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THE CONCEPT OF LANDSCAPE IN LAND-USE STUDY FOR ENVIRONMENTAL ASSESSMENT CONCERNING LAND AND SOIL IN A DEVELOPMENT PROJECT

by

DOMINADOR Z. ROSSEL* and FELICIANO M. LAPID**

INTRODUCTION

This piece of exposition is written to document our concept of landscape in land-use and soil study for environmental assessment with particular emphasis on land and soil — the most important heritage of the people. It is said that human society progresses on two "feet" — namely, communication and transportation. In this brief exposition our intention is to communicate to our fellowmen the little we know in the conservation of natural resources and the overall environment through the application of landscape concept with its land-use patterns and categories.

GEOGRAPHIC FUNDAMENTALS

Percept and Concept. — "These terms percept and concept appear often in articles dealing with geographic education, especially in articles dealing with many kinds of academic disciplines. These two terms can not be distinguished sharply. Percepts seem to fuse with concepts. However, one can identify distinguishing characteristics. Percepts enter the mind through the senses. They are the images which result from seeing, smelling, hearing, tasting, and feeling. Percepts are based on sensation received at anytime, now or in the past. Concepts are constructs of the mind. They are a consequence of reflections, cogitation, and synthesis. Taken together, percepts and concepts are referred to as cognition experiences".[1]

To illustrate. — If you look at the Taal Volcano from the edge of Tagaytay Ridge, Cavite Province, Philippines, you see and become aware

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of its grandeur, you have a *percept*. If you reflect on this circumstance, in terms of the transformation of the landscape you are becoming involved with a *concept*.

We may also give a vivid example of a concept that transpired in an incident. Our First Lady and Governor of Metro Manila, Mrs. Imelda Romualdez Marcos went to visit the Tondo Foreshore, Manila and saw the hardship and the very miserable condition of the people, sensed the foul odor of the place, heard the people's voice of agony, and felt deeply in sympathy. In her desire to change the situation, she arrived at the concept of transforming the landscape into a well-organized settlement for the people to live in and enjoy and also progress.

Landscape. — The meaning of landscape may be found in American-published English dictionaries, such as the following:

1. "An extensive view of rural scenery; a picture representing natural inland or coastal scenery"[2]
2. "A picture representing natural inland scenery; an expanse of natural scenery seen from a single point of view;[3] and
3. "A picture representing a tract of a country with various objects it contains, such as a picture in general, or a painting of such a picture; a natural scene that might form the subject of such picture"[4]

Geographic View of Landscape. — John Emery (1980)[5] has this to say: "Geography is that field of study which focuses on the environment throughout the use of spatial concepts" (Australian Geography Teachers Association, 1971:2). "Geography, as a discipline, provides valuable environmental perspectives, both for teachers in the organization of their course and for students as they become involved in them. Dr. Don S. Biddle's articles on *Geographic Perspective,* outlines this range of structures, one of which is landscape structure. *The landscape is a structure which emphasizes tangible visible objects, forms, content, and the impact of people in their environment.*"

Landscape (as used in soil geography) is the sum total of the characteristics that distinguish a certain area on the earth's surface from other areas. These characteristics are the result not only of natural forces but of human occupancy and use of the land. Included among them are such features as soil types, vegetation, rock formations, hills, valleys, streams, cultivated fields, roads, and buildings. All of these features together give the area its distinguishing pattern. The term may be used in broad sense to include the complex pattern of an extensive area, such as the rural landscape, the mountain landscape, or it may be restricted more closely by some factors or combination of factors, as the landscape of the Miami-Brookston soil association, the landscape of the Miami silt loam, or the landscape of the forested Plainfied sand.[6]

Environment. — A dictionary meaning gives this: "The aggregate of surrounding things, conditions, or influences"; also, "all the conditions, circumstances, and influences surrounding and affecting the development of an organism."

Thomas Detwyler (1971),[7] well-known geographer, defines environment as "the aggregate external conditions that influence the life of an individual or population, specifically, the life of man. Environment ultimately determines the quality and survival of life."

Furthermore, environment refers to the complex interactions among natural, material, and social aspects of man's life, such as:

natural — air, water, land, and minerals; animals, birds, and fish; trees, plants and grasses;

material — buildings, machines, other structures and their products; and

social — health, employment, community living and relations, shelter, recreation and privacy.

Land and Soil. — Land in its physical state is defined as the portion of the earth that has distance, space, length, and width. Witness the fact that when you read and examine the Torrence Title of your land the technical description indicates distance(s) from established point(s) of reference, space, width, and length, and gives the area in hectares or square meters. In reality "land is the total natural and cultural environment within which production must take place. Its attributes include climate, surface configuration, soil, water supply, subsurface conditions, etc., together with its location with respect to center(s) of commerce and population. It should not be used as synonymous with soil or in the sense of the earth's surface only."[6]

The soil on the other hand besides these four dimensions has the fifth dimension which is depth, and is used as medium or foothold for plant and animal growth. The depth dimension of the soil makes it a natural body on the surface of the earth composed of organic and mineral substances utilized by plants for growth and development.

As per the Constitution of the Republic of the Philippines, land and soil as natural resources, belong to the State. The soil, however, is God's gift to man in *fee simple* to be used only for growing plants and animals, for the livelihood and well-being of man. When used otherwise, this soil becomes mineral. A man in the Philippines therefore must get a permit from the Bureau of Mines (now Bureau of Mines and Geo-Sciences), Ministry of Natural Resources, if he sells the soil or uses it for other purposes such as filling material in construction purposes and such other development projects.[8]

Land Use. — The term land use or land-use refers to the occupation and actual utilization of the land for many purposes, such as for residence, crop and livestock production, forestry, recreation, wildlife conservation, mineral extraction, and varied commercial and cultural purposes. For the purpose of environmental assessment and impact studies of an area where development is being programmed or to be implemented, the concept of landscape has been found to be a feasible method for the survey and mapping of the land-use patterns and land-use categories.

Land-Use Patterns and Categories. — Land-use pattern is the areal design or arrangement of land uses, major or minor, and of operation units[6]

Within the context of landscape, the land-use pattern and land-use categories are units of classification of the land and soil in the area and their relationship to each other. In this way assessment of the elements of the environment can be easily evaluated and their impact on various activities of the people can be established.

The Land-Use and Soil Survey of Great Britain under the leadership of Sir Dudley Stamp have made notable progress before and after World War II. After his death Prof. Alice Coleman of Kings College, University of London, practically inherited the mantle of Sir Stamp's great work which is now the Second Land Utilization Survey of British Land. This survey has classified, established, mapped and measured hundreds of different land-use patterns and categories.*

Land-Use Pattern. — The land-use pattern is the major unit of classification of land and soil study especially adopted for environmental assessment and impact studies of areas that are within the development projects. Coleman[9] recognized five broad types of land-use pattern, namely, *townscape, farmscape, wildscape, rurban fringe,* and *marginal fringe.* According to the author, townscape, farmscape, and wildscape are patterns or environments which planning had intended to conserve or improve. Rurban fringe and marginal fringe are environments which planning had intended to reduce or eliminate. For further ellucidation, the same author stated: "Townscape is dominated by settlement but may sometimes contain very subordinate areas of farmland or vegetative cover. Farmscape is dominated by farmland but may contain subordinate vegetation or settlement patches. Wildscape is dominated by vegetation and it, too, may contain subordinate amounts of the other two super-categories. However, not all patterns consist of one super-category dominant and the others subordinate. There may be two co-

* On June 11, 1980, Prof. Rosell conferred with Dr. A. Coleman at her office at Kings College, London, after his attendance at the 150th Anniversary Celebration, Royal Geographic Society of London on June 8-9-10, 1980 as representative of the Philippine Geographical Society.

dominant or even all three co-dominant. It is these patterns of co-dominance that generate the most severe land-use conflicts. In the marginal fringe, the conflict is between vegetation and improved farmland. If farm prices are depressed, the farmer cannot afford to protect his fields against infestation, but in better times he can upgrade some of the rough pastures to improved status. This is a zone of struggle and change; it can also expand or contract. The rurban fringe conflict is between town and country. In this example settlement is advancing in a pattern of piecemeal sprawl, producing the fragmentation and abandonment of farmland —."

Land-Use Category. — This is another unit of classification of land and soil where a certain landscape within the identified pattern is dominated by certain land-use elements in the environment. In the case of land-use pattern Farmscape the land-use categories under this pattern can be identified and established, such as rice farm (upland or lowland, irrigated or rainfed) rice-corn farm, vegetable farm, citrus farm, etc.

Likewise, land-use pattern Townscape can be classified and established as first class town, second or third class town, barrio or sitio, if the scale of the map can accommodate and show these minor categories.

In like manner, categories such as industrial area, manufacturing area, etc., can be indicated if their occurrence in the area is significant.

