POLICY ISSUES FOR CONSIDERATION IN TRANSFERRING TECHNOLOGY TO DEVELOPING COUNTRIES

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INTRODUCTION

The tragedy at the Union Carbide plant in Bhopal, India was not an isolated industrial accident. Major disasters involving hazardous materials have recently been occurring with alrming frequency throughtout the world. Two weeks before the accident in Bhopal, 80,000 barrels of liquid natural gas exploded at a depot of Petroleos Mexicanos, the Mexican oil company, outside Mexico City, killing at least 400 people, injuring over 4200, and destroying over 300 homes.[1] In February 1984, gasoline leaking from a pipeline exploded in Cubasto, Brazil, killing more than 500 people.[2] In 1979, 1200 head of livestock in Egypt were poisoned by the pesticide leptophos.[3] In 1972, hundreds of Iraquis died after ingesting unlabeled, mercury-treated grain imported from the United States.[4] These examples are only a few of the many documented disaster that have resulted from the transfer of technology to developing countries.[5]

The disaster in Bhopal illustrates many of the problems and issues involved in transferring technology to developing countries. Developing nations are generally eager to modernize by industrializing and by adopting agricultural technologies. Special favors in the form of tax breaks or concessions on utility costs may be grantd to companies from developed nations to encourage them to establish plants in developing countries. Local opposition to the establishment of new plants may be stifled by government authorities intent on advancing industrial development.[6]

Additional problems arise once a new plant is established in a developing country. Many developing countries do not have stringent health and environmental regulations, and new plants may not have the latest safety features found on sister plants in developed countries.[7] Workers may lack the skills necessary to run a facility safely.[8] In addition, workers and the population in surrounding communities may not be educated about the dangers inherent in certain industrial processes and products; therefore, in the event of an emergecny, alarms may go unheeded, such as occurred in Bhopal. Typically, the population immediately surrounding the plant is very poor and lacks modern communication devices, such as telephones and radios, which are necessary for efficient evacuation.[9]

When twentieth-century technology is introduced into a country that is not fully prepared to receive it, the problems that arise are myriad and complex. The technology transferred to developing countries can assume various forms: products, devices, agricultural practices, industrial processes or plants, and knowledge. Adoption of each form of technology involved unique problems, some of which may hold far-rreaching consequences for the developing country's population and environment. Also, some forms of technology will have a greater impact on economic growth in developing countries than will others. Therefore, when developing countries formulate policy concerning the transfer of technology, they should define at the outset what goals they want to accomplish, distinguish between the various forms of technology, and identify the long-term and short-term effects that each form of technology will have on growth and the environment. Developing countries should not view economic growth and the protection of health, safety, and environment as competing goals: instead, they should develop a rational decisionmaking approach that assesses economic benefits without obscuring the impact of technology on public health, safety, and the environment.

No one actor is singly responsible for the problems involved in the transfer of technology. All of the actors -- developed nations, multinational corporations, developing nations, and the international community -- share responsibility for the safe transfer of technology in a way that ensures the protection of humanitarian and environmental values. Each of these actors is currently responding in difference ways to the problems inherent in technology transfer. Unless they cooperate in developing a responsibile, coordinated approach to the transfer of technology, their efforts will result only in short-term, piecemeal solutions to specific situations.

With these considerations in mind, this Article identifies the key policy issues in the collection of activities known as "technology transfer." This Article first discusses important considerations underlying the selection of the technology being transferred. Second, it discusses limitations on, and issues raised by, the application of the classic cost-benefit calculus to the selection of technology being transferred, and it considers some alternative decisionmaking tools. Finally, specific policy issues facing donor countries, recipient countries, and the international community are identified.

THE CHOICE OF TECHNOLOGY AND THE COST-BENEFIT QUESTIONS

A. The Choice of Technology

Technology transfer can take the form of exported products, industrial processes, plants, or skills needed to apply technical ideas. Distinctions between the forms of technology transfer are important for purposes of policy development. One distincition involves the difference between the transfer of products or dindustrial plants and the transfer of "know-how," i.e. the skills needed to apply technical ideas to national problems. The transfer of know-how has the greatest implications for growth. The developed countries have always been willing to sell products and devices, buty reluctant to create the intellectural basis necessary for growth and self-reliance. This know-how is crucial, not only for crating self-reliance of the recipient country, but it is equally important for enhancing adaptability and the capacity to innovate in response to rapidly changing social and political conditions.

