ECOLOGICAL REPORT ON AMERICAN SAMOA

1973

Prepared by

Dr. Arthur Lyon Dahl
Department of Botany
Smithsonian Institution
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American Samoa presents in microcosm a broad spectrum of the environmental challenges faced by the developing regions of the world. The combination of a rich but materially undeveloped traditional culture, limited and fragile natural resources, and the ever-widening impact of forces for development make for a dynamic and rapidly evolving situation warranting major revisions in my earlier report of 1970. Given the potential in American Samoa for creative solutions to the fundamental problem of economic development, how to raise the living standards and the quality of life in ways compatable with the cultural heritage and environmental limits, it seems worthwhile to discuss briefly the environmental impact of the whole process of growth and development in American Samoa. Only a general outline can be presented here; detail can be found in other reports, or must await further research.

Properties of the natural system

It is inherent in the nature of island ecosystems, because of their small size, isolation, and reduced variety of habitats that they are more fragile than continental or oceanic ecosystems. It is much easier on an island for all of a species or habitat to be wiped out, or for something to upset the precarious balance evolved between the rare immigrants to such an isolated locality. This is as true of the coastal marine environment as of the terrestrial habitats, since most coastal marine forms are as ill-adapted to transoceanic voyages as land forms are to cross-ocean transport. When the full range of environments is as small as it is on most islands, it becomes particularly important to maintain the full diversity of those that do exist. The presence of frequently subtle interactions between the elements of the system means that the loss of any component can have serious repercussions in other areas. Since the biological communities are generally the major and often the only significant natural resources of an island, their degradation can be critical to the long-term prospects of island societies.

The basic elements of the natural environment of high islands such as those of American Samoa can be catalogued as follows:

Substratum: basaltic structures of volcanic origin, generally with high relief, producing soils with moderate to poor fertility, rapid leaching of nutrients, and moderately high potential for erosion. A few areas of carbonate sand or raised reef material fringe certain coasts and bays.

Terrestrial biota: A considerable flora with a significant arboreal component clothes most undisturbed areas, and while herbaceous forms can re-establish themselves quite rapidly over cleared ground, a stable and diverse forest cover is difficult to re-establish once cut. Destruction of habitat is probably the greatest threat to the scarce native fauna.

Ocean: Beyond the zone of terrestrial influence, the tropical oceans are noted for their low productivity. Commercially exploitable fish are confined to a few wide-ranging predators high in the food chain.

Coastal marine resources: The prevalence of coral reefs around much of the islands provides a highly productive near-shore marine environment as well as areas of protected moats and lagoons. While the coral reef ecosystem is complex, it is also particularly susceptible to degradation and not easily restored once damaged.

General: Other environmental factors that could be listed as resources include relatively unlimited quantities of pure air and ocean water, an equitable climate with both considerable sun and rainfall, and spectacular scenic beauty.

Human: The rich traditions and culture of the Samoan people evolved as part of the natural environment and are as significant to the world's human diversity as island ecosystems are to its natural diversity. Cultural traits are as susceptible to degradation or extinction as species or ecological systems.

The relationships and complex interactions between these major components can best be illustrated by a diagram (Fig. 1) showing the feedback dynamics of the system. Even in this highly oversimplified representation, it is possible to see how a change in any compartment or flow can effect everything else. Human resources and influences are not directly included, except as part of the terrestrial biota, since man's activities influence every part of the system.

Indeed, there is no way to prevent profound human effects on the ecosystem; these have always existed and will continue to exist. What we must do is to understand and work with the system rather than ignoring or fighting it, just as a farmer studies his land to decide where best to plant his crop, or a builder examines the topography, stability, and drainage of a site before deciding how to place his structure. Failure to acknowledge the physical

