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## Chapter 6 Population, Resources, Technology, and Environment: Trends and Implications

### Delineation of Critical Parameters

In retrospect, the decade of the 1970s may be characterized as witnessing man's first concerted efforts to examine, and control, his impact upon the environment. The accumulated legacy of growth in the post-World War II period, in conjunction with the expansion in the number of new states, each with new aspirations and legitimate claims on the world's resources, led to an awakening of the international community's collective conscience. Three initial dimensions of global issues, first recognized in isolation, are now viewed in greater conjunction: population dynamics, resource availability, and technological transformation. For pragmatic reasons, the international community has dealt with each of these complex factors in relative isolation—as evidenced by the global conferences throughout the 1970s. The Conference on the Global Environment (1972), the World Population Conference (1974), and the International Conference on Science and Technology (1979) stand out as major landmarks in the recognition of fundamental problems of the global environment. Today it is the interdependence of these problems that is stressed, as increasingly we see the futility of a partial and decomposed view. This paper highlights recent trends in these three dimensions, projections to the end of the century, and the overall implications for the international scientific and scholarly community.

In the United Nations' political and organizational context, national governments and nongovernmental organizations collaborated in contributing to the important initial articulation of problems and orientations toward their resolution. The past decade has shown that global issues can indeed be recognized as such world-wide, but that the definitions of problems and perspectives for solutions differ markedly. This difference renders these global issues intensely political. On balance this politicization is instrumental in alerting the international community to the dangers of complacency. But it is destructive to the extent that it

provides obstacles to the articulation of solutions. In an assessment made over a decade ago, we were struck by the then prevailing apolitical view of environmental issues.<sup>1</sup> Today we must recognize a new politicization and its overall implications. The approach adopted in this paper is to identify some of the changes in the critical dimensions of population, resources, and technology over the past decade and in our recognition and response to these trends, in order to highlight prospective developments in our responses in the 1980s.

### Population Dynamics: New Problems and Political Issues

Despite the accuracy of demography as a science and the extent of the international machinery for monitoring changes in population variables, ambiguities still persist about the basic nature of the "population problem" and its ramifications.<sup>2</sup> Over the past decade, we have obtained a greater appreciation of uncertainties associated with global population projections, and of the discrepancies in total numbers that a small error in estimation can make. Seasoned analysts are coming to recognize that we are playing with predictions that are wrong and have always been wrong,<sup>3</sup> but a new sense of optimism now emerges with projections from the United Nations Fund for Population Activities (UNFPA) made in 1982. For the first time in recorded history, there is some evidence of a slight, however small, downward turn in rates of growth. More optimistic from an analytical point of view, however, is the fact that the UNFPA, along with other international agencies, is stressing the importance of recognizing the overall dimensions of population, not only the issue of size. In this respect, international agencies have shown greater intellectual (and political) foresight than has the international academic community that still stresses the criticality of numbers alone.<sup>4</sup>

Among the notable factors over the past decade—in events and in our perceptions of them—are the following:

1. Nazli Choucri, "Population, Resources, and Technology: Political Implications of the Environmental Crisis," in David A. Kay and Eugene B. Skolnikoff (eds.), *World Eco-Crisis: International Organizations in Response* (Madison: University of Wisconsin Press, 1972), pp. 9-46.

2. Debates at the First World Population Conference in 1974 illustrate this point, as does the compilation of government perceptions of their demographic problems elicited by the United Nations. See Rafael M. Salas, *The State of World Population 1982* (New York: United Nations Fund for Population Activities, 1982).

3. M. C. Shelesnyak (ed.), *Growth of Population: Consequences and Controls: Proceedings of the First Conference of Population Held at Princeton, New Jersey, September 27-30, 1968* (New York: Gordon and Breach, Science Publishers, 1969), p. 57.

