



# PHILIPPINE GEOGRAPHICAL JOURNAL

VOL. XXVIII

JANUARY-JUNE, 1984

NUMBERS 1 &amp; 2

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PUBLISHED QUARTERLY BY

The PHILIPPINE GEOGRAPHICAL SOCIETY  
And The NATIONAL COMMITTEE  
ON GEOGRAPHICAL SCIENCES, NRCP  
MANILA, PHILIPPINES

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The *Philippine Geographical Journal* is published quarterly by the Philippine Geographical Society and the National Committee on Geographical Sciences (NCGS), National Research Council of the Philippines (NRCP) and is sent to all members of the Society.

Subscription Rates: Philippines, per year — — — P14.00  
Foreign countries, per year — US\$14.00  
Single copy, regular issue, local — P3.50; foreign — US\$ 3.50  
special issue, local — P5.00; foreign — US\$ 5.00

All remittances should be payable to the *Philippine Geographical Journal*.

Editorial correspondence should be addressed to The Editor-in-Chief, *Philippine Geographical Journal*, P.O. Box 2116, Manila, Philippines.

Business correspondence should be addressed to the Business Manager, *Philippine Geographical Journal*, P.O. Box 2116, Manila, Philippines.

Re-entered as second-class mail permit at the Manila Post Office on July 5, 1963.

*The*  
**PHILIPPINE GEOGRAPHICAL JOURNAL**  
VOLUME XXVIII      January-June, 1984      NOS. 1 & 2

**AN ANALYSIS OF THE PHILOSOPHY OF THE  
PHILIPPINE ENERGY POLICY<sup>1</sup>**

by

TEODORO M. SANTOS<sup>2</sup>

In preparing my paper for the UP Diamond Jubilee, I searched hard my thoughts in addressing the questions: What kind of subject matter or approach befits the dignity of the occasion? How do I make my work unique to the university milieu? Then I recall that academicians of the university differ from their action oriented counter-parts in business and government in their emphasis on concepts, principles, theories or philosophies. If one desires to inject academic flavor to energy matters it may be a lofty enterprise worthy of the UP Diamond Jubilee to scrutinize the philosophical basis of the Philippine Energy Policy which is bound to affect profoundly the life of every Filipino, now and in the future. Aside from being an interesting academic exercise, the effort might provide some useful insights which can be used to validate, expand, refine, or review the existing policy and its accompanying programs and projects. Since the Philippine Energy Policy was made in response to the energy crisis, a study of the former calls for an understanding of the latter.

Specifically, this paper aims to achieve the following: (1) identify the philosophy subsumed in the Philippine Energy Policy and the one that fits the universe of energy resources best, if it differs from the former; and (2) understand the factors affecting the energy crisis and the possible direction of their evolution.

The philosophy of the policy is identified by means of its assumptions. To determine whether such philosophy, or any other, fits the universe of energy resources, the energy crisis is investigated with respect to its causes and possible direction.

This paper is divided into three parts. Part I gives the background information on the energy crisis and the energy policy, with emphasis on the identification of the philosophy of the policy based on its assumptions and predictions. Part II analyzes the energy crisis with the view

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<sup>1</sup> A paper delivered in commemoration of the seventy-fifth anniversary of the University of the Philippines on June 22, 1983.

<sup>2</sup> Professor of Geology and Mineral Economics at the Department of Geology and Geography, College of Arts and Sciences, University of the Philippines.

of testing the assumptions and predictions of the philosophy identified in the preceding part, and if such philosophy fails the test, then to identify the philosophy which fits the facts best. The last part summarizes the highlights of the study.

## THE ENERGY CRISIS AND PHILIPPINE ENERGY POLICY

### What the Energy Crisis Means

Late 1973 marked the beginning of a great event which profoundly affects the lives of people the world over. In the assessment of Neil Jacoby, a reknown petroleum economist of Cornell University, the Energy Crisis is a catastrophe that ranks in significance with the Great Depression or with the past two World Wars.

What is the Energy Crisis? Literally it consists of two components: (1) the deliberate and seemingly endless hiking of oil prices, and (2) the creation of artificial shortages by the oil exporters.

There are two major nodes in the oil price spiral. The first is the quadrupling of oil prices in 1973-1974 when the price of a barrel shot up from about \$2.50 to \$9.30; the second occurred in 1979-1980 during which the price of a barrel of crude oil approximately tripled from about \$13.00 to \$36.00. In between these major shocks were lesser price increases which conveyed the impression that oil price is like an infinite screw which climbs incessantly as it turns around but which makes quantum jumps everytime certain nodes are reached.

The price shocks were even made more frightening by the fact that they were associated with global oil shortages. And worse still, certain selected countries were denied access to oil even if they were willing and able to pay the price.

If crude oil were a different commodity the world need not be plunged into a crisis. But crude oil is energy and the world as of the early 1970s was dependent on oil for its energy. Energy, being the capacity to do work, is used to run all productive facilities in the economy, among others, it runs factories, propel all transportation and communication media, provide light, and brings water to our kitchens and comfort rooms. In short, energy is a necessity that pervades virtually all human activities. Deprive a country of energy and its economy will grind to a halt which inevitably will be attended by among others, social and political problems of horrible proportions.

Experience in the Philippines illustrates some of the ills the energy crisis brings. For instance, the oil import bill rose more than 16 times, from \$149 million in 1972 to \$2458 in 1981 while the volume of imported oil correspondingly increased only by a third, from 63 to 85 million barrels. This means that as a result of the crisis we have to give our oil suppliers \$2000 million more than what would have been necessary without the crisis, plus a lot of thanks for being kind enough to sell us

oil. This means that our people were deprived of \$2000 million income even in 1981 alone. But the ritual, unfortunately, is a continuing process.

Viewed from another angle, the effects of the energy crisis acquire a different meaning. As percent of total exports, our oil bill increased from 13.0 percent in 1972 to 43 percent in 1981, which means that in order to cover our bills in 1981, it was necessary to allocate an additional 30 percent more of precious export earnings than what was necessary in 1972, leaving only a little more than half for other concerns and necessities. As percent of total imports, our oil bill increased from 12 percent in 1972 to 31 percent in 1981, which means that as of 1981 19 percent of our total imports have been diverted away from goods and services needed for development, such as productive machineries, factories and raw materials for our industries (Santos, T.M., 1983).

As a result of the energy crisis unprecedented inflation galloped, deep recessions, unemployment, and the attendant hardships became a common experience. Even the value of the peso has decreased so that though only about ₱6.50 were needed to buy a US dollar in 1972, by 1983 we needed more than ₱10.00 to get a dollar.

So profound were the impacts of the energy crisis and so helpless were we! Living with it is like sleeping in a nightmare. The energy crisis is like a leech that sucks the lifeblood of the people.

### Philippine Energy Policy In a Nutshell

Evidence indicates that our political leaders do not relish the thought of doing nothing while the energy crisis ravaged their people. They have to do something and fast. President Ferdinand E. Marcos, no less, described vividly how he perceived the crisis and what need be done (Velasco, G., 1981):

We are in a siege situation with respect to energy and only a concerted national effort can see us through... (because) like other nations, we recognize that continuing escalation of oil prices and the certainty of supply (disruption) are realities beyond our control.

In the context of threat to national survival and the perception of helplessness in the face of continuing oil price increases and supply disruption, the Philippine Energy Policy was conceived in 1978. It was a measure for self-defense, national survival.

Briefly the objectives of the energy policy designed to protect the country's political and economic security and growth are (Velasco, G., 1981; Santos, T.M., 1980):

- (1) Meet energy needs without compromising the objectives of sound economy, balance of payment and environment.
- (2) Provide timely, adequate, and secure energy supplies that are publicly affordable.

- (3) Minimize adverse impact of the external (foreign) sector.
- (4) Develop self-reliance (independence) in energy.

An important thrust of the policy, may I stress, is the desire to be independent of foreign energy suppliers, particularly oil suppliers, which may be achieved by developing domestic energy resources.

In order to pursue such policy, huge amounts of resources are needed. For 1978-1987, the capital requirements alone amounted to \$13 billion, excluding the vast amounts of land and skilled manpower needed to complement the energy development program. In fact, the financial requirements were so vast so that during 1978-1985 it was estimated that about 70 percent of export earnings, on the average, may have to be channelled to the energy sector, (Asian Development Bank, 1982).

It is interesting to look at the details of the programs engendered by the policy. They range from institution building, technology acquisition, oil tanker fleet, crude oil stockpiling, energy pricing through domestic energy resources development. Among the domestic energy resources some interesting, though modest breakthroughs have already been achieved: domestic oil, coal, geothermal, and hydroelectric resources have already been shown to be promising; utilization of farm wastes, alcohol, coconut oil and solar radiation, among others, are now under investigation or implementation. Table 1 reflects the effects of the energy programs on the country's energy sources.

This paper, however, intends to look into the basic assumptions of the policy in order that the proposed analysis can be carried out. What then are the fundamental assumptions, which could reveal the underlying philosophy of the policy?

A study of the assumptions of the policy suggests that they are propositions inspired by the politics of the energy crisis. They can be summarized as follows (Velasco, G., 1981):

- (1) Oil (or energy) is indispensable for the country's economic health and survival.
- (2) The trend of rising oil prices is permanent, irreversible.
- (3) "Even more significant was the growing certainty that oil, a depletable resource, was fast running out."
- (4) The oil exporting countries will remain united and firm in their effort to extract the maximum returns from their oil.
- (5) Implicit in the first assumption is the proposition that growth in oil consumption will proceed as in the past or will outpace production.
- (6) Development of domestic energy resources and facilities will provide the country with secure and stable energy supplies at globally competitive prices.

Viewed from the prism of dependency theory, or from the interaction of group interests, or from the preservation of political power, I can

TABLE I. PHILIPPINE PRIMARY ENERGY SOURCE, 1981, 1987  
IN PERCENT

Energy Source	1981	1987
Oil		
Imported	78.00	39.24
Domestic	1.59	4.99
Nuclear		
Imported	nil	4.76
Coal		
Imported	nil	6.67
Domestic	1.05	11.84
Hydro	7.46	12.37
Geothermal	5.52	13.97
Nonconventional	0.39	1.52
Bagasse	5.99	4.64
TOTAL	100.00	100.00

Source: Ministry of Energy, 1982. *The Philippine Energy Development, 1982-1987*, p. 15.

Note: Total consumption in million barrels of oil equivalent, 86.10 in 1981; 127.38 in 1987.

see no flaw in these propositions. It appears that the country's energy policy is based on sound political analysis.

However, a country's energy policy is not all politics but has also a large economic component. In order to understand clearly the economic dynamics of the policy one should ask for its philosophical (or theoretical) basis because in so doing hidden assumptions and factors can further be exposed.

Any body who is familiar with the economics of resource scarcity will recognize that assumptions (1), (2), (3), (4) and (5) are basically predictions or assumptions of the Malthusian Theory of Resources. It is therefore reasonable to conclude that the country's energy policy is at least inspired, if not propelled, by this theory. Our energy policy makers seem to be followers of the prophets of Malthus as the following quotations suggest (Velasco, G., 1981, 83):

In March 1972, a prophetic book, *The Limits to Growth*, have warned that unless economic and population growth are restrained, and a balance between the earth's resources and its inhabitants' appetites is struck, the world would face a sudden and uncontrollable collapse within a hundred years.

So locked in is the world in the use of oil for energy that oil's dominance will continue, even now that the world has come to accept its constantly increasing price and its uncertain supply. Forecasts show that even after making generous allowances for the expansion of energy sources, world oil production will have

to almost double by 1985 to balance energy supply with the historic growth of demand.

Much of this supply comes from the Middle East, whose countries together hold 370 billion barrels of oil reserve. Yet, despite this huge potential supply, it is unrealistic to expect that Middle East production will increase sharply to meet the world's demand. First, Middle East reserves are exhaustible. They can not sustain indefinitely the extremely high production increases that are needed. Second, the producing countries naturally want to maximize their revenues from all over the long term while diversifying their economic base. Then also, even if they were to increase production, they have a limited capacity to absorb the revenues. Third, the producing countries seem more and more disposed to use their oil as a political weapon.

These quotations, and the book "The Limits to Growth" identify the economic theory held by our key energy policy-makers with the philosophical school of Malthus. However, the glimmer of hope that is implicit in the program for developing domestic energy resources, if sincerely believed in, is a radical departure from the Malthusian Theory, because under this system society can not escape the harsh realities of oil exhaustion (Barnett, H. and C. Morse, 1955).

The grim world predicted by the Malthusian Theory requires a policy of survival that demands extreme sacrifice. The gravity of such sacrifices demanded of us is hinted in a statement of President Ferdinand E. Marcos when he ordered in August 1980 the compression into a Five-Year Program of the Ten-Year Energy Development Program (Velasco, G., 1981):

"In revising the plan, the President recognized perceptively that the crucial energy parameters have begun to transcend the questions what and how much. Today the operative question is by when. In short, energy availability has its time value and its delay carries a cost penalty..."

As a mineral resource economist I infer from this quotation (and from other related acts such as the revision of the nuclear plant budget from \$1.0 billion to \$1.9 billion on environmental consideration) a dreadful order: Develop your energy resources soonest no matter how much they cost, to survive.

One may ask appropriately at this stage the following fundamental questions:

- (1) Is it really necessary to pay the price exacted by a policy based on the Malthusian philosophy? Stated in another way, does the Malthusian Theory describe the energy world adequately? By following the policies suggested by the Malthusian system may we not hasten the approach to the economic or social collapse that we wish to avert?
- (2) Suppose another theory describes the universe of energy resources better than the Malthusian, would our energy



policy be the same in general or in detail? Will the execution of our energy development be as costly or as urgent?

- (3) Given any set of actions or activities which must be done, (e.g., development of alternative energy sources) to what extent or how soon should they be done? Is there any rule which we can use to guide us? Is the goal of energy independence reasonably attainable and cost effective?

Answer to the last question may be found in standard economic texts, particularly in cost-benefit analysis. However, in order to answer the first question one has to investigate the assumptions and predictions of the Malthusian Theory. As for the second question, it is necessary to examine other theories in the same way that we scrutinized the Malthusian Theory. All these questions are closely related to the policy objectives stated earlier.

In assessing the strength or weakness of a theory, we shall compare its assumptions and predictions with the empirical world. A good theory must have premises that correspond to the real world; it too must be able to explain and predict phenomena reasonably well. We turn now to the analysis of the energy crisis with the view of verifying the philosophical basis of our energy policy and of finding means to improve it, if possible.

### ECONOMIC ANALYSIS OF THE ENERGY CRISIS

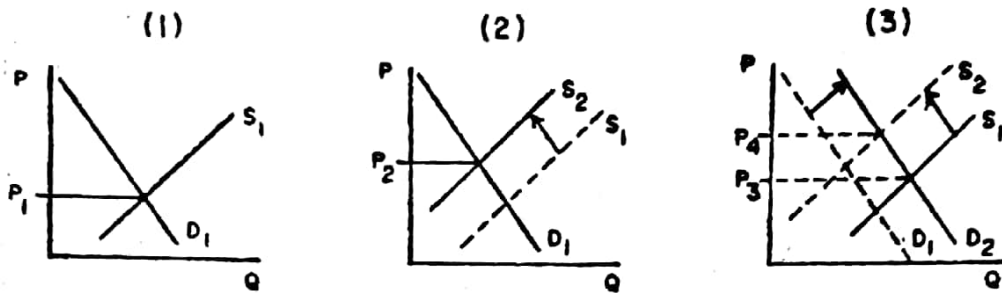
In this part we examine the factors and principles which determine the course of the energy crisis, especially those that are supported by empirical evidence. In the later part we shall compare the empirical findings with the assumptions and predictions of the Malthusian Theory. Should the Malthusian Theory fail the empirical test we shall identify the theory which fits the facts best.

The analysis consists of three parts. First, theoretical analysis will be used to identify the factors and principles that affect oil prices and supplies. Secondly, in the empirical analysis the actual behavior of the factors and certain empirically based principles are discussed. And then the final part will assess the appropriateness of the Malthusian Theory to the analysis of the energy crisis.

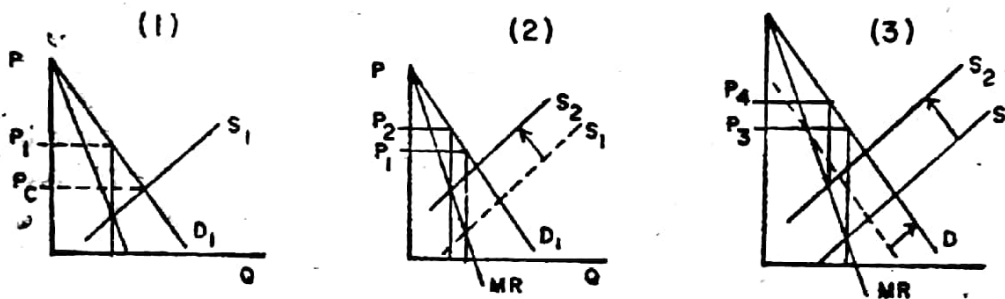
#### Theoretical Analysis

Economic theory suggests three major factors that determine the price and quantity of oil made available in the market: (1) the market organization, that is whether competitive, oligopoly, or monopoly; (2) the demand; and (3) the supply. Fig. 1 shows how the oil price will increase under competitive or monopoly (cartel) arrangement.

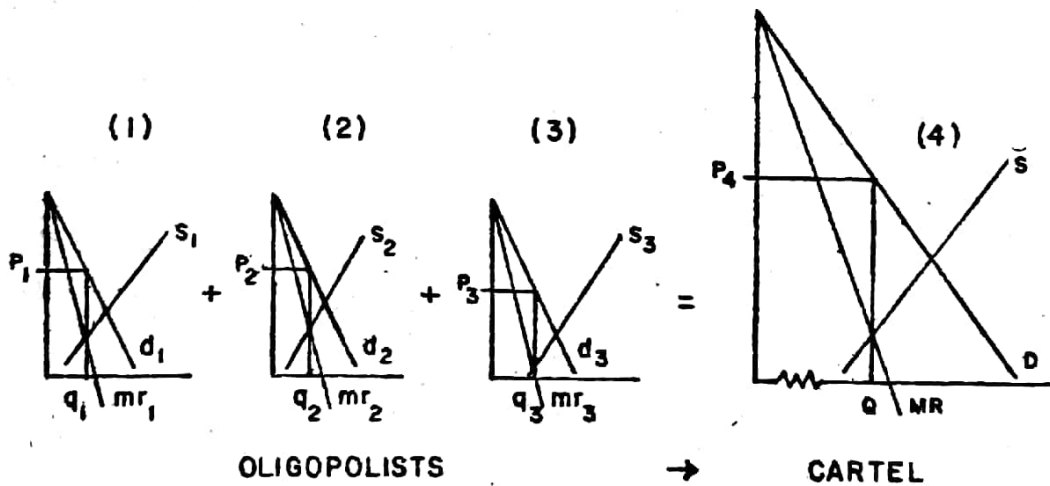
Under competitive condition, that is, if neither the buyers nor sellers could influence price or output levels, the price can be increased from such initial price  $P_1$  in three ways (a) by decrease in supply, demand



I. INCREASE IN INDUSTRY PRICE UNDER COMPETITION



II. INCREASE IN PRICE UNDER MONOPOLY



III. TRANSFORMATION OF OLIGOPOLY INTO A CARTEL

FIGURE 1. PRICING BEHAVIOR UNDER DIFFERENT MARKET ORGANIZATIONS

remaining constant, price increases to  $P_2$ ; (b) by increase in demand, supply remaining constant, price increases to  $P_3$ ; and (c) by decrease in supply coupled by concomitant increase in demand, price increases to  $P_4$  (See Fig. 1).

If however, there is but a single firm selling oil, then the seller has the market power to determine the price that maximizes its profits. As in the case of competitive condition, price can be increased from  $P_1$  if (a) supply decreases while demand remains constant; (b) demand increases while supply remains constant; and (c) supply decreases and demand increases (See Fig. 1).

Suppose the market consists of a small number of firms such that the pricing or production behavior of one affects the other, then we have a market or organization called oligopoly, the pricing behavior of which is expected to lie between monopoly and competitive market. To maximize profits as a group, and to avoid the usual destructive price wars that plague an oligopoly the limited number of firms comprising the market may band together into a single decision unit, into a cartel thereby creating a monopoly. The behavior of a cartel is therefore like that of a monopoly (See Fig. 1).

Price increase can also be effected without changing the level of supply or demand provided the market organization changes from competitive to monopoly. Conversely, price decrease may come about without changing supply and demand if a monopoly market situation transforms into a competitive one (See Fig. 1, particularly II[1]).

Economic theory, therefore, tells us that the escalating energy prices we have experienced may be due to any of the seven situations we have described; which of these is the true cause is an empirical question. Again the intensity and duration of the effects depends on the actual property of supply and demand.

### The Empirical Analysis

In this section we examine briefly the facts concerning the organization of the oil market, as well as the behavior of the demand and supply so that we can gain an insight as to the "true" causes of the crisis and how they may evolve over time.

*Effects on Demand.* — We investigate now the behavior of demand before and during the crisis. Behavior of demand before 1973 can be used to explain why the crisis occurred, while behavior after 1973 can be used to assess the effects of the crisis and its possible future course.

Before World War II coal was the world's dominant energy source. However, after the war oil became the dominant energy source so that by 1972 many countries were dependent on imported oil, of which 90 percent originated from OPEC (Organization of Petroleum Exporting

Countries).<sup>3</sup> Average growth rates in consumption for the world was 7.8 percent. Some countries experienced phenomenally large annual growth rates in consumption, as exemplified by W. Europe (11.8%) and Japan (22.8%). As of 1972, about 95 percent of energy consumption in the Philippines was represented by imported oil.

The series of large price increases which started in 1973 has dampened the growth in oil consumption. For instance, during 1973-1978, annual world oil consumption grew only at 2.0 percent. Among the highly industrialized countries such as Italy, France, Germany and the U.S., annual consumption even decreased by a factor of 1.5 to 5.0 times in 1972-1977, in contrast to that of 1960-1970 (Sawhill, J. 1979). In the Philippines, consumption grew only by 1.2 percent per year in 1973-1979 in contrast to the 7.2 percent per year of 1965-1972 (Asian Development Bank, 1982).

Substantial decreases in oil consumption occurred after 1973 because of (a) the recessions, and (b) the conservation efforts made feasible by the high oil prices.

The recessions triggered by the oil crisis caused decreases in oil consumption due to decrease in gross domestic products (GDP). Income elasticities, the percentage change in consumption per one percent change in GDP, have been found to vary between 0.10 and 1.26 among different developed countries, suggesting large potential declines in oil consumption as a result of the large decreases in GDP. (Sawhill, J., 1979).

