

MADAGASCAR:
TRAINING FOR SAFER CONSTRUCTION
AFTER CYCLONE KAMISY

Draft for Review

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EXECUTIVE SUMMARY

This study examines the post-cyclone reconstruction program designed and conducted with USAID support following the 1984 Cyclone Kamisy in Madagascar, with regard to the sustainability of its message and practice during the more than eight years since its inception. The USAID/OFDA project illustrates an effort to apply a mix of program approaches -- materials distribution, an educational program for builders and homeowners on improved techniques for wind resistance, support to existing and new local micro-enterprise development related to the program, and transition to a trained local team -- within the short-term funding constraints of OFDA, that would initiate a base of long-term preparedness and mitigation activities in an island country at high risk of cyclonic storms and flooding.

Cyclone Kamisy struck Madagascar on April 9, 1984, at the north coast port of Antsiranana (Diego Suarez), and again on April 11th at the town of Mahajanga on the west coast. The storm caused significant damage to both communities. Warehousing, schools and other public buildings suffered extensive damage. Similarly-affected were the residential areas of both towns. These areas as well as nearby villages consisted largely of owner-built, simple single-family houses. Almost all were similarly-structured frame buildings covered with a variety of materials depending on locality and cost of materials: usually raffia, corrugated metal sheeting, palm thatch or, in some cases, concrete block.

The AID Office of U.S. Foreign Disaster Assistance hired a private consulting company, INTERTECT, to conduct a post-disaster assessment. This initial mission lasted from May 15 through May 27, 1984, and produced a report documenting local building practices, typical types of damage encountered, and recommendations for assistance activities.

The overall recommendations were as follows:

- The project budget should be raised from \$500,000.00 to \$3,500,000.00 for the direct purchase of building materials in nearby African countries and in Madagascar, and for the stimulation of local production capacities of these materials. These materials would be sold to those in need at a subsidized price.
- A training program should be run concurrently with the materials distribution program to promote safer building techniques.
- This program should be disseminated to other areas of the country not affected by the cyclone.

The training component was to be carried out through use of technical advisors who would train personnel from the Ministry of Public Works at the central level. They would also work with national and local authorities to develop a public awareness program.

Following this, the team would help establish procedures for a subsidized materials distribution program. The money generated from the sales of these materials was to be used for four purposes:

1. to purchase additional materials;
2. to establish small labor-intensive projects to be reserved for disaster victims;
3. to establish small enterprises in the building sector; and
4. to pay private building contractors who would assist families in the safe repair of their houses.

Lastly, a certification procedure would be established to identify builders and contractors who had completed the training. This entire program was to be completed in six months with the bulk of the technical assistance portion to be completed in 2 months.

A contract was issued by USAID to INTERTECT on June 23, 1984, under the title of "Madagascar Training Program". The work statement of that contract reads:

"To design and conduct a program of housing education focused on introducing appropriate technology in housing repair and reinforcement coupled to a materials distribution program, as part of the integrated disaster relief response following the devastation caused by Cyclone Kamisy -- to assure the effectiveness of the \$500,000.00 building materials contribution.

Despite intentions to react quickly, the project team became mired in political negotiations in Madagascar over the institutional home for the program, the mechanics and controls of the distribution program, and the difficulties of using the PL480 grain sales as a funding source. Although the team had been working since July, it was not until Sept. 1984 that the distribution and educational programs were finally begun.

After this initial period of problem-solving in Madagascar, reports and other communications regarding the project were very positive. The program seemed to be a first for Madagascar, in which real advances were being made in the long-abandoned housing sector. Project staff were rightfully self-congratulatory over the fact that many of the early difficulties had been worked out.

The training program consisted of hands-on training to mostly unskilled laborers in cyclone resistant construction techniques. Strengthening was to be carried out mainly through proper roof pitch, better methods of joining the wood members together, better use of corrugated metal roofing sheets with appropriate roofing nails and nail spacing, diagonal bracing of the wood frames, and cyclone straps to anchor the roof structure to the walls.

When the team left Madagascar in December 1984, it reported that 12 model houses had been constructed. A materials distribution system was established, and training aids were designed and printed. The program was turned over to a Madagascar team headed by a local architect recommended by the Ministry of Public Works. The team's mandate was to continue the training program and distribution of materials, and to administer the reflow projects.

Records from this period are sketchy at best. The project was formally administered by the "Special Cyclone Kamisy Commission" supervised by this architect who had been taken aboard the program earlier and prepared specifically for this responsibility in the transition from the original project technical assistance team. Ultimately under the Ministry of Public Works at the national level, the Commission was viewed as separate and not under the control or authority of the local Public Works offices. As no records remain in either the USAID office or the Ministry of Public Works, and as the architect could not be reached, the actual workings of the program during this time cannot be detailed. Interviews with some people associated with the project and others only secondarily involved indicate that there may have been widespread corruption in the distribution program at this time.

Later that year (1985), the remaining materials and offices of the project were shifted from USAID/OFDA auspices to those of the USAID Regional Housing & Urban Development Office (RHUDO) in Nairobi, in order to make the transition from disaster assistance to a permanent low-income housing program integrating disaster mitigation with a standard housing construction project.

What few reports can be found during this period were consistently more negative than those mentioned earlier. There was some concern voiced over the relatively small amount of materials that had been distributed, and the growing amount of materials unaccounted for. At least one of the reports from this time questions the validity of the project structure and especially the subsidized distribution program.

In March 1986, another severe storm hit Madagascar. Cyclone Honorinina struck Toamasina on the east coast of the island. This cyclone caused a flurry of memos concerning the continuation of the Cyclone Kamisy Reconstruction Team. Since the team was already trained and experienced, use of this existing resource was proposed by almost all parties concerned, but there was disagreement on what form the team, and funding for the team, would take. Options that the team would continue as a para-statal non-profit organization, or as an entirely private enterprise, were discussed. Apparently the transformation from a project team to a permanent entity, whether private or public, was too much to overcome and no USAID assistance was provided specifically in support of extending the team's activities to the east coast.

The program was formally terminated June 15, 1986, three months after the Honorinina disaster. The materials remaining from the Kamisy program were ultimately given to Caritas-Madagascar for their use in the reconstruction effort in Toamasina. Although there was discussion with Caritas about using the Kamisy team and their training program in Toamasina, this did not happen. Furthermore, records of the distribution of the

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Kamisay program materials in Toamasina were not kept by Caritas, so there is no simple way of determining the usefulness of the materials in that area.

While the program is not well-enough documented to analyze some aspects, several lessons were learned during the course of the field survey:

1. The funding source for disaster response should be immediately accessible in hard currency and be free of excessive in-country controls and sign-offs. For initiatives such as the Kamisay Reconstruction Program where long-term development goals overlap with short-term aid goals, there may be a need for easily-accessible bridging funds guaranteed by other larger "development funds". This is not to totally buy into the old arguments for speed at any cost; rather, the timing of a more complex mix of components (e.g., training/skills upgrading, materials procurement/distribution, technical assistance for repair, promotion of small enterprises, etc.) relies heavily on the ability to allocate resources in an effective and reliable manner.
2. Administration of this program was made more difficult due to the lack of a clear "institutional home". Valuable time was lost during the contest for control among the various Malagasy agencies involved. Ultimately the arrangement arrived at proved less than desirable as well since the project staff and experience are no longer accessible through any existing agency.
3. Because of the problems that had to be overcome due to points 1 and 2 above, much time and energy was spent simply in reaching what should have been the starting point of the project. Communiques reporting the early successes of the program were in fact reflecting the success of the technical assistance team in pulling the project out of an untenable situation, not their success in making any real advance on the scheduled activities of the program.
4. The administrative controls placed on the project to control theft and abuse of the subsidized material distribution system proved ineffective after the technical assistance team left. There is a general impression in at least one of the project communities that this system was greatly abused. In situations such as this where the program is seen as corrupt, it sparks additional abuse, undermines the benefits of the program, and makes accurate record-keeping and future evaluation very difficult. Blame does not appear to fall on the project design but rather on the lack or insufficiency of monitoring and supervision exercised during the conduct of the materials distribution component.
5. Programs supported by subsidies often last only as long as the financial support continues. In this case every person interviewed stated that the improvements proposed by the program were unreachable for the typical homeowner. Only those able to receive the original project materials at half-price were able to use them. It was further stressed that, in large areas of Madagascar, the poor could not even afford the half-priced materials.

6. The sustainability of the model houses constructed in the two project areas as technology dissemination points could be better. While the model houses are lasting records of the project and of the technologies used, many of them remain unused in their communities since ownership of these houses was never resolved.
7. Although RHUDO planned to initiate a follow-on permanent low-cost housing program, incorporating cyclone resistant construction techniques and utilizing the project team trained in the OFDA project, there is no documentation that this took place. Similarly, despite accolades for the project and its accomplishments, no permanent political constituency was achieved. Without consistent follow-up and accessible technical information, vulnerability reduction efforts are sporadic, *ad hoc* and often insufficient.

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INTRODUCTION

During the December 1983-April 1984 cyclone season, the island of Madagascar was struck by about 10 cyclones, of which Kamisy was by far the most destructive. Cyclone Kamisy first hit the island on April 9, 1984, coming ashore near Antsiranana (Diego Suarez). After crossing the northern tip of the island, it continued westward toward the Comoros, then reversed direction and turned southeast to strike again on April 11th at the western port of Mahajanga (Majunga), traveling southeast across the island toward Antananarivo (Tananarive) and Toamasina (Tamatave).¹

Mahajanga, a provincial capital sited at the mouth of the Betsiboka River with the sea to the west and north, suffered from both high winds and flooding, particularly in the low-income residential areas adjacent to mud flats and tidal marshes [see Figure 2]. Squatter settlements in these areas were inundated by riverine flooding and possibly by a sea surge. Widespread damage occurred in virtually all parts of the city to housing, schools, hospitals, churches and other public buildings. The port itself had extensive damage from erosion and scour, and much storage capacity was lost as warehouses (uninsured) were severely damaged. The nearby town of Boanamaray, site of the cement plant and another port facility, suffered extensive damage in areas with wattle-and-daub construction.

The most common damage was loss of all or part of the roof, not only in low-rise housing but also high-rise buildings in the downtown area. Many older traditional houses with interlocking clay tiles suffered extensive damage as the unfixed tiles flew off. Houses built of low-quality concrete block with metal roof sheets suffered extensive damage not only because roofs were torn or blown off, but also because the block walls were not reinforced with steel bars. Missile damage was common as roof sheets, uprooted trees and other flying debris were propelled by high winds into the structures.

Antsiranana, also a port city and provincial capital, is situated on a series of hills well above sea level and flooding from sea surge was not a problem except for nearby coastal villages [see Figure 3]. However, low-income neighborhoods, full of houses with light wood frames covered with thin metal sheeting, suffered extensive damage. Of the houses built of more permanent materials such as concrete block, stone and brick, the most common damage was loss of metal roof sheets. Schools and medical facilities also suffered roof losses. Port damages were less severe than at Mahajanga.