4. See Salas, 1982.

1. There is a near-universal recognition of population problems globally and of the burden of numbers on social resources. Governments acknowledge the burden as a public charge.<sup>5</sup>

2. The mobility of populations, internally and, especially, across national borders, has assumed proportions that are increasingly compelling. International mobility in response to economic conditions (labor migration) or to political conditions (refugeeism) provide new dimensions to the population problem.<sup>6</sup>

3. Changes in age structure are now a clearly recognized issue.<sup>7</sup> For many developing countries it is the youthfulness of the population, and its continued slant toward a nonproductive age structure, that is defined as a national problem. In advanced industrial societies, the aging of population places burdens on social security schemes and threatens to stress even further an already strained population of working age. Age structure and the anticipated evolution of age structure broaden conventional problems of labor productivity.<sup>8</sup> The social, economic, and political significance of productivity takes on a new guise when the working-age population must assume a greater burden and the dependent population is growing.<sup>9</sup>

4. The vulnerability of populations to economic conditions is attaining near-epidemic proportions. While labor in all countries is always sensitive to the economic climate, the conjunction of several factors has made this vulnerability greater for some countries over the past decade. In Europe, where migrant workers ("guest workers" or "foreign labor") have entered the lower echelons of skills, the slowdown in economic activity makes these people the first to be affected.<sup>10</sup> Individual countries are developing schemes to increase incentives for departure or for

5. An early articulation was by Emilio Q. Daddario, "Technology and the Democratic Process," *Technology Review*, vol. 73 (July-August 1971), p. 20.

6. See, for example, Mary M. Kritz, Charles B. Keely, and Silvano M. Tomasi (eds.), *Global Trends in Migration: Theory and Research of International Population Movements* (New York: The Center for Migration Studies, 1981).

7. See essays in Nazli Choucri (ed.), *Multiple Dimensions of Population and Conflict: Theory and Evidence* (in press).

8. The effect of the aging of populations is undoubtedly one of the most novel dimensions of the population issue.

9. Recent assessments of the social security system in the United States and Canada point to burdens on the system due to an increasing dependent population and attendant strains on the working age group.

10. Schemes designed to provide incentives for migrant workers to return to their homes, as illustrated by the German efforts, are indicative of an organized response. Periodic outbreaks of hostility against migrant populations, as against Algerians in France, illustrate less organized ("knee-jerk") responses.

returning "home."<sup>11</sup> In oil-rich countries where in many cases foreign labor is an essential backbone of the labor force, the surge of investment in the early 1970s has pulled outside labor into these countries; the slowdown of economic activity in the early 1980s, in conjunction with declines in oil prices, is "pushing" labor out. These factors inevitably have political, and not only social, repercussions.

5. Notable strides in employment of women, coupled with recognition of the importance of improving the status of women, are catapulting this segment of the workforce into the status of potential claimants of an increased portion of social resources.<sup>12</sup> If the history of enfranchisement in the West provides any useful hypothesis, it is that participation in the labor force is often a condition for political participation. Demands for economic equality may sometimes become a prelude to demands for political equity.<sup>13</sup> Social systems everywhere are affected by the articulation of claims by (or for) women.

6. Ethnicity, a dimension of population that had but a small role at the World Population Conference in 1974, has increasingly shown its political implications.<sup>14</sup> The threat to political community and statehood posed by ethnic conflicts in certain parts of the world is drawing the attention of scholar and policy-maker alike. Where the fabric of governance rests on a social pact among ethnic or religious groups, this lesson is self-evident. But its complications become more complex when (or if) governments are also faced with any one, or more, of the five foregoing issues.

7. Discussions of "optimum population" have tended to recede into the background, since the question: "optimum with respect to what?" has never been satisfactorily resolved. The international community has opted for a situation-specific definition (as perceived by national governments) in conjunction with a new global ethos of "basic social needs."

8. The "basic needs" thrust in international discourse has legitimized state intervention and the growth of the public sector but it has also

11. It is too early to tell how effective the European experience has been in this regard.

12. The UNFPA is placing the issue of the "status of women" high on its agenda of priorities. The social effects have not yet been fully elucidated.

13. It is difficult to believe that rapid strides in the improvement of the status of women and their greater involvement in economic activity will not engender attendant claims for political participation.

14. Of the 307 conflicts since World War II for which good data have been compiled, at least 143 have their roots in ethnic differences. See Nazli Choucri, *Population and Conflict: New Dimensions of Population Dynamics* (Cambridge, Mass.: M.I.T., 1983).

assigned responsibility to governments for delivery of such "needs." The somewhat vague "quality of life" response which characterized much of the frustration with environmental degradation has been almost entirely replaced by a more pragmatic approach of "basic needs."<sup>15</sup> It is ironical that the philosophical origins of such needs, articulated well over twenty years ago, are entirely lost, and their political ramifications ignored.<sup>16</sup>

9. Governments increasingly give formal expression to their perception of population problems. Demographic factors have penetrated into the realm of the political,<sup>17</sup> either by virtue of the increasing wisdom of government or, as is more likely the case, due to increased perception of threats to governance or to statehood.