Landscape and Its Conservation. — Landscape in terms of land-use pattern and categories is natural resource modified by man. This natural resource in this context is composed of land and soil. Their modification from their virgin status may be described as improvement, degradation, or extreme abuse. For example, a farmland used for corn production is a part of land-use category called *corn land* under the land-use pattern Farmscape. This corn land although relatively endowed with high productive capacity can still be improved to produce higher yields by appropriate farm management practices. But a similar land nearby tilled by a farmer bent on following his grandfather's old farming practices sooner or later, produce lesser and lesser yields to the point when subsistence farming becomes very unrewarding due to the degradation of the land and soil. This loss is an economic burden not only on the farmer himself and his family but also to the community, and in the long run to the generations to come. This loss should be avoided. And as stronger pressures keep on demanding for increased farm production to feed our exploding population, one safe but often elusive solution is to practice land and soil conservation. Moreover, since under the land-use patterns we also have the townscape, wildscape, and the two fringes of rurban and marginal, it is also desirable and imperative to conserve the townscape and the wildscape to remain viable and productive for the benefits of the towns people in the development

project area. The rurban fringe should be under regulation to minimize encroachment of good farmlands. As to the marginal fringe, conservation principles and practices would go a long way in making such areas produce assets instead of liabilities.

SUMMARY

Key words in this paper are defined and some examples given. The concept of landscape is not new but its application in the study of land-use for the assessment of the environment is emphasized. Land-use patterns and categories are also defined and distinguished as parts and parcel of the landscape, whether they are inside the confines of the limited development project area or in the country at large. Conservation practices applied on land-use patterns, will ensure continuing production benefits to the people.

We believe that in the process of development of the Republic of the Philippines, say in education, commerce, industries, and scientific and technological endeavors, these must go hand in hand with the conservation of our natural resources such as land and soil, water, natural flora and fauna, energy and such other natural resources endowed by His Divine Power to man for him to utilize for generations to generations.

When we say conservation, we mean wise utilization of natural resources where we maximize benefits, avoid waste and keep intact such resources for generations to come.

In our land-use and soil study for the Philippines, it would be advisable to study other countries' models to give us ideas and draw out concepts adaptable to our conditions. It is recommended that the Great Britain Model of Land-Use be studied and find out if it can be adopted for our National Program of Land Use and Soil Survey of the Republic of the Philippines.

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Prof. Rosell was Supervising Scientist and Chief, Division of Agricultural and Natural Resources Research, National Science Development Board, Republic of the Philippines, Manila; he retired on November 5, 1968 at the age of 63 years. Before this position, he was Chief Soil Scientist, Division of Soil Conservation until September 30, 1952. On October 1, 1952 he became the administrator, Irrigation Service Unit and Program Director, Pump Irrigation Program of the Philippines up to November 5, 1960 when he was appointed Supervising Scientist, National Science Development Board, which is today the National Science and Technology Authority.

Prof. Rosell was Professorial Lecturer for 22 years in Geography, Philippine Women's University, Manila, from 1952 to 1975 and in the College of Arts and Science, University of the Philippines from 1973 to 1978.

Presently, Prof. Rosell is President, Philippine Geographical Society, Editor-in-Chief and Business Manager, Philippine Geographical Journal, now in Volume XXVI, 1982. As Soil Technologist and Environmental Geographer, he is consultant in soil and land-use studies especially in environmental assessment and impact studies of development projects.

Prof. Rosell is a member of the International Honor Society of Phi Kappa Phi, U.P. Chapter and the Honor Society in Agriculture, Gamma Sigma Delta, UPLB Chapter. He was Past President of Philippine Association for the Advancement of Science, Soil Science Society of the Philippines, and the Radioisotope Society of the Philippines. Presently, he is the Chairman, National Committee on Geographical Sciences, National Research Council of the Philippines. He is a prolific writer and researcher.

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Mr. Lapid earned his bachelors degree in the chemistry at the San Jose State College, now the University of California at San Jose, California, in 1938. Not long after graduation he returned to the Philippines and found employment in 1940 in the Division of Soil Survey (now Bureau of Soils) under the Department of Agriculture and Commerce. During the Japanese occupation, he worked as a distillery analyst at the Pampanga Sugar Mills, Pampanga, his home province. After liberation he was hired as an assayer in a gold mining company in the Baguio mining district. In 1954 he was back at the Bureau of Soils (BS) where he held various positions. Ten years later he was appointed as Head Soil Technologist and Chief, Soil Research Division and held the position until his retirement in 1978. While at the BS, Mr. Lapid continuously sought further improvement on his technical capabilities by attending several seminars, workshops and training grants, notable of which were two one-year stints, a fellowship grant by the International Atomic Energy Agency on radioisotope use in soil fertility studies at the University of Tennessee in 1962-63 and a Colombo Plan Training in Soil Chemistry in Japan 1967-68.

Mr. Lapid has many published articles (as author and co-author) on soils work, mostly in soil analysis — chemical, spectrographic and radioisotopes methods. Lately, he has been contributing book reviews covering geographic aspects in the PGJ. As junior author of the "landscape" article, his work experience in soils is made to bear in pointing out the relationship of soils to landscape patterns and categories for environmental conservation.

THE ROLE OF THE PHILIPPINE COPPER INDUSTRY IN NATIONAL DEVELOPMENT

by

TEODORO M. SANTOS, Ph.D.[1]
FRANCIS GOLEZ[2]

ABSTRACT

The Philippine Copper Industry exhibited a phenomenal growth from 1950 to 1979 mainly due to its favorable geological and human endowments, developed institutions, enlightened government policies conducive to the participation of private and foreign firms and favorable market conditions.

More fundamentally, however, the impressive growth of the copper industry became possible because Philippine society perceived it as valuable in promoting national development. The industry was, among others, an important earner of foreign exchange, a source of tax revenues and a big employer. And had it tried harder the industry could have done a lot more to enlarge its share in the economic and social development of the country.

Whether the industry could continue the present rate of its growth or not depends on society's evaluation of its contribution to national development.

INTRODUCTION

This paper was first presented in the recent Porphyry Copper Symposium such that the content is slanted towards the porphyry copper industry. However, the paper applies just as well to any natural resource, so that we can take the copper industry as merely a particular application, not the only application. Although some of the concepts and problems addressed sound unfamiliar, I assure you that they are the kind of things that policy makers and government planners are concerned about, and which top corporate managers would have to grapple with. The paper may be thought of as presenting the other dimensions of the mineral industry which the geologists and engineers normally overlook.

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The paper apparently presents two theses: (1) the determinants of the mineral industry, as exemplified by the copper industry; and (2) the role of the mineral industry in national development. But deeper reflection indicates that these theses are really one, that is, they represent the major factors that determine ultimately the development of the mineral industry — any mineral industry, anywhere. Let us proceed with this preface.

One may wonder why one should talk about the role of the copper industry in national ecconomic and social development in a gathering designed to unravel some of the "secrets" of the phenomenal growth and development of the Philippine copper industry. Of course, we can always argue that the problem, if viewed from different angles, will look different. Ask a geologist why the Philippines is such a copper country and he will tell you about the virtues of favorable geologic setting, lithology, structures, wallrock alterations and the magic of geochemical and geophysical exploration. The engineer will not hesitate to add the grandeur of open pit mining and sulfide ore beneficiation. In the minds of the geologists and engineers, these are the factors that made the Philippine copper industry. No doubt, if we ask other groups of people, they will have different explanations.

Then the topic "The Role of the Philippine Copper Industry in National Development" is just another version of the same story told by the engineers and geologists?

I dare say, yes. But hidden behind this outlandish title is the proposition that the "Philippine copper industry became what it is now because society perceived, perhaps subconsciously, that it has an important role to play especially in transforming the country from an underdeveloped to a developed status." The proposition is more suggestive, even ominous, if put in the negative, that: "If society did not perceive that the industry is socially beneficial, then society will not allow it to be what it is." Society has the power to stop it at its incipient stage-if perceived to be useless, or worse, if considered harmful. Government, the guardian of society, will reflect in its policies the interest of society. Within this context we recognize that the concept of what is good to society changes over time and hence the industry must be attuned to it to remain relevant and useful.

This paper proceeds with the assumption that the industry plays an important role in national, economic and social development. It focuses on two related issues, namely: (a) the factors responsible for the development of the copper industry, and (b) the role of the industry in economic growth and development.

At this stage, a few definitions may be in order.

CONCEPTS AND DEFINITIONS

Porphyry copper. — refers to disseminated or stockwork deposits, or to all copper deposits so called by engineers and geologists.

Copper Industry and Porphyry Copper Industry. — The industry consists of all the firms producing copper. Except for Lepanto and the Bagacay mines of Marinduque Mining, all the other major firms produce from porphyry copper — hence they comprise the porphyry copper industry. As of 1979, about 93 percent of total copper production comes from porphyry firms and hence the porhyry copper industry can represent the entire copper industry with a small margin of error. Table 1 shows the major copper producers in the country and Table 2 indicates the share of porphyry copper in total production for various years.

