

تخطيط القوى البشرية

د. انطوان زحلان

اي عمل مهما صغر او كبر يكون بحاجة الى الطاقة البشرية التي توجهه ، ونفسين استبرار عمله . ولذا فان قضية تخطيط القوى البشرية ومعرفة كل ملابساتها يعود في غاية الاهمية ، اتي جانب كونه موضوعا غاية في التعقيد . ويركز هذا البحث اساسا على ما يمكن تسميته « بالقوة البشرية القيادية » وهم هجري الجملعات وحملة المؤهلات العلمية في العالم الثالث . كما يتناول بالدراسة بعض العقبات التي تواجه القوى البشرية التي تعمل في مجال التخطيط ، موضحا بعد ذلك اثر هذه العقبات على الاهداف التربوية والاجتماعية للمجتمع .

وترمي هذه الدراسة ايضا الى دراسة موضوع القوى البشرية العلمية او الكفايات العلمية في دول العالم الثالث والتي نالت تعليمها في الخارج وما يتعلق بها من قضايا مثل عدم عودة تلك الكفاءات الى بلادها . ثم دور القيادات في تحويل اعتماد الدول النامية على الصناعة بدل الزراعة . وكذلك انعكاسات الثقافات الاجنبية على الكفاءات في الدول النامية . وخاصة في الوطن العربي .

كما نجد في هذه الدراسة مبعثا يتعلق بوسائل الاتصال المختلفة بين العلماء والكفاءات باعتبار الاتصال المختلفة بين العلماء والكفاءات باعتبار الاتصال والتعامل بينهم من اهم مقومات الابداع والازراء . وهي امور تزداد هجرة الدول النامية اليها في سبيل خدمة قضية التقدم والتنمية .

MANPOWER PLANNING:

THE PROBLEM

Dr. A.B. Zahlan *

Lecture presented at "THE SYMPOSIUM
ON THE IMPACT OF
SCIENCE ON SOCIETY", University
of Islamabad (Pakistan), May 20 - 25, 1974

Introduction

The performance of any activity requires the participation, direct or indirect, of man. Because of this simple and obvious fact manpower planning is extremely complex and important, for manpower is an integral part of an intricate system. The output of the system depends on its total performance rather than on the properties of its sub-components. The emphasis of my lectures is on the so-called high level manpower — (HLM) — or university graduates of the Third World. In this first lecture I wish to look at HLM within the context of the entire system to delineate the nature of the constraints imposed on the manpower planner and to point out the impact of these constraints on educational and institutional objectives.

* Arab Projects and Development, Beirut, Lebanon.

1. The Manpower Environment in Third World Countries

Over the past 25 years Third World countries assumed that the power and economic well being of the Western World stemmed from science and technology and that the pertinent know how could be acquired by dispatching their youth abroad to secure degrees that certified the mastery of a discipline; these foreign-trained youth would then bring back all that their society lacked. But the solution was not so simple, and many complications arose : many of those trained abroad did not return; the education proffered them was "foreign" and inadequately adapted to their own social, economic, cultural and technological environments; those that returned became "new elites" and created islands within which they could secure the income and standards they had been educated to expect; no institutions committed to the adaptation of HLM to local needs existed at home; likewise, no local institutions dedicated to the resolution of relevant problems had been created. In short, the gap between the foreign inspired education and the skills the HLM required in order to cope and interact fruitfully with their fellow countrymen was too large to be overcome. Thus the concepts and planning techniques utilized are often derived from frameworks that are totally inapplicable to a Third World environment. It is this cultural transplant that is at the root of the problem of the HLM today.

In a Third-World community the percentage of HLM in society is about 1% with about 3% in the labour force. 60-80% of the labour force is generally illiterate and with poor skills, agriculture employing about 60% of the entire force. Table 1 summarizes some data on the population characteristics of a Third World country. In view of the abundance of cheap low skill labour, one would have expected an intense concern with the development of agriculture and the employment and training of individuals with low skills. Nothing remotely resembling this pattern has actually been implemented. The nationalist elites who have controlled the destiny of Third-World nations have assumed that industry, and not agriculture, is the sector for the future.