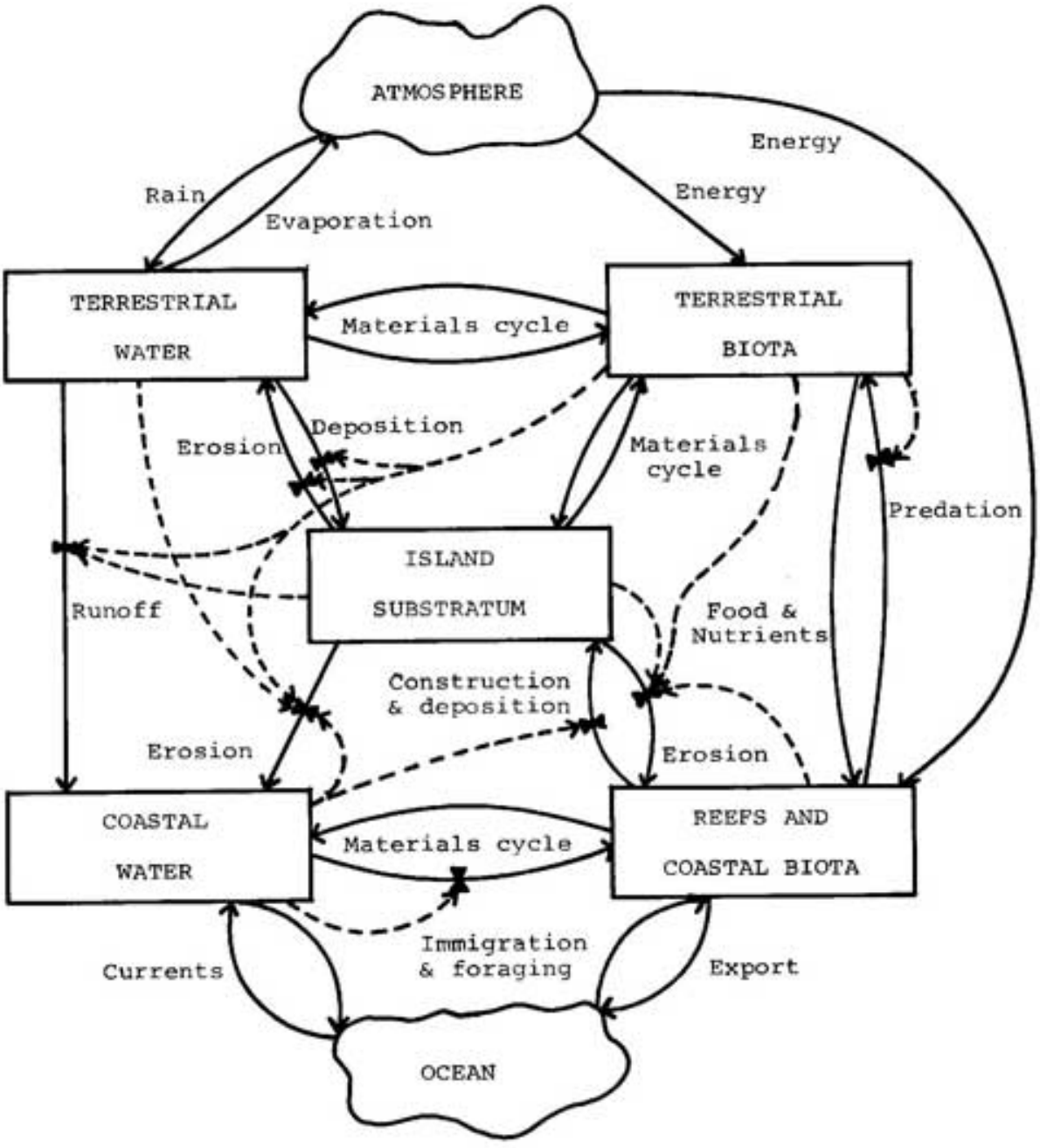

Figure 1. Diagram of flows of energy and materials through the high island ecosystem, with principal controlling factors.

compartment, pool outside system,
flow of materials, valve controlling flow,
controlling influence.

Coastal marine resources. Significant damage has been done to the coral reefs, particularly in Pago Pago Harbor and in areas of construction, dredging or terrestrial runoff. There is some evidence of recent reef recovery near the entrance of the harbor, but this is an extremely slow process (taking 20-50 years under good conditions) while the destruction of reef life can happen very quickly. Data are inadequate to evaluate long-term changes in fishery resources. Coastal water pollution has become increasingly significant although current control efforts may be stabilizing the situation.