Figure 1: Track of Cyclone Kamisy, April 1984

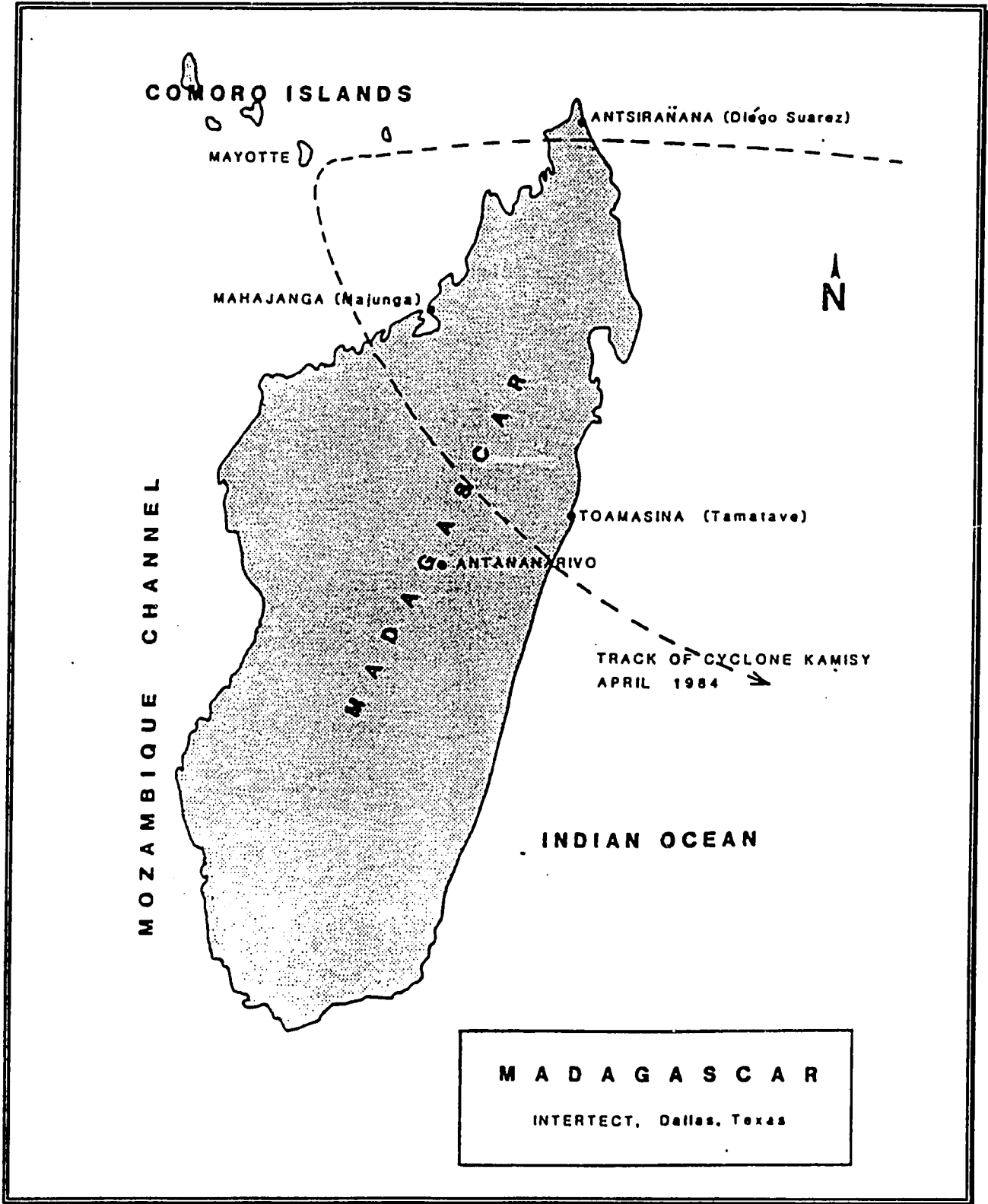


Figure 2: Mahajanga Area Map [Institut National de Geodesie et Cartographie]

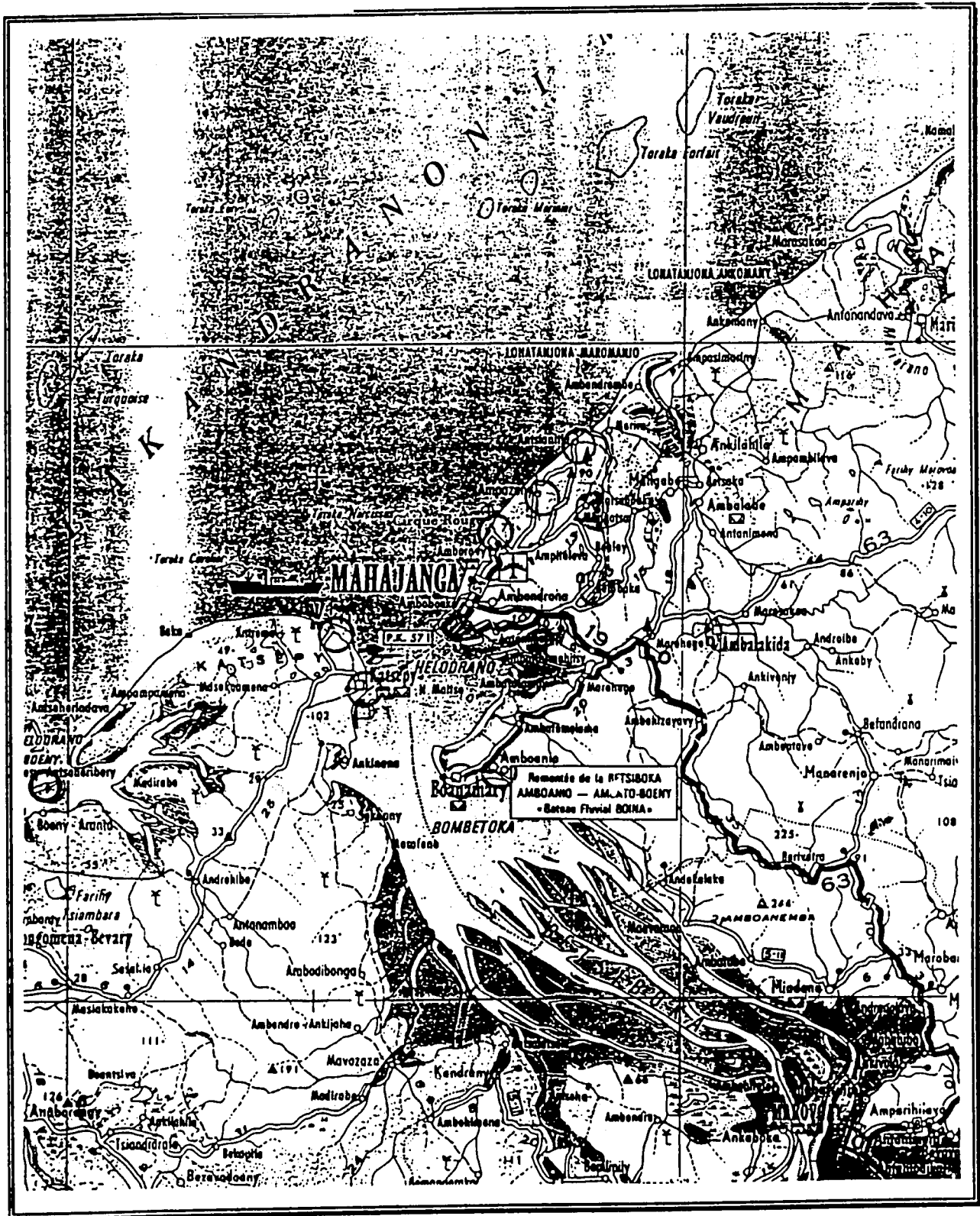
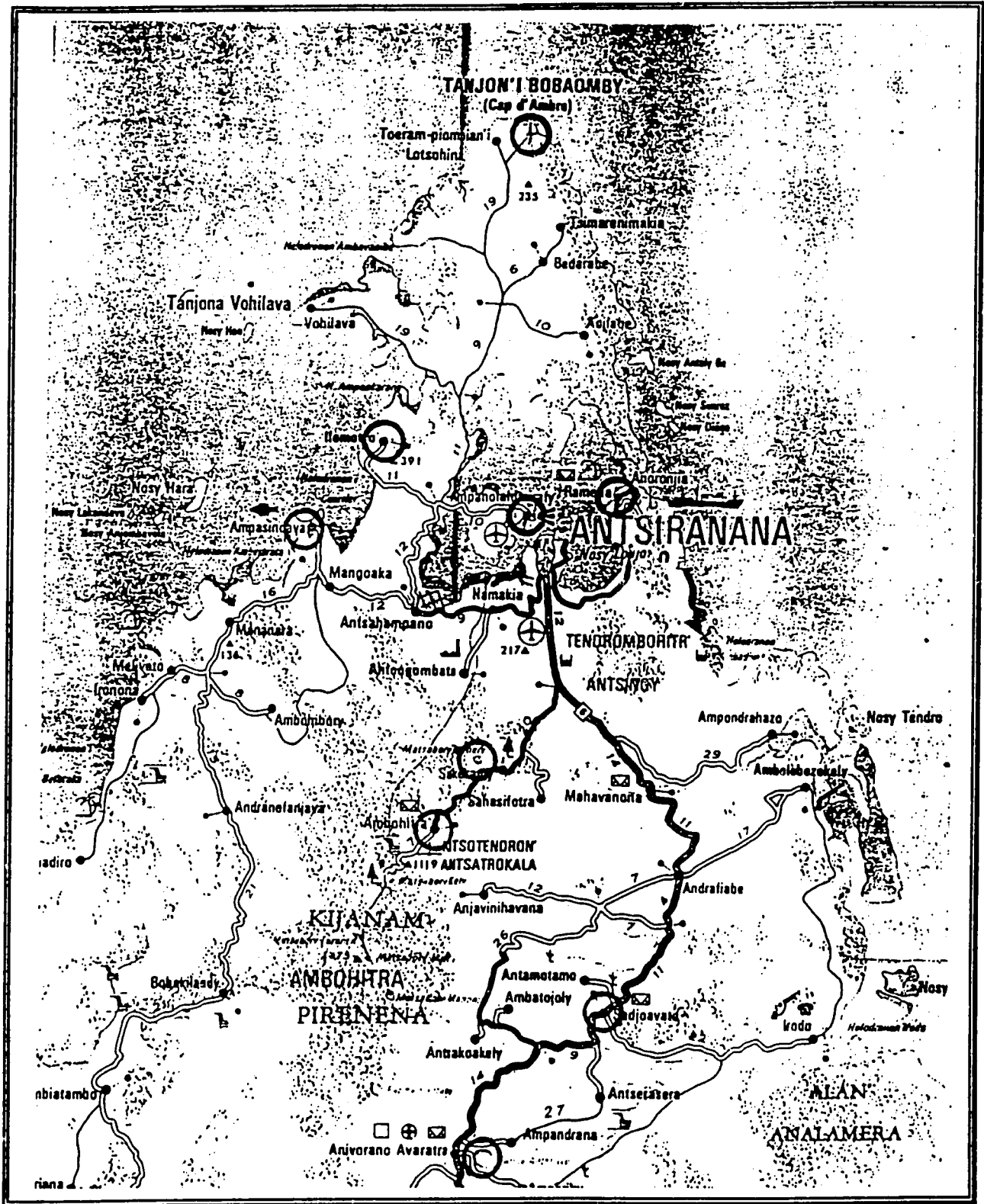


Figure 3: Antsiranana Area Map [Institut National de Geodesie et Cartographie]



CONTEXT

A. ENVIRONMENT

The island of Madagascar lies in the western Indian Ocean south of the equator, off the coast of Africa about 392 km. from Mozambique. The main island is 1,580 km. long and averages about 450 km. in width, making it the world's fourth largest island (over 587,000 sq. km.). A chain of rugged mountains runs approximately north-south, with the volcanic peak of Tsaratanana in the north forming the highest point on the island at 2,876 meters. The climate of its central high plateau is temperate, the south is semi-arid, and the east and northwest coasts are tropical, hot and humid.

A poor economy and traditional agricultural practices have led to immense environmental degradation. Where forests used to cover most of the mountain slopes and hills, by 1980 only 10-20% of the island was defined as forest or shrub cover.² Years of deforestation, slash-and-burn subsistence farming, and pasture clearance by zebu herders have combined to turn forest into savannah, carve huge red clay gashes on the hillsides, silt the rivers and streams, and exhaust the fragile productive top soil. Fortunately, the uniqueness of its flora and fauna -- Madagascar has been termed a "living laboratory for evolution" -- has brought these problems to both national and international attention, and environmental protection/conservation is now a priority vying for already-scarce internal and external funding.

Floods and cyclonic storms have historically been the most common natural hazards, with drought and accompanying famine becoming more deadly recently. By the end of 1986, for example, 40,000 deaths were estimated as a result of a long drought in the southeast. The frequency of meteorological hazard events has contributed to the massive deterioration of the country's infrastructure -- particularly visible when traveling through the country via its roads and bridges. And if ever a classic example of the interaction between natural hazard events and environmental degradation is needed, Madagascar provides the clearest possible picture of that synergy and opportunities for long-term mitigation.

B. DEMOGRAPHICS AND ECONOMY

Madagascar had a population estimated at 9,199,000, of which about 19.5% was urban, with an average household size of 5 people. Its estimated GNP per capita was US \$320.00 in 1982 and \$290 in 1983, prior to the cyclone. Fifty percent of the population was believed to be below the absolute poverty income level.³

Although Madagascar is very prone to cyclone activity (1 to 5 per year), a major storm had not hit these urban areas in about 20 years. During that time, the cities had experienced a tremendous growth in population, particularly in the low-income sectors.⁴ Approximately 2,000,000 people lived in the regions of Mahajanga and Antsiranana, with 130,000 and 106,000 respectively living in the urban centers. After the cyclone it was.

estimated that Mahajanga had 45,000 homeless residents and Antsiranana had 40,000, with 15,000 homeless in each city from total destruction of their houses.

