1	1	2	3	1	1	2	2	1	1	22	0.36	27	
Root collecting:																				
Vanana	2	1	1	1	3	2	1	5	3	4	1	5	1	3	1	1	35	2.03	20	
Ramy	4	1	3	1	1	1	4	2	1	4	2	3	1	3	1	1	33	1.43	21	
Varongy	5	1	2	1	2	2	2	2	2	4	3	3	4	3	2	2	40	1.13	12	
Bird hunting	4	4	1	1	3	1	2	4	1	5	2	4	4	2	4	1	43	1.96	9	
Ravin-dahasy collection (weaving)	1	2	1	1	1	2	1	3	1	1	1	1	4	2	2	1	25	0.75	26	
Sarana (roofing wood) collecting	1	2	1	1	1	2	1	3	2	3	1	1	4	4	1	1	29	1.15	23	
Traditional beehive setting	2	4	1	1	4	4	3	1	2	1	3	5	3	2	3	3	42	1.48	11	
Total score 247																				

Table A2-2. Prioritization of direct human pressures on the protected area by APNs, Ranomafana, November 1993

	Participants																Total	Variance	Rank order by total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16			
1 Crayfish collecting	4	1	1	2	5	5	1	3	2	1	5	5	2	3	4	5	49	2.56	5
2 Eel collecting	3	1	1	1	1	5	5	3	2	1	3	3	2	2	4	2	39	1.75	14
3 Honey collecting	4	5	5	2	4	3	5	5	4	2	5	5	4	4	5	3	65	1.06	1
4 Frog collecting	3	1	1	1	1	1	1	3	1	1	1	5	1	2	1	4	28	1.56	24
Wood collecting for building use	3	4	1	1	3	1	1	5	2	4	3	3	4	3	1	1	40	1.75	13
Forest exploitation	5	5	5	5	2	1	1	5	1	5	1	1	5	3	4	1	50	3.36	4
Vakoana collecting (weaving)	2	1	1	1	3	3	1	3	1	2	1	5	4	3	3	3	37	1.46	16
Nónoka collecting (figurative sculpture)	4	4	1	1	5	1	1	3	1	3	1	1	4	5	3	5	43	2.59	10
Harefo collecting (weaving)	1	1	1	1	1	1	1	3	1	1	3	1	4	4	1	1	26	1.23	25
Bamboo collecting	3	3	1	1	1	2	1	5	2	4	3	1	4	5	5	4	45	2.28	7
Lemur trapping	5	5	5	2	3	1	2	5	2	5	5	4	5	4	5	1	59	2.34	2
Boar hunting	3	1	1	1	1	4	2	1	3	2	4	4	3	3	2	1	36	1.31	18+19
Forest pastures	3	2	1	1	1	4	3	1	3	5	3	1	4	3	1	2	38	1.61	15
Fern pots	5	1	1	1	5	1	1	4	1	4	1	1	4	5	5	5	45	3.40	8
Bush fires	5	5	1	1	3	1	1	5	1	5	4	1	5	3	5	1	47	3.31	6
Wood cutting for tools	3	1	1	1	2	1	2	4	1	2	2	1	3	2	5	1	32	1.38	22
Bark collecting	4	2	1	1	1	1	1	3	1	4	2	3	3	2	4	3	36	1.31	18+19
Tavy	5	5	4	4	2	2	1	5	2	5	4	2	5	4	5	1	55	2.50	3
Human occupation	4	5	1	1	2	2	1	5	1	3	1	1	5	2	1	2	37	2.34	17

Table A2-4. Direct human pressures on the protected areas prioritized (Table 1) by section chiefs, Ranomafana