General: The expansion of industrial and commercial facilities and the extension of residential areas up steep hillsides, together with little attention to the visual appearance of many buildings, has marred, at least superficially, the scenic beauty of some more populated areas.

Human: In the inevitable process of transition from an isolated culture to a component of a world society, the Samoan people have been threatened with the loss of much of their cultural heritage. Recent vigorous efforts may be reversing this trend, but it is too early to evaluate their success. The continuing population increase is placing great strains on both the natural environment and the social system. The significant inputs of energy, materials, and technology represent new factors that must still be incorporated harmoniously into the balance of the island system. The society is at the stage of wanting everything at once, and has not yet faced up to many choices that must be made between incompatable directions.

Planning for the future

American Samoan society is presently in a state of unstable equilibrium between the traditional Samoan culture and that imported from America. Because of the narrowness of its resource base, its options for the future are limited. If the natural resources are to contribute to the continuing evolution of Samoan society, future growth and development will have to harmonize with environmental requirements. The Samoan people will have to decide what kind of a society and lifestyle they want, then adjust this view to fit the practical limitations of their situation, and finally develop and apply the steps necessary to get there.

GOALS. The American Samoa General Plan currently being prepared* provides an excellent framework within which discussions

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*As described in the American Samoa General Plan Interim Report, Nov. 1972 and its Addendum, June 1973.

on ultimate goals can take place. It clearly defines just where American Samoa stands today in economic and social terms, and what options for future development are realistic. Its projections are based on the explicit goals of economic self-sufficiency, political self-determination, social stability, and environmental happiness. The assumptions underlying these goals, however, deserve general discussion, so that the public is aware of the choices it is making. Economic self-sufficiency and political self-determination, for instance, are interpreted within the context of a strong relationship to the United States. It should be accepted that this brings costs as well as advantages. American values will continue to be adopted at the expense of Fa'a Samoa, and the increasing disparity between life in American Samoa and elsewhere in the South Pacific will make relations with neighboring island groups more difficult. The goal of social stability calls for the control of population growth, immigration and emigration, and the preservation of Fa'a Samoa. Population control is absolutely essential in the light of limited island space and resources, and an increasing reluctance of other nations to accept immigrants, but it will require a fundamental change in traditional Samoan attitudes. How compatable is the preservation of Fa'a Samoa with goals of economic development and an American political structure? Can such a goal be more than hypocritical lip-service to a dying past? If priorities must be set or choices made, which will take precedence, development or Samoan tradition, and how will the decisions be made? Environmental happiness incorporates the preservation of natural beauty and the quality of life, the enhancement of the physical environment, and the fostering of artistic and cultural expansion. How will such goals be implemented, especially when there are conflicts between them (i.e., natural beauty vs. economic development)?

This report is not the place to take sides on these questions, but there are underlying biases and assumptions in the General Plan that need to be considered in a public discussion of such issues. Americans tend to think of culture as art, literature, and music, not the social organization or basic values and attitudes toward life that are fundamental to Fa'a Samoa. If these latter are to be retained, it may be necessary to give a lower priority to, or be more selective about, the material advancement so highly prized by Americans. Also, the increased planning necessary to achieve such a broad combination of goals will inevitably reduce the scope for individual choice or free enterprise, and this too should be recognized.

The decisions and compromises to be made will be politically difficult and require sacrifices on all sides, but they must be made, as postponement means foreclosing options, and therefore

itself involves making choices. Two avenues are open to answering fundamental questions: they can be ignored, leaving the choices to the loudest or most powerful interests; or they can be discussed publicly and frankly, with opportunity for a democratic expression of majority opinion.

MEANS. As directions are selected for the continuing evolution of Samoan society and the environmental goals and compromises become more explicit, the problem of means becomes important: How should environmental sensitivity be incorporated into decision-making?

