26
PN-ABL-857
78527

UNDERSTANDING ENVIRONMENTAL ISSUES IN THE DEVELOPMENT PROCESS: THEORETICAL TOOLS AND PRACTICAL EXAMPLES FOR THE URBAN CONTEXT

by

John H. Ashworth, Ph.D.

Director, International Technical
Assistance Division
Meridian Corporation

Prepared for:

The Urban Institute

and

Office of Housing and Urban Programs
Bureau for Private Enterprise
U.S. Agency for International Development
Washington, D.C. 20523

Date: September 21, 1989

Introduction

The developing world is in the midst of a number of concurrent crises that receive extensive media and analytic coverage: massive foreign debt, proliferation of both conventional and nuclear weapons, long-lasting insurgencies, pervasive corruption, as well as periodic devastation caused by earthquakes, tornadoes, and famine. Yet underlying all of these are two long-term problems that threaten to overwhelm the progress that has been made in the past thirty years in social and economic development. These are urbanization and environmental degradation. Both have been occurring incrementally and relentlessly for the past several decades, but have been overshadowed by national development programs and projects. However, at the current rates of growth, a number of cities in the developing world have already become or will soon become unable to provide even basic governmental services to the rural-urban migrants that fill the shanty-towns and barrios around the cores of the major cities.

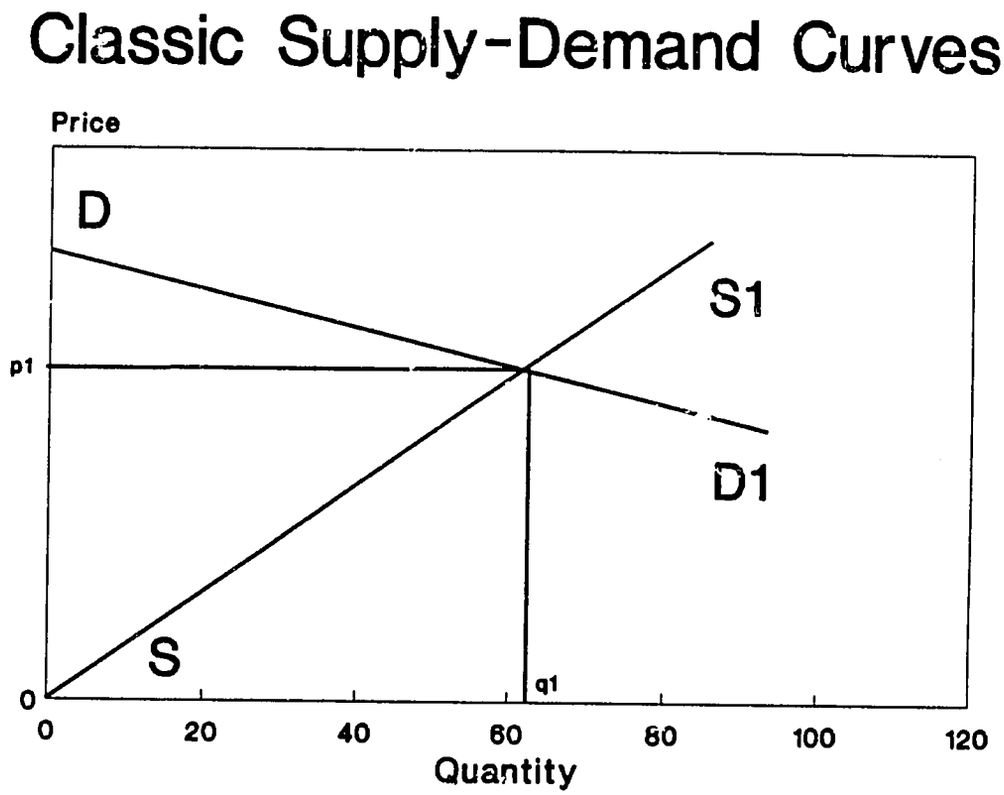
Similarly, a variety of conscious governmental policies and individual decisions by donor agencies and private sector managers are leading to massive environmental damage which will be difficult or impossible to reverse and which will slow the process of economic and social development. These decisions are being made in a wide variety of arenas that may seem to be far removed from environmental issues: settlement patterns, rapid industrialization, mechanization of agriculture, and the provision of food and fuel to urban areas are several that spring to mind. In each of these cases, incentives are being set up which favor such massive environmental destruction that the underlying resource base is being destroyed. Therefore, one of the issues to be examined is how to create policies that make the socially optimal use of a resource coincide with the private economic use of that same resource.