Previously a major exporter of rice, by 1970 the government began to import rice to close the gap between agricultural productivity and population growth. From the mid-1970s to the mid-1980s, real economic growth fell, inflation increased, agricultural yields declined, the trade deficit increased, and infrastructure began to deteriorate. The educational system collapsed, and the continuing French exodus meant that needed technical skills were no longer available. By the end of the 1970s, the government attempted to retrench, embarking on a major externally-funded capital investment program which increased its external debt. While debt service payments were only 3% of export earnings in 1972, they reached 75% in 1982.

C. POLITICS

Madagascar was declared a French colony in 1896. Growing nationalist fervor brought unrest and a post-war uprising in 1947 when as many as 80,000 people were said to have been killed. The country gained its independence in June 1960 but remained very much under French control and influence; for example, an estimated 85% of the country's industry was owned or controlled by the French. A military coup followed massive demonstrations in 1972, resulting in a government which embraced socialism and a widespread nationalization program. The government turned inward to pursue a policy of import substitution manufacturing in order to increase its independence and self-sufficiency.

By 1980, unemployment, inflation and food shortages led to further social unrest and demonstrations. The government changed course in favor of more market-oriented policies and accepted the austere fiscal discipline which was required by the IMF in return for emergency foreign exchange aid.

With the recent transition to a new government, and changes in the constitution (approved in 1992), the national government is now seen as committed to decentralization and a liberalized economy but the process is still evolving from the weak local government tradition. The extent of federalization and decentralization of power to the *faritany* varies around the country.⁵ The country is often characterized as being under- rather than over-governed, with government staff at all levels seen as slow to make decisions and take responsibility.

It is clear that in 1984, as now, there were political and economic factors acting in the system that tended to derail internal operations. Ministries were changing mandates and programs and were vying for power and budgets. In this situation, planning is difficult and governmental agencies and ministries are unpredictable.

HOUSING PROCESS

At the time of Cyclone Kamisy, low-income housing in the formal sector was built by the national housing agency, SEIMAD (Société d'Équipement Immobilier de Madagascar). Many of the housing developments, called "*cités*", were built in the 1970s, and these homes were originally offered for rent at a subsidized cost. Between 1975 and 1985 there was no investment from abroad and public housing initiatives ground to a halt. During this period many of the SEIMAD homes were put up for sale. Everyone interviewed about these sales noted that the price put the homes out of the reach of most people. SEIMAD also found that even the more recent *cités*, while built for low-income residents, could only be afforded by the middle-income population.

In the non-formal sector, large numbers of houses were, and still are, self-built using low- or no-cost materials at hand. In rural areas this may be palm thatch or raffia and wood poles. In urban areas these houses are often built from low-grade concrete block or thin wood poles with metal sheets used for both roof and walls. In the poorer areas, these sheets are usually salvaged second- or third-hand roofing sheets or flattened oil drums.

A. TRADITIONAL MATERIALS

Many rural houses in the cyclone-stricken regions were built of wood and raffia with palm-thatch roofs. The raffia palm grows in low, wet areas and is generally held to be a free resource.⁶ Although prepared materials are sold in urban centers, rural people may collect these materials themselves in nearby areas for no cost except for transportation [Figure 4].

Wooden poles for the house frame may be similarly collected by rural residents and sold in urban areas by those who collect them. In both Mahajanga and Antsiranana, this type of wood pole has become somewhat scarce; as a consequence the diameter of the frame poles is in some cases quite small, from 3 to 5 cm. [Figure 5].

In some villages, 100% of these houses collapsed in the cyclone. While these houses were only expected to last 5-7 years and, with easy access to these building materials, might have been quickly rebuilt, good wood was scarce and much of the raffia nearby was badly damaged. So these residents swelled the ranks of the homeless for a longer period of time than might have been predicted.

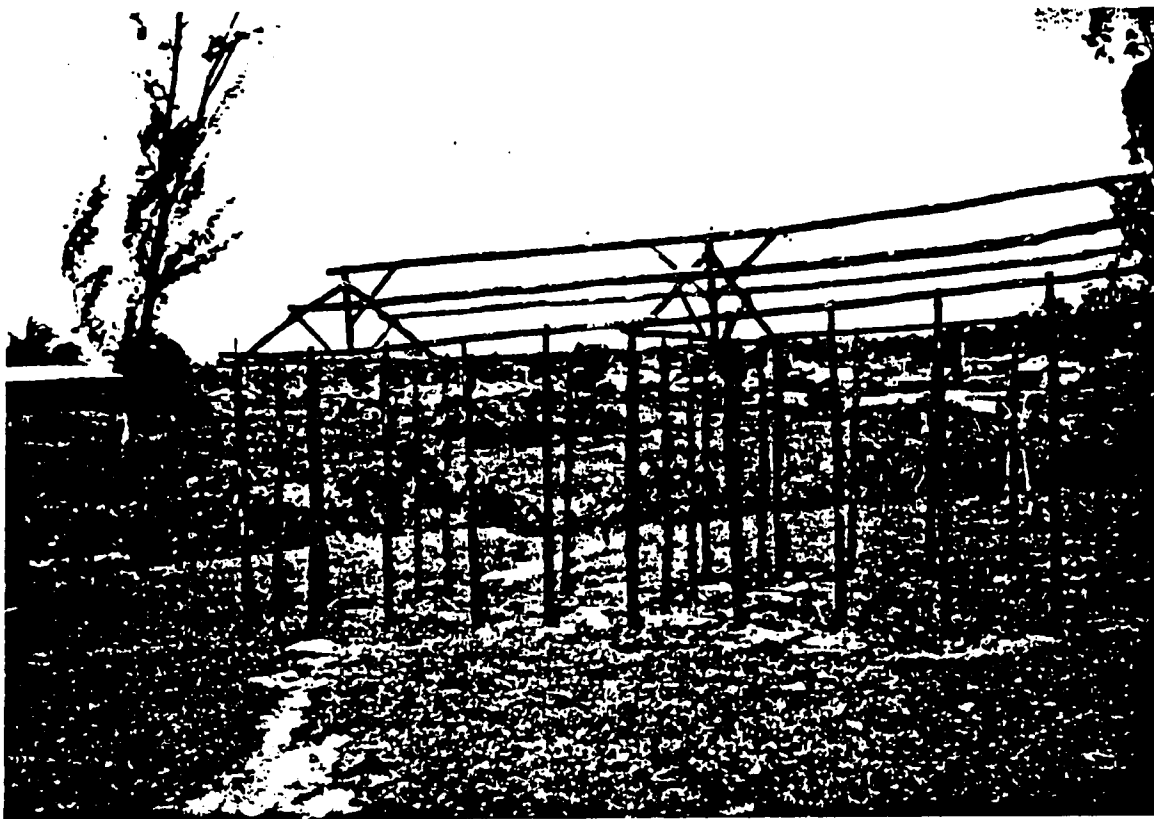
Other non-formal housing types include metal sheet-wrapped structures, unreinforced cement block with metal sheet roofs, and a combination of wood and raffia with metal sheet roofs.

Due to both its affordability and the lack of access to suitable alternatives, metal sheet houses appear to have been the most common house type in both Antsiranana and Mahajanga, with the corrugated sheets used not only for roof and walls but also often for

Figure 4: House built by one of the Kamisy teams in Anivorano. The frame was erected by the trained crew and the walls infilled with raffia by the owner. Here the verandah has been partially enclosed as well, extending the living space for the family.



Figure 5: New house frame in Mahajanga. The poles are thin unsawn saplings. Most of these members are so small that they cannot be nailed without splitting.



interior partitions and outbuildings. In many cases salvaged, flattened oil drums and other metal containers were used in lieu of corrugated roofing sheets for both walls and roof; whole neighborhoods in Antsiranana have been constructed from re-used roofing sheets and flattened oil drums. Presumably much of this sheeting became available for salvage in the immediate aftermath of Cyclone Kamisy.

Replacement building materials were identified as a major problem for reconstruction, in terms of both their availability on the island and their cost which increased with the post-disaster demand. Production capacity for cement; for example, has never been able to meet demand, and cement continues to be imported, raising the cost to the home builder.

Pre-fabricated metal cyclone straps were not found in any shops or building supply companies in Antsiranana, Mahajanga or Antananarivo. Although the idea of the straps was accepted (and replicated in some areas), they are not readily available for the home builder. Some of the suppliers offered to fabricate the straps from steel stock angle sections.

Roofing nails with washers were available in all the towns visited. The cost, however, was exceedingly high. Very few houses seen used appropriate roofing nails. Notable exceptions were the school buildings and other structures built by the Ministry of Public Works.

Figure 6: Local creativity in Anivorano – use of metal bottle caps as washers for roofing nails.



B. TRADITIONAL CONSTRUCTION

Wood-framed structures were prevalent in both areas, so the actual erection process was fairly standard except for the selection of wall covering material:

A wood frame, usually made of unsawn wood poles of approximately two inches (5.08 cm) in diameter (or sometimes rough-cut or hand-hewn wooden boards approximately 2x2 inches (5x5 cm) square), is erected with the principal columns placed approximately 12-18 inches (30-46 cm) in the ground. In most cases, especially in urban areas, the columns are secured in place by laying a concrete floor that helps anchor the columns. No diagonal bracing is used in the frame to provide lateral resistance, and there are usually insufficient members to provide rigidity to the walls or to prevent vibration of the CI sheets during high winds... The most popular configuration is a two-sided gable roof... The roof frame is also made of small wooden poles....⁷

This description is still applicable today. The concrete floor mentioned above in securing the wood poles is often used where the floor needs to be elevated in a wet, low-lying area.

Most of the damage this type of structure suffered in the cyclone was due to poor workmanship and detailing, weak fastenings and connections, and lack of strength in the building frame. Concrete block construction, not as common because of its higher cost, was rarely properly reinforced and experienced heavy damage. Roof loss was common and, with inadequate mortar and rebar, exterior walls also often collapsed. Collapse of wattle-and-daub and raffia houses was less dangerous to occupants because of the lightweight construction.

C. FINANCE

According to a UNDP study completed after the cyclone, 35% of all households in the country were below a level of poverty such that they would never be able to afford to buy or build a house; 40% could afford a house of 1.4 - 4 million FMG; and 20% could afford a house of 4 - 6.5 million FMG.⁸ Construction materials represented about 50% of the total cost of a house.

Lack of access to credit continues to bar many people from obtaining housing. Most young people must rent because they cannot afford a house. According to a young urban professional, a house for a family of 4-5 to lease in Antananarivo now costs about 100,000 FMG for 2 rooms plus a kitchen and bath; it would cost 50,000-75,000 FMG for a one-bedroom house.

D. ACCESS TO LAND/TENURE

Although the process appears fairly straightforward on paper, land tenure is problematic because of the growing scarcity of affordable land and the cumbersome, time-consuming process of obtaining title. When a family does acquire a plot of land, obtaining a new title or land transfer through the land titling agency may take at least 21 discrete steps up and down the decision ladder, and applications can be backlogged for over a year.⁹

Land availability is a great problem in urban areas. Usually young couples live with the wife's parents or build a small addition or house on the property of the wife's parents. In Antananarivo the problem of homelessness is visible and growing, while large developments of expensive modern homes are under construction outside the city center.

E. CODES/STANDARDS/INSPECTION

A national building code, the TBM, was in place in 1984, but it applies primarily to engineered structures. This code is theoretically self-enforced by the Ministry of Public Works. While they admit that there is a shortage of staff to carry out systematic building inspections,¹⁰ a private firm based in Antananarivo -- Société de Contrôle Technique et d'Expertise de la Construction/SOCOTEC -- is often contracted to fill this need. They seem to be an almost para-governmental agency as they perform construction administration and quality control for large public and commercial buildings throughout the country. They have about 30 people on staff, of which 5 or 6 are engineers. SOCOTEC often works for insurance companies to verify the quality of a finished building. They also are retained by the World Bank to perform damage assessments; they carried out the national damage assessment and cost estimates after Cyclone Kamisy.

Almost everywhere we were told there is no real means of control over housing construction in the country for several reasons. First, the country has no money to invest in housing and it is not a current priority for them. Housing is largely left up to private enterprise and private individuals, thus there is little control over the technology, materials or skills. Second, there is no real inspection process and there are few inspectors available.

There are only two inspectors on the Public Works staff in Mahajanga. The *Fivondronana* and other levels of local government have the right to inspect, so Public Works suggests that these offices might have inspectors on staff as well, but this was not verified. Public Works approves plans for buildings and also provides advice on proper construction. One Public Works official said that "everyone knows it is more costly to repair than to build new safe construction in the first place". He also said that Public Works tries to check even on those who do not submit plans for their buildings.