	Participants								Total	Variance	Rank order by total	Weight
	1	2	3	4	5	6	7	8				
1 Tavy agriculture	5	5	5	4	5	5	5	3	37	0.48	1	7.34%
2 Brush fires	3	2	4	4	5	3	5	2	28	1.25	6	5.56%
3 Kararika	3	3	3	3	3	3	4	5	27	0.48	8	5.36%
4 Bamboos	5	1	3	3	2	3	4	3	24	1.25	13	4.76%
5 Honey	4	3	2	4	5	3	5	4	30	0.94	5	5.95%
6 Crayfish	4	5	4	4	5	3	3	5	33	0.61	3	6.55%
7 Valuable hardwoods	2	3	4	5	2	5	5	2	28	1.75	7	5.56%
8 Valcoana	3	4	2	3	2	3	4	5	26	0.94	10	5.16%
9 Fern trees	5	4	3	5	5	4	5	5	36	0.50	2	7.14%
10 Ficus	5	4	4	5	5	3	5	2	33	1.11	4	6.55%
11 Crabs	1	4	3	3	3	2	3	3	22	0.69	15	4.37%
12 Eels	1	4	2	4	3	3	2	3	22	0.94	16	4.37%
13 Frogs	1	4	3	2	2	2	2	2	18	0.69	19	3.57%
14 Birds	3	3	4	1	3	3	5	1	23	1.61	14	4.56%
15 Lemurs	3		4	3	5	3	5	1	24	1.67	12	4.76%
16 Fuelwood	3	4	3	2	1	5	1	2	21	1.73	17	4.17%
17 Construction materials	4	4	3	3	2	5	3	2	26	0.94	11	5.16%
18 Cyperus	3	3	4	5	3	3	3	3	27	0.48	9	5.36%
19 Cattle	1	2	5	4	2	3	1	1	19	1.98	18	3.77%
Total Score: 504												

Appendix 3: Prioritization of Indirect Pressures (Rating Sheets)

RATING SHEET

Degre de Liason/Association Entre Activitee et Reponse aux Pressions Indirecte Indique

L'Activitee : _____

Nom de Participant : _____

1: Degrec/Liason tres bas, indirecte, difficile a voir

5: Degrec/Liason tres haut, tres evident, impacte importante

CRITERE D'IMPACTS: PRESSIONS INDIRECTE	SCORE
1. Croissance de la Population (reproduction, meilleur sante/soin)	3
2. Croissance de la Population (Migration)	2
3. Besoin de Diversification	4
4. Besoin D'Alimentation	2
5. Besoin d'argent (ressources financieres0	4
6. Manque d'Information/Appreciation/Connaissance des residents du PZ sur valeur Ressources AP	2
7. Ressource de Base pour Systemes de Production Agricole et Elevage en train de disparaitre dan le PZ	3
8. Ressources de Base Foresteres en train de disparatre dan le PZ	5
9. Mauvais Gestion des Permit de coupe de bois/ressources forestieres	5
10. Perception des Residents du PZ que le AP est leur Ressources pour Exploiter, mais qu'il est en train d'etre proteger pour autres	1
11. Manque de de Connaissance de lois en vigueur	3
12. Manque de surveillance suffisiente dans le AP	2
13. Mecontentement des residents envers le AP	1
14. La Tradition, Pratiques Cultureles Ancestrales	2
15. Question de la Regieme Fonciere	1
16. Movement de l'opulation dans PZ.	1

Appendix 2. Prioritization of human pressures—tabulation and rank orders

Table A2.2 Prioritization of indirect causes of human pressures (Table 3, p. 13) by extension agents, Ranomafana, November 1993

# *	Participants									Total	Variance	Rank order by total
	1	2	3	4	5	6	7	8	9			
1	9	8	7	4	6	10	7	10	2	63	6.44	11
2	3	3	1	1	1	9	3	3	8	32	7.80	16
3	8	6	12	6	8	13	13	13	10	89	7.88	5
4	13	15	9	15	13	14	13	12	13	117	2.89	1
5	10	8	12	11	12	16	7	13	16	105	8.67	4
6	3	7	8	11	10	8	6	6	4	63	6.00	10
7	10	13	9	5	10	15	15	13	15	105	10.44	3
8	11	10	8	7	4	7	10	1	14	72	13.33	7
9	9	2	11	7	6	8	8	2	1	54	11.11	13
10	4	10	3	12	7	4	4	5	8	57	8.67	12
11	7	2	13	8	15	3	7	4	7	66	16.67	8
12	4	3	11	9	14	11	15	12	6	85	16.25	6
13	0	14	5	4	8	1	3	6	5	46	15.21	15
14	9	16	12	13	15	10	12	12	10	109	4.77	2
15	8	11	7	12	2	3	4	9	9	65	11.06	9
16	8	8	2	1	3	4	8	10	6	50	8.91	14
17	2	1	0	0	0	0	0	11	2	16	11.28	17
Total score 1194												

* of Table 11 for the list of indirect human pressures assessed here.

