



Policy and Research Paper N°8

Population and Environment in Industrialized
Regions
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Introduction

Policy & Research Papers are primarily directed to policy makers at all levels. They should also be of interest to the educated public and to the academic community. The policy monographs give, in simple non-technical language, a synthetic overview of the main policy implications identified by the Committees and Working Groups. The contents are therefore strictly based on the papers and discussions of these seminars. For ease of reading no specific references to individual papers is given in the text. However the programme of the seminar and a listing of all the papers presented is given at the end of the monograph.

This policy monograph is based on the seminar on 'Population and Environment in Industrialized Regions' organized by IUSSP Scientific Committee on Population and Environment and the Institute of Geography and Spatial Organization of The Polish Academy of Sciences, held at the Polish Academy of Sciences, Warsaw, Poland and The Institute of Geography of the Jagellonian University, Cracow, Poland from 27-30 June 1994.

Summary of Main Points

1. Relationships between population, environment and industrial processes are reciprocal and vary according to the geographic and time scale on which they occur. The reciprocal impacts between population, environment, and industrial activity may occur from a local to global scale and may emerge over the short-term or long term. In all instances they are mediated by social and economic factors. As a result, the formulation of policy which responds to these characteristics requires the coordination, collection and integrated analysis of multisectoral information at global and local levels.
2. The current transition of many Central and Eastern European countries from centralized resource control and unregulated industrial development to private resource management, market economies, and more stringent industrial regulation presents a major opportunity for 'sustainable development'. To accomplish sustainable development, governments at all levels as well as grassroots organizations should play a role. Examples from Eastern and Central Europe suggest that policies based on sustainable development require integrated future planning and addressing the consequences of past development patterns.
3. Although a general correspondence between industrial and demographic trends has existed historically, policy makers cannot assume predictable effects. Current patterns of industrial restructuring from heavy to lighter industries have ushered in a new historical epoch, the 'post-industrial' age where the correspondence between economic and demographic trends is not always clear. Recent conditions, however, have created a 'window of opportunity' for policy makers to undertake measures for improving relationships between population, environment, and industry alongside restructuralization.
4. The threat of negative environmental or population impacts due to industrial activity will always exist. As a result, governments, private industry, and affected populations should engage in a continuous process of 'risk-management'. What is called for is the creation of a 'new societal disposition' where government, industry and affected populations share a sense of mutual responsibility to the environment and to each other. In looking for 'lessons learned' it is important to consider successes as well as failures.
5. 'Urbanization' or industrial and population concentration in cities has characterized development in the West as well as in newer industrialized and industrializing countries in Europe, Latin America, Africa and Asia. As a result of these trends, the environment in urban areas has been significantly transformed and has had a reciprocal impact, for better or worse, on population. The man-made nature of urban environments brings into focus the concept of 'quality of life'. Because of the concurrent demographic, industrial and environmental trends affecting large populations in urban areas they represent a critical locus for policy efforts.

1. Relationships between population, environment and industrial processes are reciprocal and vary according to the geographic and time scale on which they occur. The reciprocal impacts between population, environment, and industrial activity may occur from a local to global scale and may emerge over the short-term or long term. In all instances they are mediated by social and economic factors. As a result, the formulation of policy which responds to these characteristics requires the coordination, collection and integrated analysis of multisectoral information at global and local levels.

The Characteristics of Population-Environment Relationships in Industrialized Regions

The first challenge confronting policy makers who aim to address population-environment relationships in industrialized regions is that of understanding the reciprocal relationships which exist. The spatial distribution of population, in particular the concentration of population and labour resources in urban areas, is a key requirement for industrial development. Industrial activity and the pull of higher urban wages, in turn, encourages further in-migration to cities. Higher population concentration or 'density' in cities may allow the widespread provision of basic services, especially schools and health facilities, higher standards of living, and better environmental conditions. At the same time, high urban population density and the consumption patterns of a rapidly growing urban population create various physical environmental problems with, for example, waste disposal and vehicle emissions. Industrial activity also directly transforms the environment through the production of industrial wastes leading to problems of water, soil and air pollution. Environments polluted by industrial activity, in turn, adversely affect population health.

These reciprocal relationships between industrial, population and environmental trends may vary according to the temporal and geographic scale at which they occur and policy measures should be adjusted accordingly. Concurrent long-term global trends of increased population growth, population concentration, consumption and industrial activity are believed to play some role in global environmental changes such as acid rain, ozone depletion and climatic warming. Policy makers seeking to modify these trends should work within international forums to support the continued monitoring of global change and global policy responses. The 1992 United Nations Conference on Environment and Development held in Brazil and the 1994 United Nations Conference on Population and Development held in Cairo, both of which produced major policy documents, have presented an opportunity for such global monitoring and policy formulation.