10. The conjunction of these nine factors provides an increasingly expanded agenda for the international community's response to population issues. Still missing, however, is a willingness to appreciate and articulate the distinctly *political* features of the demographic dimension. There is an insensitivity in international civil servants that is truly impressive—bordering on that of the proverbial ostrich's head in the equally proverbial sand—and which results in an astonishing myopia. Perhaps many more political systems must literally explode before governments and international agencies confront this crucial aspect of population characteristics.

There are no simple lessons or conclusions to be drawn in social science analysis. At a general level of abstraction recent trends seem to indicate that increased population means more government and that more government means greater regulation of individual behavior. The trend toward centralization emerges as much from the increasing complexity of social organization as from the recognition that resource constraints imposed by growing population need to be subject to discipline regarding their uses.<sup>18</sup> But there is no indication that this trend toward increased centralization continues on the supranational level. Scarcities might well obstruct the development of international organizations.

15. See, for example, the World Bank's efforts to examine this issue, as evidenced by an expansion of its basic needs concerns.

16. Christian Bay, *The Structure of Freedom* (Stanford, Ca.: Stanford University Press, 1958).

17. The UNFPA-sponsored conference on Population and Conflict at M.I.T., October 1981, is an illustration of this concern.

18. The establishment of ministries of energy in many countries as a result of the events of the past decade is an illustration of the new concern for regulation of resource issues.

Among the most critical implications of increasing populations for political systems and social institutions are the following: population growth places unavoidable and increasing demands for goods and services upon national governments;<sup>19</sup> in underdeveloped countries it is generally the lowest economic or politically powerless groups which remain unattended in the allocation of resources and wealth; severe problems of governmental management that result from population pressures are especially evident in countries that are both large and less developed. Aside from pressures on the allocation of resources, numbers alone are not crucial to the political process in developing societies. But they are increasingly important in developed societies in which political participation is high and in which demands can be expressed proportionate to numbers. Related to this is the consideration that governments find themselves in a position to manipulate the population issue in desired ways. In countries where there are insufficient job opportunities there is a tendency to channel excess manpower into the educational system, thus overburdening educational facilities and artificially underemploying labor.

However straightforward these implications might be, their ramifications in terms of political instability or violent behavior are highly ambiguous. Indeed, there is no evidence that dense population *per se* leads to instabilities. Those correlations that do exist are spurious and do not hold cross-culturally. Many densely populated areas of the world have been highly stable, and many of the most unstable areas in Latin America and Africa have low population densities. More rigorous, multivariate, statistical analysis of the relationship between density and internal violence or instability has confirmed this singular absence of a direct causal relationship.<sup>20</sup>

The related proposition that density occasions external violence is also dubious. Many high-density countries lack the capabilities for effective expansion or external aggression. Whatever relationship exists is neither direct nor empirically evident. If at all causally connected, linkages between population and social conflict are likely to be mediated by intervening effects of technological development and resource constraints.

The view that over-population can be a cause of wars of territorial expansion has gained considerable currency. However, there are many

19. An early assessment was presented in Myron Weiner, "Political Demography: An Inquiry into the Political Consequences of Population Change," in *Rapid Population Growth: Consequences and Policy Implications* (Baltimore, Md.: Johns Hopkins Press, 1971), pp. 567-617.