1. Consideration needs to be given to the scale at which environmental impact may be expected. Ecosystems such as an island have various levels of interaction. If a particular proposal (such as herbicide usage) might affect the entire island system, it should be discussed within that context and not just at the level of agricultural uses. If it involves only a small part of the system (i.e., the water supply for a particular village), broader consideration may not be needed, although there might be a review for unsuspected or cumulative impacts of small-scale decisions. It is the broadest scales that are most frequently overlooked.

2. There needs to be appropriate institutional arrangements to deal with such matters, involving the assignment of suitable authority and responsibility to new or established organizations or individuals at each level of environmental concern.

3. Those involved in such decision-making must be educated to understand and appreciate the environmental perspective, particularly the interlocking nature of the system and the kinds of interactions that can be expected. There is a special ecological pattern of thought that is always asking: How will this affect other elements of the system? Free communication and rapid interchange of ideas and facts within the apparatus of government at different levels are also important.

4. Since environmental effects are frequently the result of many individual actions, public education for environmental awareness and ecologically-sensible behavior is essential.

5. Many environmental problems result from creeping degradation (coral broken by shell collectors here, sand removed for construction there, a little illegal dynamiting or poisoning of fish; result: dying reef). Some government oversight is needed to monitor such gradual long-term changes and to institute appropriate corrective measures as needed. A simple standardized environmental monitoring program would be useful.

6. Special efforts should be made to anticipate ecological impacts before they occur, since it is easier to prevent than to cure. The General Plan can help greatly in this regard. Its projections can be considered within the framework of the island ecosystem and action taken accordingly. For instance, the plan predicts a doubling of housing in 20 years. Decisions can thus be made now on land use, and residential vs. agricultural or scenic priorities. Compensating actions can be taken for effects including utilities and transportation systems, watersheds, vegetation cover, increased runoff, erosion during construction, adjacent reefs, sources and imports of building materials, etc. The proposed major growth of tourism raises questions of the cultural impact of masses of wealthy visitors and the need to serve them, and the environmental impact of facilities construction and recreational activities, that should be considered well in advance.

ALTERNATIVES. The General Plan describes one major alternative for the future of American Samoa, and based on its underlying assumptions it may be the most reasonable. But suppose some of those assumptions do not work out, or unanticipated factors come into play. Will everything possible have been done to keep other options open? A general discussion of alternatives and contingencies can increase public awareness and make readjustments easier if they should be necessary. What if there were a world economic disruption comparable to the depression of the 1930's? What if U.S. support were largely withdrawn? Even a proposal like the major oil refinery opens new options (less industrial employment and tourism, perhaps a different mechanism of income distribution such as to the chiefs for family benefit, making possible the greater preservation of Fa'a Samoa). In a period of international instability greater social and economic flexibility may be a considerable asset.

Conclusions

American Samoa is faced with difficult choices, but the enviable opportunity to make them while so many options are still open. The rich environmental and cultural heritage has on the whole not yet been irreparably damaged. Efforts are already well underway to reverse undesirable trends, and the General Plan provides a framework of facts and explicit assumptions within which rational decisions can be made. The territory shares many problems with the developing nations, but at the same time has the resources available through its relationship with the United Stated to solve the problems. The essential requirements are the will to act, a spirit of innovation, and and underlying harmony of purpose, seeking a natural and social environment in which the people of Samoa can individually and collectively fulfill their human potential.

PART II

SPECIFIC PROBLEMS AND RECOMMENDATIONS

This part of the 1973 Ecological Report on American Samoa represents an updating of the 1970 report on Tutuila. It makes no attempt to repeat what was in the earlier report, much of which is still pertinent.

In the three years since the last report, considerable progress has been made in a number of areas. An Environmental Quality Commission has been established to improve communication between government departments, a staff ecologist has been hired in the Office of the Governor, major improvements have been launched in the solid waste and sewage disposal systems, pollution regulations have been adopted and increasingly enforced, and public education programs have been established concerning population control and cultural appreciation. However, some problems have continued to grow as well. Some are in areas where change is inevitably a slow process, and are touched on in the 1970 report and below; others have resulted from the attempt to change, involving particularly the impact of increasing American expenditures and associated influences.