The overwhelming majority of impacts between population, environment and industry, however, occur at the local level. Acute industrial disasters, for example oil spills, toxic waste production and nuclear power accidents, make this fact strikingly apparent. The monitoring and analysis of these local impacts through the use of existing data collection systems, the establishment of new systems and the carrying out of specialized studies is important. Based on such information, policy makers at the national and local level as well as industries, private organizations, non-governmental organizations and groups of affected populations will be able to more effectively shape local-level conditions.

In considering local environmental impacts of population and industrial activity, the baseline fragility of particular ecosystems undergoing population and industrial growth must also be taken into account. Coastal areas, which are frequently the setting for urban development, are inherently subject to natural transformations such as sea-level rise or erosion. Population or industrial activity may both affect and be affected by these natural processes. For example, in coastal areas of California sea-level rise possibly related to global warming and continued development has led to increased flooding which threatens the ever-increasing coastal population. Similarly, cities in mountain valleys, such as Mexico City or Cracow, Poland, may be predisposed to problems of air pollution due to natural wind circulation patterns. In planning and assessing past or future impacts policy makers should take into account baseline natural resource characteristics and endowments.

Frequently the geographic and temporal scale of impacts between population, environment and industry may not be clearly defined. Although industrial pollution may emanate from a localized source its impacts may extend across geographic and administrative boundaries. Moreover, several resources (water, air, soil) or several distinct populations may be affected at the same time. Distinction may be made between endemic long-term deterioration and short-term disaster situations, for example due to industrial accidents or natural calamities. However, it is often difficult to classify the time frame of population, environment and industrial relationships since effects are often lagged. For example, the impact of industrial pollution on populations or the environment may not be apparent until several decades after it occurs. A need, therefore, exists for determining 'situations' as opposed to

sites. Analysis of impacts may need to go beyond geographic and administrative boundaries to consider wider interacting productive, ecological and demographic 'systems'. In addition, both long and short term impacts should be considered.

Whatever the geographic or time scale considered, social and economic factors mediate relationships between population, environment and industry and must also be taken into account, particularly in identifying affected populations. The segregation of economic groups within cities means that poorer populations are exposed to more negative environmental conditions in city slums, peripheral squatter settlements or industrial areas. At the same time, more well-off groups may reside in better neighbourhoods or 'suburbs' which are not as affected by industrial activity and environmental pollution. Sociodemographic factors such as age may also enhance negative environmental impacts. For example, children and the elderly are naturally more vulnerable to negative environmental conditions. The mediating role played by numerous socioeconomic factors also suggests that identifying direct causal relationships between demographic, environmental and industrial changes may not be feasible. Rather, relationships should be understood within the particular historical, social and economic context in which they evolve.

Strategies for Information Collection and Analysis

Understanding these reciprocal and varied relationships requires the collection and synthesis of a large range of information on industry, population, environment and socioeconomic conditions. Although easily stated, this is a daunting task requiring the collection and integration of multisectoral information across government ministries and local governments, non-governmental groups, community groups and research institutions. The availability and quality of sectoral information varies between countries and between sectors within countries. Highly industrialized countries such as the United States and countries in Europe with a high level of institutional regulation of industry and environment and specialized departments dedicated to these tasks have more and better quality data as well as more integrated analysis of information. In rapidly industrializing countries in Asia, Latin America and Africa where institutionalized record keeping and environmental and industrial regulation is nascent, the infrastructure, availability and quality of data and their integrated analysis at any level may be limited. Also, the quality and availability of information between sectors may be unequal. Data incompatibilities or a lack of communication between government ministries may also make it difficult to link information for integrated analysis.

Recent advances in information technology may help facilitate the combination of multisectoral information and integrated analysis. The creation of Geographic Information Systems (GIS) technology allows multisectoral social, population, environmental and industry-related information to be displayed on a single map image (see Box 3). However, the use of GIS systems to produce information for planners and policy makers requires a high degree of coordination among sectors which may or may not exist. GIS and other multisectoral approaches required to understand relationships between population, environment and industry, may require initiating or strengthening multisectoral data collection as well as cooperation.

Box 3: Poland: Identification of Hazard Areas

Information on industrial activity and environmental and population change have been collected in Poland since at least the 1950s. However, only during the 1980s was this information linked by geographers through the use of Geographic Information Systems (GIS) technology. As a result 27 'hazard areas' in the country have been identified where industrial activity has created significant ecological and health risks. These hazard regions cover 10 percent of the country's total territory and a third of the total population (10 million people). Between 1985 and 1990 a 'Survey of the Demographic Consequence of Environmental Degradation' in 22 urban hazard areas (including Warsaw and Cracow) revealed that increased mortality and sickness among adults and, in particular, children were significantly related to urban environmental pollution. In response to these findings, various sectors of the government have undertaken several policy measures including instituting stricter industrial regulation, the development of environmental curriculums for schools and the initiation of health promotion programmes in hospitals. The potential exists for the development and identification of hazard areas in other countries, based on Poland's example. Comparative studies of hazard areas between countries may allow the development of international standards for ranking situations. This would afford policy makers at all levels a tool for both assessing current situations and prioritizing policy responses.