As development professionals, you are required to design, develop, and manage projects that are created to assist specific country-level objectives, while supporting institutional reform and the AID-host country policy dialogue. But most of us have never had the time or the analytic tools to think systematically about the unintended impacts of our projects (or of the whole development path that we are pursuing) and how we can eliminate those that are harmful. In the next few minutes, I will attempt to provide you with some new perspectives on the broad context of the urban development process and on how you can begin to get an analytic grasp on the subject.

The General Problems of Externalities and the Particular Problem of Environmental Degradation

Classic microeconomic theory is built around two notions: that there can be an optimal allocation of resources -- the so-called Pareto optimum for you economists -- and the possibility of an equilibrium between supply and demand. At a given price, the producer is willing to supply so much, and the consumers are in turn willing to buy some other amount. Each move up or down his curve until the amount supplied is just equal to the amount demanded. (See Figure One below)

FIGURE ONE

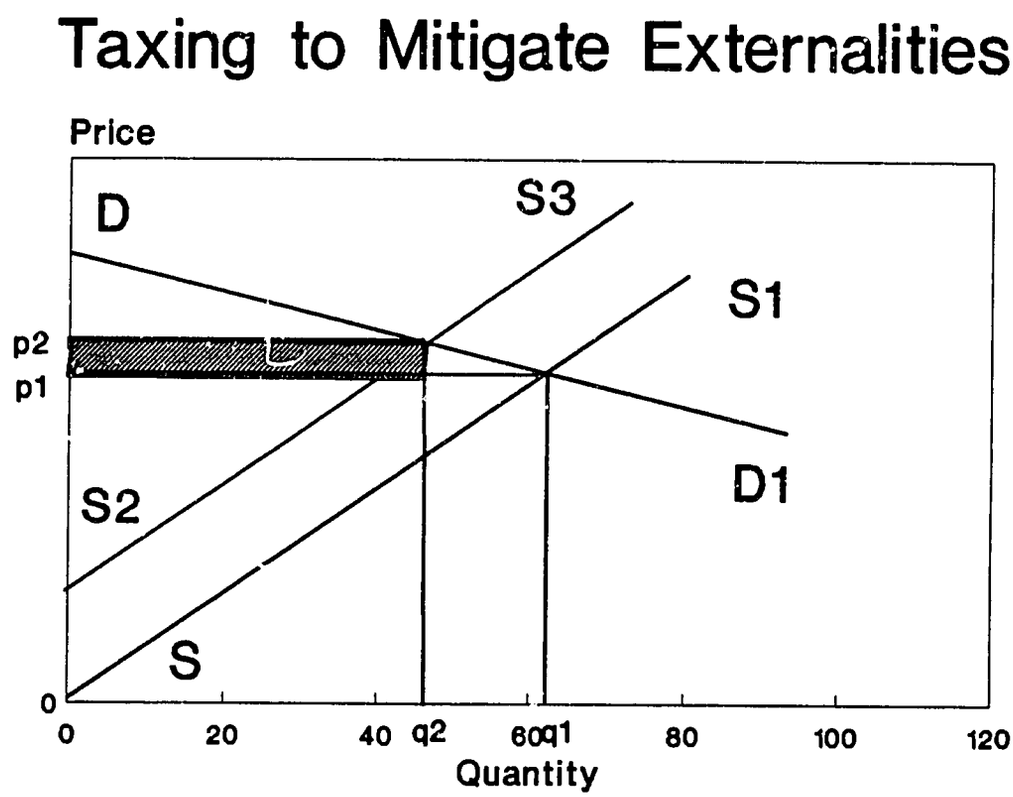


However, in the real world there may be costs of the production process which are incurred not by the producer or the consumer but by some third party. These are known as production external diseconomies or, more commonly **externalities**. In many developing country situations, substantial portions of the costs are passed along to someone outside the decision-making location,

whether that location is a marketplace or a governmental ministry. Therefore, the total costs to the society are greater than the private or project costs. although affected, those individuals bearing the costs are not consulted in the decision. Part of the task of the analyst is to not only identify what the potential externalities are, and to estimate their size, but to develop policies that pass these costs back to the producers and consumers of the good.