Table 1

A THIRD WORLD COMMUNITY

Low literacy rate	: 30 — 40%
Lack of institutional structures	
Absence of widely diffused skills : managerial, technical, organizational, social, cultural (poetry, aesthetics, music, etc.)	
Low rate of completion of high school age group : 10%	
Poor quality of education	
Low standards of health : 5000 citizens per 1 MD	
Low rate of college education : approximately 8% of age group	
Poor quality of college education	
Absence of communication channels, internal and external	
Low labour productivity	
Low life span : 45-55 years	
High percentage of society afflicted by a serious disease	
Labor force : 20-25% of population	
Youth below 18 : 50% of population	

Furthermore, agricultural activity has been looked down on as backward, subservient and on the way out; an attitude that has been strengthened by the conditions of abject poverty in which the farmer in these societies lives.

The fact that elites and the middle class make up approximately 1 to 10% of population and are generally isolated from the rest of their society, combined with the absence of institutionalized systematic intellectual activity, have all helped to shelter Third-World HLM's from seeing themselves as mini-feudal lords. Within this framework, "objective" Western concepts of efficiency, profit and cost-effectiveness make sense and justify the perpetuation and well-being of this social class. In several Third World countries the powers of this class are such that it is difficult to introduce new planning concepts. In a country where between \$1 and \$10 are spent per capita per year on health services, for example, a middle class power structure would spend the funds on hospital services which only meet the needs of the middle class; a society concerned with the average citizen would spend then on public health services and on preventive medical care.

Another harmful byproduct of the superimposition of foreign concepts on the planning process in Third-World countries is that economic planning and five year plans tend to be project oriented rather than people oriented. The planner begins by selecting specific hardware goods: a dam, a petrochemical complex, power stations, hotels. Third World countries then seek financing from IBRD and foreign banks. Such financing requires that an economic and technical feasibility for the project be carried out by qualified international consultants. Thus the "international consultants" perform the planning which international contractors are hired to implement. The nationals, the proclaimed beneficiaries, are only called on to participate at the very end of the project.

2. Miseducation at Home and Abroad

For some two centuries Western domination of the Third World has been eroding and destroying the traditional economy, traditional means of education and a considerable portion of traditional cultures. Since World War II attempts by ex-colonial states to liberate themselves from their overlords have succeeded in eliminating the physical occupation but, except for China, there has been only limited success in self liberation from equally pernicious forms of occupation and exploitation. One path

pursued by most Third World countries for self liberation has been education. The assumption was that if these countries would provide small numbers of their youth with high quality education, these youths will shortly thereafter contribute to improving the health, economy, engineering and science of the society. The process was conceived as autocatalytic, a bootstrap operation, a spiralling process. There certainly has been change but the rate of change and the efficiency of the process appear to be low. Even more disquieting is the superficial nature of the on-going changes and objectives. Native resources have been progressively placated, discredited, manipulated and fossilized. Thus the penetration and rape of Third World countries over the past two centuries by Western culture has not only displaced native culture in the seat of authority but the elites of these countries have adopted uncritically thought-systems and values "contributed" by the imperialistic cultures. This adoption has been superficial : factories, planes and guns were purchased but not the intellectual capability to invent them. The reason for this inability for Third World countries, as cultures, to develop their analytical and intellectual capabilities to come to terms with their predicament has received little attention and yet it is of the utmost importance. Professor Edward Said has noted that "the borrowings and indebtedness tend to postpone an essential task, that of locating native resources with which first to attack European colonialism, then to go on and create a truly native society. In the long run that job, if not attended to soon enough, will set the post-colonial society on an even more disastrous course of lostness and distraction".*

* Edward Said, "With-holding, Avoidance & Recognition", *Mawaqif*, March (1972). English version of this paper may be obtained from professor Said, English Department, Columbia University, New York.

Although the future of numerous cultures is, to say the least, uncertain at the moment, these undeveloped human cultural entities may be structures within which fresh and non-Western relationships between science, technology and man appear that could help to resolve the numerous diseases of Western society. In other words, it is in the very interest of Western society and the human race to restrain their cultural imperialism and/or to find measures to promote native creativity in Third World countries.

Two major factors can be identified that are involved in transforming a "backward" society into a "modern" one. Two interrelated processes must occur :

- i. Cultural transfer via the channel of foreign study.
- ii. Native institution building to provide an infrastructure for imaginative and creative adaptation of imported knowledge and its absorption into the community's cultural heritage and the development of native cultural resources.

In most Third World countries both of these processes are exceedingly slow and this slowness is disturbing.