2. The current transition of many Central and Eastern European countries from centralized resource control and unregulated industrial development to private resource management, market economies and more stringent industrial regulation presents a major opportunity for 'sustainable development'. To accomplish sustainable development, governments at all levels as well as grassroots organizations should play a role. Examples from Eastern and Central Europe suggest that policies based on sustainable development require integrated future planning and addressing the consequences of past development patterns.

The Concept of Sustainable Development

The idea of 'sustainable development', which emerged in the early 1970s, has become a guiding principle in the formulation of policies addressing the relationships between population, environment and industrial development. Generally speaking, sustainable development means that (1) social and economic development is to be pursued in conjunction with the protection and preservation of the earth's resources for current and future generations and (2) the recognition that natural resources and the capacity of natural systems to respond and adjust to man-made changes is limited. With the aim of institutionalizing sustainable development among member states, the United Nations in 1987 established the World Commission on Environment and Development or the 'Brundtland Commission' named in honour of its chair, the Norwegian Prime Minister Gro Haarlem Brundtland. The Commission report, entitled Our Common Future, defined five clear principles of sustainable development for policy makers to follow which include:

- Changing current patterns of economic growth, technology, production and management which may have negative impacts on the environment and population.
- Ensuring employment, food, energy, safe water and sanitary services for all populations.
- Controlling global population growth.
- Protecting natural resources for future generations.
- Integrating economic, environmental and population considerations in policy decision-making and planning.

The current transition of many Central and Eastern European countries from centralized resource control and unregulated industrial development to private resource management, market economies and more stringent industrial regulation presents a major window of opportunity for the creation of 'sustainable development'. However, former Eastern Block countries also bring into focus the challenge confronting all regions of the world which aspire to sustainable development. This challenge consists of moving away from narrowly focused policies supporting industrialization to reshaping and creating comprehensive policies in all sectors which may affect population, environment and industry.

Strategies for Sustainable Development in Industrialized Regions

To accomplish sustainable development, governments should continue to play an active role at all levels. Many countries have created environmental ministries, departments or agencies to accomplish this. The scope of environmental ministries is necessarily broad and may consist of a portfolio of activities including regulation and monitoring of industry, agriculture, energy and transport systems, population health, waste management and natural resources. The policy instruments available to ministries vary but generally include formulating and reinforcing laws, undertaking industrial reform and regulation, establishing environmental protection funds and incentives, extending environmental education and, supporting continued research.

Arguments for governments to play an active role in pursuing sustainable development in free market environments rest on the fact that industry cannot be relied upon for regulating itself. Industries may be expected to maximize profit and reduce costs by the efficient use of energy and raw materials as well as keeping their work force healthy. However, the incentive is equally strong to reduce operating expenses and production costs making investment and spending on environmental or worker protection measures and equipments unattractive. Thus, national and local legislation, planning, administration, monitoring and enforcement may be necessary to both regulate current impacts and guide future development. These activities may need to be among a government's highest priorities since the health, productivity and natural resource base of the nation are what is at stake.

Less developed countries confront the problem of having limited funds available for channelling into environmental ministries and state regulation. However, environmental and health economics increasingly suggest that the economic costs of negative industrial impacts may be significant. In Poland, losses to industry caused by environmental pollution may amount to from 5 to 10 percent of the Gross National Product (GNP). Costs related to health impacts on population may also be significant. There may be powerful economic reasons for environmental protection and monitoring regardless of a country's development status. In the past economists have had a major effect on policy makers and planners and the formulation of development strategies. New economic perspectives, such as those of environmental and health economists who work to quantify health and environmental costs due to industrial activity should also be integrated into policy making and development planning.

Government activity should occur alongside the development of non-governmental and grassroots activity by community and local groups. Changes in environmental as well as political policies in Poland, in fact, came largely through the activities of worker unions, the most well known of which was 'Solidarity'. Certain environmental resources such as water whose availability and quality may vary according to local circumstance may be more responsive to solutions undertaken by local authorities and other community or private business groups. The availability of information and political empowerment of different populations may affect the degree to which such activity occurs. In this context, environmental education and increased availability of information as well as forums for airing concerns are important.

Hungary: Sustainable Development on the Hungarian Plain

The example of the Hungarian Plain reflects the opportunities and challenges for sustainable development which political change in Eastern Europe presents. During the post war period the region became a centre for large-scale collective agriculture and food processing under centralized state production. In conjunction with the growth of these farm and food industries, large agro-towns developed on the plain in which population densities rose without the development of infrastructure (roads, schools, other services). With the demise of centralized government in the 1980s and the shift to a market economy, these farm and food industries have declined and the region is currently experiencing economic depression and high levels of unemployment. Also, previous years of unregulated agricultural activity have produced widespread water and soil pollution. The future fate of the plain is not clear and its rehabilitation and development has become an issue of national concern.