There is a construction permit process wherein small houses are required to get a permit from the *Fivondronana* and houses over 2,000 square meters need additional approval

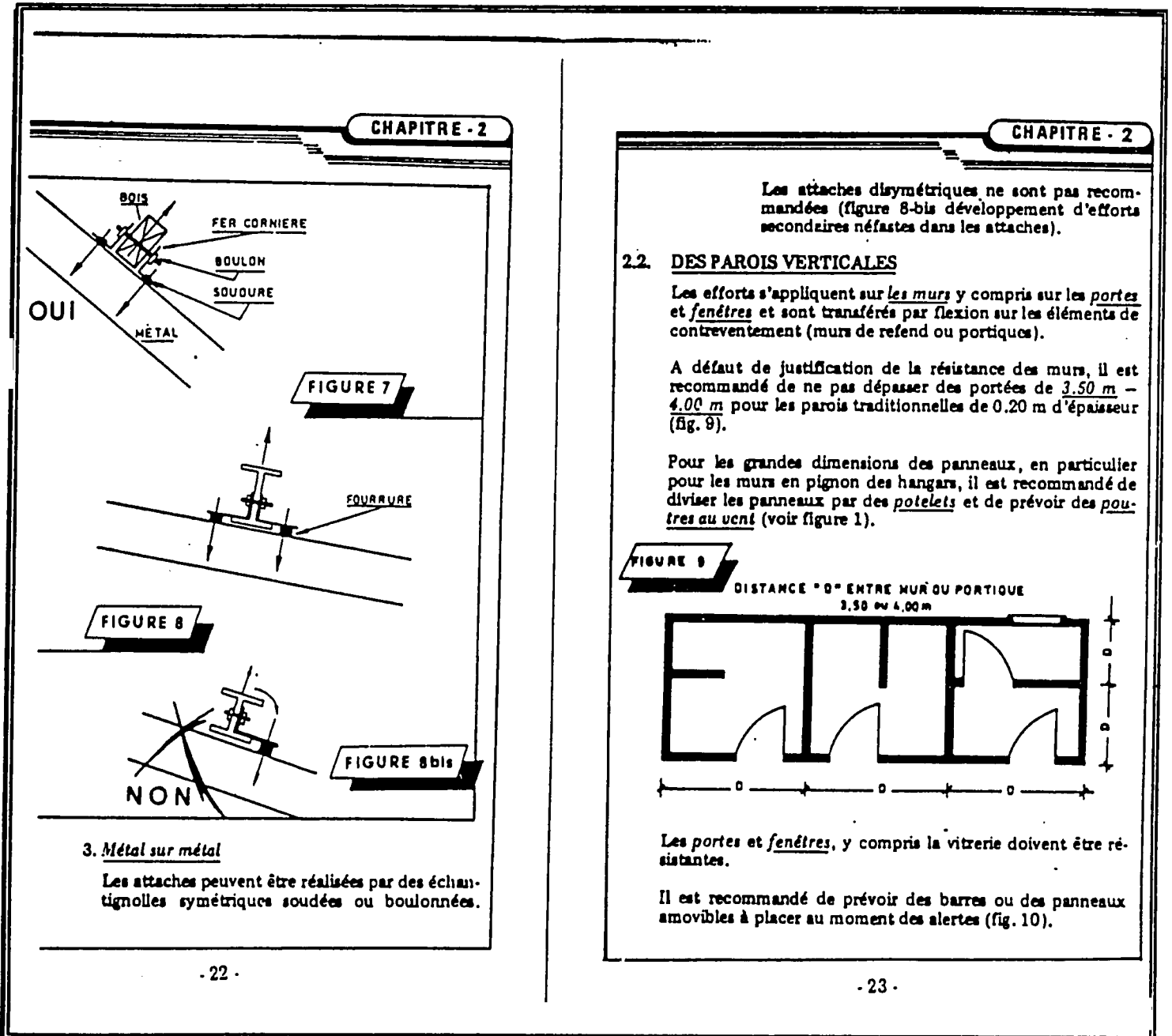
from the Ministry level. Applicants must first prove that they own the land, then get a registered survey, then submit an application along with a plan of the proposed structure. If it is approved, the plan is registered at the *Fivondronana* and construction may begin. The application process is said to take about 45 days. There is no inspection except for a final one to see if the house has been built according to the registered plan.

This process basically relates to zoning concerns rather than construction quality; it is designed to screen out houses that are too large for their lot or that are proposed to be built on restricted areas. We did in fact see one instance where this had taken place: a homeowner had erected the wood frame and concrete floor but left it unfinished because he was told that he could not build a house with concrete walls so close to the street. It should be noted that this type of zoning requirement that only applies to permanent structures may in fact encourage people to build less substantial homes, thereby circumventing the requirements. Construction on this house was not stopped due to the fact that the house was too close to the street, but rather because the house was too close to the street to be built in "durable materials".

Permits for construction are supposed to be required of everyone, but perhaps only 40% of those legally required to get permits actually do, and they are usually involved with the more expensive homes and major buildings. The primary function of the permit appears to be to record the residence or structure for collection of taxes.

Knowledge of anti-cyclonic building techniques is said to be required of all Public Works personnel, and the Ministry does have an internal program of training, using a pamphlet about wind resistant construction techniques produced in collaboration with SOCOTEC [see Figure 7].

Figure 7: Excerpt from the "fascicule", said to be used as an extension of the national building code, incorporating recommendations for cyclone resistant design based on experience during cyclones Kamisy and Honorinina. The 30-page booklet provides both generalities and details regarding wind design issues. [DAUH 1988]



THE USAID/OFDA MATERIALS DISTRIBUTION AND HOUSING EDUCATION PROJECT

A. GOALS/OBJECTIVES

As set forth in the original project contract, the OFDA objective was "to design and conduct a program of housing education focused on introducing appropriate technology in housing repair and reinforcement coupled to a materials distribution program, as part of the integrated disaster relief response following the devastation caused by Cyclone Kamisy -- to assure the effectiveness of the \$500,000 building materials contribution". In other words, the project aimed to maximize the investment in materials by promoting and enabling not just rebuilding but safer rebuilding. Activities were to focus first on the Mahajanga area for approximately 3 months, then be duplicated in the area of Antsiranana, during the period June 23-Nov. 30, 1984.¹¹

The specific tasks to be accomplished under the \$117,202 budget were:

- Training aids for masons: design and produce training aids of wind-resistant construction techniques for use by local craftsmen, carpenters, masons (printed by GOM)
- Training aids for instructors: (printed by GOM)
- Community awareness material: via pamphlets, posters and the like
- Training for instructors: through 3-day workshops, a minimum of 30 shall be trained in each location to work with local craftsmen and assure quality control
- Training for the construction industry (workshop)
- Assist Ministry of Public Works to develop an institutional framework for the new program: (assigning personnel...)
- Construct and/or repair model houses -- at least 6 in each area demonstrating wind-resistant construction techniques
- Subsidized sales program -- assist to establish a program of subsidized sales of building materials, including a procedures manual
- Labor-intensive work project, procedures manual for use of reflow money from sales programs
- Small-scale micro-enterprises -- preparation of guidelines for the GOM

B. PROJECT DESIGN

After funding a damage assessment and recommendation report, OFDA chose to support an integrated program for materials purchase and subsidized sale, combined with local skills training for repair and reconstruction. The project was to build on prior USAID-funded programs for materials distribution carried out in Guatemala (1976) and Dominica (1979-80), neither of which included a housing education component, and on a post-earthquake housing education project in Colombia (1983), as well as previous housing vulnerability reduction activities in Jamaica, the Dominican Republic and the South Pacific region.

Included in the original project proposal was the intention to assist the GOM in developing a plan for continuing the housing education program after this project was completed and for replicating the educational component in other parts of the country in order to reduce national vulnerability to future cyclones. When the contract was issued, no formal mention of continuing or replicating the project was included in the tasks.

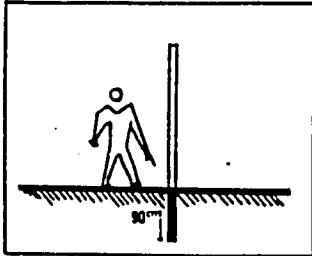
C. IMPLEMENTATION

Beginning in September 1984, model houses were to be built in the Ambilovato and Abbatoir districts of Mahajanga and at two sites in Antsiranana district. Community meetings and a radio education program were to be undertaken. Construction of owner-built houses was to take place using builders supervised by SEIMAD. A materials distribution structure was set up with SEIMAD and a private retailer (Bonnet et Son Fils) to guarantee the security of USAID materials. A relocation project was planned at Antanimasajy to move residents from the flood plain in Mahajanga to a newly-developed area.¹² Community works projects (such as building roads and drainage ditches on new land) were to be initiated with the reflow money from materials sales.

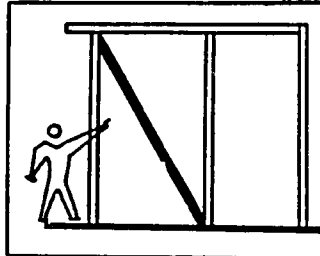
By the time the technical assistance team left Madagascar in December 1984, they reported that 12 model houses had been constructed, instructors were trained at the two regional offices and were conducting classes for both masons and carpenters, and for engineers and building supervisors. A flip chart, two booklets and scale-models of building details were designed for classroom use. Community awareness materials included posters, pamphlets and a radio announcement to explain the program. A distribution system was designed to include program accountability and security for the building materials. Production of cyclone straps by local entrepreneurs was encouraged and the straps were sold at cost in the hope of establishing an on-going market after the subsidized sale of other materials ended. The project was turned over to a national director, with 2 regional offices continuing the training, construction assistance, sale of building materials and reflow projects.

Figure 8: Poster illustrating all the safe housing recommendations, designed by project staff and distributed to every family who bought materials in the program.