Growth and development. — Growth refers to that process whereby a thing changes in size between two points of time. For example, if production in year one is 100 units and 120 in year two, the growth rate is plus 20 percent. Development, on the other hand, implies growth plus something more. Development includes change in size, structure or substance. So a country that develops is expected, among other things, to increase income and distribute the same more equitably,

TABLE 1. — THE PHILIPPINE COPPER PRODUCING FIRMS AND CONCENTRATE PRODUCTION, 1979 (IN METRIC TONS)

Atlas	450,000
Marcopper	145,282
Marinduque[1]	131,172
Philex	100,000
Consolidated Mines	59,900
Western Minolco	53,000
Baguio Gold	23,000
Black Mountain	11,601
CDCP	70,055
Benguet Consolidated (Wildcat)	—
Sabena	40,657
Acoje	3,696
Lepanto	60,000
T o t a l	1,146,363

Source: Philippine Bureau of Mines.
[1] Note: Bagacay Mines account for 21,600 metric tons.

increase literacy and stock of technical skills, and enlarge its industrial capacity. Applied to an industry, development connotes, among others, change in the number of firms and their shares in production, change

TABLE 2. — COPPER PRODUCTION IN THE PHILIPPINES: PHILIPPINES & BY PORPHYRY COPPER PRODUCING COMPANIES (IN METRIC TONS)

Total/Copper Producing Co.	1955	1960	1965	1970	1975	1977
Copper-Phils.	17461	44010	62740	160276	225775	272791.73
Porphyry Copper	6101	26163	44351	121229	204680	250546
%	34.94	59.44	70.69	75.62	90.62	91.84

TABLE 3. — COPPER MINE PRODUCTION AND GROWTH RATES IN NONCOMMUNIST WORLD (THOUSAND METRIC TONS COPPER AND PERCENT)

Country	Production 1960	Production 1975	Average annual growth rate of production
Philippines	44	218	11.3
South Africa and Namibia	70	205	7.4
Australia	111	227	4.9
Canada	399	771	4.5
Chile	532	817	2.9
Zaire	302	426	2.3
United States	980	1,288	1.8
Peru	184	218	1.1
Zambia	576	662	0.9
Others	419	938	5.3

Source: Tilton, J.E., 1977, The Future of Non-fuel Minerals, Washington: The Brookings Institution, p. 44.

in the volume, variety and sophistication of products, increase in the participation of indigenous population in the various aspects of the industry and growth in the stock of productive capital.

Developed and underdeveloped countries. — Developed countries are characterized by high per capita income, large per capita stock of capital, large and varied stock of technical skills, and well developed secondary and tertiary industries. Underdeveloped countries are indicated by low and skewedly distributed income, scarcity of capital and skilled labor, usually agricultural and has undeveloped secondary and tertiary industries.

Stages of the Mineral Industry. — Refer to the various activities involved in the finding of a deposit through all steps up to the point when the refined metal is produced. They consist of exploration, development, mining, milling, smelting and refining.

After defining some terms, we can now examine the nature and causes of the rapid development of the copper industry which made its contribution to national development worthy of public scrutiny.

THE DEVELOPMENT OF THE COPPER INDUSTRY

Inquiry into the development of the copper industry may be divided into two parts, viz., 1) What is the so-called phenomenon of the development of the copper industry, essentially a question of structure, and 2) What factors made such development possible?

1. Structure

What comprise the phenomenal development of the Philippine copper industry in the 1950's through the 1970's?

First, copper output grew 85 times from 3,200 metric tons in 1947 to 270,000 metric tons in 1977, thereby making the country the sixth biggest copper producer in the non-communist world. This clearly established the Philippines as the top copper producer in Asia and Oceania.

Second, the development phenomenon becomes even more remarkable if the growth rate of the industry is compared with those of other countries. During 1960-1975 (Tilton, 1977) copper production in the country exhibited an annual average compound growth rate of 11.3 percent in contrast to the 7.4 of South Africa, 4.9 of Australia, 4.5 of Canada and the very much lesser growth rates in major copper-producing countries like Chile, Zaire, U.S., Peru and Zambia. (See Table 3). The annual growth rates which during a good year even exceeded 50 percent

TABLE 4. — COPPER PRODUCTION: SELECTED COUNTRIES (WORLD TOTAL; PERCENT GROWTH RATE PER YEAR)

Country/area World (Thousand MT)	1967 5030	1968 5590	1969 6070	1970 6500	1971 6560
World	—	11.13	8.58	7.08	0.92
USA	—	26.26	28.22	11.33	(11.48)
USSR	—	3.12	6.06	5.71	7.02
CIPEC	—	11.79	4.26	2.15	(1.35)
CANADA	—	3.25	(9.48)	17.36	7.24
AUSTRALIA	—	19.38	14.32	13.56	21.57
Philippines	—	28.55	28.19	21.99	23.26

Country/area World (Thousand MT)	1972 7150	1973 7550	1974 7710	1975 7330	1976 7840
World	8.99	5.59	2.11	(4.92)	6.95
USA	9.37	3.19	(7.03)	(11.49)	13.60
USSR	4.04	2.91	—	3.77	2.72
CIPEC	6.84	2.75	7.72	(7.70)	9.45
CANADA	9.96	14.47	(0.30)	(10.66)	1.81
AUSTRALIA	(0.63)	15.59	24.15	(4.49)	(7.34)
Philippines	8.14	3.50	1.94	(0.13)	5.22

Source: United Nations Statistical Yearbook, 1977.

all the more highlight the phenomenal growth performance of the Philippine copper industry. (See Table 4, 5).

A better understanding of the development process may be served by examining the elements of growth and development in the industry. The main product of the copper industry is copper concentrate. In addition, gold as a byproduct or coproduct augments the income from

TABLE 5. — PHILIPPINE COPPER PRODUCTION, 1947-1977
(QTY. IN METRIC TONS; VALUE IN PESOS)

Year	Qty.	Annual growth Rate, %	Value
1947	3223		3,110,503
48	2043	(36.6)	2,057,796
49	6007	94.0	4,564,025
1950	10384	36.0	8,254,164
51	12712	22.4	14,987,533
52	13241	4.2	19,385,701
53	12715	(4.0)	14,901,911
54	14349	12.9	18,973,080
55	17461	21.7	29,795,396
56	26963	54.4	47,073,079
57	40382	49.8	46,871,332
58	47030	16.5	49,926,691
59	49521	5.3	61,159,989
1960	44010	(11.1)	59,067,192
61	51875	17.9	78,285,092
62	54728	5.5	116,691,887
63	68686	25.5	140,127,165
64	60458	(12.0)	145,552,255
65	62740	3.8	184,884,880
66	73758	17.6	316,995,759
67	86161	16.8	350,767,518
68	110275	28.0	469,639,126
69	131426	19.2	657,503,944
1970	160296	22.0	1,113,124,310
71	197415	23.1	1,233,494,170
72	213695	8.2	1,360,427,795
73	221195	3.5	2,296,188,666
74	225485	1.9	2,793,714,402
75	225775	0.0	1,640,032,606
76	237587.73	5.2	1,841,542,299
77	272791.73	14.8	1,927,152,803

Source: Bureau of Mines, Mineral News Service.

TABLE 6. — PHILIPPINE GOLD PRODUCTION
(TROY OZ.)

Year	Primary	Secondary	Total
1968	356299	171056	527355
1969	336590	234555	571145
1970	326778	275937	602715
1971	294071	345806	639877
1972	260894	345836	606730
1973	228136	344179	572315
1974	190032	347644	537676
1975	181889	320744	502633
1976	152424	348843	501267
1977	117107	441192	558299

(as a percentage of the total)

Year	Primary	Secondary	Total
1968	67.56	32.43	100.00
1969	58.93	41.06	100.00
1970	54.21	45.78	100.00
1971	45.95	54.04	100.00
1972	43.00	56.99	100.00
1973	39.86	60.13	100.00
1974	35.34	64.65	100.00
1975	36.18	63.81	100.00
1976	30.40	69.59	100.00
1977	20.97	79.02	100.00

Source: Bureau of Mines.

copper. Details about the historical development of copper and gold production are given in Tables 5 and 6. Due to porphyry copper mining, secondary gold production progressively evolved until in 1979 it represented about 80 percent of total gold production. (See Table 6). Lesser products of the industry are silver, molybdenite, pyrite and magnetite.

Over the years the proportion of copper production by porphyry mines increases from 35 percent in 1955, 92 percent in 1977 and to 93 percent in 1979. This reflects the growing competitiveness of the economics of porphyry over other types of copper deposits as the intricacies of finding, developing, mining, milling and beneficiating huge volumes of low grade ores are mastered. Table 2 indicates the increasing share of porphyry coppers in total national production.

If we examine the firms comprising the copper industry we will notice that 1) they increase in number as total output increases with

time and, 2) bigger and more profitable deposits were developed ahead of the lesser ones. The second observation is exactly what Ricardian economic theory predicts, meaning the industry has rigorously adhered to the tenets of economic rationality and efficiency, truly a tribute to the character and ability of the people who fostered its development. The first observation, that is, the growth in the number of firms and volume of production, reflects the persistence of favorable conditions — social, political, economic — and the increasing number of firms and people who succeed in mastering the art of copper mining. (See Table 1, 7).