Geographers have suggested a plan which includes developing infrastructure to make the region competitive with other areas in attracting industry, regulating population settlement patterns and undertaking active conservation measures to rehabilitate the region's ecology. This may be partly accomplished by a return to traditional agricultural systems used on the plain prior to collectivization. The degree to which such sustainable development will occur and to which the opportunity presented by political change will be seized is not yet clear. Because of the scale of development which must be undertaken, this may depend to a large extent on government commitment. The example of the Hungarian Plain suggests that sustainable development requires an integrated plan focusing on future population, industry and environmental relationships while addressing the consequences of past patterns of development.

3. Although a general correspondence between industrial and demographic trends has existed historically, policy makers cannot assume predictable effects. Current patterns of industrial restructuring from heavy to lighter industries have ushered in a new historical epoch, the 'post-industrial' age where the correspondence between economic and demographic trends is not always clear. Recent conditions, however, have created a 'window of opportunity' for policy makers to undertake measures for improving relationships between population, environment and industry alongside restructuralization.

Impacts of Industrial Restructuring

In the West a general correspondence between industrial and demographic trends has generally occurred (Table 1). Urban growth, increased standards of living and declines in family size and mortality went hand in hand with industrialization. Common policy assumptions made based on this historical experience are that government measures encouraging socioeconomic and industrial development may stimulate urban growth and an improved quality of life. However, even in historical Western experience important local-level variation in the relationships

between industrial and demographic trends occurred. For example, in rural areas of Belgium, as well as other countries during the earlier stages of the industrial revolution, standards of living were actually lower in cities than in the countryside and urban mortality was actually higher. Policy makers cannot assume that economic, industrial or population distribution measures will necessarily have predictable effects on each other.

This may be even more important in the current era. In both older and more recently industrialized countries industry and population concentration traditionally grew up around local resources and heavy industry such as coal, iron, steel and shipbuilding. Due to rapid technological change in recent years demands for these products have declined and many countries have undergone a common transition away from heavier industries based on raw materials to lighter consumer (plastics, fibre, communication) and service industries. Meanwhile, all countries have become more and more interdependent as greater 'economic globalization' occurs. This overall sequence of events has been termed 'deindustrialization' although the more appropriate term may be 'restructuralization' since industrial activity in many instances has changed rather than declined altogether. Many social scientists see this restructuralization as ushering in a new historical epoch or the 'post-industrial' society.

Table 1: Historical Correspondence Between Industry, Population and Environment Trends

Stages	Industry	Population	Environment
<i>Initiation</i>	<i>Rapid growth of heavy industry in urban areas</i>	<i>Rapid urban population growth</i>	<i>Direct and indirect impacts of population and industrial activity not yet apparent</i>
<i>Maturity</i>	<i>Concentration of heavy industry in urban areas</i>	<i>Population concentration in urban areas</i>	<i>Short-term impacts of population and industrial activity apparent</i>
<i>Stagnation</i>	<i>Stagnation and decline of heavy industry in urban areas</i>	<i>Decline in urban population growth</i>	<i>Short and long-term direct impacts of population and industrial activity apparent</i>
<i>Restructuring</i>	<i>Restructuring from heavy to light industry</i>	<i>Stability of population growth in primary urban areas and growth of secondary urban areas</i>	<i>Active efforts to regulate population and industrial impacts</i>

Adapted from: Marksoo, Ann and Juri Roosare, 'Changing Settlement Patterns in North-East Estonia: A Region of Polluted Environment and Political Conflicts', Institute of Geography, University of Tartu, Tartu, Estonia, 1994.

In post-industrial society new industries, new skills and new amounts of labour are needed to make a country competitive. However, industrial restructuring has not occurred sufficiently in most countries. Even in highly industrialized nations, programmes and education systems needed to train or retrain workers in new skills have not been adequate while labour-saving technologies have become more and more pervasive. As a result, restructuralization (or rather a lack of it) has in many countries been accompanied by rising unemployment and economic depression. In many Central and Eastern European countries these negative trends have been enhanced by the abrupt transition from a centralized to market economy. This economic downturn has been associated with a concurrent 'demographic' depression in many areas of Eastern and Central Europe, including Poland and Germany, where fertility has dropped dramatically in urban areas and urban growth has slowed. In other countries, particularly in Africa, population growth has remained high despite the deteriorating economic situation in the continent.

Ironically, decreased activity of heavy industry combined with new technologies in recent years has had beneficial impacts on the environment in many countries due to fewer industrial emissions. This raises the question as to what may happen if industrial activity once again picks up? In a sense, declining industrial activity has created a 'breathing space' in which environmental policies may be restructured alongside industry. In this context, the need to establish resource management and regulation may be a priority. Many countries in Eastern and Central Europe, including Poland, are responding to this window of opportunity by the creation of active environmental ministries alongside measures to reshape industry and the economy.