But even without recession large contraction in oil consumption can be expected due to conservation because studies indicate a wide latitude for reducing energy consumption without sacrificing convenience and income. To illustrate: (1) Among the developed countries the amount of oil in tons used per million US dollar of GDP vary between 795 (France) and 1772 (Canada), suggesting that the most oil extravagant country can produce the same GDP with much less energy by practising conservation. (2) It was estimated that the US can save up to 15 million barrels of oil equivalent per day by using energy more efficiently; also, by year 2010 similar standard of living as today can be provided with 20 percent less energy than consumed today. (3) A study on Britain concluded that Britain can treble its GDP during 1975-2025 with an energy consumption on the same level as in 1975 by applying conservation at higher levels (Stobaugh, R. and D. Yergin, 1979). (4) Price elasticity of demand, the percent change in oil consumption per one percent change in price, indicates very hefty decreases in oil consumption due to high oil prices. Values of elasticity range between 0.07 and 2.82, all being negative (Sawhill, J., 38-39).

<sup>3</sup> As of now OPEC consists of Kuwait, United Arab Emirates, Venezuela, Algeria, Ecuador, Gabon, Iraq, Iran, Indonesia, Libya, Qatar, Nigeria and Saudi Arabia.

More energy savings can be expected in the long run through the use of technological innovations after much of the savings from improved housekeeping and waste recovery are realized.

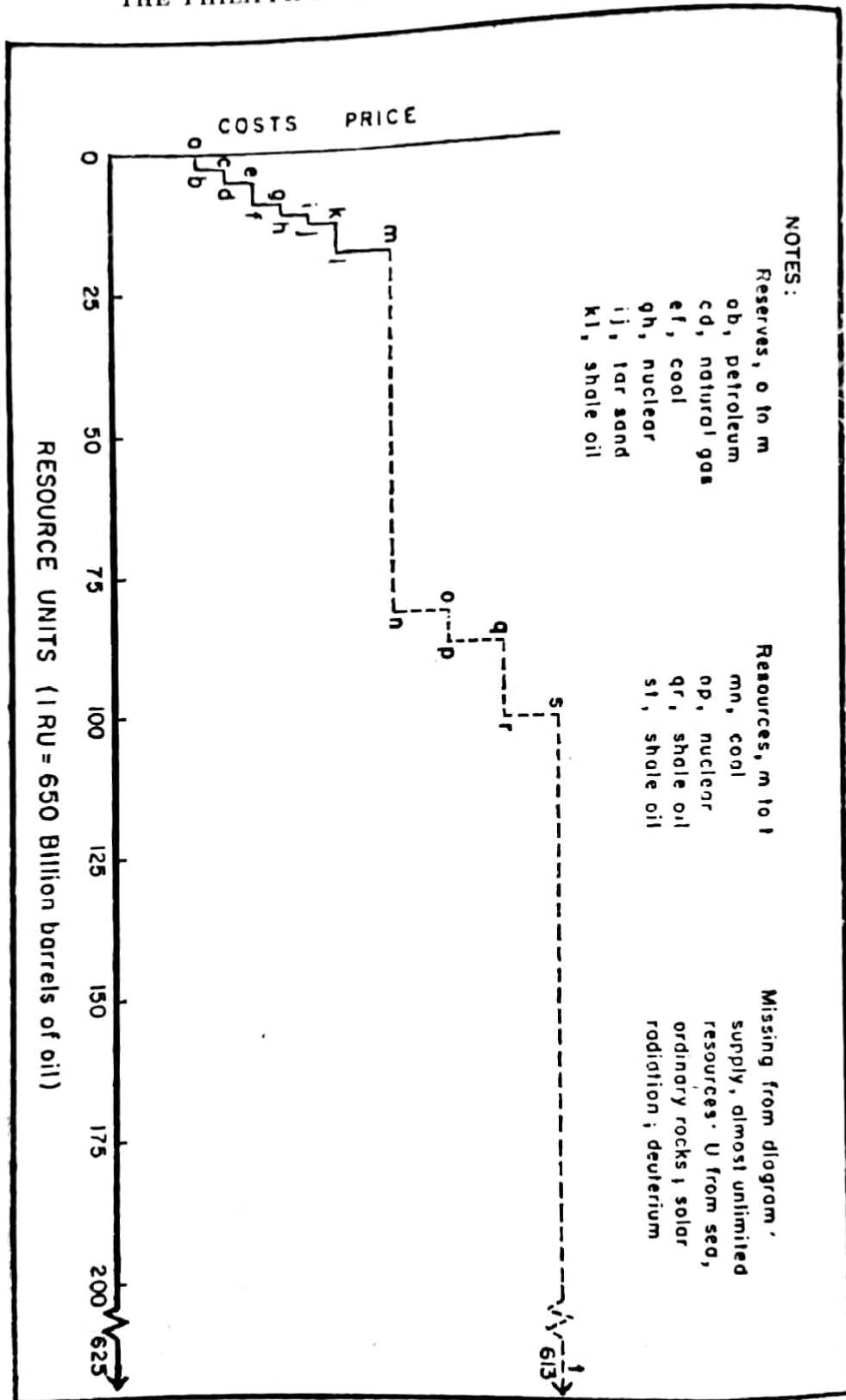
*Effects on Supplies.* — If supply scarcity was indeed increasing and rapidly running out, as many "respectable" analysts have asserted, then reserves and production must have been decreasing and production costs must be very high and increasing. However, evidence seems to indicate the contrary, hence:

- (1) Oil production grew annually at 10.3 percent in 1948-1972 (in contrast to the 7.5 percent of demand) and 9.5 percent in 1962-1972. World reserves, on the other hand, grew annually at 9.9 percent in 1948-1972 and 7.5 percent in 1962-1972 (Santos, T.M., 1982; p. 115).
- (2) Estimates of production costs in Africa and the Persian Gulf were put at \$0.10-\$0.20 per barrel in the late 1960s and tenable up to 1985 (Adelman, M., 1973).
- (3) Even the very conservative estimates of potential supplies, reserves, indicate that recoverable nonrenewable fuel resources could last for at least a hundred years at about 2.0 percent annual growth rate, and the Middle East oil reserves for about 50 years, at 1977 consumption rate (see Table 2). Such energy reserves could last for more than 600 years if consumption does not grow above the 1977 level. (Barney, G., 1982; p. 187).

As a result of the dramatic increases in oil prices equally dramatic expansion in the world energy supplies can be expected (see Fig. 2).

Energy resources, the measure of potential supplies, can be divided into reserves and subeconomic resources on the basis of economics (cost-price ratio). Reserves consist of resources which can be extracted at a profit under existing technology, prices, and socio-political arrangement, among others. Since most reserve estimates were made before the energy crisis, they subsume assumptions on prices, socio-political arrangement and technology which are too conservative and are no longer valid. Another reason why estimates of reserves tend to understate future supplies is the fact that development of (measured or known) reserves from raw prospects involves tremendous expenditures and prudent management practice does not consider it wise to invest tremendous sums in reserves that will not be used until after 20 or 30 years later (Santos, T.M., 1977, 1966).

Subeconomic resources, on the other hand, are those which were not profitable to extract when they were estimated. Compared to reserves they must be larger by several orders of magnitude. In fact, if prices or technological breakthroughs make possible the economic use of direct



**FIGURE 2. WORLD SUPPLY OF ENERGY RESOURCES**  
 (In unit of known Petroleum Reserves, i.e., 650 Billion Barrels of Oil Equivalent Per Unit)  
 Source of Basic Data: Barney, G.O. (dir.), 1982 Global 2000 Report to the President.

solar radiation, uranium of the sea, or deuterium from seawater, we are going to have virtually unlimited inexhaustible sources of energy at constant costs (Santos, T.M., 1982, 1977).

Between deuterium and the cheap Saudi oil several categories of resources lie, each larger than existing energy reserves. Some of them must have been elevated to reserves by the phenomenal oil price increases we witnessed; others by deliberate government policies. Given enough time to develop new technologies and socio-political arrangements and perceptions, even more resources can be expected to rise to the levels of reserves. We can therefore visualize the curve of future energy supplies to be made up of a series of steps of ascending costs, each higher step being wider than the lower, and the highest being of infinite width. Each such step is a brake (limit) to ascending price (or costs) (Santos, T.M., 1982).

Although reserves may have been expanded, the degree of knowledge about their location, size, quality and related attributes must be ascertained by exploration and development so that what were unknown before can be classified into known, then into measured, the basis of production.

A rough estimate of what may be available in the future due to the oil crisis can be made from the energy supply elasticity. Assuming a conservative unit elasticity in the long term and eight times increase in prices in real terms reserves may be expected to increase by eight fold, which means that oil alone may last for more than 200 years and energy reserves for a thousand years, at 1977 consumption rates. These estimates strongly indicate that exhaustible energy resources will perhaps be available for long enough to allow the transition to inexhaustible resources (Santos, T.M., 1977).

*Effects on Monopoly.* — Evidence indicate that the world oil market has a tendency to oscillate between monopoly and competitive arrangement.

- (1) The period before World War II was dominated by the "Seven Sisters", (Exxon, Mobil, Gulf Oil, Texaco, Socal, British Petroleum and Shell) which were alleged to have monopolized the World oil market (Jacoby, N., 1974; Sampson, A., 1979).
- (2) The world oil market evolved into a competitive one after World War II but before 1973, due to the entry of many large firms, both government and private (Jacoby, N., 1974).
- (3) The year 1973 marked the beginning of the cartelization of the world oil market by members of OPEC which has been able to effect hefty price increases, particularly in 1973-1974 and 1979-1980.
- (4) The OPEC cartel has shown signs of weakening, or tendency towards disunity, during times of low demand. Saudi Arabia which has acted as the most effective price leader,

due to its ability to affect the level of supply, is the strongest single factor that keeps OPEC together.

- (5) In two instances, cleavage in OPEC ranks surfaced culminating in the two-tier prices in 1977 and the \$5.00 a barrel reduction in posted price in early 1983.
- (6) The entry of new oil producers after 1973 — U.K., Norway, Mexico, USSR, China, Egypt and Malaysia, among others, as well as the increasing effectiveness of the development of alternative energy resources and conservation programs in various countries have weakened the OPEC control on oil supplies and prices.

### Empirical Findings

Our findings are presented in two parts. These are (a) the causes and direction of the energy crisis, and (b) implications on the philosophy of Philippine energy policy.

*Causes and Direction of the Crisis.* — Our empirical inquiry indicates that the seemingly endless price spiral and oil shortages that we have experienced since 1973 resulted from the transformation of the world oil market from a relatively competitive one up to 1973 into a cartel of sovereign states since 1973. This event permitted the OPEC countries to hike oil prices during times of tight supply.

The hypothesis that the oil crisis resulted from rapidly dwindling energy resources is contrary to facts. It is basically a "myth" apparently designed to provide philosophical trappings or theoretical validity to an act which caused massive human sufferings.

Although there are strong economic and political incentives to keep the OPEC cartel cohesive and powerful in influencing oil prices and supply, there are equally powerful economic, social and political forces that tend to undermine the cartel and which are likely to prevail in the long term.

It appears that the ability of the OPEC members to abide by the discipline of the cartel has visible limits. As market shares of the members shrink they become less cooperative in sticking to agreed upon production and pricing agreements, obviously due to political, social and economic pressures. Saudi Arabia was particularly helpful in making the cartel work because of its current ability to expand supply substantially, when necessary, or reduce its output to accommodate recalcitrant members during gluts.

The market share of OPEC is likely to diminish for the following reasons:

- (1) Conservation programs in various countries are likely to become more effective over the years.
- (2) More oil deposits are likely to be discovered and developed in the long term. New discoveries, for instance, have made



U.K., Norway, Mexico and China, among others, new factors in the oil market.

- (3) Alternative energy sources such as coal, geothermal, and oil shale, among others, are likely to become important energy sources.
- (4) Technologies either for conservation or substitution are likely to be developed more fully if given enough time.

Conservation, exploration and development of conventional resources, utilization of alternative resources and invention of new technologies are all likely to contribute towards alleviating the oil crisis because the high prices and the uncertainty of oil supplies have already made investments in these activities worthwhile.

*Implications on the Malthusian Theory.* — We recognized in an earlier section that the Philippine energy policy assumes as basic premises the predictions of the Malthusian Theory of resources specially with regard to depletion, and the behavior of demand, production costs and prices which inevitably lead to catastrophic collapse of society. Since we are able to identify the theory, we are able to exhume its assumptions. We proposed to test if the theory describes reasonably well the universe of energy resources by comparing its assumptions and predictions with the facts. Should the theory fail the test we also proposed to identify which philosophy fits the facts best.

Assumptions of the Malthusian Theory contradict the facts. While the Malthusian Theory assumes that all resources are known and of uniform quality, we noted that in the real world apart from known resources there are much more which are unknown and which differ in economic quality. While no close substitutes are required by the Malthusian Theory, the real world harbors many substitutes. A very important premise of the Malthusian Theory is constant socio-technical arrangement but we find in the real world people and institutions which adjust to the challenges of the energy crisis.

If the assumptions of the theory are not consistent with the world it purports to describe, can we expect it to predict correctly? We found out that the certainty of resource depletion, the rapidly increasing trends in production costs and prices, the continuous exponential explosion of demand and the certainty of collapse of societies do not square with facts. We found out that man has some measure of control over these predictions; he can influence his destiny.

In view of these findings we arrive at the following conclusions:

- (1) The Malthusian Theory does not describe correctly the universe of energy resources, hence the Philippine energy policy is not anchored on proper philosophical foundation.

TABLE 3. EMPIRICAL TEST OF THE MALTHUSIAN THEORY

Basis	Malthusian	Empirical Findings
Market Organization	Competitive (a) both producers and consumers are price takers; (b) free and available information regarding costs and prices; (c) free entry or exit.	(a) Cartel before World War II (b) Competitive, World War II to 1973 (c) Cartel after 1973
Resources	Homogeneous	(a) Energy resources different in kind, quality
Homogeneity Knowledge	All known; fixed in amount; no new discovery possible	(b) Many resources are unknown
Substitutes	No close substitutes	Many substitutes to oil exist
Technology	Constant	Technologies change in response to new challenges
Social Arrangement	Constant	Government policies change to face new problems
<b>Prediction and Empirical Findings</b>		
Depletion	Certain; stock, decline in size; supply will decline.	Exhaustion of energy resources in foreseeable future not certain
Production Costs	Increasing irreversibly	Not necessarily increasing indefinitely. Some cost reductions possible; some limits exist.
Prices	Increasing irreversibly	May increase in general up to some step-like limits; occasional reverses possible.
Demand	Expand at exponential (historical?) rate as population	May expand quite modestly in general; occasionally growth may decline.
Steady state	None; societal collapse inevitable	Social collapse not certain. Some steady state can be found.

- (2) The theory whose assumptions and predictions correspond to the universe of energy resources closest is the Modern Theory of Resources (Neo-Ricardian) of the variety expounded by Barnett and Morse.
- (3) Strictly, the Philippine energy policy is not completely consistent with the Malthusian Theory because while the policy assumes the predictions of the Malthusian Theory it practices the assumptions of the Neo-Ricardian Theory. This is the reason why the policy appears to promise some rays of hope in contrast to the doomsday that the Malthusian Theory predicts.

At this juncture we can ask the question: of what good is it to know the theory upon which the country's energy policy is based?

We believe that by applying the proper theory we can determine where we are weak or where we are strong; to avoid the pitfalls where we might fall. For example, a common criticism of the Malthusian Theory of the variety embodied in *The Limits to Growth* is its policy prescriptions, if followed, may hasten a society's approach to its collapse. For instance, if we should decide to pursue energy self-sufficiency at any cost, this might provide us abundant high cost energy supply by siphoning most resources from other sectors of society with the result that growth in other sectors may be stifled for lack of investments.

Is there any rule which we can use to scrutinize our energy policy or any of its components? Before we answer this question we have to consider that the ultimate objective of society is to promote its well-being through growth and development, not energy for its own sake. As such, we therefore have to remain competitive, efficient.

In pursuing our energy policy, we have to be aware that such activities like stockpiling oil, conserving electricity, or developing alternative energy resources such as geothermal, coal, alcogas, cocodiesel or hanga tree, are but different forms of investments which compete for scarce resources with projects from other sectors. Investment theory tells us that only those projects that will allow us to maximize social benefits, subject to our budget and other constraints and considering various types of risks, should be pursued.

By applying this rule it is possible to discriminate among projects and to time their implementation efficiently.

### SUMMARY AND CONCLUSIONS

Our inquiry focused on the analysis of the philosophical basis of the Philippine Energy Policy, hoping that the exercise may provide new or deeper insights which can be used to validate or improve parts of the policy. Specifically, we sought to identify the philosophy by its assumptions and predictions, which we compared with corresponding facts.

When the initial philosophy was shown as not descriptive of the universe of energy resources an alternative philosophy that fitted the facts best was identified. Since the energy policy was conceived in response to the energy crisis the latter was analyzed with respect to causes, principles and factors which tend to shape its direction or intensity, and in the process providing empirical basis for the analysis of the philosophy of the energy policy. We present our conclusions in two parts: (a) on the energy crisis; and (b) on the philosophy of the energy policy.

### On the Energy Crisis

Analysis of the energy crisis indicates that the high and rapidly increasing oil prices and periodic shortages which the world has experienced since 1973 are situations contrived by the OPEC cartel. They are not expressions of increasing energy resources scarcity. However, so long as the OPEC cartel lasts it will continue to influence oil supply and prices.

Whether the power of OPEC to influence oil prices will persist or perish depends on whether the OPEC members can remain united and on how energy supply and demand will evolve over time.

Although there are strong economic and political incentives for the OPEC to remain united, it appears that there are equally strong forces that are capable of sundering such unity. In times of glut, when oil revenues dip to low levels, strong internal pressures in some countries, particularly those with dense population, make them reluctant to adhere to agreed upon prices and production quotas. This was evident in 1977 when two tier-price structure prevailed and in early 1983 when a \$5.00 per barrel price reduction became imperative to maintain OPEC unity. Saudi Arabia, with its small population and large actual and potential production, is a potent factor for keeping OPEC operative. The history of the oil industry, however, seems to indicate that after a cartel has been established certain natural forces are unleashed tending to break the monopoly.

As regards demand, evidence shows the large potential for cutting down energy consumption without sacrificing income levels or convenience. For instance, in the US some estimates show that as much as 40-50 percent of 1972 consumption can be saved mainly through more efficient housekeeping and waste recovery. Large exponential growth in energy consumption, it seems, is not necessary to maintain the same standard of living. In the long term even greater opportunities for conservation can be expected as older facilities are replaced by new and more efficient ones and as new energy efficient technologies are developed.

With respect to supply, the picture unravelled is one which does not support the hypothesis of rapidly depleting or already depleted resources. Energy reserves, those that are economic to extract under the economic, technological, social and political conditions when they were assessed (very likely before the crisis) were estimated to last for more than 600 years at 1977 consumption rate, and for more than 130 years if consumption grows at 2.0 per cent per year. Subeconomic resources, which are orders of magnitude greater than reserves, are observed to increase in step-like manner, as economic quality decreases, until a plateau of almost limitless and inexhaustible resources is reached, corresponding to direct solar radiation, uranium from sea water and ordinary rocks and deuterium from the sea. Natural gas, coal, geothermal, uranium reserves, tar sand, and oil shale, among others, are the resources that lie between the low cost Middle East oil and the high cost limitless energy resources. High oil prices and uncertain supplies must have transformed considerable amount of these resources into reserves. These resources will act as brakes to oil price spiral. In short, there are probably adequate energy resources for making the transition between Middle East oil and limitless supply.

Of course much of these resources can only be made available in the long term because of the long lead times needed for their development.

It appears that very powerful demand and supply forces have been irreversibly triggered by the energy crisis. They are likely to undermine the OPEC cartel's control on prices and supply.

### **On the Philosophy of the Philippine Energy Policy**

In diagnosing the underlying philosophy of the energy policy we made use of its assumptions and other pronouncements of key policy makers. Among the important assumptions are (1) permanent and irreversible trend of rising prices, (2) certainty that oil is fast running out, (3) growth in consumption will proceed as in the past, and (4) certainty of collapse of societies due to the crisis. These premises turned out to be the predictions of the Malthusian Theory of Resource Scarcity.

When the assumptions and predictions of the Malthusian Theory were compared with the corresponding facts we concluded that this theory does not describe well the universe of energy resources. Instead we found out that the Neo-Ricardian Theory of Resources, as expounded by the school of Barnett and Morse, seems to fit the facts best.

It is remarkable that despite the Malthusian Theory as its basic philosophy the Philippine Energy Policy has taken a shape that properly addresses the critical energy problems of the country. It appears sound

in its direction and broad outlines. Good political analysis and the pragmatic approach of the policy makers contributed, undoubtedly, to the merits of the policy.

Notwithstanding the apparent merits of the energy policy, an analyst who is familiar with the operation of the Malthusian Theory may sense some danger somewhere because one's theory conditions his belief which in turn determines his action. The Malthusian Theory makes extremely grim predictions which are likely to elicit "overreactions". In fact, it has been remarked that by following the policy prescriptions of the Malthusian proponents a country might hasten its approach to the "limits to growth" which it purports to avoid.

In order to avoid the Malthusian pitfalls or undesirable overreactions, it is suggested that the policy be treated as a package of investments which competes for scarce resources among themselves and with similar packages in other sectors in the economy. Only those that contribute most to the national welfare, given existing constraints, must be considered. This approach has the virtue of assessing systematically the effects of parameters affecting the desirability of any project such as time, interest rate, cost, prices, and risk, among others. Some aspects of the energy policy which may be scrutinized using this criterion are the energy independence goal; energy pricing; the energy mix's components; and timing of alternative energy resources development.

It may also be a good policy strategy to facilitate the operations of the market in order to benefit from those forces which tend to automatically alleviate the effects of the energy crisis. In this sense, among others, making information about energy available or less expensive, if not free, and facilitating entry of firms in the energy industry are desirable measures.

On the premise that a correct theory implies correct policy, it is suggested that the Philippine Energy Policy be reviewed using the Neo-Ricardian Theory as philosophical base. The exercise can be expected to reveal the strengths and weaknesses of the policy and identify critical areas not considered before. Finally, with the use of this analytical tool it is proposed that the energy policies of other countries be re-examined to see what lessons can still be learned from them.

#### ACKNOWLEDGMENT

The author acknowledges debt of gratitude to Minister Geronimo Z. Velasco who furnished him two books pertinent to Philippine energy policy. Cris Angeles typed up the drafts of this paper and Manong Bunuan kindly drafted the figures.