Another distinction involves the difference between importing products, such as drugs, presticides, and appliances, and importing industry per se. Where products are imported, planners may be better able to focus on problems of ecosystem integrity and consumer safety. Once potentially hazardous products are identified, it is easier to control the problems that they present. In contrast, the impact of industries is much less easy to define. When they locate in developing countries, they become an integral part of foreign investment: they create jobs and an infrastructure. Their products also affect worker, consumer, and citizen health, as well as ecosystem integrity, but their activities are less easily monitored and perhaps more difficult to change once entenched in the developing country. A country can stop importing a particular pesticide in a matter of months or weeks, but it is much more difficult to relocate a plant after jobs are created and an industrial environment has grown up around it. Regulatory efforts have often focused on products and devices, but directed very little attention to foreign investment and the importation of industries, the more serious problem in developing countries.[10]

A final distinction among the types of technology relates to technology assessment. Technology should be evaluated in at least two ways: 1) efficacy and untility, and 2) consequences for health, safety, and the environment. Concern with the former, i.e. use of the product or need for the industry, has been the primary driving force behind strategies for adopting technology in developing countries.[11] The occurrence of tragic accidents such as chemical explosions, spills, and poisonings fosters a perception that industrial accidents are an inevitable consequence of economic development.

The conventional wisdom is that a Hobson's choice must be made between the goals of occupational health and wages or between environmental integrity and a healthy economic base. The resolution of this alleged conflict is fashionably termed a cost(risk)-benefit trade-off. Economic growth and environmental concerns are not, however, mutually exclusive goals. In developed countries, regulation of health, safety, and the environment has stimulated technological innovation and generated a whole host of new products.[12]

In assessing technology, great care must be taken to distinguish long-term effects on growth and the environment from short-term, or transitory effects. In formulating policy, it is important to distinguish those strategies that attempt only to avoid tragic accidents, such as the disaster in Bhopal or mercury-treated seed consumption in Iraq, from those strategies which are aimed at bringing about systemic change. Of course, both are important, but they require very different institutional responses over very different time horizons.

Allocating Decisionmaking Responsibiity

The final issue to be raised concerning choice of technology is the allocation of responsiblity in choosing technology for a developing country. To what extent do developed nations have a right to impose their own calculus on developing nations? Some commentators argue that developed countries are obligated by international morality and environmental self-interest to attempt to prevent developing countries from undertaking controlled, large-scale exploitation of the environment similar to that which accompanied industrialization in developed countries.[51] Other commentators reject this approach as too paternalistic and argue that developing countries have a right to estabish their own priorities.[52]

Developing countries do have a right to establish their own priorities, but that right should not be absolute where global health and environmental consequences are concerned. Solving the problems inherent in technology transfer requires the complete cooperation of both actors -- developed and developing countries alike. This Article suggests that the developed countries have a substantial responsibility to promote the safe, responsible development and use of particular technologies. Promoting the benefits or utility side of technology is only one-half of the developed country's role; it is also obligated to minimize the risk side of the equation. This can be accomplished, in part, by transferring knowledge, educating responsible managers, and fostering concern for the health, safety, and environmental consequences of adopting particular technologies.[53] Developed countries should at least notify developing countries abolut the risk side of the equation by supplying notice that certain substances or products have been banned or restricted at home.[54]

A Uniform Approach

There are dangers inherent in V individual nations adopting divergent national policies towards risk. As discussed above, the data for risk are controversial, and the data concerning the usefulness of particular technolgies are often unreliable.[55] In addition, when different countries adopt different national policies for acceptable risk they invite continued production of harmful products because sellers know that the products can be sold somewhere. For example, producers will invest in environmentally risky products if the market in some developing country will bear risks unacceptable to the United States market.[56] Thus, a divergent spectrum of risk acceptance in various countries will encourage more environmentally unsound products in all countries. The existence of countries which have a higher risk tolerance may encourage the creation of polution havens and the export of hazardous industries from developed nations.[57]

Nations shoud cooperate to establish uniform levels or risk tolerance around the globe. Decisionmakers in a developing country may think that the best method of promoting growth, and improving the quality of life in their nation is to demonstrate a greater tolerance towards high risk products and industries than their neighbors. This is illusory. Building stringent health, safety, and environmental standards into a country's industrial system is most likely to be the best strategy for attaining a high quality of life. A low level of protection will ensure that the quality of life will, only after many decades (if ever), reach the levels that the purchase of technology allegedly offers.