Another important trend accompanying the current era of change which has implications for population and environment in many countries is the growth of tourism. Tourism forms an important part of the economy particularly in many developing countries. However, it introduces large numbers of 'temporary' migrants, hotels

and other service industries which may have significant physical and social impacts on the local environment. The potential for negative impacts is particularly great with 'ecotourism' into protected areas and fragile ecosystems such as rain forests and game reserves in South America, Asia and Africa.

The environmental, social and economic impact of tourism should also be integrated into development planning and policy at the local and national level.

4. The threat of negative environmental or population impacts due to industrial activity will always exist. As a result, governments, private industry and affected populations should engage in a continuous process of 'risk-management'. What is called for is the creation of a 'new societal disposition' where government, industry and affected populations share a sense of mutual responsibility to the environment and to each other. In looking for 'lessons learned' it is important to consider successes as well as failures.

Risk Management and Responsibility

The threat of negative impacts from industrial activity will always exist even with the highest levels of monitoring and regulation. Governments, private industry and affected populations must, therefore, engage in a continuous process of 'risk-management'. Government planners and policy makers at all levels should weigh the needs for increased production and socioeconomic improvement against the potential for short or long-term industrial pollution or disaster. Environmental impact assessments included as a regular part of development planning offer a means of assuring such deliberation. Private industry should also actively weigh the higher short-term cost of environmentally safe production processes against the long term benefits on both the environment and health of their worker population. Public and private industry and multinational cooperations should undertake appropriate protective measures and disaster planning in relation to their worker population and the communities and environments in which they locate. At the same time, potentially affected populations should be aware of the risks posed by local industries and their work environment. Educational activities have an important role to play in promoting such awareness.

If short or long term negative impacts occur, governments and private industry should be ready to assume responsibility for population and environmental outcomes. Legislation should support the compensation of victims, environmental clean up measures and industrial reform. Affected populations should also have a means of actively making claims and pursuing compensation. Since the impacts of cumulative industrial pollution and even short-term disasters may have a lagged effect on population and the environment, governments, industry and affected populations should take into account both long and short term consequences. In short, what is called for is the creation of a 'new societal disposition' where government, industry and affected populations share a sense of mutual responsibility to the environment and to each other. Recent short and long term disasters in India and Brazil give some idea of the degree to which these 'ideals' may or may not be achieved.

India: The Bhopal Chemical Disaster

In 1984 a major leak of toxic chemical gas from Union Carbide Chemical Plant in the city of Bhopal, India with a population of 200,000 occurred due to a combined lack of safety monitoring and enforcement by both the government and the Union Carbide Company. A total of 320,000 people in Bhopal and surrounding towns were exposed to toxic gas, as many as 10,000 died immediately and an estimated 100,000 persons continue to suffer from chronic eye, respiratory, gastrointestinal and psychiatric illnesses and cannot live or work normally. The environment and economy in Bhopal has also suffered due to water, soil, food and livestock contamination. The poorest population living in the slums around the Union Carbide plant suffered the brunt of these impacts.

The Indian government sought legal compensation from Union Carbide in United States and received a sum of \$470 million dollars, an amount which may be inadequate to cover the long-term health, economic and human impacts caused by the disaster. Distribution of these funds has proved problematic due to the difficulty of establishing compensation criteria. Also many in the affected population are incapable of making claims due to a lack of information on mental and physical illness related to the disaster. The Indian Council of Medical Research, UNICEF and an international medical commission undertook baseline surveys of victims immediately following the disaster. However, the existing hospital-based health system in the region is inadequate to carry out proper follow-up and treatment which requires more extensive community-oriented services. Important issues such as the resettlement of population away from the plant area and the creation of employment opportunities for the affected and disabled population which now have disabilities have yet to be addressed. The response by the

government and Union Carbide has, therefore, been deemed inadequate and incomplete. The Bhopal disaster underlines:

- The problem governments confront in formulating a response to disaster situations when poverty levels are high and health infrastructures and government resources are severely limited and
- The need for private multinational (or public) industries to take some responsibility towards the environments and populations they locate within.

Brazil: Cubatao, 'The Most Polluted City in the World'

Cubatao, a city of 91,000 people on the outskirts of Sao Paulo, Brazil, contains one of the largest petrochemical complexes in Latin America and has been known as 'the most polluted city in the world'. Unregulated industrial growth of state and private industries since the 1940s has been associated with negative environmental impacts such as acid rain, deforestation, pollution and adverse population health impacts (infectious, respiratory, skin and congenital diseases). Only after 1984, were the long-term impacts of industrial activity in Cubatao officially recognized by the government. Previously, official policy held that some amount of environmental pollution was the price to be paid for progress. However, the lack of attention to the health impacts of long term pollution in Cubatao is also related to the fact that the most affected population were poorer groups of the workers who lived in the vicinity of the industrial area but lacked the power to organize and bring attention to their claims. More empowered groups of middle-class professional workers commuted in daily to Cubatao but resided elsewhere and were, therefore, not inclined to lobby for change. The example of Cubatao underlines the fact that:

Socioeconomic factors mediate not only the impact of environmental pollution on population but also the response by affected populations to such impacts and

Government responses (as well as those by industry and affected populations) are shaped by their own priorities or perceptions.