20. See Douglas A. Hibbs, *Mass Political Violence: A Cross-National Causal Analysis* (New York: Wiley, 1973).

highly populated countries that have not been expansionist and other less populated ones that have been highly belligerent. A prominent conclusion in the social sciences is that "wars are not due to unrest of compressed populations, but to differences in pressure."<sup>21</sup> Acutely overpopulated societies do not generally command the capabilities or resources for sustained military activity. One source of optimism is that there appears to be no direct link between population density and international conflict.<sup>22</sup>

Finally, one of the most important factors of the population dimension is the evidence of declining growth rates globally. If these are projected to the end of the century, we find that the numbers would be lower than earlier projections indicated. The increasing awareness in governments of population-related issues may help the social sciences to explicate the increasingly direct impact of population dynamics on political and social issues. The importance of an interdisciplinary perspective and approach to the analysis of population issues is increasingly recognized.<sup>23</sup>

#### Resources: Fuels and Minerals<sup>24</sup>

The oil price increases of October 1973 heralded a decade of crisis and complexity in the world oil market. With the benefit of hindsight and sobriety imposed by apparently declining oil prices, one can now characterize the events of the past decade in the energy field and make some projections to the end of the century.

1. It is now apparent that there was not one oil crisis, but several, propelled by dynamics of their own.<sup>25</sup> Higher oil prices meant power to some, but they also meant vulnerability to others. By the end of the decade almost everyone agreed to embark on a search for "just prices." Market mechanisms pre-empted this search, and the abeyance of today remains to be resolved by the laws of supply and demand.<sup>26</sup>

21. See Alfred Sauvy, *General Theory of Population* (New York: Basic Books, Publishers, 1969), p. 516.

22. The *indirect* linkages are strong, however. See Nazli Choucri and Robert C. North, *Nations in Conflict: National Growth and International Violence* (San Francisco: W. H. Freeman, 1975) for analysis of a historical case.

23. See Choucri (ed.), *Multiple Dimensions of Population and Conflict* (in press).

24. The issues in this section are, by necessity, treated in summary form.

25. Nazli Choucri, "Power and Politics in World Oil," *Technology Review*, vol. 85 (1982), pp. 24-36.

26. There are major uncertainties about this particular issue.

2. Fundamental structural changes in the world political economy have occurred as a result of the oil price hikes and subsequent events. Among the most important of these is a decline in the influence and power of the international oil companies and a rise in the number, power, and prominence of state oil enterprises.<sup>27</sup>

3. States increasingly interact directly with each other on fuel exchanges. This has brought producers and consumers in direct contact with each other in a market where traditionally international companies were dominant. The above structural changes have not only politicized energy issues but increasingly bureaucratized them as well.<sup>28</sup>

4. The behavioral ramifications of the oil situation engendered in 1973 have been truly profound: as consumers have become conscious of the "finiteness" of conventional fuels, demand modifications have occurred, as have serious efforts at conservation. Producers have suddenly been exposed to the seemingly unbounded opportunities associated with the absence of limits on financial resources. The irony is that the economic systems (and expectations) of both oil consumers and oil producer states have been disrupted, and the full effects of required adjustments are not yet appreciated.

5. The new conditions created by these disruptions—economic recession in the West and adjustment in oil demand of consumer states, and social implosion in producer countries followed by a relative decline in financial flows—will generate higher-order effects in all contexts.

6. Although investments in the expansion of non-conventional sources of energy appear not to be increasing in the West, energy substitutes as a legitimate policy orientation are expanding everywhere. Depending on energy profits in question, countries differ regarding their policy perceptions. This concern has motivated serious investigations into the structure of energy/economy interactions and into the prospects for technological innovations. The conclusion to date is one of technological optimism, but economic costs remain high.<sup>29</sup>

7. The search for substitute energies has contributed to an appreciation of the plight of disadvantaged groups within nations and of poor states.<sup>30</sup> The sector is beginning to draw international attention as a

27. See, for instance, Chapter 8 in Nazli Choucri, *Energy and Development in Latin America: Perspectives for Public Policy* (Lexington, Mass.: Lexington Books, 1982).

28. The International Energy Agency is a case in point, as is the expansion of the role of the state in managing national policy.

29. See Thomas B. Johansson, Peter Steen, Erik Bogren, Roger Fredriksson, "Sweden Beyond Oil: The Efficient Use of Energy," *Science*, vol. 219 (1983), pp. 355-361.