Responsibilty and Liability

A final note regarding the allocation of responsibility in technology transfer decisionmaking concerns the distinction between responsibility and legal liability. All of the actors -- the international community, developed and developing countries, and multinational corporations -- share responsibility for ensuring the safe development and use of technology. In the event of a disaster, however, the corporate owners of the industry involved also assume legal liability.[58] Corporations clearly have an incentive, if only to prevent extensive legal liability, to promote technology in a manner that minimizes any adverse consequences to human life and the environment. Corporations in developing countries sometimes possess the leverage to promote concern for the protection of health, safety, and the environment.[59] For legal and moral reasons multinational corporations should assume a high level of responsibility in exercising the influence that they acquire in developing countries. They should use their influence to comply with, rather than avoid, appropriate regulation.

In sum, when selecting technology, developing countries should develop a rational decisionmaking approach that permits them to implement a long-range policy for attaining both economic growth and the protection of public health, safety, and the environment. In addition to the limitations discussed above, a simple cost-benefit analysis is inherently inappropriate as the sole decisionmaking method for choosing technology because it tends to pit economic growth aginst environmental concerns as though they were mutually exclusive goals.

Although the choice of technology ultimately is made by the developing countries, the other actors involved in technology transfer should encourage and assist developing countries in responsibly selecting technology in a manner that promotes both goals. Section II sets forth policy implications for each group of actors involved in these resource allocation decisions.

POLICY IMPLICATIONS FOR THE MAJOR ACTORS

The problems raised by the transfer of technology ae global in scope. The governments of exporting and importing countries, in cooperation with the international community as a whole, must accept joint responsibility for the flow of hazardous commerce. No single international organization, government, or corporation has the authority or the means to control the flow of dangerous substances in international trade or the location of industrial plants; therefore, several distinct groups of actors share responsibility for developing an implementable policy for technology transfer. One group is the exporting or donor countries, typically, the developed countries. The second group is the importing or recipient countries, usually developing countries. The third group is the international community, made up of organizations and members of both developed and developing countries. The fourth and most important group of actors are commercial firms that export or import the technology. Certainly, some commercial firms behave responsibly when transferring technology, whether of their own initiative, out of altruism, or from fear of legal and economic consequences of the magnitude now faced by Union Carbide as a result of the Bhopal disaster. Other corporations will be influenced by government regulation and pressure from international and national public opinion.

Policy Implications for Donor and Recipient Countries

There are a variety of measures that both donor and recipient countries can adopt to minimize the health, safety, and environmental dangers presented by technology transfer. This section discusses the most important measures that countries can implement.

Information Systems

No country can correctly weigh the advantages and disadvantages of a given technology unless it has accurate and complete information on the health, safety, and environmental effects of the technology. At present, few nations have organized systems for the storage and dissemination of such data. Furthermore, there is presently no organized and simple method for sharing this information among nations. If potentially hazardous technologies are to be developed and transferred in a rsponsible fashion, both donor and recipient countries must establish their own

domestic data base systems for the storage of risk data. Each domestic system will be more effective if all are linked and information available to one nation is available to all.[60]

To develop a comprehensive data base that can be utilized effectively, donor and recipient countries must overcome a number of obstacles. Currently available data are of poor quality, due largely to the fact that compilation of reliable data is a formidable task, beyond the capability of most nations. Extensive pre-market testing of certain chemicals and products may be required to assess the safety hazards, utility, and acceptability of various products.[61] Testing may also be required on substances and products already on the market.[62] Many industries presently possess information on the hazards of their particular processes and products, and those responsible for creating a data base might obtain some information directly from industry. Unfortunately, the level of testing and the quality of data vary considerably among manufacturers and classes of substances.[63] Moreover, data from industry sources may not always be sufficiently reliable for direct inclusion in a government data base because manufacturers are often unwilling either to conduct exacting tests or to release information that could threaten their competitive positions.[64] Hazard assessment data must, therefore, be scrutinized by independent sources, such as government laboratories. Yet even this level of verification may not be easy to achieve because some national governments are reluctant to release data that may harm their own domestic industry.[65]