Since the production of mines is determined by the volume of reserves, that is, those deposits for which considerable geological and

TABLE 7. — PORPHYRY COPPER FIRMS AND THEIR PHYSICAL PRODUCTION (IN METRIC TONS)

Total/Porphyry Companies	1955	1960	1965	1970	1975	1977
Atlas Consolidated	6101	15954	26876	43445	102098	127630
Philex Mining		3273	6663	16797	27107	33159
MMIC-Sipalay Copper Product		6936	10491	19778	24270	26314
Black Mountain				2344	3035	2889
Consolidated Mines				4984		
Marcopper Mining				33881	34476	47236
Baguio Gold Mining Co.					3514	4683
Western Minolco					8482	7837
BCI-Wildcat Copper Project					1698	798
Total Porphyry Cos.	6101	26163	44351	121229	204680	250546

Source: Bureau of Mines, Annual Reports.

TABLE 8. — QUANTITY OF COPPER ORE RESERVES AS OF DEC. 31, 1968, 1970-1977

Year	Quantity (in MT)	Average Grade, % Cu.
1968	347,903,230	0.857
1969		
1970	1,375,322,306	0.69
1971	1,684,998,800	0.636
1972	2,034,653,554	0.62
1973	2,294,141,132	0.596
1974	3,206,225,132	0.55
1975	3,518,324,306	0.55
1976	3,628,113,049	0.264-14.57
1977		

Source: Bureau of Mines.

engineering studies have been made, we now focus on their behavior. Table 8 indicates that since 1968 the volume of reserves systematically increased from 0.3 to 3.6 billion metric tons while the average grade declined from 0.8 percent copper in 1968 to 0.3 in 1977. This suggests that over the years there were enough economic incentives and perhaps increasing skills in finding new ores and that conditions warrant the exploitation of lower grade deposits. After examining the important elements of the growth and development of the copper industry, we then investigate the various factors that made the phenomenon possible.

2. Factors of Development

Development is not a chance process. If it is not the product of deliberate plan, at least it results in the convergence of a number of critical factors. For the development of the Philippine copper industry, we can posit the following hypothesis, that is, development Q depends upon factor endowment F; socio-political factors G; global economic environment E; and investments I. Symbolically,

$$Q = f\ (F, G, E, I)$$

This relationship implies that growth and development, partly measurable in terms of production, is the result of the interaction of the factors on the right side of the equation. We grant that these variables are extremely complex and are normally not amenable to measurement. At this stage, we can at best describe what each is about, and is able to do.

2a. Factor Endowment

A factor refers to a material or agent which provides valuable services in production. In connection with the copper industry two factors are of paramount importance, namely, the geological and the human endowment. The geological endowment refers to the sum total of physical conditions which made possible the localization and concentration of copper in the country. Thus, its location in the island arcs, its rocks and structures suitable to copper mineralization and all other related attributes comprise the geological, or more specifically, the natural copper endowment. Without the copper endowment, needless to say, no copper industry can be possible.

In contrast to the purely physical geological endowment, human endowment reflects the existence of a group of people and their environment with skills and dispositions suitable or adequate for doing a particular job well, in this case mining. It implies knowledge and experience. It reflects the fact that the Philippines already had considerable manpower suitable for developing the copper industry since the 1950's. We may note that since the 1930's there were already several

mining schools in the country and these were augmented by the establishment of geological schools later. Likewise, considerable experience in mining was gained in the country since the gold boom of the 1930's, and even earlier.

More significantly, the Philippine educational system provided a variety of training in various professions and related educational opportunities which were accessible to the people, not to mention the fact that Filipinos were already engaged in various aspects of business for a long time. By the 1950's and 1960's therefore, the country already had a stock of geologists, engineers, accountants, entrepreneurs and other professionals knowledgeable in mining. This human factor endowment is perhaps one of the most important pillars of the mining industry.

2b. **Socio-political**

Given the factor endowment, the next requisite for development is a well-defined scheme whereby the rules for acquiring and developing mineral lands as well as in producing minerals are clearly and unequivocally spelled out.

The basic principles upon which mineral development in the country has been based is the Regalian Doctrine which stipulates that all minerals belong to the State. For this reason the right to possess and develop a piece of mineral land can only be acquired through lease from the government for which certain taxes are imposed. Furthermore, only Philippine nationals or corporations of which at least 60 percent of ownership is controlled by nationals are allowed to acquire mineral lands. A special amendment to the constitution, however, conferred to American citizens the same rights as Filipino nationals in acquiring mineral properties. This special privilege, however, terminated in 1974.

Another fundamental principle relevant to mineral development is the operation of laissez faire in the economy in which private entities are permitted to participate in mineral development. An important corollary is the authority given to qualified foreign firms to exploit domestic mineral resources as the latter have the expertise and capital to develop them (at least during the early period).

To facilitate the management and development of the mineral industries, the Bureau of Mines was also created in 1936. Apart from administering mineral lands, the Bureau was also entrusted the task of conducting geologic mapping and similar works to be made available to interested parties. In fact, by the 1950's a monograph on copper, describing the location and characteristics of all known copper occurrences, was already published.

Cognizant of the need for incentives, the government provided a complex of tax exemptions, occasional subsidies, guarantees on repatriation of investments, profits and the like, to encourage participation of the private sector, both domestic and foreign.

In short, government policies during the period may be characterized as nationalistic, enlightened, and conducive to private sector participation in mineral development.

TABLE 9. — EXPENDITURES ON THE GROSS DOMESTIC PRODUCT IN PURCHASERS' VALUES AT CURRENT PRICES — JAPAN IN THOUSAND MILLION JAPANESE YEN

Year	GDP in Producers' Values	Annual Growth in %
1960	15,503	
1963	24,542	58.3
1965	32,052	30.6
1967	43,676	36.3
1968	51,570	18.5
1969	59,838	15.6
1970	70,868	18.4
1971	79,373	12.0
1972	90,603	14.1
1973	111,004	22.5
1974	132,486	19.4
1975	145,620	9.9

Source: U.N. Yearbook of National Accounts Statistics, 1976.

Note: Average annual compound growth rate, 1960-1975, is 16%.
Average annual compound growth rate in real terms for 1960-1970 is 11%.

2c. World Economic Environment

The mineral industry, being global in scope, is strongly influenced by developments in the world markets. Booms bring about increased demands, favorable prices and high profitability while recessions depress demands and prices. But a very important pre-requisite to mineral development, however, is access to market.

Events favorable to the development of the local copper industry occurred in the 1950's, 1960's and early 1970's. High copper prices, strong demand, accessible markets all converged to stimulate the domestic copper industry.

Post war reconstruction fostered intense economic activities particularly in Europe and Japan. Germany manifested a prodigeous growth in the 1950's and 1960's which was only surpassed by the phenomenal growth of the Japanese economy later. Unheard of sustained growth rates were registered in Japan (See Table 9). Superimsoped on the reconstructive activities were the Korean War of the 1950's and the Vietnam War of the 1960's and early 1970's. These factors created tightness in copper supply causing prices to rise at high levels, the economic signal for new investments (See Table 10).

Proximity of the Philippines to Japan, among other reasons, gave Philippine copper a comparative advantage over other producers in that

TABLE 10. — AVERAGE ANNUAL COPPER PRICES (CENTS PER POUND)

Year	Actual Price	Constant 1973 Dollar	Constant Price Index
1954	29.5	50.8	100
1955	37.3	63.3	125
1956	42.5	69.8	137
1957	30.1	47.6	94
1958	26.3	40.6	80
1959	30.7	46.6	92
1960	32.1	48.0	94
1961	30.0	44.2	87
1962	30.8	44.9	88
1963	30.8	44.3	87
1964	32.6	46.2	91
1965	35.4	49.3	97
1966	36.6	49.6	98
1967	38.6	50.7	100
1968	42.2	53.2	105
1969	47.9	57.6	113
1970	58.2	66.4	131
1971	52.0	56.8	112
1972	51.2	54.1	106
1973	59.5	59.4	117
1974	77.3	70.1	130

Source: H.J. Schroeder, 1975, "Copper", in U.S. Bureau of Mines, Mineral Facts and Problems.

market. On the other hand, American ownership of Philippine copper mines, in addition to the colonial ties between the two countries, made the U.S. market accessible too. Hence Japan and the U.S. were among the first buyers of Philippine copper. Efforts toward market diversification to avoid the risks and other dangers of excessive dependence on one or two buyers in the later years, however, have given the local industry access to markets outside Japan and the U.S. (See Table 11).

2.d. Investments

The relatively rich factor endowment, interacting with the favorable domestic conditions and stimulating world economic environment, gave rise to investments in the various stages of the mineral industry — in exploration, development, mining and milling. This made possible the growth in reserves and production noted earlier in this paper.

TABLE 11. — DESTINATION OF COPPER (METAL) EXPORTS-VOLUME
(PERCENTAGE OF TOTAL COPPER METAL EXPORTS)

Country	1976	1970	1975	1977
Copper (metal)	100.00	100.00	100.00	100.00
Japan	75.75	87.12	84.29	71.31
USA	27.24	12.87	5.83	5.49
China (Peking)			3.91	7.11
South Korea				4.67
Switzerland				1.80
Russia				1.91
Romania				2.02
West Germany				1.78
Yugoslavia				1.31
Sweden				1.38
Taiwan				0.70
North Korea				0.48
India			1.87	
Greece			2.75	

Source: Bureau of Mines, Mineral News Service.