Education at the community level and the activity of non-governmental, labour and grassroots organizations may have a important role to play in changing such perceptions as well as in empowering affected groups.

The above examples from India and Brazil consider crisis situations and represent what are in a sense policy failures. However, in looking for 'lessons-learned' it is equally important to consider successes or situations where industrial development has occurred successfully without widespread negative environmental and health impacts. Documentation of successes are limited at present. This gap in information underlines the fact that monitoring, evaluation and regulation by policy makers and non-governmental or community groups should work to identify not only problems but solutions as well.

5. Urbanization or industrial and population concentration in cities has characterized development in the West as well as in newer industrialized and industrializing countries in Europe, Latin America, Africa and Asia. As a result of these trends, the environment in urban areas has been significantly transformed and has had a reciprocal impact, for better or worse, on population. The man-made nature of urban environments brings into focus the concept of 'quality of life'. Because of the concurrent demographic, industrial and environmental trends affecting large populations in urban areas they represent a critical locus for policy efforts.

Industrialization and Urbanization

The majority of population and industry in Western and Eastern Europe and United States is currently concentrated in or around urban areas. Shortly after the year 2000 it will be the same in the developing world. Even with the process of industrial restructuring towards lighter or service industries, cities will remain responsible for producing the largest proportion of the gross national product (GNP) in most countries. This constant process of urbanization has and will continue to shape the urban environment. In the developing world the process of urbanization and industrialization has been more rapid and more concentrated in time and space than in historical Europe and the United States. 'Megacities' (Sao Paulo, Mexico City, Shanghai, Bombay, Buenos Aires, Rio de Janeiro) have grown up whose populations have soared to over 10 million in less than three decades.

To alleviate the demographic and economic dominance of megacities many developing countries have instituted explicit 'decentralization' policies aimed at developing industry, administrative activities and population settlement in smaller or 'secondary' size cities. The efficacy of these explicit policies to develop secondary cities has been confounded by industrial restructuring and the loss of attractive power in major urban areas in recent years. In any case, the existing size of large cities continues to be of concern to policy makers in both older and more newly industrialized countries. Existing urban areas clearly bring into focus the reciprocal impacts at play. Urban policy makers, therefore, must consider both the environmental impacts of urban population and industrial activity as well as the population impacts of environmental and industrial change.

The Environmental Impacts of Population and Industry

Rapid urban population growth occurs mainly through in-migration and affects the environment in two ways: (1) by expanding the actual land area covered by the city and (2) by increasing 'population density' or the number of people that live in already settled urban areas. New migrants to the city, as well as new industries, frequently settle on the urban periphery where land is more available and less expensive. In this way, the urban area continually expands and incorporates surrounding areas, transforming former fields and villages into residences and roads. Growth of the urban area also creates demands for the extension of services such as transport, water and waste disposal which may or may not be successfully met. This rapid land use change and pressure for infrastructure development associated with urban expansion may upset natural ecosystems and introduce pollution causing wastes and emissions.

Rather than settle peripheral areas, migrants to urban areas may alternatively join relatives or friends who are already living in the city, leading to increased population density. Increasing population density results in increased demands placed on existing urban services. If these services do not keep pace with this demand, they will deteriorate along with urban environmental quality. Deterioration in the urban environment due to rapid urban expansion and increased population density has been called by some 'overurbanization'.

The process of overurbanization, although related to population growth, is clearly mediated by social and economic conditions. For example, high density living areas in cities are frequently also the poorest areas. The greatest demand for services exists in areas least capable of making the investments needed to support such services. Poorer individuals also tend to settle in squatter areas on the city periphery where standards of living may be lower. Overall efforts to address overurbanization, therefore, should involve not only limiting urban population growth (for example by encouraging the development of secondary cities) but also addressing the socioeconomic differentials inherent in that growth. In doing this, the role of central and local government should be balanced against the activity of non-governmental organizations, community groups and the informal economic sector. In Mexico City, for example, a large informal industry has developed around garbage collection and recycling. This informal economic activity may facilitate the extension of services which the public sector alone could not achieve while providing a viable source of income for the individuals involved.

Another important aspect of population impacts on the urban environment relates to consumption levels. In contrast to rural areas where households most directly affect their environment through productive activities on the land, urban households have their greatest impacts on the environment through their consumption patterns, including their use of cars, fossil fuels and disposable products. The overall size of the urban population clearly affects consumption levels and environmental impacts. For example, more people will use greater numbers of vehicles leading to more air pollution. At the same time it is important to recognize that consumption levels are also mediated by social and economic factors including income and social class. More affluent groups have higher consumption levels. For example, they are likely to more often own and more often use cars. Because of their higher consumption levels more affluent groups, although they are fewer in number, have a greater impact on the environment than the larger yet poorer urban population. As such, environmental education aimed at changing consumption patterns among high income groups may be an important measure for reducing environmental impacts.