Let us go back to our simple one product model (Figure Two). Having determined that the production of the good has external adverse impacts, the government has imposed a tax or fine of x. The producer then shifts his production curve to S_2S_3 to reflect his higher costs, and the consumer in turn only buys q_2. The shaded area is the tax revenue generated, which is hopefully used to reimburse those adversely affected by the production.

FIGURE TWO



Applying the Concepts to Externalities to AID projects

I have worked with AID over the past 12 years, designing, managing and evaluating technical assistance projects. AID's whole approach to development is built around the reasonable premise that sufficient technical, financial, and institution-strengthening resources applied to a particular problem or

issue can, over time, produce benefits that outweigh the costs. Elaborate guidelines have been developed for the calculation of benefits vs. costs, for the shadow pricing of certain factors, and for the inclusion of social vs. economic objectives.

We have even developed indicators that allow the program manager to at least crudely measure how the project is approaching some pre-defined set of objectives and range of benefits. Most of you have undoubtedly worked on logical frameworks, and have struggled with what indicators can measure progress, even in an integrated urban development project. For example, we might be trying to alleviate the plight of rural-urban migrants on the outskirts of Calcutta by building low-cost housing units, providing clean drinking water, and encouraging the construction of community sanitation facilities. We can measure success indirectly by the number of housing units built, the families service etc, or directly by measuring the reductions in child mortality, the drop in water-borne diseases, and other events we can count. This process of counting up the costs and benefits of development projects or interventions appears to be straight-forward.

Cost/benefit analysis was carried to a high art form in the 1960s and 1970s by the World Bank for some of their major infrastructure projects. For example, the cost/benefit analysis undertaken for the Tarbela Dam project in Pakistan required more than 40 volumes to look at everything from increased in agricultural output due to irrigation to increased electricity sales to the displacement of farmers in the area to be covered by the dam reservoir. However, one of the problems confronted is that classical economic analysis assumes that decisions are made on rational economic grounds, by individuals or institutions who are operating with sufficient or even perfect information. In the models, market decisions are made by individuals who create markets and equilibrium prices by buying, selling or trading goods and services until some type of equilibrium is reached.

But the calculation of either a project benefit/cost ratio or the development of a equilibrium price presupposes high quality information, as well as equally important caveat that the individual making the decision is incurring all of the costs and benefits. In the real world, this is rarely so. It is particularly true in environmental issues. The individual paying the cost of overcutting of firewood in the Himalayan foothills in Nepal is a peasant in Northern India who is struck by flash floods from the rivers flowing out of Nepal. When toxic waste from Germany are dumped in Africa, it is the children who live around the dumping ground who pay the price in the form of deformities and shortened lifespans.

One of the analytic difficulties with project cost/benefit analysis is that the external costs are often diffuse and incurred over a long period, whereas the benefits accrue to a defined group over a known period of time. The classic example is air or water pollution. The benefits accrue locally, whereas the hidden costs can be borne by individuals or groups dozen or hundreds of miles away. As you probably know, one of the major causes of the death of hundreds of lakes in Eastern canada and in New England is sulfur dioxide released by power plants in the upper Midwest, in particular around the Chicago area.

Part of the job, then, of the AID project planner, is to identify the range of potential environmental problems and to have someone, whether yourself or a member of your staff or a consultant, quantify the magnitude of the problem. When we discuss industrialization a little later on, we will provide you with an example of the complexity even of a simple factory siting decision.

Measuring and Mitigating Externalities

With the passage of the National Environmental Policy Act, the development of environmental impact statements or EIS became a major growth industry in the United States. Major governmental construction projects and private sector developments in certain areas had to undergo a lengthy and expensive front-end analysis of the potential environmental implications of the proposed project, including everything from impacts on migratory waterfowl to projected air and water pollution. AID was required in the project paper development stage to note any adverse environmental implications of a proposed project, but it quickly became one of the myriad items on the PP checklist and little more.