30. See, for example, the World Bank, *Energy in the Developing Countries*, August 1980.

legitimate claimant upon resources, and as the context for a novel approach to low-cost energy.<sup>31</sup>

8. The interest in new sources of energy has not displaced more conventional concerns for investments in petroleum exploration and development. These have always been subject to economic conditions, resource assessments, and evaluation of market situations. What is new, however, is the attempt to devise formalized means of attracting international resources to investments in developing countries, or in areas where such investments have not been deemed attractive to date.<sup>32</sup>

9. The internationalization of energy issues is seen in the efforts of industrial states to coordinate approaches to energy issues (IEA) on the one hand and in the attempt by the producer countries to institutionalize their organization (OPEC) on the other. Criteria for success are not easy to devise, and it is not easy to estimate their actual performance. To some extent the IEA has successfully managed information sharing among its members, and OPEC has succeeded in extending certain services to its members. But both the IEA and OPEC have failed in policy coordination among their respective members—in each case with certain serious and somewhat predictable effects.

10. The international energy environment in the early 1980s is considerably more complex in terms of the network of flows of conventional fuels, and in terms of actors, institutions, and organization. No one controls the market, and even Saudi Arabia, the major producer, is not finding it possible to adopt policies that would permit it to re-assert its former predominance. The behavior of multitudes of anonymous consumers, in conjunction with the aggregate effects of their behavior, has substantially altered the demand side of the market—at least for the immediate short term—reducing any immediate pressures for investment in expanding options on the supply side. It is this latter factor that may revive the essence of a "crisis" once again.

For all practical purposes the sense of urgency in energy markets has disappeared. A new complacency has taken over.<sup>33</sup> However justified this reaction may be, it is shortsighted, for it reduces prospects for engaging in precisely those behaviors and investments that would assure

31. The interest in renewable resources is motivated by an appreciation of the role of non-commercial sources of energy in developing countries. See, for example, Choucri, *Energy and Development in Latin America*, 1982.

32. The establishment of the International Energy Development Corporation headquarters in Geneva is an illustration of this new concern.

33. See Choucri, "Power and Politics in World Oil," 1982.

the continuation of the auspicious conditions of the early months of 1973. Indeed, it is precisely the downward adjustment in demand (and prices) that may lead to an upward swing once stockpiles are depleted and if suppliers cut back their oil production.

An enormous amount of learning has taken place internationally in the energy field. The first and second Arab Energy Conferences (1976 and 1979) are evidence of this learning, and the range of issues discussed has drawn the developing countries closer to the industrialized world and to each other. While a meeting of minds on policy prescriptions is not in the offing, a shared recognition of global energy issues has emerged. A coherent research agenda is yet to evolve. Many of our most cherished empirically-based dispositions have been called into question by the events of the past decade. For example, the strong relationship between industrialization and energy consumption (evidenced by the nearly perfect positive correlation between energy consumption per capita and gross national product [GNP] per capita)<sup>34</sup> must be reassessed in light of the recent downward adjustments in energy demand. So, too, the policy in many developing countries of subsidizing domestic users of fuels on equity grounds has pushed energy consumption to levels that are thoroughly unsustainable over the longer (or even medium) range.<sup>35</sup> In such cases, the relationship between energy and economy is a function of social policy and not of economic activity or level of industrialization.

Resource security is the broader rubric under which strategic aspects of energy issues must be placed. Over a decade ago we considered the security dimension in the context of minerals and minerals policy, noting the importance to the economy. While the oil crisis has raised questions about prospects for cartelization, everyone agrees that none of the essential minerals has a prospect of this sort. Not even copper, the most likely candidate, holds serious prospects for cartelization.<sup>36</sup> More hopeful analysts can look at tin as a good example of a commodity regulated by an association of producers and consumers.<sup>37</sup>

In the final analysis, perhaps the most long-lasting lesson of the energy "crisis" for the past decade is seen in the almost universal recog-

34. This often-cited relationship has served as the basis for many of the assumptions about the role of energy during the past decade.

35. Several developing countries are changing their domestic pricing policies as a result of their appreciation that an annual rate of domestic energy consumption of 10 percent is unsustainable.

36. Vincent Ferraro, *The Political Dynamics of International Resource Cartels: Case Studies of Petroleum and Copper* (Cambridge, Mass.: M.I.T., Ph.D. thesis, 1976).

37. This format is, of course, not necessarily applicable to other commodities, given the structure of the respective markets.

nition of the vulnerability of states and of their interdependence. No one is immune from the threat of disruption if market conditions are ripe, and no economy can be insulated from transnational influences—regardless of market conditions. For economic analysts the energy situation of the past decade has shown the importance of understanding energy/economy interactions; for policy analysts, it is the relative costs and benefits of alternative policy instruments that must be understood and fully weighed. The scholarly community has only just begun to take stock of these issues.