Having singled out urban areas for attention, it is important to recognize the 'urban-rural continuum' or that relationships between population, environment and industry also link urban and rural areas together. Rural areas closest to cities are most affected by land use change and incorporation as the urban area grows. The flow of working age individuals from rural to urban industrial areas creates a shortage of working age population in rural areas. In Latin America, Asia and especially Africa, this trend has been associated with rural social and economic crisis and environmental degradation. Urban demands for food, water and other rural-based resources may also severely limit their availability in rural areas. At the international level, the demand for illegal drugs in cities in the North has led to the conversion of significant proportions of countryside as well as rural economies in Asia, the Middle East and Latin America to dependence on drug-producing crops and industries. The negative environmental, economic and social consequences of this process in drug-consuming and producing countries are widely recognized.

The Population Impacts of Industry and Environment: Poland and Mexico

Acute disasters, for example earthquakes and industrial accidents may have dramatic negative impacts on urban population health and distribution. However, most negative impacts of the urban-industrial environment on population are evident over the long term. Decades of unregulated industrial growth within Poland's major cities, for example, have led to serious problems of water and air pollution. A survey of 22 major cities during the late 1980s indicated that infant and general mortality and morbidity levels among all age groups (and especially among men) were higher in these cities than elsewhere. One serious finding was that certain air pollutants were related to long-term genetic damage among urban populations. Current mortality in urban areas has contributed to the fact that Poland was one of the few countries in the world where life expectancy has recently decreased. This contrasts with historical Western experience where urbanization was generally accompanied by rising standards of living across all socioeconomic groups and a continual increase in life expectancies. The example of Poland suggests that:

- The impact of industrial activity and environmental pollution on population must be considered over both the short and long-term and that
- Improvements in living conditions may not automatically accompany urbanization and industrialization.

In Mexico City some middle-class families have related illnesses in their children to acute air pollution problems in the city. In response they have taken the radical step of leaving Mexico City for smaller cities. The option of out-migration from Mexico City in response to deteriorating urban environmental conditions may be open to more affluent groups who have the resources to relocate and greater flexibility in labour options. The poorer majority of Mexico City's urban population may have a much more limited range of responses. Little information on how different economic groups cope with urban environmental deterioration is available and may be an important area for future research. The example of Mexico City reinforces the point that:

- Socioeconomic factors play an important role in mediating environmental and industrial impacts on population as well as population responses to these impacts.

Quality of Life and Livable Cities

The urban environment is largely man-made. The scope for policies in shaping urban environments is, therefore apparent. As such, cities bring into focus the issue of the 'quality of life' or the expectations governments and urban populations may have as to what constitutes acceptable living conditions and the degree to which these expectations may be realized. Notions of the quality of urban life and what constitutes 'livable cities' may vary widely between countries and cultures. However, with the majority of the world's population increasingly concentrated in urban areas, the need exists for definition of some general criteria.

The principles of sustainable development provide some guidelines for the development of such criteria which include ecologically-oriented urban development and access to employment, food, energy, water supplies and sanitary facilities by city residents. Another specific measure which may contribute to the creation of more livable cities is decreased reliance on automobiles and increased reliance on public transport. Automobiles may adversely affect the physical and social environment not only by contributing to air pollution but also by absorbing large amounts of land for parking and roads and by reducing human interaction. Additional measures for improving the quality of urban life may include increasing the availability of public spaces, designing new forms of high density dwellings and developing mixed commercial and residential areas which are accessible and encourage human interaction rather than isolation.

Policy Conclusions

A variety of potential strategies for the formulation of policy aimed at improving population-environment relationships in industrialized settings have been discussed. Specific entry points for immediate action may be gathered from this general discussion. They include:

1. Multisectoral Policy and Planning

The formulation of effective policy affecting population, environment and industry calls for activity across different sectors. Many countries have opted for the creation of a specialized agency or ministry to carry out this task. In any case, the comprehensive policies required can only be designed through the use of multisectoral information. Policy-makers should encourage the collection and integrated analysis of multisectoral information and multisectoral cooperation in development planning and policy formulation.

2. Undertaking Sustainable development, Risk-management and Responsibility

Correspondence between industrial, demographic and population trends cannot be assumed by planners and policy makers despite correlations that may have historically existed. The principles of sustainable development, however, offer some guidelines for pursuing socioeconomic development and should be adopted in the creation of national development plans.