However, several developments in the past three-five years have changed this. The first was the attention to the extreme environmental implications of several major infrastructure projects funded by consortia within the international development community. One dam in Brazil, flooded more than 50,000 acres of virgin rainforest while only producing 250 MWe of electricity. Somehow, the World Bank sponsors and the Brazilian electricity planners had failed to include the huge environmental and social externalities of a relatively low output dam in their interest in providing power to the urban centers.

The second is the realization that short-sighted policies undertaken to solve urban problems can have irreversible results on fragile ecosystems hundreds or even thousands of miles away. The recent building of a major highway in Rondonia in Brazil is perhaps the best example of this. The federal government in Brazil decided to build a major East-West road directly through the heart of the Amazon rainforest in order to encourage the migration of the urban poor from Sao Paulo and other over-crowded cites to new virgin lands. With amazing rapidity, thousands of squatters moved down this new opened road, staking out sections of forest land, hacking down the existing trees, burning them, and planting corn and other crops. We all know the result. By 1989, 500,000 peasants and urban migrants had heeded the lure of free land and a fresh start in life. By mid-1988, more than 50,000 square miles of land was being put to the torch annually, and during the dry season more than 50,000 fires were burning at once. The burning was so wide-spread that the course of the road could be tracked via the Landsat and Spot satellites using photographs of the fires. The smoke was so thick that plane travel had to be halted for lack of visibility. The thin rainforest soil was quickly depleted, and squatters moved on, leaving the recently cleared land open to erosion and destruction as large ranching operations moved in to graze cattle.

The steps taken by each squatter individually makes sense economically. Burning enables him to clear the land quickly and get in a crop to feed his family. The ash from the burned forest provides a shot of fertilizer to the

crops. Having no capacity to defer returns from the land, the farmer is totally uninterested in long-term land-management. But from the society's point of view, it is an unrivalled disaster. Since the trees are gone, the land no longer is able to absorb the rains when they come, and the water rushes off taking the thin topsoil with it. The entire program is a net loss to the resource base of the country, and it is not easily reversed.

A third issue that we as development professionals have to realize is that the experience of the temperate areas may not apply to environmental issues in the tropics. Let us take the example of rainforest deforestation again. As you know, settlers and farmers indiscriminately cleared vast tracks of North America in the 19th century. After farming failed, the land was allowed to revert to forest. A hundred years ago, Vermont was 70% cleared and 30% forest. Today the proportions are almost exactly reversed, with hardwood forests having reclaimed most of the cleared hillsides. Unfortunately, this analogy does not apply to Brazilian rainforest in Rondonia. The soil is very thin, and burning process released most of the nutrients, which are in turn leached out by the heavy rains. Unlike Vermont, tropical forests are not normally dominated by a few species. Rather, there are hundreds of tree species in the rainforest, spread thinly out over a vast expanse. Many rely on remarkably specialized pollination by animals and birds, rather than by insects. When large tracks are cleared, the wildlife migrates, and many of the tree species simple die out. Also, the movement of tropical forest tree seeds is often accomplished by animals and birds, just as the pollination is, and in large open areas the seeds simply do not move sufficiently to repopulate. Lastly, cleared areas are quickly populated by tough grass and shrubs, which will crowd out most of the more delicate tree seedlings even if they do get established.

The four issue driving the re-examination of Third World environmental issues is the realization that the developing world is a significant participant in the global climate change that is occurring today, and will be even more of a significant actor in the years to come. What decisions India and China make in fuel utilization will have direct results for the citizens of the United States and Argentina. If China goes forward with its plans to install 75,000 MWe of coal-fired power generating capacity in the next 15 years, it will release huge quantities of carbon dioxide and other gases into the atmosphere. If the worst scenarios come to pass, the build up in atmospheric gases will result in global warming, a partial melting of the polar ice caps, and the rise in the levels of the ocean which will submerge portions of the coastal areas of the United States and Argentina. Destruction of the rainforest removes the biological "sink" that draws carbon dioxide out the air, thus accelerating the process of global warming even without the Chinese power plants. So it is in our personal as well as collective self-interest to pay attention to environmental issues in the developing world, whether it is in urban or rural areas.