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## A C K N O W L E D G M E N T

The Philippine Geographical Society gratefully acknowledges a grant from the National Science and Technology Authority (NSTA) in support of this issue of the Philippine Geographical Journal. Arrangements for this subsidy were made by the Philippine Social Science Council, Inc.

# THE SETTLING OF ASIAN IMMIGRANT GROUPS IN THE CHICAGO METROPOLITAN AREA, 1965-76

by

ALVAR W. CARLSON<sup>1</sup>

Foreign immigration to the United States has become today an increasingly important topic of concern not only because it is a significant factor in this country's annual population growth rate, but also because of its changing composition. In particular, since the passage and implementation of the 1965 Amendments to the Immigration and Nationality Act which eliminated nationality quotas, large numbers of Asians have immigrated to the United States.<sup>2</sup> In fact, Asians now account for approximately one-fourth of the annual legal immigration, whereas in the decade prior to the new immigration laws they accounted for less than 10 percent. Several Asian countries became ranking sources of immigrants by the mid-1970s. These included South Korea, India, China/Taiwan, and the Republic of the Philippines (Table 1). This new wave of immigrants has an impact upon the composition of America's population today and probably even more so in the future.

As in the case of the vast majority of recent foreign immigrants to the United States, the Asians settle overwhelmingly in urban places, especially in the large metropolitan areas of the most populous states. It is not readily evident from the limited published data, however, where these recent Asian and other immigrants settle within the metropolitan areas. For instance, do they settle in the inner city or in the suburbs? Do they tend to settle in close proximity and consequently form ethnic concentrations? Do they settle in particular income areas? Do they settle in areas dominated by Blacks? Are there apparent differences and similarities in the settlement processes of immigrant groups? These

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<sup>2</sup> For background information on the 1965 Amendments and changes in immigration, see Charles B. Keely, "Immigration Composition and Population Policy," *Science*, 185 (August 16, 1974), pp. 587-593; "The New Immigrants: Still the Promised Land," *Time*, 108 (July 5, 1976), pp. 16-20, 23-24; Setsuko Matsunaga Nishi, "The New Wave of Asian Americans," *New York Affairs*, 5 (Spring, 1979), pp. 82-96; J. Wareing, "The Changing Pattern of Immigration Into the United States, 1956-75," *Geography*, 63 (July, 1978), pp. 220-224; Monica Boyd, "The Changing Nature of Central and Southeast Asian Immigration to the United States: 1961-1972," *International Migration Review*, 8 (Winter, 1974), pp. 507-519 and Alvar W. Carlson, "Recent Immigration, 1961-1970: A Factor in the Growth and Distribution of the United States Population," *Journal of Geography*, 72 (December, 1973), pp. 8-18.



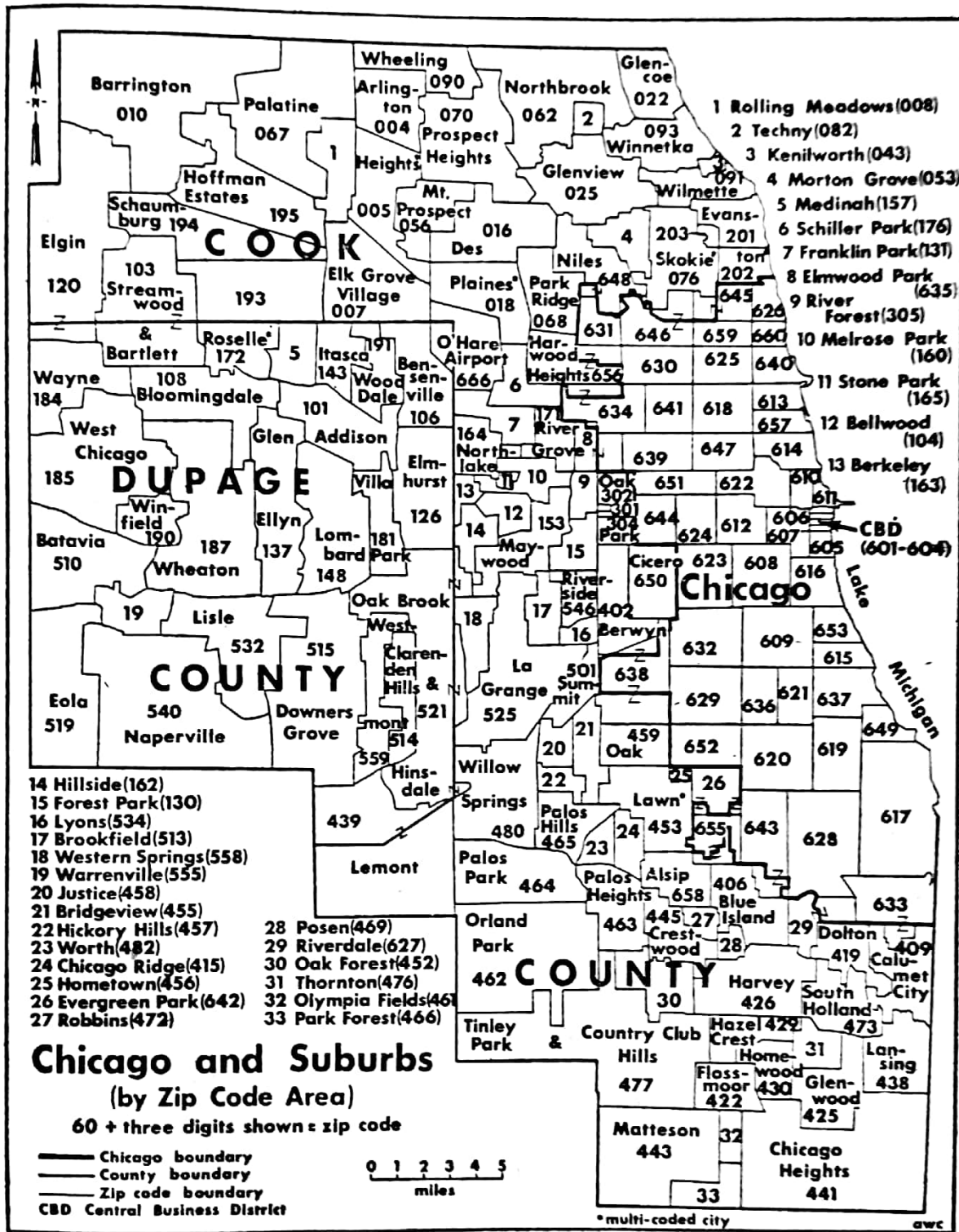


FIGURE 1. CHICAGO AND SUBURBS

questions prompted an investigation into the settling processes of four large Asian immigrant groups (Chinese, Koreans, Filipinos and Indians) in Cook and Du Page counties, which comprise the core of the Chicago metropolitan area.

### DATA SOURCE

It is difficult to conduct in-depth research on foreign immigrants because of the confidentiality of the data that appear on the various legal forms. However, upon initiating the process for citizenship each immigrant is required to file a "Petition for Naturalization" (Form N-405) at a federal courthouse. This form is not confidential and is kept in a permanent file.

The petitions for naturalization completed between June 2, 1975 and May 28, 1976 by males of the four Asian immigrant groups 18 years of age or over who had entered the United States in 1965 or thereafter provided the basic data for this study. These petitions are on file at the Federal Courthouse in downtown Chicago. Each petition included the following limited information on an individual: name, date and place of birth, present address and postal zip code, date of entry, marital status and number of living children. Data were gathered on males rather than on females because of the opinion that males would more clearly represent heads of households and also to avoid duplication of data particularly in mapping, the locations of households. The mapping was accomplished by using postal zip code areas (Figure 1).

The Chicago metropolitan area is a major destination for many foreign immigrants. In the period 1970-76, it received over four percent of all the legal immigrants who entered the United States. The four Asian immigrant groups comprised 27 percent of those who chose Chicago and its suburbs.

### IMMIGRANT CHARACTERISTICS

The majority of foreign immigrants who entered the United States in the decade after the passage of the 1965 Amendments were females (Figure 2). This is especially true of those immigrants in the age group of 20-29 years. In analyzing, likewise, the sex/age pyramids of the four Asian immigrant groups it is apparent that females, especially in the age group of 20-29 years, dominated except in the case of the immigrants from India (Figures 3,4,5,6). Where the Chinese immigrants tend to be considerably older in age, the majority of each of the other three Asian immigrant groups is under 30 years of age. Many older Chinese and Chinese refugees immigrated to the United States largely in order to reunite families. The other immigrant groups probably represent more young Asians with families and singles coming to this country to establish a new life for the first time. The occupational differences upon entry

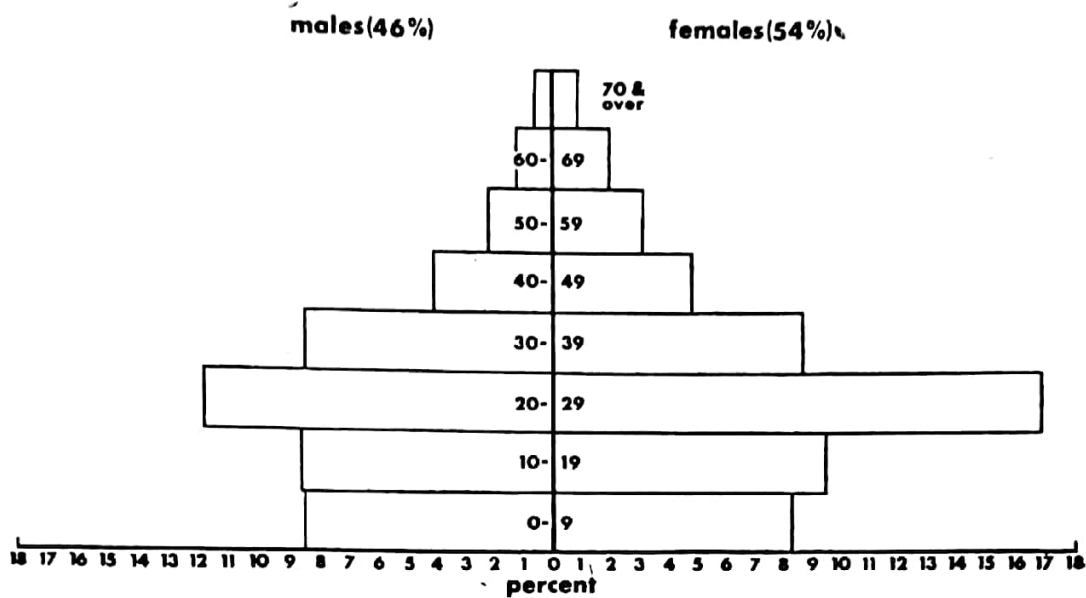


FIGURE 2. SEX/AGE PYRAMID, U.S.

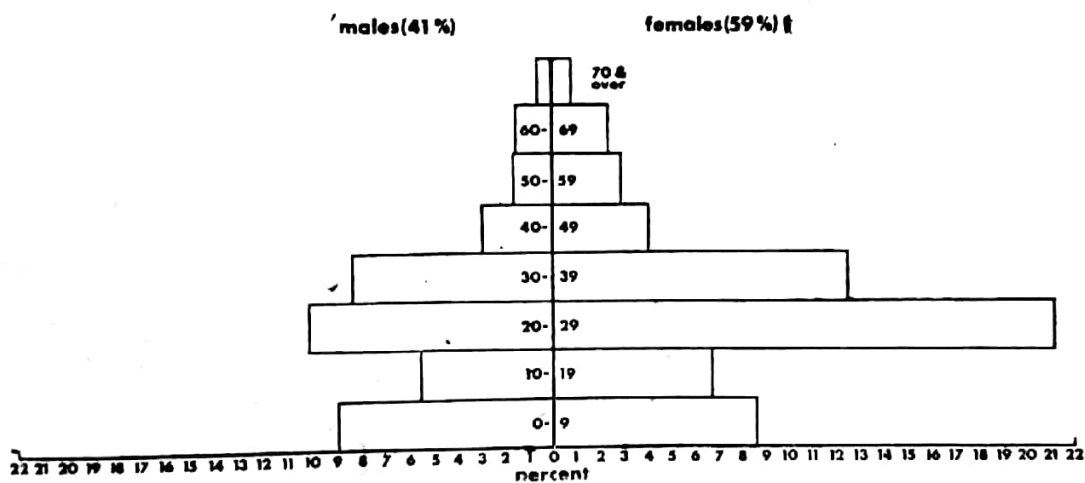


FIGURE 3. SEX/AGE PYRAMID, PHILIPPINE ISLANDS

of each immigrant group are shown in Table 2. In each case, approximately one-half or more of the immigrants are housewives, children and others with no reported occupations. Those immigrants classified as professional, technical and kindred workers comprise a large share of the reported occupations, but there is considerable variation here when India (44%) is compared to Korea (14%). The occupational skills of nearly all those who reported occupations indicate the immigrants need to be primarily urban-oriented in order to be employable in the United States.

For the emigrating countries, the concern of a brain drain is repeatedly mentioned and discussed, but the better economic conditions and working facilities presently found in the United States continue to serve as strong pull factors.<sup>3</sup>

During the year being checked, 1150 males (18 years or older) representing the four immigrant groups completed petitions for naturalization (Table 3). The average age upon entry was 31.7 years and the average age at naturalization (the vast majority become naturalized shortly after filing petitions) was 37.3 years. The required waiting period prior to naturalization is normally five years which indicates that the Asian males filed naturalization papers as soon as possible. The petitions also revealed that three-fourths of the males had children, indicating families, and that the Indian and Korean males had an average of two children whereas the Chinese and Filipino families were slightly larger (Table 3).

### ASIAN IMMIGRANT SETTLING

Except for the Indian male immigrants, the majority of the Asian male immigrants settled within the city limits of Chicago (Table 3). Overall, the four immigrant groups tended to settle mostly in Chicago's north side neighborhoods and their adjacent suburbs (Figure 7). One of every 10 of the 1150 Asian males resided in zip code area 60640 which is largely the community of Uptown. An indepth mapping analysis of where each immigrant group settled reveals, however, distinct clusterings or concentrations which are not readily apparent on the composite map.

The Philippine Islands, a country of accelerating population growth, is a principal source of immigrants to the United States.<sup>4</sup> In fact, it has become the leading source of Asian immigrants. The Filipino population of metropolitan Chicago has increased rapidly since 1950. The city's *Philippine Times*, a weekly newspaper, serves this population. By 1970, Filipinos numbered nearly 12,000 of which over 6,800 were employed, largely in the professional and related services and wholesale

<sup>3</sup> For references to Filipinos, Indians and Koreans, see William A. Glaser, *The Brain Drain: Emigration and Return* (New York: Pergamon Press, 1978). There is little discussion in the published literature of a brain drain as a result of Chinese emigration.

<sup>4</sup> Information on Filipino immigration to the United States can be found in Donn V. Hart, "The Filipino-American Press in the United States: A Neglected Resource," *Journalism Quarterly*, 54 (Spring, 1977), pp. 135-139; Peter C. Smith, "The Social Demography of Filipino Migrations Abroad," *International Migration Review*, 10 (Fall, 1976), pp. 307-353; James P. Allen, "Recent Immigration From the Philippines and Filipino Communities in the United States," *Geographical Review*, 67 (April, 1977), pp. 195-208; Ferdinand Mempo and T.J. Buhain, "Emigration From the Philippines," *Migration News*, 24 (November-December, 1975), pp. 14-20; Ferdinand Mempo, "Emigration From the Philippines," *Migration News*, 23 (March-April, 1974), pp. 18-22; Ernesto M. Pernia, "The Question of the Brain Drain From the Philippines," *International Migration Review*, 10 (Spring, 1976), pp. 63-72 and Charles B. Keely, "Philippine Migration: Internal Movements and Emigration to the U.S.," *International Migration Review*, 7 (Summer, 1973), pp. 177-187.

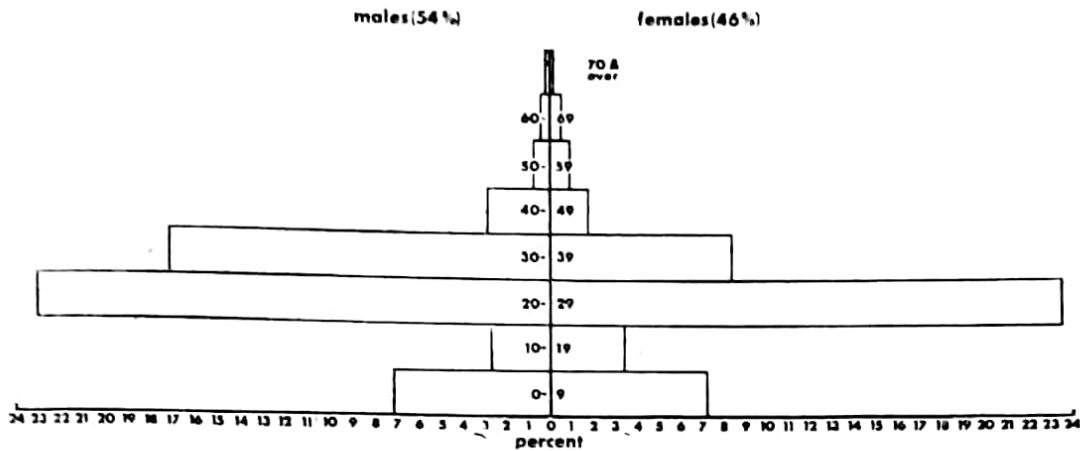


FIGURE 4. SEX/AGE PYRAMID, INDIA

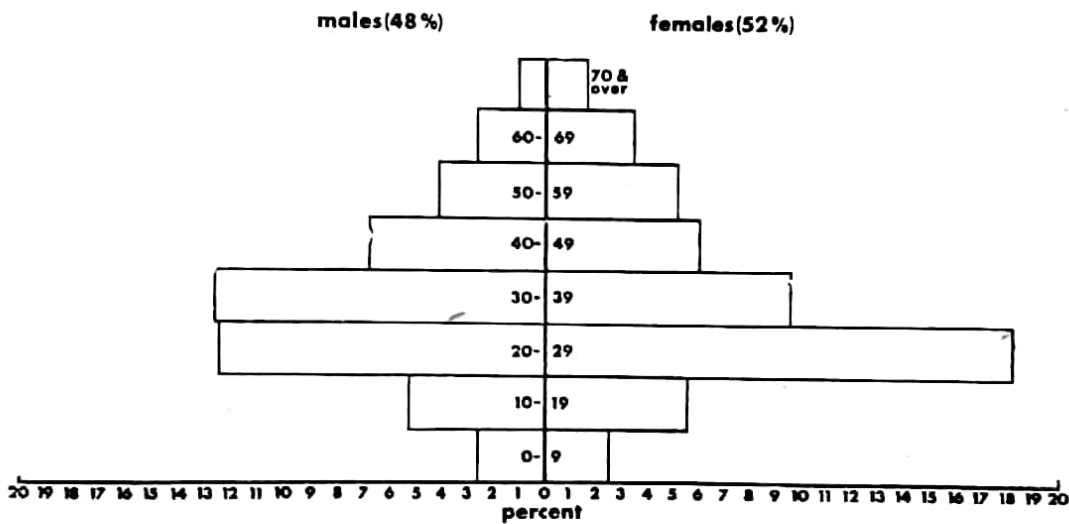


FIGURE 5. SEX/AGE PYRAMID, CHINA/TAIWAN

and retail trades. Over 80 percent of the Filipinos lived within Chicago in structures which were built mostly before 1940. Their median family income was approximately \$11,500.<sup>5</sup>

The 498 Filipino males constituted the largest Asian immigrant group in this study, originating mostly in Luzon.<sup>6</sup> Many chose to settle in two areas within the city — on the north side in Uptown (60640) and

<sup>5</sup> U.S. Bureau of the Census, *Census of Population: 1970*, Subject Reports, Final Report PC (2) — 1G, Japanese, Chinese and Filipinos in the United States (Washington, D.C.: Government Printing Office, 1973), pp. 168-177.

<sup>6</sup> The Filipino male immigrants were born in the following regions/provinces: Manila (16%), Ilocos-Mountain Province (8%), Cagayan Valley-Batanes (4%), Central Luzon (23%), Southern Luzon (21%), Bicol (5%), Western Visayas (6%), Eastern Visayas (5%), Southwestern Mindanao (2%) and Northeastern Mindanao (3%). No birth place was given for seven percent of those who filed petitions.

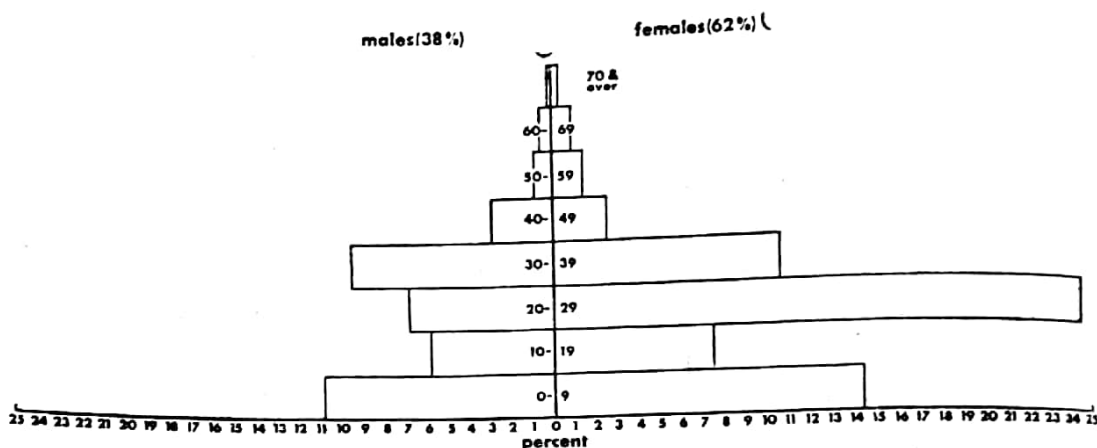


FIGURE 6. SEX/AGE PYRAMID, KOREA

adjacent Lake View (60613) and to the west of the CBD (central business district) in West Town-Humboldt Park (60622) and Austin (60651) (Figure 8). Both areas have large hospitals and other medical facilities which employ English-speaking Filipinos as physicians, pharmacists, dentists and dieticians.