Another difficulty in developing an adequate data base for international use is the reluctance of some governments to rely on foreign data and data evaluation.[66] The international community can overcome this difficulty by establishing a uniform set of standards for testing chemicals and technologies. The Organisation for Economic Co-operation and Development (OECD)[67] has taken steps in this direction by proposing several initiatives aimed at promoting uniformity in data collection and assessment. These initiatives propose the mutual acceptance of chemical evaluation data through the establishment of guidelines for proper test procedures and laboratory practices. The initiatives also recommend that countries require industries to make available to them minimum data before allowing companies to market new products. This would help ensure that the adverse effects of chemicals can be evaluated before the products are placed on the market.[68]

A data base system will only be successful if the participants co-operate in collecting and disseminating data. One example of a positive governmental response to industries reluctant to disclose data may be found in the United States. In 1976, the United States Congress passed the Toxic Substances Control Act (TSCA).[69] This act requires manufacturers of toxic substances to release certain risk data to the government.[70] Prior to either the manufacture of a new chemical substance or a significant new use of a chemical substance already on the market, the manufacturer is required to provide the Environmental Protection Agency (EPA) with test data which will permit EPA to assess adequately the risks of the substance.[71] EPA also has discretion under TSCA to require industries to provide test data on their substances already on the market.[72] In addition, once EPA makes a threshold finding that a substance may pose an unreasonable risk, is produced in substantial quantities, or leads to significant exposure, the Agency has authority to require that the industry generate data by performing tests to determine the health and environmental effects of that substance.[73] TSCA imposes certain record-keeping and reporting requirements as well. Under the Act, the EPA Administrator may require chemical manufacturers, importers and processors to maintain records and report to EPA known health and environmental effects of substances, and to record and report any significant adverse reactions indicating a substantial risk of injury to human health or to the environment.[74]

In the United States, "right-to-know" laws also mandate release of certain data by industry. Right-to-know laws direct manufacturers and employers to disclose information regarding toxic substance exposure both to workers and their unions. Government agencies charged with the protection of the public health may also obtain this information.[75]

The type of disclosures required may include obligations to compile and maintain records of certain workplace events or activities (e.g., regular monitoring of workers for evidence of toxic exposure),[76] to provide access to information held by the manufacturer or employer if requested by a worker, union, or agency,[77] and to automatically disclose information pertaining to toxic substance exposure in the workplaced.[78]

Although the United States is attempting to acquire and compile data, historically it has been reluctant to accept foreign chemical evaluations and data to augment its data base. The United States justifies this reluctance by asserting its desire to minimize any risk in introducing new chemicals into the American market.[79] Although this view may have been justified at one time in light of discrepancies between American and foreign testing procedures, it is no longer tenable, and today creates an unjustified impediment to establishment of an international data base. Chemical research and development activities in other nations have significantly increased in recent years due in part to large scale investment by United States corporations in overseas research. The total of chemical research and development expenditures by nations in the European Economic Community is now much larger than that of the United States, and the level of research and development by the Japanese pharmaceutical industry is comparable to that in the United States.[80] Partly because of the overseas research investment by United States corporations, the United States Food and Drug Administration has begun to liberalize its policies toward accepting foreign chemical data.[81] This change in position is prudent because, unless the United States makes better use of foreign data, it will needlessly burden its already

overburdened regulatory system.

Although the United States does not have a comprehensive system for disseminating information on hazardous exports to recipient countries, some attempts have been made to establish notification schemes under existing laws. At present, seven federal statutes forbid the export of certain banned or significantly restricted substances unless the importing country has been notified of the regulatory status of the substance in the United States.[82] Only after notification occurs is export permitted.

Recipient countries have a parallel responsibility to ensure that technology is transferred with minimum risk to the health of their citizenry and environment. Each recipient country should develop a data base, corresponding to that developed by donor countries, that assesses the efficacy and health effects of various technologies in light of the national demographics and the unique environment of the recipient country. Furthermore, the data base in the recipient country must be flexible and capable of keeping pace with growth rates in developing countries. Unless the recipient country can create a data base to assimilate and assess incoming information, it cannot properly evaluate the benefits of new technology. Without more sophisticated information systems, the information transferred from donor countries will alert recipient countries only to the most obvious hazardous technologies.

Provision of Technical Assistance

A second policy that donor countries should adopt to ensure the responsible transfer of technology is a commitment to provide technical assistance to recipient countries for evaluating the usefulness and efficacy of transferred technolgy. Donor countries should send technical assistance along with information on the capabilities of specific technologies, so that recipient countries can reconcile for themselves the goal of growth with health and environmental concerns. Technical assistance helps accomplish long-term systemic, rather than short-term transitory change.