It is a phenomenon of the twentieth century that two billion citizens of Third World countries depend almost exclusively for advanced training up to the Ph.D. level on universities in advanced countries. There is an equally strong dependence on foreign resources in planning and development and on foreign scholarship and funds for research work into local problems. The degree of dependence varies both qualitatively and quantitatively from country to country. In numerous countries 100 per cent of all Ph.D.s are earned abroad, while in others same Ph.D.s are earned at home. In general, Ph.D.s earned at home are in special areas, such as law. The quality of graduate education at home is generally not up to the requisite standards. When one examines the type and content of dissertation level studies, whether at home or abroad, it is found that :

- A. The quantity of research on problems of vital importance to Third World countries is extremely modest. Research and scholarship within the framework of native value systems and thought processes is virtually non-existent.
- B. A good portion of the dissertations earned at home and abroad are on irrelevant and trivial topics.

C. A significant fraction of the research on Third World countries is by non-natives. An "actual count" revealed that 90 per cent of all books and papers on the Arab World is by non-Arabs. 1

1— Hilda Shiber and A.B. Zahlan, "An Assessment of Arab Doctorates Earned in the United States and the United Kingdom on the Arab Intellectual Output" (First draft Copies available, to be published).

Since a great deal of scholarship is ethnocentric, the major sources of information and analysis available to "native scholars" and researchers in Third World countries is foreign — and often ethnocentric — scholarship and writing. 1

- D. Important areas of research of vital importance to the cultural and socio-economic development of these countries are untouched.
- E. Substantial proportions (reaching 90 per cent in some fields and for some countries) of the handful of individuals, who study abroad and are expected to be the channel for the flow of information and change, "brain drain." 2
- F. Those who do return are often ineffective as imaginative agents of cultural change because :
 - i. The cultural concepts of change, progress and development in advanced countries, where Third World societies send their youth to acquire knowledge, contrast severely with the concepts of the solidity and permanence of their traditions as well as the inhospitality their society offers the would-be creative thinker. Youth are dispatched by a fossilized society in the hope that they will bring back new vitality and ideas — but upon their return everything is done to neutralize them.

1. Here one can enumerate a wide variety of examples. Gunnar Myrdal in *Asian Drama : An Inquiry Into the Poverty of Nations* (Pelican Book, 1968), among other examples, shows how "Western concepts (re unemployment and underdevelopment) — even when embellished by a few modifications and qualifications — fail to come to grips with the realities of economic life in the region... The basic source of inadequacy, however, is the unrealistic and inadequate conceptual frameworks underlying these studies." (See his Appendix 16, pp. 2203-2221).

2. A.B. Zahlan, "The Arab Brain Drain", *Middle East Studies Association Bulletin*, Vol. 6, No. 3, October 1, 1972, pp. 1-16. Compare also United Nations Institute for Training and Research, *The Brain Drain from Five Developing Countries* (UNITAR Research Reports, No. 5, New York); and The Committee on the International Migration of Talent, Charles V. Kidd (Chairman). *The International Migration of High-Level Manpower: Its Impact on the Development Process* (New York: Praeger, 1970).

- ii. The value system imparted with education in advanced countries stresses self-seeking professional advancement, and advanced countries criteria for problem selection, priorities and awareness. In many situations it is these value-factors which induce the brain drain or enhance the effectiveness of a returnee in becoming a creative member of his society. All Third World countries face problems of unemployment and very low labor productivity. This is due — to some extent — to the type of technologies that are being imported,
- iii. Naturally, universities in advanced countries have not been set up to promote the education of Third World communities. Foreign students are a minority and these are allowed to study, along with the native students, for whom society has made possible these facilities. Thus the priorities, programs and motivations of the university and research programs have been evolved to match the demands and needs of the advanced society. Thus some 100 Arabs have earned their Ph.D. degrees in nuclear engineering — mostly at government expense — when there is no possibility of utilizing these skills in the Arab World (1) Yet there are few Arabs specialized in land drainage, although in Iraq alone 8 million acres of salted land (about 600 metric tons of salt per hectare) constitute an immense economic waste and the reclamation of this land would, it is estimated, cost more than ID400 million (\$1 billion). Though many aspects of soil conservation and improvement have attracted attention, few, if any, problems have been resolved by means of common sense. Somehow Third World education at home and abroad frequently strips the individual of his common sense. Thus citizens, technocrats or professional planners in the Third World usually fail to identify the most serious problems and even when they do, most often fail to solve them rationally and economically.

1— There are three 2-3 magawatt reactors — all of foreign make — in the Arab World. These are more than ten years old.