### Technology: Choice, Transfer, and Innovation

Essential to the theories of economic growth is that residual element which, for the want of a better term, has been labeled technology. Increasing efficiency in combining inputs for generating outputs has been regarded by conventional theories of growth as a panacea for development. When more mundane prescriptions had been known to fail, analysts and policy-makers alike held out for technology and technological advances as bearing solutions to almost any problem. The choice of "appropriate" technology has characterized much of the debate in this field and the arguments persist.<sup>38</sup>

In the international realm it has become clear that much of the confusion over definitions and strategies of technological development lies in the difficulties of selecting criteria for choice.<sup>39</sup> So, too, the fact that transfer of technology across national borders is essentially a commercial relation—where goods and services are bought and sold—obscures many of the attendant issues.

In developing countries a new concern has crystallized over the past decade, namely, developing the indigenous capabilities for selecting those technologies that are required and hence the flourishing of science policy both as a governmental endeavour and as a field of study. The dual emphases of selection-capability and of implementation-capability are now evolving in parallel. Manpower characteristics and economic conditions then determine the relative influence of these two factors in the formulation of technology policy.

For industrial countries the technology arena poses new challenges for employment, productivity, and competition. Innovation in technique

38. See, for example, Frances Stewart, *Technology and Underdevelopment* (London: The Macmillan Press, 1978).

39. National Academy of Sciences, *Appropriate Technologies for Developing Countries* (Washington, D.C.: National Academy of Sciences, 1977).

and efficiency in management are pitting industrial countries in a confrontation where the outcomes can have long-standing effects. The now proverbial label "Made in Japan" signifies a degree of efficiency and innovativeness that is evoked by few other symbols.<sup>40</sup> For industrial states technological innovation and competition also manifests itself in the military area. There the stakes are high, visible, and intimately tied to the conception of security. Not to innovate and not to advance technologically really is to accept the status of presumed military vulnerability.

In the context of international organization, the efforts of the United Nations Industrial Development Organization (UNIDO) are noteworthy in addressing the concerns of developing countries—ranging from bricks and boards and building materials to transfers, pricing, payments, patents and licensing. For many developing countries these issues are enigmatic, posing ambiguities of insurmountable challenge. A major task of UNIDO is to educate, familiarize, and induct many societies into an international technological culture.<sup>41</sup> The focus is on implementation. For such a focus to be effective it must run in conjunction with concerted efforts to upgrade technical skills, often beginning with the broadest aspects of basic education in science and technology. Therein lies an important convergence of the mission of UNESCO with that of UNIDO, on the one hand, and that of the ILO, on the other.

One important fact is that for almost everyone in the international system, technology is power. The goal of technological autonomy is unrealistic for all but a few industrial states, yet at the technical level, at least, it is one to which everyone aspires. In its most simplistic guise, conflict of views between industrial and developing countries over the past decade was shrouded in a calculus of exchange: technology in return for raw materials. This calculus never materialized in this simple way, yet it provided the basis for articulating some tenets of the new international economic order.<sup>42</sup>

40. Toshio Shishido, "Japanese Industrial Development and Policies for Science and Technology," *Science*, vol. 219 (1983), pp. 259-264.

41. An expansion of UNIDO's role is indicated by the Secretariat of UNIDO, *Review of Systems for Regulating Technology Inflows in Selected Developing Countries* (UNIDO, 5 November 1981).

42. Karl P. Sauvart (ed.), *Changing Priorities on the International Agenda* (New York: Pergamon Press, 1981).

### Conflict Dimensions and Interactive Effects

In retrospect, there is evidence to suggest that the interactive effects of population growth, technological development, and resource constraints can, in some cases, have implications for conflict among nations. In the historical context, for example, nineteenth-century colonial expansion was accompanied by considerable population growth in Europe in combination with increases in economic productivity, technological capabilities, and need for resources. Recent investigations show that the nature of the population-resource-technology calculus is critical in determining propensities for conflict.<sup>43</sup> Unless capabilities are available, unless a certain level of skills can be called upon, and unless certain resource needs or constraints are present, the population variable *alone* cannot provide significant motivation for violence and warfare.