Presently, the United States does not have a program devoted to providing technical assistance along with the technology it exports. Indeed, even in the United States, a consumer may have difficulty in determining the usefulness or effectiveness of a chemical product. An American farmer, for example, may be pressured by distributors from different pesticide companies, each claiming that only a specific chemical will do the job. Lacking a means of determining which in fact is the most effective pesticide, the farmer may end up using a little of each one. If the American farmer cannot obtain definitive information concerning which pesticides to use, it is highly unlikely that consumers in developing countries will be able to do so.[83]

Congress presently has one research arm, the Office of Technology Assessment (OTA), that is capable of providing a central focus for technological assessment of usefulness, and health and environmental effects of hazardous products. Congress should initiate systemic change in the way firms do business at home and abroad by requiring OTA to oversee assessment of exported technolgies.

Export and Import Control

The third policy that donor countries might consider is the direct control of exports. One means of directly controlling exports is to prohibit the export of hazardous substances or products that do not meet domestic standards.84 Arguably, a developed country has a moral obligation to extend the same protection to foreign nations that it accords its own environment and citizenry, particularly in light of the fact that many developing countries lack the resources and the inclination to extensively evaluate the hazardous products and substances that they import. On the other hand, it may not always be logical to impose such bans on other nations because a domestic ban may reflect unique environmental conditions or distinct domestic considerations in the individual exporting nation,. A flexible, case-by-case assessment is the best approach to determining whether the export of a domestically banned product or substance is appropriate.[85]

A less restrictive method of controlling exports directly is to condition the export of a substance on prior notification to the recipient country of the regulatory status of the substance in the donor country. As discussed above, the major environmental statutes in the United States already require much notification.[86] Of course, these schemes permit export of banned or restricted substances merely upon notification, thus, they are effective only as a means of alerting the recipient countries of well-defined problems.

In the United States, Congress and several Administrations have considered the appropriateness of controls on exports of hazardous technologies. Congress passed amendments to the Export Administration Act in October of 1979 authorizing the President to use export controls to further the foreign policy of the United States and to fulfill its international responsibilities.[87] On the basis of the authority granted by the Export Administration Act, President Carter issued Executive Order Number 12,264 on January 15, 1981, proposing a comprehensive approach to hazardous exports.[88] Carter's Order required coordination of the various notification schemes under the existing laws pertaining to hazardous exports, compilation of an annual list of all products banned or restricted in the United States, and pursuit of international agreements on hazardous exports. The Order also mandated the imposition of export controls over substances considered so hazardous that notification would not provide adequate protection. For such substances, the amendments authorized the Department of Commerce to determine whether to grant an export license. If the foreign government raised no objection and if the export would not cause clear and significant harm to United States foreign policy interests, the State Department could recommend licensing.[89]

On February 17, 1981, just thirty-four days after Carter issued his Executive Order, President Reagan rescinded it citing a need to cut excessive regulation and to reduce export restrictions to enhance the competitive position of United States exports.[90] Instead, President Reagan called for a comprehensive study of United States exports of hazardous substances. He also authorized the Departments of State and Commerce to reassess the statutes regulating hazardous materials (in particular their notification schemes), and to recommend revisions that would be more cost-effective.[91] The Reagan Administration report, released in May 1982, made several recommendations. It proposed the elimination of export notice requirements for toxic chemicals and pesticides, and the substitution of an annual compendium of regulatory activities in the United States. The report also proposed the elimination of existing prohibitions on the commercial export of drugs that cannot be lawfully marketed in the United States but can be marketed abroad. Finally, the report called for the exchange of information between countries on regulatory actions and for the provision of assistance to developing countries to help them make better decisions regarding the use of hazardous substances. The press widely criticized the report on the grounds that it would ease restrictions on hazardous exports. To date, the Reagan Administration has not made any proposals for statutory changes based on the review by the State and Commerce Departments.[92]

Despite the inaction of the Reagan Administration, the United States Congress recently has made some progress on the export issue. In 1985, Congress passed amendments to the Export Administration Act that explicitly recognize that exporting banned or severely restricted products can damage the credibility of the United States as a responsible trading party and pose a risk to American foreign policy. The Amendments grant explicitly authority for the President to impose export controls on specified hazardous substances under certain conditions.[93] This authority is merely discretionary; nevertheless. the new amendments represent a concrete step toward the development of a more comprehensive export policy.