MINING INVESTMENTS
APPROVED BY BOARD OF INVESTMENTS, 1968-1977
(IN THOUSAND PESOS)

Total	Filipino	Total Foreign	American	Chinese	Japanese
1481013	669747	811266	153599	10123	491955

Investments in the copper industry came from both local and foreign sources. Because Americans were accorded the privileges of Filipino nationals as regards mining, they were the dominant foreign investors in the country in the early years and controlled most of the principal mines. However, expiration of this special privilege in 1974 made them gradually relinquish control of mines to Filipino nationals and other foreign interests so that in 1968-1977 the top investors in order of decreasing importance were Filipinos, Japanese, Americans, Chinese and others, as the above table shows.

Sustained growth requires continuing investments. Hence the rapid growth in the copper industry was supported by steady flow of investments made possible from the high profits earned in the industry.

RETURNS TO EQUITY IN THE COPPER INDUSTRY

Year	%
1967	35.0
1968	43.2
1969	48.2
1970	51.9
1971	35.0

Source: Annual Report of Major Copper Mining Companies.

While return to equity in other industries were on the average, around 10 percent (chemicals, wood) of the copper firms had about 35 percent return on equity in a bad year and exceeding 50 percent in a good one. Consequently a 100 percent dividend in the industry was a common occurrence; one firm declared 800 percent stock dividends in a single year, another succeeded in enlarging its assets 190,000 times from ₱50,000.00 in 1950 to ₱950 million in 1979. Of course it is also true that for every successful mining company there are many which never reached the production stage. Obviously the failures never dented the charm of success as continuous growth of the industry implies.

The preceding discussion suggests that the growth and development of the Philippine copper industry from the 1950's thru the 1970's resulted from the superposition of favorable world market conditions upon a receptive domestic environment in which favorable physical and human factors reside. In short, the Philippines was ready to respond to the stimuli of development because of its existing stock of relevant skills and experience, established institutions, as well as workable and enlightened policies.

The favorable environment for development, therefore, was fashioned by man over many years because the industry was perceived as necessary and beneficial to society. It is appropriate now to inquire into the benefits that society derives from the industry.

CONTRIBUTION TO NATIONAL ECONOMIC GROWTH AND DEVELOPMENT

Although the mineral industry is not a necessity for national development, it can be used as a springboard to shorten the period of transition from underdeveloped to developed stage (McDivitt, 1976). While a developing country is characterized by scarcity of capital, mineral deposits are capital which can be transformed into renewable assets. Authorities (e.g., McDivitt, 1976) enumerate the potential contribution of the mineral industries in the form of, among others: 1) infrastructure; 2) manpower training; 3) an environment conductive to development; and 4) financial contributions, like foreign exchange, taxes and royalties. Subsequent discussions will focus mainly on the fourth because it is only here where considerable information exists.

1. Contribution to Infrastructure

Among mining people, it is common knowledge that before a major mine is put into operation, substantial investments in roads, railways, ports, schools, hospitals, communication facilities and the like are made. These are facilities which benefit not only the people in the mines but also those in the vicinity. If the location and construction of these facilities are harmonized with the social and economic development plans of the government in a region, they can serve as centers of development. Anyway, these infrastructures are among the elements needed for development.

2. Manpower Training

Since a characteristic of underdeveloped countries is scarcity of skilled labor, a mining firm contributes to national development every time it trains a technician, an engineer, or a manager in the intricacies of the mining business. The contribution is enhanced if some of the trained personnel seek employment elsewhere with their newly acquired experience and skills.

3. Environment Conducive to Development

Due to the magnitude of investments in mining, firms usually employ the methodologies of science in management, and in various operations. Every activity in the mine is a demonstration of some scientific experiment. People or communities exposed to this experience learn to value scientific procedures and methods and become receptive of progressive or nontraditional ideas. Indeed, this particular contribution is very amorphous but intuitively potent.

4. Financial Contributions

The mineral industry is however more noted for its financial contributions to economic and social growth and development, particular in the form of a) foreign exchange earnings, b) taxes paid to the government, c) employment, d) contribution to national product, and e) domestic purchases.

4.a. Foreign Exchange Earnings

Since a developing country has a limited stock of capital and skilled manpower, it has to secure them abroad. Hence, it needs hard currency to pay for them. As a principal earner of foreign currency, the copper industry therefore helps fuel the country's growth and development thrust. Table 12 shows the historical evolution of the copper industry's contribution to the total dollar earnings from exports which rose from less than one percent in the 1950s to more than 17 percent in the early 1970s. This indicates that growth in the copper industry has made possible the increased contribution to foreign exchange earnings.

TABLE 12. — VALUE OF TOTAL EXPORTS & COPPER EXPORTS, 1949-1976 (FOR VALUE IN THOUSAND U.S. DOLLARS)

Year	Total Exports	Copper	% of Total
1949	247854	2478	0.99
1950	331035	1730	0.52
1951	427447	1593	0.37
1952	345727	4227	1.22
1953	398252	3269	0.82
1954	400504	5030	1.25
1955	400649	7391	1.84
1956	453179	13595	2.99
1957	431062	15365	3.56
1958	492758	16809	3.41
1959	529493	21932	4.14
1960	560389	29589	5.28
1961	499512	27355	5.47
1962	556021	28600	5.14
1963	727106	41338	5.68
1964	742036	34263	4.61
1965	768448	46518	6.05
1966	828195	74635	9.01
1967	821456	74924	9.12
1968	857715	89249	10.40
1969	854601	132810	15.54
1970	1061702	185190	17.44
1971	1136431	185135	16.29
1972	1105538	190867	17.26
1973	1891188	290281	15.34
1974	2724989	393184	14.42
1975	2294470	212081	9.24
1976	2573676	265879	10.33

Source: CB 1949-1970
NCSO 1970-1976

Some economists rightly object that the magnitude of mineral sales in dollars does not reflect the industry's true contribution to the dollar reserves of the country since if the expenditures to earn a dollar is large then the actual contribution may be nil. A recent study of the cost of earning a dollar in the copper smelting industry showed that every dollar of sales required an expenditure of ₱3.31, very much smaller than even the prevailing official exchange rate of ₱7.40 per dollar (Abarquez, et al., 1979). This shows that the copper industry is an efficient dollar earner.

TABLE 13. — TAXES PAID BY THE COPPER INDUSTRY 1967-1976
(IN PESOS)

Year	Taxes Paid at current prices	Growth Rate (in %)	Deflated taxes paid	Growth Rate (in %)	Present Value of taxes paid at current prices	Present Value of deflated taxes paid
1967	33,527,000		50,492,469		86,960,398	130,964,450
1968	49,625,000	48.0	72,977,941	44.5	117,013,140	172,078,160
1969	77,731,000	56.6	112,165,940	53.7	166,623,394	240,437,780
1970	238,184,000	206.4	301,498,730	168.8	464,153,230	366,682,180
1971	247,640,000	4.0	272,431,240	(-9.6)	438,709,360	482,628,550
1972	313,757,000	26.7	313,757,000	15.2	505,308,780	505,308,780
1973	426,841,000	36.0	374,421,920	19.3	624,937,900	548,191,130
1974	629,267,000	42.4	413,447,430	10.4	837,554,370	550,298,520
1975	159,575,000	(-74.6)	96,947,144	(-76.6)	193,085,750	117,306,040
1976	238,842,000	49.7	136,637,290	40.9	262,726,200	150,301,010
TOTAL	₱2,414,989,000		₱2,144,777,104		₱3,697,072,522	₱3,264,196,600

Source: Annual Reports or Major Copper Producing Firms.

4.b. Contribution to Government Revenues

As government operations expand, and become more complex, its financial requirements also escalate. Taxes paid to the government cover the costs of public services and of various infrastructural and other development projects. Over the years the taxes paid by the copper industry has been growing (See Table 13). During 1967-1976 the industry paid more than ₱2.4 billion pesos at current prices with a present value of more than ₱3.6 billion (Gonzales, S. 1979).

4.c. Contribution to Employment

For a developing country like the Philippines, one of the most important problems faced by the government is the provision of job

TABLE 14. — NUMBER OF DIRECT EMPLOYEES IN MAJOR PORPHYRY COPPER MINES

Year	Number
1967	8180
1968	8482
1969	11325
1970	17795
1971	19416
1972	19853
1973	35394
1974	29589
1975	21265
1976	24840

Source: Annual Reports of the Major Porphyry Copper Producing Firms.

TABLE 15. — INDEX OF AVERAGE MONTHLY EARNINGS OF SALARIED EMPLOYEES AND WAGE EARNERS IN THE PHILIPPINES BY INDUSTRY DIVISION AND CONSUMER PRICE INDEX
(1972=100)

Year	All Workers		Mining & Quarrying		Consumer price index
	salaried	wage earners	salaried	wage earners	
1957	53.01	50.28	54.76	40.87	40.52
1960	62.70	56.02	74.74	48.96	44.11
1965	70.62	63.73	83.61	59.41	57.67
1970	86.86	88.81	87.04	81.99	75.83
1971	93.43	91.20	95.48	92.57	92.30
1972	100	100	100	100	100
1973	110.10	101.9	107.9	124.10	116.60
1974	121	111.9	105.1	141.2	156.30
1975	135.70	125.30	123.90	160.60	166.90
1976	151.60	143.80	125.60	157.90	182.30

Source: NEDA Statistical Yearbook.

opportunities to its labor force. Unemployment implies foregone production, wealth lost by default or unharnessed development energy.