The Case of Urban Cooking Fuels

There is virtually no area where the inter-connection of urban policy with environmental issues is clearer than in the provision of cooking fuels for urban inhabitants. As was first pointed out by Eric Eckholm in 1976, the developing world was facing another "energy crisis": firewood. In parts of Africa, rural women and children were spending as much as four hours a day

gathering firewood to cook one or two meals per day. An AID-sponsored study in Botswana in 1983 found that the average household in the village of Ditshegwane spent an astonishing 27 hours per week in gathering wood, dung, shrubs, agricultural residues, and other biomass for domestic cooking.

Moreover, firewood foraging and cutting has been linked to accelerating desertification in the sub-Saharan countries in Africa and with deforestation in the mountainous regions throughout the developing world. The villager cutting or gathering the firewood is able to cook, but the society as a whole pays a large and continuing price. Deforestation on steep slopes has led to massive erosion, destruction of watersheds and catchment basins, and the movement of thousands of tons of topsoil into rivers, lakes, and reservoirs. The long-term impacts are often distant and unexpected. For example, in countries with forest overcutting, urban areas dependent on hydroelectric power generation have found that electricity output is dropping, since the silt flowing down the rivers is filling up the reservoir and lowering its holding capacity.

Studies in the 1980s have showed that the problem of deforestation is more complex than originally thought. The demand for fuels from urban areas, and government pricing policies for fuels, turn out to cause a significant portion of the problem. In urban areas, there is less of an opportunity to gather fuels, particularly for individuals functioning in modern sector. For cities like Ouagadougou, most of the trees within a 30 mile radius have been stripped or cut down. Therefore, cooking fuels are purchased from brokers or street vendors. The vendors in turn buy their wood or charcoal from wholesalers.

Even a small city has a formidable appetite for fuelwood. Not only does each family have to cook, but individual small industries such as bakeries, blacksmith shops, and breweries often can use as much wood as good-sized village. To supply that fuel, wholesalers may have to go hundreds of miles to distant forests. Unlike the local inhabitants of those locations, the firewood wholesalers will harvest the whole tree, using chainsaws and other modern tools. Often the harvesting is illegal, done on government land or forest reserves. To cut down on transportation costs, the wholesaler will often first convert the wood illegally harvested to charcoal in primitive kilns that destroy 50-75% of the heating value of the wood in the conversion process.

Let me take the case of Kathmandu, which is quite a small town compared to most national capitals and quite enlightened about its energy use. Despite government campaigns to limit the cutting of firewood in the foothills of the Himalayas, large lorries loaded with wood arrive in town everyday, unloading at informal firewood depots. From here it is distributed throughout the city via street vendors. With a population of 120,000, Kathmandu requires more than 120 tons of wood or 60 tons of charcoal per week, and more in the colder winter months. Efforts to get people to switch from wood and charcoal to modern fuels (kerosene in particular) have been successful only among individuals with substantial disposal income.

What then are some of our public policy options for reducing environmental damage from the cutting and collection of urban cooking fuels?

1) Ignore the issue, assuming that it will work itself out. Rely on the

existing markets and infrastructure, and ignore an external environmental implications.

2) Promote the use of fossil-fuel based cooking devices, either by low-cost/no-cost household hook-ups or by subsidizing fuel costs. This general approach is being used by natural gas and LPG gas in Thailand and Malaysia. This reduces the need for charcoal and firewood.

3) Actively promote the use of efficient wood and charcoal-burning stoves and industrial devices, as a means of reducing demand. They can cut demand by 50% or more per family. Provide subsidies for the purchase of these units to the urban poor.

4) Regulate firewood sales and pricing. Tax firewood sales, and use the proceeds to replant areas that have been deforested.

5) Stimulate urban firewood plantations, to increase local supply and therefore reduce the pressure on distant forests.

4) Experiment with and actively promote different cooking approaches that lower the fuelwood consumption for each type of cooking device.