As a result of the influence of the above three factors on the individuals who pursue their studies abroad — who are expected to be the carriers in the transfer process — we can safely say that the "transfer channel" is very ineffective and in its present form will never meet adequately the needs of the Third World for creative "planners" who retain a symbiotic relationship to the community and its problems. 1

- G. That a great deal of vital and useful technical and non-technical information is not being absorbed and utilized by Third World countries for a variety of known and unknown reasons.

In view of the above it should not be surprising that the rate of real change in the human condition of Third World countries is extremely slow and visibly lower than the attainments of several other societies."

3. Truth Seekers, Efficiency Seekers and Development

The specific case of one educated elite, the scientists, should now be examined for a consideration of its role in society. Scientists have responsibilities towards their society as citizens and as scientists. As individual they must assume more responsibility than the average citizen because of their possession of special knowledge and knowhow. Only scientists can provide the best advice concerning the implications of their findings as well as the intellectual and practical worth of their products. Since knowledge has an international market and scientific knowledge is universal this places the scientist in a dual position. The Third World scientist can easily migrate and become integrated in a foreign society, but if he remains in his own relatively backward community his life is one of contrast between what he is actually doing and what he feels he could do.

In any society there are two strategies that may be pursued both by individuals and by the state : these policies have been labelled by Harry Harding as the efficiency seeking and the truth seeking. The "efficiency seekers" attempt to invest their lives and their capital in those projects and places where they can optimize on the investment

(1) See for example, "National Planning for Education in Science and Technology" by A.B. Zahlan, in UNESOB, *Elements for a Regional Plan for the Application of Science and Technology to Development in Selected Countries of the Middle East*, ESOB/HR/72/31, Beirut 30 September 1972.

in the short run. Clearly this policy leads to the migration of professionals from the village to the city; and in the city from the poor area to the rich area. Hence, in Lebanon one finds a large concentration of doctors in the affluent Ras Beirut area and only a few in the rural regions of the country. (78% of all Lebanese doctors are in Beirut). Furthermore, the individual doctor migrates en masse from Iraq, Egypt, and Lebanon to France, the United Kingdom, the United States and Canada. The "truth seekers" attempt to invest their lives and capital in projects and areas that are based on social needs and justice. Thus they attempt to reduce the existing social inequities. Since in developing societies there is a large gap between the poor and the rich, the haves and the have-nots, efficiency seekers contribute to the widening and ossification of this gap. This is why truth seekers see that the strategy of building on existing strength is inherently socially irresponsible and unjust. It is only by adopting a policy where the development is spread across the entire community that one can in the long run create a society built on strong and firm foundations. In the view of the truth seeker the efficient short term solutions lead to a class war and social injustice. Thus the truth seeker will not decide to work in upper Egypt or southern Yemen because the job brings great financial rewards but because the people there are in the greatest need for his services. Harding interprets the Cultural Revolution in China in this light, that is, as an attempt to secure development and modernization with social justice.

One may safely say that todate there are no "truth seekers" to speak of in the Arab World. Nabeel A. Shaath ¹ reported that 60% of the agricultural engineers, 78.5% of medical school graduates, 74% of the commerce graduates, work in Cairo, Giza and Alexandria whose combined population was 18% that of the whole of Egypt. Arab university graduates are no different in other Arab states. Relatively few agricultural engineers live and work with the people who need them most and in so doing contribute to the improvement of agriculture and the quality of their lives.

There is no question that Arab efficiency seekers have excellent arguments for migrating to the cities and to the United States. In a number of studies on Arab universities and Arab science, I have described in some detail the relatively miserable lot of research and of professors

1— Nabeel Shaath, "Education, High level Manpower and the Economic Development of the United Arab Republic," (Ph. D. dissertation, University of Pennsylvania, 1965), P. 201.

at Arab universities. My purpose in so doing was not to scare new young talents away but to provide them with some of the information they need to enable them to contribute and render the struggle for development of Arab institutions more effective.

The Arab World, as far as the Arab professional is concerned, is a relatively open society. It is open to leaving one's state; it is relatively open to internal migration within one's country and between Arab States and it is open to travel to the West, to Latin America, to Australia, to East European countries and to the USSR. It is open also in the sense of access to newspapers, movies, magazines and mail. What does all of this do ? It makes it much more difficult to be an individual "truth seeker". You know that you need not rot in the universities of Alexandria, Beirut or Mosul. You know that when your equally educated peers and superiors are petty, cheap, vicious and are doing everything in their power to destroy whatever self confidence you have and that you can be somewhere else where you would be respected, well paid, and could excel, why stay ? Let somebody else shoulder the responsibility. So another efficiency seeker leaves.

