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More With Less
Managing Energy and
Resource Efficiently

Agency for International Development



**More With Less:
Managing Energy and
Resource Efficient Cities**

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More With Less: Managing Ener



Bureau for Science and Technology

gy and Resource Efficient Cities

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Cover photo: View of a main street in the commercial center, Phuket, Thailand.

Title page photo: Children near the MEREC rainwater collection urn that provides water for their preschool in Phuket, Thailand.

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Foreword

MEREC was an exciting idea in its formative days, full of promise. It is no less exciting now, five years later. The idea has become reality in three demonstration cities: Tacloban, Philippines; Guarda, Portugal; and Phuket, Thailand. More than that, the MEREC concept is spreading to other cities and rural centers in these countries, and the concept now brings with it the full benefit of a flexible and adaptable planning and management approach, tried and tested technologies, and an evaluation system that tracks impact sector by sector.

The MEREC story began as an idea. Inspired by Richard Meyer's timely and pioneering book, *Planning for an Urban World: The Design of Resource Conserving Cities* (The MIT Press, 1974), MEREC was developed by AID as a response to rapid urbanization and population growth in the face of high energy costs and increasing pressures on scarce natural resources, a combination particularly hard on the developing countries. Dr. William R. Miner, Director of the then Office of Urban Development in AID's Science and Technology Bureau, encouraged his staff in the development of the idea, and it was later put into action by that Bureau's Office of Rural and Institutional Development. The underlying assumption was that small but growing cities with most of their growth and expansion yet to come, could develop into the future using much more resource-conserving and economical approaches than had been practiced by the world's cities heretofore.

The way in which the MEREC approach was developed is somewhat unusual. It required the complete collaboration of the first MEREC demonstration city, Tacloban. The first MEREC team arrived in Tacloban in late 1981 to meet with Mayor Abdulia R. Cinco and her key department heads with little more than the MEREC idea and a summary review of the literature. The mayor liked the idea—that ways could be found in Tacloban to develop each sector of the city and the city itself in ways that would not only save scarce resources like land, water, electricity, and fuel, but also stimulate private initiative and development in the process. She also warmed to the realization that the team did not come armed with preconceived notions about how to carry out a MEREC project, that she and the city would have to help create the MEREC implementation process, and that this "pretest" in Tacloban was an integral part of the development of the MEREC project.

The enthusiastic support of the mayor and the city was engaged and the basic MEREC approach was created largely through their efforts, assisted by MEREC consultants for AID and several private consulting firms. The global MEREC project was approved within AID, thanks in large measure to the pioneering work done in the Philippines. The Tennessee Valley Authority was selected to implement the project for AID based on its experience in the resource field internationally and its more than 50 years of work assisting with the planning and development of small towns and cities in the TVA areas.

Work progressed in Tacloban and soon thereafter in the two other MEREC demonstration sites. The MEREC approach was refined and improved through application but never lost its underlying strength—reliance on local people and institutions to develop local responses to the basic MEREC challenge. That is why, as the reader will discover through reading this book, the MEREC approach differs in each of the demonstration cities but always achieves its energy and resource-conserving objectives.

MEREC

MEREC to date has been an experimental project. Those who shared in the risk taking were the USAID field missions in the Philippines, Thailand, and Portugal, without whose initial and continued support and guidance the demonstrations would not have been possible; the Tennessee Valley Authority and its highly effective and creative MEREC team led by James Gober; the author of this book, Avrom Bendavid-Val, who served as a consultant and inspiration and energy source throughout much of the project; and most important, the host governments and the MEREC cities themselves, without whose dedicated and resourceful leaders, technicians, administrators, entrepreneurs, and general citizenry, there would be no MEREC concept or project. In Washington, those sharing in the risk were the Asia and Near East Bureau of AID, which helped in the selection of and continued liaison with the three MEREC countries, and the leadership of AID's Bureau for Science and Technology which approved, funded, and encouraged this endeavor.

The risk phase of MEREC is over. The concept has proved adaptable to and effective in a variety of different situations. Already MEREC is being promoted and adopted in the Philippines, Thailand, and Portugal beyond the initial demonstration cities. The challenge and the opportunity now are to move the MEREC approach and its consequences into the global arena.

**Eric Chetwynd, Jr., Acting Director
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Ronnit Bendavid-Val provided research and editorial assistance.

The following people helped gather information about the MEREC demonstration cities during research field visits.

Tacloban:

Emmanuel Veloso, Mayor and MEREC Project Manager
Crescencio Gonzales, Public Services Officer
MEREC Sector Chiefs
Occupants of MEREC demonstration housing
Obdulia Cinco, Former Mayor and MEREC Project Manager

Guarda:

Manuel Porto, President, Central Regional Coordinating Commission (CCRC)
Abilio Curto, President, Municipal Council of Guarda
Joao Rebelo, MEREC Administrator, CCRC
Silva Afonso, MEREC Adviser, CCRC
Joao-Paulo Galvao, Public Affairs Officer, CCRC
Maria-Jose Castro, MEREC Coordinator for Guarda
Sergio Gamelas, Technical Support Unit, Guarda

Phuket:

Charoen Kiattikul, Vice-Mayor and MEREC Coordinator
Prapai Intakart, City Clerk and MEREC Secretary
Siri Teerajamorn, Public Relations Officer
Ruknarm Thongton, MEREC Assistant Secretary
Sunit Bunlimtheng, MEREC Assistant Secretary

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Chapter 1

Introduction

About The MEREC Project

Toward the end of the 1970s, the Agency for International Development became concerned about the heavy and growing urban demands on scarce energy and natural resources in developing countries. Research showed that unless cities found ways to improve the quality of urban life with relatively less resource consumption, unless they found ways to provide public services more efficiently, and unless they found ways to create new resources, their futures were bleak. Current trends in urbanization rates combined with rates of growth in urban consumption or destruction of fuels, land, water, wood, and other natural resources simply could not be sustained for long.

Most efforts to address the concern, by AID and other donors, concentrated on metropolitan areas. This stands to reason, since big cities are the largest, most intensive, and most dependent consumers of energy and natural resources.

But AID noted that smaller cities offered opportunities to build energy and resource efficiency into urban systems that were still in early stages of formation. If local transportation systems, waste management methods, water supply systems, building designs, industrial technologies, and land use patterns in smaller growing cities could be structured and managed for resource efficiency, those cities might never face the massive problems now confronting the large cities. Moreover, in smaller cities, existing resource inefficiencies often could still be corrected through relatively modest measures. Finally, experience indicated that institutional frameworks in smaller cities tend to be more accessible and flexible, making coordinated and timely responses to energy and resource concerns easier to achieve.

A decision was made to undertake an action-research and demonstration project concerned with improving energy and resource efficiency in rapidly growing smaller cities of secondary and smaller size. The project was named Managing Energy and Resource Efficient

Cities—MEREC. It was developed and managed by what is now AID's Regional and Resource Development Division, Office of Rural and Institutional Development, in the Bureau for Science and Technology.

AID's project planners reviewed available models for energy and resource projects but found in them little practical design guidance. They knew that the project should include multisectoral demonstrations in several selected cities and that each demonstration should involve leaders from all relevant agencies. But experimentation would be needed to figure out just what sort of approach to follow in the demonstration cities. This would be a learning-based project in which both the demonstration cities and AID would learn together what needs to be done.

To help in the learning process, AID enlisted the participation of the Office of Natural Resources and Economic Development of the Tennessee Valley Authority (TVA). TVA worked successfully with small towns in the Tennessee Valley of the United States for nearly 50 years. When TVA started in the Tennessee Valley, the characteristics of the Valley and its towns were very similar to those in many developing countries today. What TVA had learned about resource management in Tennessee Valley towns could be useful to cities participating in MEREC. Moreover, on the staff of TVA were technical specialists in a wide range of urban and natural resource management fields. If needed, these specialists could be called on to support the efforts of MEREC cities.

MEREC began with pilot testing in the city of Tacloban, Philippines, late in 1981. By mid-1982 MEREC was fully operational there. During 1983 two more demonstration cities were added: Guarda, Portugal, and Phuket, Thailand.

Where MEREC Worked

MEREC has been successfully at work in these three very different cities that range in population size from 40,000

MEREC

to 100,000. Tacloban is a regional commercial and administrative center and serves also as a small port. Guarda is a mountaintop town with a diversified economy and a cool climate. Phuket, also a regional administrative center, serves as a focal point for local tourism, tin mining, and rubber plantations. The national administrative systems of the Philippines, Portugal, and Thailand differ greatly; and the extent of independent municipal authority, technical capability, responsibility, and budget control varies greatly between the three cities.

Cities were selected and offered the opportunity to be MEREC demonstration cities by AID with the help of their national governments. While there were no economic, administrative, or geographic selection requirements, AID and TVA knew that MEREC would not work everywhere. There had to be tangible local interest in a project that involved a serious planning exercise to achieve greater energy and resource efficiency; there had to be sufficient local administrative and technical capacity to support a MEREC effort; and there had to be a recognized need for what MEREC promised. In short, there had to be local interest, capability, and motivation for MEREC. These qualifications were translated into a set of minimum criteria that a potential MEREC city should have:

1. Local support for a MEREC project, expressed by
 - readiness of local leadership, including the mayor, to give time and high priority to MEREC activity,
 - interest in improving the local planning and management processes, and
 - concern for energy and resource efficiency.
2. Technical, administrative, and financial feasibility of a MEREC project, in that
 - there is a reasonably well-developed municipal administration,
 - basic information requirements regarding resources and urban sectors can be met, and
 - sufficient financial and personnel resources will be available for the MEREC effort.
3. Need and usefulness of a MEREC project, in terms of the
 - urgency of local need for greater resource efficiency,
 - likelihood that MEREC will reinforce other ongoing local development activity, and
 - potential for replication in other cities of the country.

MEREC worked well in the three demonstration cities, so it can be concluded that MEREC would probably work well in any small city that met the minimum criteria. But another factor that was present in the three MEREC demonstrations was supportive participation by all levels of government and the private sector. Without this, there is very little that can be accomplished at the local level in developing countries.

The early pilot-test experimentation in Tacloban enabled the MEREC participants there, with the help of an AID/TVA team, to develop a core design for local MEREC planning processes. Each MEREC city was invited to elaborate and modify the core process to suit its own circumstances. But in every case the aim was to bring together local and national levels of government, research institutions, and the private sector to identify, design, implement, and demonstrate solutions to current resource-related problems; and to do so in a way that would also establish long-term patterns of efficient energy and resource use.

TVA was instrumental in helping the three MEREC demonstration cities learn from their own experiences and from each other. TVA staff traveled between the three cities, sharing the lessons of experience, innovative ideas, and the solutions to common problems. They dealt with administrative issues between the cities and AID, so as to minimize diversion from the MEREC process. They also helped prepare MEREC explanatory materials based on experience during the Tacloban pilot test as well as on experience with towns in the Tennessee Valley. And they brought MEREC representatives of the three cities together on two occasions to share experience and distill guidance, such as appears in this book, for other cities.

The MEREC planning processes led to packages of 10 to 20 local resource-efficiency projects that each city implemented. These included biogas digesters, rainwater collection systems, human waste fermentation tanks, master transportation plans, urban agriculture, land use plans, energy auditing, water system leak detection and repair, energy-efficient housing, and much more. MEREC cities monitored and evaluated the resource-efficiency gains resulting from each project and conducted educational programs about them for their citizens and for officials of other cities.

During the AID-funded demonstration effort, MEREC cities received small amounts of technical assistance from TVA specialists in various fields. Yet the "new" technologies and approaches used in local MEREC projects most often were already accessible in the city.

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The MEREC planning process created the means and opportunity for them to surface and be put to effective use.

Local project implementation started in the MEREC demonstration cities during 1984 and 1985. In all three cities, implementation was financed from a variety of sources in addition to MEREC implementation funds from AID. At the time of this writing, early 1987, implementation of most local projects is complete, and a substantial amount of data on their resource-efficiency and development benefits is available.

But in a sense, most of the projects will never really be "complete," because they represent permanent changes in the way things are done in the MEREC cities. In all three cities, further planning, implementation, monitoring, experimentation, and educational work is continuing without AID support.

It is safe to say that elements of the MEREC approach and philosophy are firmly established in each of the three demonstration cities, both among the public and among local leadership. There is a generally heightened awareness of the importance of good resource management and ways to practice it, and there is a more coordinated and resource-based approach to addressing the needs of the city. It also is clear that local projects completed and under way will continue to provide resource and development benefits for years to come.

In addition, the groundwork seems to have been laid for expanded MEREC-related activity in the countries of each of the MEREC demonstration cities. In one country, MEREC has already been expanded to seven additional cities; in another, the MEREC approach is being used as a basis for strengthening local rural governments; in the third, a MEREC conference for officials of small towns is being arranged in the MEREC city. In all three countries, one sees further applications of lessons learned through the MEREC demonstration. All this has no formal link with the original MEREC demonstration project, for which all funding and authority terminate by mid-1987.

About This Book

The MEREC demonstration cities have refined a planning approach that brings together a wide variety of

indigenous resources, expertise, and operating agencies to solve local resource-related problems; and to solve them through technological and management innovation. They have shown how improved management of urban resources increases development opportunities. They have designed, installed, and documented innovative applications of resource-efficiency technologies. They have shown how good plans can attract funds from other levels of government, the private sector, and donor agencies. They have provided models for forging new links among local government, the private sector, public institutions, and central government agencies. They have produced novel ideas for teaching resource awareness, and they have demonstrated how much can be accomplished with local initiative and resources.

This book is meant to help share the lessons of MEREC with a wide audience. It aims especially to provide information useful to policymakers and program managers. What is the MEREC approach? Who is involved in it? How does it work? What are the products? What are the costs and gains? What is needed to start it? What is needed to sustain it? What are some difficulties to be aware of? What kind of administrative capacity is needed? What kind of technical support is needed? What is a "resource-related" problem? What are the funding issues? Can it be employed in rural areas and cities of other size?

The following chapter describes the first MEREC demonstration city. Chapter 3 discusses the overall MEREC approach as it has been refined through experience. The next two chapters are devoted to the demonstrations in the other two MEREC cities. These chapters highlight the consequences of the unique administrative and environmental circumstances of each city and describe its local MEREC projects. Chapter 6 provides a summary of lessons learned from the MEREC demonstrations. It addresses specific questions that might be asked by policymakers and program managers interested in launching a MEREC-type effort in their own countries.

This book complements other MEREC publications that provide technical specifications of local MEREC projects, monitoring and evaluation data, MEREC training material, and step-by-step guidance for a local MEREC effort. These, and other sources for more information, are listed in the appendixes.



Chapter 2

Tacloban, Philippines

The City

Tacloban is a tropical city with a population of about 100,000, well over 70% of which is low income. It is located on the eastern shore of the island province of Leyte, on the eastern side of the central cluster of Philippine islands. Tacloban is Leyte's administrative center and a regional commercial center. The harbor and central commercial area bustles with passenger and trade activity on foot and in boats, buses, trucks, "jeepneys," private vehicles, motorized tricycles, and carts, in a bazaar atmosphere. There are small, elegant housing districts here and there, but most prominent are the large tracts of squatter settlements and public housing proj-

ects, and the many rural-style homes that appear to have remained in place as the town expanded out over nearby villages.

Tacloban is governed by an elected mayor, vice-mayor, and city council. It has a wide variety of municipal departments and offices, including a city assessor, engineer, agricultural officer, and development coordinator. The municipal government levies a property tax and a variety of fees. It is responsible for waste management and sanitation, land use planning, health services, local roads, drainage, parks and recreation, building and construction permits, business licenses, public markets and depots, and the like.

Tacloban

Local offices of national agencies are responsible for traffic planning and control, water supply, harbor management, national roads that pass through the city, education and school construction, police, and more. An electric cooperative linked to the national transmission authority is responsible for electricity distribution. Although it is not without its problems, a tradition of consultation and coordination among municipal authorities and local branches of national authorities is fairly well established.

Small city municipal government in the Philippines has more independent authority and responsibility, and more revenue collection capability, than is usually the case in developing countries. It is therefore not unusual for cities like Tacloban to take the initiative in major municipal improvement activities. Some authority that is distinctly municipal, however, is limited by a requirement for central government endorsement. For example, while the city has responsibility for land use planning, and for building and use permits through which land use is controlled, the central government must approve the city's land use plan for it to be a valid instrument.

Thus, in Tacloban, the MEREC administrative context was one in which municipal officials and local representatives of other levels of government were generally responsible for different major aspects of city management. While there was reasonably good communication among representatives of the municipal and other levels of government, there was no precedent for a sustained collective effort that encompassed many aspects of city operations simultaneously, and that examined the interrelationships among various sectors of municipal activity.

MEREC in Tacloban

The principal permanent participants in Tacloban's MEREC Steering Committee reflected the agencies with the greatest stake in what MEREC promised. They included:

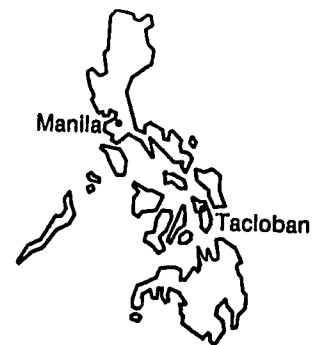
Municipal agencies:

- Office of the Mayor
- City Planning Office
- Public Services Office
- Public Works Office
- Office of the City Agriculturalist
- General Services Office



Opposite: Tacloban's city center, from a nearby hill.

Above: A scene in Tacloban's central commercial area.



National/Regional agencies:

Leyte Water District
Police Department
Electricity Cooperative

Other:

A private business leader

Other national agencies, such as those for education, housing, and energy, as well as other municipal offices, a local university, private firms, and private sector representatives were involved with the MEREC effort for different periods. They either participated for a time in the MEREC Steering Committee, or they worked with the sectoral Working Groups for limited specific purposes.

In Tacloban, not only did the Steering Committee and Working Groups meet on a regular basis, but MEREC progress was a formal agenda item at each monthly meeting of municipal department heads.

The resources of major concern identified in Tacloban were urban land, transport fuel, energy, urban waste, local building materials, and water.

The key urban sectors originally were land use, housing and construction, water/sewage/drainage, waste management, electricity supply, and transportation. It will be recalled that Tacloban was the site of the MEREC pilot test. As the pilot test was completed, a core MEREC process had been formulated, and Tacloban passed into its formal MEREC effort, another sector was added, MEREC education. This reflected the concern of the mayor that sight not be lost of what she felt was a principal purpose of MEREC, educating the public about resource efficiency. Resource Situation Reports were prepared for each of the resources of major concern. Primary responsibility for preparing them was taken by a representative of the agency most closely associated with the resource and that stood to derive the greatest benefit from more efficient use of it. These officials were supported by their own staffs, and sometimes by specialists from other agencies or by consultants.

Tacloban then developed a MEREC Strategy and summarized it in matrix format, as shown in an illustration in chapter 3. In fact, in Tacloban, as in the other two demonstration cities, a preliminary matrix was developed that was subsequently refined through a succession of discussions among members of the Steering Committee and Working Groups. In its final form, Tacloban's MEREC Strategy even included specific objectives for the MEREC education sector.

The specific objectives in Tacloban's MEREC Strategy reflected the following overall concerns about major local resources.

Urban land was being used in a way that was becoming an obstacle to development and in some cases was lying idle when it could be put to use in the public interest.

Consumption of expensive transportation fuel was very inefficient and added a cost to travel, commerce, and municipal operations that put a brake on economic development and public service provision.

Electric energy was used inefficiently, and in many cases unnecessarily, and was unreliable. Potentials existed for developing local alternative energy sources.

Management of urban waste was expensive, and the dump site was unsightly, unsanitary, and fast running out of capacity.

As families passed out of poverty and into the lower levels of the relative middle income group, their houses, whether privately or publicly built, tended to be constructed largely from materials imported to the area, such as cement, and to employ resource-inefficient housing designs. This denied a market to potential producers of local building materials and increased utility and public service costs.

Bay water, an important food source, was becoming polluted. There was considerable unnecessary use and system loss of potable water.

On the basis of its MEREC Strategy, with resource-efficiency objectives spelled out for each key urban sector, the Steering Committee and Working Groups hammered out a MEREC Action Plan. Tacloban's original Action Plan contained the following projects:

Land use sector

- Use of idle land for food and fuelwood production
- Development of a new land use plan oriented to resource efficiency

Housing and construction sector

- Design and construction of eight demonstration houses that are resource efficient and make use of local building materials
- Design and demonstration of a low-cost energy-efficient cookstove made of local materials

Water/Sewage/Drainage sector

- Reduction of water distribution losses

- Design and installation of oxidation ponds to reduce bay pollution from the city slaughterhouse
- Study of city slope system and development of a plan to reduce erosion and flood damage

Waste management sector

- Design, fabrication, and installation of centralized waste containers in main commercial areas
- Design and installation of a biogas digester at the city slaughterhouse
- Design and installation of a sanitary landfill that would eventually create additional urban land
- Design and introduction of pushcarts to expand waste collection services

Electricity supply sector

- Electric meter calibration to improve detection of system losses
- Study and recommendations for increasing overall efficiency in electricity distribution
- Energy auditing and consultation program for large electricity users

Transportation sector

- Development of a fuel-efficiency oriented master traffic and transportation plan

Education sector

- Demonstration of the results of MEREC projects
- Classroom education program
- Public awareness program

Some of these projects, such as the centralized waste containers, were carried out entirely by local staff of the participating organizations. Others, such as the slope study, were carried out with the help of outside consultants. In the case of the demonstration housing, design and construction management was done by local staff, but the fabrication of components and construction of the houses were contracted to local construction companies. In a few cases, such as the electricity supply sector, an expert from TVA visited briefly to provide advice and training to local staff.

Tacloban's original MEREC Action Plan was perhaps overly ambitious. Some of the projects in it were eventually combined, and some were postponed or substantially modified because they turned out not to be feasible in Tacloban at the time. For example, the oxidation pond

at the slaughterhouse was combined with the biogas digester as a waste management project, and the drainage study was incorporated into the land use planning project.

On the other hand, projects in Tacloban's "final" MEREC Action Plan, which are described in the following section of this chapter, gave rise to further MEREC-related activities in the city. These spinoff MEREC activities were embraced as part of the MEREC effort and followed closely or even adopted by the Steering Committee and relevant sectoral Working Groups. Here are some examples of MEREC spinoffs in Tacloban.

New primary school design. The Provincial Engineering Office developed a primary school design based on energy-efficiency principles. The new design arose out of lessons learned and experience gained through experimentation with eight different models of MEREC demonstration houses and features an energy-efficient roof design modeled after one of them. A new three-room school based on the design is planned for a site a few miles south of Tacloban. The model has been proposed by the Ministry of Public Works as a standard design for new schools in the administrative region in which Tacloban is located and will be adopted if the prototype proves successful.

Light-bulb bank. A city official in the Energy Working Group organized a revolving light-bulb bank when he heard about a low-energy light bulb that was available, but only in bulk orders. He convinced the Steering Committee to authorize the use of \$2,000 of MEREC funds for an initial bulk order. City offices and local institutions purchase bulbs from the bank as they need them, and with the revenues the bank periodically replenishes the supply. The initial investment is returned in energy savings.

Savings on municipal lighting. As a result of MEREC's influence, the Tacloban municipal government undertook a study of public lighting. It found that energy-saving 20-watt fluorescent lamps could be used for street lighting instead of the incandescent or mercury bulbs then in use, without compromising safety or convenience. A conversion program is now under way.

Traffic and transportation improvements. One of the projects in Tacloban's MEREC Action Plan was development of a master traffic and transportation plan. While MEREC funds from AID were used to develop the plan, they were insufficient to implement it. City maintenance funds are being used to carry out street marking, establishment of loading zones, and construction of

traffic islands. Businesses illegally occupying sidewalk space, forcing pedestrians into the street and congesting traffic, are being removed. A World Bank project is funding a new bus terminal. The city, the national government, and a World Bank project together are funding the widening of certain streets and extension of others to improve traffic flow to, through, and from the city. And a Tacloban Traffic Committee has been formed to coordinate transportation improvements. The committee includes representatives of the national police and land transportation agencies, and of the municipal engineering and planning offices. All these actions are components of the new traffic and transportation plan developed through MEREC and aimed at reducing congestion and the resultant waste of transportation fuel.

Sanitary landfill. To allow for more sanitary and efficient solid waste disposal, and to create additional urban land, a sanitary landfill was designed under MEREC. The city has purchased the land with its own funds, a World Bank project is funding development of the site to specifications, and AID funds have been used to purchase landfill equipment.

Centralized waste containers. Under MEREC, centralized waste containers were designed, built, and installed at high-traffic locations throughout the city in order to reduce fuel consumption associated with solid waste collection. As a continuation of that experiment, an improved container design has been developed by the city. Funding has been secured to construct and install 10 additional containers of the new design.

The Tacloban MEREC demonstration started well before the demonstrations in the other two cities, so there has been more of an opportunity for MEREC spinoffs to develop there. Similarly, Tacloban has been monitoring its local MEREC projects for a longer period and has therefore been able to watch unfold, and to record, more of the direct development, management, financial, and human welfare benefits of its resource-efficiency efforts. Many of these benefits, as associated with specific projects, will be presented in the next section of this chapter, but they can be summarized as follows.

- Resource efficiency aids commerce, creates jobs, and generates new private enterprise opportunities.
- Efficiency in water and electricity distribution increases the financial viability of the utilities, resulting in better service for less cost.
- An energy-efficiency approach to transportation planning also benefits commerce and enables individuals to make more productive use of their time.

- An energy-efficiency approach to municipal operations saves enormous amounts of money, enabling local government to provide better service.
- Resource efficiency through urban farming makes possible improved diets at virtually no monetary cost and therefore stands to benefit the poor greatly.
- Resource efficiency is a good focus for intragovernmental and intergovernmental management and development coordination.

Tacloban's local MEREC projects, and the Tacloban MEREC demonstration as a whole, have been noticed in the Philippines. Citizens of Tacloban see objects with the MEREC logo everywhere, hear about it on the radio, and are exposed to a continuing series of MEREC training programs, exhibits, projects, and demonstrations. A number of ideas associated with MEREC demonstrations have already been picked up by others elsewhere in the city. Visitors from other Philippine cities and other donor agencies visit Tacloban to learn from the MEREC experience, and often to learn how to copy specific local projects. Some projects are already being replicated in other cities. In mid-1987 Tacloban hosted a conference and is participating in a training program for officials of other small cities throughout the Philippines.

Although MEREC is now fairly well integrated into routine municipal operations, and despite a change in government, MEREC continues to be an important agenda item at Tacloban's City Hall. In fact, Tacloban's most recent annual report contains a special section devoted exclusively to progress and results of MEREC projects. One reason for the continuing interest in MEREC, despite the fact that the AID-supported demonstration has been concluded, is that MEREC participants have seen benefits accrue directly within their own sectors.

Because the mayor in Tacloban during the AID-funded demonstration had a background as an educator, MEREC in Tacloban had a particularly innovative education component. There were MEREC jingle contests in the schools and MEREC quizzes on the radio. One Tacloban educational innovation is the MEREC T-shirt, which is given to students from other cities who visit MEREC projects. During their visits they receive an overall explanation of MEREC, as well as a presentation on the particular project. The MEREC team has found that when the students return to their home towns and put on their T-shirts, people ask them what "MEREC" is. In this way, students who visit MEREC projects in Tacloban become disseminators of MEREC principles, concepts, and ideas.

Tacloban's MEREC Projects

Urban Farming

The urban farming project was designed to make use of idle urban land for food and fuelwood production. Vegetable gardening was undertaken in 10 neighborhoods, on demonstration plots of 1,000 square meters each; livestock production was undertaken in 10 neighborhoods, involving an average of 15 pigs and 4,000 kilograms of chickens each; and plantings of fast-growing ipil-ipil trees (*leucaena*) for fuelwood were undertaken in 10 neighborhoods, on plots of 1,000 square meters each.

MEREC funds from AID were used to purchase seed, fertilizers, livestock vaccines, and tools. They were also used to purchase a motorcycle and sidecar for distribution of seed and other farming materials and for sending speakers and equipment to neighborhood urban farming training meetings. All other costs were borne by the city.

The staff of the City Agriculturalist's Office identified suitable idle urban areas, organized interested individuals in each neighborhood, and helped participating families get started on their plots. In the first 18 months of the project, an estimated \$10,500 worth of vegetables were harvested, \$263,000 worth of livestock went to market, and 1,500 bundles of firewood valued at \$850 were produced. But more important are the nutritional benefits for participating low-income families.

The urban farming project is now under expansion, supported entirely by the city with the help of civic organizations. Urban farming sites at 25 schools have been designated, totaling 11 hectares. The aim here is to instill the value of urban farming in school children through hands-on experience. The City Agriculturalist's Office has a goal of an additional 9 hectares under cultivation in neighborhoods, for a total of 20 additional hectares, by December 1987. To some extent the program is now self-sustaining, producing its own seed, saplings, chicks, and piglets. Although run by a municipal department, the program makes extensive use of volunteers.

Land Use Planning

Under Tacloban's MEREC land use planning project, a new resource-efficient land use plan has been developed for the city. Studies in preparation of the plan utilized aerial photography as well as conventional statistical means to help assess land slopes, land types, current land use, and best land use.

MEREC funds from AID paid for aerial photography, topographic mapping, and soils analysis; all other costs, including preparation of the actual plan, were borne by the city.

The new plan has been approved by the Regional Technical Review Committee for the region that includes Tacloban, a committee chaired by a representative of the Ministry of Human Settlements.

In the new land use plan a major emphasis is placed on growth centers that will cluster residential, commercial, and light industrial development in tight growth nodes and will encourage light industry and institutions such as schools to be dispersed throughout the city. Dispersed light industrial development will help locate jobs closer to homes, shortening home-to-work trip distance and conserving transportation fuel. The overall objective of the plan is to control areas of growth in a way that will make for the most efficient use of urban land in light of drainage patterns, the most efficient expansion of utilities such as electricity and water, the most efficient traffic flow, and the most efficient expansion of public infrastructure.

Because of public hearings held in connection with development of the plan, this project has served as a vehicle for introducing Tacloban's citizenry and institutions to urban resource-efficiency concepts. The focus has now shifted to means for implementing the plan.

Demonstration Houses

Under this project, eight demonstration housing units were designed and built, forming a MEREC Demonstration Community within a public housing area. Other houses in the area were designed and built by the National Housing Authority in accordance with its standard designs.

The objective was to demonstrate siting and design principles that maximize comfort and functionality with minimum use of public utilities, that utilize higher proportions of local building materials, and that are more self-sufficient and less expensive than equivalent conventional housing. The housing units are designed for the lower middle income market, where habits of energy and resource waste usually begin.

The houses incorporate design principles that encourage a cooling upward air flow even when windows are closed. While conventional equivalent houses use cement for flooring, galvanized iron for roofing, and concrete block for wall surfaces, the MEREC demonstration houses utilize a variety of alternative local materials for these

components. Alternative materials include coco slab, "bahi" (palm) siding, oil-tempered lawanit, plywood, marine plywood, bamboo, clay tile, timber bark, nipa (palm leaf), and clay block, some of which were previously thought of as waste materials.

In the yards of the housing units are pigpens, chicken coops, biogas digesters charged by livestock waste, rain-water collection tanks, and areas for growing vegetables.

MEREC funding from AID paid for construction of the houses, at an average cost of \$6,500. These costs were estimated to be approximately one-third higher than would be the case if the materials used were all readily available on the market and if local builders were familiar with construction procedures and materials used in the demonstration designs.

Land, design work, and construction management were provided by the city. The housing units are occupied by volunteer families who pay rent to the city, which uses the rental revenues for further demonstration activities.

Local private contractors were engaged for construction of the houses. In the course of their work, with the help of the MEREC Housing and Construction Working Group, they learned new resource-efficient design and construction techniques and learned to work with locally produced building materials. Opportunities for private businesses to manufacture ceramic roofing tiles, bamboo construction members for modern housing, and other building materials were created through the demonstration.

In a recent interview, a family living in one of the MEREC demonstration housing units in Tacloban described a typical day in this way:

As the sun begins to hit the house in the morning, the hottest air rises and escapes through vents in the roof, starting an updraft that continues and cools the house all day. When rain-clouds appear, we know that the rooftop rain-water collection system will be storing free potable water. The morning meal is cooked on a double-burner gas stove connected by tubing to the biogas digester partially sunk in the ground of the backyard, near the piggery and chicken coop. Each morning we wash down the piggeries and the concrete floor under the chicken coop, and the waste flows by gravity into the biogas digester. We have 1 sow and 7 piglets, and 200 chickens. Some we use for ourselves, and most we sell on the market.

Our oldest son is responsible for recording temperatures in the house at different times of

the day, utility use, and backyard production. He turns this information in to the MEREC people monthly and also stays in touch with them about design problems and the results of our own experiments.

At the end of the workday when we return home, we work in our flower and vegetable gardens. As the sun sets, some of us often tinker with one thing or another, such as experimenting with modifications to a gas lantern that will enable it to operate on methane from the backyard digester.

We often spend the early evening preparing for guests who will be dropping in. We like to serve as much as possible from our own yard, and often can offer papaya, bananas, chicken, roast pig, and more. It is all cooked, of course, on backyard gas.

We get many visitors, and enjoy showing them our special house and how productive our small yard is. We buy no fuel and use relatively little electricity and water from the public systems.

Monitoring data show that the MEREC demonstration houses are 2-5 degrees Celsius cooler than conventional counterpart units, partly accounting for the 30% average savings on electric bills that occupants experience relative to their neighbors in conventional housing. Rain-water collection systems save occupants an average of 40% on water bills. The estimated value of the water stored and utilized from the storage tanks is \$213 per year for the eight houses.

Each family raises an average of 5 pigs and 150 broilers, at a profit of \$20 per month. The estimated value of backyard vegetable production is \$3,244 per year for the eight housing units. The methane gas produced by each biogas digester is the equivalent of two to three small bundles of firewood daily, adequate for all cooking requirements, with an annual value of about \$550.