Table A3-1. Prioritization of indirect pressures (Table 3, p. 13) by section chiefs, Ranomafana, November 1993

	Participants												Total	Variance	Rank order by total	Weight	
	1	2	3	4	5	6	7	8	9	10	11	12					
# x																	
1	7	8	15	11	15	12	7	14	10	11	9	5	124	9.89	4	8.70%	
2	5	2	9	6	7	2	6	9	1	1	9	4	61	8.74	13	4.28%	
3	12	7	8	14	13	10	4	7	7	2	12	0	96	18.00	6	6.73%	
4	14	15	13	15	15	15	6	12	12	13	9	11	147	6.52	1	10.31%	
5	13	9	10	13	10	9	3	4	13	13	15	11	123	12.35	5	8.63%	
6	4	4	10	2	3	4	9	8	5	9	1	9	73	8.74	10	5.12%	
7	15	12	11	12	14	12	2	1	14	13	14	11	131	19.24	2	9.19%	
8	1	8	4	10	10	10	4	3	7	6	5	9	77	8.58	8	5.40%	
9	0	9	4	4	5	6	10	6	0	3	2	6	55	8.91	15	3.86%	
10	10	10	7	8	3	5	9	8	10	5	8	8	91	4.58	7	6.38%	
11	3	2	3	6	4	5	11	7	8	8	4	7	68	6.39	12	4.77%	
12	11	12	0	8	7	2	12	8	4	7	2	4	77	15.08	9	5.40%	
13	7	6	6	2	5	3	0	3	7	6	1	2	46	5.47	16	3.27%	
14	7	5	14	6	1	13	14	9	15	15	13	15	127	21.08	3	8.91%	
15	3	6	2	2	8	0	5	7	2	4	2	5	52	4.61	14	4.07%	
16	8	5	4	0	0	4	9	15	6	4	9	8	72	16.00	11	5.05%	
													Total Score	1426			

cf Table 4 for list of Indirect Pressure Parameters ranked here.

Appendix 4: Illustrative list of proposed activities at Ranomafana

Conservation

Recherche (aires protégées et zones périphériques)	Ecotourism	Aménagement et gestion du aires protégées
<ol style="list-style-type: none"> 1. Recherche appliquée 2. Suivi biodiversité <ol style="list-style-type: none"> a) Etablissement système suivi d'écosystème 3. Recherche fondamentales 4. Meteo 	<ol style="list-style-type: none"> 1. Musée 2. Aménagement circuit <ol style="list-style-type: none"> a) sentiers b) cabines 3. Relations publiques <ol style="list-style-type: none"> a) Publications des brochures b) Film or video c) Livres des revues d) Environnemental éducation pour RNP visiteurs 4. Promotions des infrastructures 	<ol style="list-style-type: none"> 1. Exécution plan d'aménagement et de gestion du aires protégées <ol style="list-style-type: none"> a) Développement et gestion infrastructure b) Officialisation des limites de parc 2. Contrôle et surveillance 3. Sensibilisation et animation

Développement

Agriculture et élevage	Education	Sante
<ol style="list-style-type: none"> 1. Riziculture (paddy) 2. Tavy (jinja) 3. Tavy (ala) 4. Cultures maraîchage 5. Agro-foresterie 6. Foresterie 7. Elevage des lapins 8. Elevage des volailles 9. Elevages des porcins 10. Elevage des abeilles 11. Pisciculture: écrevisses 12. Pisciculture: poissons 13. Micro-projets (secétaires, églises, femmes, jeune) 	<ol style="list-style-type: none"> 1. Formation environnementale: les écoles <ol style="list-style-type: none"> a) Embellissement de sortie nature b) Réserve scolaire c) Production des matériel didactique d) Formation des enseignants 2. Actions au niveaux des populations <ol style="list-style-type: none"> a) alphabétisation (child and adult) b) bibliothèque rurale c) sensibilisations pour les micro-projets d) visites d'informations 3. Formation du personnel du projet <ol style="list-style-type: none"> a) APN (aires protégées) b) <i>Animateurs</i> (zones périphériques) c) Techniciens (aires protégées et zones périphériques) d) Cadres e) Personnel d'appui 	<ol style="list-style-type: none"> 1. Hygiene et sante <ol style="list-style-type: none"> a) Pharmacie villageoise b) Latrines c) Points d'eau d) Construction Postes Sanitaires e) Réhabilitation Postes Sanitaires f) Soins primaires g) Immunisations 2. Nutrition <ol style="list-style-type: none"> a) Education nutritionnelle b) Suivi alimentaire des bébés et enfants 3. Planning familiale 4. Coordination avec d'autres organisations régionales sante

Appendix 5: Rating sheet for Activity Prioritization

Table A5. Ranking of the effect of activity #19, tavy applied research (Table 7, p. 18-19), on indirect human pressures (Table 3, p. 13) by section chiefs, Ranomafana