Because most of us need to be part of a larger organization and immersed in a larger movement, truth seeking cannot be shouldered by "average" individuals, few can do so with success. We cannot expect to see an Arab Mao in the foreseeable future simply because we have along way to go before we can evolve to the point that our society can generate this level of leadership. Furthermore, bourgeois values are so predominant in present day Arab society that we may have to develop our own type of "truth seekers" from whom the sacrifice is minimal. No matter how it is viewed any sensible development program would involve personal sacrifices.

Truth seekers would say that Arab professionals must return and assume their social responsibilities. They must sacrifice for their people — after all it was this same society that raised them and paid, directly or indirectly, the cost of their upbringing. The efficiency seekers will reply that all of this is well and good but nothing can be done under existing conditions.

4. Relevance and Quality of Science and Technology

For science and technology in developing countries to take root, it

must become more relevant to the country concerned. For it to become relevant, scientists and engineers must become involved in the problems facing their society. During the past 25 years it has been increasingly clear that the upbringing and education of Third World scientists and engineers did not prepare them for a useful career of relevance to their societies. Thus they could easily justify breaking off and brain draining. One wonders how individuals can justify fighting for their country — taking a low pay and running the risk of getting killed — but at the same time remain unwilling to work for their society at a pay equivalent to that of the armed forces of even advanced countries. I feel that the failure begins when the university graduate either admits or subconsciously realizes his inability to cope with the problem. No scientist would struggle with a problem once he feels he is incapable, uninterested in or incompetent to handle.

The challenge is to find ways and means to re-equip, re-educate and support scientists in Third World countries to become more relevant and useful. This is not an easy task. The transformation of the would be scientist must aim at looking intellectually at himself, and at being able to relate national discourse to his daily problems. This process may begin simultaneously at different levels: at the pre-college level and college levels.

Communication must play an important role in bringing about the fusion of individual minds. A scientist must, in addition to maintaining his professional standing, fulfill a directly relevant role. Western scientists during World War II concerned themselves with making an A-bomb, inventing operations research, manufacturing and intelligence. No counterpart behavior of scientists in Third World countries has occurred so far. What are the reasons for this? It is not likely that the answer lies in their small number — after all, 18th and 19th century American scientists in geology and exploration did not require large numbers or much communication. The probable reason, however, has been the availability in the 20th century of a huge market for HLM in the U.S. that is draining away everything within reach. No such market existed in the 18th or 19th century.

5. Communication among Scientists

It is a characteristic of scientific research that it involves a very high density of informational flow :

- (a) joint research effort
- (b) discussions
- (c) conferences
- (d) publications and journals

Each of these communication channels may be quantified and conclusions drawn. We find that the scientist in Arab States, and I believe the case to be the same for most Third World countries, is extremely isolated. As a matter of fact, it is virtually impossible for him to pursue his profession when compared with the prevalent conditions in the West.

It is a well known but poorly studied fact that scientific activity, whether involving pure or applied research, involves a wide variety of communications, simultaneously and at a high intensity. The informational flow is interactive: the information generates interaction in the mind of a scientist that alters, develops and extends his previous state of knowledge. Although there is a wide range of levels of self-sufficiency among scientists and scholars, total isolation, the type prevalent in Third World countries for most professionals, is deadly in less than six years.

The lack of communication results in the annihilation of professional aptitudes as well. Let me discuss a specific example. Most countries of the Arab world have been developing their water potential. The Aswan High Dam project is just one such project that attracted the public eye. These dams come in the hundreds of million dollars sizes. They are large-scale projects that should involve **both** professionals with knowhow in designing and constructing dams and a wide range of talents concerned with the implications of such a structure and such a large volume of water. For example, the disaster, health, agricultural, power, water table, fish farming aspects, to name a few, must be looked into, and their interaction examined, **prior** to the actual construction; otherwise, as with the Aswan project, optimal results are not forthcoming. It is not surprising therefore to learn that the bilharzia infested feces of the workers who constructed the Aswan High Dam led to infestation of Lake Nasser. This in turn resulted in a tenfold increase in the incidence of bilharzia in Egypt. In 1967 WHO estimated that the economic loss to Egypt of bilharzia was £E. 80 million, i.e. some \$200 M annually. There are other negative side effects : threat of erosion of the Nile delta, erosion of river banks (and collapse of bridges), and increasing soil salinity due to