As in the case of the Filipinos, many of the Korean males also chose to reside in Uptown and in adjacent zip code areas (Figure 9). Some are employed by the medical institutions, but many have unskilled factory jobs or are small shopkeepers. It should be pointed out that the Uptown area has witnessed, since 1960 in particular, considerable migration to the suburbs by second and third generation Europeans which has left behind substantial dwellings that can be purchased or rented at fairly low costs. In 1970, Chicago's Korean population numbered less than 3300 people and most of them resided on Chicago's north side, especially in Uptown and the adjacent neighborhoods. The annual influx during the 1970s of additional Korean immigrants into the area enlarged this relatively small, but growing ethnic concentration. Nearly one-half of the Korean males were born in Seoul and presumably had lived in an urban environment before moving to Chicago.<sup>7</sup>

A Chinese population has lived in Chicago since the early 1900s.<sup>8</sup> It located eventually in the Near South Side neighborhood in the late

<sup>7</sup> For background information on Korean immigrants, see Won Moo Hurh, *Comparative Study of Korean Immigrants in the United States: A Typological Approach* (San Francisco, California: R & E Research Associates, Inc., 1977).

<sup>8</sup> For background information on the Chinese in Chicago, see Stanford M. Lyman, "Social Demography of the Chinese and Japanese in the United States," *The Asian In North America* (Santa Barbara, California: ABC — Clio, Inc., 1977), pp. 131-149; Betty Lee Sung, *Statistical Profile of the Chinese in the United States, 1970 Census* (Washington, D.C.: U.S. Department of Labor, Manpower Administration, 1975); Tin-chiu Fan, *Chinese Residents in Chicago* (San Francisco, California: R & E Research Associates, 1974) and Harold M. Mayer and Richard C. Wade, *Chicago: Growth of a Metropolis* (Chicago: University of Chicago Press, 1969), pp. 414-415.

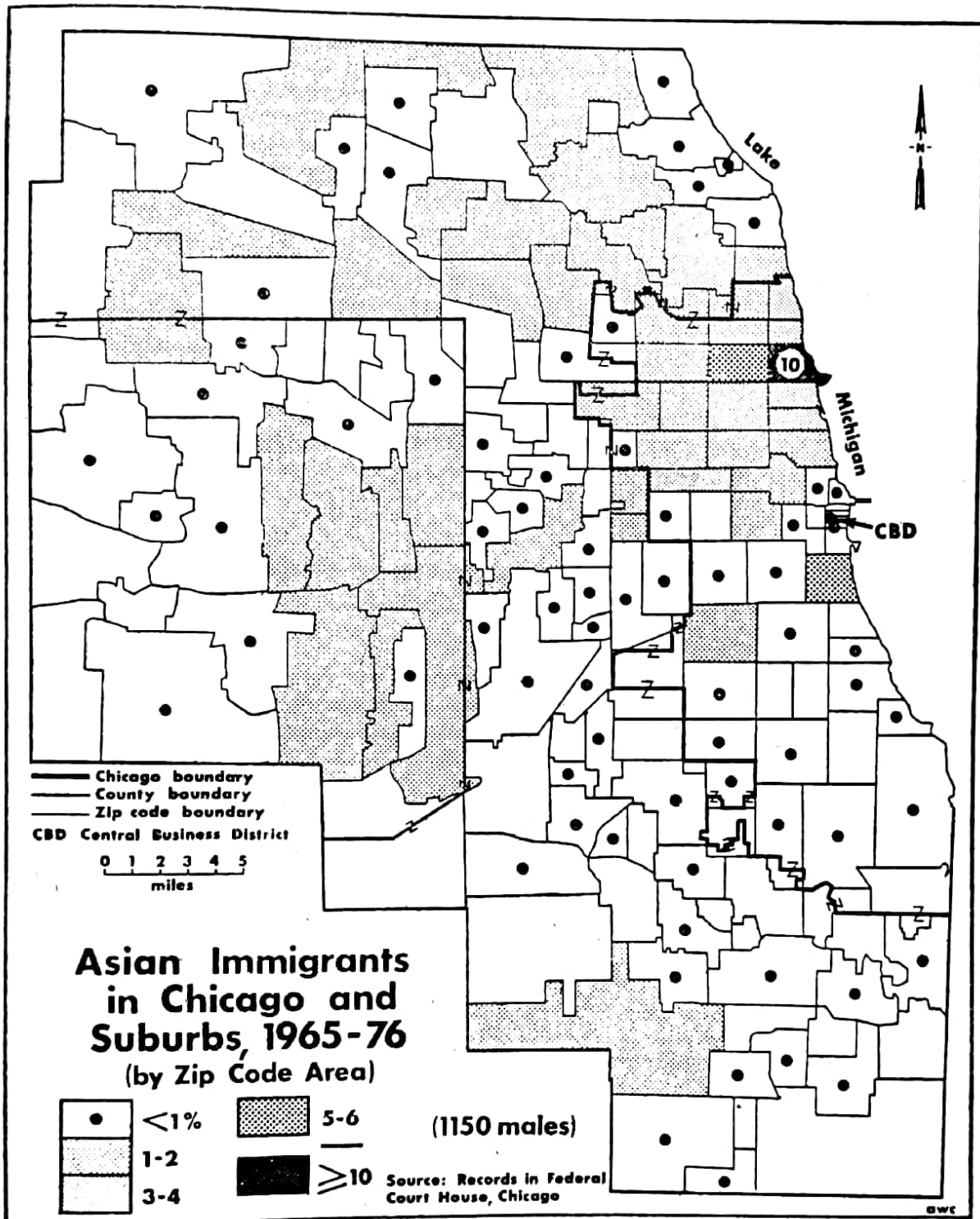


FIGURE 7

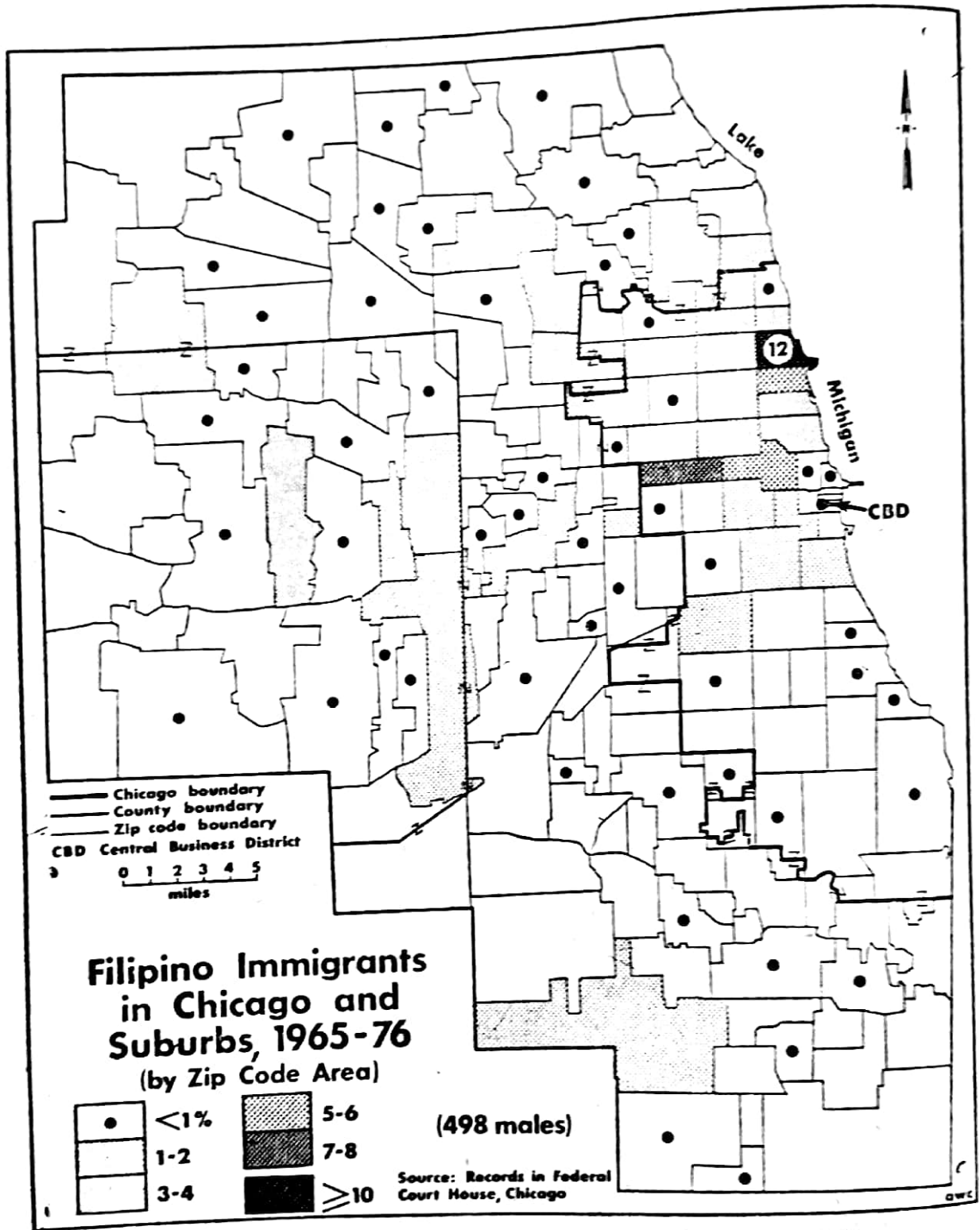


FIGURE 8



TABLE 1. LEADING SOURCES OF IMMIGRANTS TO THE UNITED STATES, 1955-1976

1955-1964	1965-1976
1. Mexico	1. Mexico
2. Germany	2. Cuba
3. Canada	3. Philippines
4. United Kingdom	4. Italy
5. Italy	5. Canada
6. Cuba	6. United Kingdom
7. Poland	7. China/Taiwan
8. Ireland	8. Korea
9. Hungary	9. Dominican Republic
10. Greece	10. Greece
11. Japan	11. Jamaica
12. Netherlands	12. Portugal
13. China/Taiwan	13. Germany
14. France	14. India
15. Yugoslavia	15. Colombia

Source: U.S. Department of Justice, Immigration and Naturalization Service.

1920s, just south of the CBD, where a Chinatown developed. This area is still home for several thousand Chinese residents who continue to live in housing built largely before 1920. It became hemmed in by factories, warehouses and transportation facilities which allowed little expansion. A second Chinatown has been planned for the Uptown area.<sup>9</sup> An estimated 7000 Chinese live scattered on the north side, but Uptown seems to be a focal point. The Chicago metropolitan area's Chinese population numbered 12,000 in 1970, with 8,900 living within Chicago where two-thirds of them lived in structures built in 1939 or earlier. Most of the employed Chinese were involved in wholesale/retail trade, the food service industry and in the professional and related services while the median income of all those employed was \$11,850.<sup>10</sup>

This study revealed that nearly one-fifth of the 203 Chinese males lived in the old Chinatown of the Near South Side (60616) (Figure 10). A considerable number also chose to reside in Uptown (60640) and the adjacent neighborhoods. Many of the Chinese immigrants rely on kinship assistance, especially in cases where educational deficiencies are encountered in obtaining employment.<sup>11</sup> Consequently, a large number become

<sup>9</sup> Paul Gapp, "2d Chinatown Planned For North Side," *Chicago Tribune*, February 14, 1974, Sec. 4A, p. 1.

<sup>10</sup> U.S. Bureau of the Census, *Census of Population: 1970*, Subject Reports, Final Report PC (2) — IG, Japanese, Chinese and Filipinos in the United States, pp. 109-118.

<sup>11</sup> Peter S. Li, "Occupational Achievement and Kinship Assistance Among Chinese Immigrants in Chicago," *The Sociological Quarterly*, 18 (Autumn, 1977), pp. 478-489 and Peter S. Li, *Occupational Mobility and Kinship Assistance: A Study of Chinese Immigrants in Chicago* (San Francisco, California: R & E Associates, Inc., 1978).

TABLE 2. OCCUPATIONS OF ASIAN IMMIGRANTS UPON ENTRY TO THE UNITED STATES, 1965-76<sup>a</sup>

	Country			
	China	India	Korea	Philippines
Professional, technical and kindred workers	18%	44%	14%	27%
Farmers and farm managers	— <sup>3</sup>	—	—	—
Managers, officials and proprietors <sup>b</sup>	5	2	3	2
Clerical and kindred workers	4	2	2	3
Sales workers	1	—	—	—
Craftsmen, foremen and kindred workers	2	1	3	2
Operatives and kindred workers <sup>c</sup>	5	—	1	1
Private household workers	1	—	—	3
Service workers, except private household	9	—	2	2
Farm laborers and foremen	—	—	—	2
Laborers, except farm and mine <sup>d</sup>	2	—	—	1
Housewives, children and others with no reported occupation	52	47	74	57

1. All immigrants from China, India, Korea and the Philippines.

2. — denotes less than 1%.

3. Managers, administrators, except farm.

4. In 1974-76, included categories of operatives, except transport and transport equipment operatives.

5. In 1974-76, included laborers, except farm.

Source: U.S. Department of Justice, Immigration and Naturalization Service.

TABLE 3. ASIAN IMMIGRANTS IN CHICAGO AND SUBURBS, 1965-76

Country of Origin	Number of Males	Average age at entry	Average age at naturalization	Percent residing in Chicago	Percent with children at naturalization	Average number of children per family
China	203	33.9	40.0	57	75	2.6
India	205	30.0	35.8	41	80	1.9
Korea	244	31.2	36.5	56	87	2.0
Philippines	498	31.9	37.3	70	77	2.6
Total	1,150	31.7	37.3	60	80	2.3

Source: Records in the Federal Courthouse, Chicago.