Although the Export Administration Act has never been used to control hazardous exports, there is no reason why it could not be. Some officials in the United States government are increasingly sensitive about the reputation of the United States in developing countries.[94] These officials may be in a position to encourage presidential intervention through the Export Administration Act and thereby prevent soime kinds of exprots. Unfortunately, occasional presidential curtailment of exports will not create systemic change. Moreover, governmental control of exports does not control the nature of United States corporate investment in recipient countries. Foreign investment activity, a key element in responsible technology transfer, is beyond the reach of the Export Administration Act.

For their part, recipient countries must establish a products or technology purchasing control mechanism. They should institute a centralized authority capable of closely scrutinizing chemicals and devices that are brought into their countries. In addition, recipient countries must institute mechanisms to evaluate the effects of foreign investment and the establishment of industrial plants within their borders.

Environmental Awareness

A fourth policy that donor countries should adopt is a program to increase environmental awareness at home. The citizens of donor countries will not be concerned with hazardous exports unless they are concerned with the global environment as an important element of their quality of life. The role of the press in encouraging this awareness is particularly important. The relative success of the environmental movement in the United States is due in part to the fact that the American press operates with a high degree of freedom and has considerable access to information held by government agencies responsible for controlling toxic materials.[95]

Recipient countries need to enact legislation that will prevent uncorntrolled industrial growth, and in effect limit those developments that adversely effect the environment and consumer and worker health and safety. Public opinion is of paramount importance in legitimizing these goals and in enacting effective control measures. To mobilize public opinion, efforts should be made to sensitize the local press to environmental issues.

Recipient countries must also coordinate their industrial development policy and environmental policy. If the Minister of Industry does not talk to the Ministries of the Environment, Health, or Labor, a recipient country will have difficulty reconciling economic growth with health and environmental concerns.[96] The institutional cause of conflicting industrial and environmental policies is often the balkanization of those concerns within government, industry, and academia. This problem is not limited to developing countries. Agency conflicts occur within the United States and other developed nations as well. Departments of Commerce, Labor and Environment often are separated and frequently are pitted against one another. Industries separate their toxicology laboratories from production and design departments. Universities separately educate engineers, business managers, lawyers, and public health scientists.

National governments and international organizatons can help promote long-term systemic change by taking steps to ensure that environmental issues remain visible. They particularly should focus their efforts toward those groups directly involved in technology transfer.

Decisionmaking Structures in Recipient Countries

In addition to coordinating industrial policy with health and environmental policy, recipient countries should create a decisionmaking structure free from technocratic dominance. No one group, neither ecologiests nor industry chemists, should dominate decisions about what technology

to import or how to import it. Properly trained analysts are required. These decisionmakers could be trained in recipient countries, but it is likely that they would receive better training abroad in developed donor countries. In addition to educating analysts, recipient countries ought to sensitize their engineers, scientists, and development managers (the professionals who truly make technological decisions) to environmental, health, and safety issues.[97]

Responsible Foreign Policy

A final policy that donor countries should consider is the establishment of an ecological awareness in their foreign policy that will foster a responsible approach toward the use of toxic materials. International development programs of developed countries could condition assistance for the construction of chemical manufacturing plants in developing countries on adherence to sound environmental policies, and the incorporation of advanced safeguards into the plants at all stages of development, production, and distribution. In the United States, international development projects are administered by the Agency for International Development (AID),[98] which has agreed to observe the requirements of the National Environmental Policy Act.[99] One requirement of the National Environmental Policy Act is that appropriate agencies prepare environmental impact statements for all "major Federal actions significantly affecting the quality of the human environment."[100] This requirement could be employed more broadly to increase AID's sensitivity to the environmental effects of its programs abroad.

Policy Implications for the International Community

The current international situation regarding hazardous exports is characterized by disparate national approaches to the evaluation and introduction of toxic substances and divergent national policies toward the degree of risk acceptable in particular technologies. The international community can take a variety of measures to alleviate these differences. They can mobilize public opinion and prod developed and developing countries into recognizing that significant health and safety risks or environmental degradation cannot be tolerated. Secondly, the international community should promote multilateral cooperation in regulating the development, use, and trade of hazardous exports. As previously discussed, this would involve creating an internationally accepted data base and the development of uniform standards for both the evaluation of toxic substances and for the safety of workers who handle them. Various organizations currently are undertaking extensive efforts in the international community to promote these objectives.