Indirect Causes of Human Pressure	Participants													Total	Rank order by total	Weighting for Priority Courses *
	1	2	3	4	5	6	7	8	9	10	11	12	13			
1	3	3	3	5	5	5	4	5	2	3	2	4	2	46	3	8.70
2	2	3	3	5	5	2	3	5	2	1	2	3	2	38	9	4.28
3	2	2	4	5	1	2	2	5	2	2	1	4	1	33	12	6.73
4	5	3	4	5	5	5	5	5	3	5	4	4	2	55	1	10.31
5	5	2	5	5	5	2	3	5	2	4	3	4	1	46	4	8.63
6	1	3	2	1	1	1	1	5	1	4	1	4	1	26	14	5.12
7	5	2	5	5	5	5	5	5	1	5	4	2	1	49	2	9.19
8	5	3	3	5	5	2	2	5	1	3	2	2	1	37	10	5.40
9	5	2	3	4	1	1	1	5	1	1	1	4	1	30	13	3.86
10	2	1	3	4	1	4	4	5	1	5	3	3	1	37	11	6.38
11	1	2	2	4	1	1	1	2	1	1	1	2	1	20	15	4.77
12	1	1	1	5	1	1	1	2	1	1	1	2	1	19	16	5.40
13	2	1	5	5	2	4	4	5	1	4	5	3	1	42	5+6	3.23
14	2	2	4	5	3	4	5	5	1	1	4	5	1	42	5+6	8.91
15	4	1	5	5	2	5	5	2	1	1	4	5	1	41	7	4.07
16	1	2	3	5	4	5	5	2	1	4	2	5	1	40	8	5.05
														Total score	601	

See Appendix 3A-1

Ranomanaña

Les Activités Prioritisées

Ordre	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Ordre Prioritaire	
19	400	163	222	567	397	133	450	200	114	236	95	103	136	374	167	202	19	395.9
21	365	141	323	526	440	154	414	265	133	204	86	103	120	312	114	162	21	386.2
18	418	167	229	588	432	118	450	130	91	198	81	86	126	303	142	212	18	377.1
20	400	150	357	577	492	97	422	162	68	185	67	97	126	321	73	137	20	373.1
26	235	116	337	546	500	184	349	173	87	172	110	135	100	330	77	152	26	360.3
48	252	133	303	299	328	184	349	308	167	274	143	157	94	267	85	172	48	351.5
15	269	137	242	289	354	179	294	313	186	249	162	178	103	294	114	136	15	349.9
36	278	137	276	392	388	215	377	194	87	255	129	119	110	285	98	141	36	348.1
16	270	128	201	268	276	266	312	194	140	293	196	156	139	330	110	152	16	343.1
33	234	85	242	330	258	292	368	205	148	262	210	184	123	249	98	111	33	339.9
27	322	111	323	588	492	123	395	151	61	134	76	81	78	241	53	146	27	337.5
24	287	128	296	495	466	108	414	97	68	211	72	97	100	258	73	157	24	332.7
23	305	120	289	546	466	108	487	113	68	121	67	86	90	223	57	157	23	330.3
49	287	128	276	526	406	97	386	167	68	147	57	97	97	276	102	152	49	326.9
1	252	98	289	505	475	154	340	167	53	172	81	140	81	249	81	131	1	326.8
28	304	120	303	526	414	148	368	130	61	147	105	81	78	232	53	121	28	319.1
44	183	111	276	340	483	205	230	178	87	223	134	157	90	249	77	121	44	314.4
22	304	124	296	526	423	87	404	119	68	128	62	86	100	214	57	141	22	313.9
31	200	86	242	381	319	220	368	189	84	204	114	86	74	258	69	91	31	298.5
3	226	90	209	186	302	138	312	297	160	191	76	140	94	294	102	152	3	296.9
25	235	90	256	516	483	87	386	113	65	108	62	70	81	223	57	121	25	295.3
11	244	132	215	268	397	184	229	124	84	211	114	103	123	312	73	131	11	294.4
14	191	107	155	206	217	143	257	205	129	204	176	319	107	232	98	136	14	288.2
6	226	116	188	278	267	174	248	216	133	191	119	135	81	241	98	136	6	284.7
2	208	111	201	319	337	195	331	140	80	255	67	86	129	143	65	121	2	278.8
17	226	107	155	217	250	179	285	205	129	191	129	216	94	196	77	101	17	275.7
10	226	116	303	258	492	123	193	146	80	179	105	92	107	178	57	101	10	275.6
9	200	98	195	206	233	256	239	157	76	236	110	124	116	321	61	91	9	271.9
46	392	111	182	423	233	143	221	108	53	128	91	70	94	276	53	101	46	267.9
37	433	133	162	268	147	148	230	113	61	140	110	86	90	312	69	152	37	265.4
13	218	107	162	217	207	210	239	178	103	211	134	130	103	187	69	116	13	259.1
43	522	146	155	227	164	118	211	113	49	108	95	92	84	303	65	136	43	258.8
32	226	77	135	186	147	241	257	162	84	223	157	103	113	241	61	91	32	250.4
28	252	90	108	175	138	230	229	189	99	262	153	108	87	196	65	91	29	247.2
41	409	133	168	227	198	123	184	108	49	128	86	86	100	258	57	157	41	247.1
30	209	81	148	165	164	225	193	200	99	262	129	119	74	214	90	91	30	246.3
4	200	77	155	237	198	194	303	221	99	198	81	130	68	160	61	71	4	245.3
35	252	90	148	196	164	256	202	140	68	191	162	91	84	258	65	66	35	245.3
47	426	146	141	289	155	118	184	97	53	140	81	81	103	214	53	126	47	240.7
40	392	154	162	163	207	154	156	92	61	160	76	76	94	169	65	177	40	235.8
34	331	86	135	186	181	184	175	113	72	172	134	92	90	241	57	96	34	234.5
5	174	73	114	165	155	169	239	205	110	191	110	189	81	196	61	86	5	231.8
39	392	133	162	196	147	118	129	92	53	134	91	76	87	249	61	172	39	229.2
42	444	133	155	186	164	97	165	86	49	115	100	81	103	187	53	152	42	227
38	392	137	168	196	190	92	119	76	49	121	72	76	113	241	53	172	38	226.7
8	183	98	161	217	181	148	239	178	87	166	86	130	78	143	57	96	8	224.8
7	209	98	114	165	129	164	175	178	87	223	81	178	81	151	57	101	7	219.1
45	400	128	135	155	147	92	184	103	53	134	72	76	97	241	53	116	45	218.6
12	183	94	148	155	268	149	156	119	72	179	100	194	68	125	70	76	12	215.6
	290	116	211	320	295	162	283	162	87.4	187	106	118	97.7	244.2	75.16327	129.5102	25	