Experimentation and demonstration activities continue in the MEREC Demonstration Community, without AID assistance. Experimental modifications are being made in component designs, materials, layouts, and backyard farming in attempts to further improve comfort, convenience, resource efficiency, performance, or durability.

The city has an active demonstration program built around the MEREC community that involves builders, visitors from other cities, students, central government officials, and the general public of Tacloban. Terms of rental of the demonstration houses require that occu-

Tacloban

MEREC DEMONSTRATION HOUSING PROJECT
 Monthly Monitoring Report
 MEREC, Tacloban City
 Monitoring Data Sheet
 For the Month of _____, 19__

Name of Occupant: _____
 Type of House: _____

A. Comfort—Temperature in °C

Date	MEREC House		Non-MEREC House		Date	MEREC House		Non-MEREC House	
	11:00AM	3:00PM	11:00AM	3:00PM		11:00AM	3:00PM	11:00AM	3:00PM
1					16				
2					17				
3					18				
4					19				
5					20				
6					21				
7					22				
8					23				
9					24				
10					25				
11					26				
12					27				
13					28				
14					29				
15					30				
					31				

B. Biogas Utilization

1. Cooking _____
2. Lighting _____
3. Ironing _____

C. Livelihood Projects

Name of Project	Harvest		Number of Swine/ Chicks Maintained	Sales	Cost	Income/Loss From Sales
	Kilogram	Amount				
Vegetable Garden						
Poultry Project						
Piggery Project						

- D. Monthly Electric Consumption:** _____ kw.
 Monthly Electric Bill: _____ ₱
 Monthly Water Consumption: _____ kw.
 Monthly Water Bill: _____ ₱
 Others: Specify _____

E. Number of Visitors: _____

Respondent:

 (Name)

 (Date)

The monitoring form used by families living in Tacloban's MEREC demonstration houses to record daily temperatures, biogas utilization, backyard farming production, water and electricity use, and visitors to the demonstration site. Note that temperature readings are taken twice daily and compared with readings in non-MEREC houses. The forms are collected and tabulated monthly.

MEREC

pants maintain records on resource-efficiency indicators and that they stand ready to act as guides and educators for visitors.

Some of the demonstration principles concerning use of local building materials have already been adopted elsewhere in the city in both housing and commercial establishments. Energy-efficiency principles have been incorporated into the design of a new primary school. There are now local contractors, producers, and traders with experience in various elements of the demonstration houses, who are able to supply services and goods for application elsewhere.

In 1986 one of the families living in the MEREC Demonstration Community was blessed with a new child. In what is perhaps the ultimate personal expression of appreciation for what the demonstration community represents, the new baby girl was named Mecer-Anne.

Water Distribution System

At the start of MEREC, system efficiency of the Leyte Metropolitan Water District (LMWD) was 53%. Put a different way, nearly half the water that entered Tacloban's distribution system, according to meter readings, disappeared before reaching users. Some was lost through leaks in the distribution system, some went unrecorded owing to faulty meters, and some, perhaps, was lost through meter tampering and illegal connections to water lines. This represented a serious financial problem for LMWD, as well as a problem of serious resource waste. The objective of this project was to raise water system efficiency by at least 5% in the first year.

MEREC in Tacloban worked with LMWD to carry out this project and encourage water conservation through educational activities, but no MEREC funds from AID were allocated to it. LMWD felt it should be able to achieve the objective using its own resources, and that the required actions would be more sustainable in the long run if it did so.

The project entailed a series of activities, including:

- leak detection and repair;
- installing tamper-proofed flow meters on neighborhood water mains to aid in leak detection and household water meter calibration;
- calibrating individual user water meters;
- installing anti-tampering guards on water meters;
- adding staff so that meters can be read monthly.

LMWD planned out its project and began work in January 1983. By January 1984 a system efficiency of 61.2% had been achieved, surpassing the original objective. Within another 18 months, the water distribution system achieved an efficiency of 75%. Efficiency has continued to improve since then, but at a reduced rate, because at this level of efficiency additional gains are harder to achieve.

Since the start of the project, water billings and revenues have increased substantially, though it is estimated that there has been only a slight increase in actual water consumption by metered users. Savings accruing to LMWD as a consequence of actions taken in the first 2 years alone amounted to nearly \$140,000. Much of this represents savings that will continue to accrue—or losses that will not occur—each year.

Activities initiated under the MEREC project are now a routine part of LMWD operations.

Solid Waste Management

This three-part project grew out of the urban waste Resource Situation Report, which examined the resource potentials of all types of urban waste. However, the report could not help but look as well at the ways in which other resources, such as urban land and transportation fuel, are consumed in the management of urban waste. And so, the three "subprojects" of the solid waste management project aim at reducing the cost of solid waste collection, extending and improving solid waste collection, and converting solid waste into an urban resource.

The first subproject was to design, construct, and install large centralized solid waste containers in the main commercial areas of Tacloban. The purpose was to improve solid waste management by providing an alternative to placing piles of waste on the street, and to reduce fuel consumed in waste collection by reducing the number of stops for waste collection vehicles.

MEREC funds from AID were provided for the construction of ten metal containers. The city funded 10 additional containers and used municipal staff to design and install them.

Monitoring data show the containers responsible for a 12.4% reduction in fuel used per cubic meter of solid waste collected, and there are additional savings associated with more efficient vehicle and manpower use. Moreover, sanitation in the areas served by the containers is materially improved.

On the basis of experience with the first 20 containers, the city has now improved their design and is building and installing 10 more.

The second solid waste management subproject was to experiment with pushcarts for waste collection. The purpose here was to make better use of collection trucks and the fuel they consumed by using pushcarts to collect refuse on a house-to-house basis and then concentrating it at truck pick-up points. MEREC funds from AID were provided for the construction of five pushcarts. The city has hired 11 additional workers to staff them.

Monitoring data show the pushcarts accounting for a 17.4% decline in fuel consumption per cubic meter of waste collected. Thus, the pushcarts and centralized waste containers together account for a reduction of nearly 30% in fuel consumption per cubic meter of waste collected. Eleven new jobs have been created, with salaries covered by savings, and sanitation has been improved. One area served by two pushcarts extends or improves service for about 15,000 people.

The pushcart experiment has passed into routine waste management procedures, and the city will be adding more pushcarts to service additional areas.

The third subproject was to design a new sanitary landfill. The purpose was to replace an open dump with a landfill that could eventually be redeveloped to create additional urban land. The design and siting were to improve sanitation, facilitate separation of waste for recycling, and reduce fuel consumption in waste management.

A new site was located and acquired with city funds, and MEREC funds from AID were used for landfill equipment. The new site is located only 3 miles from the city center, which will result in an estimated fuel savings of 20% to 30% in the fuel cost of solid waste collection, and will also eventually produce additional high-value land needed for city growth. A World Bank project is funding development of the site.

Slaughterhouse Biogas Plant and Oxidation Ponds

The purpose of this project was to convert a waste disposal and pollution problem into the means for producing new resources. MEREC funds from AID were used for construction, and the city funded construction supervision and adjustments required during the initial period of use. Local contractors performed the construction.

The first component of the project was to design and install a biogas plant at the city slaughterhouse. The basic

design of the biogas plant is an adaptation of the Maya Farms model developed in the Philippines. Animal wastes are washed from slaughterhouse holding pens to a mixing sump, where they form a mixture of approximately one part manure and two parts water. Once a day, the contents of the mixing sump are charged into the digester chambers, where anaerobic decomposition takes place.

Biogas is collected in a separate floating gas holder. In the process of decomposition, the solid portion of the waste is fermented into sludge and liquid effluent, which escape through an outlet pipe during the daily charging process. The sludge is ultimately recovered for use as soil conditioner available to area farmers, and the liquid flows through canals to oxidation ponds. The methane gas is used to heat the slaughterhouse scalding vats.

The gas produced by each day's charging is sufficient for all slaughterhouse requirements for the following day, representing a savings of 15 large bundles of firewood daily.

The second component of this project involved design and construction of a system of two oxidation ponds. Effluent from the biogas digester and washings from the slaughterhouse floor and holding pens are directed to these ponds. Through the settling and oxidation processes of these ponds, the biochemical oxygen demand (BOD) of the effluent, which is discharged into nearby bay waters, is reduced by 90%. As with the sludge from the biogas digester, sludge sediment from the ponds is used for soil conditioning by farmers in the area and also by the city on public lands.

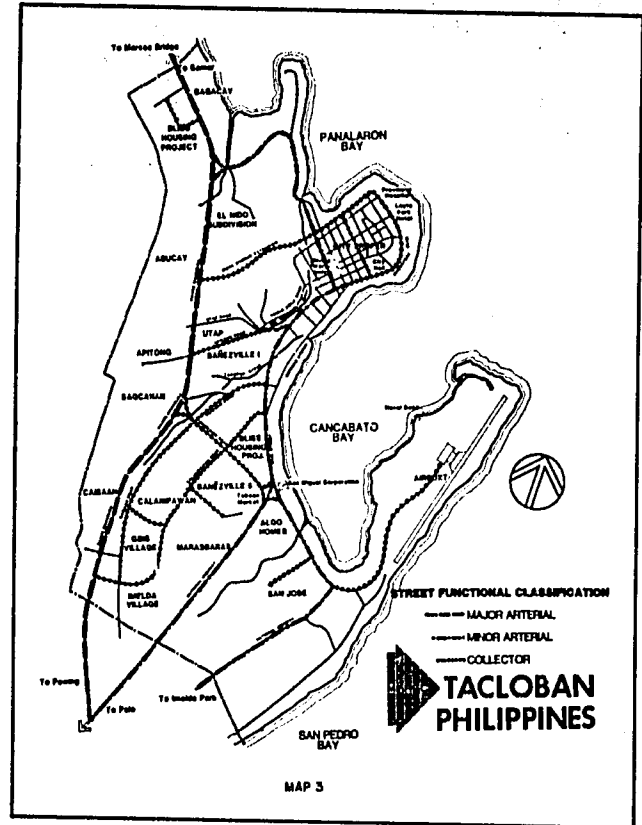
Electricity Efficiency

This project included three principal components: electric meter calibration, distribution system improvements, and energy audits. Leyeco II, the electricity cooperative serving Tacloban, recorded an efficiency level of 68% at the start of MEREC. Put otherwise, 32% of the electricity purchased by Leyeco II did not reappear on the meters of consumers. The objective of the project was to increase system efficiency to at least 84%, and to help large institutional and commercial consumers reduce their electricity consumption.

MEREC funds from AID were used to purchase a meter calibration device. Experts from TVA helped the cooperative to design a program to increase its operating efficiency and trained Leyeco II staff to conduct energy audits.



TACLOBAN TRANSPORTATION PLAN



Staff of the cooperative had tested and calibrated over 2,000 consumer electric meters by the end of 1986, and the calibration process is now a continuing activity of Leyeco II. Monitoring data show that faulty meters account for approximately 10% of the distribution system loss.

Leyeco II is implementing its new distribution system efficiency improvement program developed under MEREC, which includes:

- theft and diversion prevention activities;
- large customer use review and meter connection adjustments;
- repair of malfunctioning voltage regulators in substations.

The efficiency objective has been achieved, and estimated annual savings of over \$200,000 accrue to Leyeco II. The energy auditing program continues, but data on individual user savings are not yet available.

Traffic and Transportation Plan

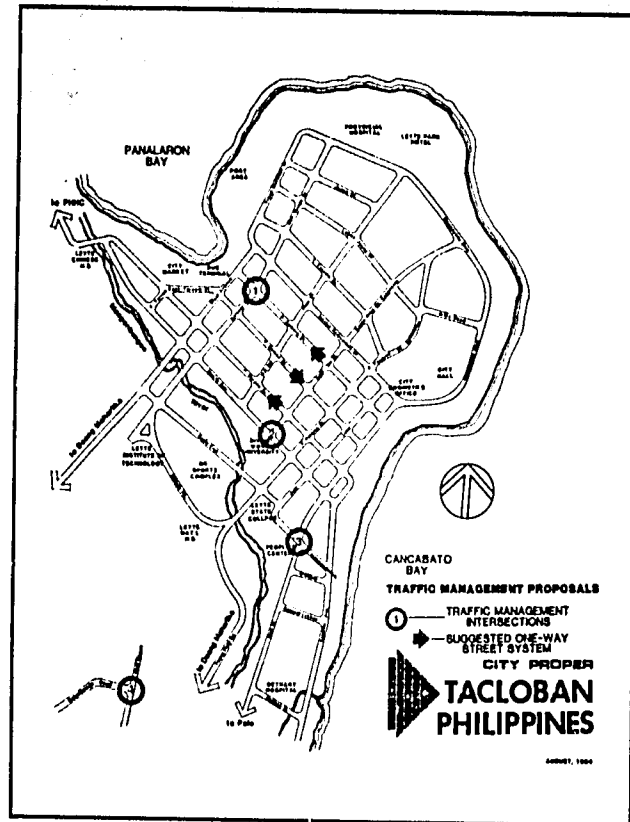
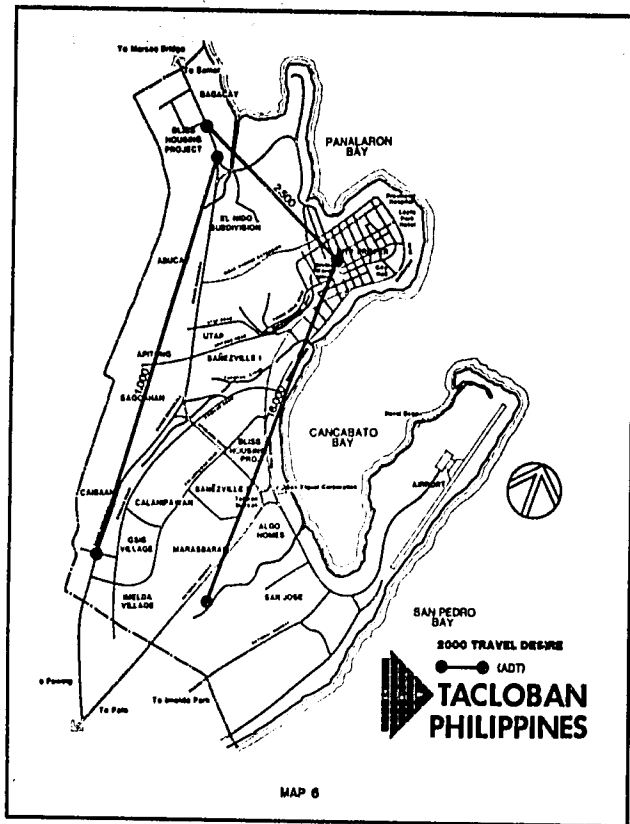
Vehicular and pedestrian traffic flow through the city center of Tacloban was chaotic, congested, and clearly very fuel inefficient. This project was to develop a fuel-efficiency oriented traffic and transportation plan. A

transportation planning specialist was provided by TVA, and primary responsibility for plan coordination was taken by the local office of the National Police.

The new transportation plan, coordinated with the new land use plan, has been completed. Its key elements include:

- rerouting through the introduction of one-way streets;
- a new bus terminal;
- establishment of loading zones in commercial areas;
- new street markings, signs, and traffic islands;
- removal of businesses illegally occupying sidewalk space and forcing pedestrians into the streets, increasing traffic congestion;
- new parking patterns;
- widening pedestrian lanes;
- widening and extending main arteries to, through, and out of the city;
- establishment of an interagency Tacloban Traffic Committee to coordinate traffic improvements.

All elements of the plan have either been executed or are in progress, utilizing municipal, national agency, and non-AID foreign donor funds. The MEREC Transpor-



tation Working Group also undertook design of a traffic information project to educate citizens about the new transportation plan; this was eventually incorporated into activities of the MEREC Education Working Group.

Even the so-far partial implementation of the traffic and transportation plan has had material results. Vehicular and pedestrian traffic flows more smoothly through commercial areas, and though undocumented, the transportation fuel savings cannot be denied; access to commercial establishments has been improved. Complete implementation of the new plan promises further dramatic easing of congestion and further fuel savings for Tacloban.

MEREC Demonstration, Classroom Education, and Public Awareness

As part of Tacloban's MEREC effort, a regular program of demonstration activities was begun and continues to be conducted. These include a program of visits to MEREC projects for college students; tours for visitors from other cities, central government agencies, and donor institutions; and neighborhood demonstration, training, and education meetings.

The cover and three maps from Tacloban's MEREC Transportation Plan. The first two maps are a functional street classification and a trip demand estimate for the year 2000 for Tacloban;

Municipality; the third is the street pattern of the city center, with proposed traffic management intersections and one-way streets.

MEREC

MEREC in Tacloban has also featured an extensive program of classroom education in resource-efficiency principles involving teacher training, urban farming, and other elements. One innovative aspect of the classroom education program was a resource-efficiency jingle contest among public school students. The jingles of contest winners, in the local dialect, received wide publicity.

Following are translations of some of the winning entries.

Gas, gasoline, water,
and electricity
Must be conserved for
The country's prosperity.

Let us bear it in mind:
Collect all wastes and make a
compost pile;
Grasses, leaves, and waste are
all that's needed for robust
plants.

If we use energy the proper way,
It will help advance the nation's
prosperity.

Pick up and don't burn scattered
pieces of papers in the yard.
Waste papers, like bottles and cans
are convertible to money, and
when collected also clean our
yard the SARILING SIKAP way.

Switch off lights,
put out fires in your stove.
Save water, and so much energy
will be conserved.

Public awareness and education campaigns have included a variety of innovative approaches. MEREC T-shirts and other elements, such as traffic education, were mentioned earlier. Local radio spots on MEREC activities are aired regularly. Extensive use is made of the MEREC logo and slogans throughout the city. And radio quizzes (the prize is a bag of rice) have been conducted through the local radio station.

Examples of radio quiz questions are:

- What does "MEREC" mean?

- What can we get from animal wastes, such as pig manure and chicken dung, that can be used for cooking food?
- What materials have been used for roofing in the eight houses of the MEREC Demonstration Community?
- What is the project at the Tacloban slaughterhouse that helps improve sanitation, controls pollution, and creates resources?

Conclusion

The array and accomplishments of Tacloban's MEREC projects are indeed impressive. As we leave Tacloban and move on to a fuller discussion of the overall MEREC process in the next chapter, it is useful to consider some general impressions that come from Tacloban's MEREC experience.

The leadership of the Tacloban MEREC effort can be characterized as a combination of national/regional agencies and municipal departments working cooperatively under the committed guidance of a dynamic mayor.

Tacloban showed that to achieve progress in improving city life, local government need not be restricted by limited central government budget allocations or local revenues. Rather, it can take the lead in creating new resources and in using existing resources more efficiently and effectively; and in doing so, it can help create new employment and income opportunities for its citizens.

Tacloban showed that this does not necessarily mean big, expensive construction projects. Relatively modest efforts can count for much if they are well-planned and undertaken in the context of a larger local planning process.

Tacloban was the first MEREC city. Through application of the core MEREC process it refined many procedures and put in place technologies later adopted elsewhere.

It adapted MEREC to its own circumstances so successfully because it took a learning approach to the MEREC effort. This approach recognized the importance of adaptive experimentation and learning from experience.

Tacloban

In fact, education was a particularly strong theme throughout the Tacloban MEREC demonstration. The whole MEREC effort was seen as an opportunity to educate the citizens and youths of the city, for it was recognized that this was essential for MEREC to have a lasting effect. All along, there was an emphasis on involving people in the process and on demonstrating to

them how much can be done with so little if resources are used to best advantage.

Most important, Tacloban demonstrated that in the fields of energy, water supply, construction, transportation, and more, means for improving the quality of urban life are readily available if human resources are bent to managing natural resources efficiently.





Urban farming in Tacloban, Philippines. Through the city's MEREC urban farming project, idle land is being put to use by low-income families for livestock, vegetable, and fuelwood production.



A public presentation of Tacloban's new land use plan prepared as part of its MEREC effort. The plan is coordinated with a new transportation plan and with proposed utility extensions. It emphasizes

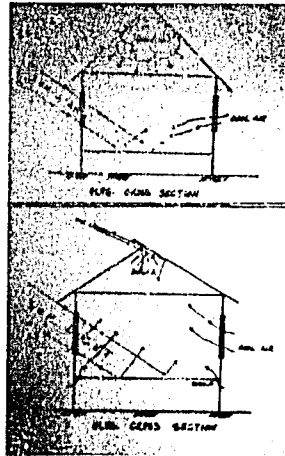
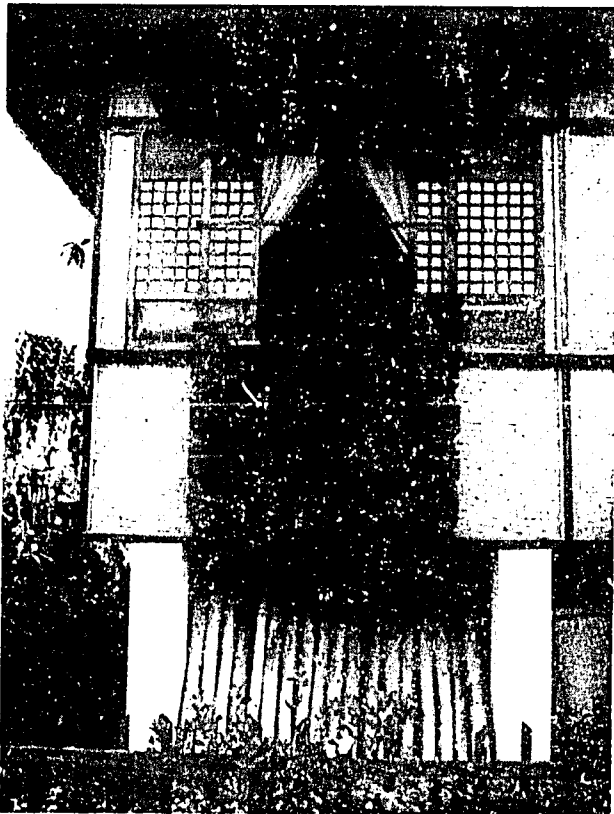
efficient use of urban land and minimization of travel distances. Photo by Tennessee Valley Authority.

Tacloban



Under Tacloban's MEREC demonstration housing project, eight houses incorporating resource-efficiency principles and local building materials were designed and built. The upper photo shows one of the MEREC demonstration housing units under construction. The lower photo shows the counterpart conventional home of a family living near the MEREC demonstration houses. Upper photo by Tennessee Valley Authority.

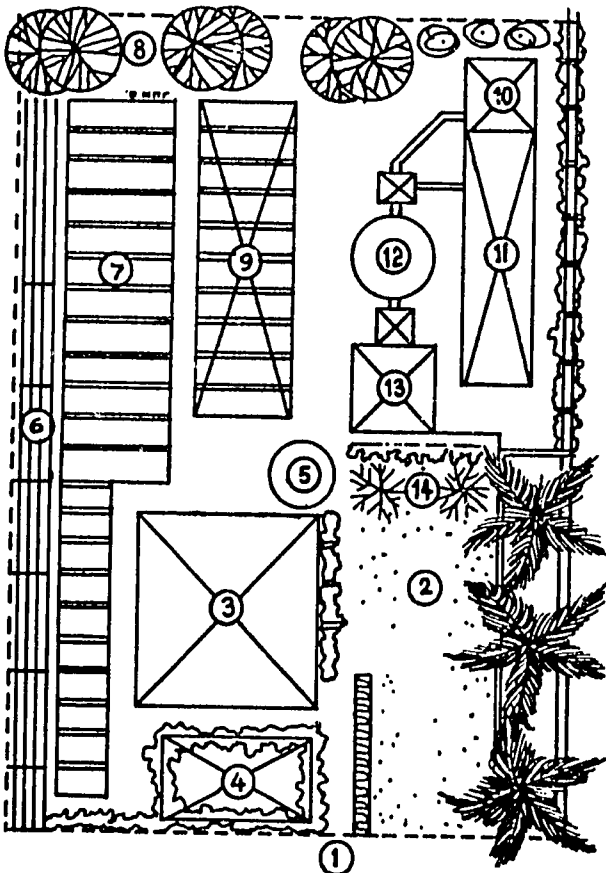
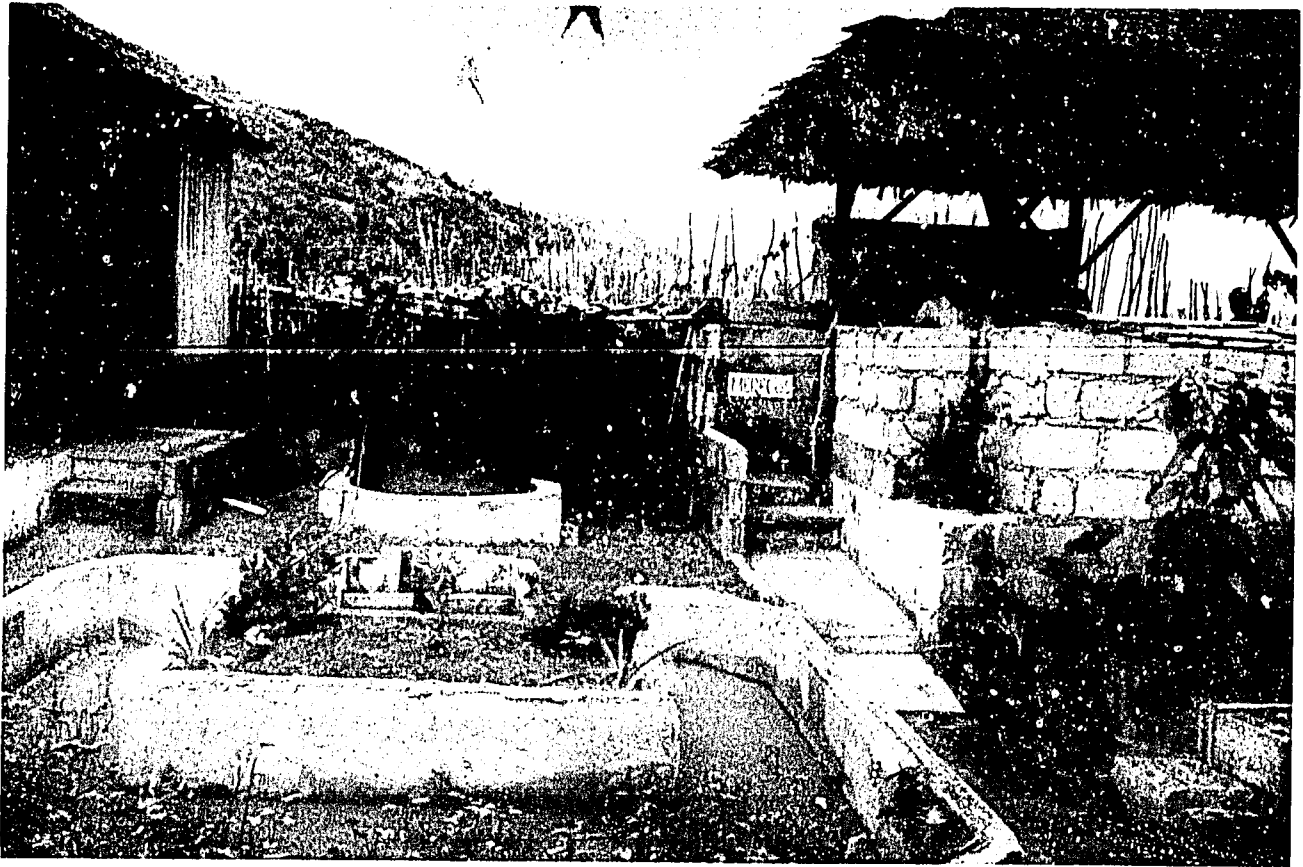




Top: A completed MEREC demonstration house, built entirely with local building materials and incorporating resource-efficiency design principles, in Tacloban, Philippines.

Far left: A corner of one of Tacloban's MEREC demonstration houses. The window design allows cool air to be drawn into the house even when the window is closed.

Left: A diagram used by Tacloban's MEREC Housing and Construction Working Group to explain the cooling air circulation principles employed in demonstration houses.



Top: The backyard of one of Tacloban's MEREC demonstration housing units. The family that lives here uses solid residue from its biogas digester, the cylindrical object in the center, to enrich the soil of a flourishing backyard garden. The digester is charged with waste from the pig pen, upper right, and the chicken coop, a corner of which is seen in the upper left. Liquid residue from the digester is channeled to enrich a small pond, in the foreground. In the pond, the family raises fish and edible snails, vegetables for home consumption, and azola. Azola is a highly nutritious feed for the pigs, and is also nitrogen-fixing, which improves the growth of the vegetables. Methane gas produced from the digester fuels the family cookstove.

Left: Typical layout of one of Tacloban's MEREC demonstration housing units, as shown in the city's annual report. Key to the numbers: (1) Entrance, (2) Open court, (3) House, (4) Flower garden, (5) Rainwater tank, (6) Trellis, (7) Vegetable plots, (8) Fruit trees, (9) Service area, (10) Pig pen, (11) Chicken coop, (12) Biogas digester, (13) Decantation tank, (14) Shrubs.



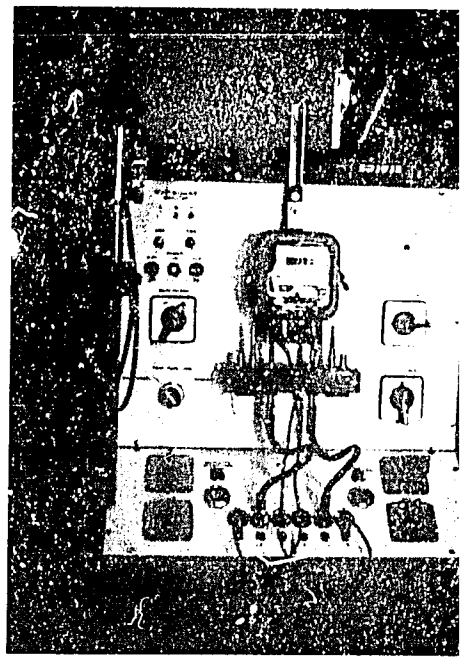
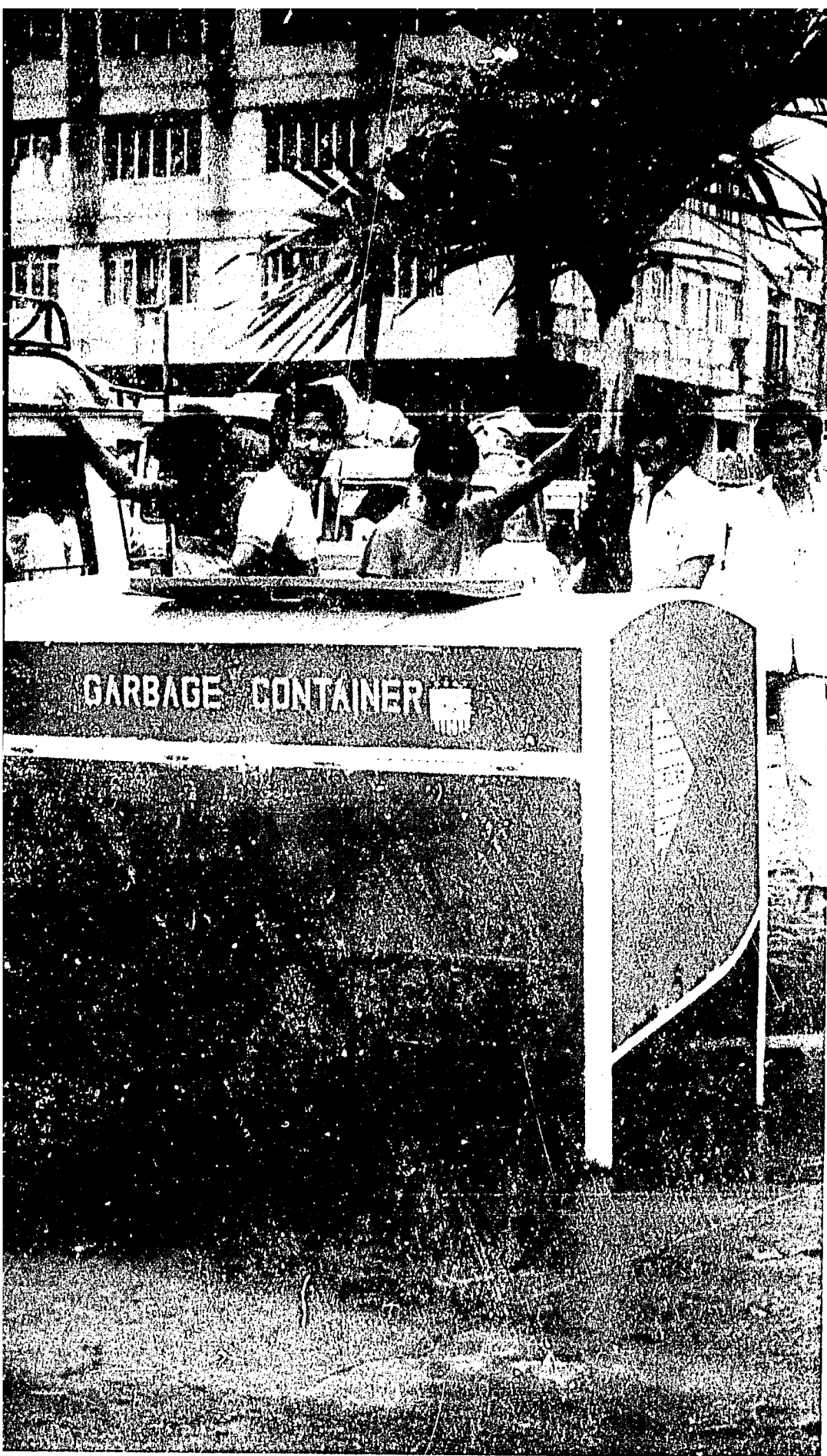
Tacloban



Left: Staff of the Leyte Metropolitan Water District checking a flow-meter as part of Tacloban's MERECE effort.