It should be noted that it is not generally possible to assign blame for the problems described here. They are largely of long standing or diffuse origin, and have only become sources of concern as knowledge of their impact has increased.

The island ecosystem

Attention now needs to be paid to the broader dimensions of the island ecosystem preparatory to a more comprehensive approach to resource management. Baseline information should be compiled through a comprehensive scientific inventory of the habitats, fauna, and flora of the territory, leading to a system of classification of the natural resources. Some parts of this survey are already well under way, and others are planned with support from the Bureau of Sport Fisheries and Wildlife. The marine resources will require the most attention in this regard, because of the greater diversity of marine forms and poorer coverage in the past. The staff ecologist should define the needs, coordinate the survey, and compile the results, with strong support from the Office of Marine Resources, taking advantage wherever possible of visiting experts such as those routed through Samoa by the Smithsonian's cooperative program.

Terrestrial environment

LAND MANAGEMENT. Increased planning for land use will be necessary in the light of the projections in the General Plan and the classification mentioned above. Because of the difficult cultural and legal issues involved in questions of land use, a distinctly Samoan approach to this question seems appropriate. A possible mechanism would be a Samoan Land Board, consisting of nine members chosen for one year terms on a rotating basis by each of the villages in the territory, and supported by a professional staff. Only departures from traditional uses should be regulated, with appropriate trade offs in the benefits and sacrifices required of villages, in keeping with the reciprocity of Fa'a Samoa. For instance, for each acre converted to development, five could be chosen by the board for inclusion in a permanent conservation classification. There also should be legal penalties for misuses of land (erosion, excessive destruction of vegetation cover in watersheds, accumulation of trash or junk, disfigurement of scenic areas, etc.) sufficiently well-defined to be enforceable.

EROSION. Because of the steep island contours and heavy rains, erosion will always be a continuing problem, especially with accelerating construction. It is particularly serious because even a single heavy inundation of silt can clog streams and kill coral reefs. Preventive measures should include strict construction standards, such as the use of protective matting or mulch over exposed slopes, the construction of catch basins below sites, and prompt planting of bare areas, together with frequent inspection of construction sites.

AGRICULTURE. The expansion of agriculture should play a major role in development planning, with primary emphasis on reducing food imports. Much of this expansion should come from more intensive cultivation of existing areas, rather than clearing additional and generally marginal land. This should be accompanied by careful research on the maintenance of soil structure and fertility under more intense use. New crops should be investigated that may be more appropriate for the frequently steep terrain, new cultivation techniques, or inter-cropping. With land so scarce, there is probably little use in developing agricultural exports, except possibly of low-bulk, high value items (gourmet foods, spices?). Good agricultural land should be given high priority in land use planning. A monitoring program should be established for fertilizers, pesticides, herbicides and other materials in stream runoff that might pollute the surrounding reefs. Even sampling once a year under appropriately-standardized conditions would give an indication of possible deleterious changes.

Marine environment

The recent example of the decline of Kaneohe Bay in Hawaii has demonstrated how rapidly and completely a coral reef area can be destroyed by terrestrial development, and the excellent film on the subject made by the University of Hawaii should certainly be given wide exposure in Samoa.

The continuing monitoring surveys of various reefs around Tutuila have indicated no major changes in the areas examined. Recent minor damage was observed at two sites (boulders overturned by shell collectors in Fagaitua Bay, rubble bulldozed for a road project at Afono), while other areas are apparently stable. The reefs are still a subject for continuing concern, as the cumulative effect of various damaging acts (essential construction or dredging, dynamiting or fish poisoning, silt runoff from land clearing or construction) can be a steady decline in average reef quality. Reef destruction can easily be hastened by synergisms; occasional silt deposits, or slight water pollution might not be too harmful alone, but one might prevent recovery from the effects of the other. Damage may be exceeding rates of recovery in some areas, but more detailed surveys will be needed to determine this.