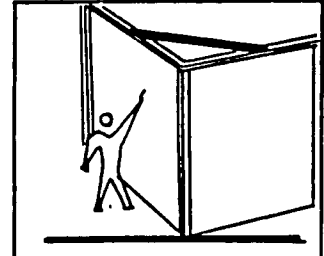
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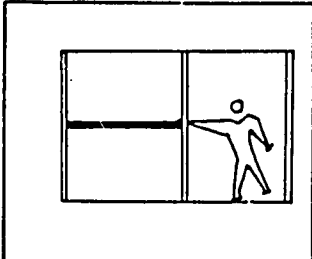
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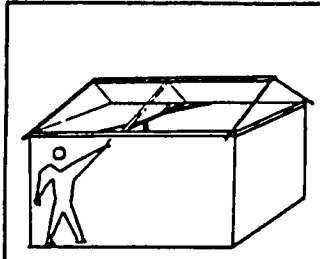
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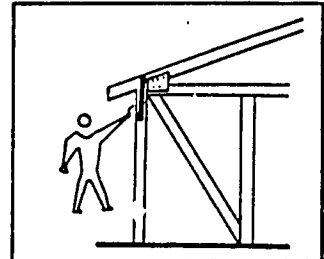
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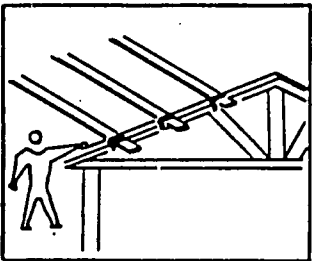
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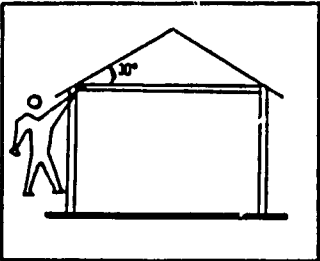
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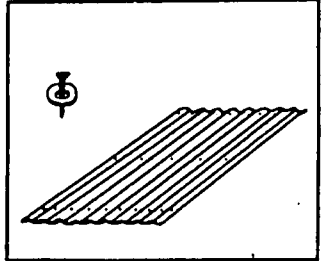
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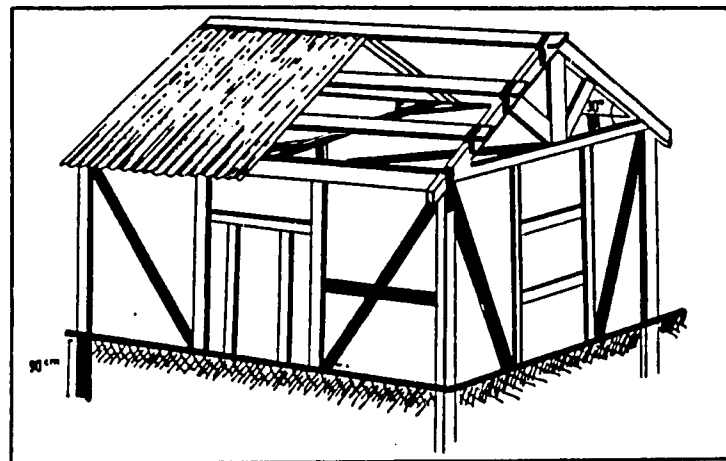
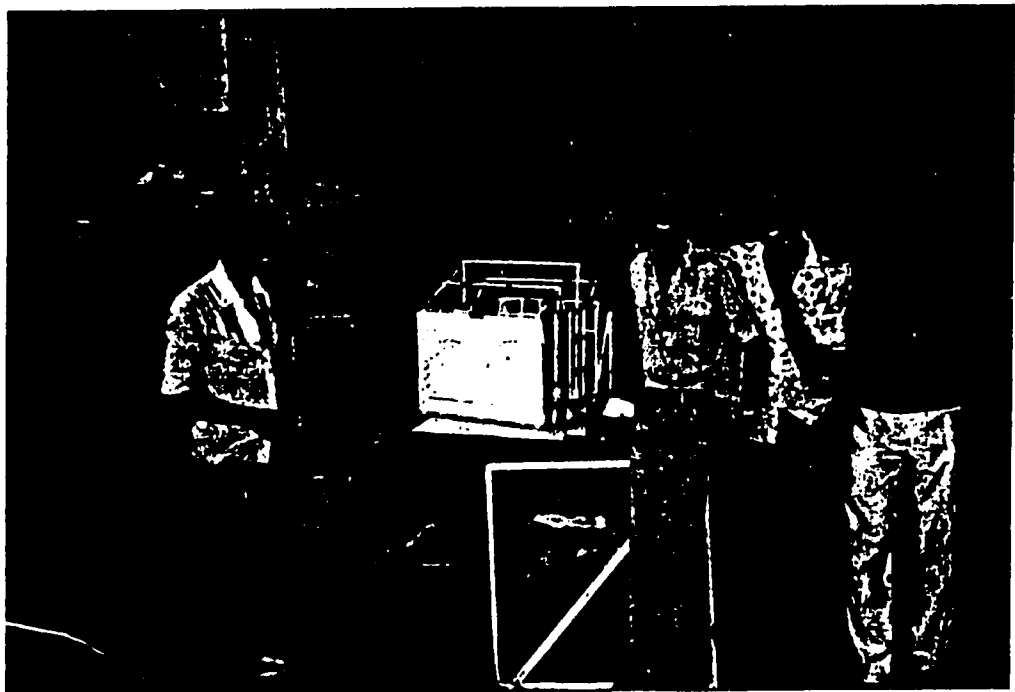
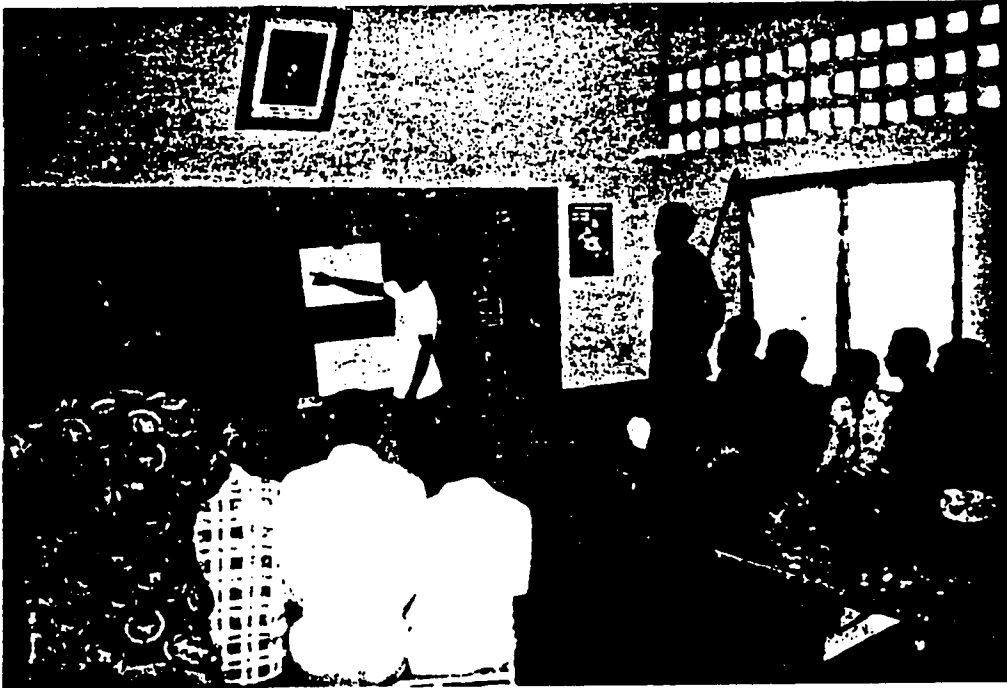
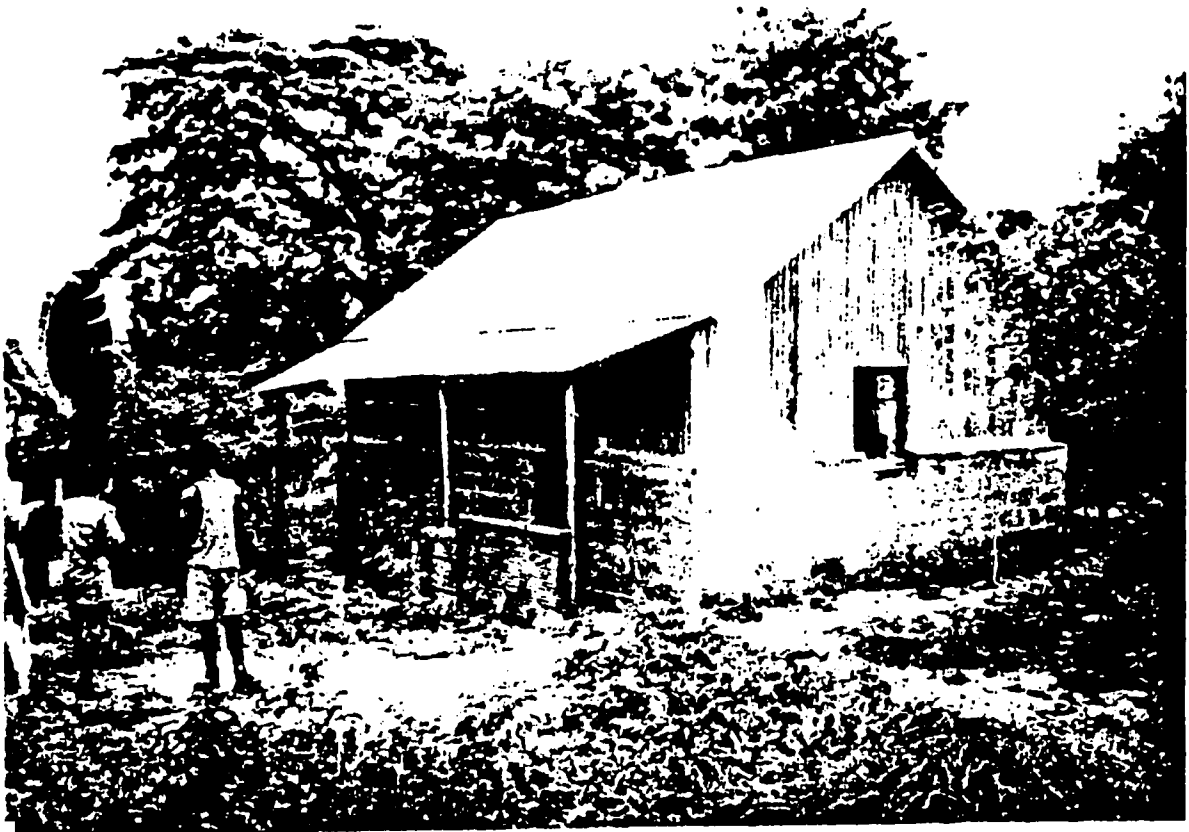


Figure 9: Training aids and scale model used in classroom training, 1984.



A number of model houses were built in both towns and in outlying communities. There are minor material and stylistic differences among these units but the following description generally fits them all. The houses are about 4m x 6m. All have simple gable roofs with roof pitches of about 30 degrees. All have corrugated metal roof sheets on wood frame structures. The size of the wood uprights varies but is normally about 8 cm. x 8 cm. Joints are notched and nailed. Wall infill varies but often is mixed concrete block and corrugated steel sheets. The wall framing is braced diagonally at the corners in both horizontal and vertical planes [see Figure 10]. Even in structures where full-height concrete block walls were erected for closure of the house, the structural support is provided by the wood frame.

Figure 10: Typical project house in Mahajanga. This one has concrete block half-walls. Its occupant built the house with 4 others on a construction team supervised by the private contractor on whose land the house is sited. He now acts as a guard for the contractor whose home is next door.



The structures were easily identified by local people as model houses from the "Kamisy Program". One area where the model houses were built in Mahajanga is now informally referred to as "Cité Americaine", presumably after the U.S.-sponsored houses in that neighborhood (Tsararano Ambony).

Although the houses are known to be associated with the program, the general perception of the function of the model houses varies widely among local residents. We were told by different individuals that the model houses were:

- built as a kind of catalog of designs, for those in the program to choose the type of house they wanted to build.
- built as a training exercise for those workers involved in the project.
- built to be sold to people who were in need of housing.
- built by the project manager as income-generating rental units.

It is a fact that several of these structures remain unoccupied due to the confusion or politics of assignment in both Antsiranana and Mahajanga. In "Cité Americaine" we talked to a young woman living in one of the three model houses grouped there [see Figure 11]. She told us that she was the daughter of one of the masons who had been on the original construction crew. She said that her father was installed in the house to act as a guard for the property. She also verified that until the past couple of years, people had come to view and tour the demonstration structures. She presumed that the three houses belonged to the project manager, John Rakotomanga.

D. FOLLOW-UP ACTIVITIES

The original technical assistance team from INTERTECT departed in Dec. 1984. As of January 1985, technical oversight was to be provided by RHUDO/Nairobi. The "relief project" was to terminate in September of 1985 and this spawned a brief flurry of cable traffic to review its progress. An Oct. 1985 cable from Nairobi said that 20 construction teams of 5 members each had been trained and had achieved "commendable levels of efficiency and quality". Over 185 new houses were constructed by these teams, a delivery system for wooden poles had been established, and the project had also fostered creation of an assembly facility for prefabricated housing components and a forge to produce many of the tools used.

In effect, this has become Madagascar's first low-cost housing program in over a decade and it is being viewed as a potential model to help alleviate the country's acute housing shortage, as well as serving as an integral part of larger disaster rehabilitation and preparedness efforts.¹³

Figure 11: One of three model houses grouped in "Cité Américaine". This is a wood frame structure with concrete wall screen around. The gables are sheathed with wood siding. There is no running water or electricity to the site of the houses. Two of the 3 houses remain unoccupied.



Discussions were held regarding the possibility of transitioning the trained local construction team into either a non-profit organization under the auspices of the Ministry of Public Works or a special unit of the Ministry, to undertake a program of core and complete low-cost house construction to be sold at market price. Later, the team leader/project manager, John Rakotomanga, proposed that the team become an ordinary for-profit company.

In November 1985, it was agreed that the remaining building materials not used in the Cyclone Kamisy relief and rehabilitation program would be contributed to a permanent housing production program for low-income families, to be managed and monitored by RHUDO/ESA (the USAID Regional Housing & Urban Development Office). The program was to employ cyclone-resistant building techniques and would serve as a model for further disaster preparedness and mitigation programs. RHUDO felt that "...this would represent a vivid demonstration of how a short-term disaster effort can turn into a much more enduring program and could be used as a model for future interventions."

However, the RHUDO/Nairobi director briefly evaluated the project in a Nov. 1985 memo to OFDA, and concluded that the project was not as successful as it could have been because of the original project design and goals. He particularly commented on the unnecessary construction of model houses and that the "design concept of selling ... materials at half price and using the reflows for public works projects is ... faulty". According to this memo,

... of the original 5,450 listed families, only 28% were served by the project. Some 40% of the roofing, 20% of the cement, most of the shovels, saws and other construction tools are still in storage. Considerate quantities of cement disappeared.¹⁴

Because of other priorities, use of straps was a mixed success in the project areas and very few of the families not directly served by the project chose to invest in them. He suggested that the greatest real success was in the village of Anivorano where virtually everyone was affected and there was no "establishment" to take advantage of the situation.