**PRIORITISATION DES
PRESSIONS INDIRECTE**

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Ranomafana (Chefs de Volet,
CTP, S&E)

Volet, CTP, M&E)

	1	2	3	4	5	6	7	8	9	10	11	12	13				
#														<u>Somme</u>	<u>Poids</u>	<u>Indice</u>	<u>Average</u>
1	2	1	3	1	1	5	2	5	1	1	1	1	5	29	8.7	252.3	2.23
2	1	2	2	2	1	4	2	5	2	1	2	2	5	31	4.28	132.68	2.38
3	5	3	4	4	3	1	1	5	3	3	5	3	5	45	6.73	302.85	3.46
4	3	1	2	2	1	3	1	5	1	1	5	3	1	29	10.31	298.99	2.23
5	3	3	4	3	3	1	1	1	3	3	5	4	4	38	8.63	327.94	2.92
6	3	2	2	2	4	1	2	4	3	1	4	4	4	36	5.12	184.32	2.76
7	3	3	3	3	2	1	1	4	2	5	5	3	3	38	9.19	349.22	2.92
8	5	4	5	4	5	1	4	5	4	5	5	5	5	57	5.4	307.8	4.38
9	2	4	5	1	2	1	4	5	4	1	5	5	5	44	3.8	167.2	3.38
10	2	3	1	4	4	1	3	5	5	1	5	4	5	43	6.38	274.34	3.3
11	1	4	3	1	1	2	1	4	4	1	2	2	4	30	4.77	143.1	2.3
12	1	4	2	1	1	1	1	4	3	1	3	3	4	29	5.4	156.6	2.23
13	2	2	1	1	3	1	1	4	1	1	4	4	4	29	3.23	93.67	2.23
14	4	3	2	2	2	4	1	1	2	3	3	2	1	30	8.91	267.3	2.3
15	3	1	1	1	1	1	1	1	2	3	2	3	1	21	4.07	85.47	1.61
16	3	4	1	2	2	3	1	5	3	3	1	2	4	34	5.05	171.7	2.61

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