Industrialization

The creation of a vibrant industrial sector has always been a mainstay of the long-term development program of most developing countries. It generates employment, can display imported finished goods, potentially provide export earnings from foreign sales, and stimulate the growth of all the secondary sectors that are needed to support industrial growth. One of the pillars of AID's current development is to stimulate the growth of the private sector, including factories in a variety of sectors from food-processing to heavy industry. But, in supporting the creation of proposed industrial estates, particularly those in the private sector, it is crucial that the donor community consider the environmental implications of how the plant is designed and operated, because it is doubtful if the plant owner will. Let me give you a straight-forward example, which is typical of how the industrialization process has occurred in many developing and newly industrialized countries. Let us assume that the finance and industrial development ministers of a hypothetical country that I will call Amazonia are considering a new factory proposed by a local entrepreneur, just across the river and downstream from the capital city of Centralia. The new factory will create at least 500 jobs. It will burn local high-sulfur coal as a boiler fuel, while turning out a product with a strong overseas market, thus generating much needed foreign exchange. Moreover, the factory developer proposes to even provide some housing on the factory site for workers, helping to relieve a critical housing shortage in Centralia. When it up and operating, the factory will also be discharging industrial solvents, mercury, and superheated cooling water into the river, while releasing untreated exhaust from the coal-fired boiler through two tall smokestacks.

From the point of view of the Centralia city planners and the Amazonia national industrial development analysts, the project is a god-send. It

creates jobs, housing, and foreign exchange. It uses a local fuel rather than imported oil. The benefits are great, and the investment is coming from private capital. The government agencies involved will probably be willing to incur substantial costs, in the form of tax holidays, training grants, low-interest loans, etc to get the plant up and running. They will also be interested in getting technical and financial assistance from major donors to support this project, as well as a variety of training for the future operators and managers.

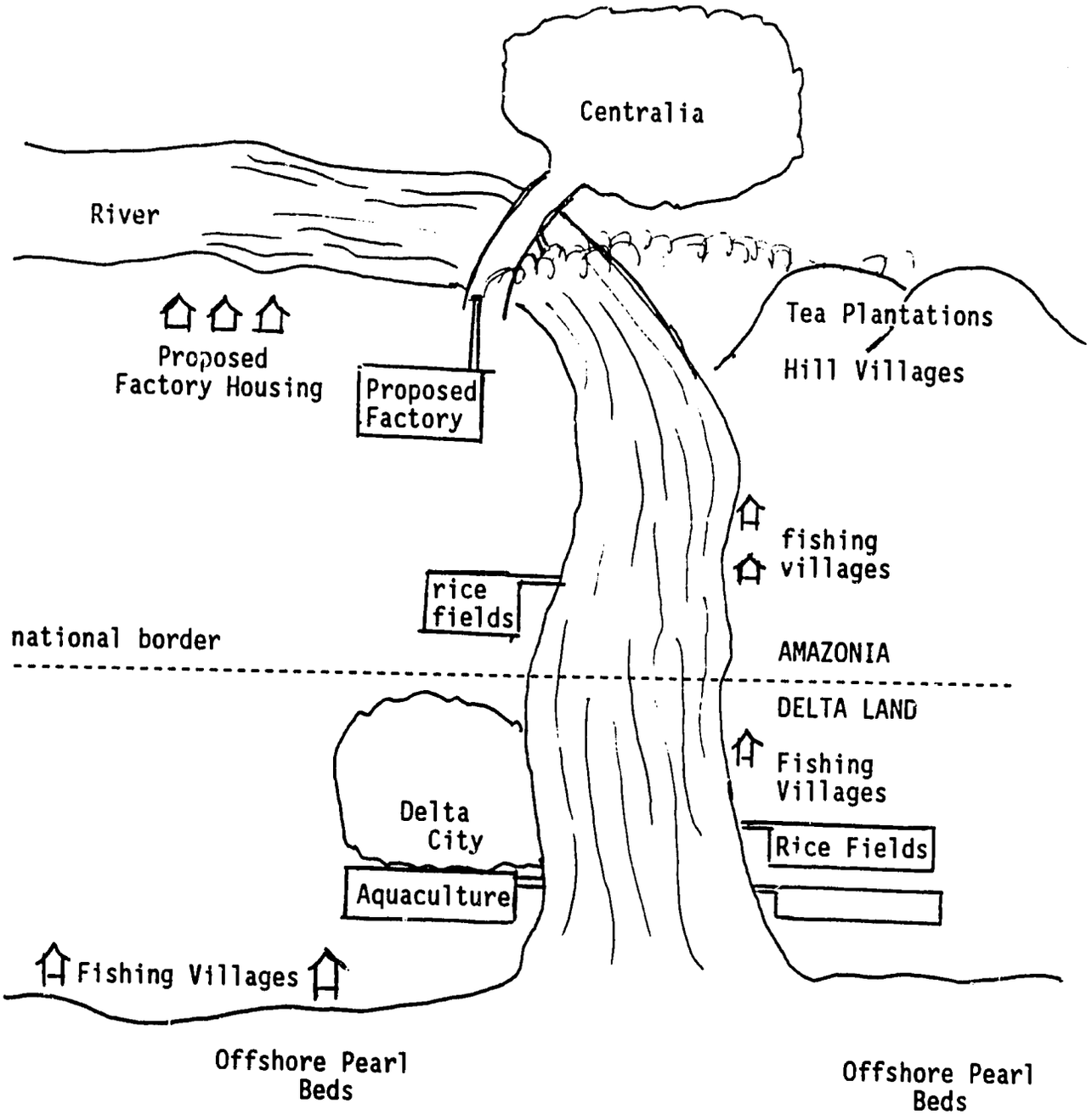
From the greater society's point of view, however, the cost/benefit equation less clear (see Figure Three). The heated water discharged into the river will raise the river water temperature significantly in the 20 miles below the plant, sharply reducing fish populations. Moreover, the fish that do survive will be heavily contaminated with mercury, as will be the drinking water of all of the villages and cities downstream. Rice yields downstream will also drop, due to the impacts of the industrial solvents. The sulfur dioxide pollutants emitted in the plume of the smokestack will precipitate out on the nearby hillsides, reducing the yield of the tea plantation there by 25% in the near-term and lowering the lifetimes of the individual tea plants from 20 to 12 years.