PAGO PAGO HARBOR. The reefs in the harbor are a special case. Careful records from the Carnegie Institution study in 1917-1920 and resurveys conducted in 1970 and 1973 indicate a drastic decline in reef quality (as measured by amounts of living coral) over that period. The water then was so clear that Carnegie scientists swimming off what is now the Americana Hotel could identify corals on the bottom 70 feet below. However, one site near the harbor mouth at Tulutulu Point has experienced a significant increase in living corals over the last three years. With further improvement in pollution control efforts around the harbor, continuing reef recovery may be possible.

PALA LAGOON. The recent study of this unique estuarine resource by Krasnick and Caperon has demonstrated its high productivity and dangerous susceptibility to pollution. It is still not clear what effect deepening the lagoon would have on its ecology and productivity. However, any regular usage of Pala Lagoon by boats, either fuel barges or motorized pleasure craft with their inevitable pollution, would have serious biological effects.

DEVELOPMENT OF COASTAL MARINE RESOURCES. While it may take some years before coastal marine resources begin to play a significant role in Samoan development, it is not too early to start accumulating the background information and local expertise necessary for future developments such as aquaculture projects. To accomplish this a small program (possibly one full-time specialist, with part-time assistance from other staff and Vista workers) should be initiated within the Office of Marine Resources to survey

and then monitor the reefs and other coastal waters, gradually accumulating a data base for eventual management decisions. This survey should involve precise mapping of reef areas and regular monitoring of parameters such as living coral cover, water salinity, temperature and turbidity, and obvious signs of disturbance or degradation. At present, Marine Resources is too heavily committed to other programs to permit the incorporation of this project into the existing staff and budget. The relatively small additional commitment of funds required now should be considered an investment in the future productive resources of Samoa, as well as a major assistance to the conservation and management of the islands' marine resources.

Scenic values

The great beauty and equitable environment of the Samoan Islands is in itself a valuable resource both for the quality of life of the inhabitants and as the basis for the tourist industry. Using the projections to 1990 of the General Plan Interim Report for tourism alone, this beauty could be said to have a minimum capital value of $160 million (based on income potential, calculated at 10% per annum, of $16 million) making possible 2,400 jobs. Such estimates are arbitrary, of course, but they do indicate the economic as well as aesthetic importance of scenic values. At the same time, this resource is one of the most fragile and easily degraded because it is so difficult to define. Each patch of native vegetation cleared, each building built without attention to aesthetic criteria, each new scar on the landscape diminishes the natural capital of Samoa. This is particularly true in the Pago Pago Harbor area, the focus both of tourist interest and rapid urbanization. Rectifying this problem is not easy, given the local resistance to land use control measures. Education of local decision-makers (business and family leaders) to see how their actions can either enhance or destroy a significant island resource, may be a partial substitute, and could create an acceptance of need on which other controls could be based if ultimately necessary. Free voluntary government assistance with architectural improvements, efficient and aesthetic land use, and beautification would also help.

Human factors

Most ecological problems in American Samoa concern not only the natural environment itself but the interactions between the environment and the human population. These also must be considered in an ecological analysis, and are thus discussed briefly below.

GENERAL GOALS. Before decisions on environmental management can be taken, there must be some general agreement on the goals the society wishes to pursue. Often these are assumed or taken for granted, but this is frequently unsatisfactory or even disastrous, particularly when different cultures are involved as in Samoa. A more satisfactory approach is to explicitely state the goals and assumptions underlying the decision-making process and to encourage the public discussion of these goals so that they can be modified to accommodate the wishes of both majority and minority elements. Fortunately, the American Samoa General Plan is attempting to define such goals and to project into the future the kind of life that may result from their adoption. This plan should be used as a framework for wide public discussion of the directions Samoan society should take. However, it is easy to state a long series of desirable goals without discussing the extent to which they may be conflicting or mutually exclusive, a weakness evident to some extent in the General Plan Interim Report. Conflicts between goals are central to most social problems, since it is human nature to try to avoid the sacrifices necessary to achieve a desirable end. Through continuing discussion, however, the two can become linked in the public's mind, hopefully leading to the enthusiasm and dedication that comes from having realistic and worthwhile goals. Questions such as: What do we want to achieve as individuals? as a society? What do we want our environment to be like? What underlying human values do we consider most important? should be taken up within all social groupings: schools, churches, family councils, villages, businessmen's associations. Such a process of education and discussion can lay the foundation for a true expression of the will of the community through traditional and democratic processes. The role of government should be to encourage the discussion and to be sensitive to the result.