changing patterns of irrigation. The reclaimed land in Egypt turned out to be a bigger challenge than anticipated. The full potential of Lake Nasser for intensive fish farming and touristic development are barely being explored now. Preventive and curative measures to protect the delta and soil conditions could have been taken. One would have imagined that the construction of such a major engineering project would attract the intellectual and imaginative concern of a wide class of people in a Third World country. The absence of professional activity and communication, however, militates against the emergence of such a concern. First, in order that there be intellectual and imaginative concern by professionals there is a need for the dissemination of large quantities of information, numerous study groups, hearings, conferences, and seminar courses; there is a need for extensive library facilities; it is essential to have trans-disciplinary discussions and research activity. Dam construction is viewed as an engineering project that requires financing — nothing more or less. In the case of the Aswan, the issue became politicized and this made it a sensitive issue. But non-political dam construction in Iraq, Syria or Saudi Arabia is not receiving greater concern by the educated citizenry.

This lack of concern and involvement has other important side-effects: when professors, doctors, senior engineers are not involved in a visible and effective way in the most important development projects in a country, the university students will have no access to, and no communication with, the developmental planning in the country. As a result the graduates from the national institution are not integrated professionally and intellectually with the problems of their community and with the national development plan. Furthermore, their education is so often divorced from the realities around them that it becomes nothing less than a preparation for expatriation and brain drain. Thus the lack of communication between professionals and the absence of relevant professional concern and interaction with national problems are resulting in large mis-education. It is no wonder that about a third of Arab MD's emigrate abroad and 60% of our B.S. agricultural graduates gravitate to an office job in the capital cities.

The dilemma of the Third World scientist can be illustrated by contrasting the prevalent conditions of his communications with that of his counterpart in the West. In Table 2, I have estimated a wide range of parameters that describe numerically the interaction of a professional

man with his peer group at home, abroad and with his society. One finds that the average professional man barely communicates with anybody.

6. Instabilities of Third World Communities

Thus far we have briefly examined some of the reasons for the inadaptability of the HLM of the Third World to their respective local environments. The resulting inefficiency of prevailing manpower policies has brought about a general instability in Third World communities that are so fragile they can be shaken by any unforeseen event : a typhoon, drought, the higher cost of loan money and fuel can all result in nationwide civil disorders. The various pressures acting on a Third World community are schematically presented in Figure 1.

This instability is a direct product of the **defacto** manpower policies in force in Third World countries. The present educational system and economic structure maintain a small middle class that is capable of meeting its own needs adequately but is unable to generate sufficient economic activity to provide the entire population with the requisite economic advantages to overcome its present conditions.

Table 2**COMMUNICATION PATTERNS**

<u>Interaction</u>	<u>Size of Class in a</u> <u>Typical Arab State</u>	<u>Frequency of</u> <u>Professional Contact</u>
1.0 Professionals —		
<u>Direct Contact</u>		
(non-medical fields)		
1.1 Size of class of professionals on university faculties, research institutes (in a local urban community)	$3 \times 10^2 - 10^3$	An average of 1 minute per person per day
1.2 Number of professionals in a pure or applied science specialty in similar fields		Max. of 10 minutes per day per person Average 0.5 minutes per day per person
* in urban center	1	
* in region	2	
1.3 Association with the international "Invisible College" in professional field.		Average 5×10^2 participation per person per year in an international professional meeting
1.4 Professional Conferences in all fields excluding medicine in Arab World	—	1 per year
1.5 General conferences (semi-academic) per year in Arab World	—	10 per year

Table 2 (Cont'd)

<u>Interactions</u>	<u>Frequency of Professional Contact</u>
2.0 Research activity in all fields in all Arab world.	10 ³ papers/year
2.1 Research activity in scientific fields e.g., physics	Max. 30 per year per country Average 3% per country Average 10 paper per physicist per year
3.0 Access to scientific literature.	
Availability of journals.	In maybe 6 Arab cities
Adequacy of university libraries.	Only 6 libraries for 34 universities and 80 colleges may have about 200,000 volumes and may be considered "adequate"
4.0 International indirect contact with professionals, By correspondence	1 letter/Arab profession per year.
5.0 Relevant and professional contact with national society	
5.1 Opinion solicitation 8 on general scientific matters.	5X10 ¹ opinion solicit- ation per professional per year.
5.2 Professional consultation	10 consultation per person per year.