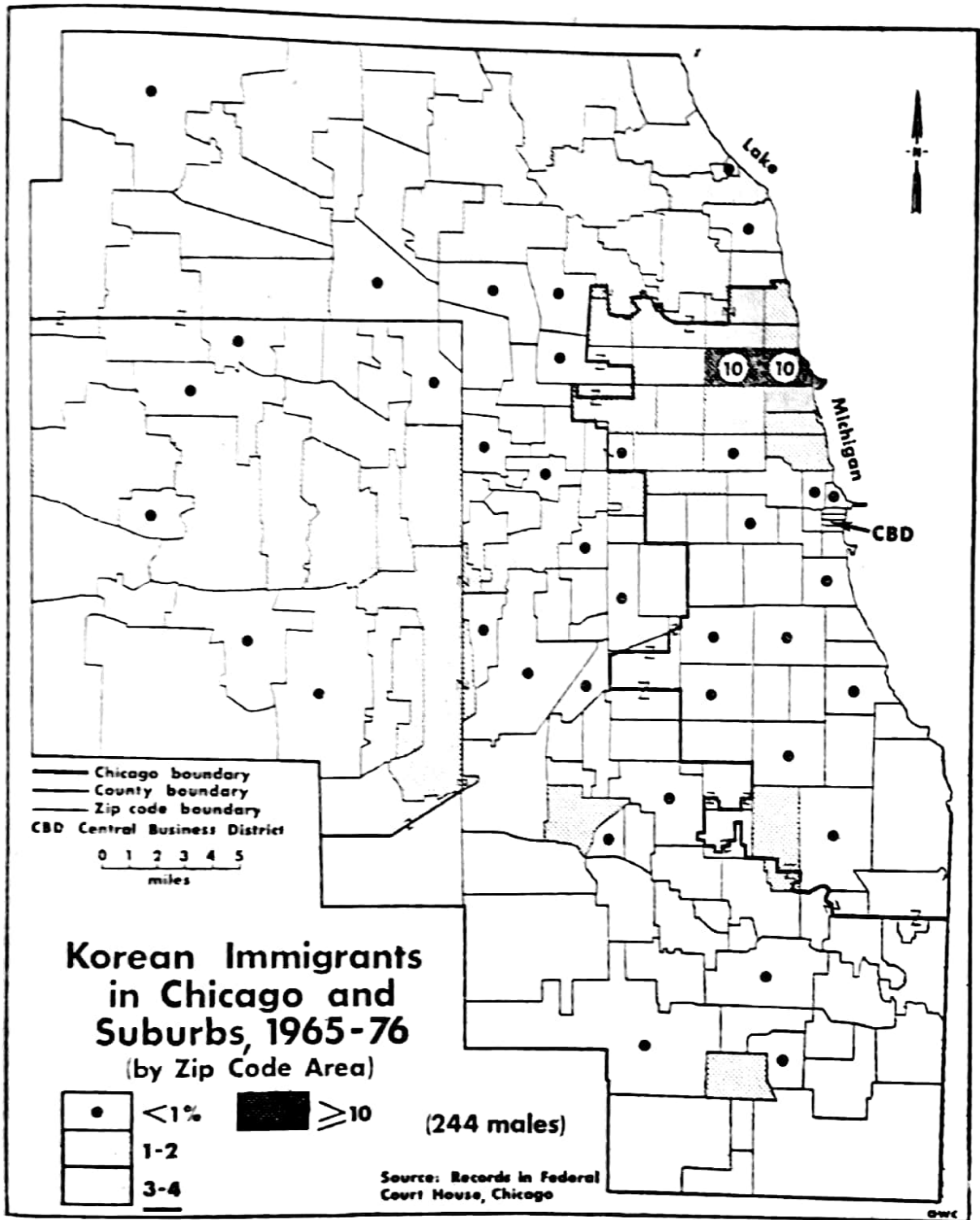


FIGURE 9

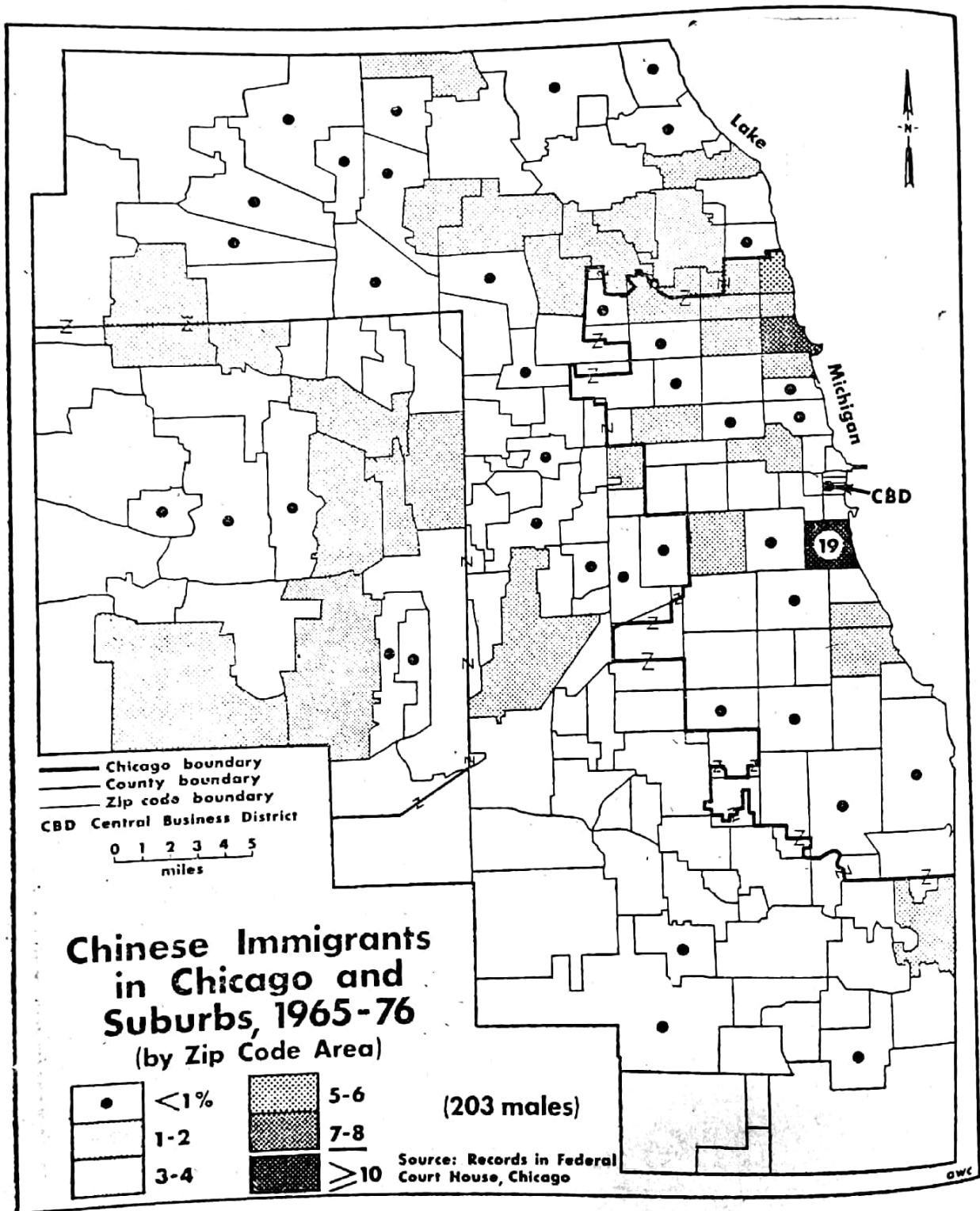


FIGURE 10

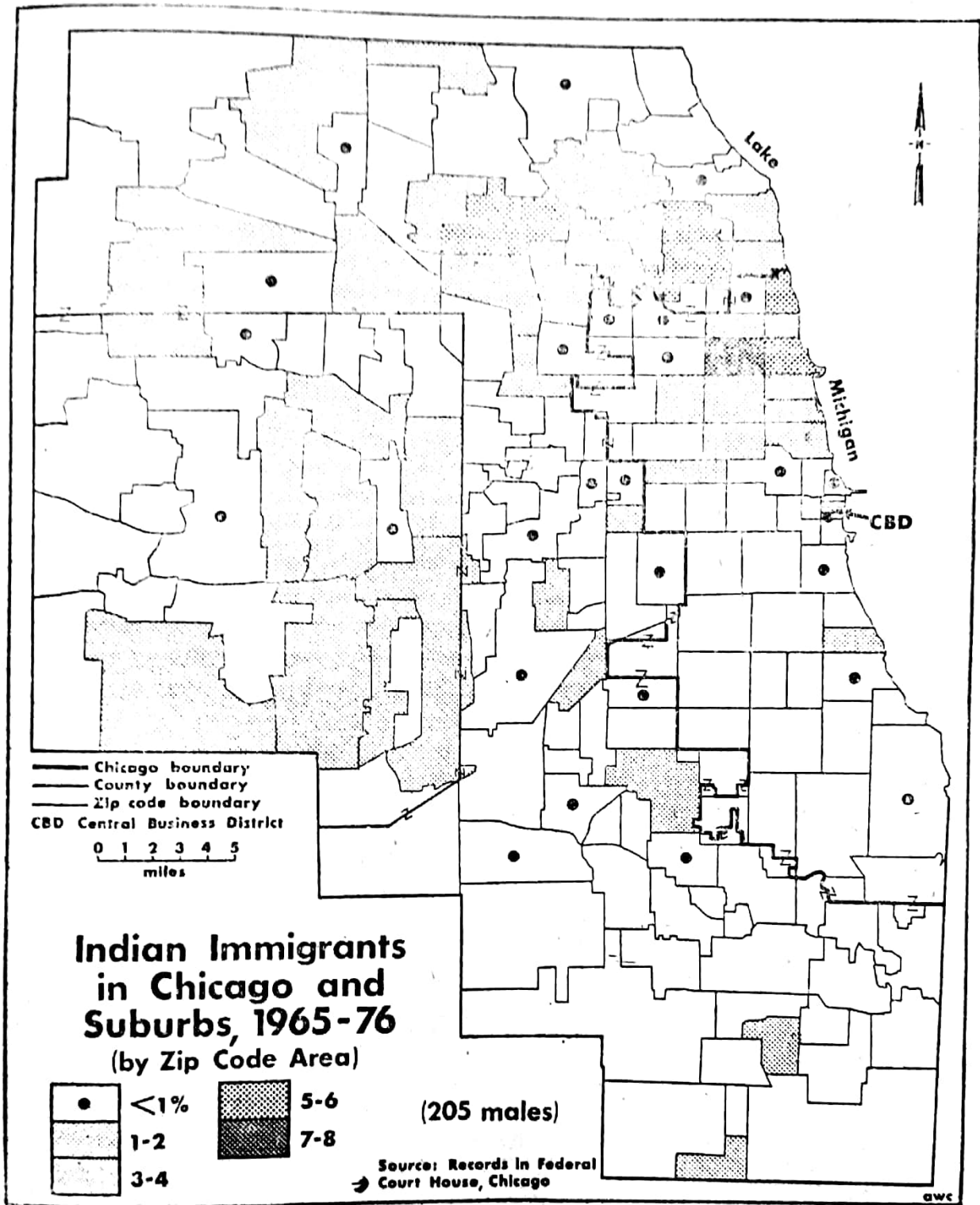


FIGURE 11

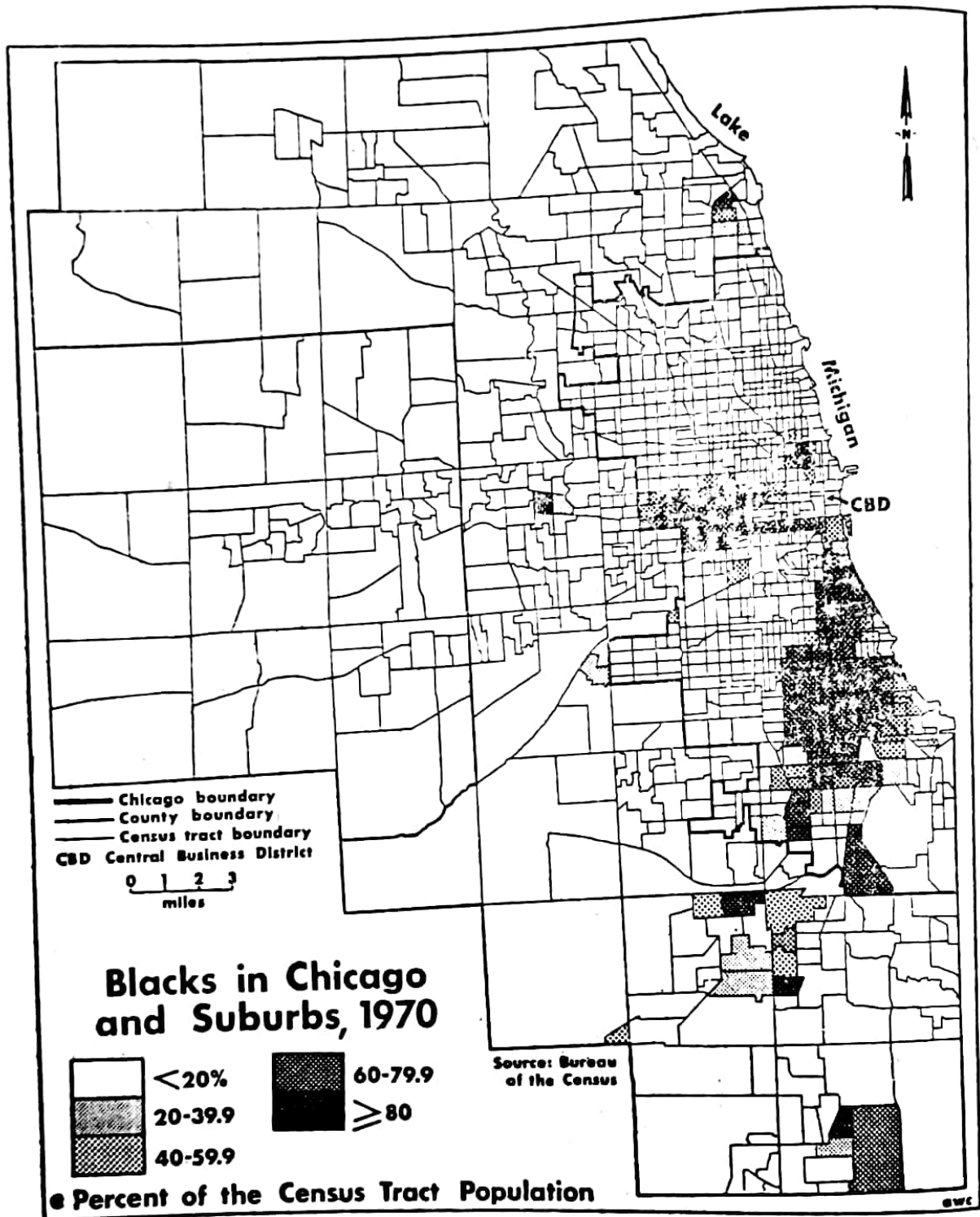


FIGURE 12

involved in ethnic businesses in their locale. Nearly one-half of the Chinese males indicated they were born in Kwangtung Province, chiefly in Canton.

Unlike the other Asian immigrant groups, less than one-half of the Indian males who applied for naturalization during the study period resided in Chicago (Figure 11). Many chose the northern suburbs, especially Skokie (60076) and Des Plaines (60016). Of course those who chose to settle in Chicago, most lived on the north side along Lake Michigan, particularly in Uptown and Rogers Park (60626). Indian male immigrants enter the United States largely as professional, technical and kindred workers. Many are medical personnel while others are educated in the various fields of engineering. Some are also operators of small businesses and restaurants.

Usually the Indians emigrate as families. Single females are rarely immigrants.<sup>12</sup> In the case of the 205 males, nearly one-fourth of them were born in the state of Gujarat. Large numbers were also born in Andhra Pradesh, especially the city of Hyderabad in Punjab and in Maharashtra, particularly Bombay. By the mid-1970s, approximately 10,000 Indians lived in Chicago and its suburbs. They comprise one of the more recent immigrant groups to settle in the metropolitan area.<sup>13</sup>

By analyzing the map of the 1970 Black population in the Chicago metropolitan area, it is apparent that the four Asian immigrant groups settled outside of areas dominated by Blacks (Figure 12).<sup>14</sup> The exception is old Chinatown in the Near South Side which is encircled by Blacks. It was well established prior to the rapid areal expansion of the Black population after World War II. A sizeable number of Filipinos

<sup>12</sup> For background information on Indian immigration to the United States, see Ralph R. Ireland, "Indian Immigration to the United States, 1901-1964: Retrospect and Prospect," *Indian Journal of Economics*, 46 (April, 1966), pp. 465-476.

<sup>13</sup> James Jackson, "Indians Here Add Dash of Curry to Sweet Smell of Success," *Chicago Tribune*, March 25, 1973, Sec. 1, p. 45 and Susan Nelson, "People: A New Gift From India," *Chicago Tribune*, April 3, 1972, Sec. 2, pp. 13, 16.

<sup>14</sup> For background information on the development and expansion of the Black ghettos in Chicago, see Brian J. L. Berry, *The Open Housing Question, Race and Housing in Chicago, 1966-1976* (Cambridge, Massachusetts: Ballinger Publishing Company, 1979); *The Negro In Chicago* (New York: Arno Press and The New York Times, 1968); Allan Pred, "Business Thoroughfares As Expressions of Urban Negro Culture," *Economic Geography*, 39 (July, 1963), pp. 217-233; Ying-cheng Kiang, "Recent Changes in the Distribution of Urban Poverty in Chicago," *Professional Geographer*, 28 (February, 1976), pp. 57-61; Community Renewal Program, *An Atlas of Chicago's People, Jobs and Homes* (Chicago: Chicago Housing Authority, Department of City Planning, June, 1963), pp. 23-24; Pierre de Vise, "Chicago's Widening Color Gap" in Irving Cutler, ed., *The Chicago Metropolitan Area: Selected Geographic Readings* (New York: Simon & Schuster, Inc., 1970), pp. 280-298; Otis D. Duncan and Beverly Duncan, *The Negro Population of Chicago: A Study of Residential Succession* (Chicago: University of Chicago Press, 1957) and Karl E. Taeuber and Alma F. Taeuber, "Negro as an Immigrant Group: Recent Trends in Racial and Ethnic Segregation in Chicago," *The American Journal of Sociology*, 69 (January, 1964), pp. 374-382.

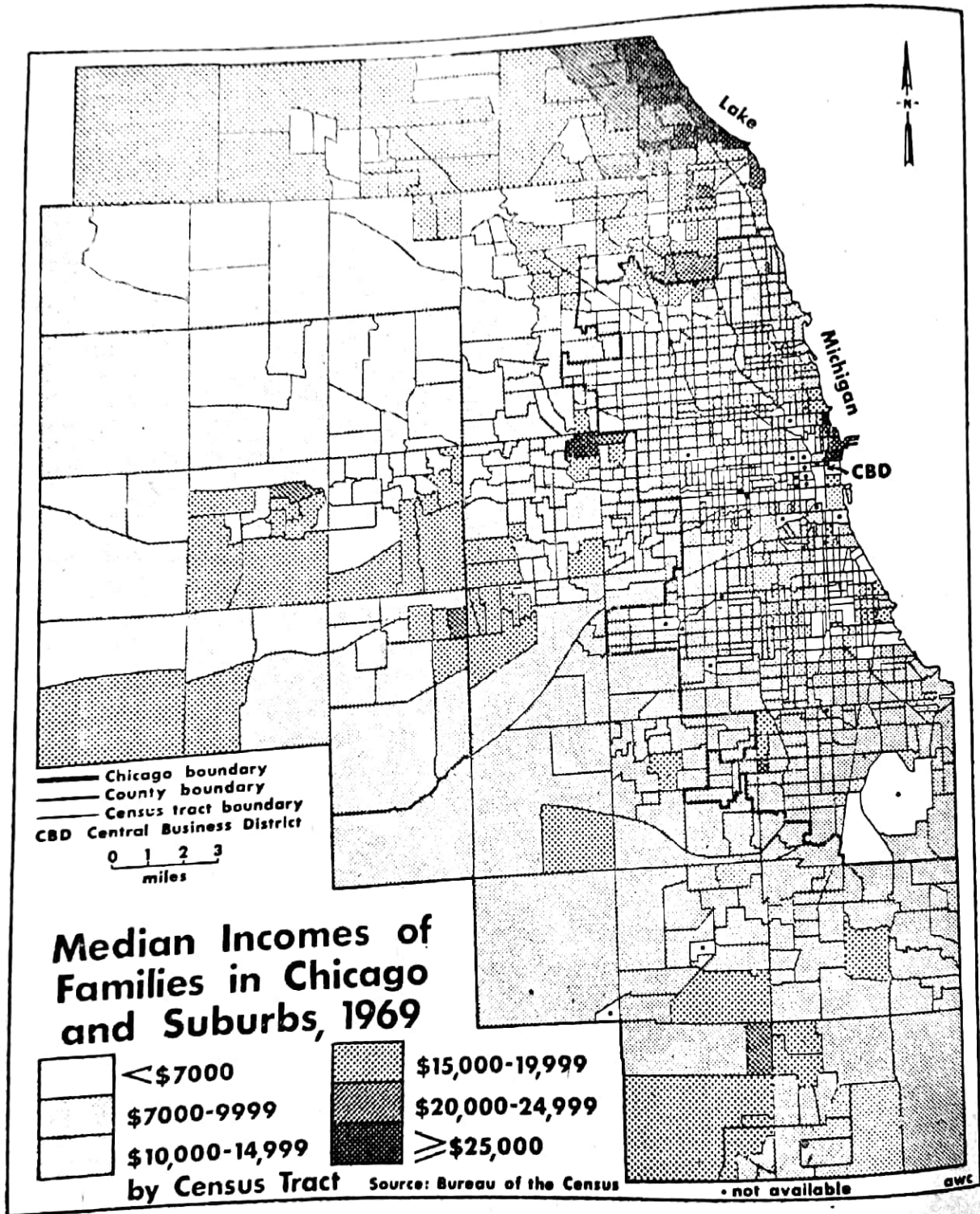


FIGURE 13



resided in close proximity to the Black community which extends westward from the CBD.

Likewise, few of the male Asian immigrants chose to reside in census tracts with median incomes of families less than \$7000 in 1969 — these were inhabited largely by Blacks — except for several tracts in the adjoining Uptown and Lakeview neighborhoods (Figure 13). In general, the majority of the 1150 males lived in census tracts with median incomes of families under \$15,000. This settlement pattern conforms to the average family incomes indicated earlier for the Filipinos and the Chinese. Many of the Indians, and others, who lived in the more affluent northern suburbs were in census tracts with median incomes of families exceeding \$15,000.

### CONCLUSION

Asian immigration to the United States has become especially significant since the passage of the 1965 Amendments to the Immigration and Nationality Act which eliminated quotas based upon nationality. The Chicago metropolitan area has become a major destination for a growing number of Asian immigrants. It is documented that the vast majority of foreign immigrants choose to reside in urban places, especially in metropolitan areas. On the other hand, it is not well documented, because of the nature and confidentiality of immigration data, where foreign immigrants reside within metropolitan areas. This study, based upon data extracted from petitions for naturalization, provides insights into where four Asian immigrant groups (Chinese, Filipino, Indian and Korean) settled within Chicago and its suburbs.

Petitions for naturalization were analyzed for 1150 males, 18 years of age or over upon entry. Most of these males chose to reside in Chicago's north side neighborhoods and the adjacent suburbs. A major exception is the sizeable number of Chinese males who settled in old Chinatown, south of the CBD. In contrast to the other three immigrant groups, more Indian males chose to live in the suburbs than in Chicago. Different variables — the location of professional employment opportunities, the availability of low cost housing, kinship roles — undoubtedly played important roles in the immigrants' decision-making processes. Each of the Asian immigrant groups chose not to live in areas heavily dominated by Blacks.

An analysis and mapping of these immigration data provide an important key to understanding the settlement processes of new immigrant groups, the transition and succession patterns that take place as

groups move in and out of neighborhoods and the emergence of new ethnic concentrations in today's metropolitan areas.<sup>15</sup> This exploratory study can serve as the basis for more detailed analysis in the future.

### ACKNOWLEDGMENT

The author acknowledges the financial support of the Association of American Geographers which allowed him to gather data in Chicago.

<sup>15</sup> For similar analyses of Asian immigrant groups residing in metropolitan areas, see Alvar W. Carlson, "Filipino and Indian Immigrants in Detroit and Suburbs, 1961-1974," *Philippine Geographical Journal*, 19 (October-November-December, 1975), pp. 199-209 and Alvar W. Carlson, "The Mapping of Recent Immigrant Settling in Cleveland and Cuyahoga County Based Upon Petitions for Naturalization," *Ecumene*, 10 (April, 1978), p. 32.

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Owner: PHILIPPINE GEOGRAPHICAL SOCIETY	P.O. Box 2116, Manila
Publisher: PHILIPPINE GEOGRAPHICAL SOCIETY	P.O. Box 2116, Manila
Printer: BOOKMAN PRINTING HOUSE	373 Quezon Ave., Q.C.
Office of Publication: PTRI Compound, Bicutan, Tagig, Metro Manila	

In case of publication other than daily, total number of copies printed and circulated of the last issue date July-Dec., 1983.

1. Sent to paid subscribers .....	510
2. Sent to others than paid subscribers .....	490
T o t a l .....	1,000

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# URBAN PLANNING AND GEOGRAPHIC INFORMATION SYSTEMS (G.I.S.): AN OVERVIEW

by

P.W.K. YANKSON\*

## ABSTRACT

This paper provides an overview of the relationship between urban planning and spatial information systems. The need for information systems and their properties and specific requirements for urban or spatial planning are highlighted. The comments as to the relevance of spatial information systems for planning in the developing countries are made at the end of the paper.

## INTRODUCTION

It is widely recognized that lack of suitable statistics computed on the basis of systematically collected basic data is a major obstacle to the preparation and implementation of urban and regional development plans. The necessity for an extended information base for planning at all levels is strongly felt in every country particularly in the developing countries where their planning effort is always hampered by lack of adequate data base.

Closely related to the problem of lack of data is the difficulty involved in establishing efficient system for collecting, storing and communicating data to the planning agencies. Thus the need for information systems to speed up the planning efforts and to enable the planning process to be more flexible or adaptable to changes in the urban and regional milieu has become urgent now than before. Forces underlying the urban and regional growth and changes have become very complex. At the same time new ideas and techniques of planning have been introduced and used especially in the developed countries. These techniques include modeling, the use of statistical methods, mathematical programming and operation research. These and other methods are now used to solve problems, to generate alternative plans and to simulate the possible effects of alternative policies on the growth and change in the urban environment. This approach has prospects for planning for it could improve the planners ability to make better recommendations to decision makers as to which policies to adopt to achieve certain objectives. These techniques are largely quantitative and depend upon adequate data, which can be processed into relevant information, for their accuracy.

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\*Lecturer, Department of Geography, University of Ghana.

Planners in the developing countries are increasingly adopting these techniques but they are at a disadvantage compared with their counterparts in the developed world in that their data base is generally very weak. In recent years, the use of information systems in business management and in other fields has become widespread especially with the introduction of computer technology. In planning too, some efforts have been made in the advanced countries towards the development and the use of Spatial or Geographic Information System (GIS). This is because planners have realized the potential role GIS can play in planning efforts. However, much as planners consider the usefulness of GIS, very few planning agencies have developed and incorporated such systems in their planning process.

This paper presents an overview of GIS and planning in the belief that it could serve as an introduction to a detailed study of GIS. It discusses in general the advantages and the problems involved in using GIS in Planning. The emphasis is on Spatial systems because urban planners are concerned with the development of the urban areas and their environs and thus are much more concerned with data not as entities in themselves but in their aggregate and distributions. There are various aspects of GIS which planners need to be conversant with if they are to derive meaningful benefit from the use of computer technology. These include data acquisition, organization of data in the system, data processing, storage, and information retrieval. Each of these requires detailed discussion which is not the purpose of this paper.

### INFORMATION SYSTEMS

The concept Information can simply be defined as collected data which have been processed, analyzed and transformed into a form which is needed and usable by decision makers (Fisher 1968). The assumption behind the need for information is that it could lead to a better decision and better planning. It is, therefore, fundamentally linked to the decision making process (Hoos 1971). There is a whole range of steps through which data have to become information. These steps include data collection, data organization, data storage and retrieval. All these can involve computer handling and each of these steps is linked to each other and together they form a system.

An information system has been defined by Fisher (1968) as an "open, self-adaptive man-machine system capable of providing needed information. It involves a sequence of steps in the synthesis of information from raw data input by use of automated methods..." Specifically, the entities and activities of any information system can be described in terms of four subsystems: management subsystem, data processing subsystem, data analysis subsystem and the information use subsystem (Tomlinson 1972). **The management subsystem** consists of

organization, staff procedures and rules for directing one or more of the other subsystems depending on the functions included in the information system. The **data processing subsystem** includes: data acquisition, input, storage and retrieval via a sequence of operations utilizing various automated and non-automated procedures. The **data analysis subsystem** includes any manipulation of data, summarization, statistical analysis and modelling as well as the preparation of data for output as information in various forms (computer graphics, charts, etc.) The **information use subsystem** is the user decision system where the information is brought to bear on a particular problem. By way of analogy, an information system may be likened to an assembly line in that an end product is achieved after specifying, collecting, processing, disseminating and applying appropriate raw materials that meet the demands of the users or clients of the end product (The Council of Planning Librarian, Sept., 1972). Thus an understanding of the concept of systems is essential in information system.

In general, a system can be viewed as "A group of entities and activities meaningfully connected and satisfactorily bounded, which interact for a common purpose or purposes" (Tomlinson 1972). Any system can be divided into subsystems, the idea behind this is to break the system into parts, which show greater degree of interaction and interconnection, and study them into details. The use of systems analysis enables planners to approach problems systematically and scientifically. GIS vary with respect to areal coverage, information and level of precision. The geographic area of concern may be national, state or province, regional or municipality. The spatial precision can range from specifying the precise location of a single event to average values for regions.