While new opportunities for sustainable development exist, particularly in Central and Eastern Europe, the consequences of past decades of unregulated industrial activity and the ever-existent threat of industrial disaster and negative impacts should also be recognized and addressed through risk-management. When negative industrial impacts occur governments and industry should assume responsibility for meeting the needs of affected populations. These populations in turn should have outlets for making their grievances heard.

3. Integration of Government, Industry and Affected Populations in Policy Process

Governments at the national and local level have an important role to play in the shaping of better relationships between population, environment and industrial activity. However, the pursuit of sustainable development, risk-management and responsibility calls for the creation of a 'new societal disposition' on a wide scale. In this process, there is a role to be played by all stakeholders: national and local government, non-governmental organizations, industry and affected populations. Educational activities in particular may be important in encouraging this broad participation.

4. Emphasis on Urban Areas

The majority of the world's population will soon reside in urban-industrial areas. Cities, therefore, represent a critical locus for the pursuit of sustainable development. The formulation of common expectations and criteria for 'the quality of life' and 'liveable cities' should guide sustainable development in urban areas.

Seminar on Population and Environment in Industrialized Regions

List of the papers presented at the Seminar on 'Population and Environment in Industrialized Regions' organized by IUSSP Scientific Committee on Population and Environment and the Institute of Geography and Spatial Organization of The Polish Academy of Sciences, held at the Polish Academy of Sciences, Warsaw, Poland and The Institute of Geography of the Jagellonian University, Cracow, Poland from 27-30 June 1994.

Session 1: Overview of the Theme

- 'Elements of Built Environment and Lifestyle Best Suited to the Needs of Modern Industrial Societies' by Lincoln H. Day
- 'Environmental Conditioning of the Demographic Situation in Poland' by Stefan Kozlowski

Session 2: Changing Residential Patterns in Industrialized Areas I

- 'Environnement, comportement démographique et bien-être dans une région désindustrialisée de la Wallonie' by Michel Poulain
- 'Changing settlement patterns in North-East Estonia in an Environmental and Politically Conflicting Region' by Ann Marksoo and Juri Roosare
- 'Special Environmental and Social Conflicts in the Great Hungarian Plain' by Balint Cstari
- 'Récents changements de comportements démographiques et résidentiels dans les aires industrialisées de la Toscane' by Irene Campari and Ubaldo Formentini

Session 3: Changing Residential Patterns in Industrialized Countries II

- 'Changing-Images of Environment and Well-being: Perceptions of the Environment as an Intermediate Variable in Demographic Behavior' by Alice T. Day
- 'Impacts of Global Sea-level Rise on California Coastal Population Resources' by Maurice Van Arsdol Jr., Douglas J. Sherman, Angela Constable, Jinkang Wang and Louise Rollin
- 'Migration in Response to the Urban Environment: Out-migration by Middle Class Families from Mexico City after 1985' by Haydea Izazola and Catherine M. Marquette

Session 4: Deindustrialization and Unemployment

- 'The Impact of Deindustrialization and Unemployment on Family Formation and Fertility in East Germany' by Jochen Fleischhacker
- 'Restructuralization, Deindustrialization and Unemployment in Poland: Case Study of Warsaw' by Alina Potrykowska
- 'Relations Between the Environmental Pollution and Spatial Structure of Cracow' by Zygmunt Gorka and Andrzej Zborowski

Session 5: Industrial Pollution, Morbidity and Mortality I

- 'Degradation of Climate and Population in Industrialized Areas' by Barbara Obrebska-Starkel
- 'The Effects of Total Water Hardness, Smoke Particles and Sulphur Dioxide Levels on Mortality in Urban Areas of England and Wales' by Andrew Slogett and Adrian Downing

Session 6: Industrial Pollution, Morbidity and Mortality II

- 'Quality of the Environment as a Determinant of Mortality in Large Cities in Poland' by Anna Kowalska
- 'Environmental Pollution and Health Status of Population in Warsaw' by Zdzislaw Biernacki
- 'Institutional Aspects of Water System Management in Poland: Mechanisms for Ensuring Public Health' by Sharon Moran

Session 7: Demographic Consequences of Industrial Disaster

- 'Population, Poverty and Pollution in Cubatao, Sao Paulo' by Daniel Joseph Hogan
- 'Demographic Consequences of Bhopal Disaster' by Sudesh Nangia

The International Union for the Scientific Study of Population (IUSSP) is the foremost international professional association dedicated to the scientific study of population. Its four basic objectives are:

1. encouragement of research into demographic issues and problems world-wide;
2. stimulation of interest in population questions among governments, international and national organizations, the scientific community and the general public;
3. promotion of exchange between population specialists and those in related disciplines;
4. wide dissemination of scientific knowledge on population.

The Scientific Committees and Working Groups of IUSSP are the principal means of implementation of the scientific programme of the IUSSP. Generally they have a life of about four years. Scientific Committees are active in well-defined fields of research whereas the Working Groups are often established in newer areas in which the Council of IUSSP thinks further development and definition of scientific issues is required.

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