OECD Initiatives

The Organisation for Economic Co-operation and Development (OECD) has made the greatest strides in promoting internatioanl environmental cooperation. The OECD member countries[101] are in a unique position to promote international cooperation in controlling hazardous exports because the twenty largest chemical manufacturing corporations in the non-Communist world are located within their borders. Furthermore, OECD members use a large percentage of the non-Communist world's total chemical output.[102]

From the beginning, the OECD has called for a unified, comprehensive approach to assessing the effects of chemicals on the environment.[103] In 1978, the OECD instituted a special Program on the Control of Chemicals under the auspices of its Environmental Program. The "Special Chemicals Program" was designed to harmonize the regulatory effects of OECD members, to prevent the creation of technical barriers to trade, and to avoid duplication of effort and cost in chemical testing among the member nations [104] The Program specifically addressed the need for a consensus on methods and means to assess chemicals, the need to facilitate the international exchange of information (and implications of that exchange of information, e.g. loss of confidentiality), and the need to address economic and international implications of legislation emerging in member nations.[105]

The Special Chemicals Program resulted in several significant OECD initiatives on hazardous exports. One is a set of guidelines designed to provide a uniform integrated approach to assessing the risks of chemicals. The guidelines suggest basic pre-market data requirements for assessing health and environmental hazards of a substance, and an intensive testing program when the initial assessment indicates that a substance may jeopardize human health and the environment. To promote accurate data assessment, the guidelines also encourage monitoring at all stages of chemical development, use, and disposal.[106] The OECD has also adopeted principles of good laboratory practice and guidelines for enforcing them nationally.[107] In addition, it has adopted the principle of mutual acceptance of data among countries that adhere to OECD guidelines for testing and principles of good laboratory practice.[108] Although disagreement exists over the establishment of a minimum set of pre-marketing data, OECD efforts represent an important step toward adequate international control of chemicals.[109]

Another significant OECD initiative is a proposed set of guidelines for an information exchange system between governments.110 The essence of the proposed guidelines is that, when an exporting country has banned or severely restricted the use or handling of chemicals, the country should notify an importing country prior to export. The exact timing of the notification, though, is left to the discretion of member countries. Additionally, the scope of the information exchange is left open because the guidelines do not specfically define "severely restricted chemicals."[111] This initiative is significant because it promotes the exchange of information between countries.

Another noteworthy OECD initiative is a proposed code of conduct concerning the export of hazardous chemicals.[112] The OECD has proposed the code as a voluntary form of self-commitment designed to complement the inter-governmental information exchange system. The code proposes that exporting countries impose the same quality standards and requirements on toxic substances manufactured for export as those applied by a manufacturer for comparable domestic products. The code also proposes that parent companies apply the same quality standards and requirements to subsidiaries abroad as they apply to themselves at home.[113]

The OECD efforts have met with some significant success. For example, in cooperation with specialized agencies of the United Nations and the European Economic Community, the OECD successfully has restricted the production and use of polychlorinated biphenyls (PCBs), except for very specific purposes, in all twenty-four of its member nations. Originally passed as a resolution by the OECD Council, the restriction has since been adopted in national legislation in all OECD member nations.[114]

The OECD has taken advantage of its unique international position to foster responsible transfer of technology among nations.

United Nations Initiatives

Numerous organizations within the United Nations have also attempted to promote multilateral cooperation in regulating hazardous exports. The International Labor and World Health Organizations, for instance, have sought to compile, assess, and distribute data on hazardous substances·[115] Additionally, over the past five years, the United Nations General Assembly has adopted several significant resolutions, designed to discourage the export of banned or severely restricted substances, and to encourage information exchange systems between member states.[116] On December 18, 1984, two weeks after the Bhopal incident, the U.N. General Assembly passed a resolution requesting that the Secretary-General prepare a consolidated list of products that are bannedm, severely restricted, or not approved for use in various countries. Although United Nations resolutions are only recommendations and are not binding as a matter of international law, such resolutions demonstrate a recognition that all nations have an obligation toward one another to act responsibly when trading in hazardous exports. The United States was the only country to vote against the resolution.[117]