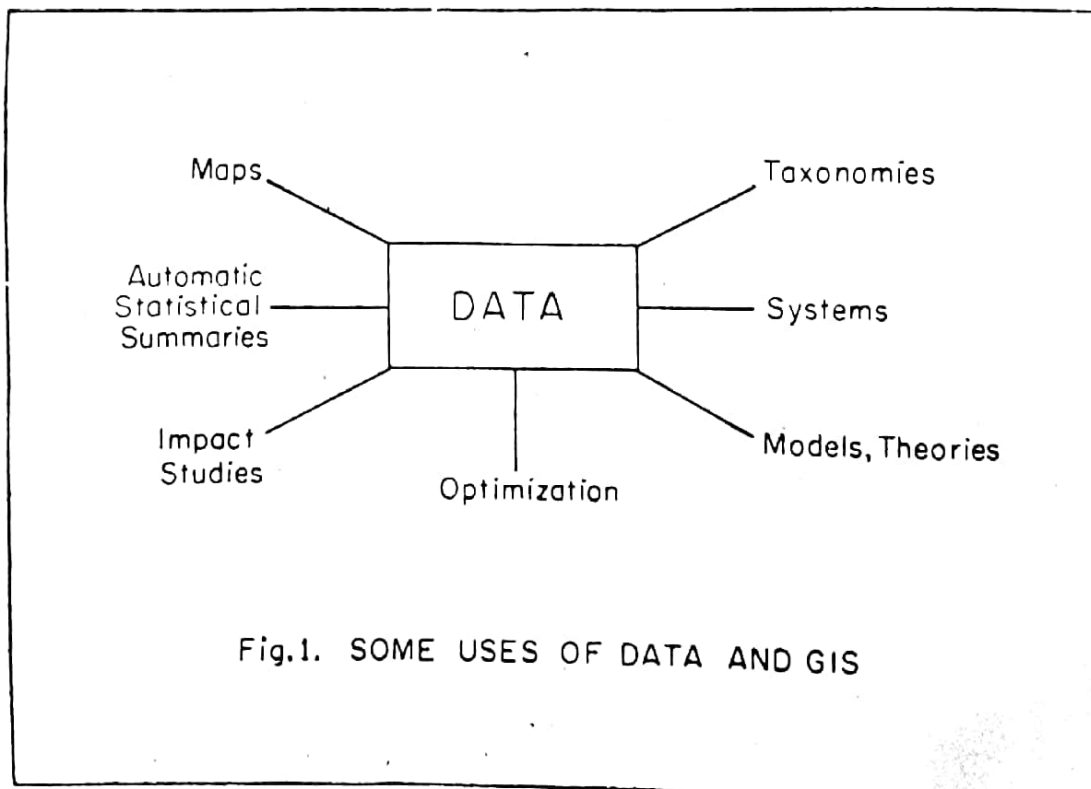
### PLANNING AND GIS

There are various definitions of what planning is and ought to be. On the whole planning is a process. It consists of making choices among alternative policies or approaches aimed at improving the quality of life. It also involves the use of scarce resources to secure the implementation of these policies. Planning is future oriented — what step to take now to guard the development of the environment in the future is the concern of physical or urban planning. Harris (1965) has noted the major interrelated steps involved in planning:

"The projection of probable future development; the identification of objectionable or undesirable features of their development; the identification of desirable alternative patterns and direction of development; the invention of policies and public actions which may influence development in desired directions, the generation of plans reflecting various combinations of these policies and actions, testing these plans for effectiveness, feasibility, and costs; choosing or assisting in the choice among alternative sets of policies and initiating still further improvements."

This sequence of steps may appear simple in theory but there are a number of factors which tend to make them extremely difficult in practice. The urban and metropolitan areas are complex functional entities in which people, business and institutions interact. A lot of development takes place under private initiatives not completely subject to direct public control and in response to influences which are not completely understood. At the same time, there is a large amount of data which the traditional or conventional methods of data analysis cannot cope with in producing information at the time needed.

Information system can play a significant role in the planning process. It facilitates the accessibility of data and ensures wider distribution of information. Moreover, the use of GIS can lead to the generation of new information never before observed, recorded or reported. Again, GIS provide data upon which analysts and planners can test and modify hypotheses, theories and models about the general relationships in the urban environment. GIS enable information to be retrieved in various forms: as statistical summaries of user specified areas, or in the form of computer graphics (maps, diagrams, or both) (see Figure 1).



Catanese (1973) considers four basic conditions necessary for the use of GIS. First, the development of any GIS should be guided by the circumstance where the scientific techniques and methods used for the GIS are scientifically complex and sophisticated and also where the burden of information can be eased by an information system. According to him

"this condition is consistent with the view that information system must be based upon analytical systems since there are no advantages to be gained from an information system which simply gives us information to mull over without any analytical framework."

The second condition occurs when the data are sufficiently large and complex and manual processing methods are inadequate. Analytical systems require large amounts of data. Much of these are complicated and also the problem of storage, retrieval and processing are beyond human capabilities. Computers have the processing speed and memory-capabilities to do this job.

Thirdly, there must be a sincere desire among planners and decision makers to improve the quality of decisions by basing these decisions on adequate information. Lastly, and related to the above, the conviction must exist that the urban system could be improved and the quality of life improved through planning principles established on sound information systems.

Granted that the above conditions are satisfied before any planning agency undertakes the expensive task of developing information systems, there are certain urban planning requirements which must be considered if maximum benefits are to be derived from the use of information system in the planning process. Planning is a heuristic process in which planners learn more about a problem, identify its dimensions and focus as they try to find solutions to them. New ideas are also developed as a result of insights gained from the initial exploration of the problem. This cyclic process requires that an information system for urban planning purposes be flexible and open ended. This directly imposes specific operational requirements that the data base and the data processing component must fulfill.

The United States Housing and Urban Development's (HUD 1968) report on urban and regional information systems describe four operational features of GIS data processing system which could satisfy the information needs of the planning process. First, GIS must possess a comprehensive set of processing capabilities that will support GIS applications to planning problems. Second, GIS must provide mechanism for planners to communicate easily with the system and the data base through a convenient non-programmer language that is oriented to the users' processing needs.

Third, GIS must be able to respond to needs by having a mechanism in the system which can alter easily the processing functions and lastly,

a GIS must facilitate subsequent incorporation of additional data sets when the need arises and also update data when considered necessary. These requirements have made the development of GIS a fairly difficult and expensive undertaking. These requirements also point to the need for a serious consideration of the performance properties of GIS as they affect not only the quantity, frequency or reliability of information but also the quality of information retrieved from any GIS.

### INFORMATION SYSTEMS PERFORMANCE PROPERTIES

Fisher (1968) has identified and discussed eight general properties which may be used to appraise or evaluate GIS. These are the systems' capacity, compatibility, timeliness, coherence, flexibility, dependability, economy and quality. Some of these properties have already been referred to but they need a bit of elaboration. **Capacity** of the system relates to the size of the system and the users' demand upon it. The system should be able to collect, store and process all the data necessary for the development of information required by users. There should also be possibilities for expanding the data base. Insufficient capacity of any system manifests itself in various ways such as the restriction of the number of data items on record, the number of records that can be packed in a tape block, the number of values or records contained in a file. Insufficient capacity can, most often, be directly traced to hardware limitations and inadequate anticipation of users needs (HUD 1968). **Compatibility** relates to users needs and the information systems. Technical considerations and development are of major importance in ensuring that data from various sources will be compatible and thus allow sophisticated analysis for the development of information. Levels of compatibility which may be achieved will undoubtedly relate closely to achievement in the area of geo-coding and small area data collection data storage and data retrieval.

**Timeliness** relates to the temporal relationship between user demand and the information system response or the time efficiency with which queries are answered. Another significant temporal property relates to the time for which information is representative (or time interval).

**Coherence** "...is a property achieved through the planning and control subsystems and an interactive process completed as a result of feedback between all elements or subsystems of the major structure" (Fisher 1968).

**Flexibility** is essential to adjustments which will be required as user needs change. The system must also be capable of anticipating the need for data collection adjustments. Flexibility of a system also depends



on how easily the data base could be manipulated by users. This largely depends on how data are organized and stored in the data base.

**Dependability** is very much related to other properties. Dependability allows the information system to perform at a given level of accuracy and within given time constraints.

**Economy** or cost effectiveness of an information system is difficult to determine because the really significant attribute of cost is that relating to cost resulting from errors of judgment rather than the cost of securing information.

**Quality** in a general sense relates to each of the performance properties considered. There is another dimension of quality which is a more specific quality and in the more restricted sense and it is defined as "the difference between measurement, processing and analytical capabilities (accuracy) and the level demanded from appropriate action by users" (Fisher 1968). The value of a system will relate directly to the level of quality attained. It is difficult to discuss any system and evaluate its performance properties because there are no operational definitions regarding any of the properties described. There are no standards against which one could measure and thus evaluate a system's performance level so as to be able to compare various GIS. It is hoped that as the use of GIS becomes widespread among planners and various problems are addressed using various properties of GIS, efforts may be directed at finding solutions to such problems.

### COMMENTS

GIS is a new technique in the planning process. No study has been made to measure its impact on the planning process particularly in decision making. One cannot assume that once information flow is constant and reliable, decision makers would be able to take better and accurate decisions that affect the direction and nature of growth and change in the urban environment. It should also be realized that information systems alone cannot give complete guidance to the solution of planning problems. The data in the data base are those which are machine readable. In addition, there are certain socio-economic dimension which cannot be incorporated in the data base. These include such variables as people's perception of their environment, socio-political affiliations and the quality of life in general. These directly and indirectly affect decisions regarding the type, location and quantity of service and facilities to be provided. For these and other reasons, developing countries which may want to utilize GIS must know the limits of this technology. They must also be aware of the cost involved in developing GIS.

Because developing a GIS is an expensive venture, it cannot be done by small planning groups or agencies that are mainly private concerns but by large groups or agencies which are mainly governmental bodies. This fact underlies the significant part played by various levels of government in planning, designing and implementing some of the major systems in the advanced countries such as Canada. In this regard, it could be said that the justification for the survival of any GIS depends very much upon the level of its usage. The governmental planning bodies which can develop and use GIS must try and extend the facility to other planning agencies so that the full potential of the system may be realized. This may involve extensive information distribution to the various planning agencies, libraries of the various institutions of research and higher education. These may include aspects of the various systems, their potentialities, objectives, the data bases and the problems which could be addressed using the systems. Again, there may be a need for a detailed study to ascertain the levels to which planning agencies are likely to utilize GIS when offered the opportunity. At the moment, there is scanty information available on GIS development even in the advanced countries. This situation arises from the fact that some of the systems are in the experimental stages of development and system designers and developers are unwilling to circulate information on anything that is not conclusive. Despite this it would be interesting for planners to know the stages of development of each system.

Developing countries generally lack the financial resources and technical expertise to undertake such projects. The experience gained by such countries as Canada and the United States in developing GIS could be of great help to them in their effort to develop their own GIS. This is especially so when the need to design systems to suit their technical and financial capabilities arises. There is also the personnel problem.

There is the need for adequate personnel to handle the various systems and to respond to users' demand as quickly as possible. Part of this problem may be solved when systems are designed so that planners could use them without having to acquire high level computer technology which takes time to acquire, but some simple knowledge of computer language and data manipulation options. However, there is a limit to the extent to which systems could be designed to be used by virtually anybody. The objective functions of some systems are such that their design criteria, methods and operations necessarily have to be complicated.

The future of GIS appears excellent in the advanced countries. It deserves to be watched closely by planners. In the developing countries which have not yet embarked on the use of this technology, caution must be exercised in adopting this science. Governmental planning bodies need to consider its use in relation to their specific needs, financial resources and expertise.

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# ASIAN GEOGRAPHER

A Regional Biannual Journal  
that comes out in April and October  
Published by the Hong Kong Geographical Association.  
Address: c/o Dept. of Geography and Geology,  
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# SWAZILAND'S PROPOSED LAND DEAL WITH SOUTH AFRICA — THE CASE OF INGWAVUMA AND KANGWANE

by

WOLFGANG SENFTLEBEN<sup>1</sup>

Since the Gambia united with Senegal under a Confederation recently, Swaziland (with an area of 17,363 sq.km.) has been the smallest country in mainland Africa (followed by Djibouti with 21,783 sq.km.), but this could change very soon. In mid-1982 it was announced that the Republic of South Africa is willing to transfer two of its land areas totalling approximately 10,000 sq.km. to the Kingdom of Swaziland. Together, these two areas would increase Swaziland's size by more than 60 per cent and give the hitherto land-locked state access to the sea with a potential port at Kosi Bay, just below Mozambique. The principal benefits for both countries are only too obvious: For Swaziland it means a realization of a long-standing dream of the late King Sobhuza II to incorporate all lands of the traditionally Swazi realm, besides ending Swaziland's status as a land-locked state. For South Africa it would be a major success of her apartheid policy (or territorial separation) by excommunicating two of its African tribal areas with a population of together 850,000 people, which would give South Africa a tacit quasi-recognition of her homeland policy, besides the advantage of creating a buffer zone between white-ruled South Africa and Marxist-oriented Mozambique for security reasons. However, such land transactions are carried out at the expenses of the local population in the respective areas of Ingwavuma and KaNgwane. Swaziland had called the land deal "the most significant political occurrence of the twentieth century." Indeed, the land transfer, if it goes through, constitutes a geopolitical unique case unprecedented in world history. For the first time two countries are willing to transfer two substantial areas of land on an entirely voluntary and equitable basis for the mutual benefit of both. A remote parallel, however, could be seen in the quasi-forced expulsion of the State of Singapore from the Federation of Malaysia in September, 1965 on political and racial grounds; yet with the important difference that Singapore opted for complete independence which was subsequently recognized by the world community.

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The following treatise may analyze some of the implications involved in the land deals with regard to political and administrative factors, ethnic considerations, traffic and communications, as well as the geopolitical situation in Southern Africa. However, let us first examine the geographical and socio-economic position of the two land areas involved:

1. **KaNgwane (or Swazi) Tribal Homeland** is South Africa's second-smallest non-independent homeland with an area of 2,090 sq.km. located in the eastern part of Transvaal Province. It forms a crescent-shaped sliver of land on Swaziland's northern border, originally consisting of two separate areas which now have been consolidated into one single part. The predominant agricultural use of the territory can be described as "mixed farming" between agriculture and stock-farming, but large areas are still utilized for subsistence farming. KaNgwane is cutting an arc across Swaziland's northern border through citrus and sugar-cane country to the Mozambique border. It is probably one of South Africa's worst rural slums with a complete absence of mineral resources and industrial development (African Business, June 1982, p. 4). Social and health conditions are appalling. South Africa's 1980 cholera epidemic, for instance, originated from KaNgwane's overcrowded shanty settlements. Typhoid broke out in early 1981. Malnutrition and disease are rife, sanitation, health, educational services and basic infrastructure are all rudimentary.

Of particular interest is KaNgwane's population situation. Of the approximately 750,000 in South Africa living Blacks of Swazi origin (*de jure* population of KaNgwane), only 20% currently live in KaNgwane Homeland, a further 6% of the Swazis reside in one of the other tribal homelands or Bantustans (KwaZulu, Gazankulu, Lebowa, etc.), and the rest are settling on areas reserved for whites. Therefore, KaNgwane had a *de facto* population of only 150,000 people, with 70% being Swazis, the rest belong to Zulu, Shangaan and North-Sotho tribes. The formation of quasi-political parties is still in the infant stage of development. The four main political groupings can be distinguished by their attitude towards King Sobhuza II of Swaziland. The majority of all Swazis of KaNgwane, although they respect King Sobhuza as the cultural figurehead of the Swazis, have voiced opposition to being incorporated into Swaziland. After the death of King Sobhuza II on August 21, 1982 at the high age of 83, many Swazis of KaNgwane may be less inclined to recognize the suzerainty of a new Swazi monarch. Enos Mabuza, Chief Minister of KaNgwane Homeland, flatly rejects the dubious benefits of Swazi citizenship in exchange for the more valuable South African citizenship. He said: "We have no wish to be part of the medieval monarchy that rules by decree." Indeed, political parties and labour unions in Swaziland were banned after the country's Parliament was abolished in 1973. The large majority of the people of KaNgwane are certainly united in rejecting the land transfer. Thousands of members of the tribal

Inyandze movement pledged to resist the cession of KaNgwane to Swaziland at a meeting in KaNgwane's capital of Kanyamanzane.

The crucial issue is that of citizenship and employment permits. If the land transfer goes through, another 750,000 black South Africans would be deprived of their South African citizenship. The people in KaNgwane fear they will lose their South African mining jobs if they are no longer citizens. Most of KaNgwane's people work in South African mines or in nearby South African towns and would have to continue to do so, since KaNgwane has no industrial or commercial base to absorb them. This would certainly make Swaziland economically more dependent on South Africa than ever before. Another vehement opposition against the KaNgwane land deal comes from white farmers in the area of eastern Transvaal. The boundary changes would also isolate a wealthy white farming area near the border town of Komantipoort, leaving it connected to the rest of South Africa by only a narrow corridor, and the conservative, generally pro-government farmers, have also held protest meetings. South Africa's main opposition party, the Progressive Federal Party, is another principal opponent of the land transfer.

So far, the opposition has achieved some tactical victories on the legal front blocking the immediate land transfer for the time being. In June 1982 South Africa abolished the Legislative Assembly of the black KaNgwane Homeland, and the proclamation R-108 in the government gazette gave full powers to the South African Department of Co-operation and Development (Black Affairs) to administer the territory. Subsequently, the Transvaal Province Supreme Court Appellate Division declared the method adopted illegal, when KaNgwane officials challenged the validity of the proclamation dissolving their Legislative Assembly. In an out of court settlement announced in Pretoria in November 1982, the Department of Co-operation and Development agreed to withdraw the proclamation and to pay all the Homeland's legal costs. In terms of the National States Constitution Act of South Africa, the State President did not have the right to dissolve the KaNgwane Legislative Assembly, but such action could be only taken by the Parliament in consultation with the government. Therefore, this court judgment could be simply over-ruled by passing appropriate legislation in the white Parliament in Cape Town.

2. **The Ingwavuma Area or Tongaland** is the most northernly coastal magisterial district in the KwaZulu Homeland of South Africa's Natal Province, directly bordering Mozambique. Its area is approximately 4,255 sq.km. The district forms part of the country formerly known as Tongaland. Except for high ground along the Lebombo Mountains (700 M) on its western border to Swaziland, the land is low lying. The Mosi Swamp stretches parallel with the coast for a distance of some 24 km. A large part of Ingwavuma is Bantu reserve and part is unalienated

State land. It is a scenic wilderness with no tarred roads, where hippopotamuses bath in the rivers and wild game still roam. Ingwavuma possesses few natural resources, apart from its wildlife. Most of its 80,000 people raise cattle, the traditional source of Zulu wealth. When the Jozini Dam (or J.G. Strijdom Dam) and the Pongolapoort irrigation scheme are completed, a large block of land on the Makatini Flat will come under irrigation. There are also potentials for tourism development. Kosi Bay (roughly 80 km. east of Swaziland and 10 km. south of Mozambique) is the strategic town of the region and a potential site for a deep-water port.

Tongaland (comprising more or less the Ingwavuma District), a Natal tract of land with undefined boundaries, had some political significance toward the end the nineteenth century. Tongaland became important to the Swazis in the 1890s, as the South African Republic (since 1884 a sovereign state consisting of the Transvaal Republic and the Orange Free State) wished control over Swaziland, because Swaziland could give the South African Republic access to Tongaland, and in turn an ocean outlet with a potential port at Kosi Bay. A railroad between eastern Transvaal and Kosi Bay across Swaziland was already projected. The British ended this thinking by concluding an agreement with the rulers of Tongaland, and by annexing Tongaland in 1895. Thus, the South African Republic lost much of its interest in Swaziland. So, once before in the 1890s, Ingwavuma (Tongaland) was a hot geo-political issue and a disputed territory in the power struggle for an outlet to the sea.

The ethnic composition of the Ingwavuma region presents a rather complex and diverse picture. The principal tribal group is made up of Tongas who never created an empire or developed a clear territoriality. They were constantly vulnerable to attacks from the Zulus and the Shangane who ruled over them between the 1830s and 1890s. All the tribal groups of the Ingwavuma area, however, belong to the large Nguni tribal family. The Zulus are traditionally rivals of the Swazis whom they call "dogs". Most Zulus strongly believe that Ingwavuma is traditional Zulu tribal territory. Ingwavuma contains the burial place of the revered Zulu Chief Dingaan whose unsuccessful attack on the Boers in 1839 was so violent it is known as "the Battle of the Blood River" (Newsweek, 9 Aug. 1982, p. 15). According to Zulu beliefs Ingwavuma had never at any time been under Swazi rule. According to Swazi sources, however, four chiefs from the Ingwavuma magistral area were all Swazis, but the Zulus say these chiefs had come to the Zulu Royal house to pay allegiance to King Goodwill Swelithini, Chief of the Zulu people. Indeed, Zulu passions run deep on the land issue. The Zulu political leader, Chief Gatsha Buthelezi, is leading the opposition against the land deal and staged a series of mass protests in the region and the KwaZulu capital of Ulundi. The Zulu King called a "ndaba" (Consultation of the Zulu people), the first since the Zulu War of 1879 to tell his people about the

impending crisis. Motions run high, the situation remains sensitive and some people argue that angry Zulus could make common cause with the illegal "African National Congress" (ANC) as a consequence of the "unjust" land transfer.

On 14th June, 1982 Proclamation R-109 issued by the South African State President excised Ingwavuma from KwaZulu. But in terms of an order given by the Durban Supreme Court on the 25th June, 1982 the South African Department of Co-operation and Development was called to relinquish control of the Ingwavuma area to KwaZulu. The government then issued a second Proclamation R-121 under different legislation, the Black Administration Act of 1927 which grants the President of the Republic of South Africa the right to alter boundaries of KwaZulu without consultation. The second Proclamation was also found to be invalid by a full bench of the Natal Supreme Court. Then the government lodged an appeal at the Appeal Court at Bloemfontein (O.F.S.), South Africa's highest judicial body. In September, 1982 the Appeal Court rejected the transfer of Ingwavuma from KwaZulu to Central administration, arguing that under the 1971 Constitution Act, KwaZulu has original and not delegated legislative capacity. However, these court rulings are insignificant. The long protracted legal struggle between the Central and KwaZulu governments over Ingwavuma could be abruptly ended by simply pushing a bill through Parliament in Cape Town making it lawful for them to take the land.

**3. Swaziland's Position:** The incorporation of all traditional Swazi areas into the Kingdom of Swaziland will be a fulfillment of a dream of the late King Sobhuza II that began back in the 1920s around the time he succeeded to the throne. Sobhuza believed that the areas to the north and southeast of the Kingdom's present borders were pilfered from Swaziland during the reign of Sobhuza's father. Ingwavuma and KaNgwane areas were annexed from Swaziland by "unjust" treaties in the 1890s. Both regions are claimed on historical grounds as part of the traditional realm of the Swazi monarchs.

In anticipation of some vehement opposition against the land deal by the Organization of African Unity (O.A.U.) and some African states Swaziland has sent out delegations to other African countries to explain the Swazi arguments for the land transfer. Swaziland's deputy prime minister, B.M. Nsibandze, for instance, led a delegation to Tanzania, Zambia and Zimbabwe to explain the land issue and boundary adjustments between Swaziland and South Africa. The Swazi foreign minister, R.V. Dlamini, has gone to Nairobi to see the current chairman of the O.A.U., and to the pre-summit meeting of the O.A.U. in Tripoli armed with a quote from the South African historian Peter Becker to justify his country's proposed takeover of Ingwavuma. The quote which comes from Becker's book "The Rule of Fear" says that the Zulu King Dingaan



was killed by Swazis after he had fled across the Pongola River... "beyond his territories..." following the defeat of his army.