Widening gaps between affluent and poor states were at one time thought to lead directly into war, the inference being that the starving millions will be goaded into violence by their misery. We now realize that the threat of international violence emerges less from such possibilities than from second- or higher-order effects linking competition and interactions between larger states to political considerations affecting poorer societies. When technological and resource variables are interposed into the equation, the task of social science inquiry becomes one of mapping out linkages and transactions between technologically advanced and less advanced states, between resource-rich and resource-poor states, and between states that vary in population size, density, and rates of growth.

Not unrelated is the consideration that many of the resources traditionally vital to continuing growth and to advanced industrial societies are located in relatively less developed societies. Their territories and accompanying resources have at times supplied the arena for potential conflicts and competition between more advanced states, and they themselves are likely to be under pressure to line up on one side or the other. Control and penetration by advanced industrial societies assures continuing flows of needed resources. The erosion of cold-war dynamics in no way reduces the impact of these processes. The use of trade, foreign aid, and other modes of transfer are rarely devoid of political pressures.

In these terms national propensities for expansion, conflict, and violence differ considerably depending upon the nature of the population-resource-technology calculus. States rating high on population, tech-

43. Robert C. North, "Integrating the Perspectives: From Population to Conflict and War," in Choucri (ed.), *Multiple Dimensions of Population and Conflict* (in press).

nology, and resources are likely to behave in the international system in ways that are markedly different from states with low population, low technology, and low resources—or variants thereof. A state's population must be viewed in conjunction with its resources and technological capabilities. Different combinations of population and capability allow for different internal and external policies and behaviors. Only through second-order effects do population variables assume any political importance.

There is some evidence to suggest that major conflicts often emerge by way of a two-step process: first in terms of internally generated pressures toward expansion of interests that are occasioned by growing needs and demands, and then in terms of reciprocal comparisons, rivalries, and conflicts for control over resources, valued goods, territory, or spheres of influence.<sup>44</sup> Each step is closely related to the other, and each is intimately tied to the nature of the underlying population-resource-technology differential.

### The New International Exchanges

Over the past decade, we have observed the development of large-scale flows—of people, resources, technology—which have engendered equally large-scale financial flows. The complexity of the financial flows still remains to be fully recognized. Here we note the critical flows, some of which have been noted above in other contexts, and some of their financial ramifications. The conclusion which emerges from this accounting is the consolidation of new patterns of international exchanges, between North and South, East and West, and rich and poor.

1. The large-scale flow of investment into the industrial economies from the oil-rich states invigorated—even, at times, overwhelmed—the international banking system. However, the successful handling of petrodollars made the problem of recycling essentially obsolete within two or three years of its emergence.

2. The novel flows involved massive importation of goods and services from industrial economies to all the oil-rich states both within OPEC and outside. Such flows contributed to the improvement of the balance of trade on the current accounts of industrial states.

3. Almost overnight two sets of people-flows occurred, one on a massive scale, the other more modest. The first entailed importation of foreign workers in the oil-rich states, primarily of the Gulf, which transformed the demographic structure of the region almost overnight. The

<sup>44</sup> Choucri and North, 1975, and North

(above).

second was the flow of skilled manpower from the West, principally technicians, to oil-rich economies to assist and advise on investment plans and their implementation.

4. A corollary of the above was the flow across national borders of technology—embodied in equipment, hardware, printed material, blueprints, and manpower. The transfer of technology throughout the past decade assumed a new and important role: there was a demand for the *purchase* of technology from industrial states, thereby making technology exchange commercial rather than philanthropic, tied mainly to aid and assistance. Buyers could now, in theory at least, select not only among commodities but among sellers. Thus goods from industrial countries (or firms) could be selected by buyers on the basis of criteria other than “tied-aid.”

5. This massive commercialization of technology transfer created an attendant demand for the development of the local technical and scientific capabilities to sustain, maintain, and manage such transfers. Flows of education-related materials—including structured courses, supporting information, equipment, laboratories, libraries, computer systems, etc.—thereby accelerated the rate of introduction of new approaches in education.