The copper industry contributes considerably to national employment which increased from 8200 in 1967 to 24800 in 1976 as shown in Table 14. Compared to workers in other sectors, wages in the mineral industries have been generally higher since 1970, though a bit lower earlier (See Table 15).

Some critics of the industry who are obsessed with job creation and income distribution consider its contribution to employment rather small in proportion to total assets and therefore does not contribute enough to national development. This view is at best simplistic, narrow-minded and may be injurious to the country's development for it presumes development to be merely unidimensional and negates the most valuable contributions of the industry.

Granting the inherent capital intensiveness of the industry, its contribution to employment is greater than the number of names in its payroll. Studies abroad (Ta, Li, 1979) indicate that for every job in the mining industry one to ten jobs may be created somewhere in the economy. Of course, this cannot be appreciated here because the industry does not collect and disseminate the pertinent information.

4.d. Contribution to National Product

National product refers to the value of goods and services produced by a society in a given period, measured usually as gross domestic product, GDP. Contribution of the entire mineral industry is about 2.0 percent of the total GDP of which 50-70 percent was derived from copper. The value-added measure of production omits the costs of materials and services from the market value of output (See Table 16).

TABLE 16. — GROSS VALUE-ADDED IN THE MINING INDUSTRY (IN MILLION PESOS AT CURRENT PRICES)

Year	Total Mining & Quarrying	Copper Mining	% of Total
1967	436	262	60.09
1968	539	355	65.86
1969	729	520	71.33
1970	1181	520	77.13
1971	1187	911	78.18
1972	1346	928	75.11
1973	2407	1011	79.47
1974	3097	1913	77.23
1975	2000	2392	51.30
1976	2128	1026	53.05
1977	2643	1129	45.13

Source: NEDA Statistical Yearbook, 1978.

Although the present contribution to national product is substantial though by no means impressive, the copper industry could have done better. Experience of other countries indicates that if processing of minerals is carried to smelting and refining, the contribution to GDP may rise by a factor of 10 and may even increase by a factor of 100 if the refined metals are fabricated (McCaskill, 1976).

It is sad to say that while other developing countries — Chile, Zambia, Zaire and Peru — smelt and refine their copper, the local industry has been contented as a supplier of concentrates. The return on investments of processing concentrates is perhaps lower compared to mining, but the social returns in terms of employment, taxes, foreign exchange earnings, industrialization — in short, in terms of growth and development — is indeed very high. The plan to put up a copper smelter locally is indeed wise, though belated. Certainly, realization of the proposed copper fabricating plant, in addition, will go a long way towards rationalizing the copper industry and increasing its contribution to industrial development.

4.e. Domestic Purchases

Further contribution of the industry to development takes the form of purchases of domestic goods. The demand of the industry for a commodity proportionally expands production capacity through investment which generates jobs, profits, taxes and other social returns. Unfortunately, information about this subject is non-existent.

As an exercise, we can produce a long list of benefits that the industry generates for the Filipino society. But one can also produce a list of adverse effects. Finally, it must be admitted that though on balance the benefits outweigh the costs, the industry could have contributed much more to development. But in the ultimate analysis the most important lesson we can draw is that the environment — social, political and legal — in which the industry operates is shaped by society's valuation of its contribution. This environment will change and will determine in which direction the industry can go.

CONCLUSIONS

In explaining the rapid growth of the copper industry since the 1950's, this paper identified a number of factors which existed in the country, the more important being the schools which gave instructions in disciplines directly or indirectly related to mining; previous experience in various aspects of the mineral and other related industries; enlightened government policies which encouraged participation of the private sectors including foreign capital; and institutions for the development and management of the mineral industry. Because of these factors, when favorable world market conditions occurred, the country was therefore

ready and able to translate them in terms of sustained investments which resulted in the phenomenal growth of copper production.

Finally, it is pointed out that the industry plays an important role in national growth and development, mainly as earner of hard currencies to buy the necessary goods and services abroad which are needed to develop the country. Furthermore, the industry also pays considerable taxes, provides employment, and adds to the country's physical and social infrastructure and to the pool of skilled manpower. The industry has made other contributions which are perhaps more valuable but difficult to evaluate because information about them do not exist now. In effect, society propelled the copper industry to its phenomenal growth to amplify these benefits.

Though the performance of the industry appears impressive it could have done better by undertaking certain tasks which may not be as lucrative as mining, but which could bring about large social dividends. It could have coordinated with the government in developing the mining sites and their environs as rural growth centers by integrating its infrastructure projects, manpower training and similar activities with those of the government. It could have gone into smelting and refining of concentrates and achieved necessary forward linkages thereby generating additional industries, more jobs and foreign exchange.

In any event, the environment in which the industry operates will evolve as it did earlier, depending on society's assessment of its value. To the extent that the industry is responsive to the changing needs of society, it will be nurtured and protected. Need I say more?

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POPULATION FACTS: AT A GLANCE*

DEMOGRAPHIC TRENDS

. The total population of the world in 1981 is estimated at 4,510 million. Of this 3,371 million or 74.7 per cent live in the developing countries.

. Historically, from the origin of mankind to the end of the 18th century, world population reached only one billion. The second billion followed in a little more than a century, between 1800 and 1925, and the third and fourth billions in the half century between 1925 and 1975.

. The world population is currently growing at 1.70 per cent per year or a "doubling time" of 41 years. The developing countries are growing at a much faster rate — at 2.04 per cent — a doubling time of 35 years.

. While in 1950 there were only four countries with populations exceeding 100 million, the number of such countries is expected to increase to eleven by the year 2000 (China, India, U.S.S.R., U.S.A., Indonesia, Brazil, Bangladesh, Pakistan, Nigeria, Mexico and Japan).

. In any country, the numbers of births, deaths and migrants determine the growth of population. The momentum in these demographic processes is called respectively fertility rate, mortality rate and migration rate. The nature of the world population in the future is also conditioned by future global trends in these three rates.

. The level of fertility, as measured by the crude birth rate, varies from country to country. It exceeds 50 per 1000 population in some countries including Malawi, Mauritania, and Niger. A crude birth rate over 45 is quite common in 28 countries of Africa, and seven countries in South and Southwest Asia. By contrast, the crude birth rate in developed countries is quite low, in the range of 10 to 17.

. The level of mortality, as measured by the crude death rate, also varies widely but within a narrower range. The crude death rate is the lowest in Fiji with 4.2 and is the highest in Ethiopia with 23.1. Most developed countries have presently crude death rates in 8 to 13 range.

. The mortality gap between developed and developing countries, as measured by average expectation of life at birth, is very wide: The levels of life expectancy are uniformly high in the developed countries around

* Reprinted from a publication of the United Nations Fund for Population Activities, 220 East 42nd Street, New York 10017, dated 30 November 1981.

72 years; the levels are much lower in developing countries around 57 years with Central Africa having the lowest level of life expectancy with 41.6 years.

· Wide differences in the levels of crude birth and death rates between developed and developing countries are responsible for the large differential in the growth rate of population between the two regions — 0.71 per cent in developed countries and 2.09 per cent in developing countries.

· Prospects for population growth appear to be undergoing rapid change, both in terms of magnitude and major causal determinants. World population seems to have begun to grow less rapidly. The annual rate of growth has declined from a high 1.94 per cent during 1965-70 to 1.73 during 1975-80. The current rate of growth is estimated to be 1.70 and it is projected that the annual growth will reach 1.50 per cent just before the end of this century. Acceleration, a feature of the last several centuries, seems to have given way to deceleration, that is, a decline of fertility in a large number of developing countries. This should not, in any case, lead to a sense of complacency in international population dynamics. While there is a trend towards moderation in the rate of world population growth, there is no lessening of the mass of annual increments in absolute numbers.

· Despite the current and projected declines in fertliity, the world will be adding another 1.6 billion people by the year 2000. The projected world population of 6.1 billion for the year 2000 will continue to grow in the twenty-first century and is expected to reach 8.1 billion in 2025.

. The medium variant projections of the United Nations that the world population may stabilize at 10.5 billion in the year 2110. This would imply that the world population will continue to grow for the next 130 years even though the fertility rate will be declining. This phenomenon of population growth in the face of fertility decline is primarily due to the demographic inertia built into the population structures in most of the developing countries.

· According to the United Nations projections, the fertility level in the developing countries is projected to attain replacement level in the year 2040. However, the population in those countries will cease to grow or become stabilized only in 2110, that is, after a 70-year time lag.

GLOBAL POPULATION ISSUES

· The perception of governments of developing countries of their population problems has undergone a dramatic change since the late 1960s.

· In the early 1950s, there was only one country, India, which had recognized the importance of a population policy as an integral part of its development plan.