In March 1986, Cyclone Honorinina struck, with heavy damage in Toamasina (Tamatave; pop. 125,000). A situation report from RHUDO/ESA noted that the Cyclone Kamisy Construction Team still existed and its involvement in this new disaster at a different location was under consideration.

The Cyclone Kamisy Reconstruction Program was formally terminated on 6/15/86, when the two field offices in Mahajanga and Antsiranana, as well as headquarters offices in Antananarivo, were closed.

A June 1986 inventory revealed that a number of construction materials remained, and it was proposed that they be sold to Caritas at the "Kamisy" price, reduced to reflect

deterioration, with the remaining tools to be donated. The Cyclone Kamisy team would prepare a simple manual on resistant building techniques to distribute to low-income families through local committees working with Caritas. These and other efforts would be integrated in a rehabilitation program for the Fenerive area struck by Honorinina. While Caritas did donate the extra metal roof sheets to local low-income people to assist in the rebuilding, and they did speak with the Cyclone Kamisy Team Director, they say there was no money to fund any type of training program so none was carried out.¹⁵

Between the period Sept. 1985 and June 1986, little documentation remains of what happened with the project and its assets. Apparently RHUDO's offer to transition the project into a low-income housing production scheme was agreed to in principle but not implemented. After Cyclone Honorinina, it was noted that the materials remaining from the Kamisy program (later given to Caritas) were earmarked for a low-income shelter project; however, it appears that this was predicated on the use of PL480 Title II funds destined for Kamisy assistance but not disbursed by the GOM Ministry of Finance.¹⁶

E. PROBLEMS/CONSTRAINTS

Financial resources: The project was to be funded using monetized PL480 rice. The Embassy had originally proposed using unspent OFDA funds for the project, but was advised that these funds were dedicated for material purchases only. Thus the technical assistance project team, having arrived in July 1984, could not begin any substantive work beyond the administrative structure phase, and was unable to travel. By August 3, OFDA cabled for suggestions in financing the interim period before the PL480 rice arrived and was converted to currency.

Additionally, hard currency was needed to purchase construction materials not available in country. REDSO/Nairobi (Regional Economic Development Services Office/East & Southern Africa) advised the Embassy that PL480 funds could only be converted to FMG and not hard currency to be spent outside Madagascar.

The search for both bridging and hard currency funding was time-consuming and frustrating, particularly since the GOM was using the project to "kick off a new co-ordinated approach to development and expectations are high".¹⁷ Delays in acquiring operating funds resulted in consideration of project contract extensions as early as Sept. 18th (and eventually to a needlessly contentious extension granted after the contract completion date). Delays also meant that most of the trained building craftsmen were no longer available. Knowledgeable builders were already working full out on reconstruction by the time project could get underway, so the project used unskilled and semi-skilled workers. Thus there was a lot of simple construction information that had to be added to the training; also there was no guarantee that those trained would remain builders after the project invested in their training.¹⁸

PL480 Title I (Concessionary Food Aid) and II (Emergency Food Aid) programs had been used in Madagascar since 1981, primarily to finance self-help agricultural rehabilitation programs. A 1986 review stated that in the period 1981-1986, the U.S. had donated \$62,000,000 worth of food, sales of which had generated 40 million Malagasy francs, of which 16 million had been spent on 248 projects. A Special Account was set up by the government in which local currency proceeds from the sale of the food were deposited. Each agreement specified a date by which the deposits must be made. The steps to be followed, and the accounting procedures required, were time-consuming:

For example, the FY84 agreement was signed on March 7, 1984. Then the GDRM opened bids in the United States for purchase and shipping of the commodities, and the final shipment arrived in Madagascar on June 29, 1985. The first projects were submitted and approved by AID in September 1985. With such a time line, to date [July 1986] only funds from FY81-84 have been allocated to projects, a total of FMG 14 billion (\$20 million).¹⁹

Once a project was approved and work was underway, payments were made from the Special Account in the central bank, outside the normal state accounting system, after approval from the treasury office which maintained a special department for control and processing of all counterpart funds. Delays were common, whether due to accounting requirements or to incorrect documentation.

2. Institutional context: From the outset, there was some confusion as to the appropriate ministry to be involved in housing reconstruction. At different times, the program was to operate under the auspices of the Ministry of the Interior, the CNS (Conseil National de Secours), SEIMAD, the CNC (National Coordination Committee) or the Ministry of Public Works. Until a decision was made, no local personnel would be assigned to the program. A final government decision to place the program under Public Works was not made until November 1984, more than 6 months after the cyclone and at the intended end of the OFDA project whose objectives relied heavily on government participation.
3. Shifting mandates: Between the time of the OFDA damage assessment (May 1984) and arrival of the team (July 1984), the disaster response phase -- which had been handled by the Comité National de Secours (CNS) -- was declared over and recovery was to be handled by the regular ministries. However, a World Bank evaluation and subsequent initiative mandated that the GOM establish a National Coordination Committee (CNC) through which all donor aid would be channeled.

According to an Oct. 1984 World Bank report, the Bank requested that the Ministry of Finance establish in the Ministry of Public Works a National Coordination

Committee composed of full-time representatives of all the ministries concerned and headed by an advisor to the Ministry of Finance. Apparently the World Bank intended the institutional framework for its project to reinforce and improve GOM procedures for coping with disasters; thus the CNC was established and aided with technical assistance to become a model for coping with future emergencies.

In the short-term, however, the changeover was not handled well and resulted in hard feelings and resentment between the groups. In addition, with regard to the OFDA project, the original concept of subsidized sales was nullified at first, and the INTERTECT team had to spend a great deal of time working closely with the Ministry of Public Works, SEIMAD, and others to develop an actual project plan that would reflect the project objectives decided upon prior to the changes in the political environment.

4. Control/audit procedures: Various RHUDO communications say that the subsidized materials were the target for black marketeers, and that it had been necessary to devise elaborate controls to prevent this. This was also clearly reflected in the 1984 project documents where both security of storage and establishment of a clear audit trail were serious concerns from the outset. Where the project operated, the temptation was great. A team project report in November 1984 describes the following situation:

In the two zones our program is the only source of building materials. Black market prices for roof sheets are 5 times the legal, controlled price or 10 times our subsidized price. Every staff member has been approached by powerful businessmen to sell them large quantities of materials.²⁰

The team devoted a large portion of its time to the establishment of sufficient procedures to protect against this likely possibility. However, after the team transitioned project management to a national project director, apparently the controls did not operate as intended. Particularly in Mahajanga, public opinion is almost unanimous that many of the subsidized materials were sold to profiteers in that city and to wealthy business contacts in Antananarivo.

One local resident described the most common abuses of the system in the following way. First, a list was put together which indicated all those people who had lost their homes or who needed extensive repairs to their homes due to Cyclone Kamisy. The integrity of this list was lost early in the process, and often people not needing the materials were made eligible to receive them. Second, the people on the list (whether legitimately or not) found themselves holding a valuable resource. Entrepreneurs approached these people and offered to buy their signature on paperwork required for the purchase of the subsidized materials. The sellers received this payment immediately and thought themselves fortunate. The buyers of the listees' signatures

collected the subsidized materials and were then able to resell them, absorb the cost of the bribe, and still make a profit selling the materials at market value.

5. Slow definition and implementation of the works projects: No documentation was located on the "labor-intensive works projects" which were scheduled to begin at about the time that the project transitioned from the OFDA/INTERTECT team to national management and RHUDO oversight. Project planners saw this as a critical part of the assistance effort, enabling residents to earn cash to use for building material purchases or other recovery needs while performing needed community work. The only reference found was an Oct. 1985 cable from Nairobi which stated that "...the Public Works component never got started and proceeds from the sales of materials were used instead to support the project unit."
6. Beneficiary designation: The local politics involved in deciding who would be eligible to receive a house built in the program caused immense consternation and numerous delays when the program was initiated. Many of the houses remain unfinished and vacant today.

LONG-TERM IMPACT ON THE HOUSING PROCESS IN THE COMMUNITIES

A. FORMAL INSTITUTIONALIZATION

With the large turnover in staff and reassignment of whole sections to different ministries and agencies during recent political changes in Madagascar, institutional memory is not very good. What often appears to be a desire to avoid taking official responsibility also makes it difficult to pin down authority and decision-making concerning the project and its long-term impact.

The only physical sign of formal institutionalization is the "Fascicule: Dispositions constructives applicables au travaux des bâtiments édifiés dans les zones dites 'à hauts risques cycloniques'", published by the Ministry of Public Works in collaboration with SOCOTEC in 1988. Directed toward ministries, "decentralized collectivities" (the administrative divisions of the country, e.g., *faritany, fivondronana*), training centers, construction entrepreneurs, etc., the booklet of cyclone-resistant building techniques and standards grew out of a desire to highlight and disseminate the lessons learned in Cyclones Kamisy and Honorinina, but clearly was designed for use by the formal sector. The details provided are appropriate for larger, engineered buildings. Since the pamphlet is circulated mainly among Public Works offices (who do not deal with private sector housing), there is little chance that homeowners or local builders are influenced by it. This is the only written publication that we found anywhere in the country about building for disaster resistance. The "fascicule" is intended to be used in conjunction with and as an extension of the national building code/TBM.²¹

The Ministry of Education controls the Lycées Techniques and the provincial director in Mahajanga thought that the local Lycée Technique offered a course concerning wind resistant design in its construction syllabus. However, we could not see that any specifically anti-cyclonic techniques were included in the schedule of classes, although general builder training is conducted regularly. The Deputy Director of the Lycée was not familiar with the 1984 project nor with the "fascicule", and nothing of this type was found in the school library.

The Ministry of Public Works does have an internal program of training for anti-cyclonic construction and they say that knowledge of wind-resistant building techniques is required of all Public Works personnel. A member of the Public Works staff in Mahajanga confirmed that he received training in anti-cyclonic construction techniques and that the "fascicule" is used. However, Public Works does not have an involvement with low-income housing, so this might only be expected to have some impact on major construction projects.

Apparently, aspiring engineers can get some engineering training in-country, but for architectural training, students must travel abroad. The usual source for this type of training in the formal sector is France.

For the most part, people cannot afford to hire anyone else to build for them. Materials are salvaged from other projects or collected from nearby sources. Most houses are very simple structures and the poorest people use whatever is handy. They go into the forest to cut the wood they need, harvest raffia, or cut earth for red mud bricks. There does not appear to be any extension program that attempts to reach the small or self-builder. SEIMAD recognizes the problem and would like to institute some control over the quality of self-built housing, but this remains just an idea while they struggle to redefine their niche in the evolving political climate.

B. VISIBILITY/AWARENESS OF PROGRAM

Local memory of the project is clear in most areas visited, from local administrators and Public Works staff to residents who participated one way or the other in the program.

The *Faritany* council in Antsiranana knew of 3 model houses built there and of numerous houses built in Anivorano. They remembered that some dissemination of information had been carried out; they recognized the poster from the program and took us out to see the models on the way to the airport. The models sit in the middle of a large area of open land where large new and expensive concrete homes are being constructed. The man who lived in one model confirmed that it was "a cyclone-proof house".

The house was in good repair, with two small additions -- one on either end. Two similar houses were nearby. The Public Works representative said the reason that the second house was not occupied was that it was too expensive: the roof pitch required extra material

for framing, the concrete block was too expensive, and cement had to be imported, so who could afford all this? When we asked about the other homes in this area, our driver said that the property was once public land but was made available for private lots after the cyclone. Neither the sale price of the lots nor the beneficiary of the sale was identified; however, it was clear that this area was being developed by and for the wealthiest strata of the community. The two model houses seemed totally out of place -- too small and spartan for the upscale neighborhood. This visit provided an interesting juxtaposition of perspectives: houses thought to be too expensive for local people to build now appearing to be small sheds compared to the modern homes springing up nearby

In Anivorano, near the sacred lake about 75 km. south of Antsiranana, we found masses of the houses built in the USAID project. They were easily recognizable; the typical house had about a 30° gable roof, was generally 5 X 6 or 7 meters, with strips of metal tying down rafters to posts and tying parts of roof trusses together. Some but not all had diagonal bracing in the corners. Memory of the project training sessions and construction was still very clear for many people. Apparently, about 200 houses were built after the cyclone, but not all of these had benefited from the program.