POPULATION. The continuing threat of population growth to the natural environment and the quality of life must be addressed directly in spite of the traditional resistance to altering the view that large family size is a status symbol. Continuing the high level of emigration cannot be considered a permanent solution as it strains the society by removing the most productive segment of the population. The present educational programs are a welcome start in confronting the problem. Discussion of the ways in which traditional Polynesian societies limited population size (methods generally discarded today--like warfare or starvation of women and children) might help to demonstrate the need for change.

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capacity in the next 16 years, including the construction of 4000 new units and 850 newly urbanized acres of land. Great care must be taken to insure that this expansion has minimal impact on the islands' scenic beauty, and this must involve a general improvement in construction standards and more attention to landscaping. In the more dense urban areas, more planning, infrastructure, and rebuilding will be needed to correct past mistakes and to anticipate future growth. Since land is so limited, however, it will be better to encourage as much concentration of the population as possible around appropriate urban foci, leaving the major part of the islands for more agricultural or scenic conservation uses. Urban areas can also be scenic if imaginatively planned, and should express particularly Samoan characteristics. What is needed is a concept of the village updated in terms of architecture and planning, but encouraging the kind of integrated family life of Fa'a Samoa. The challenge is to avoid both suburban sprawl and slum conditions while doubling housing capacity at moderate cost. The most appropriate step for the Government to take in addition to fostering the planning process would be to expand the excellent current efforts to provide imaginative low-cost house plans, but adding to this free advice on village planning (short- and long-term), building siting, inexpensive but attractive building materials (preferably produced locally), protective plantings, and landscaping. These activities would best be centralized in a single office rather than scattered throughout the government departments, perhaps staffed with employees on part-time assignment from other departments under the supervision of a full-time coordinator experienced in working with the general public.

TRANSPORTATION. The General Plan estimates over 500 acres of land devoted to transportation and communications by 1990. Given the small size of the islands, fuel shortages, and the import and maintenance costs of automobiles, serious attention should be given to local transportation alternatives, including bicycles and bicycle routes where terrain is not steep, small, low-speed vehicles like golf carts, 3-wheeled scooters, etc., and cog railway or cable transport across the central island ridge. Standard automobiles should probably be gradually phased out if mixing them with other vehicles presents a safety hazard, and in the interim, lower speed limits would make mixed traffic more practical.

WATER SUPPLY. With current water usage largely at capacity, planning and phased construction are needed now to allow for anticipated growth. Setting aside essential watersheds and increasing storage capacity are particularly important. The more widespread use of roof catchment systems for rainwater is a significant option widely used elsewhere in the tropics that may be more economical and environmentally sound than central storage and distribution in many areas.

WASTE DISPOSAL. There is still a major need to control the import of superfluous or non-biodegradable materials wherever possible. An auto import-export link, requiring the export of an old vehicle before permitting the import of a new one is one possibility that is also applicable to other types of merchandise. Disposal taxes on particularly troublesome items (cans, bottles, plastic) could be considered. Landfill areas in the islands are limited, and not well managed at present, creating a serious health hazard, yet the total amounts of waste are too small to make most "high technology" disposal or recycling techniques viable. Composting of biodegradables, incineration of other materials at a downwind site, followed by use of the ash and residue for landfill or construction might be the most reasonable alternative. Vehicles and other large items could be hydraulically compacted or mashed with a bulldozer, followed by export as scrap or even dumping at sea (a reasonable alternative for the small amounts produced in Samoa, if restricted to a single area).