. In the past few years, there has been a sharpened awareness of the linkage between population, resource use and environmental deterioration, and the relationship of all of these to development itself. This awareness was highlighted by the World Population Plan of Action, adopted at the World Population Conference in Bucharest in 1974 and encouraged and reinforced by international assistance. Now, the governments of almost all countries recognize the importance of population factors in their development planning.

. This concept was further recognized by the community of nations in the International Development Strategy for the Third Development Decade, adopted by the United Nations General Assembly in December 1980, which calls upon all countries to continue to strengthen their implementation of the recommendations of the World Population Plan of Action and points out that "population policies will be considered as an integral part of over-all development policies" and that "all countries will continue to integrate their population measures and programmes into their social and economic goals and strategies."

· As global consciousness of population has increased, so has the conceptualization of population programmes sharpened. For example, the results of the Population Enquiry of the United Nations, based on the latest responses from developing countries, indicate that 44 per cent of those countries consider that their high rate of natural increase is a hindrance to development; over 80 per cent of them consider their level of mortality, as measured by life expectancy at birth, quite unacceptable; in an overwhelming majority of countries, over 90 per cent access to family planning is permitted and in about 70 per cent of them there is direct government support to family planning activities; and finally, in 60 per cent of developing countries, the current patterns of spatial distribution of population are considered quite imbalanced.

· The current rates of fertility are considered too high in a very large number of countries. Almost 80 per cent of the total population of developing countries reside in countries which consider their levels of fertility too high and would like them reduced. By contrast, only about three per cent of the population of developing countries would like their fertility rates increased.

· There has been a general deceleration in the decline of mortality in the less developed countries. Both living standards and the availability of public health measures and medical facilities are responsible for mortality declines.

· Fertility is declining in several developing countries. An analysis of 26 developing countries by the United Nations indicates that substantial declines of birth rates in those countries are attributable to decreasing fertility because of a number of social and economic factors as well as the availability of family planning information and services.

· Rapid urbanization in the developing countries will increasingly become a serious problem. Latest estimates by the United Nations suggest that world urban population has doubled since mid-century and may well double again before the century is over. Urbanization in the developing countries has caused the emergence of very large cities. In 1950 there were seven such agglomerations, with five million inhabitants each. At present, there are 29, 19 of which are in developing countries. The projections indicate that there may be 59 agglomeration by the end of the century with 47 of them in the developing countries.

· Distribution of population and movement of people within countries and across national boundaries are assuming a major significance. The rural exodus to cities, migration of population from small-to-medium cities to very large cities and the high rate of natural increase in urban areas are essential elements in the maldistribution of population in developing countries.

· International migration of workers across national boundaries has acquired a new character in the 1970s. Such labour movements have involved all the major continents and have been between Latin America and North America, within Europe, and into Europe, and the oil exporting nations from North Africa and Asia. A combination of "pull" factors abroad and "push" factors at home has made the developing countries seek out economic opportunities across their national boundaries. These trends are likely to continue well into the future, portending a new wave in international labour migration. Given the somewhat unique set of factors influencing these migration trends, problems of economic and cultural assimilation of these migrants at destination have become more difficult.

· A population issue that is already important in developed countries and is likely to become significant in developing countries is the ageing of human population. As a consequence of declining fertility and mortality, the average age of population has been on the increase for some time in the developed countries. One of the important manifestations of this trend is the accelerated growth of population which is "older", that is, 65 and over. The current estimate of "older" population is put at roughly 128 million people or over 11 per cent of the total population in the developed countries. While only a four per cent of the population of developing countries is similarly aged, the absolute number of older persons is already higher (132 million) in the latter. Between 1980 and the year 2000, the developing countries are expected to experience an 80 per cent increase in the number of older people in their population as against only a 30 per cent increase in the developed countries. This rise in the absolute size of the older populations augurs a predictable increase in social concern for the medical, housing economic and social services' problems of the aged in both developed and developing countries.

. A preliminary analysis of World Fertility Survey (WFS) data from twenty-one developing countries indicates that the level of completed family size, as measured by average number of children ever born among women close to the end of childbearing, is uniformly high and ranges between 5.2 children in Indonesia and 8.6 children in Jordan. While these data are highly illustrative of the past levels of fertility, they do not throw much light on the current norms of fertility.

. Data on the "desired fertility" from the same countries show that couples in most of these countries wish to have around 4 to 5 children. The average desired family size varies between 3.0 in Turkey to 6.8 in Kenya. Generally, high fertility is associated with low levels of contraceptive practice and vice versa. Such a relationship is quite pronounced in WFS data sets also. For instance, the per cent of "exposed" women currently using any contraceptive method is very low, under twenty per cent, in Bangladesh, Kenya, Nepal and Pakistan; the percentage is moderately high, between 20 and 50, in Dominican Republic, Guyana, Indonesia, Jamaica, Jordan, Republic of Korea, Malaysia, Mexico, Peru, Philippines, Sri Lanka and Thailand; and the extent of contraceptive practice is comparatively quite high, over 50 per cent, only in Colombia, Costa Rica, Fiji, Panama and Turkey. The total fertility rate, an index of current fertility, is the highest (6.7) in the first group, is moderately high (5.1) in the second group and relatively low (4.2) in the third group, confirming the inverse relationship between the level of fertility and the prevalence of contraceptive practice.

· The same analysis indicates that there is an enormous gap between the need for contraception and the actual practice of contraception in most developing countries. The level of contraceptive practice is found to be very low even among those couples not desiring any additional children. The percentage is less than 30 per cent in four countries and is less than 60 per cent in over a dozen countries (Bangladesh, Colombia, Guyana, Indonesia, Jamaica, Jordan, Kenya, Republic of Korea, Mexico, Pakistan, Peru, Philippines and Sri Lanka). This illustrates the high proportions of couples in developing countries who are in immediate need of information and family planning services.

· There are presently 784 million women in the childbearing ages in the developing countries and roughly 574 million of them are "married". The findings of the World Fertility Survey in twenty developing countries indicate that, on the average, nearly 26 per cent of married women are practising some method of contraception. If this average rate is assumed to be valid for all the developing countries, then, it can be estimated that about 425 million women are in need of family planning information and services. Given that contraceptive practice is even lower in many populous countries, it can be concluded that perhaps the quantum need for family planning is in excess of 500 million as recently pointed out by the IPPF.

MULTILATERAL EFFORTS

· Established by the Secretary-General in 1967 as a Trust Fund for Population Activities, the United Nations Fund for Population Activities became operational in 1969.

· An organ of the United Nations General Assembly, UNFPA has been guided by three basic concepts: 1) neutrality — UNFPA does not prescribe any particular approach or solution to population problems but provides assistance in those areas to which developing countries themselves attach importance and for which they request assistance; 2) flexibility — UNFPA is flexible in the types of assistance it provides as well as in the kinds of activities it undertakes; and 3) innovation — UNFPA has adopted new approaches to programming and programme execution in order to respond more efficiently and effectively to requests for assistance.

· UNFPA's mandate, which was laid down by the Economic and Social Council in 1973, outlines the following goals:

1) to build up the knowledge and capacity to respond to national, regional, interregional, and global needs in the population and family planning fields;

2) to promote co-ordination in planning and programming and to co-operate with all concerned;

3) to promote awareness of the social, economic and environmental implications of population problems and possible strategies to deal with them in accordance with the plans and priorities of each country;

4) to promote awareness of the human rights aspects of family planning;

5) to extend assistance to developing countries at their request so that they can deal with their population problems; and

6) to co-ordinate projects supported by the Fund.

· The first few years of the Fund's work were devoted to the creation of awareness of the importance of population factors in development and to building up the capacity of the United Nations organizations to deliver population to countries in need at their request.

· The principles on which its programme of activities is based are: a) To promote population activities proposed in international strategies, particularly the World Population Plan of Action adopted by consensus at the World Population Conference held in Bucharest in 1974; b) To meet the needs of developing countries which have the most urgent need for assistance in the area of population activities, in view of their population problems; c) To respect the sovereign right of each nation to

formulate, promote and implement its own population policies; and d) To give special attention to meeting the needs of disadvantaged population groups.

. Much of the Fund's assistance to developing countries is in eight main or "core" areas: 1) Basic Data Collection — population censuses, vital statistics registration, surveys; 2) Population Dynamics — analysis of demographic data, demographic projections, determinants and consequences of population trends, interaction of demographic and socio-economic variables, including modelling; 3) Formulation of Population Policies and Programmes — policy formulation, evaluation of policies, integration of demographic factors into social and economic plans; 4) Implementation of Policies and Programmes — implementation of "beyond family planning" programmes: law and population, status of women, economic policies, programmes to influence demographic trends: morbidity and mortality, internal and international migration, sterility; 5) Family Planning — delivery systems, programme management, fertility regulation techniques; 6) Communication and Education — communication for family planning motivation, population education in schools, out-of-school programmes; 7) Special Programmes — women, children and youth, aged, programmes to promote social justice and social welfare through participation in development, disadvantaged: the poorest of the poor, the handicapped; 8) Multisector Activities — population conferences, documentation centres, clearing houses, interdisciplinary training.

· At end of 1980, UNFPA was assisting 1,831 projects: 1,317 country, 212 regional (45, Africa; 77, Asia and the Pacific; 50, Latin America and the Caribbean; 40, Middle East, Mediterranean and Europe); 107 interregional, 195 global. At the end of 1980, 1,135 projects had been completed.