Table 2 (Cont'd)

<u>Interactions</u>	<u>Frequency of Professional Contact</u>
5.3 Unsolicited public statement (book/article)	10 ² "emissions" per person per year.
6.0 Personal non-professional contact with society.	
6.1 Clashes in value system.	Daily clashes
6.2 Family relatives	Strongly coupled.

* The Sample of the Arab Scientific Community referred to in this table consists of :

- * Ph.D.'s in pure and applied sciences, excluding medicine.
- * In this group there may be about 6000 to 8000 Arabs (physics, chemistry, math, biology; engineering fields)
- * Probably less than 40% of these 8000 are in the Arab world. Dispersed among 140 million people.
- * These 3200 persons work at 34 universities and 80 colleges, government ministries, etc.
- * In a large urban center of 1 to 2 million, there may be about 20 Ph.D's in physics.
- * Most of the 3200 are above 35 years of age — the brain drain is highest among the young.

THE PRESSURES ON A THIRD-WORLD COMMUNITY

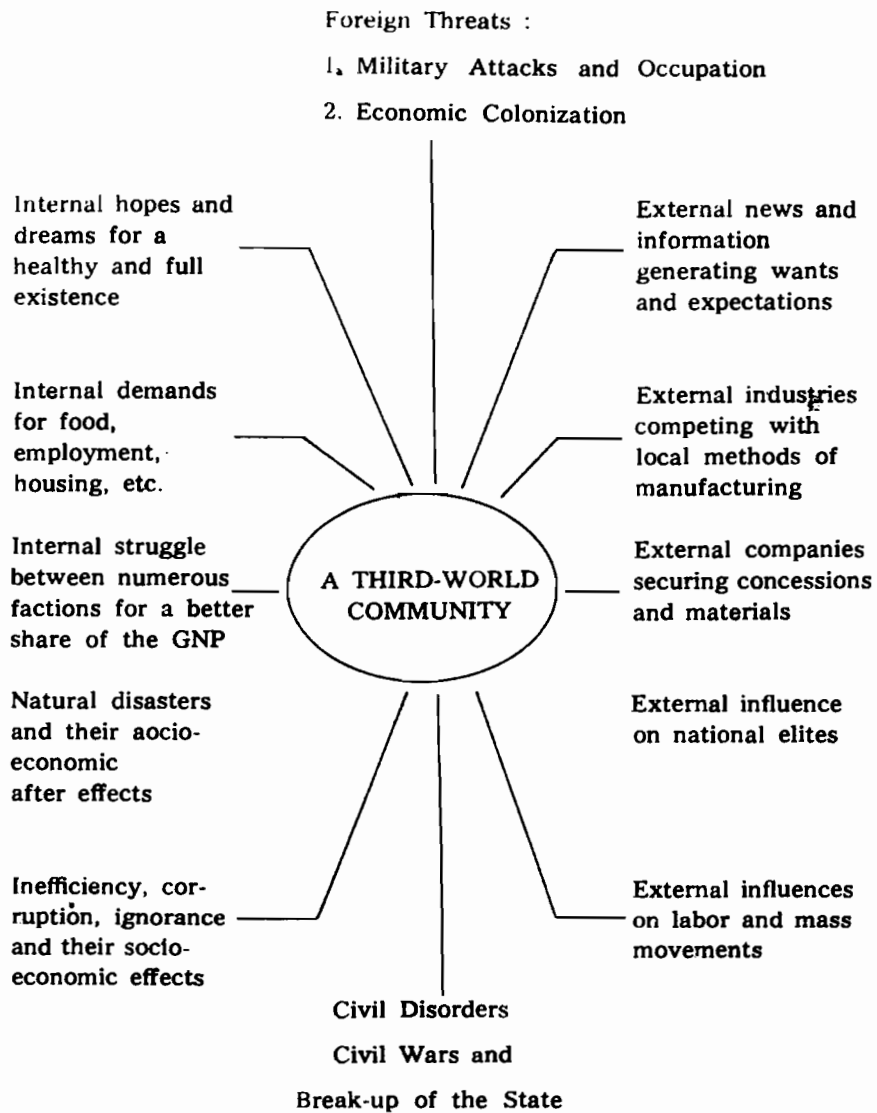


Figure 1