Right: An energy-efficient service vehicle of the Leyte Metropolitan Water District.

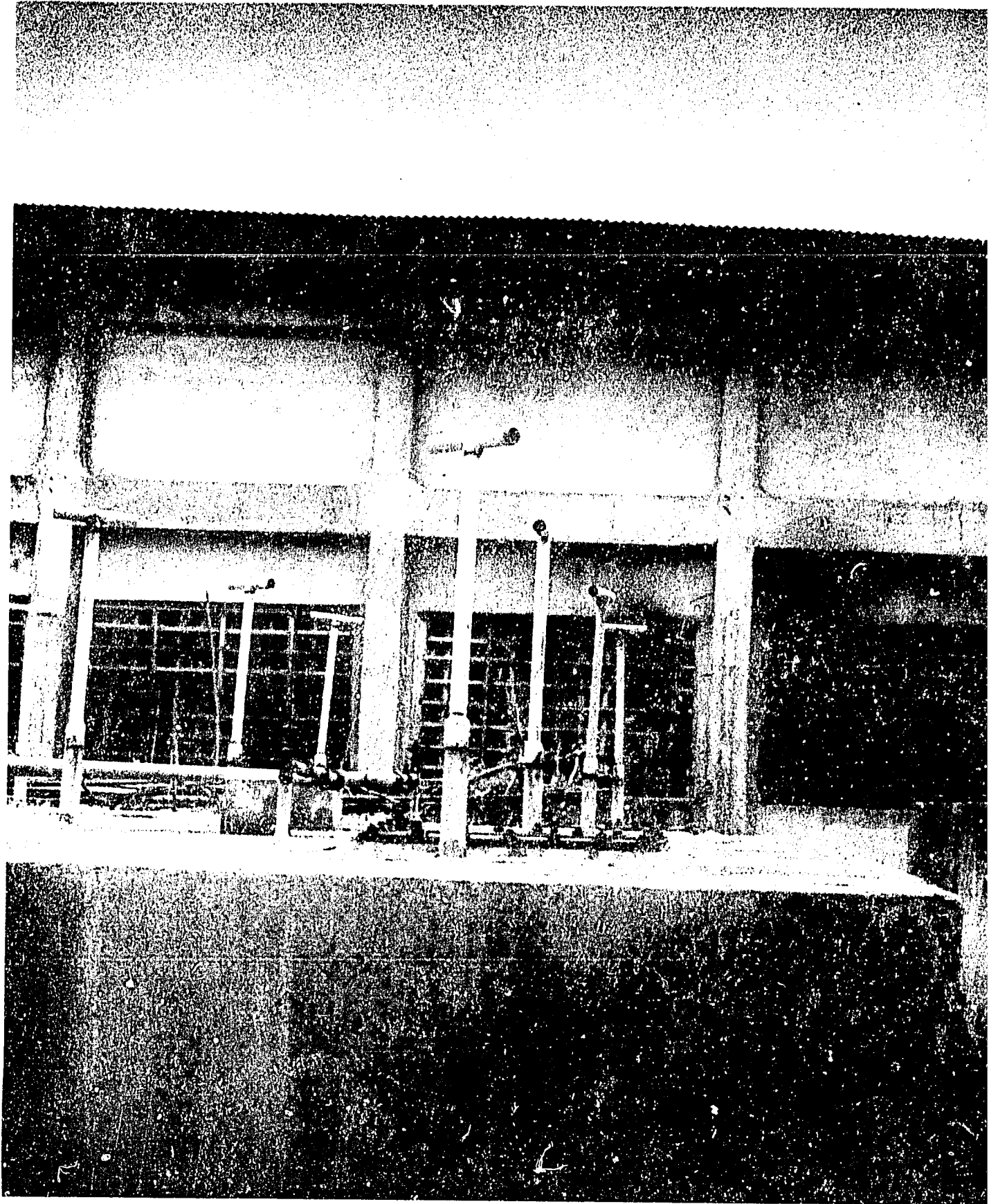




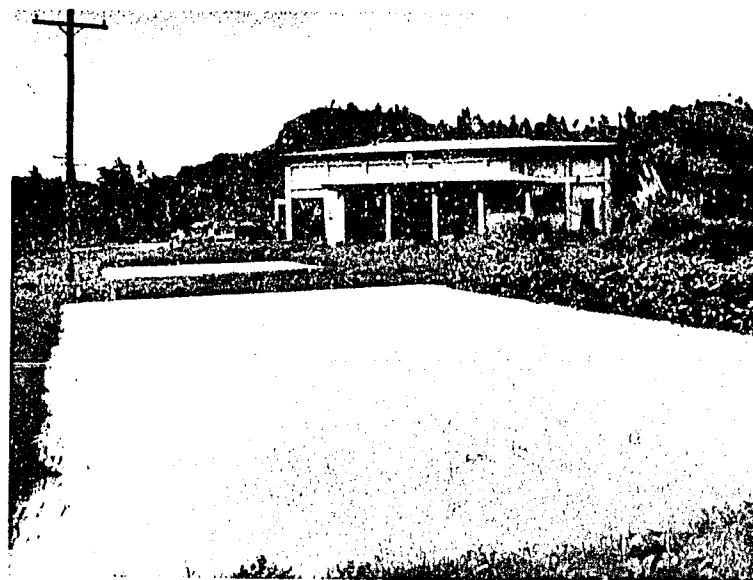
Far left: A trash collection pushcart put into service through Tacloban's MEREC effort. The pushcarts are used to collect refuse from individual homes, for pickup by trucks at central locations.

Center: A container for centralized trash collection in commercial areas of Tacloban. The pushcarts and centralized containers together account for a 30% reduction in fuel consumption per cubic meter of waste collected by the city. Photo by Tennessee Valley Authority.

Right: An instrument for calibrating electricity meters, acquired and put into service by Tacloban's Leyeco II electricity cooperative under the MEREC demonstration.



Tacloban

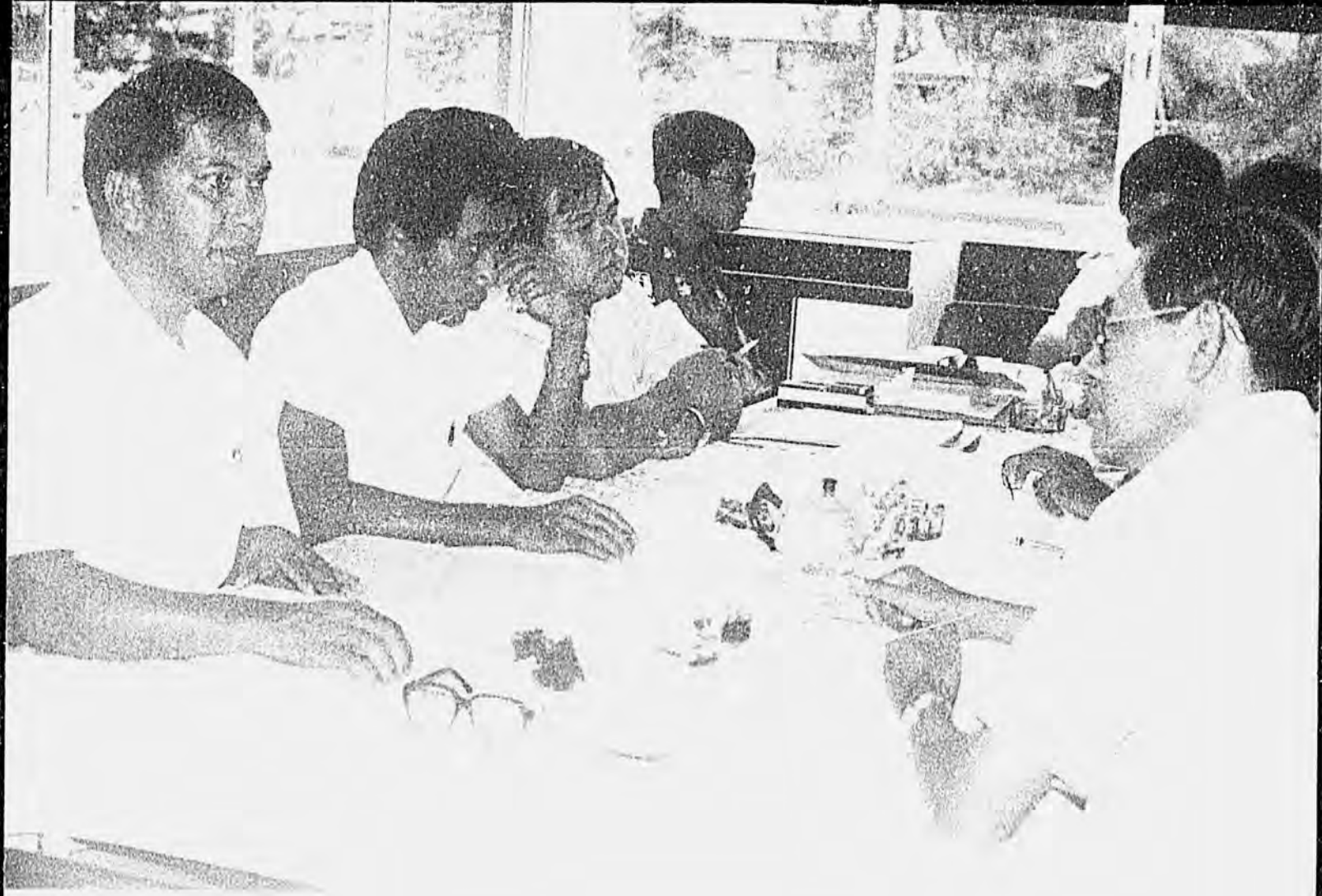


Left: A portion of the biogas digester, in the foreground, designed and installed through MERECE at Tacloban's municipal slaughterhouse, in the background. Rods for mixing the sludge during fermentation can be seen extending from the top of the digester.

Above upper: Oxidation ponds at Tacloban's slaughterhouse. These ponds reduce by 90% the

biochemical oxygen demand of slaughterhouse effluent ultimately discharged into nearby bay water.

Above lower: Gas from the biodigester is used to heat slaughterhouse scalding vats, formerly heated using wood fuel.



THE MEREC Approach

The MEREC Approach

pating in MEREC. Working Groups are usually chaired by the head of the relevant municipal department: the Water Supply Working Group, for example, would be chaired by the head of the municipal water department.

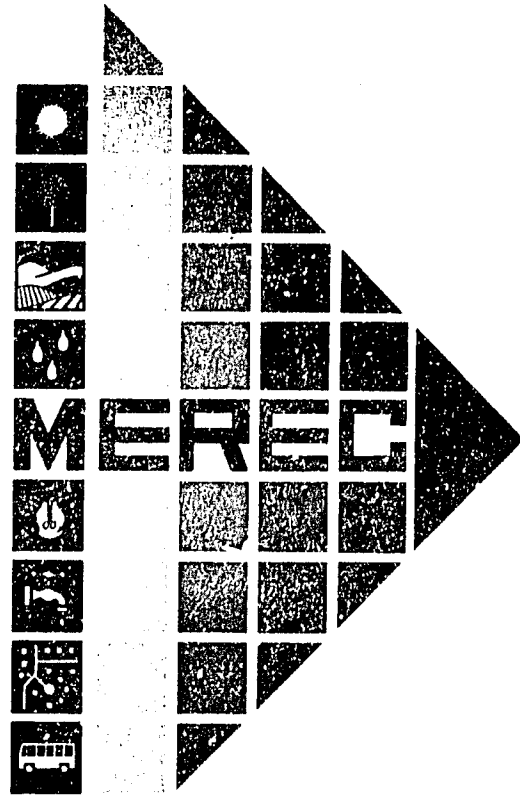
Most Steering Committee workshops begin with reports by Working Group representatives, then develop or revise major guidance documents such as the MEREC Strategy or Action Plan, and finally detail MEREC tasks and responsibilities for the next 2 to 3 months.

MEREC requires a full-time administrator/coordinator for at least the first year. The reason for this is that although MEREC takes only a small portion of the time of even the most involved participants, there is constant activity from the very first day, as the city moves rapidly from ideas to implementation. There is a continuous need for organizing, communicating, coordinating, preparing documents, keeping records, publishing materials, and related tasks. This burden dissolves when implementation is well under way and MEREC activity has been largely integrated into routine municipal activities. The administrator/coordinator is designated by the mayor and normally comes from the mayor's senior staff.

The Startup Phase lays the conceptual, organizational, and procedural base for the MEREC effort. During this phase, participating individuals and institutions come together to familiarize themselves with the MEREC approach, structure the Steering Committee and sectoral Working Groups, assign responsibilities, figure out how to obtain needed technical expertise not available locally, examine potential funding sources, and even exchange preliminary ideas about resource problems and potentials. Most importantly, during the Startup workshops the core MEREC process is examined carefully and then modified to suit the national administrative context and local circumstances.

By the end of the Startup Phase, the local MEREC Steering Committee and sectoral Working Groups are firmly in place and functioning, interorganizational arrangements for participation, cooperation, and coordination have been concluded, and a workplan for the Planning Phase has been developed.

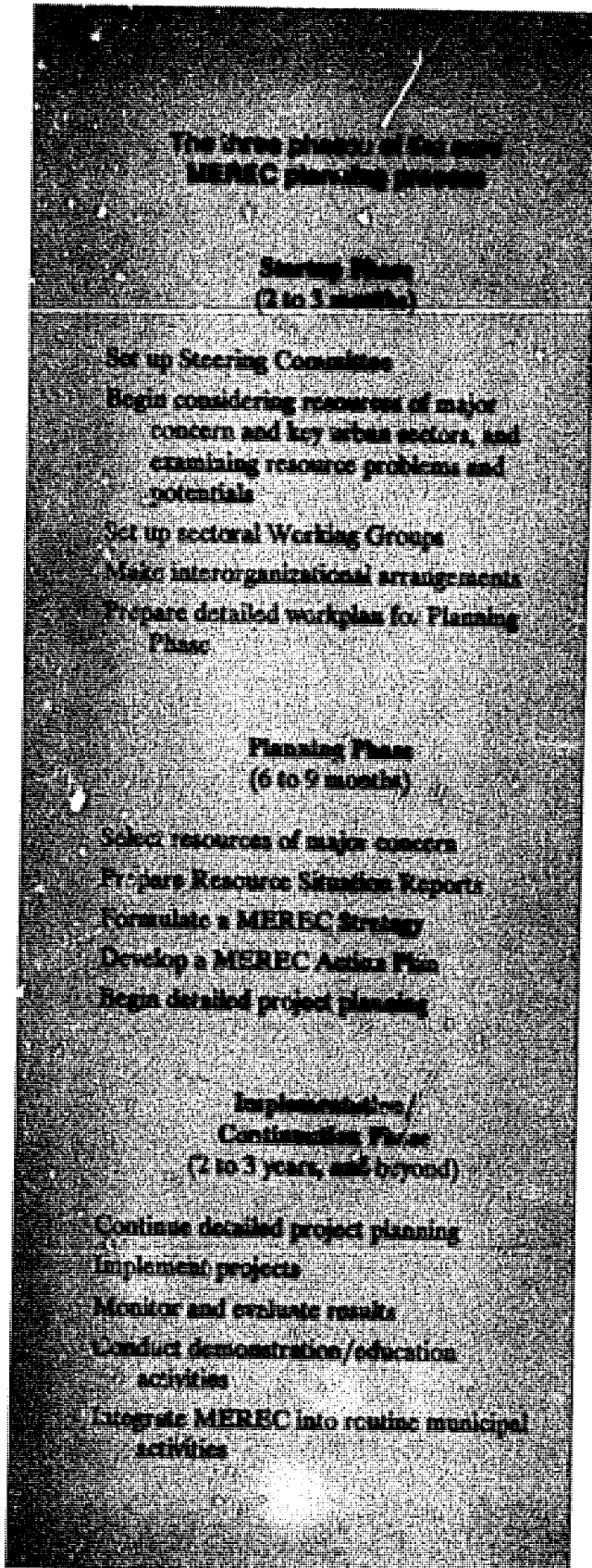
The Planning Phase includes four major tasks. The first is to identify up to six local "resources of major concern"—those local resources concerning which the city is facing major problems or that have significant untapped potentials. Major resource problems are those that impede local development and improvements in human welfare; significant resource potentials are those that could promote local development or improvements in human welfare.



Opposite: A MEREC meeting in Phuket, Thailand, involving representatives of national, provincial, and municipal government, and of the university helping with Phuket's MEREC effort. Meetings of this type are a regular feature of the MEREC planning process. Photo by City of Phuket.

urban sectors. The arrowhead is overlaid with a grid pattern, suggesting a matrix of resource and sector interactions. The squares of the matrix are of varying shades, representing a multiplicity of participants, but the pattern of shading and the overall form show increasing unity with progress.

Above: The MEREC logo. The overall arrowhead shape stands for progress. The symbols in the upper left represent resources; those in the lower left represent



Resources of major concern vary from city to city. The MEREC demonstration cities included resources such as energy, water, urban land, urban waste, and local building materials in their lists. The process of identifying resources of major concern begins during the Startup Phase and is concluded at the first Steering Committee workshop of the Planning Phase.

The second major task of the Planning Phase is to prepare Resource Situation Reports, one for each resource of major concern. The purpose of these reports is to bring together available data and knowledge about the resources; preparing the reports normally entails no original data collection. They describe the general status of the resource in the city, significant problems and opportunities associated with the resource, current projects and plans related to use of the resource, and relationships between the resource and key urban sectors.

Key urban sectors number up to six and are those that have a major influence on the use of local resources. Because of their importance for MEREC purposes, they are the sectors for which MEREC sectoral Working Groups are established. Sectors designated as "key" also vary from city to city, depending on local circumstances. The MEREC demonstration cities included water supply, waste management, land use, construction, transportation, and electricity supply among their lists of key urban sectors.

The third major task of the Planning Phase is development of a MEREC Strategy based on information in the Resource Situation Reports. The overall MEREC Strategy is the collection of resource-efficiency strategies for each individual resource. These individual resource strategies may call for making more efficient use of the resource, generating more of the resource, or even creating a new resource. They specify objectives for each sector that have a major influence on the way the resource is used.

When the individual resource strategies are put together as the overall MEREC Strategy for the city, the collection of objectives for each key urban sector with respect to all the resources on which it has a major influence can be seen. In this way, the resource-efficiency strategies for resources can be converted to resource-efficiency strategies for individual sectors.

The fourth major task of the Planning Phase is formulation of a MEREC Action Plan. The MEREC Strategy is translated into an Action Plan by identifying specific local projects to achieve the resource-efficiency objectives contained in the Strategy. Following the same pattern as

the Strategy, the MEREC Action Plan can be taken as a set of individual resource action plans, or as a set of individual sector action plans.

The departments of municipal governments are generally organized on a sectoral basis. That is why the MEREC Working Groups are set up on a sectoral basis, and why MEREC Action Plans tend to be taken as sets of sectoral action plans rather than resource action plans. The sectoral Working Groups are responsible for detailed planning and implementation of local projects and for their integration into routine municipal operations. Detailed project planning for the 10 to 20 projects in the Action Plan begins during the Planning Phase of MEREC, as a natural extension of Action Plan development. It continues into the Implementation/Continuation Phase.

During the Implementation/Continuation Phase, detailed project planning is completed and specific projects are undertaken. Local projects may involve construction, long-term studies or planning activities, experimentation with changes in local government operations or new organizational forms, private sector experiments, or educational activities. As projects are implemented, associated resource-efficiency achievements are monitored, evaluated, publicized, and fed back into the continuing MEREC process.

In all three MEREC cities, most of the technical expertise that was needed was accessible through the organizations participating in MEREC. Specialists to help with the Resource Situation Reports, project identification, detailed project planning, implementation, monitoring, and evaluation came from a variety of sources. Technical support to the local MEREC efforts was contributed by public agencies from other levels of government, private consultants, universities and community colleges, private enterprises, individual citizens, and the staffs of municipal departments.

The MEREC demonstration cities needed only limited technical support from the Tennessee Valley Authority. One TVA adviser visited each MEREC city for a few days once every 3 months during the life of the formal demonstration effort. The TVA adviser provided advice on startup, planning, implementation, and monitoring. The adviser also assisted with administrative arrangements between the MEREC city and AID and from time to time arranged for a brief visit by a TVA specialist with critical technical expertise not otherwise available to the city. As mentioned earlier, TVA staff also helped each of the three demonstration cities to learn from the experience

of the others.

















































MEREC was originally conceived with the aim of improving efficiency in energy and resource use in rapidly growing smaller cities. In practice, this has turned out to be more of an organizational and procedural challenge than a technological challenge. Yes, MEREC has resulted in technological innovations leading to greater resource efficiency in the demonstration cities. But no less important, MEREC has demonstrated that resource management provides a concrete, practical, and measurable focus around which effective management and development planning for local areas can be organized and systematically strengthened.

The MEREC demonstration project was structured as a capacity-building, and therefore learning-based, project. Learning that builds capacity requires the opportunity for discovery, application, and a perceived increase in capability resulting from what has been discovered and applied. This was built into the MEREC approach in the following ways:

- MEREC cities were provided with only a core MEREC planning process, which they had to adapt and elaborate to suit local circumstances;
- the cities were assured from the outset that some implementation funds would be available from AID, so they knew that planning would definitely lead to results;
- the implementation funds provided by AID were relatively limited, however, requiring that the cities give thought to additional sources of implementation support early in the planning process;
- financial arrangements between AID and the cities encouraged experimentation and flexibility;
- demonstration city selection procedures required candidate cities to organize to promote their involvement in MEREC;
- responsibility for the MEREC effort remained entirely with local officials and the local MEREC Steering Committee;
- means for publicizing the MEREC effort and involving local citizens with it had to be a part of the MEREC process.

Resources and Sectors

The MEREC planning process calls first for identifying resources of major concern and key urban sectors in the

RESOURCES							
SECTORS							
							
							
							
							
							

city. A resource may be of major concern because it is needed and is being depleted or degraded, because it is in short supply or is very expensive, or because it represents a significant unexploited opportunity for local economic development. Key urban sectors are those that play or could play a significant role in the way local resources are used. Each MEREC city defines resources and sectors in terms that are meaningful and useful in its own case.

It may be difficult at first for MEREC participants to think in terms of resources, sectors, and the relationships among them, since municipal decisionmaking is not traditionally approached in this way. MEREC demonstration cities tackled this problem by first considering four broad categories of resources critical to the life of the city: energy resources, food resources, building resources, and economic development resources.

This led to lists of specific resources in each category. Solar energy, oil, coal, geothermal energy, natural gas, wood, and other types of fuels were identified as energy resources. Food resources included agricultural land, fishing areas, water, vacant land, compost, cooking fuel, and more. Building resources called to mind such things as local building materials, buildable land, heating or cooling fuel, waste treatment capacity, and water. Mineral deposits, recreation and heritage areas, waterways, electric power, transportation fuel, urban waste, industrial land, fishing areas, commercial crops, and raw materials for local production were suggested as economic development resources.

The MEREC Steering Committees reviewed the resource lists they developed, and selected from them the few resources with which were associated the greatest problems or opportunities. The following are examples of resource problems and opportunities discussed in the MEREC demonstration cities.

Resource Problems

Energy

- Scarcity of wood fuel
- Unreliable electricity supply

Water

- Inadequate supply
- Considerable loss in distribution

Agricultural land

- Prime farm land used for urban expansion

Urban waste

- Unsanitary/ecologically dangerous dump site

Transport fuel

- In short supply and costly

Fishing areas

- Becoming polluted

Resource Opportunities

Energy

- More can be produced locally

Water

- Untapped sources
- Distribution leaks can be detected and repaired, which will also improve revenue collection

Agricultural land

- Vacant urban land can be used for food and fuel production

Urban waste

- Can be converted to fuel, compost, and recycled materials

Transport fuel

- Could be used much more efficiently with small changes in traffic patterns, which would also reduce air pollution

Fishing areas

- Increased fish population would create jobs and lower food costs

Local building materials

- Could be used much more instead of imported materials, and also create employment and income opportunities

The MEREC Approach

Sectors	Resources					
	Urban Land	Transport Fuel	Electricity (and other energy)	Urban Waste	Local Bldg. Materials	Water
Land use	Achieve more efficient land use for all purposes	Reduce fuel consumption through better land-use patterns	Provide alternate energy sources through urban agriculture	Identify future sites for waste disposal	Produce local building materials and furniture through urban agriculture	
Housing and construction			Create housing designs that conserve and create energy	Use common biogas digesters	Employ local building materials and improve local building materials	Utilize rain water instead of city water
Water, sewerage, drainage	Increase usable urban land	Increase fuel efficiency through better road access and maintenance				Reduce water losses Reduce bay water pollution
Waste management	Establish reclaimable landfill site Provide fertilizer for urban agriculture	Reduce fuel consumption via push carts, centralized containers, and new landfill	Convert waste to fuel	Increase the percentage of resources recovered		Reduce water pollution (both ground and bay water)
Electricity (and other energy)			Increase efficiency of electricity distribution and consumption			
Transportation	Coordinate traffic patterns with desired land use	Conserve fuel through transportation planning Promote alternate transport fuels	Utilize local alternative energy sources			
Summary strategy for each resource	Achieve more efficient use for all purposes	Increase transportation fuel efficiency	Increase efficiency of existing sources and utilize alternate energy sources	Promote efficient utilization of urban waste for energy use and other purposes	Promote the efficient use of local building materials and designs	Conserve water and water sources

Opposite: Graphic representation of a MEREC Strategy matrix, from a MEREC orientation booklet. Symbols representing the resources of solar energy, land, trees, water, minerals, and fossil fuels are shown along the top of the matrix. Symbols representing urban sectors, such as housing, sewage and drainage, energy supply, water supply, urban

planting, and transportation are shown along the side. The shaded boxes represent major resource/sector interactions, for which specific resource-efficiency objectives are formulated.

Above: A MEREC Strategy matrix developed in Tacloban,

Philippines. The strategy matrix serves as the basis for a MEREC Action Plan, which translates the objectives, appearing at the intersections of resources (columns) and sectors (rows) into specific local resource-efficiency projects.

Recursos Sectores	Água	Resíduos Sólidos	Solo Urbano	Energia	Materiais locais de construção	Solo Agrícola	Desenvolvimento Económico
Objectivos Gerais	Utilização eficiente da água no sistema de abastecimento e distribuição	Uso dos lixos para a produção de energia e outras finalidades	Uso mais eficiente do solo para as diversas finalidades	Conservação de energia e aproveitamento das possibilidades locais de produção	Aproveitamento de recursos locais como materiais de construção	Uso mais eficiente do solo para produção agrícola	Utilização industrial de recursos locais e rentabilização de infra-estruturas
1. Abastecimento de Água e Esgotos	Estratégia — Melhorar a qualidade e garantir os caudais e pressões necessários Projectos Propostos ● Remodelação da estação de tratamento de água			Estratégia — Redução dos consumos energéticos na adução de água à cidade Projectos Propostos ● Estudo de remodelação da adução actual			Estratégia — Drenar e tratar todas as águas residuais, domésticas e industriais Projectos Propostos ● Ampliação da rede de esgotos
2. Gestão dos Lixos		Estratégia — Aproveitar produtos componentes do lixo Projectos Propostos ● Reciclagem de bens materiais, incluindo aproveitamento de compostos ● Aproveitamento energético do gás produzido no aterro sanitário		Estratégia — Reduzir consumos energéticos na recolha e transporte de lixos Projectos Propostos ● Desenvolvimento de um plano para a recolha e transporte dos resíduos sólidos.			
3. Abastecimento de Energia				Estratégia — Converter resíduos animais em Bio-Gás e aumentar a utilização de energias renováveis (sol, madeira, vento)			
4. Produção Agrícola						Estratégia — Caracterização da aptidão agrícola dos terrenos e melhoria da sua utilização.	
5. Planeamento Municipal			Estratégia — Melhorar a gestão e o uso do solo urbano Projectos Propostos ● Plano de Ordenamento Físico Concelho e de gestão urbanística				
6. Construção Civil				Estratégia — Aumentar a conservação de em Edifícios Projectos Propostos ● Elaboração de uma brochura sobre regras de construção e de uma proposta de regulação municipal.	Estratégia — Incrementar a utilização de materiais locais na Construção civil Projectos Propostos ● Estudo económico das potencialidades da produção e comercialização da madeira e do granito ● Elaboração de projectos/desenhos de elementos construtivos tradicionais		Estratégia — Incrementar a utilização industrial de materiais locais para a Construção Civil Projectos Propostos ● Programa de formação de Artífices de Construção Civil (madeira, granito) ● Estudo de reconversão ou criação de pequenas empresas no domínio da utilização da madeira e do granito
7. Informação e Educação							

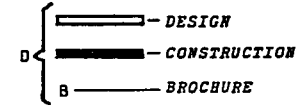
A preliminary MERECS Strategy matrix developed in Guarda, Portugal. Here, both strategy objectives and proposed projects

are summarized in the boxes of the matrix.



MANAGING ENERGY AND RESOURCE EFFICIENT CITIES
GESTÃO EFICIENTE DE RECURSOS E ENERGIA - CIDADE DA GUARDA

PLANO DE TRABALHOS PROJECT PLAN



SECTOR CIVIL CONSTRUCTION

PROJECTO PROJECT	RESPONSABILIDADE RESPONSABILITY	TAREFAS TASKS	ORÇAMENTO BUDGET	PROGRAMAÇÃO - SCHEDULE																																														
				1984									1985									1986																												
				JA	FE	MA	AP	MA	JU	JU	AU	SE	OC	NO	DE	JA	FE	MA	AP	MA	JU	JU	AU	SE	OC	NO	DE	JA	FE	MA	AP	MA	JU	JU	AU	SE	OC	NO	DE											
<u>REF. CC-2</u>	Arch. Sérgio Gamelas	A ₁ - Survey of construction kinds and systems																																																
Increase use of local materials in the civil construction (taking traditional shapes and technologies into account)		A ₂ - Survey of traditional production capability																																																
		A ₃ - See A ₃ in CC-1																																																
		B ₃ - Brochure-Construction Solutions																																																
		C - Regulations (see C-CC-1)																																																
		D - Demonstration (see D-CC-1)																																																
		Dem.Proj.1 - Cubo Prim. School																																																
		Dem.Proj.2 - Alfarazes P. Sch.																																																
		Dem.Proj.3 - Qca.do Pinheiro																																																
		Dem.Proj.4 - House in S. Silvestre																																																
		E - Dissemination																																																
		F - Monitoring in accordance with handbook																																																

1) See notes in CC-1

SITUAÇÃO EM JAN. /86

Workplan for one of Guarda's local MERIC projects. The workplan incorporates schedules for survey, design,

construction, dissemination, and monitoring activities.

MEREC

Discussion of resource problems and potentials early in the MEREC planning process is a self-education experience for participants. It helps to clarify the concept of "resources" and how they relate to immediate concerns of the city, and it brings to light an important aspect of the MEREC approach: beginning by thinking about local resources, not local problems. Moreover, it highlights the fact that many resource problems contain within them development opportunities, and that resource efficiency is a means of promoting local development.

Although MEREC participants are usually more at ease with the concept of sectors than with the concept of resources, it has been found that here, too, it pays to think first in terms of broad categories, such as production sectors, trade and support sectors, and public service sectors.

Under production sectors, MEREC demonstration cities have listed agriculture and agro-processing, manufacturing, mining, vehicle modification and repair, and construction. Trade and support sectors have included food supply, crafts, commerce, energy supply, transportation, and so on. As public service sectors, human services, public institutions, transportation, water supply, recreation, sanitation, waste management, public works, land use planning, and the like were identified. These were sorted out into the few sectors with the most direct relationships to the use of major resources.

The process of identifying key urban sectors is important not only for purposes of relating resources to sectors, but also for determining who should be represented on the MEREC Steering Committee and sectoral Working Groups. Following are examples of urban sectors and organizations that might be represented on corresponding sectoral Working Groups.

Energy supply

- Local electric company
- National energy agency
- Local industrial energy users

Land use planning

- Municipal land use planning and enforcement departments
- Local developers
- Citizen groups

Transportation

- Local transport companies, cooperatives, and trade organizations
- Police
- Municipal traffic department

Agriculture

- Municipal land use planning department
- Neighborhood groups
- Agricultural extension office
- Local farmer groups

Waste management

- Municipal waste management department
- Local farmer groups
- Commercial and industrial groups

The heart of the MEREC approach is to examine the status of each of the resources and the way in which urban sectors interact with them. This is done in the course of preparing and discussing the Resource Situation Reports mentioned earlier. These reports, one for each resource of major concern, are essential for good planning; for until the relevant facts are known, good planning is impossible. The reports review resource utilization trends, document linkages between resources and key urban sectors, and identify development opportunities and constraints associated with the resources.

Preparation and discussion of the Resource Situation Reports also help representatives of individual sectors understand how their interests are connected to those of other sectors through use of shared resources. This understanding, in turn, leads to an appreciation of the need for intersectoral coordination.

For example, in the case of all three MEREC demonstration cities, review of the status and use trends of energy and urban land resources on one hand, and of sectoral operations on the other, revealed previously unappreciated interconnectedness among the energy supply, transportation, water supply, waste management, and land use sectors. Reducing energy costs and ensuring adequate energy resources for transportation, water supply, and waste management meant coordinated planning for service provision. Land use planners wanted services located where they planned development and wanted to discourage development in certain areas. These sectors, traditionally at odds with each other, found they would each be strengthened through coordinated and cooperative participation in planning.

Intersectoral rivalry was replaced by a resource management approach, where the aim is to maximize local benefits from the use of available resources, accounting both for immediate needs and long-term requirements.

Strategy, Plan, Project

The MEREC approach stresses viewing things in context. The core MEREC planning process is adapted to

The MEREC Approach

the local context. Problems, opportunities, and sectoral operations are considered in their resource contexts; resource-efficiency strategies for sectors derive from a context of multisectoral strategies for resources. Similarly, the basic MEREC sequence is one in which each step refines the context for the step to follow. The Resource Situation Reports provide the context for the MEREC Strategy; the MEREC Strategy is the context for the MEREC Action Plan; the MEREC Action Plan, in turn, is the context for detailed project planning.