Indeed, the arbitrary defined borders between Transvaal and Swaziland resulted in the exclusion of a considerable area of land to which the Swazi nation laid claim. In 1866 the first attempts were undertaken to survey the boundary between Transvaal and Swaziland, but only in 1880 a Royal Commission demarcated the Transvaal-Swaziland boundary. Between 1890 (First Swazi Convention) and 1905 there were close administrative connections between Transvaal and Swaziland, and only in 1905 the administration of Swaziland separated completely from that of Transvaal. In 1908 the territorial delimitation of the country was finally completed. Thus, when colonial administrators drew up the boundaries, it happened that more Swazis resided in South Africa than in the Kingdom themselves.

The tremendous benefits of the land deal for Swaziland are obvious: Control of Ingwavuma would give Swaziland access to the Indian Ocean and a potential harbour at Kosi Bay. A front-page article in "The Times of Swaziland" of 28th July, 1982 proclaimed proudly:

"Kosi Bay will be ours." The caption describes the Bay which is included in the controversial land transfer, as "the probable location of a new Swazi port and our future gateway to the world." Kosi Bay is a tropical paradise containing some of the rarest forest, fauna, and flora, a sanctuary teeming with rare fish and turtles which will undoubtedly be a valuable asset to Swazi's tourist industry. The mountain Kingdom could supplement her geoformalism of upland tourism (spas and gambling facilities) by offering seaside facilities at the coast. Ingwavuma has two small national parks: The Kosi Bay Nature Reserve has a lake system where gulls, terns, waders and other aquatic birds occur, and where there is abundant fish-life in unusually clear water. The Ndumu Game Reserve has as its principal attraction the bird-life centered around several large pans and the adjoining indigenous forest. Game to be seen includes hippo, rhino, and several species of antelope. Both parks would be a welcome addition to Swaziland's touristic offers. Above all, the addition of Ingwavuma means the tiny Kingdom will no longer be land-locked. On the other hand, KaNgwane brings with it much farmland and forestry. But the most significant impact on Swaziland will be people — so many that the population will double (Newsweek, 5 July 1982, p. 25). Swaziland would also acquire a number of small wealthy towns in the Eastern Transvaal, one of them being Witbank, a rich coal mining centre.

**4. South Africa's Position:** For white-ruled South Africa the hand-over would be a major diplomatic and political victory. Moreover, a member of the O.A.U. and S.A.D.C.C. would be giving tacit recognition to the viability of the apartheid program of ethnic "self-determination"

(African Business, June 1982, p. 4). The magic formula of white Nationalist politics in South Africa is "racial segregation", for which the Afrikaanse term of "apartheid" has been coined by Daniel Malan in 1948. The doctrine of quasi-independent "tribal homelands" (Bantustans) can be seen as the cornerstone of the whole apartheid system. With sectarian fanaticism the absurd "territorial fragmentation" of South Africa's landscape was put into practice. Since 1959 the policy has been extended through the creation of supposedly "independent" Bantustans. "Territorial apartheid" is achieved by decanting the "surplus" African population of the white areas into ten so-called homelands and Bantustans, of which four have already been granted "independence" from South Africa: Transkei, Bophuthatwana, Venda and Ciskei. However, the international community has refused to recognize these Bantustans as sovereign independent political entities. The suggested land deal would bring South Africa one step nearer to the ultimate goal of denationalizing the African population. South Africa clearly feels it would gain by such a land transfer, particularly from a security point of view. The incorporation of Ingwavuma into Swaziland would provide South Africa with a buffer zone to the Marxist-ruled black neighboring state of Mozambique, which, according to South African claims, harbors black nationalist guerillas. The land deal could result in Swaziland taking a softer line against South Africa at international forums.

5. **International Opinion:** International voices about the proposed land deal are still scanty. However, major opposition can be expected from the O.A.U. A doctrine has been adopted by the O.A.U. in its well-known resolution of July 1964 which "solemnly declares that all member states pledge themselves to respect the borders existing on their achievement of national independence." Colonial boundaries in Africa are sacrosanct (inviolable) and any attempt to redraw them on tribal-ethnic lines will be strongly condemned by the O.A.U. Historical ground are not recognized as valid reasons for territorial expansion and boundary changes. However, the proposed land transfer is not a "boundary conflict" *strictu sensu*, since a boundary conflict exists only when territorial ambitions of at least two parties are irreconcilable. South Africa's territorial fragmentation will certainly not be sanctioned by the O.A.U. or other African institutions, since it is contrary to the idea of the indivisibility of political entities in the process of independence. However, there is a remote precedent in favor of South Africa and Swaziland, when the former British Cameroon was desected in October 1961, with a small northwestern section joining Nigeria and the rest joining the independent Cameroon under a Federal structure.

Zulu leader Chief Gatsha Buthelezi of KwaZulu and the "African National Congress" of South Africa have already appealed to the O.A.U. and the African heads of states to help them opposing the land deal. Under extreme circumstances, Swaziland could face to be expelled from

the O.A.U. and "derecognized", if the land deal goes through. Besides jeopardizing Swaziland's membership in Pan-African institutions, the country might also end her right to receive financial aid from African organizations. However, the O.A.U. has long recognized the "special relationship" between South Africa and the neighboring semi-enclosed states of Swaziland, Lesotho and Botswana. Few foreign governments have revealed their attitude toward the land deal so far. The Libyan foreign secretary said that Libya supported Swaziland in her claim to the disputed land. According to the United States ambassador to Swaziland, Mr. Robert Phinny, the land deal is a bi-lateral matter between two sovereign states. However, other U.S. officials have carefully avoided taking a position on the controversial issue themselves. There are also outside charges that the land deal is merely a pretext to give the U.S. Navy an Indian Ocean port at Kosi Bay so that it can avoid the embarrassment of having to dock in South Africa (Newsweek, 5 July 1982, p. 25).

6. **Outlook:** Following the death of King Sobhuza II of Swaziland in August 1982 and the present political and economic uncertainties in that country, the Swaziland government has kept a low profile on the land issue, but has always declared her persistent commitment to the land deal. South Africa, faced with the internal opposition by the Kwa-Zulu and KaNgwane tribal leaders and the tactical defeat through court rulings, decided not to steamroll the land incorporation through. A tripartite Commission of Inquiry headed by a South African legal figure, Mr. Justice Rumpff, was appointed to look into all aspects of the land transfer. It is widely believed that the Commission will eventually come out in favor of some kind of incorporation (African Business, January 1983, p. 7).

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# PHILIPPINE MANGOES AND THEIR RELATIONSHIP TO SOUTHEAST ASIAN CULTIVARS

by

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## POLYEMBRYONY AND RACES OF MANGO

The cultivated mangoes of the world are usually classified as either monoembryonic or polyembryonic. The seed of monoembryonic types produces an offspring which is a new plant different from the parents. Indian mangoes comprise a very large group of monoembryonic mangoes.

Mangoes of Southeast Asia are polyembryonic, i.e., one seed produces more than one seedling, each capable of growing into mature plants.

T.T. Sturrock studied polyembryony in mangoes and concluded that: (1) The polyembryonic condition is a recessive factor and is probably controlled by a single pair of genes; (2) The condition becomes phenotypic only if the individual receives genes for the characters from both parents and is homozygous for the characters; (3) An individual that contains only one of the recessive genes would be heterozygous and would not display the characters; and (4) The involvement of more than one pair of genes would result in a much more complicated array of phenotypes in the progeny.

Plants produced by polyembryonic mangoes are "true-to-seed". Variations exist but minor and the main characters of the parent plant are well reproduced. This makes possible clean separation of fruits with common parentage into distinct groups. W. Popenoe applied the term "races" to these groups of cultivated plants with well-marked differentiating characters and propagate true-to-seed except for simple fluctuating variations.

Well-known races of mango include "Saigon", "West Indian", "Philippine", "Cuban", and "Hawaiian". Thailand, Indonesia, Burma, Sri Lanka, Kampuchea, Reunion, Malaysia, and many other countries have races of mango not yet described in recent literature.

Mangoes in Southeast Asia are originally polyembryonic. Races of mangoes in West Indies, Tropical America, and Africa have largely arisen from introduced, originally monoembryonic mangoes. The Hawaiian race

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came from Mexico and other places. This shows characters similar to the West Indian race. Many other mangoes are most likely members of yet unrecognized races. Sri Lanka, for example, has a famous Jaffna race little known elsewhere.

### THE FILIPINO RACES OF MANGO

J.G. De Leon described many forms of Philippine mangoes which are reproduced below. These forms differ but slightly from, and retain the general features of, 'Carabao' and 'Pico'. By definition of races, 'Carabao', Alulongue, Mulatto, Anis, Corazon, Lamao No. 1, and 'Manila' belong to one group; 'Pico', 'Cabayo', 'Bulak', 'Cecil' and 'Earle' to another forming the so-called Filipino races of mango. A less recognized Filipino race is the 'Pahutan' group with Pahu, Titi, and 'Dudul' among others as members.

#### Forms of 'Carabao'

**Corazon (Heart).** — The small fruit measures on the average 8.4 cm. long, 5.7 cm. wide and 4.8 cm. thick, and weighs about 125 g. each; the fruit is roughly heart-shaped with full cheeks; ventral shoulder more prominent than the dorsal; stem inserted obliquely; base rounded; beak almost invariably a sharp point, coinciding with the apex, placed on the dorsal, instead of on the ventral part; nak about 1 to 1.5 cm. above apex, fairly prominent; surface smooth; color yellow; lenticels pale-yellow, numerous and well scattered all over the body; skin medium-thin tough and with pronounced brownish veins; flesh yellow, paler than that of the 'Carabao', very tender and juicy; flavor very sweet with a peculiarly agreeable aroma; fiber coarse, short except along ventral edge of the seed; seed oblong, medium-large.

**Alulongue.** — Fruit small, about 9.6 cm. long; 6.3 cm. wide, and 5.7 cm. thick, weighing about 192 g.; form oblong, slender, asymmetrical with full cheeks; ventral shoulders slightly more prominent than the dorsal; stem inserted almost squarely; base markedly depressed; beak distinct, not coinciding with apex; nak about 10 to 20 mm. above the apex, somewhat prominent; surface very smooth; lenticels small, numerous; skin medium-thin, tough; flesh yellow, tender, juicy; flavor sweet and aromatic; quality very good; fiber, medium-coarse, abundant, short except at ventral edge of seed; seed oblong, medium-large.

**Mulatto.** — The average fruits are 11.9 cm. long, 7.9 cm. wide, 7 cm. thick, and weigh about 325 g. The outline of the fruit when seen broad-wise and frontwise are oval, with very full cheeks; ventral shoulder more prominent than the dorsal; stem insertion square or oblique; base rounded, sometimes narrowed; beak indistinct, generally coinciding with apex; nak about 1.5 to 2.5 cm. above apex, not prominent; surface rather coarse; color yellowish, tinged with green; lenticels large, pale-yellow, more numerous around apex than around base; skin thick but

not tough; flesh yellow, very tender and juicy; flavor very good, aromatic but not so sweet as the smaller 'Carabao'; fiber medium-coarse, rather long, especially along the ventral edge of seed where it is very long; seed small in proportion, thin and wide; quality very good.

**Anis.** — This is a very small mango and resembles closely in color and flavor the Corazon, though not so juicy and different in shape. It is 8.1 cm. long, 5.3 cm. wide, 4.6 cm. thick, and weighs about 105 g.; the form often resembles that of the 'Pico', but it is much smaller; ventral shoulder usually prominent; dorsal shoulder sloping down gradually, stem inserted rather obliquely; base rounded; beak distinct, not coinciding with apex; nak 0.5 to 1 cm. above apex, prominent, almost coinciding with beak; surface smooth; color yellowish; lenticels few, light-yellow; skin medium-thick, though, netted with conspicuous brown veins; flesh yellow, paler than that of the 'Carabao', very tender and juicy, but not so much so as the Corazon; flavor very sweet, delicate, with a distinct aroma similar to that of the Corazon; fiber medium-coarse to fine, short, not abundant along the edge of seed where it is long; seed comparatively large, oblong.

#### Forms of 'Pico'

**Cabayo (Horse).** — This mango may be said to be intermediate between the 'Carabao' and the 'Pico', as it partakes of the character of both of these mangoes. Its plumpness and the slope of the back are characters which belong to the 'Carabao', while the qualities of the skin and the flesh closely resemble those of the 'Pico'.

The fruit is long but full-cheeked, measuring about 12.3 cm. long, 6.4 cm. wide and 6.3 cm. thick, and weighs about 246 g.; form oblong, symmetrical, with full cheeks, usually as thick as wide; ventral shoulder slightly prominent dorsal shoulder sloping down abruptly; stem inserted somewhat obliquely; base rounded, often with a wide furrow running ventrally from stem base to beak; beak not sharp, coincident with apex; nak 15 to 25 mm. above apex, variable in size; surface smooth; color yellowish, splashed with green between the basal and apical ends; lenticels inconspicuous, very sparse, especially on the upper half; skin medium-thick, not tough; flesh orange, tender; flavor good, aromatic; fiber coarse, very abundant, long especially along ventral edge of seed; seed long; oblong, medium-large.

**Bulak (Cotton).** — This mango resembles the 'Pico' very much. The name of this mango probably refers to the whitish color of the flesh of the green fruit.

Average size of the fruit, 11.2 cm. long, 6.1 cm. wide, and 5 cm. thick, weight about 175 g.; form long-oblong, asymmetrical, flattened; ventral shoulder slightly more prominent than the dorsal; dorsal shoulder sloping abruptly down; stem inserted squarely or obliquely; base roundish; beak distinct, not usually coinciding with apex; nak 1 to 1.5 cm.

above apex, prominent; surface smooth; color distinctly orange, lenticels light-orange; sparse at basal but abundant on the apical portion of the fruit; skin thick and tough; flesh orange, tender and somewhat coarse; flavor good, aromatic; fiber medium-coarse, short except along the ventral edge of the seed; seed long-oblong, small.

#### RELATIONSHIP TO MANGOES IN VIETNAM

American writers classify the Filipino and Saigon races as one. Cultivars often cited as closely similar and which represent the Filipino and Saigon races, respectively, are 'Carabao' and 'Cambodiana'. Present-day 'Cambodiana' grown in the Philippines has characteristics different from 'Carabao'. The former has a short beak which David Fairchild earlier pointed out. The beak of 'Carabao' is indistinct. 'Cambodiana' has a short, somewhat rounded form which is not typical of 'Carabao'. 'Carabao' mangoes approaching this shape are abnormal, having rough skin with bulging outgrowth. 'Cambodiana' fruits sampled in Masin, Candelaria, Quezon matured within 70 days from full bloom whereas 'Carabao' requires at least 81 days. Wavy leaves are a feature of 'Cambodiana' in Laguna and Quezon. Normally, 'Carabao' leaves are not undulating. On many occasions 'Cambodiana' fruits were better eaten just before full ripening, i.e., when the skin is still yellowish green. Beyond this, its flavor is flat and taste panelists often rate them low. 'Carabao' is known to be at its best when fully ripe. 'Carabao' and 'Cambodiana' have sufficiently different characters to cast doubt in considering them as members of the same race.

S.K. Mukherjee incorrectly interpreted P.J. Wester that 'Cambodiana' is the parent of 'Carabao'. This is very unlikely. 'Cambodiana' came to existence only in the early 20th century while 'Carabao' has been known even during the Spanish regime in the Philippines which dates back to the 16th century. This is long before 'Cambodiana' came to existence.

No mango in Vietnam is known by the name "Cambodiana". This is so because foreign workers gave the name 'Cambodiana' to fruits known in Vietnam as 'Xoai Voi'. Some authors consider 'Cambodiana' and 'Xoai Voi' synonymous but 'Xoai Voi' is a seedling cultivar and 'Cambodiana' is an asexually propagated cultivar from a 'Xoai Voi' offspring. S.K. Mukerjee probably meant 'Xoai Voi' in referring to 'Cambodiana' as the parent of 'Carabao'.

Another cultivar which has arisen from later importation of seeds from Vietnam to the U.S. is said to slightly differ from 'Cambodiana' described by W. Popenoe.

Members of the presently recognized Saigon race produce fruits of considerable variations. The differences are very evident in the forms of fruits independently published by many authors. It may well be that more than one race comprise the Vietnamese mangoes. The Saigon group could be separated from the Cambodiana group but the status of 'Xoai



Voi' is not clear because of insufficient information. Some forms of these Vietnamese mangoes are admittedly similar to members of the Carabao group. Hence, American authors consider that they belong to the same group or race and are of the same origin.

'Xoai Cat' is a recently introduced cultivar from Vietnam to the Philippines. It is a large Vietnamese mango which looks like 'Carabao' except for the size.

Fruit large, 15.2 x 7.8 x 7.2 cm., 456 g.; form oblong oblique to ovate oblique, stem inserted obliquely, base obliquely rounded; cavity absent, ventral shoulder rounded slightly prominent, dorsal shoulder ending in a long curve, apex broadly pointed, beak absent, lenticels large and widely spaced.

In Los Baños, unripe 'Xoai Cat' is acid, characteristics of 'Carabao'. Flavor of ripe fruit is rather variable. One of two grafted trees, which are only a few meters away from each other, produces fruits of flat taste; the other too sweet. Some forms of 'Xoai Cat' in Vietnam are claimed to be similar in size and quality as 'Carabao'.

'Pahutan' is a Philippine cultivar listed as member of the Saigon race. The relatively small fruit, abundant fiber, large seed in proportion to the fruit, very sweet flavor and exceedingly vigorous tree of 'Pahutan' are not typical of the Saigon race. 'Pahutan' is related to 'Dudul' of Mindanao. They thrive in moist areas, hence, in Luzon 'Pahutan' is extensively cultivated only in Cavite, Rizal, Laguna, and Batangas. Both are sucking types. 'Pahutan' is evidently different from representatives of the Saigon race. It should be classified as a separate Filipino race.

In form and flavor, 'Pico' is similar to 'Xoai Thanh Ca', another important cultivar of Vietnam. Fruit of an alleged 'Xoai Thanh Ca' is oblong, stalk inserted obliquely, base rounded, apex pointed, ventral shoulder slightly prominent, dorsal shoulder falling abruptly, cavity absent, beak absent, skin color golden yellow, lenticels minute and widely spaced, aroma distinct, flavor very sweet. The fruit is pleasant to eat ripe or unripe. 'Pico' almost always produces fruits that are pleasant to eat when unripe and this strengthens the possibility that it is related to 'Xoai Thanh Ca'.

#### RELATIONSHIP TO MANGOES IN THAILAND

Wester claimed that mangoes in the Philippines (Luzon) were introduced from Thailand but he did not support this with analysis of the fruits of the two countries.

At present, 'Nam Doc Mai' and 'Okrong' are among Thai mangoes often considered as similar to 'Pico' and 'Carabao', respectively.

The flavor of 'Nam Doc Mai' in Thailand according to one report, is not too sweet (Table 1). This is exactly opposite of the flavor of 'Nam Doc Mai' produced locally. Supha Anotharom (personal commu-

TABLE 1. FRUIT CHARACTERS OF SOME POLYEMBRYONIC MANGO CULTIVARS OF SOUTHEAST ASIA (BEMBOWER AND CHAMPOOPHO, 1955; POPENOE, 1920; WESTER, 1920)

Character	'Carabao'	'Pico'	'Okrong'	'Nam Doc Mai'	'I'ong Dum'	'Cambodiana'
1. Size	medium to quite large	medium to fairly large	medium to large	medium	medium	below medium to medium
2. Length (cm)	up to 12.5	up to 12.5	10.2 to 12.1	—	12.1	9.5 to 11.4
3. Diameter (cm)	—	—	5.7 to 7.0	6.4 to 7.6	7.0	—
4. Thickness (cm)	up to 8.5	rarely more than 8.0	4.8 to 5.7	5.4 to 7.0	6.4	6.4 to 7.0
5. Weight (g)	230 (ave.) 560 (max.)	215 (ave.), 460 (max)	—	567.5 to 794.5	453 to 567.5	226.4 to 283.0
6. Form	quite variable from short-oblong to rather elongate	oblong, semi-reniform, asymmetrical, more distinctly flattened than 'Carabao'	oblong, compressed laterally	ovate, plump	long, ovate, plump	oblong to oblong ovate, compressed laterally
7. Stem	inserted squarely or obliquely	inserted squarely or obliquely	inserted obliquely	stout, attached obliquely	— — —	inserted squarely or slightly to one side
8. Base	rounded	rounded	rounded	well rounded	hemi-spherical, slightly raised at stem insertion	rounded

Character	'Carabao'	'Pico'	'Okrong'	'Nam Doc Mai'	'Tong Dum'	'Cambodiana'
9. Cavity depression	—	—	slight	—	—	absent
10. Ventral shoulder	usually prominent	usually prominent sometimes compressed toward base	rounded with groove along edge	well rounded	round	—
11. Dorsal shoulder	short	short frequently almost wanting rounded	sloping	falling abruptly	falling rapidly	—
12. Apex	blunt		bent toward ventral side, very bluntly pointed	bluntly pointed toward ventral side	round, one-fourth to one-third the size of base	pointed
13. Beak	rather indistinct and variable sometimes coinciding with apex	distinct, ventral side above beak concave	inconspicuous about 2.5 cm from apex	small 1.6 cm from center of apex	slightly raised, 3.3 cm from apex end	present
14. Nak	about 1.5 to 2.5 cm above apex, usually not prominent	usually well above beak	—	—	—	small point, 1.3 cm above longitudinal apex

Character	'Carabao'	'Pico'	'Okrong'	'Nam Doc Mai'	'Tong Dum'	'Cambodiana'
15. Surface	smooth	smooth	—	smooth	smooth	smooth
16. Color	yellowish tinged with green	light orange netted with brownish veins	pale green becoming straw colored and wrinkled in storage	greenish yellow becoming entirely yellow on exposed portions	gray green becoming yellow at basal end	yellow green to deep yellow
17. Lenticels, dots	light yellow usually sparse at basal end, abundant on apical portion	pale yellow sometimes almost entirely absent except at apical end		small, abundant, gray with few black ones	medium, numerous, light gray with few scattered black ones	—
18. Skin	medium thin	thick with a thick coating of flesh adhering tough	thin separates easily from flesh tender	thin, tender separates easily from flesh tender	medium thick easily separates from flesh somewhat tender	very thin
19. Skin texture	tough					tender
20. Flesh color	yellowish, paler than 'Pico'	rich orange yellow, nearly always assuming a reddish tinge at apex	pale, straw colored	—	orange yellow	deep yellow

Character	'Carabao'	'Pico'	'Okrong'	'Nam Doc Mai'	'Tong Dum'	'Cambodiana'
21. Flesh texture and melting	very tender and melting	tender but not melting	firm, somewhat juicy	smooth, firm	firm, juicy	very juicy
22. Flavor	subacid, <sup>a</sup> sweet, <sup>a</sup> very delicate, aromatic and spicy	sweeter than Carabao, rich but lacks spicy delicate aroma of Carabao	sweet, rich, spicy, excellent	not too sweet, fair	sweet, rich, slightly spicy	mild subacid, slightly aromatic
23. Flesh fiber	absent, short and medium coarse fiber found near edges of seed	absent, short and fine fiber found near edges of seed	few, tender	absent	almost absent	absent, short fiber found on ventral side of seed
24. Quality	excellent <sup>a</sup>	good to very good <sup>a</sup>	(excellent)	fair	good	good

<sup>a</sup> Unpublished.