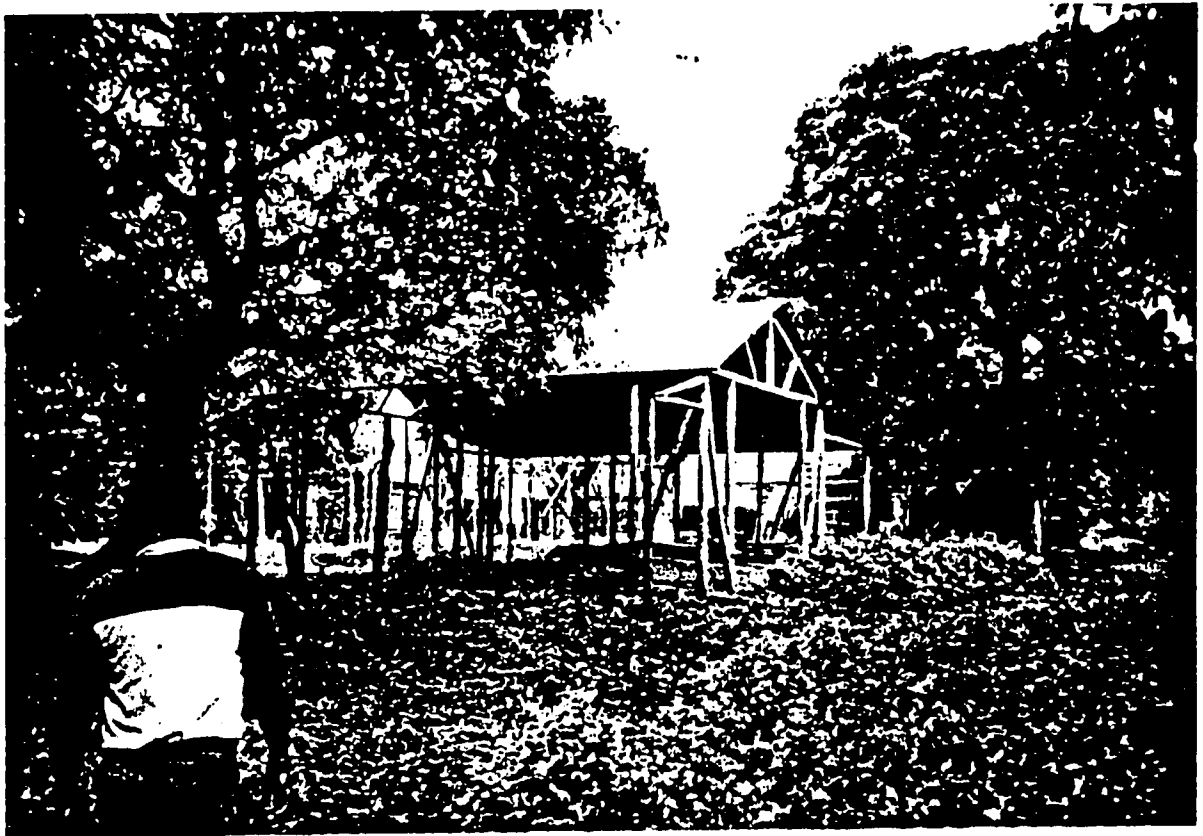
There also were a number of unfinished and unoccupied houses in Anivorano. The original wood frame had been erected and the metal roof was in place, but eight years later there were still no walls [Figure 12]. The reason given was lack of money. But knowing the early problems with beneficiary designation, they may not have been completed because ownership was never decided. Many of the houses did not have the usual cement-finished floor, either.

Most of the houses were constructed by first setting the poles in the ground, putting on the top plate (poles, in most cases), bracing the poles, setting the roof framing, putting on the roof, and leaving the rest for the family to complete. Most have cement-finished floors poured after the poles were set in the ground. The fact that they used cement-finished floors probably was the single most important factor in raising the cost of the house for completion, because there was no regulation that you had to have cement block walls; they could have added walls of almost any inexpensive material -- and often did.

One example of a model house with continuing high visibility is located in the Ambalavato neighborhood of Mahajanga and serves as a community center and meeting hall for local government.

Almost every house built in the program and visited during this field review was in good-to-excellent shape, and many evidenced additions and/or improvements made by the residents. All the residents with whom we spoke were very happy with the houses as homes and believed them to be very strong.

Figure 12: "Kamisy house" in Anivorano, still unoccupied and incomplete.



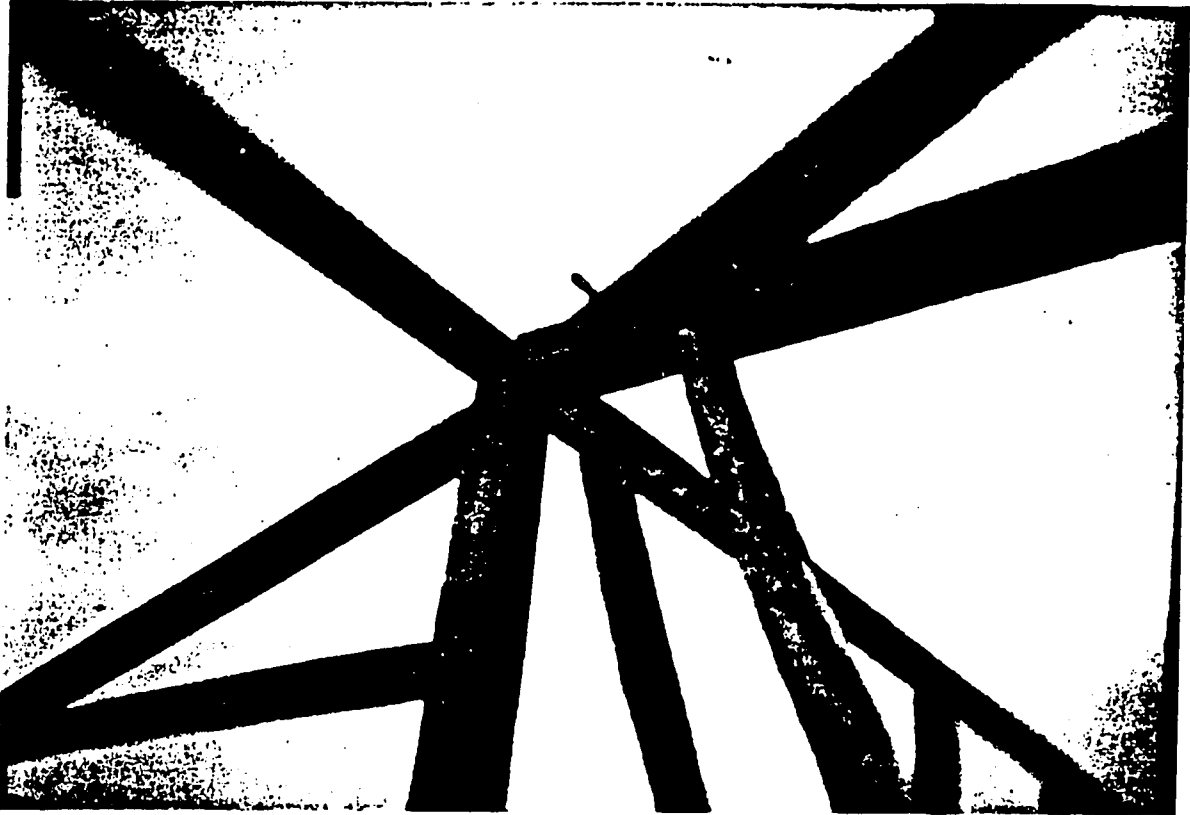
C. REPLICATION

Some instances of continuing replication can be found. Outside of Antsiranana, we saw a new house under construction on the road to the university. The frame was well built: a typical building style on no foundation with the poles set right into the ground as is usual, with diagonal bracing and crude cyclone straps made out of odd pieces of steel angle and plate. Wooden pegs were used instead of nails at major joints and throughout the roof structure [see Figures 13 and 14]. The owner said that he had built the house himself to be cyclone-resistant. The roof pitch was good; the roof sheets were only partly installed and not well-fastened, but he said that this was only a temporary roof. We were not able to determine where he had learned these techniques – whether from seeing model structures or reading books or talking with builders. He did say, however, that he intended to build a wind-resistant house. He said the whole process could take about 45 days.

Figure 13: New house under construction in Antsiranana. Poles are set directly into the ground. Note diagonal bracing.



Figure 14: Detail of new house in Fig. 13. Note wooden pegs used in lieu of nails.



In Anivorano, we spoke with one of the program homeowners and his family. He explained that he himself was the builder; he was very proud of this and the fact that we had come to see the house. He pointed out the bracing, the cyclone straps, etc. We saw another house under construction -- a bit smaller than the usual program house, but it did incorporate a simple version of the straps. They were very small and thin but the idea was plainly there. There was no sign of any diagonal bracing and the roof pitch was somewhat lower than recommended but still better than most. Obviously, some of the local people had gotten the idea of the program and were trying to copy as they built new homes. Some, however, copied incorrectly or insufficiently to accomplish their purpose [see Figure 15].

Figure 15: Detail from Kamisy-era house in Anivorano. Although the size of the members is appropriate and bracing should be effective, the attempt at strapping with the small piece of metal shown is completely inadequate.



In Mahajanga, four small buildings similar to the model house design were erected after Cyclone Kamisy, probably by Caritas, on vacant land across from a Catholic Church. It is said that their construction followed a request for post-disaster assistance for the community from the parish priest, so the plans and materials may derive from the USAID/OFDA project. In any case, they have become the school at Antanimalandy, and the director says they have withstood numerous storms since their construction.

Figure 16: Two of the buildings which serve as a school at Antanimalandy. Note bracing, straps, and similarity of design to the USAID Kamisy houses.



D. USE/DISSEMINATION OF TRAINING MATERIALS

In 1991, a mission from AID/Washington came to USAID/Antananarivo and advised them to systematically destroy old records to make way for other files. In searching the USAID library, we found an early project binder with a few documents, some prepared by the OFDA/INTERTECT team members and some apparently by the national project director. Other than the Mission Disaster Relief Plan, there was little else and none of the training aids that were developed and refined during the project. After project close-out (basically a financial and administrative one for bookkeeping purposes), no real records were kept in country.

Within the Ministries of Urban Development & Tourism and Public Works, which would seem to be the logical repository of training and public awareness materials, there are now no records of the project. Most people interviewed assumed that some other ministry or agency had been responsible for the program. They always associated Jean Rakotomanga with the project and referred to it as his program, as though the team operated in a gray area somewhere outside of the regular chain of command of the Ministry of Public Works as a sort of blue ribbon commission on reconstruction of the Kamisy-damaged areas.

An architect at the Ministry of Urban Development & Tourism, Architecture and Construction Unit, did have a copy of the 1984 poster (shown in Figure 8) on his wall but otherwise could not provide copies of the booklets used. In fact, photocopies of this poster were shown to almost everyone interviewed in the three areas covered during this field review (Antananarivo, Antsiranana and Mahajanga) and numerous people recalled it, so we assume that at least a portion of the dissemination activity was effective, despite the lack of evidence that any training materials still exist.

When Cyclone Honorinina hit in 1986, Caritas was given the roof sheets left over from the USAID project in Mahajanga. They were offered the training booklets and they talked with the Cyclone Kamisy Construction Team leader, but Caritas says that the people in Toamasina could not afford to build stronger houses and Caritas could not afford to hire the team to establish a training program. There was not enough money from the sale of roofing materials in Mahajanga to start a new project in Tamatave. According to Caritas, most people in Toamasina lived in thatch and palm houses; they used the donated roof sheets and added their own walls of wood or other materials. We were told that the roofing sheets which were donated from the Kamisy program were sold to those in need for only the cost of the transportation. When asked about amounts of material or number of people aided after Cyclone Honorinina, we were informed that Caritas was an aid agency, not an accounting firm. They stressed that it would be impossible to account for the materials donated since they had no records of the program.

During our attempt to track the training aids, an official at the Ministry of Urban Development & Tourism said he thought John Rakotomanga took all the records and publications with him when the program was terminated. We heard variously from other

people that the program controller (an internal auditor) who still lived in Mahajanga might have records from the time when the project office closed down, or that the local Public Works office might have taken them. Both the official in Public Works and the program auditor assured us that, if the records still existed, they would surely be with the national project manager, Jean Rakotomanga.

The national project manager had always been a primary contact on our list for this study, and we had noted the need to contact him long prior to our departure for Madagascar. We never found him. We were told that he was overseas, that he was busy on a project, or that he did not wish to be contacted. Almost everyone knew him or of him and his involvement with the program, but no one -- USAID, SEIMAD, local architects, Public Works, et al -- knew how to find him beyond his known addresses.

A UNICEF official (originally from Mahajanga and familiar with/involved in the Lions Club relocation efforts there after Kamisy) knew nothing about the housing education classes and training aids. Aware of the continuing threat from cyclonic storms and the vulnerability of local housing, he expressed real interest in receiving copies of the training materials if we could ever locate them.