The MEREC Strategy sets out policy regarding the resources of major concern in the city, translated into resource-efficiency objectives for each key urban sector. The objectives are not highly formalized. They are basically statements of a resource management intent for each resource: increasing its availability, reducing its consumption per capita, replacing imported resources with local resources, and the like.

The MEREC Strategy is summarized in matrix format. Resources are listed reading across the column headings, sectors are listed reading down the row headings, and objectives for each sector with respect to each resource, where relevant, appear in the boxes of the matrix. A summary statement of management policy for each resource may be included at the bottom of each resource column. Each row summarizes the implicit resource-efficiency strategy for that sector. The MEREC Strategy stands as the expression of agreed aims and priorities for the local MEREC effort and thus constitutes a firm foundation for agreeing on an Action Plan.

The MEREC Action Plan is summarized in the same matrix format as the Strategy. The package of resource-efficiency projects for any resource is summarized in the column for that resource. The package of projects for each sector is summarized in the row for that sector. Each individual project can be seen in its resource context on the one hand, and in its sectoral context on the other.

About 45 local resource-efficiency projects, representing a wide variety of activities, have been identified, planned, and implemented through the MEREC approach in the demonstration cities. Many of these projects will be presented in the following chapters. AID suggested to the demonstration cities that the Steering Committees develop guidelines for projects appropriate to the MEREC context. AID offered as possible guidelines, that local projects be required to:

- have a direct relationship with the MEREC strategy;
- be demonstrably cost-effective;
- be technologically sound and of appropriate scale;

- be manageable by families, firms, community groups, or local agencies;
- be capable of being developed further by the private sector or encouraging private sector growth;
- be capable of becoming self-sustaining;
- be capable of contributing to the local knowledge base.

Each of the MEREC demonstration cities adopted its own set of guidelines, more formally or less formally. In all three cases, project guidelines were relaxed for admittedly experimental activities.

Continuing the Process

While local resource-efficiency projects in the Action Plan are being implemented, meetings continue to be held on a regular basis, some project plans are further refined, additional funding is secured, project performance is monitored and evaluated, and demonstration and education activities are conducted.

Monitoring and evaluation are carried out in accordance with criteria and procedures formulated during detailed project planning. In the MEREC demonstration cities, monitoring often encompassed three aspects of each project: progress in implementation, energy-efficiency achievements, and demonstration activities.

Although MEREC meetings continue to be held well into the period of project implementation, the MEREC effort as such gradually ceases to have a unique identity. Individual projects, as they become fixtures in the city, become more and more the concern only of the sector with which they are associated. Many of the types of discussions heard in Steering Committee workshops become common in municipal chambers. Working relationships established between different government levels, the private sector, and technical institutions become relatively routine.

And many of the individuals who have participated in or been touched by the MEREC effort have learned a way of addressing city management and development, and of improving their own lives and environments, that they regularly bring to their daily activities.

MEREC has worked well in the demonstration cities for many reasons. Now that the experience and lessons of three MEREC demonstrations are on record, some of the demonstration ingredients are no longer essential. The parts played by AID and TVA, for example, can surely be done without in some cases, and in others can be played by indigenous agencies. This has been borne

MEREC

Waste Management Sector - Project #3: Construction of biogas plant at slaughterhouse

Phase 1: Implementation Monitoring

Achievement Objective: Construct biogas digester at city slaughterhouse and reduce consumption of wood and electricity at slaughterhouse by using methane gas as fuel.

Achievement Measurement Procedure: A yes/no indicator will be used to show completion of the biogas plant.

Has the biogas plant been completed?
(check one) Yes _____ No _____

<u>Month</u>	<u>(Check One)</u>	
December 1983	Yes _____	No _____
March 1984	Yes _____	No _____
June 1984	Yes _____	No _____
September 1984	Yes _____	No _____

Efficiency Objective: Reduce the consumption of wood and electricity at the slaughterhouse.

Efficiency Measurement Procedure: The following information will be collected at the slaughterhouse.

	<u>Avg. Consumption Per Month with- out Biogas Digester</u>	<u>Avg. Consumption Per Month with Biogas Digester</u>	<u>Savings Per Month</u>
Wood (cords)	_____	_____	_____
Wood (BTU's)	_____	_____	_____
Electricity (KWH)	_____	_____	_____
Electricity (BTUs)	_____	_____	_____

Note: Report measurements two months after construction completion.

Responsible for Measurement: City General Services Department.

Monitoring and evaluation of local MEREC projects can take many forms. In the case of Tacloban, Philippines, a handbook with monitoring and evaluation procedures for all

local projects was devised. Reproduced here is a page from the Tacloban MEREC Monitoring Handbook that provides initial monitoring

procedures for a project to construct a biogas digester at the city slaughterhouse. The "Achievement Objective" refers to construction of the biogas

digester, and the "Efficiency Objective" refers to resource-efficiency results obtained.

The MEREC Approach

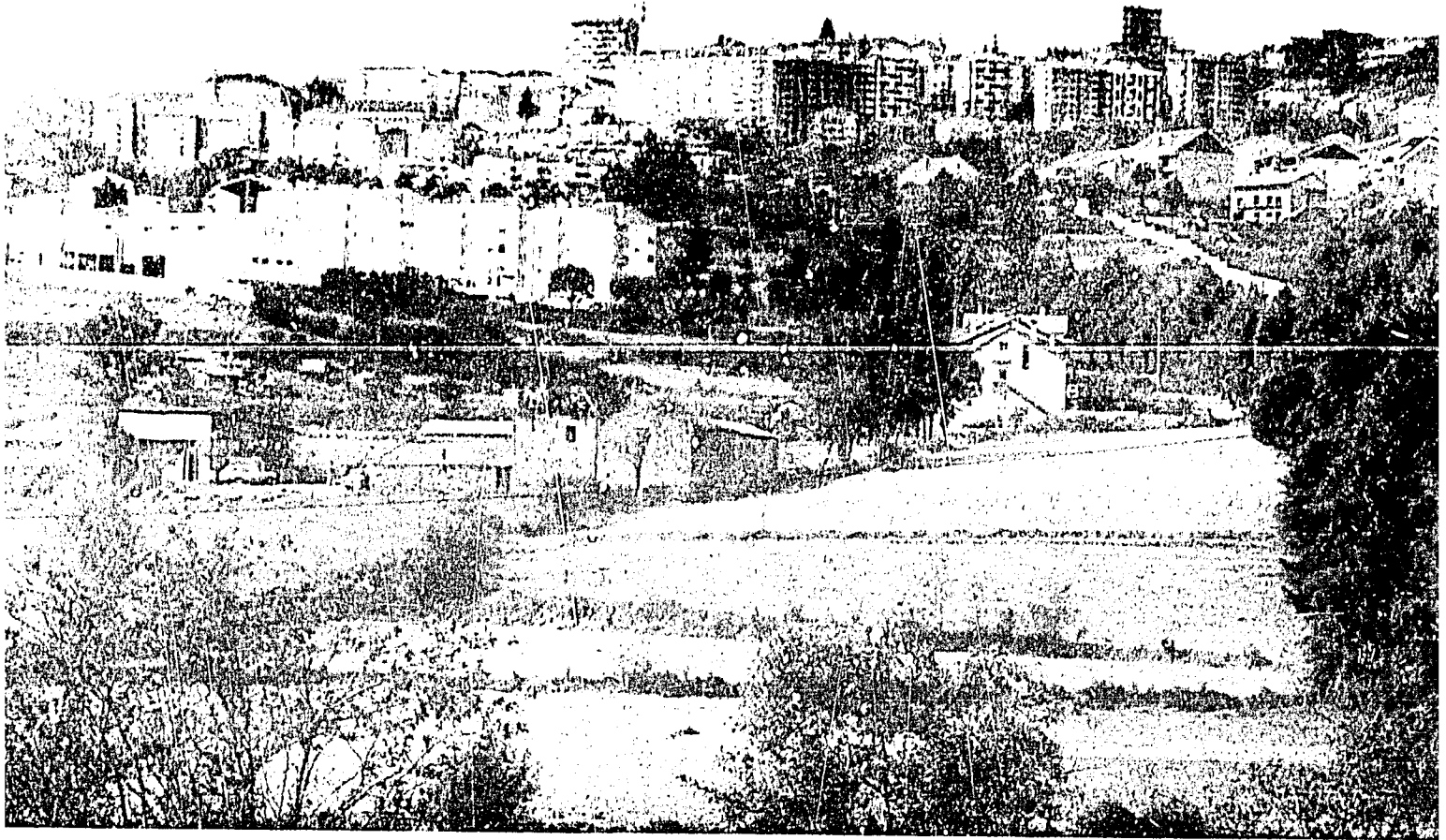
out by expansions of MEREC activity in the countries where there have been MEREC demonstrations.

There is one MEREC ingredient, however, that cannot be dispensed with or replaced, because it is the cement that holds the MEREC effort together in any local area. It is the MEREC focus on measurable resource efficiency achievements through concrete action.

MEREC participants and local citizens alike are busy people, occupied with the immediate concerns of family, work, and public responsibilities. It is easy for them to see that resource efficiency is beneficial to the city, but this alone is insufficient to command their commitment to a MEREC effort over a period of months and years. MEREC has the capability to produce direct benefits to the sectors involved. Waste management can be provided better and less expensively; water and electricity

supply can be made more reliable, and revenue collection improved; higher levels of health, sanitation, and nutrition can be achieved at virtually no additional cost; traffic congestion can be reduced, and commercial opportunities can be expanded, while reducing transportation costs. In short, through MEREC, agencies responsible for different aspects of city operations can do better what they are rewarded for doing.

Achievements like these, which have been amply demonstrated in the MEREC cities, must be understood by all as the ultimate purpose of MEREC from the outset. This understanding must be reinforced by rapid progress to documented and publicized accomplishments in resource efficiency, development, human welfare, and city management.



Chapter 4

Guarda, Portugal

The City

Guarda (“guard”) was founded in the 11th century as a walled city to stand sentry over a vital trade route to Lisbon through northeastern Portugal. Over the years, as the city outgrew its walls, the municipal jurisdiction expanded to encompass nearby agricultural areas, so that today some of its neighborhoods are actually “colonies” of the city, separated from it by intervening farmland. The population of the city proper is about 20,000, and that of the entire municipal jurisdiction is about 40,000.

Guarda’s mountaintop location gives it a cool climate, remoteness from the more populous coastal areas of the country, and proximity to granite deposits and extensive forests. Valleys within the municipality contain good agricultural soils. The mainstays of the economy are local trade and services, manufacturing, and agriculture. The central part of the city is reminiscent of many old, small, walled European towns, but new construction tends to be of a modern Mediterranean stucco style.

Guarda is governed by an elected mayor, council of aldermen, and municipal assembly. The municipal government is responsible for physical planning and for physical infrastructure requirements, such as the water distribution system, municipal roads, the public market, community centers, the sewage system, and primary schools. Larger scale functions, such as electricity transmission and distribution, development of water resources, national roads, agricultural services, and secondary schools, even when undertaken at the municipal level, are the responsibility of agencies of the central government. These sometimes operate through regional special-purpose districts, such as water districts.

Until the introduction of democracy just over a decade ago, Portugal’s towns and cities were run by the central government. As a result, the relatively new democratic municipal governments have limited technical capability and administrative experience.

Local responsibility for economic and social planning is even more recent. Portuguese law passing responsibility

and a measure of authority for local economic and social development to municipal governments is only half a decade old. It is still general practice among Portuguese municipal governments to deal primarily with current municipal problems, and not with long-term planning.

Municipalities in Portugal receive operating and capital funds from the national budget, based on population, rate of population growth, and special area problems. In addition, a portion of national tax revenues is returned to cities in rough accord with the proportion of tax payments by residents of each municipality. Other local revenue sources are restricted to user fees, licenses, and permits. On the whole, only a limited amount of local public expenditures is under direct control of municipal governments.

Portugal's recent history is in part responsible for a unique form of administrative organization. There is no provincial government. Between the national and the municipal levels of government there are two types of regional organizations created for the purpose of coordinating among municipalities and supporting them with technical expertise. One of these is the Regional Coordinating Commission; the other is the Office of Technical Support.

Guarda falls within the territory of the Central Region Coordinating Commission (CCRC). The CCRC is actually an extension of the Ministry of Interior and is the agency responsible for regional planning and for providing broad types of planning support, when requested, to the municipal governments in its area. Departments of the CCRC include those for local resources, statistics, economics, and technical training for municipal and GAT staffs. (GAT is the Portuguese acronym for Office of Technical Support.)

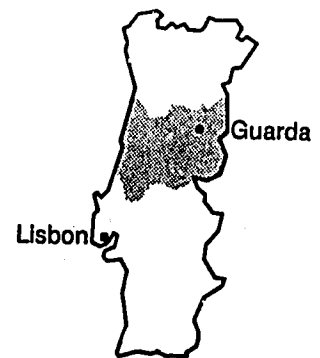
GATs, of which there are several in the CCRC territory, each work with a small number of adjoining municipalities, providing them with more day-to-day technical support than the CCRC. GATs were established by the central government but are responsible to the CCRC and the municipalities they serve. Their staffs include engineers, architects, economists, and other specialists, whose skills augment the technical staffs of the municipalities.

Thus, in Guarda, the MEREC administrative context was one in which there was insufficient technical capability or administrative capacity and authority at the municipal level to carry out a MEREC effort. But national, regional, and municipal agencies working together, and augmented by consultants and specialists from university faculties, constituted a more than adequate base of technical know-how and development authority. Guarda



Opposite: *Guarda's city center, as seen from one of the agricultural areas within the municipality.*

Above: *A scene in Guarda's central commercial area.*



had worked cooperatively and beneficially with the CCRC and staff of its local GAT, as well as with central government agencies, in the past. But never had representatives of these different levels worked jointly on broad sets of municipal issues, involving professionals from many different fields, for a sustained period. Never had there existed a context for doing so.

Some of the issues being addressed through MEREC had not previously been dealt with by any of the participating agencies. All were eager to take on the new challenges, however, because doing so was seen as a means for strengthening the process of decentralization, which is strongly supported by the central as well as local governments.

In Guarda, for example, for the democratically elected municipal government to serve all its constituency, and for it to perform a credible job of local land use planning and economic and social development, it needed the capability to account for agricultural land as a municipal resource in its planning. The MEREC approach suggested a means for accomplishing this with the participation and support of the CCRC and the Ministry of Agriculture, and thereby strengthening the capability of the municipal staff to deal with local agriculture further in the future.

Decentralized authority and technical capacity are strongly associated with fulfilling the new spirit of democracy in Portugal. But Guarda also recognized that formulating its investment needs in the context of long-term plans would add to the efficiency of its investment decisionmaking, and would strengthen its arguments for central government and outside donor assistance. An important fact that was not overlooked either by Guarda or the CCRC as they embarked together on Guarda's MEREC effort was that Portugal stood soon to join the European Economic Community. Following this there would flow a certain amount of development assistance from the EEC; such development assistance was likely to flow first to local areas poised with project plans that were formulated within an overall development planning context.

MEREC in Guarda

Because Portugal is no longer a regular AID-assisted country, Guarda's MEREC grant from AID included no "hardware" implementation funds. The initial round of resource-efficiency projects were all to be planning, research, and information/education activities; and even these required supplemental funding, either cash or in-

kind, from city, regional, or national sources. Subsequent implementation activities requiring construction or the purchase of equipment were to be fully funded by non-AID sources.

The Guarda Municipality provided physical facilities, administrative and logistical services, staff expertise, and an overall MEREC Coordinator for its MEREC effort. The CCRC, with headquarters located in a city 3 hours away from Guarda, also provided space, staff expertise, and administrative and logistical support.

The principal permanent members of Guarda's MEREC Steering Committee included those with the most direct interest in and control over the use of Guarda's resources and those lending primary technical support to the MEREC effort. The membership reflected the fact that government in Portugal is still relatively centralized, and local governments control only a small portion of public expenditures. The Steering Committee was composed of representatives of the following:

Municipal agencies:

- Office of the Mayor
- Municipal Council (represented by an alderman)
- Office of Planning, Zoning, and Building Permits
- Office of the City Architect

Regional agencies:

- CCRC
- GAT

Central government agencies:

- Department of Agriculture
- Department of Water and Sewage Supply
- Ministry of Industry and Energy

Other municipal aldermen, central government agencies, national institutions such as the national electricity enterprise, participated from time to time, either in the Steering Committee or in activities of sectoral Working Groups. In addition, the Universities of Coimbra and Porto, and private consultants, provided computer programmers, architects, engineers, agronomists, and draftsmen to Guarda's MEREC effort.

In the case of Guarda, the MEREC Steering Committee played a major role initially, but after that performed principally a review and approval rather than a leadership function. Initiative was handed over to sectoral Working Groups more than in Tacloban or Phuket. These were coordinated by the Guarda MEREC Coordinator, a professional planner who worked closely with the mayor and was supported by the CCRC.

The CCRC played a major role in MEREC in Guarda. It assisted with all phases of project activity, handled and accounted for AID grant funds, assisted with project monitoring, provided technical specialist support, and assisted with dissemination activities at local and national levels. In addition, it assisted project implementation by identifying and soliciting funds from organizations at the local, regional, and national levels and by identifying and coordinating technical assistance from central government agencies, universities, and consulting firms.

A number of central government agencies that did not participate directly in MEREC have been following Guarda's MEREC effort closely, have provided technical assistance, and are lending support to the implementation of selected projects that emerged from Guarda's MEREC planning process. The private sector has not been directly active in MEREC in Guarda, though it has adopted and benefited from some of the lessons of MEREC demonstrations.

The resources of major concern identified in Guarda were urban land, water, urban waste, local building materials, energy, and transportation fuel. The key urban sectors were water and sewage supply, waste management, energy supply, agricultural production, civil construction, and municipal planning.

Preparation of the Resource Situation Reports was coordinated by the MEREC Coordinator but was undertaken through a variety of mechanisms. Guarda municipal staff, CCRC and GAT staff, specialists from central government agencies, the Universities of Coimbra and Porto, and private consultants were all involved in developing the Resource Situation Reports. As part of the preparation of these reports, sectoral Working Groups conducted continuing series of workshops to bring together the inputs and ideas of various specialists.

In Guarda the initial MEREC Strategy and Action Plans emerged simultaneously from work on the Resource Situation Reports. The first summary MEREC Strategy and Action Plan matrix, shown in chapter 3, contained 11 strategic resource-efficiency objectives and 20 specific local projects designed to accomplish the objectives. These were later consolidated into 16 local projects, and during the course of implementation the number was reduced further.

Guarda's MEREC resource-efficiency strategic objectives reflected the following overall concerns about major local resources:

Local water supplies were inadequate for the rapidly growing demand. Distribution was unreliable, and water revenues did not cover costs.

Energy for heating was costly, owing largely to the fact that local construction did not account for Guarda's cold climate.

Urban neighborhoods had leapfrogged beyond agricultural areas, making service provision difficult and costly and threatening good agricultural lands with infill development.

The full potential of agricultural lands was not being realized.

The management of urban waste offered opportunities for resource recovery and savings in consumption of transportation fuel that were not being exploited.

The fashion in construction had turned its back on local building materials, particularly granite and wood, and on local firms and artisans that supplied and worked with them.

The 16 local projects that Guarda identified to address resource-efficiency objectives reflecting these resource concerns were the following:

Water and sewer sector

- Development of a plan to increase efficiency in the local water distribution system through leak detection/repair and other measures
- Study of water demand and supply to identify and evaluate alternative sources for meeting future potable water needs
- Evaluation of the present water treatment system, with recommendations for improving efficiency and water quality
- Study of future sewage system requirements and development of a plan for system expansion
- Study of possible utilization of water stored by a proposed hydroelectric dam to fill future water needs

Waste management sector

- Development of an energy/resource efficient plan for collection, transportation, and disposal of solid wastes
- Study of solid waste recycling feasibility
- Study of methane generation potentials at the city landfill
- Study of feasibility of a biogas generator at the city slaughterhouse

Energy supply sector

- Study of feasibility and design for generating electricity from biogas at two large animal feedlots near the city

Research, demonstrations, and information dissemination on local renewable energy sources

Agricultural production sector

Survey and classification of agricultural lands so that prime agricultural land could be targeted for preservation

Study and plan for optimal irrigation system for agricultural lands

Civil construction sector

Research to update building codes and standards to promote energy efficiency

Promotion of local materials for use in construction, including demonstrations

Municipal planning sector

Development of a resource-efficient land use plan, including coordination and incorporation of relevant elements of other studies and plans, assessment of existing land uses and management practices, a land demand forecast, and recommended urban management tools and programs for implementation

Guarda found itself unable to carry out some of these projects within the time frame of the AID-funded MEREC demonstration, and it was eventually determined that greater efficiency would be achieved by modifying some projects and consolidating others. But in one form or another, most of Guarda's local MEREC projects were carried out. The result is that Guarda is the first city in Portugal with resource-efficiency-based and modern development, land use, and urban management plans.

Because Guarda's AID-funded MEREC demonstration project included primarily studies and plans, in a sense everything that has followed from these can be considered a MEREC spinoff. These spinoffs have included:

- construction of a new water supply line to the city;
- new water treatment procedures;
- a commitment from the national electricity enterprise to expand a reservoir associated with a hydroelectric project in order to assure the city's future water supply;
- a program of water distribution leak detection and repair;
- construction of several new schools and renovation of a community center based on designs that are

energy efficient and make use of local building materials;

- an education and training campaign to encourage energy efficiency and use of local granite and wood in private construction;
- private construction using what people in Guarda call "MEREC principles" of energy-efficiency;
- a plan for strategic location of glass recycling containers;
- new zoning ordinances to preserve agricultural lands and make public service provision more efficient;
- the beginnings of a new sewage system that ultimately will include biogas digesters;
- funding from the EEC for feedlot biogas digesters;
- new fuel-efficient routing for solid waste collection trucks;
- a water conservation campaign.

Most of these activities, however, are more appropriately thought of as direct consequences of AID-supported MEREC local demonstration activities, rather than as spinoffs. Many of them will be discussed further in the next section of this chapter, in association with Guarda's MEREC projects. Guarda has only recently completed its MEREC studies and plans and begun implementation of them. Most of the true long-range spinoffs are yet to develop.

But it is already clear that the MEREC influence will continue to be felt in Guarda and neighboring municipalities for many years. "MEREC principles" are firmly institutionalized in the operations of the GAT and the City Planning, Zoning, and Permits Office and receive continuing promotion by those offices among builders and the public.

All new city buildings in Guarda and neighboring municipalities served by the local GAT incorporate at least some of those principles. Income-earning opportunities for local craftspeople working in granite and wood have been expanded. The water supply system already provides much-improved service at dramatically lower cost, and water resources have been assured for the future. Sanitation, solid waste management, and sewage have all been improved, incorporating energy-efficiency principles. Alternative energy sources are being developed, and resource recovery is being instituted. Farmland is being preserved, and farm productivity is being increased. Long-term planning is now an established part Guarda's municipal management activities.

Guarda

SECTOR	PROJECTO	RESPONSAV	CONSULT.	TAREFAS	DURAÇÃO
					J A G O S O N O V D J A F E M A J J A S O N O V D
ABASTECIMENTO DE AGUA E SANEAMENTO (A.S)	REMODELACÃO DO SISTEMA DE DISTRIBUIÇÃO DE AGUA A CL. DAVE	ENG.º BENEITA	POF ENG.º SIVA AFONSO E N.º 1	<ul style="list-style-type: none"> CONCLUSÃO DA REVISÃO DE PLANO, PARA DEFINIÇÃO DA GEOMETRIA DO SISTEMA ESTIMACÃO DOS CUSTOS E CARACTERIZAÇÃO DE ELEMENTOS ESPECIAIS E ACESSÓRIOS REALIZAÇÃO DO PROJETO ELABORAÇÃO DO RELATÓRIO E PROPOSTAS FINAIS 	[Gantt chart for project]
	AVALIAÇÃO E REDUÇÃO DE PERDAS	ENG.º BENEITA	POF ENG.º SIVA AFONSO E N.º 1	<ul style="list-style-type: none"> ELABORAÇÃO DA REVISÃO DO PLANO INCLUINDO A INSTALAÇÃO DE CONTADORES E A DISTRIBUIÇÃO DA SINA CAPTURA E VENTILACÃO CAMPANHA DE DETECÇÃO DE FUGAS COM UTILIZAÇÃO DE DETECTOR APROPRIADO ANÁLISE DOS RESULTADOS E ELABORAÇÃO DO RELATÓRIO E PROPOSTAS FINAIS 	[Gantt chart for project]
	REMODELACÃO DA ADUÇÃO ACTUAL	ENG.º FOMES PEREIRA	POF ENG.º SIVA AFONSO E N.º 1	<ul style="list-style-type: none"> CONCLUSÃO DO LEVANTAMENTO DAS CARACTERÍSTICAS DAS ACTUAIS CAPTAÇÕES VERIFICAÇÃO DA POSSIBILIDADE DE REAJUSTAMENTO DAS ACTUAIS CAPTAÇÕES AVALIAÇÃO DAS NECESSIDADES DE AGUA A CURTO/MÉDIO PRAZO ESTUDO ECONÓMICO ELABORAÇÃO DO RELATÓRIO E PROPOSTAS FINAIS 	[Gantt chart for project]
	REMODELACÃO DO TRATAMENTO	ENG.º FOMES PEREIRA	POF ENG.º SIVA AFONSO E N.º 1	<ul style="list-style-type: none"> AVALIAÇÃO DAS CONDIÇÕES DE FUNCIONAMENTO ACTUAIS INCLUINDO A REALIZAÇÃO DE ANÁLISES CARACTERIZAÇÃO DAS NECESSIDADES DE TRATAMENTO EM FACE DAS SOLUÇÕES DE MAIOR PREVISIBILIDADE ESTUDO HIDRÁULICO-SANITÁRIO ELABORAÇÃO DO PROJECTO DE REMODELAÇÃO 	[Gantt chart for project]
	ESTUDO A MÉDIO/LONGO PRAZO DE ADUÇÕES ALTERNATIVAS	ENG.º FOMES PEREIRA	POF ENG.º SIVA AFONSO E N.º 1	<ul style="list-style-type: none"> CONCLUSÃO DA REVISÃO DE ELEMENTOS BASE JUNTO DA ENP E HIDRÓLOGIA E ANÁLISE DAS POTENCIALIDADES DE CAPTAÇÃO TIPO, EM ATENÇÃO AS NECESSIDADES DE AGUA PARA A AGRICULTURA PARA A PRODUÇÃO DE ENERGIA, ETC. ESTUDO ECONÓMICO ELABORAÇÃO DO RELATÓRIO E PROPOSTAS FINAIS 	[Gantt chart for project]
	AMPLIAÇÃO DA RECI DE ESGOTOS	ENG.º BENEITA	POF ENG.º SIVA AFONSO E N.º 1	<ul style="list-style-type: none"> CONCLUSÃO DO LEVANTAMENTO DA SITUAÇÃO ACTUAL CONCLUSÃO DA REVISÃO DE ELEMENTOS RELATIVOS A NOVAS ZONAS A URBANIZAR ESTUDO HIDRÁULICO E ECONÓMICO E ELABORAÇÃO DO PROJECTO DE AMPLIAÇÃO 	[Gantt chart for project]
GESTÃO DE LIXOS (GL)	RECICLAGEM DE BENS MATERIAIS	ENG.º JOAQUIM GOMES	POF ENG.º SIVA AFONSO E N.º 1	<ul style="list-style-type: none"> CONCLUSÃO DA REVISÃO DE ELEMENTOS RELATIVOS A RESTRUTURAR A RECIÇÃO DA GARÇA REVISÃO DE EQUIPAMENTOS SOBRE EXPERIÊNCIAS DE RECICLAGEM JA REALIZADAS E ESTUDO DE VIABILIDADE SOBRE OS SEUS RESULTADOS REVISÃO DE VIABILIDADE ECONÓMICA RELATÓRIO E PROPOSTAS FINAIS 	[Gantt chart for project]
	OPTIMIZAÇÃO DO SISTEMA DE RECOLHA E TRANSPORTE DOS RESÍDUOS SÓLIDOS DA GUARDA	ENG.º JOAQUIM GOMES	POF ENG.º SIVA AFONSO E N.º 1	<ul style="list-style-type: none"> CONCLUSÃO DA REVISÃO DE ELEMENTOS BASE ESTUDO DA METODOLOGIA A UTILIZAR E SUA IMPLEMENTAÇÃO COMPUTACIONAL AVALIAÇÃO DOS RESULTADOS E ELABORAÇÃO DO RELATÓRIO E PROPOSTAS FINAIS 	[Gantt chart for project]
	APROVEITAMENTO ENERGÉTICO DO GAS PRODUZIDO NO ETÉRO SANITÁRIO	ENG.º JOAQUIM GOMES	POF ENG.º SIVA AFONSO E N.º 1	<ul style="list-style-type: none"> REVISÃO DA REVISÃO DE ELEMENTOS SOBRE AS CARACTERÍSTICAS DO BÍO-GÁS NO ETÉRO SANITÁRIO ESTUDO DO POTENCIAL DE UTILIZAÇÃO ENERGÉTICA DO BÍO-GÁS RELATÓRIO DO RELATÓRIO E PROPOSTAS FINAIS 	[Gantt chart for project]
ABASTECIMENTO DE ENERGIA (A.E)	INSTALAÇÃO PÍLITO PARA A PRODUÇÃO E O APROVEITAMENTO ENERGÉTICO DO BÍO-GÁS EM EPIDORACÕES AGRÍCOLAS E NO MATAGUDO DA CIDADE		POF ENG.º SIVA AFONSO E N.º 1	<ul style="list-style-type: none"> CONCLUSÃO DA REVISÃO DE ELEMENTOS BASE RELATIVOS A POTENCIALIDADES DE PRODUÇÃO E APROVEITAMENTO ENERGÉTICO IDENTIFICAÇÃO DE CATEGORIAS PARA O PROJECTO DO MATAGUDO ESTUDO DE VIABILIDADE TÉCNICA E ECONÓMICA ELABORAÇÃO DO PROJECTO GERAL E DO PROJECTO DE ESPECIALIDADE (ESTRUTURAS, EQUIPAMENTOS E INSTALAÇÕES ELECTRO-MECÂNICAS, ETC.) PLANO E REVISÃO DE PROPOSTAS DE EQUIPAMENTO ELABORAÇÃO DE UM PLANO FINAL (PÍLITO) 	[Gantt chart for project]
	PESQUISA, DEMONSTRAÇÃO E DIVULGAÇÃO DA UTILIZAÇÃO DAS ENERGIAS RENOVÁVEIS		POF ENG.º SIVA AFONSO E N.º 1	<ul style="list-style-type: none"> IDENTIFICAÇÃO DE BONS EXEMPLOS ESTUDO SOBRE CONDIÇÕES ENERGÉTICAS INFORMAR AO USO DE ENERGIA SOLAR NA OBRANDA INFORMAR SOBRE VANTAGENS ECONÓMICAS INFORMAR SOBRE CONDIÇÕES ENERGÉTICAS EM EDIFÍCIOS INFORMAR COM EXEMPLOS DE APLICAÇÃO SOBRE EQUIPAMENTOS INFORMAR SOBRE UTILIZAÇÃO E GESTÃO DE ENERGIA ELABORAÇÃO INCLUINDO CONTRATO COM CONSULTOR ELABORAÇÃO TÉCNICA/DIVULGAÇÃO 	[Gantt chart for project]
PRODUÇÃO AGRÍCOLA (P.A)	CARACTERIZAÇÃO DOS SOLOS DETENDIDOS DO CONCELHO ELABORAÇÃO DE UMA CARTA DE APTIDÃO AGRÍCOLA AO PEGADO (em escala de con. veniente) ESTUDO DE SISTEMAS E OBRAS DE IRRIGAÇÃO	ENG.º JOSÉ LOPES	EN.º 1	<ul style="list-style-type: none"> ESTABELECIAMENTO DE CONTACTOS OFICIAIS COM AS AUTORIDADES COMPETENTES ELABORAÇÃO DA CARTA COM BASE EM CARTAS JA EXISTENTES INCLUINDO A CONSULTAÇÃO DE UM ENGENHEIRO TÉCNICO AGRÍCOLA E UM ENGENHEIRO AGRÓNOMO TRABALHO DE CARTOGRAFIA DO SOLO (1:10 000) INCLUINDO CONSULTAÇÃO DE UM ENGENHEIRO AGRÓNOMO, UM CAPATAZ E UM ALFARTE (60.000/h) REALIZAÇÃO DOS PROJECTOS DE BARRAGENS E CANAIS DE DISTRIBUIÇÃO, INCLUINDO O TRABALHO DE UM ENGENHEIRO AGRÓNOMO, UM ENGENHEIRO CIVIL, TRÊS TOPOGRAFOS E DOIS DESDEMPHADOS 	[Gantt chart for project]
PLANEAMENTO MUNICIPAL (P.L)	PLANO DIRECTOR MUNICIPAL	ING.º MARIA JOSE	CC.º A.P.E.	<ul style="list-style-type: none"> 1ª ETAPA - ANÁLISE E PROPOSTA PARA REVISUALIZAÇÃO E REORIENTAÇÃO DO B.P. 2ª ETAPA - PLANO IMEDIATO DE GESTÃO URBANÍSTICA (PIGU) 3ª ETAPA - ELABORAÇÃO DE PLANOS DE ZONAMENTO EM ÁREAS-PROBLEMA 4ª ETAPA - PLANO DE OPERAMENTO TERRITORIAL (POT) ESTRATÉGIAS RECONSTRUTIVAS 5ª ETAPA - IMPLEMENTAÇÃO 6ª ETAPA - INQUIRITO PÚBLICO E APROVAÇÃO POR PELA AM 	[Gantt chart for project]

Summary workplan for several of the projects in Guarda's MERECA Action Plan. The projects are organized by sector. Opposite each project is shown the individual with primary responsibility, consulting

technical specialist, specific tasks, and scheduling of tasks. The year shown, 1985-86, was obviously a very busy one in Guarda

MEREC

Moreover, new relationships have been established among municipal, regional, and national agencies. In particular, the close, broad-based, multidisciplinary, and resource-focused working relationship that developed between Guarda, the GAT, and the CCRC during the MEREC demonstration continues on a routine basis. That relationship, in turn, brings more central government agencies into direct involvement with municipal concerns.