· Percentage allocations by major function were: 1) basic data collection, 19.2 per cent; 2) population dynamics, 11.4 per cent; 3) formulation and evaluation of population policies, 5.0 per cent; 4) implementation of policies, 1.0 per cent; 5) family planning programmes, 41.7 per cent; 6) communication and education, 11.6 per cent; 7) special programmes (women, youth, etc.), 1.6 per cent; 8) multisector activities, 8.5 per cent.

· Percentage allocations by geographical area, including regional activities, were: Africa, 14.2 per cent; Asia and the Pacific, 37.1 per cent; Latin America and the Caribbean, 17.8 per cent; and Middle East, Mediterranean and Europe, 12.0 per cent. Interregional and global activities accounted for 18.9 per cent of total programme allocations in 1980.

· The UNFPA relies on the expertise and technical capability of other United Nations agencies, academic institutions, non-governmental organizations or the governments of developing countries themselves to

execute its assistance programmes, that is, the United Nations Department of Technical Co-operation to assist population censuses, the World Health Organization to implement family planning projects within health service programmes, and so on.

· During its twelve years of operatonis, the UNFPA has become the largest source of multilateral population assistance. More than a quarter of total global population aid to developing countries, currently estimated at over $500 million, is channeled through it annually.

· At the end of 1980, cumulative contributions from both developing and developed countries totalled $726 million.

· Project allocations in 1980 totalled $150.5 million.

· Administrative costs for the UNFPA are the lowest within the United Nations family of agencies. In 1980, they were 8.9 per cent of total income. The percentage of women on UNFPA's professional staff was 36 per cent in 1980, one of the highest percentages among all United Nations agencies and organizations.

· UNFPA has designated 40 countries as priority countries for population assistance, and a goal of two-thirds of total programme resources available to UNFPA for population activities at the country level has been established for assistance to these countries as a group.

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COST OF BACK ISSUES

Back Issues of the Philippine Geographical Journal that are still available may be purchased from our office by paying additional costs, as follows:

YEARS PUBLISHED	Additional Cost per copy*
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This is added to the price of US$2.50 per copy beginning with Vol. 27 No. 1 issue (Jan.-March) 1983. Mailing expenses are not included in the above price list.

AN APPRECIATION

by

FELICIANO M. LAPID

The Philippine Geographical Society (PGS) heartily welcomes the announcement in the media that "a Filipino geologist was named winner Saturday (7 Aug. '82) of the 1982 Ramon Magsaysay Award for Government Service for his work in developing geothermal power in the Philippines."

The announcement further stated that the award's board of trustees recognized Arturo P. Alcaraz, 66 "for his scientific perspicacity and selfless perseverance in guiding Filipinos to understand and use of their greatest natural resources."

For more relevant information on the subject I took the liberty of taking excerpts from the write-up on Arturo Pineda Alcaraz, printed on the invitation sheet from the Board of Trustees of the Ramon Magsaysay Award Foundation, to an Informal Group Discussion on "The Potentials of Geothermal Energy for the Country's Electrical Power and Subsidiary Uses" to be led by the awardee on Friday, September 3, 1982 at 9:30 AM at the Ramon Magsaysay Center, Roxas Blvd., Manila as follows:

> "Geothermal power is the largest source economically and technically feasible energy now available on our planet. It derives from the molten mass filling the inner core of the earth where the surface on which we live forms a relatively thin crust. Problems with geothermal sources of energy are that technology for their use is new and little known and they are accessible only in "hot spots". With these the Philippine archipelago is well endowed, located as it is on the "Pacific Ring of Fire". When accurately understood and wisely used this immense arc of tectonic and volcanic activity that girdles the Pacific Ocean and has been feared for its earthquake and eruptions can become a major benefit.
>
> The first industrial harnessing of steam from the earth began in northern Italy more than half a century ago. The largest geothermal installation today is at the Geysers in California where rarely available dry steam readily lends itself to conventional generating of more than enough electric power for San Francisco. However, most of the geothermal energy available in the Philippines and elsewhere is wet steam — 70 per cent of production from a well may be very hot water — and this demands a different and more difficult technology.

Arturo Alcaraz was born in Manila in 1916 and grew up in Baguio where his father was city auditor during the gold mining boom. From the University of the Philippines, Alcaraz transfered to Mapua Institute of Technology when it offered the first degree in mining engineering. He earned a masters degree in geology at the University of Wisconsin and returned home in 1941 to be assigned by the Bureau of Mines to Palawan. Next posted to the Weather Bureau, its then director, Maximo Lachica, started him in seismology.

In 1952 the Philippine Congress responded to destructive eruptions of Mount Hibok Hibok on Camiguin Island with creation of the Commission on Volcanology. As chairman, Alcaraz could pursue more fully study of volcanoes both for warning and use. The first electric bulb in the Philippines lit by earth-heat energy was in Tiwi, Albay on April 12, 1967. Three years after President Ferdinand Marcos set apart a geothermal reservation administered by the National Power Corporation which, in cooperation with Philippine Geothermal, Inc., a subsidiary of Union Oil Company of California, has since brought on stream 440 megawatts of power at Tiwi and Macban near Los Baños. Meanwhile cooperating with New Zealand and other specialists, major geothermal energy fields in Leyte, and Negros are under development by the Philippine National Oil Compnay — Energy Corporation. This provides the Philippines a present total geothermal electric energy production of 446 megawatts — now the largest in the world from wet steam — scheduled to be multiplied six times in the next seven years, thus saving oil imports.

The Philippines may have a potential to generate 200,000 megawatts of geothermal electric power at a competitive capital about 40 times present total power generation. Added to electricity from the energy source are possibilities for refrigeration, drying, and salt making. Retired in March 1981 at age 65, Alcaraz continues as a consultant to the Ministry of Energy, training a new generation of Filipino technicians in Iceland and elsewhere to tap earth energy."

PGS has many reasons to be happy because the awardee is a Founding Member of the Society, a Life Member, former Director (1969-80), and in its 30th anniversary in December 1980, he was one of the four members awarded the title of Fellow, Philippine Geographical Society, or FPGS. Furthermore, Fellow-Awardee Alcaraz, in our view, exemplifies the personality of an outstanding geographer for he continuously and vigorously espouses the objectives of the Society, which incidentally, advocate interest in geographic education, and research, as well as encourage the proper application of geographic knowledge for the national development which in the end leads to the betterment of the quality of life.

We of the PGS congratulate our colleague Prof. Arturo P. Alcaraz for his signal honor. This brings high esteem to himself and his family, inspirations to his associates, and an added fame to his country.

MEMBERS FORUM

c/o College of Engineering
Technological Institute of the Phils.
888 Gonzalo Puyat Street
Quiapo, Manila

1 June 1982

The Editorial Staff
Philippine Geographical Journal
P.O. Box 2116, Manila

Sirs:

We heard that Prof. Dominador Z. Rosell, Editor-in-Chief and Business Manager of the Philippine Geographical Journal (PGJ), doesn't report to office since his confinement at the Medical Center of Manila, sometime in January 1982. Now, that he is also the President of the Philippine Geographical Society (PGS), may we know how the Journal and the Society are functioning?

Thank you.

Very truly yours,

(Sgd.) CARMEN P. LAYOS
Member
Philippine Geographical Scciety

——oOo——

14 June 1982

Mrs. Carmen P. Layos
Member, Phil. Geographical Society
c/o College of Engineering
Technological Institute of the Phils.
Manila

Dear Mrs. Layos:

The Editorial Staff of the Philippine Geographical Journal and the Council of the Philippine Geographical Society are happy to receive your kind letter dated 1 June 1982.

It is true that up to this writing, Prof. Rosell has not as yet normally reported to office. In response to your query, we have our energetic and experienced man in the name of Mr. Feliciano M. Lapid. He is our Society's Director and Assistant Business Manager of the Journal. He handles the business operations in the absence of Prof. Rosell.

Likewise, I am happy to inform you that though Prof. Rosell is not reporting normally to office, he also gives instruction to the staff. So, we have nothing to worry in this regard.

Very truly yours,

(Sgd.) DOROTEA M. CORPUZ
Secretary

SEMINAR — WORKSHOP II

The Philippine Geographical Society, the Philippine Social Science Council and the National Committee on Geographical Sciences, NRCP will jointly hold a seminar- workshop, entilted "Map Reading and Map Making, Part II" on October 27, 28 and 29, 1982. The seminar participants are social science elementary school teachers and supervisors coming from Metro Manila. To provide them new or relevant knowledge and skills on geographical matters and also encourage appreciation and utilization of maps to greater advantage in imparting knowledge to their students and pupils.

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"Books are the greatest inheritance of the new generations. They preserve the wisdom and beauty of the race, and carry it as a living, ever-growing stream. No man can claim education who does not read constantly. Anyone may educate himself whether he has ever been to school and college or not — by wise reading."

—*Edwin R. Embree*

ANNOUNCEMENT

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Thank you very much for your cooperation and continued patronage.

THE MANAGEMENT

ACKNOWLEDGMENT

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