In 1972, in response to a call to promote international environmental cooperation, the United Nations Conference on the Human Environment established the United Nations Environment Programme (UNEP).[118] UNEP is known best for developing a program, known as the Earthwatch system, which is designed to provide early identification of environmental hazards and to collect and assess environmental data concerning those hazards for use by any government that may need the data. Earthwatch is comprised of the Global Environmental Monitoring System (GEMS), the International Referral Service (IRS), and the International Register of Potentially Toxic Chemicals (IRPTC). The IRPTC promises to be particularly effective in encouraging uniformity in the assessment of toxic substances. The immediate objective of the IRPTC is to facilitate informed decisionmaking by becoming a registry of all existing scientific and regulatory data on the physical and chemical properties of substances, including toxicity.[119] If United Nations efforts to compile the register are successful, the IRPTC will represent a major advance in the creation of an internationally accepted data base and uniform standards for evaluating toxic substances. The success of the IRPTC depends in large part on the cooperation of other international organizations, manufacturers, and researchers. Even if it does not become an internationally accepted data base, the IRPTC still may play an important role in disseminating information and in helping to avoid unnecessary duplication of research and data storage for at least a limited range of toxic chemicals.

Other International Initiatives

The efforts of the OECD and the United Nations represent only a sample of the efforts currently being undertaken by the international community. Most of the activity relating to the evaluation and control of toxic substances undertaken at the international level has developed within existing international institutions. Efforts at the international level, however, may take other forms as well. Two or more individual countries sometimes reach bilateral or multilateral agreements which lead to scientific meetings, combined research programs, or information exchange agreements. These types of arrangements, though, have generally been specific in scope and focused on short-term problems.[120]

CONCLUSION

Ensuring the safe, responsible transfer of technology is a global concern. A re-examination of both industrial and environmental policies is required by donor countries, recipient countries, and the international community. Emphasis must be placed on accomplishing long-term systemic change. Problems must be defined in terms of maximizing economic growth and development while minimizing the adverse effects of technology on health, safety, and the environment. Above all, the actors must realize that these goals are not mutually exclusive.

As discussed above, many of the major actors involved in technology transfer have attempted to ameliorate its adverse consequences. With the increased use of chemicals, many nations, both developed and developing, have placed restrictions on the production, sale, use, and disposal of toxic substances and have regulated consumer goods that may pose health and safety hazards. Various international organizations have also

tried to promote multilateral cooperation in the regulation of toxic substances. Although these efforts, national and international, indicate a growing awareness of the problems and dangers inherent in technology transfer, most of those efforts, if undertaken randomly, will result only in short-term sdolutions. To effectuate long-term, systemic change, a comprehensive, coordinated international effort is required.

To date, regulatory efforts have focused primarily on the control of hazardous substances, products, and devices. These efforts are certtainly important to avoid some tragic accidents; however, to effect long-term, systemic change, the focus must shift to regulation of the imported industries themselves.

Decisonmakers in developing countries will be more successful in regulating technology transfer if they use effective tools in evaluating their options. Cost-benefit analysis has too many flaws to be relied upon as the only tool for technological evaluation. It fosters short-term analysis, is subject to political abuse, and does not take account of equity considerations.

Trade-off analysis is an effective alternative. Where this method is employed, decisionmakers are encouraged to identify the particular grolgups that are affected by their choices, and the relationships between those groups. This methodology goes beyond a mere search for economic efficiencu, the hallmark of cost-benefit analysis, and is therefore better suited for social policy planning.

Developing countries also must unite in requiring incoming multinational corporations to establish facilities with safety standards and precautions as stringent as those in more advanced countries. In addition, the focus must be placed on the transfer of knowledge to accompany the exported technology. Developing countries need to acquire the skills to apply technical ideas to national problems and to adapt technology to acquire the unique skills to apply technical ideas to national problems and to adapt technology to their unique social and political situations. Only in this way can developing countries become self-reliant and able to effect positive, long-term growth.

The above analysis of the policy practices employed by the actors involved in technology transfer is certainly not exhaustive. The important conclusion of this analysis, though, is that all three groups of actors (donor countries, recipient countries and the international community) must assume responsibility and cooperate with each other to bring about long-term systemic change. In the absence of cooperation, disparate national policies concerning acceptable risk will encourage the production of harmful substances and products. As long as markets for hazardous exports exist, the production of environmentally unsafe substances and devices will continue in all countries.

The magnitude of the disaster in Bhopal has focused worldwide attention on the dangers inherent in technological development. It is unfortunate that such a large loss of life was required to focus attention on a problem of long standing global concern. The problem does not belong to any one corporation or country. The development of technology without regard to the impact on public health and the environment has far reaching implications for everyone. In the future, all actors must assume a larger part of this burden and exercise a higher degree of responsibility in developing and trading in hazardous substances and industries.

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