However, I have deliberately created the ultimate in externalities: much of the long-term costs are being borne by the citizens of the neighboring country of Delta Land, while none of the benefits (jobs, exports, tax receipts, housing) accrue to them. They are not included in the decision-making process, much as the individuals living next to the Eastern Canadian lakes that have lost all of their fish and wildlife due to acid rain from U.S. Mid-western coal-fired power plants are not consulting in the development of U.S. requirements for the scrubbing of high-sulfur coal power plant emissions. The major export goods of Delta Land are pearls and rice, and both are dependent on the continuous flow of high-quality fresh water from the river. Over time, the build-up of heavy metals and mercury could reduce the resistance of the oysters to disease and star-fish attacks, leading to periodic losses of 50% or more in the pearl harvest.

This is a relatively example of an admirable urban development project with a number of very major externalities. They include everything from reduced cash crop output (from tea and pearls) to wildlife losses to major long-term health costs. But even though we have been able to at least identify a number of externalities, how do we determine the magnitude of these costs? Do we need to quantify certain externalities, such as mercury discharges, or is it sufficient just to know that it is happening and that is dangerous to people downstream? How do we plot a reasonable strategy to reduce or eliminate these externalities, and evaluate the costs of doing so versus the externalities that have been avoided?

FIGURE THREE

Externalities in the Urban Factory Siting Case



Environmental analysis helps to answer all these questions, by assigning values to such imponderables as infant mortality, water pollution, loss of wildlife habitat, and crop losses. It is only when we can estimate that the air pollution from our factory will reduce tea production and sales by $ 1.5 million per year that we can begin to attach a value of requiring the use of a stack scrubber. It is precisely such information that AID and other donor agencies can and should provide. It is unlikely that the government of Amazonia (or Delta Land, for that matter), has the resources and interest to invest in an analysis of the environmental impacts of this proposed factory. But if AID or the World Bank are concerned, then they have both the financial resources and access to the skilled professionals required to provide the information on which informed decisions can be made.