The Guarda MEREC experience has attracted considerable attention in Portugal. It has received media coverage and has been exhibited at two national energy conferences. Mayors of other towns throughout Portugal have requested information about it, and some have even lobbied for their own MEREC projects. The central government sees MEREC as a powerful tool for hastening the decentralization process. So it was perhaps inevitable that MEREC in Portugal would be expanded.

In late 1986 seven additional cities within the territory of the CCRC embarked on their own MEREC efforts, with the encouragement and support of the CCRC. In each city a startup workshop was held, chaired by the mayor, who in each case has initially taken on the responsibility of being the MEREC Coordinator. Each municipality has committed funds, technical staff, and logistical support to its MEREC effort, supported by the respective GATs and the CCRC. Each startup workshop was attended by 40 to 80 people from all levels of government and the private sector who focused their discussions on energy and resource issues as the first step in determining local resources of major concern for MEREC purposes.

The CCRC has established a series of training programs for GAT and municipal staffs and has helped organize MEREC Steering Committees and Working Groups in each of the new cities. All seven of these new MEREC efforts are now well under way, and for them all Guarda serves as the model and example of what can be accomplished with a resource-based approach to city management and development and with intersectoral and inter-governmental coordination and cooperation.

The expansion of MEREC in Portugal constitutes the first regionwide MEREC demonstration and is already providing insights into the roles different governmental and university agencies might play when MEREC is undertaken at this level.

Possibly the most important and lasting impacts of MEREC in Guarda, however, have been on the many individuals involved in it at all levels of government. It is common in conversations for many of the professionals working at the CCRC, the local GAT, and the Guarda

municipality to refer to MEREC as a watershed in their professional lives.

In one neighborhood of Guarda there stands a community center that was created by the municipality through renovation of an old building on the site. Plans for the renovation were drawn up by the local GAT architect. One section of the building was renovated 4 years ago, before MEREC. It has a plain white stucco institutional appearance, with aluminum windows, uninsulated walls, and electric heating. An adjacent section was recently renovated, after the architect had researched alternative designs under MEREC.

The newer section is of locally quarried and cut granite block and therefore appears to share a connection with Guarda's long history. It features rough-hewn roof beams, wood-frame windows, a wood-burning stove, and insulated walls and ceiling. The cost of the newer section is comparable to the cost of the older one.

The architect likes to tell the story of how MEREC made him a convert to designs that are energy efficient and employ local building materials. In fact, the MEREC demonstration in Guarda merely provided the opportunity for him to embark on a new direction in his professional work. It was he who seized the opportunity, undertook the research, and became committed to the idea. He will continue to refine and pursue "MEREC principles" in his work, whether in Guarda or elsewhere, and already has several additional "MEREC projects" under development.

He, and many others like him who have been a part of MEREC in Guarda, represent the highest form of demonstration project achievement: the opening up of opportunities for individuals to improve their own lives and make greater, and more lasting, contributions to their communities.

Guarda's MEREC Projects

Most of the studies and plans undertaken in connection with MEREC in Guarda were paid for in part with MEREC funds from AID. These funds were used primarily to pay for consultant specialists or outside services such as drafting or computer operations.

In the case of every study or plan, however, an equal or larger part of the true cost was borne by participating organizations, including the Guarda municipality, the CCRC, the GAT, the Universities of Coimbra and Porto, and a wide variety of organizations and public enterprises affiliated with the central government, such as the na-

tional electricity enterprise and the National Center for Urban Land Use Planning. These organizations provided staff experts, study facilities, logistical support, data, or services such as reproduction of plans, blueprints, and documents. A recent review of accounting records by the CCRC revealed that the value of contributions by the CCRC, GAT, and Guarda municipality alone amounted to approximately twice the dollar contribution of AID.

Some of the studies and plans discussed below were carried out entirely by local staff. Others were carried out primarily by consultants, working closely with local staff. Still others relied heavily on technical support from national agencies or universities.

More important than the details of how and by whom each of the studies and plans was carried out, however, is the fact that so much was accomplished with relatively little outside financial assistance. The procedure followed was not to determine what studies and plans were most needed, and then to calculate which of them could be financed by MEREC funds from AID; rather, it was to determine what studies and plans were needed, and then to find ways of carrying them out with the financial resources available. In a few cases this meant using no MEREC funds; in others it meant using small amounts of MEREC funds to leverage in-kind contributions of larger value from other organizations. In one or two cases, particularly where services had to be purchased from the private sector, the projects were paid for primarily by MEREC funds.

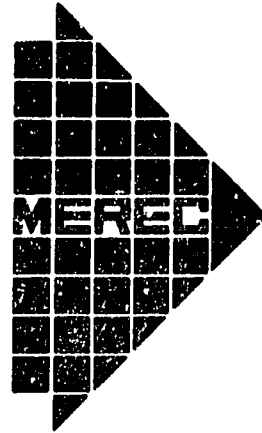
Water Distribution

Guarda is located at an elevation 600 meters higher than its water source, and water pumping is very costly and consumes an enormous amount of energy. For this reason, as well as to conserve the water resource, a high MEREC priority was to increase water distribution efficiency.

This project had two main components. The first entailed a complete technical mapping of Guarda's water distribution system, which had grown piecemeal and without adequate records over many years. The technical mapping permitted the city then to employ a calibration model to correct pressure and volume problems and increase distribution efficiency throughout the system, as well as to develop standards for system expansions.


In conjunction with this effort, an evaluation of Guarda's water treatment facility and procedures was undertaken. The evaluation led to improvements in the facility and

Câmara Municipal da Guarda
Comissão de Coordenação da Região Centro
U. S. Agency For International Development (AID)
Tennessee Valley Authority (TVA)




Projecto de
Gestão Eficiente de Recursos e Energia
Cidade da Guarda

MANAGING ENERGY AND RESOURCE
EFFICIENT CITIES




Câmara Municipal da Guarda
Comissão de Coordenação da Região Centro
U S Agency For International Development (AID)
Tennessee Valley Authority


Projecto MEREC GUARDA
Gestão Eficiente de Recursos e Energia


POUPE
ÁGUA

POUPAR ÁGUA É:
= Poupar Dinheiro
= Garantir o Abastecimento
em Boas Condições



**AVISE os Serviços
Municipalizados das
Fugas que Detectar!!!
tel. 21753**



Top: A MEREC sticker used widely during the demonstration in Guarda to help publicize MEREC activities and their messages.

Bottom: "Save Water!" This colorful sticker is part of Guarda's MEREC water-conservation awareness

program. It stresses both wise water use and repair of leaks.



The cover and a page from a book of climatic data published by Guarda, Portugal during its MEREC demonstration. The book is aimed at builders and

architects as part of a program to encourage energy-efficient building designs.

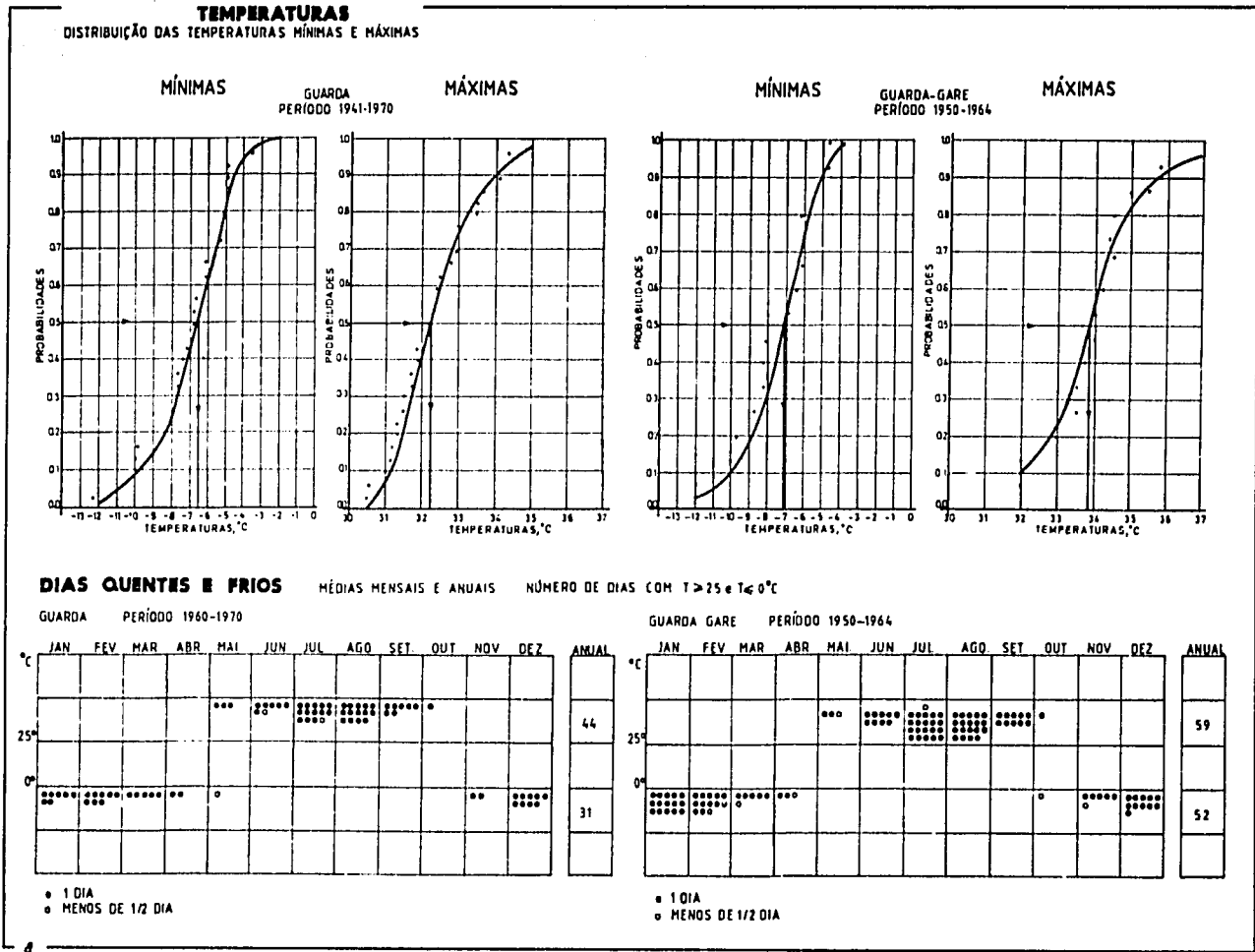
procedures that resulted in consistently higher quality water at lower cost.

The second main component involved the loan by TVA of a water leak detector for use on an experimental basis. A TVA specialist was also made available to provide training to municipal employees in use of the leak detector and in flow-meter calibration.

Tests showed that Guarda was losing about 40% of the water pumped into its system. The city mapped out and launched a program of leak detection and repair. In 6 months, nearly 30 significant system leaks were located and repaired by municipal staff, at a cost to the city of over \$7,000. However, the value of water saved was \$132,500 per year, a figure approximately equal to the municipal payroll.

As a result of this experiment, the CCRC has acquired a leak detector for further use by Guarda and other cities in its territory.

This project heightened Guarda's awareness of the importance of water distribution efficiency and water



conservation measures, and of the potentials for improvement. As a consequence, it introduced a program of more regular meter readings, revised the water rate system to encourage conservation, and undertook a public water-conservation awareness campaign.

Water Supply

During certain times of the year Guarda was plagued with daily water stoppages owing to inadequate supplies. This was not only an inconvenience but represented a serious disruption to economic activity. For example, while tourism is not a mainstay of Guarda's economy, during the summer months visitors from countries throughout Europe provide a substantial injection to local commerce. It was precisely at this time of year that water stoppages were most frequent and prolonged, causing visitors to shorten their stays, and discouraging return visits.

The components of this project included studies of medium- and long-term water demands, assessment of

potentials for increasing the supply from existing water impoundments, cost-benefit studies for capital improvements to assure adequate supplies in the medium range, and a study to determine the feasibility of enlarging a proposed hydroelectric empoundment to serve future water supply needs.

These studies confirmed the urgency of the problem for Guarda, which is a rapidly growing city, and demonstrated that solutions were both technically and financially feasible. They resulted in two major actions that, combined with the water distribution efficiency measures described above, assure the citizens and businesses of Guarda an adequate water supply for the foreseeable future.

The first action, funded and executed by the city, was to construct a new larger diameter pipeline for pumping water from the existing water empoundment into the city system. The second action was to involve the national electricity enterprise in a review of local water demand estimates for the next 50 years and in feasibility calculations for enlarging its planned hydroelectric empound-

ment. As a result, the national electricity enterprise has committed itself to a larger empondment that will create additional water as well as energy resources.

Sewage Expansion

The sewage system in Guarda, like the water distribution system, had been pieced together over the years. It was in a state of deterioration, and many areas of the municipality were not served. What was needed was a total review of the system, a program of system upgrading, and coordination of expansion plans with land use planning to achieve the highest possible level of efficiency of both service provision and use of the urban land resource.

This project entailed technical mapping of the existing sewage system, evaluating the condition and capacity of the system, estimating future demand for service and treatment, and developing a plan for upgrading and extending pipelines and for expanding treatment capacity. A long-term renovation program has been initiated on the basis of the new plan. Special features include maximum use of gravity to conserve pumping energy, expansion based on areas targeted for residential growth, use of biogas digesters in association with treatment facilities, and joint operations with a nearby town to permit better service in both places at lower cost for each.

Solid Waste Collection

The solid waste collection system in Guarda emerged without planning or attention to efficiency. As new neighborhoods developed, they were added to the collection system haphazardly. The city was spending about \$22,500 per year on fuel for collection trucks alone.

This project included a review of current practices in solid waste collection in Guarda and in other cities, and development of a new energy-efficient collection plan. The study was undertaken, and a computer program was developed to map out fuel-efficient collection routes. As a result, design and placement of public trash receptacles and collection truck routing have been revised. Early data show a consequent 20% savings in fuel used for solid waste collection. The computer model is now available for use by other cities.

Solid Waste Recycling

In an effort to reduce solid waste collection and disposal costs, and to achieve resource recovery, a study of the feasibility of recycling solid waste materials was undertaken. The project included a review of recycling expe-

riences in Portugal, analysis of solid waste collected in the city, evaluation of the market values of recoverable materials, recycling feasibility studies for recyclable materials, and plans for recycling each material with potential for profit.

The studies showed that paper and glass could be recycled profitably. A plan was drawn up whereby the city would collect and pay citizens for packaged paper waste, which would be sold to private dealers at a small profit. A plan was also drawn up for the strategic placement of glass collection containers throughout the city and for collection and sale of glass by the municipality to recycling companies.

The municipality has recently completed a building that includes 60 square meters of waste paper storage area and has begun to install the glass collection containers. It will soon be passing an ordinance requiring separation of paper and glass from other waste and then will begin implementing the recycling plans. Guarda is the first city in Portugal with a recycling program of this kind.

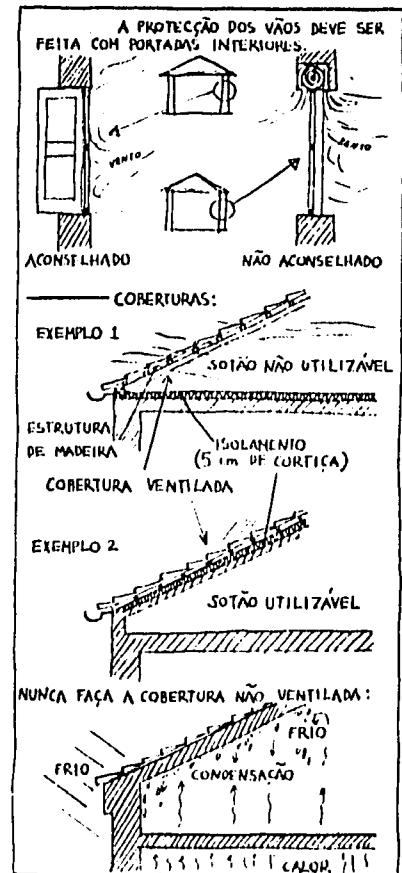
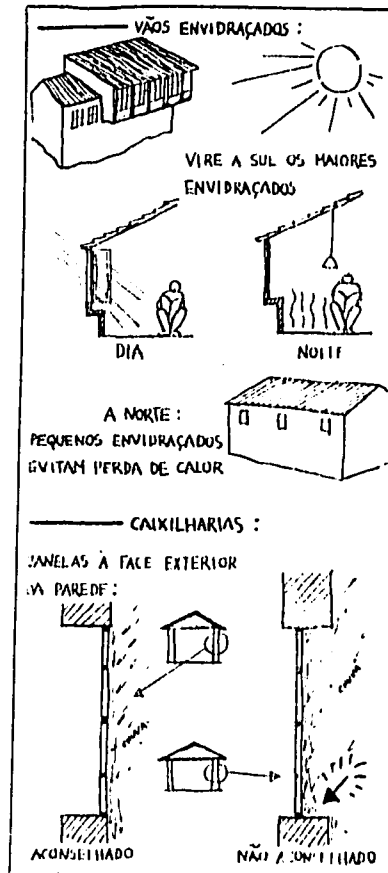
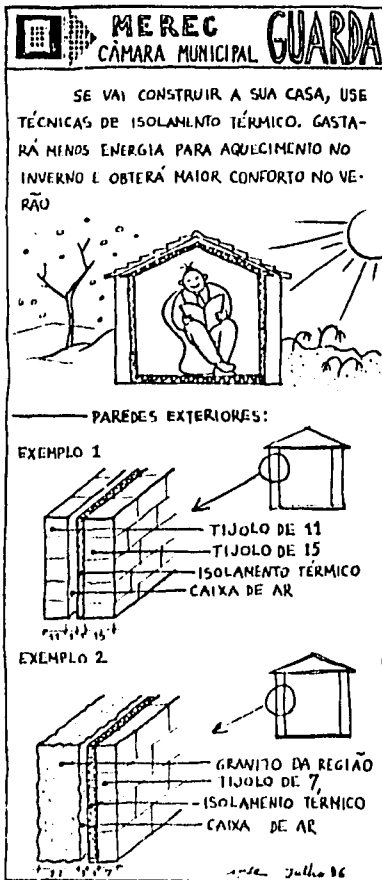
Gas Generation From Waste

This project had two components: a feasibility study for methane gas generation at the city landfill, and a feasibility study for biogas generation at two livestock feedlots in the area.

The first study reviewed the experience of other cities with producing methane from landfill waste; assessed the potential for methane production at the landfill in Guarda in terms of quantity, value, and economic feasibility; and provided recommendations for methane generation. The conclusions of the study were that methane production at the small and casually operated city landfill was not economically feasible, but that it would be feasible if a larger regional landfill were established and designed to facilitate methane generation. Guarda has now established cooperative links with two nearby municipalities toward creating a regional sanitary landfill that will improve sanitation, ultimately create usable land, and make possible methane production.

The second study involved assessing both the technical and the economic feasibility of generating electricity from biogas produced by a biogas generator charged with livestock waste. The electricity would be used first to make the feedlot operations self-sufficient in energy, and the surplus would be sold to nearby rural users.

One of the feedlots holds an average of 200 cows and 800 pigs, and the other holds an average of 35 cows, 50 pigs, and 800 sheep. The feasibility of generating electricity at



both sites was confirmed, and financing for implementation will be provided by the EEC. This project will result in improved sanitation and environmental quality, reduced waste disposal costs, reduced energy costs and consumption of publicly generated electricity, and, ultimately, lower food costs.

The first three pages of a brochure developed by Guarda during its MEREC demonstration. The brochure is aimed at people thinking about building or renovating their homes. It

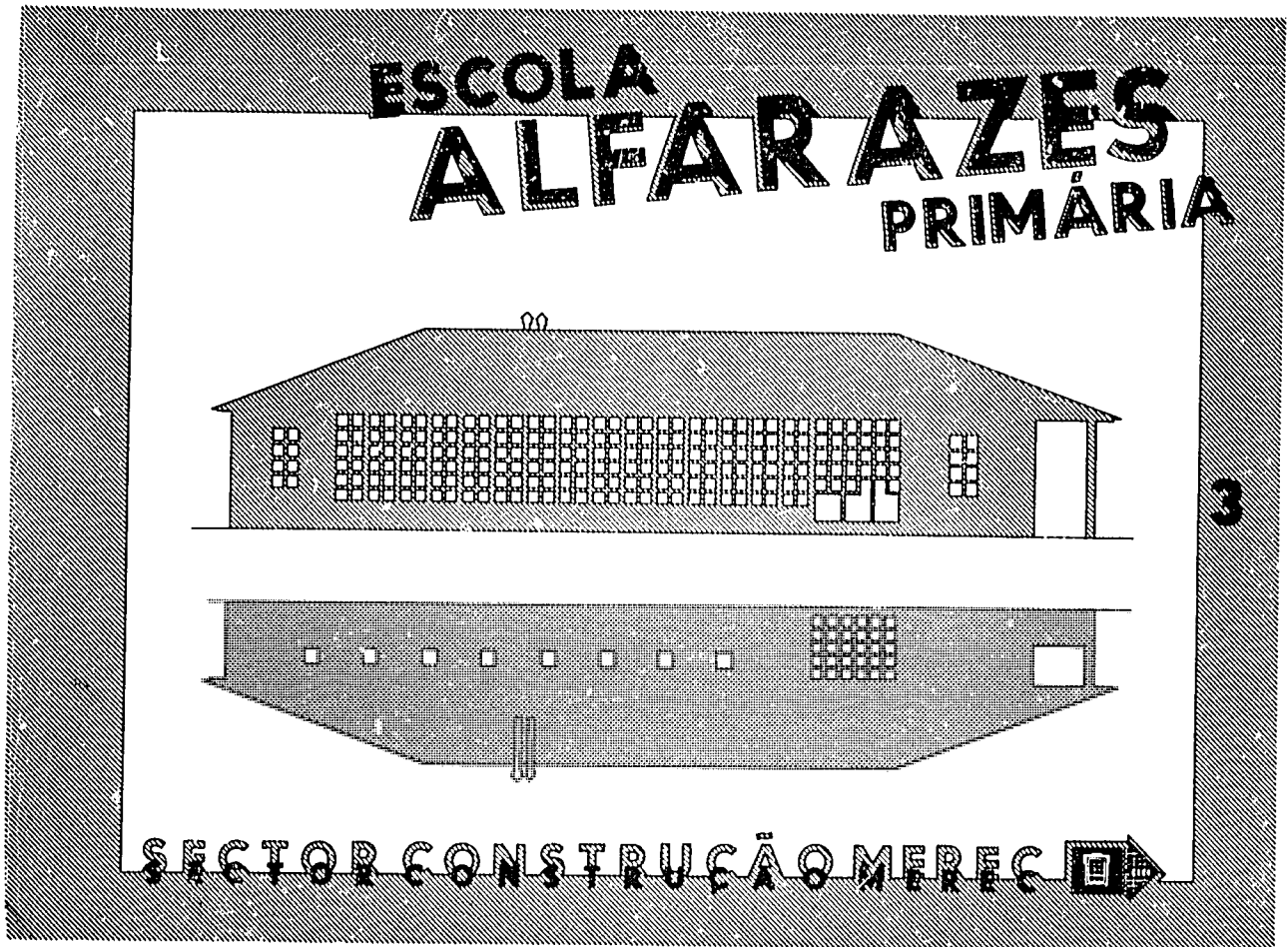
provides tips on insulation, siting, weatherproofing, heating, and more.

Renewable Energy

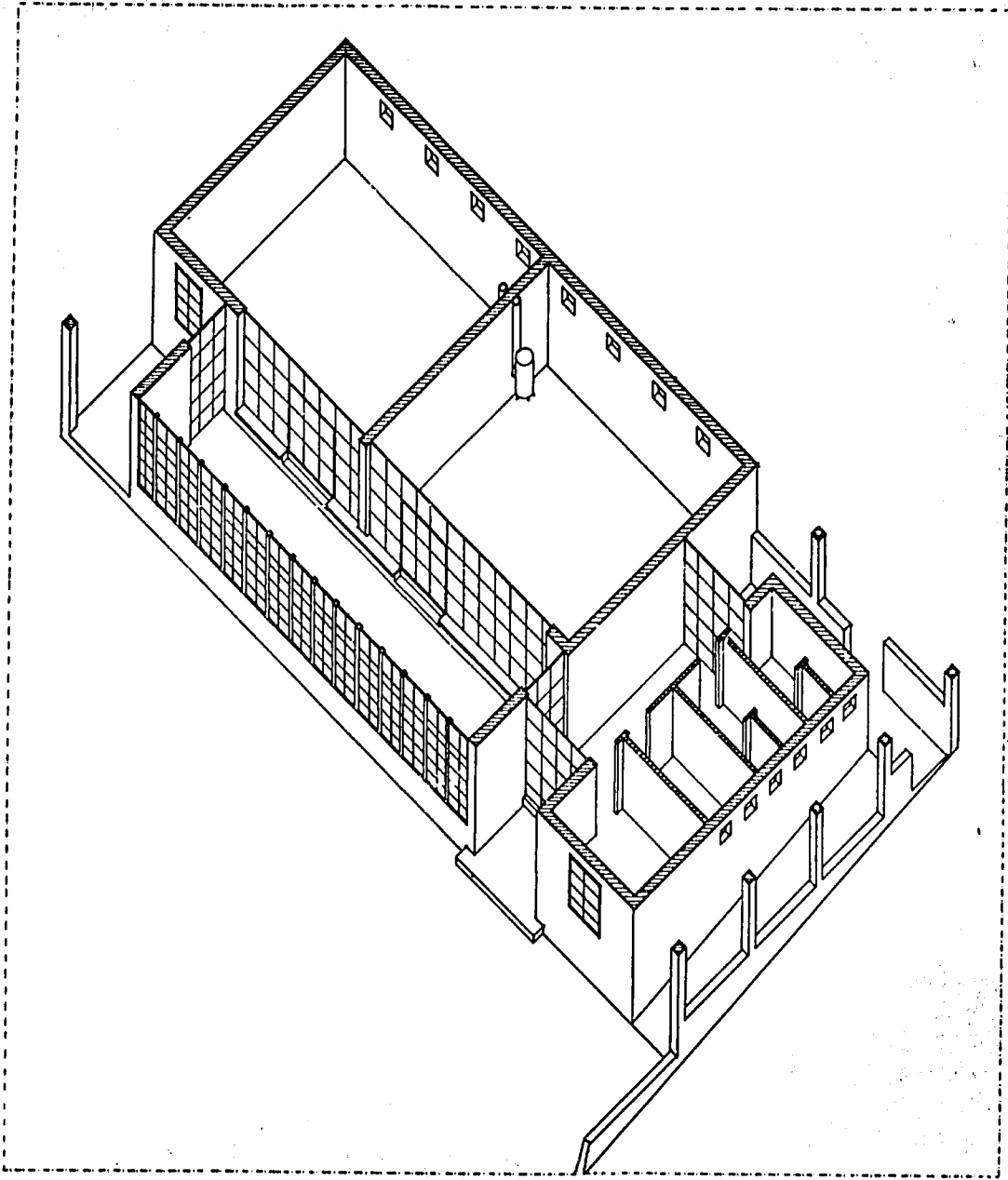
The renewable energy research and demonstration project had as its main components:

- a review of the state of the art of renewable energy systems;
- seminars on renewable energy systems in Guarda; and
- preparation, printing, and distribution of brochures on climatic data, energy consumption, and energy management.

The project concentrated on solar and wood energy. Studies were made of local climatic data relevant to building siting and construction considerations, solar energy potentials in Guarda, energy consumption in buildings, alternative solar collector designs and fire-



Guarda



The cover and a page from Guarda's MERECE book about the Alfarazes primary school designed under the MERECE demonstration. The design incorporates energy-efficiency features such as insulation,

wood window frames, and heating by direct solar energy, thermal mass, and wood stoves. The school is constructed of locally quarried granite.

place and wood-burning stove utilization, procedures for energy monitoring in buildings, and more. Workshops were held for architects and builders, and a program of distribution of energy-efficiency information was launched, aimed primarily at those involved with building construction or renovation.

Agricultural Lands

This project was aimed at conserving and improving the productivity of Guarda's agricultural land resource. Under this project, all agricultural and undeveloped lands within the municipal jurisdiction were analyzed and classified so that prime agricultural lands could be targeted for preservation through a new land use plan and zoning ordinances. This was complemented with an analysis of existing soils, streams, slopes, rivers, canals, dams, and other irrigation and drainage features; identification of problem irrigation and drainage areas; and identification of opportunities for improved irrigation and drainage efficiency. The studies were carried out in consultation with farmers in the area.

Study findings were incorporated into the land use planning project and also served as the basis for a separate irrigation and drainage plan. The irrigation and drainage plan has so far led to five new irrigation and drainage infrastructure projects in the farming areas of the municipality.

Civil Construction

The purpose of this multifaceted project was to develop, experiment with, demonstrate, facilitate, and promote approaches to public and private construction that make use of locally produced wood and granite and that incorporate energy-efficient siting and design principles. The main components of the project included:

- incorporating research findings of the renewable energy project into building component design standards utilizing these principles in demonstration public construction projects;
- preparing and distributing booklets, brochures, and handouts providing design information for both public and private construction and renovation;
- establishing a MEREC design team to respond to requests from the public and private sectors for assistance in incorporating MEREC design principles into new construction or renovation.

In the first few months of this project, the designs and/or siting of several schools, a community center, and a

public housing project were altered or completely done over by or with the help of the MEREC design team. The original designs were in accord with current national standards appropriate to a much warmer climate than prevails in Guarda and that did not take into account the availability of local granite and wood construction materials. In addition to energy-efficient siting and the incorporation of granite and wood components, the new designs employed insulated storm shutters, wood window frames, thermal mass floors, integral solar greenhouses, insulated walls and ceilings, solar-heated workrooms, and woodburning stoves. In these models the insulating material used is made of cork, also a local product.

Using local building materials reduced construction costs in the schools by an average 10%, an amount equal to the additional cost of insulation. Savings on electricity consumption average 70%. These schools represent the first time that insulation has been used in walls and ceilings of public buildings in this part of Portugal.

Booklets have been prepared and are being distributed that detail the special design features of the schools, and the MEREC design team has since assisted with the design of many private and public buildings, including all public buildings in neighboring towns designed with the help of GAT architects. The Ministries of Education and Public Works are studying the designs and expect soon to be adopting new design standards for school construction in the northern part of Portugal based on what has been learned from the Guarda demonstrations.

A series of pamphlets and handouts has been prepared that provide advice for the general public on energy efficiency and the use of local building materials in construction. These are distributed on request at public meetings, and to every applicant for a building permit. More detailed plans and specifications are distributed and used in workshops and training seminars for architects and builders.

Land Use/Urban Management

Land use and urban management in Guarda were out of control. The demands of local democratic government and population growth in Guarda had outpaced the growth in technical and administrative capacity of the municipal staff. Agricultural lands were threatened by expansion of urban neighborhoods. Traffic and transportation was chaotic, resulting in excessive use of transportation fuel, unproductive use of time, and congestion that inhibited trade in central commercial areas. Development was moving into areas unserved by public

utilities, forcing municipal services to "run after" new housing and expand inefficiently. This project represented the first major step in gaining control over use of the urban land resource and managing it for its highest and best use.

The primary components of the project included:

- assessing current land use and urban management practices;
- forecasting future land use demands;
- developing proposals for alternative future land use, with associated resource-efficiency implications;
- developing programs and urban management tools for implementation of the plan adopted by the city.

Work on this project was coordinated with water distribution, sewage, solid waste collection, soils, slopes, drainage, and irrigation work mentioned earlier. It was also coordinated with a new transportation plan that was under development before MEREC.

In carrying out the survey work for this project, extensive use was made of high-school students. This reduced costs, provided income-earning opportunities for students, and exposed the students to the resource-efficiency urban planning principles being employed.

As a result of this project, a new plan was developed and adopted by the Guarda municipality, along with corresponding zoning, building, transportation, and related ordinances and procedures. Some of the central features of the new plan are:

- concentration of future development in the present urban nucleus;
- protection and improvement of agricultural, mineral, and forest resources;
- improvement of traffic and building patterns in new areas of the city removed from the center, and preservation of traditional characteristics of the old city;
- directing growth away from areas currently without municipal services.

The comprehensive urban land use planning and management work in Guarda is being used as a model by the CCRC for other cities in its territory. The plan has drawn the attention of the national government, which is encouraging other cities in Portugal to follow Guarda's example.

Conclusion

Guarda's MEREC projects are clearly improving life for Guarda's citizens and will continue to do so for years to come.

Guarda's MEREC experience demonstrates what can be accomplished by a city with relatively little municipal improvement experience if there is supportive cooperation from other levels of government. In this case, municipal government, regional government, a subregional technical assistance office, and the national government all played important roles, and all contributed to strengthening local government. In fact, the Guarda MEREC demonstration illustrates dramatically the contribution a MEREC process can make to advancing decentralization of capacity and authority to lower levels of government. It also shows the central importance of planning in this process, and the way in which planning not only attracts funding from outside sources but assures the best use of those funds for improving the quality of urban life.

Guarda's adaptation of MEREC was to a physical environment with resource problems and opportunities rather different from what is often found in developing countries.