These five macro-flows have, in turn, affected the international financial and banking systems in profound ways. Among the most notable developments are the following:

1. Decision-making in the World Bank and the IMF, tied to representation on the boards of management, began to reflect the financial presence of the major oil-exporting countries. These international institutions that for decades had been run exclusively by industrial countries now were widening the scope of representation.

2. The proliferation of commercial and development banks controlled by oil-rich states has been truly remarkable. Some institutions, like the Kuwait Fund for Social and Economic Development, have a long record that predates the oil price increases of 1973. Others emerged directly as the result of massive resource availability. The point is, however, that on institutional grounds these banks—whether commercial or development—were a novel addition, even an innovation, in the international banking structure.

3. The foregoing meant that governments of some developing countries became donors and assisted in the development of other developing states. This, too, is a major innovation in international arrangements.

These flows and the new institutional adjustments and developments they engendered are rapidly consolidating a new network of exchanges in the international system. The earlier, simple raw materials



for technology exchange are now supplemented if not superseded by a new dimension of exchange: transferring or importing knowledge and skills associated with institutional development for the management of change within nations. The intervening factors—oil and money—created a demand for institution-building. This demand is over and above that for domestic investments and for imports of goods and services. In conclusion, one of the most critical new elements in international exchange flows converges around institutional development and institutionalization of the novel modes of investment, management, research, and education. Therein lies one of the most critical challenges for the remainder of the decade. The task of the social sciences is to marshal the analytical tools at hand to assist in the institutional developments that emanate from the macro-flows shaping the new international system.

### Implications for Social Science Analysis

There have been major studies on the development of the social sciences over the past decade. Some studies analyze the consolidation of trends in the 1960s and early 1970s; others are concerted reflections on the events of the last ten years. Among the most discernible additions to the repertoire of social science inquiry are the following:

1. The interdisciplinary approach to global issues and national problems has been increasingly regarded as an appropriate orientation for research and analysis.
2. The level-of-analysis issue, connecting the individual, the state, and the international environment, is regarded as a problem whose resolution would constitute a major contribution of the social sciences.
3. The time-frame problem, involving identification of the long-term consequences of short-term factors, or the immediate effects of longer-term dynamics, is now considered as part of a "problematique" for research and for decision analysis.
4. The unintended consequences of policies and decisions, resulting in costs (or benefits) which have to be taken into account in any assessment of decision-making, is also increasingly appreciated.
5. The linkage problem, involving domestic consequences of foreign policy or international behavior, or the international consequences of domestic policies, is being posed as a problem confronting the social sciences the resolution of which would be a contribution of research and analysis.
6. The perception problem, pertaining to the news from "above" and from "below," relating how groups located in different spheres (nation-

ally or internationally) could perceive the same phenomenon with a different warp.

7. The definition problem, involving alternative views of phenomena such as "development," "self-sufficiency," "justice," and so forth, posing problems for analysis and for policy-making, is increasingly viewed as central to the politics of decision-making and to the underlying requisite social inquiry.

8. The cautious skepticism pertaining to searches for the limits to social science analysis, and to the utility of inquiry, is now part of the predominant orientation among professional analysts.

9. The trade-off problem, involving recognition of the impossibility of attaining all objectives (however broad or limited their definition might be) and the importance of delineating the explicit trade-offs among goals, is both appreciated and viewed as a legitimate query.

10. The utility issue, related to the qualitative rather than quantitative dimensions of social concerns, has increasingly become linked with inquiry designed to highlight the direction of "satisfying" rather than "maximizing" attempted resolution of problems.

These factors, together, point to new orientations in social science analysis that reflect an appreciation of environmental problems, broadly defined, and a degree of responsiveness to changes in the international context. The next steps will entail a more complete integration of these directives in social science analysis and the attendant methodological and analytical development which will serve to realize the social science contribution to research and analysis—and even to policy debates and choices.

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# **GLOBAL CRISES AND THE SOCIAL SCIENCES: NORTH AMERICAN PERSPECTIVES**

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## Foreword

The rest of this century will be a dangerous period in human history. On many fronts—the threat of nuclear war, damage to the earth's biosphere, the exhaustion of vital resources, population growth and the food crisis, persistent poverty—humankind faces problems of survival and deterioration of the quality of life in every part of the world. These problems are not primarily physical or natural but social and cultural; they are problems of human behaviour, organization, social structure, and culture patterns.

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