EDUCATION. There seems to have been considerable progress in the school system's consideration of the environment and Samoan culture, although there was not time to investigate this in detail. Efforts in this area should certainly continue, as this is the essential foundation for any long-term improvements. More attention needs to be paid to education of the general public, both as to the general goals mentioned above, and as to specific environmental issues and "ecological thinking." An environmental column in a local paper, with contributions from the Government staff ecologist and others (including opposing viewpoints) might be useful, as would adult education programs. Special attention should be given to decision-makers in government, business, and the villages. Short courses, seminars with visiting specialists, and other programs should be used to cultivate an increasing awareness of the interrelationships between each person's narrow sphere of activity and the total island system. This general understanding can create an atmosphere conducive to effective voluntary controls and creative solutions to environmental problems.

MUSEUM. One institution that should play a central role in public education is the Museum of American Samoa, which has made an excellent start towards becoming a focus of activities encouraging cultural appreciation, and has the potential for a similar role in creating environmental awareness. The ties between the Museum and the general public should be continually strengthened through activities such as lectures, films, musical programs, school tours, special children's "see and touch" displays, etc. Once a basic core of permanent exhibits has been completed, special topical exhibits should be mounted, and small traveling exhibits should be prepared for schools, outlying villages, and the other islands. The museum should also be developed as a base of operations for visiting scientists and scholars, who can be provided with modest work space in return for advice on their specialties and contributions to the

collections. Eventually, there should be small reference collections of local natural history objects and photographs, for use in identifying the fauna, flora, and minerals of the islands. A collection of reference books and papers should also be developed, but under the care at present of the library.

INSTITUTIONAL ARRANGEMENTS. No program of improvements in the environment or the quality of life can be effective unless it is implemented through appropriate institutional arrangements. Too often degradation occurs because no one was responsible. A careful survey of the government should therefore be made, probably by the staff ecologist or someone else in the Office of the Governor, to determine that appropriate responsibilities in all of the areas discussed in this report have been assigned, understood, and implemented with adequate resources. Where assignments have not been made or no appropriate government agency exists, remedial steps should be taken.

AMERICAN CONTRACT PERSONNEL. A significant source of difficulties within the government, particularly with respect to cultural impacts and alterations, arises from the dependence on Americans hired on two-year contracts. Too frequently, the first year is spent adjusting to life in Samoa, the second in anticipating departure, with the result that too many teachers and other employees never come to understand or appreciate the people and culture they are supposed to be serving. More variability in contract terms would seem appropriate, with emphasis on a four- or five-year contract with an initial six-month probationary period. Employees would then have a greater commitment to Samoa, and presumably, therefore, a greater sensitivity and effectiveness.

AMERICAN PROGRAMS. One danger that has come with the increased U.S. Government support for American Samoa is the tendency to direct change along lines where money is available. There is no easy solution to this problem except to exercise restraint. Is it necessarily wisest in the long term to build roads, for instance, because funds are available for roads but not other forms of transportation? This can lead to the imposition on Samoa of solutions developed for radically different conditions (the continental U.S.) that may be inappropriate (to say the least) on a small tropical island.

TOURISM. Since the General Plan and other studies have singled out tourism as a major economic activity in American Samoa, the environmental and cultural impact of this development should be carefully considered in the light of difficulties encountered elsewhere. Specifically, is there a special kind of tourism most appropriate to American Samoa: extended stays as opposed to short stopovers; culturally or environmentally involved rather than a carbon copy of tourism anywhere else? Should tourists be segregated in special resorts or integrated into Samoan life? What areas should be designated for tourist development? Since most visitors

Finally, there is a real danger at present of winning all the battles but losing the war. If all of American Samoa's problems were solved through tremendous government efforts and inputs of outside funds, with no effort required of the Samoans themselves, the result would be a homogeneous, materialistic, and fundamentally unfulfilled society no different from those in many other parts of the world. Creativity often requires struggle and effort, and the greatest ecological challenge facing American Samoans today is to creatively harmonize a rich culture and spectacular natural inheritance with the pressures, tensions, and potentials of the surrounding world social environment as they find their special place in the developing world society.

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