It is clear from Guarda's MEREC experience that the validity of MEREC principles is not limited to tropical or semitropical areas. As was the case in Tacloban, Guarda showed that relatively modest efforts can lead to significant savings and improvements in water supply, waste management, construction, energy consumption, land use, and other municipal activities that have a major bearing on the quality of life. Guarda demonstrated dramatically how homegrown innovation can promote efficiencies in both the public and private sectors, and how such efficiencies can stimulate new private sector opportunities.

In Guarda we have seen that people will readily adopt innovations if the benefits are clear, and that it is often appropriate for government to take the lead, and the risk, in demonstrating those benefits. Indeed, it is difficult not to be impressed by the extent to which not just individuals, but other local governments, have seen what Guarda has accomplished through MEREC, and have taken steps to replicate those accomplishments.



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Guarda



Opposite: Guarda's new larger diameter pipeline for pumping water from the existing empoundment. It was installed after studies performed under MERECE showed this to be an appropriate solution to the city's water shortage problem until a larger empoundment could be completed.

Above: Water leak detection and repair activities undertaken as part of Guarda's MERECE effort. Photo by Tennessee Valley Authority.

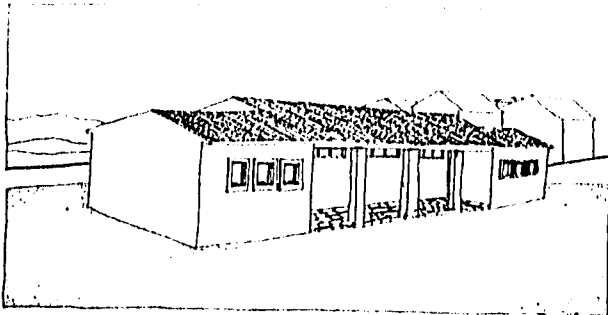
Left: Map showing soil slopes and qualities in the Guarda municipality, prepared during Guarda's MERECE land use planning project.





Citizens deposit bottles for glass recycling in containers like these. Different color containers are for separation of glass by color. A spinoff of Guarda's MEREK demonstration was development of a plan for strategic placement of the containers at convenient high-traffic locations throughout the city.

MEREC



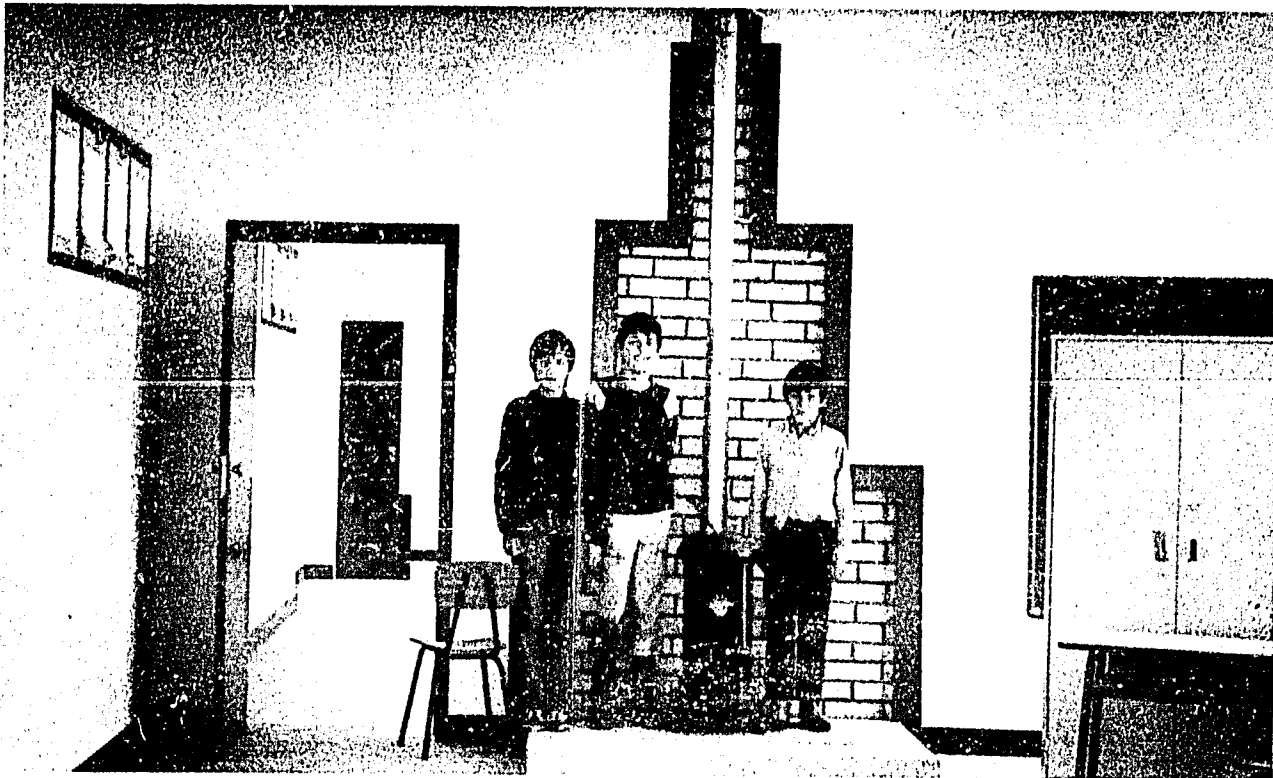
Above: A new primary school in Guarda. Designed under the MEREC demonstration, it features MEREC principles: local wood and granite construction materials, insulation, wood window frames, heating by wood stove, and more.

Left: A drawing of the school taken from a book published by Guarda that contains specifications of some of its MEREC civil construction projects.

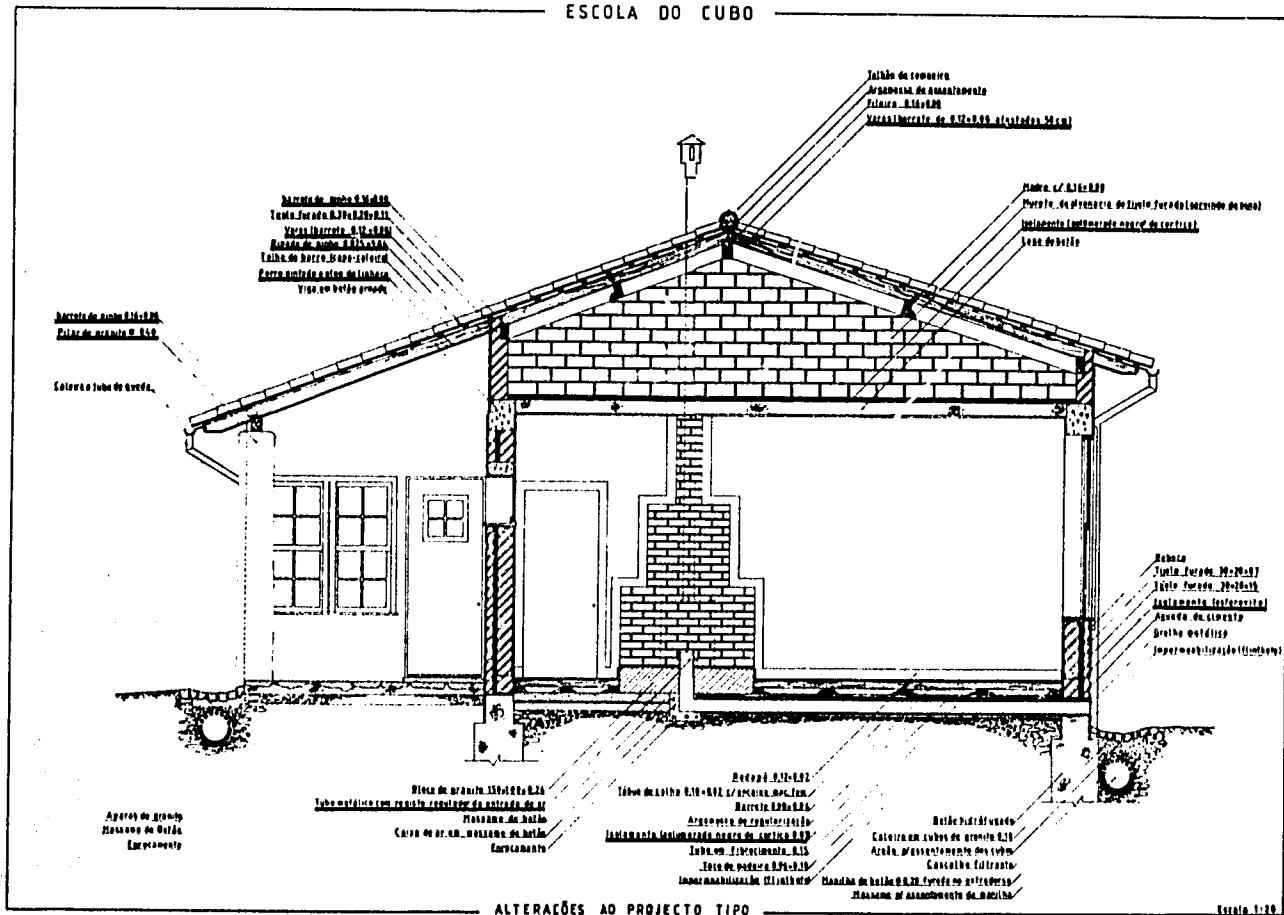
Opposite, top: The interior of the school, showing the raised wood floors, wood stove, and wood window frames.

Opposite, bottom: A design drawing of the interior, taken from the same book as the drawing on the opposite page.

Guarda



ESCOLA DO CUBO



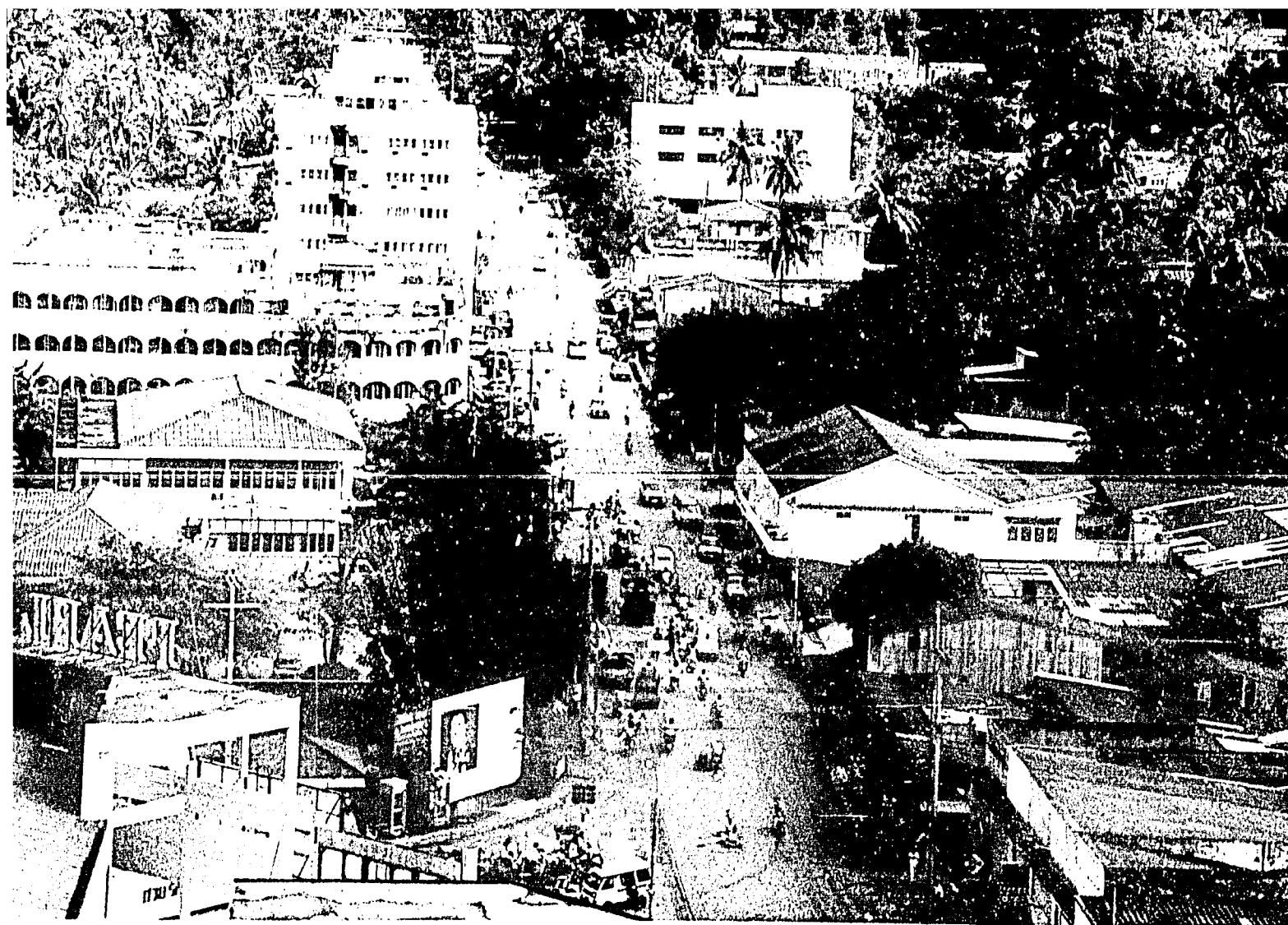


Above: A wing of a new school being constructed as part of a large educational complex for retarded children in Guarda. Guarda's MERECE design team introduced design alterations that led to incorporation of locally quarried granite and locally harvested wood into the building. The school also features wood window frames, wall insulation, insulated storm shutters, wood stove heating, and other MERECE principles.

Opposite: The end of a day at kindergarten in a Guarda neighborhood community center. The pre-MERECE wing on the left was built in a conventional manner. The portion on the right, designed under MERECE, incorporates local building materials and energy-efficiency features.







Chapter 5

Phuket, Thailand

The City

Phuket is located in southwestern Thailand on the island province of Phuket, in the Andaman Sea. It is surrounded by dozens of smaller islands, and the area abounds with inviting tropical beaches. Phuket is the provincial capital and a regional administrative center for national government agencies. Tourism, fishing and fish processing, tin mining, and rubber plantations are the major economic activities in the area and have been for many years. But many of the tin mines are spent, and tourism is now the most rapidly growing economic activity. The fast-growing city has a population of about 45,000, with another 90,000 in the surrounding area closely linked economically to Phuket.

Within the city are a number of spectacular residences and many remains of formerly elegant residences be-

longing to tin mine and plantation managers. Most residential areas, however, are low income, with many houses built in a rural style. Nearly everyone in the city seems to own a moped, and one with a broken muffler at that. In the downtown area the cacophonous roar of small engines goes unabated all day long.

The municipal government includes an executive council composed of a lord mayor and three councilors (vice-mayors), and a municipal assembly. The 18 members of the municipal assembly are elected for 5-year terms, and the executive committee is elected from among these to execute day-to-day functions of the municipality.

The operating departments of the municipality include engineering and civil works, public health, municipal treasurer, education, water supply, and the city clerk. Provincial departments include industry, commerce, agriculture, public health, transport, community devel-

opment, and police. Most other functions, including development of water and energy resources, are the direct responsibility of agencies of the national government.

To some extent provincial departments have responsibilities not given to municipalities; to some extent they have the same responsibilities as municipal departments, but for nonmunicipal areas of the province; and to some extent provincial departments are effectively regional offices of national agencies, with all authority for matters within their sectors throughout the province, whether within municipalities or in rural areas. The provincial governor is appointed by the central government, and provincial staff are employees of the Ministry of Interior.

The city clerk, who reports to the mayor, is responsible for routine municipal administration and supervision of municipal employees. However, the city clerk, like other municipal and provincial staff, is an employee of the Ministry of Interior. Thus, the municipality does not have full authority over the administration of its personnel.

The authority of the municipal government is circumscribed in other ways as well. For example, the annual municipal budget must be approved by the provincial governor, and in turn by the Ministry of Interior in Bangkok. In fact, the signing of a grant agreement directly with a donor agency such as AID is beyond the normal authority of municipal government in Thailand. Phuket's MEREC agreement with AID required the concurrence and support of the Governor of Phuket Province and had to be approved by the Department of Local Administration of the Ministry of Interior. All budget expenditures under MEREC had to be approved by this same central government department. To some degree this hampered the municipality's ability to respond expeditiously to emerging circumstances during the MEREC demonstration.

Municipal revenues are derived from user fees, permits, licenses, and revenues from sale and rental of municipal property. The national government augments local revenues so as to assure coverage of the approved municipal budget, but the amount of revenues returned to the municipality by the national government has no relationship to the proportion of national taxes paid by local residents.

Thus, the MEREC administrative context in Phuket was one in which there was a clear hierarchy of authority. Municipal initiative was not possible without support of both the provincial and central governments, both of which had effective veto power over other than the most routine municipal decisions. While relations among the



Opposite: The view down one of Phuket's main streets, from the roof of the city's largest hotel, in the commercial center. Above: A scene near Phuket's commercial center.



MEREC

three levels of government are cordial and cooperative in general, in the case of Phuket disagreements between the national and municipal governments regarding the degree of local self-determination were not uncommon.

Moreover, two modes of operation central to MEREC were without precedent in Phuket. The first was planning as a basis for project identification; the second was a high degree of intergovernmental cooperation. Because of the division of responsibilities, authorities, and resources among the three levels of government, responsibility for addressing problems within a larger municipal development context fell to no agency at any level. Each addressed discrete problems within its area of responsibility as they arose, in accordance with its own criteria and procedures. This was exacerbated by the fact that each department or agency at each level of government had its own bureaucracy, policies, and budget; and the perception that these needed to be protected from incursions by other agencies engendered a basic mistrust of proposals for intergovernmental cooperation.

A further consequence of the compartmentalization of different aspects of public administration in Phuket was a severely limited technical capacity at the municipal level. It had simply not been necessary, or possible, for the municipal government to engage in initiatives requiring technical capabilities other than for the most routine types of urban management: repairing streets, maintaining parks, mounting public observances, contracting for public construction, and the like. Thus, to carry out the MEREC demonstration project, Phuket was heavily dependent on technical support from agencies of other levels of government and from other sources, such as the university serving the southern part of Thailand.

MEREC in Phuket

Phuket was fortunate in having the enthusiastic support of the Governor of Phuket Province for its MEREC demonstration. The governor believed that municipalities that showed the desire, initiative, and capability for local self-determination should be allowed latitude to pursue it. And since MEREC offered the city of Phuket some financial resources and an approach for shaping its own future, he wanted provincial agencies to lend their support to the endeavor.

Phuket was doubly fortunate in that when midterm in the MEREC demonstration the central government rotated governors for Phuket province, the new governor was equally supportive. He welcomed the opportunity to

work cooperatively with Phuket and to help it fulfill the potential for decentralized municipal capability that he believed inherent in MEREC.

In addition, the Prince of Songkla University (PSU), with its main campus at Songkla on the mainland and a community college branch in Phuket, was very interested in participating in the MEREC demonstration. The faculty saw the Phuket MEREC demonstration as an opportunity for establishing a precedent of community service by the university, for a hands-on municipal management experience that would contribute to strengthening its courses, and for testing its specialized skills in a real-life situation.

The MEREC Steering Committee in Phuket was headed by the lord mayor and included a councillor designated as the first vice-mayor, the city clerk, selected officials of municipal departments, representatives of certain provincial departments, representatives of the central government, and representatives of PSU. They represented agencies with the most direct control over use of financial resources in Phuket, those that had to support Phuket's MEREC effort for it to be successful, and those that were able and likely to lend technical specialist assistance. Specifically, the permanent members of the Steering Committee included representatives of the following:

Municipal agencies

- Office of the mayor
- Office of the vice-mayor
- Office of the city clerk
- Heads of selected municipal departments

Provincial agencies

- Office of Industry
- Office of Commerce
- Office of Agriculture
- Office of Public Health
- Office of Transport
- Office of Community Development

Central government agencies

- Ministry of Interior
- National Environmental Board

Other

- National Institute of Development Administration
- Prince of Songkla University

Other agencies participated in Phuket's MEREC effort more casually, by occasionally participating in Steering Committee meetings or in specific project activities. These included the Land Development Department, the

National Water Authority, and the Mineral Resources Department on the national level, and local private sector representatives.

The Steering Committee took responsibility for establishing MEREC policy, and for approving recommendations and monitoring the work of all Working Groups. The vice-mayor assumed the position of MEREC coordinator. An additional key position, that of MEREC secretary, was created to maintain MEREC records, monitor day-to-day progress, assure publicity for MEREC activities, and receive and distribute reports and documents. This position was taken by the city clerk, assisted by MEREC assistant secretaries selected from her staff. Reflecting the pattern of organization of the municipal government, a MEREC Executive Committee was designated, composed of the mayor, the MEREC coordinator, and the MEREC secretary.

The municipal government provided in-kind services to the MEREC effort in the form of large amounts of paid time of its personnel, office space and support, and the use of municipal equipment, including machinery and vehicles. In addition, the municipality contributed substantial amounts of funds from its budget to specific projects.

The Executive Committee elected to rely heavily on PSU for the extensive technical support needed by the municipal staff to carry out the MEREC effort, rather than on national or provincial agencies. While the latter were called on when necessary, the mayor felt that in general their other obligations made them a less reliable source of assistance, and their competing bureaucratic interests made them likely to be less responsive to the concerns and desires of the municipality.

PSU designated seven faculty members to provide primary technical assistance to Phuket's MEREC effort and concluded a technical assistance agreement with Phuket that spelled out the terms under which PSU's MEREC assistance would be provided. This agreement called for Phuket municipality to cover travel and direct expenses of PSU staff on behalf of the municipality, but not salaries. Through September 1986, accounting records show the value of PSU staff-time contributions to MEREC in Phuket for work not related to implementation of specific local resource-efficiency projects, based on average faculty salaries, to total approximately \$6,000.

Local officials associated with MEREC attached political significance to its progress and success and therefore saw to it that MEREC in Phuket had a great deal of visibility. MEREC meetings and other activities were launched with ceremony and media coverage. MEREC

logos and signs explaining individual local MEREC projects were displayed prominently throughout the city. Photographic displays of MEREC activity were, and remain, a fixture at City Hall.

The resources of major concern identified by the Phuket MEREC Steering Committee were water, urban waste, economic development, land, food, and energy. "Economic development," as a resource, referred to crops that already were put to economic use, but that could be used more widely or processed further to generate more income-earning opportunities. Originally, six key urban sectors were selected: water supply, waste disposal, industrial development, energy, land use, and agriculture. In a succession of discussions at Steering Committee workshops, these were ultimately reduced and refined to five key urban sectors: water supply, urban waste, economic crops, urban land, and energy.

Participants in the Phuket MEREC demonstration found it awkward to think separately of resources on the one hand, and sectors on the other. As the demonstration proceeded, the two concepts merged into one: each sectoral Working Group saw itself responsible for a particular resource area. As a consequence, notions of intersectoral coordination based on concerns with shared resources did not receive attention in the Phuket MEREC demonstration to the degree that they did in Tacloban and Guarda. But in the case of Phuket, the higher priority challenge was intergovernmental cooperation and coordination; and simplification of the basic MEREC approach seems to have been necessary to address that challenge.

Five sectoral Working Groups corresponding to the five key urban sectors were formed. Each contained from four to six members, representing municipal departments, provincial offices, and central government agencies most closely associated with the sector and the resource focus of the Working Group. Each Working Group was assigned responsibility for a Resource Situation Report. In each case a member of the PSU faculty took the lead in bringing the essential information together and helping the Working Group to formulate its report.

Because of the major role played by PSU in preparing the Resource Situation Reports, their approaches, sizes, and styles were fairly consistent. The Executive Committee therefore decided to combine them into a single document and include an introductory chapter on the overall geographic, administrative, economic, and social situation in Phuket. This document constitutes the first basic compendium of planning data for Phuket.

MEREC

Resource situations, problems, and opportunities discussed in the Resource Situation Reports led to a preliminary MEREC Strategy and Action Plan. Because of the novelty of intergovernmental and interdepartmental cooperation, and of approaching municipal issues against the background of a broad strategic framework, considerable time was spent expanding, refining, altering, and detailing Phuket's MEREC Strategy.

Among MEREC participants were some who from the outset had seen the MEREC demonstration as but a means for realizing projects they long had been pressing for in their sectors. These participants now came to understand that projects implemented would have to support achievement of the MEREC Strategy, and so urged modifications in the strategy that would justify the projects they wanted. The resultant lively Steering Committee discussions did, however, ultimately lead to a Strategy and Action Plan agreed to by all and were consistent with the overall purposes and approach of MEREC.

The MEREC resource-efficiency strategy objectives finally agreed on in Phuket reflected the following overall concerns about major local resources:

Water resources were inadequate for the rapidly growing population and commercial activity in Phuket. The treatment plant was operating at capacity, so that even if additional sources of water could be tapped, the distribution system could not accept additional volume. Water meters had never been calibrated, and a large volume of water was lost from the distribution system through leakage. Rainwater represented a major untapped resource.

There was no sewage treatment plant, and human waste disposal was costly and unsanitary. Solid waste collection and disposal techniques were also inadequate, costly, and unsanitary. Slaughterhouse waste represented a serious disposal and pollution problem.

There were opportunities to increase value added from rubber, coconut, and cashew resources and to expand cashew production. Urban vegetable farming represented an opportunity to increase nutrition levels among the poor, and backyard flower production offered income-earning opportunities.

Urban land given over to roadways was used very inefficiently and to the detriment of public safety. Near the city proper were abandoned tin mines that were unsightly and dangerous, that contributed to flooding in the city, and that constituted potential urban land resources.

Energy was used wastefully in many ways in the public and private sectors, in transportation, and in households.

To carry out Phuket's MEREC Strategy, the Steering Committee agreed on an Action Plan containing the following 14 local resource-efficiency projects:

Water Supply Sector

- Inspection and calibration of water meters
- Detection and repair of distribution system leaks
- Dredging of water storage ponds to increase their holding capacity
- Demonstration of ways to collect and store rainwater at small public buildings

Urban Waste Sector

- Construction of biogas digester at the municipal slaughterhouse
- Construction of fermentation and drying tanks for converting human waste to fertilizer
- Construction of centralized waste containers and placement in commercial areas
- Development of a plan for a new sanitary landfill and composting operation

Economic Crops Sector

- Study of the economic feasibility of enterprises that could add additional value through further processing or use of rubber, coconut, and cashew resources
- Demonstration of the use of local materials in housing construction

Urban Land Sector

- Reclamation of an abandoned tin mine for multiple uses, demonstrating both public and private benefits
- Development of a traffic and transportation master plan, with emphasis on increased public safety and energy efficiency

Energy Sector

- Analysis of medium- and long-term energy demands and sources of supply
- Demonstration of energy-efficiency principles in housing design

As with the Action Plan projects of Tacloban and Guarda, some of Phuket's projects were later consolidated, modified, or abandoned. For example, the housing construction and design projects were combined into a single housing demonstration project, and one of the water projects was canceled when it was learned that the national water authority was soon to begin a major water supply expansion and improvement project in the area.

Phuket

**MEREC Resource Strategy Matrix
Phuket, Thailand**

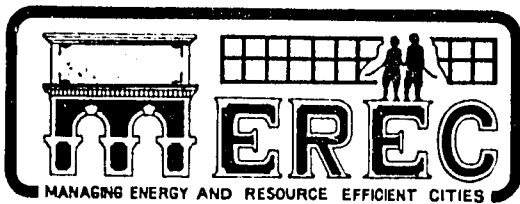
Sectors	Resources					
	Water	Urban waste	Economic development	Land	Food	Energy
Water supply	Increase efficiency of water supply system					
Waste disposal				Use rubbish to improve marginal	Convert manure to fertilizer	Improve waste collection system
Industrial development			Increase finished rubber product production			
Energy						Economize on all energy forms. Encourage alternative energy forms.
Land use				Redevelop abandoned mine land; increase areas for recreation; increase transportation efficiency; make use of local materials		
Agriculture		Utilize waste material				Use existing resources for food production and grasses
SUMMARY STRATEGY for each resource	Increase municipal water supply and distribution capacity	Promote efficient use of urban waste	Increase value of byproducts and make use of local crops	Make more efficient use of land	Increase production from existing sources	Use energy efficiently

Phuket took an approach to project implementation that was different from that adopted in Tacloban or Guarda. With the launching of the implementation phase of Phuket's MEREC demonstration, the Steering Committee was replaced with a Project Management Committee. Again, the committee was headed by the mayor, the vice-mayor served as MEREC management coordinator, and the city clerk continued in her role as MEREC Secretary. Other members included only the relevant municipal department heads. This committee was established specifically to support, coordinate, supervise, and monitor implementation of local resource-efficiency projects. Representatives of other agencies continued to attend occasional meetings to review overall MEREC progress, alterations in project plans, and resource-efficiency achievements of implemented projects, but these meetings were no longer constituted as MEREC Steering Committee workshops.

One of Phuket's MEREC Strategy matrices. Resources of major concern are shown along the top; key urban sectors are shown along the sides.

Considerable time was spent expanding, refining, altering, and detailing Phuket's MEREC Strategy.

เมืองสาธิต การจัดการ
ทรัพยากร และพลังงาน
อย่างมีประสิทธิภาพ
พ.ศ.2527-2529



จัดทำโดย ฝ่ายประชาสัมพันธ์โครงการเมอเซค

The sectoral Working Groups were disbanded. The Project Management Committee took direct responsibility for the tin mine reclamation project, and the municipal departments of engineering and civil works, public health, and water supply each were given direct responsibility for two or more projects. PSU and national and provincial agencies remained involved in project implementation and monitoring, in some cases heavily so. But they worked with Phuket municipal staff in technical support and advisory capacities, rather than as co-members of Working Groups.

All of Phuket's local MEREC projects were funded jointly by MEREC funds from AID and Phuket Municipality. In all cases, the municipality and PSU provided in-kind contributions, and in many cases in-kind and/or cash contributions were provided by provincial and national agencies as well. In some cases the in-kind contributions were very substantial and included such things as land and buildings. Individuals from the private sector participated in several of the projects but did not provide cash or significant in-kind contributions. TVA technical specialists lent technical support to waste management, tin mine reclamation, and water leak detection efforts.

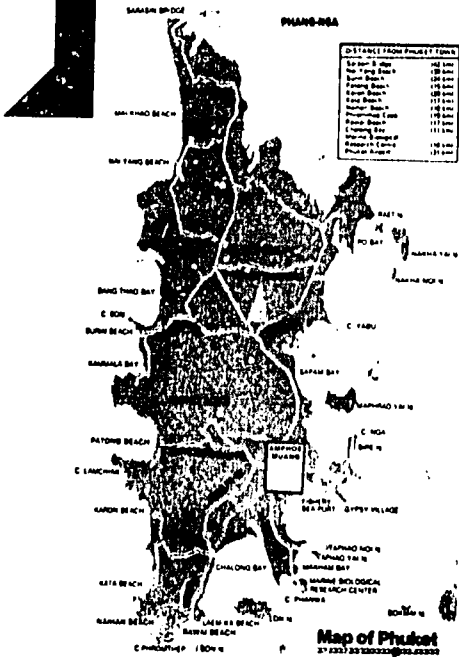
While there was no formal MEREC Education Sector in Phuket's MEREC demonstration as there was in Tacloban, efforts were made to make the public aware of MEREC, its principles, and its activities. These included deliberately holding formal MEREC meetings at different places in the city, and always inviting media coverage; five seminars for local business and industry leaders on ways to improve energy conservation in their enterprises; the widespread use of MEREC T-shirts and logos; signs explaining MEREC projects; media coverage of MEREC activities such as water leak detection; an energy-conservation slogan contest; heavily illustrated brochures and booklets distributed at City Hall and at various public meetings; MEREC exhibits at various sites throughout the city; demonstration tours of local MEREC projects; and even MEREC bumper stickers urging energy conservation. That MEREC has a prominent place in Phuket city life is readily apparent to citizens and visitors alike.

Some local MEREC awareness has come about through mishap. One unit of MEREC demonstration housing was built on unused municipal land on the other side of a creek from, and about a hundred meters behind, a commercial rifle range. A hill of fill dirt at the end of the rifle range is meant to protect the surrounding area from the target practice of poor marksmen. Nevertheless, stray bullets have found their ways to, and through, the



โครงการเมอร์เรค

MEREC



เทศบาลเมืองภูเก็ต
 -เมืองสาธิต การจัดการ
 ทรัพยากร และพลังงาน
 อย่างมีประสิทธิภาพ

Opposite and left: Two MEREC brochures, a means for disseminating information on MEREC in Phuket.
 Above: Another component of Phuket's MEREC public awareness activities. This bumper sticker enlists the image of two Phuket heroes superimposed on a map of Phuket Island in urging energy conservation.

demonstration houses. A dispute has erupted between the municipality and the rifle range operator concerning corrective measures. Incidents like this have received media coverage and have brought MEREC, as an ongoing, experimental, and significant effort, to public attention.

Implementation of local resource-efficiency projects in Phuket began about 2 years later than in Tacloban; and unlike the case of Guarda, most of Phuket's projects involved construction or related activities, rather than major studies or plans. As a result, there has so far been little opportunity for significant spinoffs to emerge. But there are already indications that the resource-efficiency and demonstration impacts will go well beyond those anticipated directly from the local MEREC projects in Phuket's Action Plan, and in some cases they already have.

For example, the municipal Department of Water Supply found itself dissatisfied with its efforts at water conservation through leak detection and repair, meter calibration, and rainwater collection projects alone, because it concluded that major achievements in conservation were possible through more efficient water use by end users. As a result, it launched a public water-conservation awareness and education campaign that simultaneously stressed actions the municipality was taking to conserve water and provided guidance to citizens on how they could do their part.

National agencies have taken note both of the MEREC process and achievements in general in Phuket, and of specific local MEREC projects. The Phuket MEREC demonstration has been featured at a national meeting of mayors. The central government, pondering what to do with abandoned tin mines in several areas of Thailand, has followed the Phuket reclamation project closely. In fact, viewing the Phuket tin mine reclamation project as a possible national model, the central government is participating in it directly and contributing a substantial amount of money to it.