E. PROJECT DOCUMENTATION

A fair amount of documentation has been kept by the INTERTECT consulting team regarding planning, preparation for, and conduct of their portion of the project tasks. The draft "shelter-to-housing program" manual was adapted and used by them in other projects. However, they do not have final copies of the French translation of most of the training aids and have little documentation on activities subsequent to their involvement.

No documentation appears to remain at the AID Office of Housing concerning their role via RHUDO/ESA. An April 1986 AID/Washington mission to Madagascar to assist in development of a USAID Mission Disaster Relief Plan contacted John Rakotomanga concerning the team's work and was told that the project had evolved into a low-income housing project. As stated earlier, USAID/Madagascar discarded almost everything related to the project. No one seems to be able to verify the content of the project as it evolved from the rehabilitation period, and little documentation remains.

At AID/OFDA in Washington, project records are stored after a period of time. Presumably, the most important documents can be retrieved if a project officer sees the need to initiate a similar activity.

F. CONTINUING HOUSING PROJECTS

A USAID/Madagascar staff member visited Mahajanga in March 1991 after Cyclone Cynthia. At that time, he looked at some of the model houses (he only knew of 3) built in 1984. It was decided that the design was not suitable for use in a new program inland from

the city, since the area is prone to flooding and these houses were designed to resist high winds. Apparently USAID/Madagascar is not presently involved in any housing projects and has no plans in the foreseeable future to get involved.

The only ongoing housing work is a UNDP project, "Promotion of Small Scale Industries in Construction Materials and Building". There is also an "on again/off again" project of the European Development Fund (FED) which is currently on hold, to build some 1,500 houses in the three cities of Antananarivo, Toamasina and Mahajanga. It was intended that this project involve two options, one of which was sites-and-services development with the recipient building his own house, and the other an actual construction project where the implementing agency would build the houses and sell them at a subsidized price. The project was originally intended for low-income people but the cost of the houses is beyond their reach. They initiated a study to see who would be able to afford them, but this has been hung up in the recent political reorganizations.

With the current lack of financing and credit, there is no money from external organizations and little bilateral interest in sponsoring housing; combined with the push toward privatization, this situation is forcing SEIMAD to take a long, hard look at its future role in the housing sector.

From every perspective it appears that the reason there is no on-going program of housing construction is that it simply is not a priority in a country with no money. Where a country is totally dependent on outside investment, it loses its options.

FINDINGS

1. The field survey team for this study visited the two towns and environs in Madagascar that were served by the Kamisy Reconstruction Program. The program was slow in starting due to technical and political problems in the release of project money and association with a "home institution".
2. A number of houses were built in both areas. In both cases they were well-built, suitably strengthened wood-framed houses which remain for the most part in excellent condition to date.
3. Ownership of the model houses in almost every case proved to be problematic. In one instance the house had been built on land appropriated from the church by the local government for that purpose. The appropriation was later argued in court, and the land and the house were returned to the church. The demonstration house (which appears to be an early, over-engineered version) is now a rectory for the minister and his family.

In another area, the demonstration houses are kept locked under the guardianship of a former mason for the Kamisy project team. People in the area assume that the houses belong to the project manager, Jean Rakotomanga.

In still another location, a model house is now the home of the guard for the contractor who supervised its construction by the current resident and 4 others.

In the town of Anivorano, a model house is a locked storeroom.

4. The strengthening methods used in the model houses were appropriate. The houses are well-suited to resist high winds and they match the typical style of other houses in the area quite well. A number of them have been exposed to high wind storms since their erection and appear to have suffered little if any damage.
5. People directly involved with the project understand the strengthening principles well. However, those interviewed almost uniformly agreed that the improvements being taught were too expensive for most people to use. Even officials in the Ministries of Public Works and Urban Development & Tourism candidly admit that most people in Madagascar simply cannot afford the additional wood, nails, straps and cement advocated in the project design.
6. In Mahajanga, there is a general belief that many of the materials in the program were pilfered or the project abused by speculators who have profited from their resale.
7. The formal ministerial-level agencies involved with construction in Madagascar have institutionalized wind resistant design techniques for public buildings. This institutionalization is largely through the printing and distribution of the wind resistant construction handbook ("fascicule") which has been sent to all Public Works offices. This may have had its genesis in the Kamisy reconstruction training materials, but the booklet is plainly designed for use by engineers and construction professionals -- not lay persons.
8. The effect of the training component of the project could not be accurately assessed. This was due both to the lack of records indicating those trained and the lack of records about the training program itself. Memories are easily recalled of the training classes and even of the original technical assistance consultants from INTERTECT. Yet it is clear that, for most people in both towns, there has been no change in building techniques since the time of Cyclone Kamisy. The vulnerability of the communities has not been significantly reduced, even though there is evidence in some areas of continuing awareness of the threat and of ways to strengthen homes.
9. The program is remembered by most people as a materials distribution program, not a training program. Particularly in Mahajanga, a great deal of house repair was

facilitated by the USAID project materials, but records were not available to enable us to track down this usage in the short amount of time allotted. The assistance provided to schools and other public buildings, on the other hand, is fairly easy to verify through the *Faritany* and local Public Works staff.

10. The program was run in an administratively-undefined area between the Ministries of Urbanisme et Tourisme, Travaux Publics (Public Works), SEIMAD, and other "recovery agencies". This action, although possibly expedient at the time, has made replication more difficult, as none of the enduring ministries or agencies have the project experience or records, nor do they recognize the value of the investment.
11. Without follow-up and an institutional (whether public or private) commitment to the concept of achieving safer low-income housing, any momentum generated by the program stalled early on. The national government has defined other priorities for its scarce resources and allows much of its agenda to be set by international and bilateral investors who also show little indication of interest in this area.

CONCLUSIONS

1. Funding: Programs funded by complex monetization schemes may not respond quickly enough to be of real value for disaster management. After the early phases of the disaster, these funds might be well used for long-term development plans, including disaster mitigation programs. Where the two programs overlap as in this case (a mitigation scheme that makes use of the reconstruction phase after disasters), the funding may be guaranteed by this type of resource but must be supported immediately by easier-to-use/access money. This finally happened in this case, although several months were lost due to the need to search for funds after the team had already arrived in Madagascar.
2. Administration: One of the earliest problems faced by the INTERTECT team was the lack of any "institutional home" for this program. This problem, although troublesome at the beginning of the project, proved in the long run to be the undoing of any advances made. With the end of the Kamisy Team, all records were lost. All administrative experience gained in this type of program were lost. All of the materials designed for education of the public were lost. And ultimately accountability for the funds spent and success of the project were lost.

The second administrative problem faced was more basic. The program appears to have operated in an environment of corruption which painted all such projects as goldmines for the administrators and associated ministries, and as boondoggles in general. Even though the administrators developed systems to defend against abuse, it appears that they were ultimately unsuccessful in this regard.

Despite early reports that praised this project for its successes, the longer view of people involved directly and indirectly with the program is tainted with hints of impropriety. This varies from accusations that the names of those eligible for the program were put there for political reasons rather than for need, to stories of massive losses of materials through abuse of the program and outright theft.

Once the program ended, there was no longer any need to keep the records. In fact, if the accusations are true, this in some ways might explain the lack of records. No one with whom we talked was willing to document any association with the program beyond the peripheral. Even the USAID/Madagascar records have been purged.

This lesson is simple: the program would have served more people better and would have been much better-documented if it had been "cleaner". If the program was abused to the extent charged by some interviewees, then it was not in the best interest of those involved to monitor or record anything.

Sustainability: The program was designed to promote mitigation against cyclone damage in the housing sector through a grassroots approach which was intended to influence individual builders to rebuild their damaged houses better. This was accomplished in some cases, notably well in the town of Anivorano. However, general perception in both Antsiranana and Mahajanga is that the improvements taught are too expensive for most residents. With the end of the subsidized material distribution, the mitigation activity ended for all intents and purposes. The program ideas could not be sustained in the absence of the subsidy.

The model houses in Mahajanga and in Antsiranana could serve as sustainable technology dissemination points as well as a permanent record of the project. However, the disposition of such houses should have been designated together with the physical design. It should have been a priority for the project managers to help local authorities reach an agreement on how these decisions would be made early in the process. Houses in the community left vacant and unfinished or locked are not conducive to technology dissemination.

Laying the groundwork for what was basically a community recovery and development project was very time-consuming, as were the various delays, frustrations, political necessities and other issues that were faced by a small team of two consultants, trying to cover a large area and complete numerous tasks in a limited period of time. Where failure to achieve a sustainable product can be assigned to project design in this case is in the naivete of expectation that the team could fulfill the full intent of the contract in the allotted timeframe; development of an institutional framework suffered on both the national and community levels. Far more important for sustainability, however, was the failure of the extended support to the national project leadership through 1985 to accomplish the transition to a community-directed activity. Had the actual and intended extensions of support focused more effort on

affordable design adaptations, public awareness and community participation in project direction, a local constituency might have coalesced during this longer period of time.

ENDNOTES

1. This study uses the formal designations for city names, although in local conversation it is more common to refer to "Tana", Diego and Majunga.
2. According to the CPSP, 80% of the forest cover has been destroyed, half in the last 40 years, by subsistence farmers and cattle herders. [USAID/Madagascar 1992]
3. Social Indicators Data Sheet, World Bank, June 1984.
4. "From 1960 to 1980 the total population of Madagascar grew by nearly 100% while the urban population grew by 210%. Between 1980 and 1988 urban population has grown by another 30%." [Hobgood 1991]
5. On the executive side of the government (beyond the president, council, prime minister, cabinet and ministries), the country is administratively divided into 6 provinces called *faritany*. These in turn are composed of 111 districts (*fivondronana*), further divided into 1252 sections called *firaisana*, and finally sub-divided into about 13,455 villages or urban neighborhoods (*fokontany*).
6. Raffia is a pinnate-leafed palm native to Madagascar that is prized for the strength of its fiber and thus used in a variety of ways (e.g., binding, weaving, construction).
7. INTERTECT, "Madagascar Post-Disaster Damage Assessment...", 1984.
8. UNDP 1989.
9. Hobgood 1991.
10. Only two inspectors, for example, are on the Public Works staff in the city of Mahajanga.
11. AID/OFDA 1984.
12. As is often the case with well-intended relocation planning, it did not go as anticipated. First delayed in obtaining a site, then in securing the funding for the overall conduct of the project, the schedule was revised to begin works projects by Dec. 1, 1984, to prepare the new site. Most if not all of these apparently never got underway. Some residents say the area was too far from the old site. Many people have moved back to their original flood-prone sites. Population, land tenure and economic pressures have pushed others to join them and these low-lying areas continue to be densely populated.
13. Cable from U.S. Embassy/Nairobi, Oct. 1985
14. Hansen 1985.

15. Interview with M. René Ramamonjisoa at Caritas office, Antananarivo, March 15, 1993.
16. Martin 1986.
17. Embassy cable 1984.
18. Phone interview with Kent Hardin, INTERTECT Team Member, February 1993.
19. For FY84, 689.64 million FMG (15.3% of total available) were designated for "Cyclone Housing Repair", under which 3 projects had been approved by mid-1986; and a separate cyclone disaster fund was established with 1,079.28 million FMG set aside but under which no projects had been funded by mid-1986. [Robinson 1986]
20. Cuny 1984.
21. DAUH 1988.

ACRONYMS

CNC	Comité National de Coordination pour les Travaux de Réhabilitation des Dégâts Cycloniques (National Coordination Committee established after Kamisy)
CNS	Conseil National de Secours
CPSP	Country Program Strategic Plan, USAID
EEC	European Economic Community
FED	Fonds Europeen de Développement (European Development Fund)
FMG	Franc malgache/Malagasy franc
GOM	Government of Madagascar (formerly GDRM = Gov't. of the Democratic Republic of Madagascar)
MTP	Ministère des Travaux Publics (Ministry of Public Works)
OFDA	Office of U.S. Foreign Disaster Assistance, USAID
PL480	U.S. Public Law No. 480 Transfer agreement: Title I - Food loan on concessional terms Title II - Emergency Food Aid Gifts
REDSO	Regional Economic Development Services Office, USAID
RHUDO	Regional Housing & Urban Development Office, USAID
SEIMAD	Société d'Équipement Immobilier de Madagascar
SOCOTEC	Société de Contrôle Technique et d'Expertise de la Construction
TBM	National Building Code, Madagascar
UNDP	United Nations Development Programme
USAID	U.S. Agency for International Development, also referred to as AID

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