Also through the tin mine reclamation project, precedents are being firmly established for interagency cooperation. Participants in that project include Phuket Municipality, Phuket Provincial Government, PSU main campus, PSU community college campus, the Land Development Department of the Ministry of Agriculture, and the Mineral Resources Department of the Ministry of Industry. This project, and the interagency cooperation that is the fundamental facilitating aspect of it, will continue for many years, providing a model for similar endeavors in Phuket Province and elsewhere in Thailand.

MEREC in Phuket has also provided a model for other cities and other universities in Thailand through its innovative technical services agreement and working relationship with PSU. The agreement specifically states that its objectives are to provide an opportunity for PSU faculty and students to gain operating experience and experience working with government agencies at all levels and for the city to gain technical support and knowledge from PSU faculty. Departments of PSU that participated in MEREC included the Department of Engineering, the Department of Management, the Department of Natural Resources, the Department of Economics, and the Phuket Community College campus.

Other cities in southern Thailand have observed this, and some have already opened discussions with PSU concerning similar arrangements. Meanwhile, PSU has created new courses and strengthened others on the basis of its experience in Phuket. In some courses, data from work in Phuket is used as case study material, giving students the opportunity to address problems in resource use and urban management using actual data from a Thai city. PSU is also establishing an advisory service for cities in southern Thailand as a fixed component of its organizational structure.

As for concrete future programs that build on Phuket's MEREC experience, there are many. On its own initiative, Phuket organized a conference in the spring of 1987 for cities in the southern region of Thailand. It allocated money both from its MEREC funds and from its own sources for this. AID/Thailand and PSU both made in-kind contributions. Representatives of the other cities came at their own expense. The conference included lectures and tours of local MEREC projects, with emphasis on intergovernmental cooperation, local initiative, the role of PSU, and the resource-based planning approach. The specific resource-efficiency technologies employed were explained, and data documenting resource efficiency, financial, public welfare, and local development gains were presented.

AID/Thailand and the Royal Thai Government have embarked on a new initiative called the Decentralized Development Management Project (DDMP). DDMP is intended to strengthen the capability of local rural governments to plan and manage rural development activity. The MEREC approach, as refined for application in Thailand through the Phuket MEREC demonstration, has been adopted as the basis for this project.

Under DDMP, 36 local rural governments in 9 provinces throughout Thailand will be provided financial and technical assistance by AID, the central government, and nongovernmental development organizations (NGOs)

to undertake resource-based planning exercises that lead to local project identification, design, and implementation. MEREC committees will be established at the local rural government level to support and monitor local progress and activities, and the Ministries of Public Health, Education, Agriculture, and Interior will provide direct support.

AID and the Royal Thai Government are also launching a Coastal Resources Management (CRM) project. CRM is intended to establish mechanisms for intergovernmental coordination toward achieving greater and longer lasting development benefits from Thailand's extensive coastal resources. Like MEREC, this project will begin with a pilot/demonstration project to experiment with and refine an approach suited to the Thai context.

The island and province of Phuket has been selected as the site of the initial project because of the successful MEREC experience. A Provincial Committee chaired by the governor will be established to identify coastal management issues and to formulate a coastal management strategy and action plan using the MEREC approach. The Provincial Committee will include central government representatives, officials of various provincial departments, representatives of the Phuket Municipality, and representatives of private sector groups such as the hotel industry, restaurant owners, souvenir shop owners, and manufacturing enterprises.

But perhaps the most significant and lasting impact of MEREC in Phuket is in the realm of local initiative. Local government in Thailand, at the provincial, municipal, and rural government levels, has historically been overwhelmingly under the control of the central government. Now, at all levels of government, there is an increasing determination to decentralize authority, responsibility, and technical capacity. Yet this remains very uncertain ground in Thailand. Central government agencies are hesitant to relinquish control until they are certain that sufficient local capability exists. Local governments are uncertain as to how much latitude higher levels of government are truly willing to permit them and are no less uncertain about their own capabilities for self-determination.

Phuket, through its MEREC demonstration, has shown a path. It has shown that local initiative can go a long way in shaping local development, and it has demonstrated mechanisms for doing this. It has shown that the path, at this juncture in Thailand's development, involves local insight, creativity, and planning, combined with the capabilities of provincial and national government agencies

and of other institutions such as Thailand's universities. It has shown that the idea is to embark on initiatives without hesitating to ask for help from others and to use the experience to strengthen local capability.

The former deputy head of Phuket's Department of Engineering and Public Works is now head of the same department in another municipality. He has begun lobbying there for construction of a biogas digester at the municipal slaughterhouse. Although the biogas digester at Phuket's slaughterhouse was paid for in part by MEREC funds from AID, it would have provided a net financial gain to the city had it been built entirely at city expense. He is planning to use monitoring data from Phuket in an effort to convince his municipal government to undertake a similar project, but on a larger scale than in Phuket.

The present city clerk and MEREC secretary in Phuket is about to be reassigned by the Ministry of Interior to another city in southern Thailand. Another former Phuket MEREC participant was reassigned to the same city some months ago. The two have been corresponding on means to transfer MEREC concepts and project ideas to the new city.

In quiet ways like these, as well as in new major development projects and in continuing MEREC activity in Phuket, the Phuket MEREC demonstration has created a legacy that will serve development in Thailand for years to come.

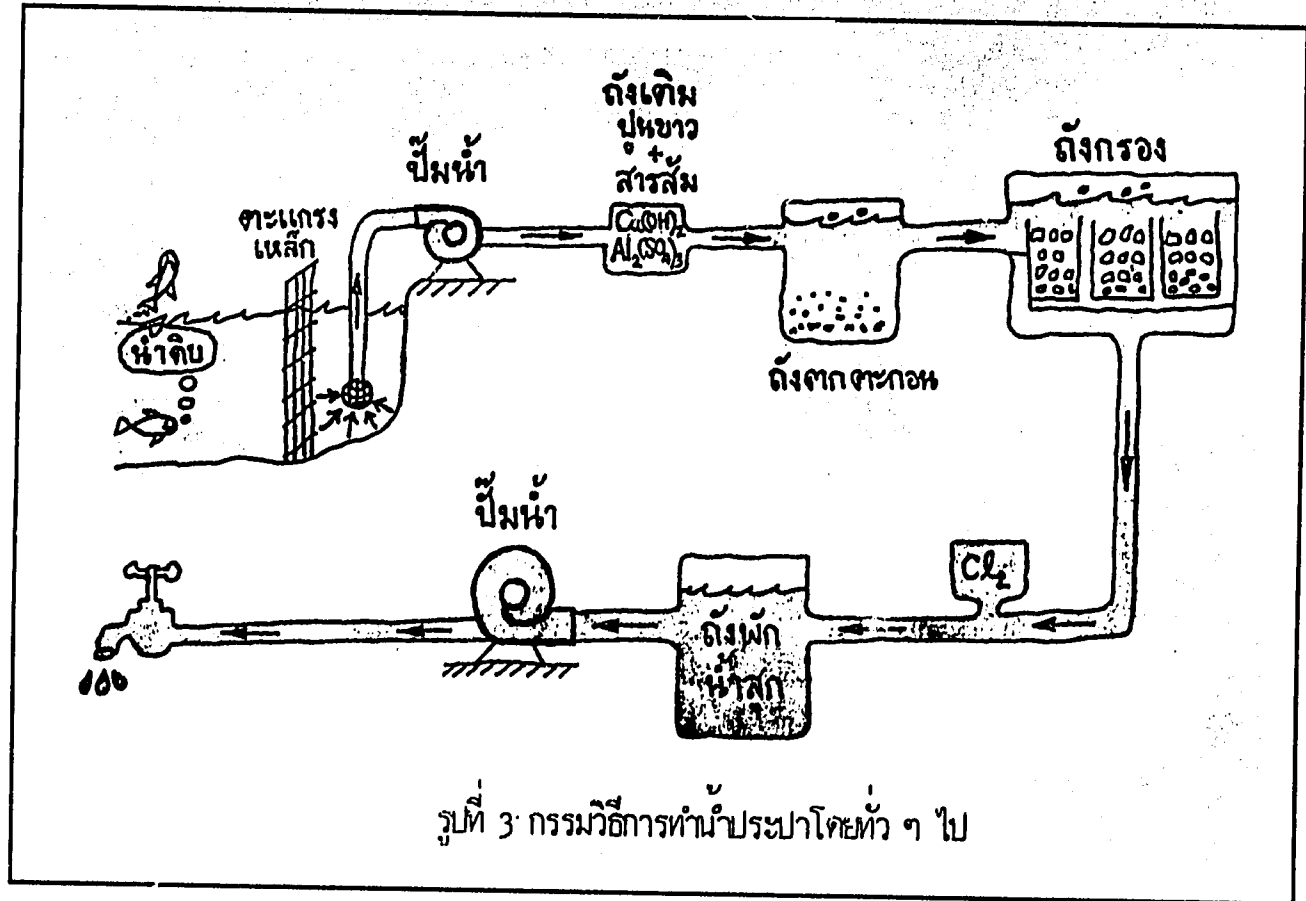
Phuket's MEREC Projects

At the time of this writing, many of Phuket's local MEREC projects had only recently been completed and begun operation, others were completed but not yet fully operational, and still others were in the final stages of construction. In a few cases, factors beyond Phuket's control caused extended implementation delays.

As a consequence, for many projects only preliminary monitoring data were available, and in some cases no data had yet been recorded. Projects listed earlier in this chapter but not covered in the discussions below were either postponed or are still in such early stages of implementation that meaningful reporting on them was not possible.

Water Supply

This project had two components: water meter inspection and calibration, and water distribution system leak



detection and repair. Its purpose was to pinpoint and repair sources of water loss in the distribution system and to improve cost recovery in water supply. Under the MEREC demonstration, pilot programs were conducted at a cost of about \$4,300 in MEREC funds from AID used to purchase equipment and an in-kind contribution from Phuket Municipality valued at about \$850. These led to permanent programs of meter calibration and leak repair.

During the pilot program, 485 water meters, including some at commercial establishments, were tested and calibrated by municipal workers. The unrecorded water use represented by the meters in the pilot program alone were found to account for financial losses to the city water system of over \$13,000 annually. In the first 3 months of use, a leak detector borrowed from TVA uncovered 27 water system leaks that, when repaired, represented an annual savings of \$8,400 worth of treated water.

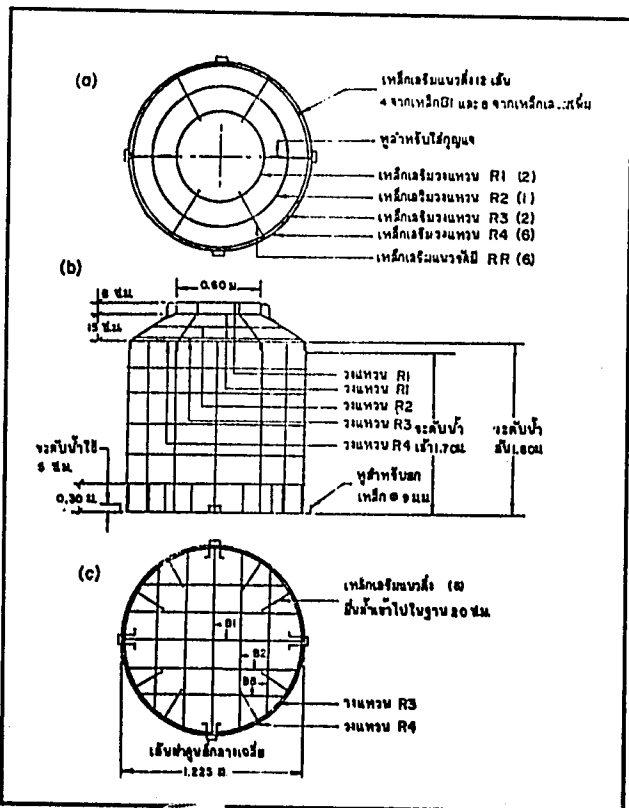
Phuket has since purchased its own leak detector, at a cost of \$2,500, to continue the program. Through September 1986, an additional 32 leaks were detected and repaired, resulting in additional water conservation valued at \$6,000 per year.

As part of this project, a TVA expert provided leak detection training for staff of Phuket's Department of Water Supply. Phuket invited staff from water departments of other municipalities to participate, so that a total of 16 technicians from 4 municipalities in southern Thailand benefited from the training.

Rainwater Storage

Phuket records an average of 2,290 mm of rainfall per year, one of the heaviest in Thailand, yet has a shortage of water supplies. This project had as its objective to develop, demonstrate, and publicize methods of storing rainwater and thereby make use of this free and renewable resource.

The project utilized MEREC funds to construct 15 ceramic urns and 10 ferro-cement tanks to capture rainwater from rooftop collection systems. The systems incorporate a valve that allows a cleansing runoff during the first rain of the season to be diverted from the container. The city designed, supervised construction of, and installed the urns and tanks at its own expense. Each urn has a capacity of 1,600 liters, and the tanks were made in 2,000 and 5,000 liter sizes.



The cover and three pages from a booklet published by Phuket during its MEREC demonstration. The booklet describes Phuket's water resource, explains the process by

which water arrives at the tap, gives water conservation tips, and provides specifications for components of rainwater collection systems.

The urns have been placed at preschool centers and rural community centers. The ferro-cement tanks have been placed at MEREC demonstration houses, public schools, and a mosque. The rainwater collection systems are being demonstrated at locations that have no public water service.

All the demonstrations are in progress and appear to be successful. However, owing to implementation delays, monitoring data and dollar valuations of water collected and used are not yet available.

Brochures describing the collection systems and booklets with technical specifications are being distributed by the city. As soon as data are available that confirm the financial benefits of the systems, the city will update these documents and launch a campaign to encourage commercial manufacture and adoption of the systems by households, rural public agencies, and neighborhood organizations. One component of this effort will be to provide guidance and assistance to small enterprises that might manufacture the urns and tanks.

Biogas Generators

Using MEREC funds from AID for construction, and city resources for design, construction monitoring, and adjustments during the trial period, Phuket installed a demonstration biogas digester at its new slaughterhouse. Because construction of the slaughterhouse was well under way as MEREC implementation activities began, and the design and siting did not accommodate full-service biogas operations, the biogas digester is of limited size. It utilizes slaughterhouse animal waste to produce methane gas, which provides energy for heating one row of scalding pots. The gas produced is sufficient to replace all the energy otherwise provided for those scalding pots from purchased wood fuel.

A second biogas generator has been constructed at the site of a MEREC demonstration house that is part of the tin mine reclamation project. Although the digester was complete, as of late 1986 operation had not yet begun because the demonstration house was still unoccupied.

Human Waste Conversion Facility

This project involved construction of a fermentation and drying system for converting human waste to fertilizer. In Phuket, human waste was collected by truck from septic tanks and spread untreated on open land, a costly and unsanitary procedure. The objective of this project was to reduce waste collection and disposal costs, improve

sanitation, and convert this problem into an urban resource. MEREC funds from AID for construction were supplemented by the municipality with substantial in-kind contributions, as well as the construction at city expense of a building to store and protect the dry fertilizer produced by the project.

The system contains 10 tanks holding a total of 336 cubic meters of sludge. Each tank bears a large number on its side representing the day of the month it is to be filled from waste collection trucks. After fermenting in a tank for 28 days, the fermented sludge is drained into concrete ponds for drying. When dry, it is bagged and stored. The fertilizer thus produced is used on public lands and on lands being reclaimed at the tin mine project site. It is hoped eventually to be able to offer the fertilizer for sale to the public.

Solid Waste Management

This project had three components: design and installation of centralized waste containers, composting at the city dump, and design and development of a landfill. The purpose of the project was to improve solid waste collection while reducing costs and use of transportation fuel; to convert some portion of solid waste to an urban resource; and to improve sanitation and efficiency of waste disposal, while creating urban land, by converting from a solid waste dump to a sanitary landfill operation.

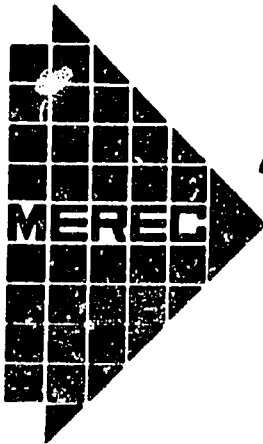
Prior to embarking on any of the components of this project, Phuket conducted an overall review and analysis of its solid waste management operations. This resulted in substantial alterations in the original project and its timing.

Studies indicated that modifying the network of solid waste containers in the city would produce only marginal gains, and that other changes in the system would produce greater savings in time and in motor fuel. For example, using trash collection pushcarts in areas inaccessible to collection trucks would enable a major expansion in collection services and associated improvements in sanitation, at little additional cost. MEREC funds earmarked for centralized waste containers were therefore reprogrammed for construction of 10 pushcarts. These pushcarts have now been put in service, together with other system modifications that will improve solid waste collection efficiency.

Composting at the city dump was determined to be feasible, since the waste deposited there was found to have a high organic content. The design of a composting operation in connection with landfill development was

PRELIMINARY STUDY

INDUSTRIAL DEVELOPMENT FROM ECONOMIC PLANTS IN PHUKET



MANAGING ENERGY AND RESOURCE EFFICIENT CITIES

PHUKET MUNICIPALITY

The cover of Phuket's MEREC "Economic Plants" study. The study was used to educate local businesspeople, investors, and bankers, as well as the national Board of Investment and

Ministry of Industry, concerning additional business opportunities in further processing or expanded production of local agricultural commodities.

MEREC

completed, but the implementation cost was found to be in excess of what was immediately available from MEREC or municipal funds. As a result, a funding proposal was prepared and submitted to the International Board for Soil Research and Development at its regional seminar in Thailand in late 1986, where related proposals from other countries were also submitted. Phuket is awaiting word on the success of its application.

A careful review of proposals made over the years for upgrading Phuket's solid waste dump to a sanitary landfill operation led to the conclusion that a new landfill was unnecessary. Redeveloping the existing site and disposal procedures would extend the life of the disposal site, make disposal operations considerably more sanitary and efficient, and ultimately create usable urban land. Phuket is now exploring means for financing redevelopment of the site.

Economic Crops

This research and development project focused on economic development through greater use and processing of the products of rubber, coconut, and cashew trees. Studies were made of such things as manufacturing finished products from locally produced latex, the processing of coconut wood into construction materials, and expansion of cashew nut production. A series of private sector opportunities were documented.

After completion of the studies, seminars were held for local businesspeople, investors, and bankers to expose them to the opportunities and the supporting data, and reports were sent to the national Board of Investment and the Ministry of Industry for circulation to potential investors. Although no private investment in the proposed ventures has yet taken place, there is a great deal of continuing interest by local businesspeople in the reports. Indications are that the potential remains high for private investment in the near future. As pilot demonstrations, the municipality employed coconut wood in its demonstration houses and will be growing cashew trees at the reclaimed tin mine site.

Demonstration Housing

Under this project, a single-family housing unit was built at the tin mine reclamation project site, and at another site within the city a single-family and a duplex unit were built. The unit at the tin mine site is intended for the family of a caretaker and is not yet occupied. The other units are occupied by municipal employees who are provided with housing or a housing allowance by the

government. The units were built with MEREC funds from AID, supplemented by in-kind contributions from the city for design and construction supervision. The units were designed by a local architect.

The purpose of the project was to demonstrate use of local construction materials and energy- and resource-efficient designs for low-income but high-quality urban housing. The houses feature rainwater collection and storage systems, a biogas digester, natural cooling designs, and coconut wood and bamboo construction materials. They cost less to construct than conventional counterpart units and of course save their occupants money through resource-efficiency features.

Demonstration tours are regularly conducted at the occupied houses.

Tin Mine Reclamation

This project demonstrates multi-purpose reclamation of waste land near an urban area. The waste land in this case is an abandoned tin mine site, of which there are many in Thailand. The project incorporates elements of other Phuket MEREC projects, including biogas digesters, demonstration housing, rainwater collection, economic crops, and use of fertilizer made from human waste.

This long-term project has three phases:

1. physical survey, data collection, and analysis of the characteristics of the site;
2. preparation of a site development master plan and an implementation plan covering a 5-year period;
3. implementation.

The first two phases are complete, and implementation is well under way.

In addition to MEREC funds from AID, Phuket Municipality has so far made substantial in-kind contributions in the form of staff time and equipment utilization and will be continuing to do so over the life of the project. The Land Development Department of the Ministry of Agriculture has contributed approximately \$9,000, both in-kind and cash; the Mineral Resources Department of the Ministry of Industry has contributed over \$20,000 in cash; and the PSU Community College has contributed over \$160,000, both in-kind and cash, most of it through dedication of the 70-acre site and construction of buildings there.

When completed, the site will feature a fish pond, flower gardens, a eucalyptus grove, cashew trees, rubber trees, coconut trees, demonstration housing, a water reservoir, a public park, a turf-growing area, vegetable gardens, a

branch of the community college that includes classrooms and dwellings, and a pasture. The contributing organizations, as well as the provincial government, have all been actively involved in planning and implementation activities.

Graded areas, drainage culverts, experimental groves, grassed areas, an access road, the demonstration house, the first community college building, and several other planned installations are already in place.

This project represents a model both of urban resource creation and of long-term interagency cooperation.

Conclusion

Phuket's MEREC projects, which are impressive indeed now, promise to deliver even greater benefits to the municipal government and citizens of Phuket in the future. Phuket, like Tacloban and Guarda, brought together several levels of administration in an unprecedented cooperative effort to strengthen local government and to improve municipal services and the quality of urban life. Phuket demonstrated that concrete municipal improvements serve well as focal points for intergovernmental cooperation, and that such cooperation enables small municipal governments to mount large and complex undertakings.

What is uniquely impressive in Phuket, however, is the role played by local and regional educational institutions.

In a spirit of public service, these institutions provided technical assistance and material contributions at cost or at no cost. The regional university and its Phuket community college branch also recognized the value to their own programs of participating in Phuket's MEREC effort. They perceived that MEREC activities would provide a learning laboratory for their staffs and students. By offering hands-on municipal decisionmaking and project implementation experience, they strengthened their own capabilities as centers of learning in these areas. They also understood that by supporting efforts to improve the municipal environment, they were ultimately supporting efforts to improve their own environment and that of their students. The region and the country as a whole are benefiting from this, because through these institutions the lessons of Phuket's MEREC experience are being spread to other places in Thailand.

Through projects such as rainwater collection and storage, the human waste conversion facility, and the tin mine reclamation project, Phuket has shown how big resource problems often contain within them the seeds of big resource opportunities. The way Phuket carried out its MEREC activities illustrates how major energy and resource efficiency efforts readily serve as sources of municipal pride, and how that pride leads to an interest in sharing achievements, and the means for accomplishing them, with other cities. Phuket's experience shows that MEREC principles have utility, and can be readily adapted, at provincial and rural government levels.

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LIVE AT THE ...

ZEPHYRUS



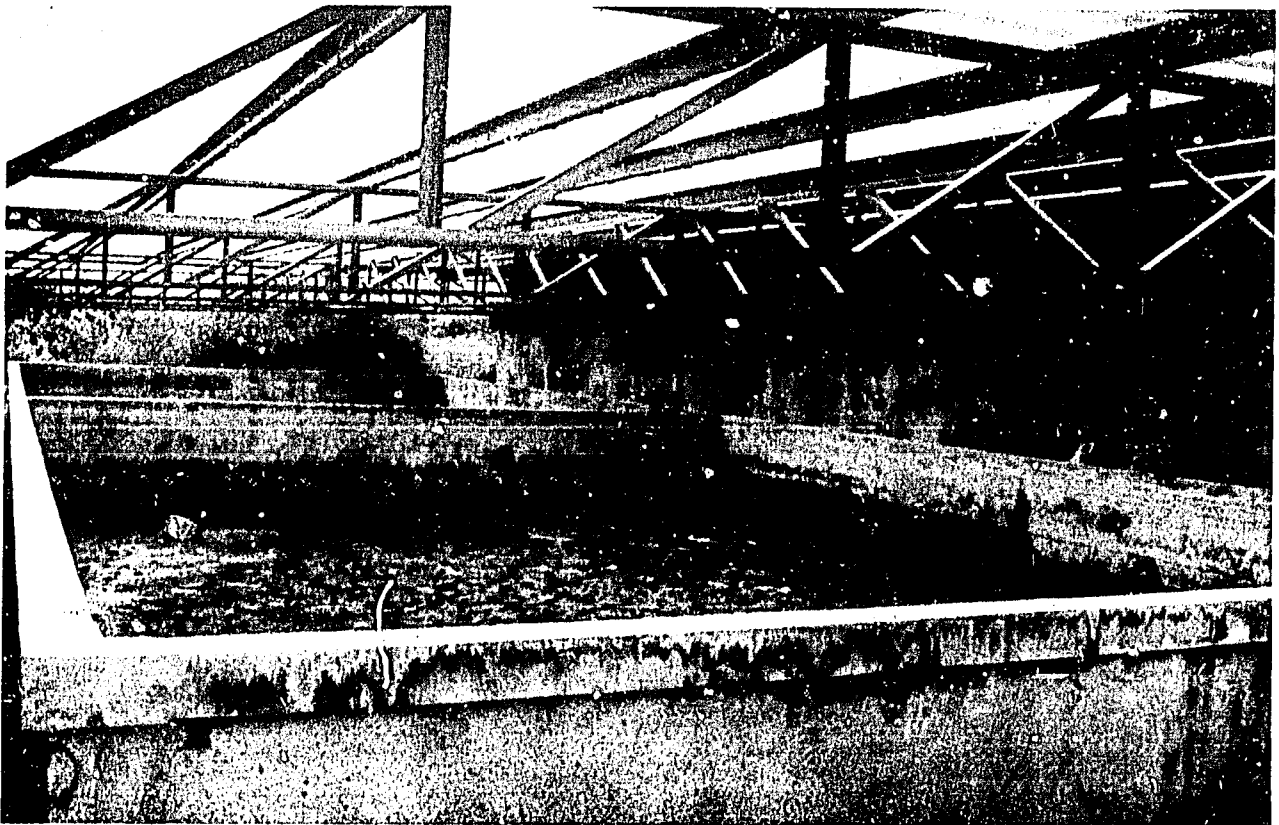
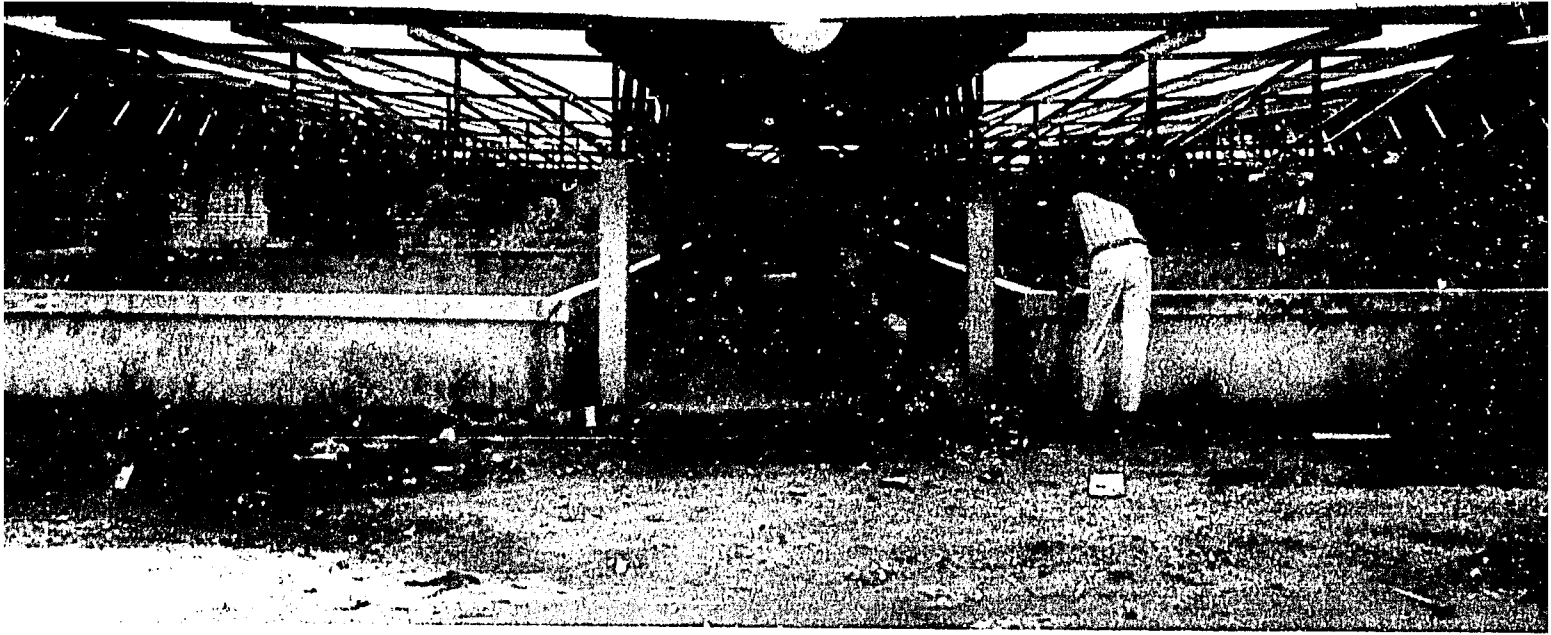


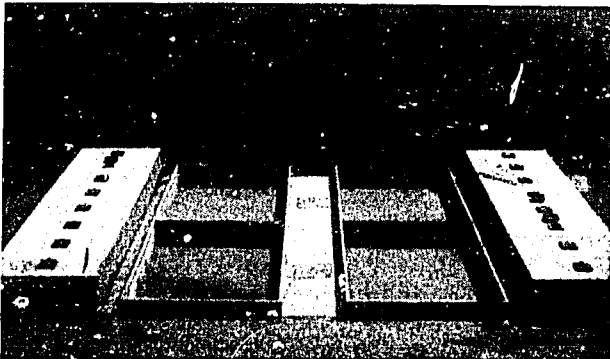
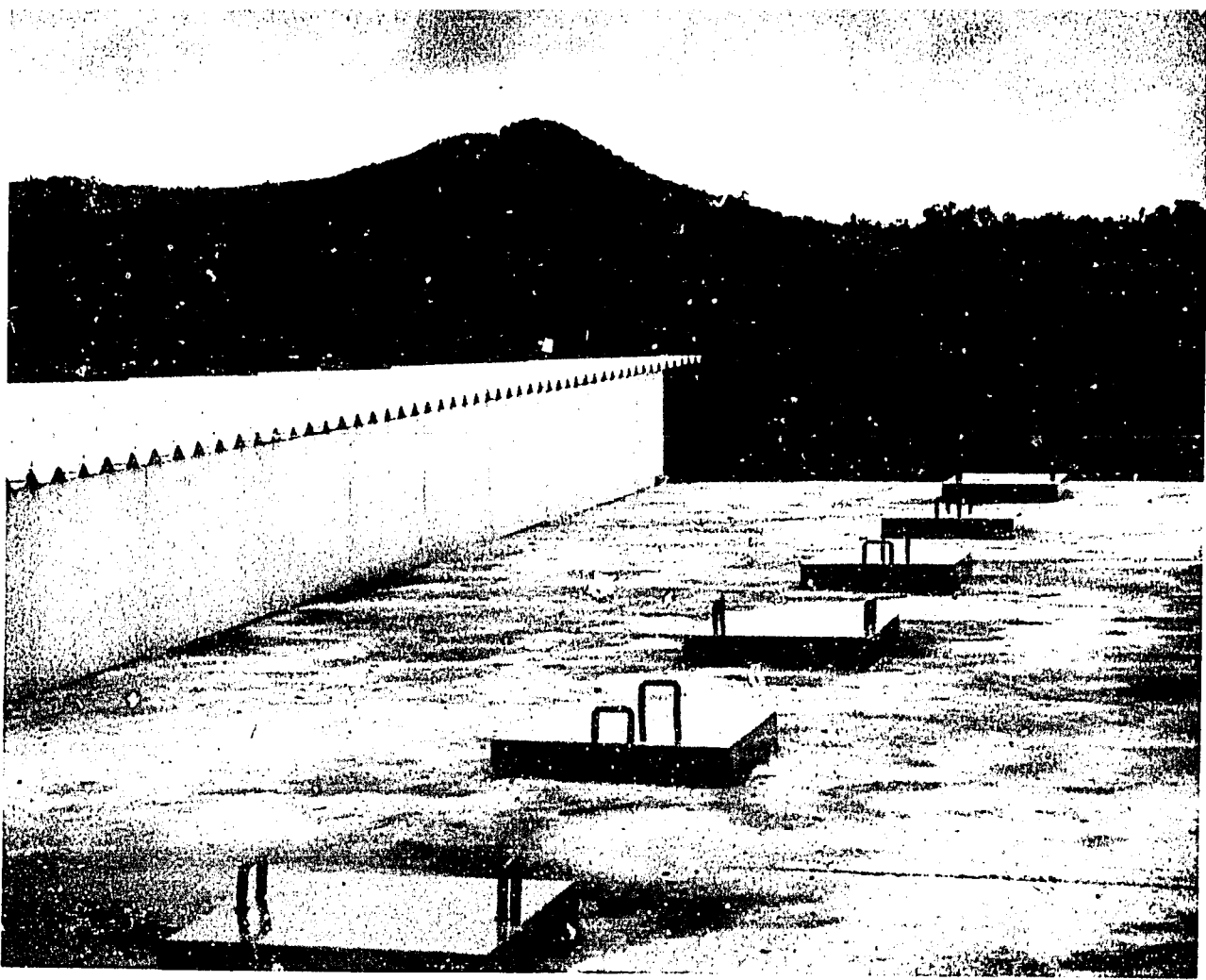
Opposite: Children at a Phuket preschool drawing water from a rainwater collection urn designed and installed under Phuket's MEREC effort. The school has no other source of water.

Above: MEREC training in water distribution system leak detection in Phuket, Thailand. Sixteen water technicians from four municipalities were trained under the program, and Phuket's water department now regularly carries out leak detection and repair. Photo by City of Phuket.



Left: This rainwater collection tank at a public school is another component of Phuket's MEREC rainwater storage project. Photo by Tennessee Valley Authority.



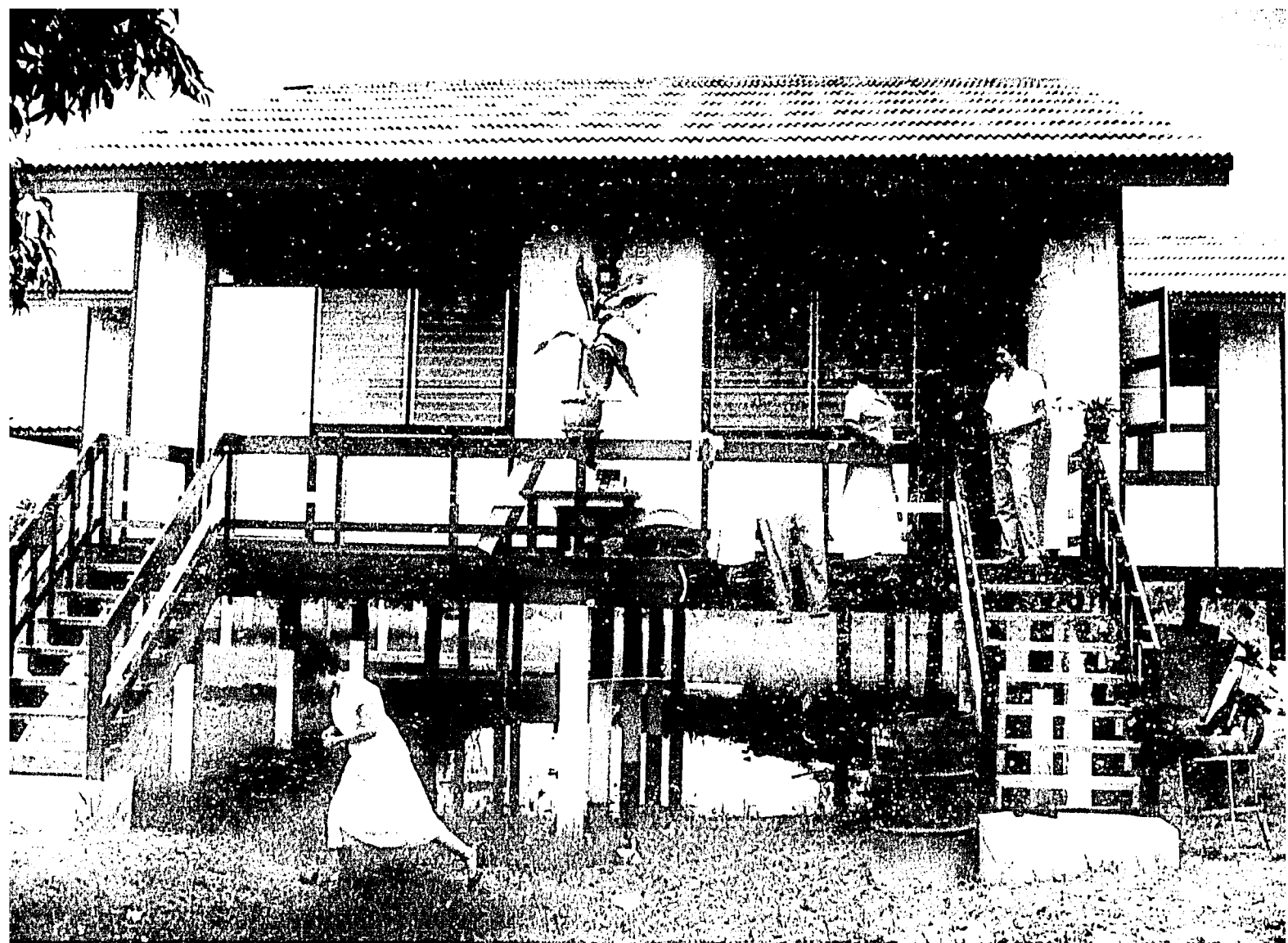


Left: Phuket's MEREC human waste fermentation facility under construction. Collection trucks deposit waste collected daily in the tanks on the left and right. After fermentation, sludge is drained into the ponds in the center for drying. Photo by City of Phuket.

Above: Close view of the right bank of fermentation tanks and the roof installed over the drying ponds. Each hatch covers a tank that receives waste from two days of collection.

Opposite, upper: A team inspecting operations at the facility. The dried material is used as fertilizer on public lands. Eventually, it will be made available for sale to the public.

Opposite, lower: Fermented sludge in the drying ponds. The numbers on the sides of the fermentation tanks indicate the days of the month that waste collected is deposited in the tanks. After fermenting for 28 days, the sludge is drained for drying.



Above: A completed and occupied duplex MEREK demonstration house in Phuket. The demonstration houses incorporate local building materials and resource-efficiency design features, including biogas digesters, rainwater collection tanks, and natural cooling.



Left: A MEREK demonstration house under construction. Photo by City of Phuket.

Phuket



Above: Interior of a Phuket MERECE demonstration house, with the proud couple that occupies it.

abandoned tin mine that is being reclaimed for use as an urban resource. The burner is fueled from a backyard biogas digester.



Left: A gas cooker in a MERECE demonstration house located at the site of an







Left: A scene in an abandoned tin mine area being reclaimed under Phuket's MERECE demonstration as an urban resource for a variety of uses. Seen here are a drainage culvert and a road through the area that is under construction. The area to the right will be public parkland and will include a fishing pond.

Phuket's MERECE effort. Solid waste from residential areas is collected in containers placed on the pushcarts, and then deposited in central locations for pickup by collection trucks. This results in substantial savings in money and fuel per cubic meter of waste collected.

Above: Waste collection pushcarts put in service under

Chapter 6

MEREC Demonstration Policy and Program Lessons

Can MEREC Be Replicated?

The demonstration cities have adapted the "core" MEREC planning process to their own situations. In doing so, they have each brought together a wide variety of indigenous resources, expertise, and operating agencies to solve local resource-related problems through technological and management innovation. The MEREC cities have designed, installed, and documented innovative applications of resource-efficient technologies and have recorded the multiple benefits to urban management and development that resulted. They have produced novel ideas for teaching resource awareness. They have used good plans as the basis for attracting funds from nonmunicipal sources. They have provided models for forging new links among levels of government, public institutions, and the private sector. They have shown how it is possible to do more with less, and to create quality cities.

Because Tacloban, Guarda, and Phuket undertook their MEREC efforts within the framework of an AID-funded demonstration project, they were able to draw on forms of support not available to counterpart cities in developing countries. For one, AID provided an average of \$250,000 as partial support for planning and implementation activities in each city. For another, TVA advisers and technical experts provided help in carrying out the local MEREC demonstrations. For a third, because the central governments had each signed a formal project agreement with AID, they had given at least implicit approval to the effort from the outset. To what extent does this account for the considerable achievements recalled above? To what extent is it possible to duplicate those achievements in cities that cannot draw on the same forms of support?

To some extent, new MEREC cities will have to replace those forms of support with others. There must be some funding, at least for implementation, from somewhere. It

can come from civic groups, municipal funds, private sector grants and investments, sales of shares to the public, service district funds, foreign assistance agencies, provincial funds, international and indigenous foundations, and/or national agencies. Management and technical specialist assistance can be obtained from the private sector, other levels of government, universities or other research institutions, or from nongovernmental development organizations. Sometimes it may have to be purchased. And encouragement is definitely needed from other levels of government, especially the central government. If it is not already there, it must be promoted.

But new MEREC cities will have advantages that MEREC demonstration cities did not have, and these will make it easier for them to obtain financial, technical, and intergovernmental support. These advantages will also make a new MEREC effort more cost-effective, and therefore less costly.

The most important advantage is that MEREC is no longer experimental; it has been shown to work in three very different small-city situations. A second advantage is that there is now a fairly rich MEREC literature. In addition to the overall description of local MEREC demonstrations in this book, MEREC publications include quarterly and annual reports recording progress and problems as each demonstration proceeded, technical specifications of local MEREC projects, local project monitoring and evaluation data, orientation and training materials, and step-by-step guidance for a local MEREC effort. A third advantage is that there is now a network of people and institutions that have learned from the MEREC demonstrations and can provide help. These include, in addition to AID and TVA, people in each of the three MEREC demonstration cities.

These are considerable advantages. The expansion of MEREC to seven additional cities in Portugal has already given some indication of how important they are

for obtaining funding, technical help, and the support of other levels of government. There are now three models to build on, and as a result, new MEREC cities will have to undertake much less trial-and-error experimentation with structures and procedures. There are now some 45 local MEREC projects that offer a rich experience with technologies, ways of putting them in place, and the results to be expected. Many of these can be directly applied elsewhere.

The question is not so much, "Can MEREC be replicated?" Rather, it is, "What can we learn from the experiences of MEREC demonstration cities that will help in replication?" In particular, what do those experiences say to policy makers and program managers about where a MEREC-type effort is most needed; where it is most likely to be successful; how it can be undertaken at other levels; and what general guidance should be kept in mind?

Where Is MEREC Needed?

MEREC is needed where urban resource inefficiencies pose an obstacle to development.

MEREC is needed where resources are used in ways that either constrain potential development or cause the growth process to be a source of problems rather than of widespread improvements in the well-being of urban residents. It is especially needed where continued growth pressures threaten to create greater problems in the future.

Unfortunately, it is not always immediately obvious that the main culprit with respect to a particular urban problem is inefficient use of a natural resource. This, despite the fact that urban problems are often thought of as resulting from insufficient availability of a natural resource. That is why, so commonly, "solutions" to urban problems cost money rather than saving it, and consume more resources rather than conserving them or creating new ones.

Poor nutrition in Tacloban could be tackled through feeding programs, curative medical programs, subsidizing the price of fuelwood, and so on. Any of these may be necessary or appropriate; but they are costly, address problem manifestations rather than causes, and could contribute to causing even greater problems in the future. The poor quality of water service in Guarda could be tackled simply by pumping more water. But this would put more pressure on the antiquated water system and assure further water insufficiency in the near future. The human waste disposal problem in Phuket could have been helplessly ignored until the unlikely time when

funds could be found to install a sanitary sewer system and waste treatment plant in the city.

Because the demonstration cities started with a review of resource use rather than by identifying "problems," they discovered that to a significant degree problems that concerned them were the result of inefficient resource use. Yes, there were resource insufficiencies and problems that were not resource related, but MEREC participants came to see that often solutions were to be found in using resources already available more efficiently.

In Tacloban idle urban land was made available so that people could improve their nutrition levels through their own efforts. In Guarda saving water through public awareness and leak repair was made a central part of the solution to its water problem. In Phuket human waste was converted to fertilizer and became a financial resource for the city and a production resource for farmers.

Tacloban's long-term MEREC experience has shown that

- resource efficiency aids commerce, creates jobs, and generates new private enterprise opportunities;
- efficiency in water and electricity distribution increases the financial viability of the utilities, resulting in better service for less cost;
- an energy-efficiency approach to transportation planning also benefits commerce;
- an energy-efficiency approach to municipal operations saves enormous amounts of money, enabling local government to provide better service;
- resource efficiency makes possible improved diets at virtually no monetary cost and therefore stands to benefit the poor greatly.

It is safe to say that in any city where there are problems of lagging employment and enterprise creation, inadequate municipal service provision, insufficient cost recovery by utilities, pollution, low productivity, or high public welfare costs, major improvements are likely to be possible through greater resource efficiency. These are places where MEREC is needed.

MEREC is needed where there is no coordinated local development management.

If public sector capabilities are not brought to bear on stimulating and accommodating local development, development cannot be expected; or it cannot be expected to happen as rapidly and efficiently as it might; or it cannot be expected to provide the benefits that it might.

Public sector capabilities cannot be brought to bear very effectively unless they are coordinated. Through their

policies, procedures, and actions, all public agencies, whether they recognize it or not, influence development. In the absence of coordination, each public sector agency concludes that development is not its responsibility or else it pursues development in accordance with its own interests, priorities, perceptions, and approaches. Whatever the results, they will certainly amount to far less development than is possible.

In the three MEREC demonstration cities there was, prior to MEREC, no experience with planning to achieve broad objectives or with allocating given resources among alternatives to achieve such objectives. These are skills needed to coordinate development management, and these are skills acquired through experience by the MEREC demonstration cities. MEREC is needed where there is no overall framework that lends development consistency to the operations of agencies with different functions in the municipality.

MEREC is needed where improved interagency cooperation would strengthen development and decentralization.

Decentralization of administrative, revenue-generating, and technical capacity has been declared a major theme of development in many developing countries. The historical evidence is that decentralization can hasten development. Yet it is quite often the case that decentralization efforts proceed little beyond the declaration.

This is because higher authorities naturally resist devolution of authority, resources, and capacity to lower levels unless convinced of the capability at lower levels to exercise them effectively and in a manner consistent with national interests. For their part, lower levels of government are often uncertain of their actual latitude because they get mixed signals from higher levels. Moreover, they tend not to leap to exercise greater latitude because they have limited local management experience and technical skills.

In the MEREC demonstration cities, all levels of government, as well as others, worked together successfully, if not entirely without moments of friction. The cooperation was remarkable in itself and made possible remarkable achievements. In all three cities the interagency cooperation initiated or strengthened under the MEREC demonstration continues, and in some cases has intensified.

As a result, these cities have permanently taken on expanded responsibilities for their own management, development, and welfare. In Portugal the regional

commission has also taken on expanded responsibilities and has strengthened its technical capabilities. Central and provincial/regional agencies, in working with local governments, have found out just what local capabilities exist, discovered roles for themselves in helping to strengthen them, and discovered they have something to learn from local governments. They have also discovered that decentralization does not result in less for them to do, but in their being able to do more.

MEREC helped bring this about by requiring involvement of all levels of government, as well as the private sector, from the outset. In every case, the participation of all agencies that stood to gain from MEREC, or were important to planning or implementation of MEREC projects, was sought early in the planning process. MEREC was made a joint endeavor involving local insight, creativity, and planning, combined with the capabilities of provincial and national government agencies, as well as of other organizations. MEREC also helped bring about interagency cooperation by providing a common focus for all participants. That focus was--improving the process of development by improving efficiency in local resource use.

The breadth of participation and the focus on a common concern enabled representatives of many different agencies to see, as MEREC progressed, the benefits of cooperation for them and their areas of operation. Where development is needed, decentralization is needed; where decentralization is needed, interagency cooperation is needed; where interagency cooperation is needed, each agency has to perceive itself as involved and benefiting from cooperation. Where experience with this is needed, MEREC is needed.

Where Can MEREC Work?

MEREC can work in small cities.

The MEREC demonstration cities ranged in population size from 40,000 to 100,000. There is no reason to believe that MEREC could not be adapted to cities somewhat above or below this range. The MEREC approach was never tried in a truly large city, but it is unlikely to succeed there.

Without doubt, many of the basic MEREC principles apply to big cities also--principles such as broad participation, analysis by resource and implementation by sector, and a focus on development through greater resource efficiency. The core MEREC planning process,

however, is likely to require modification beyond the point where any resemblance to the original remains. MEREC was specifically designed to take advantage of conditions often found in small cities but not in large ones. These include the ability to improve resource efficiency significantly through relatively modest measures, and relatively accessible and flexible administrative structures.

Together, these small-city characteristics mean that with modest funds, a number of relatively small-scale projects can be carried out quickly and can have a major and lasting impact. The MEREC core process is built around this.

Because there can be many projects, a number of resources can be addressed, and there is reason to involve many sectors. Because administrative structures are accessible and flexible, leaders are close to city problems, see each other often, can handle many matters through informal mechanisms, and are very visible. The result is the ability to involve many participants in MEREC, develop a municipal-wide strategy, and move from planning to implementation in less than a year. The advantages of not having the constraints of a large, formalized, bureaucratic structure are complemented by the performance motivation resulting from visibility.

For this reason, a MEREC city must not only be a secondary or smaller city but must also have some degree of formal democratic leadership and administrative latitude. The three demonstrations revealed MEREC to be potentially significant in local politics. This created an incentive for performance and for giving MEREC and its message even higher visibility. The incentive is removed if there is no elected leadership, and it is frustrated if elected leadership really has no latitude in municipal affairs.

Beyond this, MEREC seems adaptable to the administrative, economic, and resource circumstances of any small city. The demonstration cities had very different local, regional, and national administrative systems; and they had different types of relationships with regional/provincial and national agencies. Their climates, cultures, histories, and economic bases were very different. Their resource problems were different, their technical capacities were different, and their degrees of latitude and access to funding were different. Before MEREC, all that these developing country cities had in common was that they were smaller cities with elected officials who had a measure of responsibility for municipal management.

MEREC can work where local leadership is prepared to sustain a serious effort to improve management of city resources.

Under the MEREC approach, responsibility for project management, monitoring, and assessment remains with local officials and other leaders. The MEREC Steering Committee draws on and involves other institutions and levels of government but does not relinquish responsibility for achieving MEREC purposes to them. This places a burden on local participants that goes beyond their normal workload and continues for some time.

Local government officials, private sector representatives, and others must work their way through the MEREC planning process together. In doing so, they must establish and support new ways of communicating and relating with other levels of government and with nongovernmental organizations. They must look for funding mechanisms, conceive and work with new ideas, oversee detailed planning and implementation of numerous projects, and attend to project monitoring and reporting. And all this, while sustaining and refining a cohesive framework of coordination.

These things must be done to improve management of city resources. If they are not done, MEREC will not work. Because they require a sustained effort, they will not be done if there is not a serious commitment. Local leadership in a MEREC city must be aware of the magnitude of the task they are undertaking, as well as of the benefits of a successful effort; they must believe they are up to it; and they must want to do it.

Although it may not be necessary, there are many ways of testing for degree of commitment. Experience with selection of cities for the MEREC demonstration suggests the following as a good basis:

- Be certain there has been adequate orientation so that local officials understand the burdens and benefits of MEREC.
- Establish a competitive framework for selection among candidate cities.
- Initiate the MEREC effort with a signed agreement that spells out the minimum amount of cash, time, services, and equipment that will be provided by the city at least during the planning phase.

A sincere and serious initial commitment cannot be counted on to sustain itself over the life of a MEREC effort, however. The commitment must be reinforced by a broad range of rewards as MEREC progresses. These

rewards could take the forms of political, personal, financial, psychological, and work satisfaction.

MEREC can work where there is a desire at all levels to decentralize administrative authority and capacity.

MEREC builds the capacity for local planning, management, and project implementation. This seems to result in a considerable taste for local self-determination. If other levels of government truly encourage decentralization, they will encourage the exercise of local self-determination. If other levels of government do not encourage decentralization, whatever their official policies, MEREC will not work.

In Tacloban the MEREC administrative framework was one in which municipal officials and local representatives of other levels of government were generally responsible for different major aspects of city management and development. While there was reasonably good communication among them, there was no precedent for a sustained collective effort. In Guarda there was only a minimal local technical capacity, and heavy reliance was placed on subregional, regional, and national sources of management and technical assistance. In Phuket the municipality operated under the close supervision of provincial agencies, and its own staff were employees of the Ministry of Interior.

The three cases are different, but it is easy to see that in all of them, if provincial/regional or national agencies did not support decentralization, the MEREC effort would have been undermined. In fact, in all three cases agencies at higher levels were strengthened through MEREC.

It is true that MEREC can work where there is a desire at all levels to decentralize administrative authority and capacity. It is also true that MEREC cannot work where there is opposition to decentralization. There is, however, a frequently found between-ground, where decentralization is supported in principle, but there are reservations about moving forward with it. In cases like these, MEREC, if introduced with special caution and care, can be used as a vehicle for promoting interagency cooperation and the decentralization it engenders.

MEREC can work where there is some assurance that plans can be implemented.

An important part of the capacity building that takes place through MEREC happens via the process of making careful plans and then implementing them and seeing the results. This is an enormously rewarding experience. The assurance that at least some plans will be implemented thus constitutes a strong incentive for

sustaining the planning process during the long period when there is nothing to show for one's efforts except documents. It is as well a strong incentive for the creative pursuit of additional funding from other sources.

In the MEREC demonstrations, the availability of funds for project implementation was also a powerful incentive for embracing an intersectoral planning process. In the absence of a planning process that involved key urban sectors, the only way to allocate the funds would have been through competitive shouting and arguing, with an assured residue of acrimony. Mayors of MEREC cities were generally grateful for the MEREC requirement of a strategy and action plan, and for an orderly process for determining the allocation of funds.

Thus, some implementation funding must be guaranteed somehow from the outset. If possible, while limited to use within the MEREC framework, there should be no restrictions on the sectors or types of activities for which they are used. In the MEREC demonstrations AID wanted to encourage broad resource and sectoral coverage, and so upper limits were placed on the amount of implementation funds that could be allocated to a single local resource-efficiency project.

Another aspect of assuring that plans can be implemented, and will serve to strengthen planning and implementation capabilities in the future, is limiting them to manageable numbers, scales, and scopes. There was a tendency among MEREC demonstration cities to identify more projects than was necessary or possible. In some cases projects completely beyond local capabilities were initially considered.

All three cities went through processes of consolidating, reducing, and modifying the projects in their original MEREC Action Plans. Perhaps it is beneficial to the learning process to do so. In any case, in the MEREC demonstrations local Steering Committees had the benefit of TVA advisers, who offered friendly, objective, and respected outside voices. Had the MEREC cities planned for projects they later found themselves unable to implement for reasons of their own limitations, MEREC would not have worked.

Some mechanism is thus required in a MEREC effort to provide such a friendly, objective, and respected outside voice, if needed. That same voice should encourage experimentation and projects that challenge existing capabilities, even while speaking for a measure of restraint to assure that projects are of implementable number, scale, and scope. The voice can be that of a central or regional government adviser not directly associated with any of the other agencies participating in

MEREC; that of a university faculty member requested to play the role; that of a nongovernmental development representative or a consultant hired for the job; or even that of the mayor of another municipality. Ideally, the voice would be that of the mayor of the MEREC city.

How Can MEREC Be Undertaken at Other Levels?

MEREC can be undertaken piecemeal, in rural areas, at the provincial or regional level, or at the national level.

The MEREC demonstration project was, as the name states, aimed at cities. But spinoffs from the formal demonstration have already shown that, with modifications, MEREC-type efforts can be undertaken at other levels.

As mentioned earlier, the core MEREC process was specifically designed to take advantage of conditions often found in small cities, but not in large ones. These conditions can be adequately duplicated in smaller places, such as rural towns. They probably cannot be adequately duplicated in larger places, such as heavily populated or geographically extensive provinces, or in big cities. MEREC spinoffs have so far included the following.

- *Piecemeal application of MEREC by other cities.* Other cities in both the Philippines and Thailand have emulated what they saw in Tacloban and Phuket as best they could, by tackling a single resource problem. They have attempted to achieve more interagency coordination, but with only one or two agencies from other levels of government; and they have involved more than one municipal department in the effort. Of several known cases, it appears that most of them will eventually produce a single innovative local energy-efficiency project, and little beyond that. These cities acted on their own initiative and received no outside assistance.
- *Rural application of MEREC in Thailand's Decentralized Development Management Project (DDMP).* To adapt MEREC to rural administrative areas, this project calls for narrowing the focus somewhat in terms of the numbers and types of resources and sectors dealt with by local governments. It also calls for extensive management and technical support by higher levels of government and regional universities.
- *Regional application of MEREC in central Portugal, and Provincial application in Phuket Province.* In

Portugal MEREC is not being applied at the regional level as such; rather, seven new MEREC cities have been established within a single administrative region. The regional commission and subregional technical offices constitute the basic source of management and technical support for all the cities. In Thailand the Phuket MEREC experience is being used as the basis for a pilot coastal resources management project on Phuket Island. However, the effort is focused on a single category of resource. Extensive governmental and specialized technical support are built into the project.

- *National application in Thailand.* Thailand's DDMP project encompasses 36 local rural governments in 9 provinces throughout the country. The project offers some insights into what might be required if MEREC were to be launched in many cities throughout a country. A central office for the national project works closely with the four ministries jointly providing principal support to the participating local governments. It serves as a national coordinating office, information exchange center, and mechanism for bringing the benefits of economies of scale to local efforts. MEREC committees are established at the local rural government level. Nongovernmental development organizations and regional universities are being enlisted to provide specialized technical assistance.

Thus, while MEREC can apparently be adapted to many levels, the concentration, even at higher levels, has so far remained on smaller areas. When management and technical support were not available, as in the emulating cities in the Philippines and Thailand, or when a larger area was being considered, as in Thailand's coastal resources management project, the focus was narrowed sharply.

This suggests that in areas where the basic requirements for MEREC as such are not available, a good way to start may be by addressing a single resource, sector, or resource issue, and using that experience to build a process that in time can address a broader range of resource and development concerns.

MEREC can be undertaken at other levels if an appropriate MEREC management system is established and responsive management and technical assistance are provided.

The MEREC approach is a learning-based approach, meant to build local management, development, and resource-efficiency capabilities. The core MEREC planning process encourages municipal leadership and staffs

to take on new kinds of challenges: it establishes a sequence of activities and a cooperative planning environment that lead naturally to new types and areas of activity that are not beyond reach, but that require stretching; and it provides for immediate application of lessons learned, as well as rewards.

The experiences of the MEREC demonstration cities make it clear that in addition to the MEREC core process and assurance of implementation, MEREC cities require an appropriate MEREC management system and two types of help in meeting the new challenges: management assistance and technical specialist assistance.

Management assistance is needed to help with new types of accounting, contracting, administering, monitoring, evaluating, and coordinating. Technical specialist assistance is needed to help with the planning process and the aspects of MEREC that require specialized technical skills not otherwise available. The providers of management and technical specialist assistance are the source of a large portion of the new information and skills that are learned at the municipal level through MEREC.

The three MEREC demonstrations have illustrated many ways that management and technical specialist support can be obtained by and provided to a MEREC city. In addition to advisers from TVA, MEREC demonstration cities drew on national, regional, subregional, provincial, and service-district agencies, private sector groups, consulting firms, nongovernmental development organizations, individual consultants, universities, non-profit research and education organizations, and other sources for both management and technical specialist assistance. Whatever sources were ultimately tapped, however, a basic source of support was established before MEREC was actually launched in any city.

The source was different in each case, reflecting the amount and type of support needed, the sources available, and the administrative system of each country. In Tacloban the basic source of assistance in addition to TVA was a group of local offices of national agencies that had agreed to participate and provide this assistance. In Guarda it was a regional agency in combination with a subregional agency. In Phuket it was a regional university. In addition, the three cities established very different MEREC management systems, which in part reflected different ways of coordinating the support. In fact, Phuket used one management mechanism for planning and another for implementation.

When MEREC is adapted to levels other than the municipal level, thought has to be given to adapting the MEREC management structure accordingly and to as-

suming a basic source of management and technical specialist support that is responsive to the MEREC process. Responsiveness to the MEREC process means that assistance must be consistently available throughout the process, be both encouraging and responsive to locally determined needs, and aim to transfer as much capacity as possible to local government while providing help. MEREC spinoffs in Thailand and Portugal offer some ideas in this regard.

Overall Lessons of the MEREC Demonstrations

Resource efficiency is an important municipal government concern, and resource management is a sound focus for urban development management.

MEREC has shown that resource efficiency is a legitimate and important municipal government concern because it benefits public and private sectors, improves welfare, and accounts for the collective future. It has also shown that improved management of urban resources increases development opportunities.

The demonstration cities have provided concrete examples of how, through a resource-efficiency approach and relatively modest measures, waste management can be provided better and less expensively; water and electricity supply can be made more dependable in both the short and the long run; revenue collections for public services can be improved; higher levels of health, nutrition, and sanitation can be achieved; traffic congestion can be reduced; agriculture can be incorporated into city space and life; pollution can be reduced; municipal costs can be lowered and new sources of revenue can be created; new projects can be identified; funding can be attracted; commercial activity can be expanded; management can be improved; and development opportunities can be created. These are certainly important municipal government concerns.

The core MEREC process works.

The main elements of the core MEREC process, at their simplest, are:

- involving from the outset everyone needed for the process to work;
- addressing problems through their resource and resource-efficiency contexts;
- using facts as the basis for strategy, strategy as the basis for an Action Plan, and an Action Plan as the basis for individual projects;

Policy and Lessons

- organizing implementation of projects by conventional urban sectors;
- monitoring, evaluating, and disseminating lessons learned from MEREC activity.

All three demonstration cities made use of a matrix format for summarizing the MEREC Strategy and MEREC Action Plan. Most MEREC participants had experience with numerical tables, but not with the matrix as an analytical tool. A matrix that showed resources along the top and urban sectors along the side allowed them not only to consider relationships between each resource and each sector, but as well to consider each sector in terms of all its resource relationships, and each resource in terms of all its sectoral interactions; and this could be seen all at once.

Some participants who were for the first time exposed to the matrix as an intellectual planning tool acted as though they had just learned a new language, suddenly expressing everything in matrix terms. In the MEREC cities the matrix became something of an "in" joke among MEREC participants, with lunch-time merriment often centered around the most ridiculous use of a matrix. With all that, it was seriously appreciated and may have been indispensable to the MEREC process.

The three MEREC demonstrations have shown the core MEREC process to be adaptable to a variety of municipal situations, and to produce good results cost effectively.

For the most part, needed technologies are already available in developing countries.

Most of the technologies put in place in the MEREC demonstration cities were already available in their countries, or the skills to develop them were available. Often, local resource-efficiency projects were derivatives of similar projects at work elsewhere in the country. What MEREC provided more than anything else was a framework for bringing those technologies and skills to bear on urban management and development in the city.

In the Philippines a few MEREC participants visited a province where they saw a farmer who grew soil-enriching azola in his rice paddies, thereby tripling his rice yields. He would skim off the highly nutritious azola and fatten his pigs with it and would wash the pig manure into a biogas digester that provided household cooking and lighting fuel. The farmer had modified his motorcycle engine such that each morning he would fill up an inner tube with gas from the digester, throw it over his shoulder, mount his cycle, connect the valve of the inner-tube to the carburetor of the cycle with a piece of rubber

tubing, and drive his wife to work. Some of the innovations in Tacloban's MEREC housing demonstration were inspired by this. In Phuket the simple technology used for turning human waste to soil conditioner was first observed in another city. In Guarda using local building materials involves the revival and spread of construction techniques and skills known in the area for generations.

MEREC's principal job was providing the framework for identifying needs and then locating and adapting the technologies so as to put them to work in the city.

The most important and lasting gains may be those achieved through the new attitudes and approaches of people touched by MEREC.

Certainly, in the demonstration cities MEREC produced immediate concrete benefits. Without doubt, these benefits will continue and compound in the years ahead as the cities grow and as the spread-effects from local demonstration projects mature. But the most important disseminators of a resource-efficiency approach to urban management and development, of resource-efficiency technologies, and therefore ultimately of resource-efficiency benefits, are likely to be people who have been associated with MEREC in the demonstration cities.

That is why MEREC in any city should be as inclusive as possible in terms of both direct participants and people who come into contact with its activities.

Many of the MEREC participants in the demonstration cities underwent profound attitudinal changes over the life of the project. They acquired attitudes about the importance and power of a resource-efficiency orientation as a basis for city management and development planning that they will carry throughout their careers. They have come to see resource efficiency as the basis for development rather than an obstacle to development. They have also acquired skills in analysis, management, coordination, cooperation, and monitoring/evaluation that will benefit their communities wherever they work and whatever they do in the years to come. Instances of transmission of MEREC ideas in this way have already emerged from the MEREC demonstrations.

Continuing and compounding gains come also from the ordinary people who were touched by MEREC. The demonstration housing occupants and the urban farmers in Tacloban, the staff of the water distribution system in Guarda, and the schoolchildren benefiting from a rain-water collection system in Phuket are examples of the hundreds of people in each city who have learned important MEREC lessons. Many of them are certain to apply those lessons to improve their own lives and life in their

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communities in the future. Some have already done so. They are certain as well to teach those lessons to others. Much of the discussion in this book has been about elements of the MEREC demonstrations: the structures, interagency arrangements, procedures, projects, and results. It should be understood that behind these elements

there stand people. The aim in a MEREC effort is not so much to get people to bring MEREC to life. Rather, it is to use MEREC as means for reaching people; for reaching them and providing them with opportunities to improve their lives, their surroundings, their communities, their local governments, and their futures.

Appendix A

For More Information

For more information about the MEREC action-research and demonstration project, about MEREC in any of the demonstration cities, or about MEREC literature, write to:

Eric Chetwynd, Jr., Acting Director
Bureau for Science and Technology
Office of Rural Development
SA-18, Room 608
U.S. Agency for International Development
Washington, D.C. 20523
U.S.A.

or

James Gober, Chief
ONRED/DPS
Tennessee Valley Authority
Old City Hall Building (1G96)
Knoxville, Tennessee 37902
U.S.A.

The following are MEREC contacts for each of the demonstration countries.

The Honorable Emmanuel K. Veloso, Mayor
Mayor's Office
City Hall
Tacloban City, Leyte
Philippines

Dr. Manuel Carlos Lopes Porto
Presidente da Comissao de Cordenacao da Regiao
Centro
Rua Bernardim Ribeiro, 80
3000 Coimbra
Portugal

The Honorable Charoen Kiattikul, Vice-Mayor
Phuket Municipality
Phuket
Thailand

Appendix B

MEREC Bibliography

Each of the three MEREC demonstration cities has published a large number and wide variety of MEREC materials. These include Resource Situation Reports; MEREC Strategy and MEREC Action Plan documents; detailed implementation workplan, technical design, and financial documents related to individual local resource-efficiency projects; special studies; maps; public education brochures and booklets, including specifications for replicating certain resource-efficiency projects; and monitoring/evaluation reports. Readers interested in any of these, or in knowing more about any specific aspect of one of the three demonstrations, are referred to appendix A.

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