Character	'Carabao'	'Pico'	'Okrong'	'Nam Doc Mai'	'Tong Dum'	'Cambodiana'
25. Seed size	small to medium large	medium large	large in some types, a small kernel frequently found only in upper half of seed with lower half flat	—	medium	—
26. Seed shape	thin, oblong with blunt pointed, frequently truncate apex	long, thin	with markings depressed between ridges	with markings slightly depressed	with depressed markings	thick elliptic oblong
27. Seed length (cm)	9.9 <sup>b</sup>	10.0 <sup>b</sup>	9.9	11.4	10.2	7.1 <sup>b</sup>
28. Seed diameter (cm)	3.6 <sup>b</sup>	3.4 <sup>b</sup>	4.4	4.1	4.1	3.6 <sup>b</sup>
29. Seed thickness (cm)	1.4 <sup>b</sup>	1.6 <sup>b</sup>	1.6	1.6	1.6	2.2

<sup>b</sup> See table 2.

nication) also indicated that some 'Nam Doc Mai' in Thailand have a too sweet flavor. The published size of 'Nam Doc Mai' ranges from 567 to 795 g. (Table 1). This is not consistent with the average weight of 312 g. of locally produced 'Nam Doc Mai'. Nevertheless, 'Nam Doc Mai' is too large even for a fairly large 'Pico' (Table 2).

TABLE 2. QUANTITATIVE FRUIT CHARACTERS OF SOME POLYEMBRYONIC MANGO CULTIVARS GROWN IN THE PHILIPPINES

Character	'Carabao'	'Pico'	'Nam Doc Mai'	'Xoai Cat'	'Cambodiana'
1. Weight (g)	232.79	211.62	311.71	455.94	194.06
2. Length (cm)	12.56	4.25	15.38	15.22	9.33
3. Width (cm)	6.65	6.38	7.37	7.82	6.96
4. Thickness (cm)	5.47	5.17	6.07	7.23	6.02
5. Soluble solids (%)	20.59	16.8	16.0	17.08	15.00
6. Titratable acids (ml 0.1 N NaOH)	1.60	1.40	0.50	0.30	1.10
7. Peel weight (g)	41.69	37.55	47.72	59.99	31.82
8. Peel thickness (cm)	0.09	0.14	0.13	0.13	0.11
9. Flesh weight (g)	173.58	155.61	251.39	362.78	165.46
10. Seed weight (g)	15.99	18.97	15.59	33.05	29.26
11. Seed length (g)	9.94	10.02	11.34	10.19	7.13
12. Seed width (cm)	3.57	3.45	3.99	3.64	3.61
13. Seed thickness (cm)	1.36	1.60	1.34	2.25	2.19

'Okrong' could be mistaken for 'Carabao' in a mixed lot of these two cultivars, both in appearance and flavor. However, close examination will reveal sufficiently different characters. 'Okrong' is not a close relative of 'Carabao', as with 'Nam Doc Mai' and 'Pico'. Other well-known Thai mangoes such as 'Tong Dum' may be considered as having a form of one of the Carabao mangoes. However, it is best eaten green and 'Carabao' is reputed to be of poor eating quality at this stage.

P.J. Wester stated that 'Carabao' and 'Pico' were originally introduced (from Thailand) to the Philippines and from these have mutated other forms. Could 'Carabao' and 'Pico' have themselves mutated from earlier introductions? If indeed they were introduced as is, it is surprising that no mention of the same or closely similar cultivars has been recorded in its supposed country of origin. They are reputed to reproduce remarkably "true-to-seed". Of course, a comprehensive listing with adequate descriptions of Thai mangoes in the English language is yet to appear. Diligent search or accurate English translations of those already published might lead to the forms of, or the original, 'Carabao' and 'Pico' in Thailand.

In the same Bulletin, P.J. Wester noted the close similarity of 'Carabao' and 'Cambodian' and that one has sprung from the other. This implies that Vietnam may be the original home of 'Carabao'. Does this explain the absence of 'Carabao'-like mangoes in Thailand? Or this explain the absence of 'Carabao'-like mangoes since 'Xoai Thanh Ca' is believed to be closely related to this Philippine cultivar? But while Vietnam may be the home of 'Carabao' it is inappropriate to compare it with the present-day 'Cambo-

diana' which is distinctively different and no longer possesses the desirable attributes identified at an early date. This "original" or early-date 'Cambodiana', closely similar and with outstanding qualities as 'Carabao', may be a form of 'Xoai Voi' different from the Cambodiana group. Unfortunately recent American workers lost interest on this mango which status is now uncertain.

### RELATIONSHIP TO MANGOES IN INDONESIA

Philippine mangoes related to Indonesian mangoes are those grown in Mindanao. Of these, the best example recently examined is the 'Golek'-like mango often referred to as "Kabayo" (horse) because of the saddle shape of the dorsal side. However, "Cabayo" is a form of 'Pico' described at an early date by J.G. de Leon.

'Golek' is one of the top-rated mango cultivars of Indonesia, the other being 'Arumanis', 'Manalagi', and 'Gedong'. The last three are not in commercial cultivation in Mindanao or elsewhere in the Philippines. 'Arumanis' and 'Gedong' are found only in the experiment stations of the University of the Philippines at Los Baños (UPLB) and Bureau of Plant Industry at Guimaras Island.

The claims of a few Indonesian students at the University of the Philippines at Los Baños of similarity between 'Carabao' and 'Arumanis' are dismissed by Surachmat Kusumo. According to the latter, 'Arumanis' is dark green when ripe; whereas 'Carabao' has only a tinge of green on the skin at this stage and this is not usually evident. 'Arumanis' is also very much larger at the basal (proximal or near stem-end) than apical portion. The difference in size of 'Carabao' at these points is not as prominent.

'Arumanis', also called 'Gadung', is a widely-reputed Indonesian mango extensively grown in East Java. Commercial cultivation of 'Gedong', on the other hand, is largely in West Java. 'Manalagi', which may be less familiar, has not found its way to the Philippines.

The Mindanao "Golek" and Indonesian 'Golek' are most likely the same based on descriptions earlier presented (see January-March 1982 issue of this journal) and the illustration published by J.J. Ochse showing the similarity in form. This recent comparative analysis supports P.J. Wester's earlier accounts of mangoes in Indonesia and Mindanao. He mentioned 'Dudul', a well-known mango in Mindanao. This is most likely of Indonesian origin judging from the existence of at least three cultivars prefixed by the word "Dodol": 'Dodol Puthi', 'Dodol Wirosongko', and 'Dodol Jembar'.

None of the mangoes in Luzon could be directly related to the mangoes in Indonesia. Indirectly, 'Pahutan' may be an introduction from the latter. This cultivar, which has many features of 'Dudul', thrives well in relatively wet areas of Luzon, namely: Laguna, Cavite, Batangas, Rizal and Quezon.



## ACKNOWLEDGMENT

Acknowledgment is due Mr. Surachmat Kusumo of the Indonesian Agency for Agricultural Research and Development for reviewing part of the manuscript.

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# RURAL DEVELOPMENT AND AGRICULTURE IN SIERRA LEONE

by

FRANKLYN R. KALOKO<sup>1</sup>

Rural settlement has been and will continue to be a major factor in developing countries, because about 80 percent of the population of poor countries are rural dwellers-consequently, a greater understanding of their way of life, where they live and how they earn their living is crucial for the success of any government policy affecting them. The majority of poor countries depend dangerously on exhaustible mineral resources for government revenue and foreign exchange. They demonstrate an inability to produce their staple food.

The lack of such understanding partly explains why national plans have met with little or no success. Most of the national plans have included package deals of alien technology which is unfamiliar to these people. The planners have failed to take into account the rural conditions and the way they interact with their physical and social environment, which in most cases is fatalistic.

It is the aim of this study to show that by extending primary knowledge of the geography of rural settlement in the context of a subsistence environment, fresh insight may be developed into the relationship between the spatial arrangement of rural settlements and the prevailing socio-economic conditions. The study will assess the influence of the Tonkolili-Kono Road on the development of Central Sierra Leone and consequently on its settlement patterns. The impact of the road has been assessed by analyzing its local reaction as seen by heads of households in communities on, near or far away from its line. This reaction is expressed in migratory patterns that lead from this study area, and in this way we can draw up conclusions on the agricultural implications of such road innovations.

## THE STUDY AREA

The study area described here as Central Sierra Leone comprises the whole of the Tonkolili District (Figure 1). Tonkolili is the third largest district after Koinadugu and Bombalu in the Northern Province. It covers 2705 square miles and lies well within the interior lowlands with only its northern quadrant cutting into the interior hills and plateaus.

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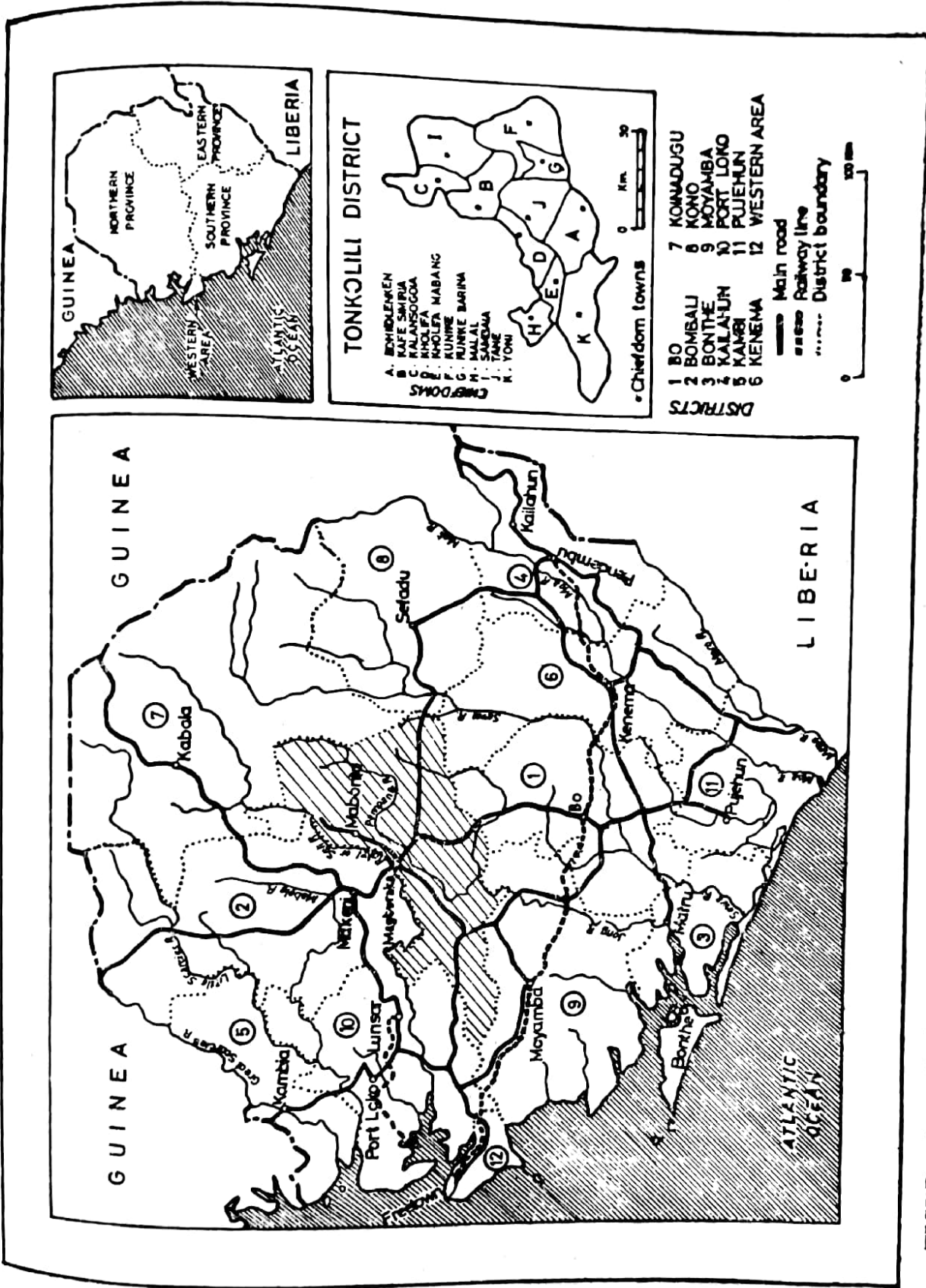


FIGURE 1. THE STUDY AREA — CENTRAL SIERRA LEONE, TONKOLILI DISTRICT

This accounts for the elevated topography in the northern chiefdoms of Sambaia Kunike, Kunike Barina, Kalansogoia and Kafe Simiria. In many respects it is a key area in rural development studies in Sierra Leone for not only does it provide some insight into up-country life, but its proximity to the diamond mining areas of the Kono District has generated a lot of out migration.

Sierra Leone as a whole is a very poor country with a very dismal trade deficit. Though the country has a variety of export items such as diamond, iron ore and bauxite, none are mined in the study area. Export crops like cocoa, coffee, piassava and ginger that form the bulk of agricultural export commodities are found in the rest of the country, especially in the south and eastern provinces.

Central Sierra Leone is not only deficient in mineral resources and export crops. The study area is not well endowed with essential services but this is general reflection throughout the country where such essential services are on the overall limited and their countrywide distribution is markedly uneven.<sup>2</sup>

In an earlier study of regionalization of economic development in Sierra Leone (Forde 1967), the country was divided into four development regions (Figure 2). Using principle component analysis input variables were collected for each of the twelve Districts and the Western Area of Sierra Leone.<sup>3</sup> The study revealed that all of the Northern Province is in the least developed category characterized by a general absence of mineral activities and large-scale out-migration.

The Central statistics office in 1972 revealed that the national economy has an annual growth rate of 4.3% in real terms, whilst the agricultural sector is estimated to have grown at only 1.7% which is just slightly above the official population growth rate of 1.5%. Thus the disparity in growth rate between the agricultural and non-agricultural sectors is reflected in the disparity between the Western Area and the rest of the country. There is a regional difference in incomes even in rural areas which reflects difference in resource use and productivity.<sup>4</sup> This has created a problem of urban unemployment because the magnitude of rural-urban migration has greatly exceeded the capacity of the modern<sup>5</sup> industrial sector to absorb the persons concerned, so that it can only employ productively a small proportion of them.

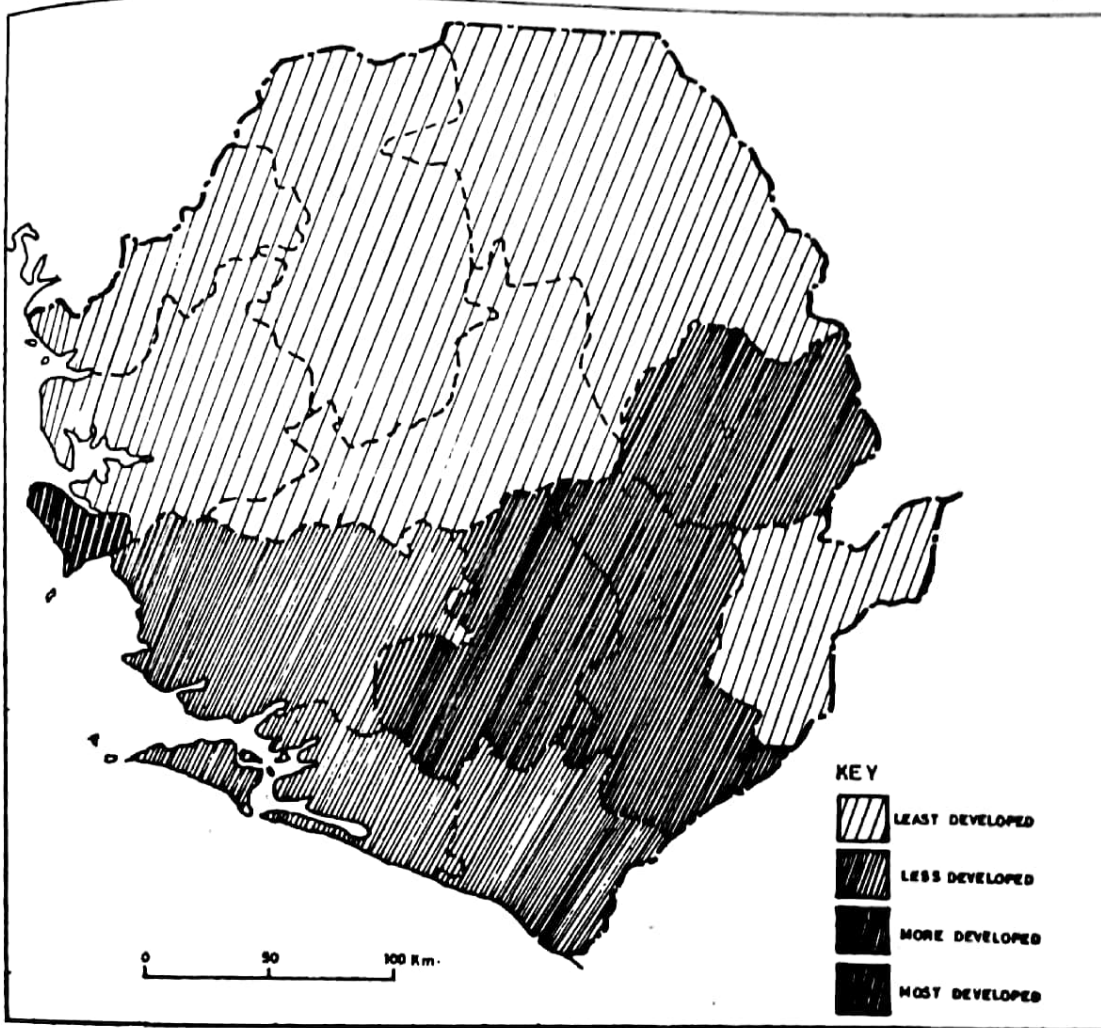
<sup>2</sup> J. B. Riddell: *Spatial dynamics of Modernization in Sierra Leone*, Evaston, 1971, pp. 43-93.

<sup>3</sup> Forde, E., R. A., *Regionalization of Economic Development in Sierra Leone*. *Sierra Leone Geographical Journal*, Vol. II, 1967, p. 49.

<sup>4</sup> Spencer, D. C. S.: "Micro-level farm management and production-Economic research among Traditional African farmers: Lessons from Sierra Leone," AREP, No. 3, *Africa Rural Employment Paper*, Michigan, 1972, p. 2.

<sup>5</sup> *Ibid*, p. 2.

FIGURE 2. SIERRA LEONE DEVELOPMENT REGIONS (1967)



In view of the development problems highlighted and present socio-economic and political problems, the government has formulated development goals of:

- (i) Preserving political and major economic stability as a major prerequisite for the uninterrupted and continuous economic and social advancement.
- (ii) Increase the welfare of the broad mass of the population and to this end.
- (iii) Achieving more equitable distribution of wealth and income.
- (iv) Achieving a rapid expansion of the productive capacity of the economy.
- (v) Creating a basis for accelerated pace of economic and social progress.
- (vi) Promoting economic and social development through self-help methods (Central Planning Unit, Freetown 1973).

These ideas though recent have reflected the thinking of the government after independence as well as the people of the region in order to promote development. Thus the Tonkolili-Kono Highway was of such development project carried out to "Provide a direct east-west road between the Tonkolili District of the Northern Province and the Kono District of the South Eastern Province."<sup>6</sup>

Whilst the mines were stimulating migration and the consequent flow of money back into rural areas, motor road development was also carried out to encourage the further expansion of rice trade in this region. Thus the development of the earlier Magburaka-Masingbin road and later Tonkolili-Kono road, Mile 91-Magburaka, the Yele link to Mile 91 and the replacement of the former government railway which stretches from Bauya to Yonibana by a motor road (see Figure 1) have all been carried out to stimulate internal trade. The consequence of all these is a revitalized economic impetus that has produced changes in most aspects of the rural environment.

#### THE TONKOLILI-KONO ROAD AND RURAL AGRICULTURE

The Tonkolili-Kono road is the result of an idea of an illiterate chief in the Kunike Barina chiefdom. As far back as 1935, Paramount chief Alimany Sorie of Kunike Barina sent a letter to the District Commissioner of the then Bombali District proposing a road linking his chiefdom town Makali, with Matotoka in the Tane chiefdom which was already along the Bo-Makeni road. His major argument was that, his chiefdom was a rice producing area and so wanted his people to get rest from transporting loads by head and promised the necessary labor and financial assistance if only government would approve of the project and support it.<sup>7</sup> After a series of set backs for 13 years, the road was constructed by stages in 1960s. The road was partly the result of the priority given by government to development programme especially because of the political situation at the time. The Prime Minister by then, the late Sir Milton Margai, leader of the ruling party (Sierra Leone Peoples' Party), wanted the support of the Kono District Parliamentarians (S.L.P.I.M.) and so supported the decision to carry on with the construction of the Highway after the crossing over of three Kono S.L.P.I.M. members to the ruling S.L.P.P.<sup>8</sup> At the same time Alhaji Sorie, Paramount Chief of Kunike Barina who proposed this development used his membership of the S.L.P.P. to advocate the passage of the road eastwards through his chiefdom.

<sup>6</sup> Government of Sierra Leone, Public Works Department *Report on the Masingbin-Jaimama Sweate Road Project Landel*, Palmer and Tritton Consulting Engineers; London, September 1961, Summary.

<sup>7</sup> District Office — Magburaka file, Makeni-Matotoka motor road.

<sup>8</sup> J.R. Catwright, *Politics in Sierra Leone, 1947-1967* — University of Toronto Press, 1970, pp. 171-173.

The road has been very widely utilized. It was found out that most of the cars, 'poda-podas' and buses are transporting passengers. This is about 75% of all vehicles that use the road which is of paramount importance to the development of the area. The new road also facilitates the mobility of the people out of the study area. It would be for shorter trips to the diamond mining areas of Kono or for more permanent ones to the other urban centers in the country. Whatever is the reason for moving, this has not helped agriculture on which the people of this region are so dependent. The volume of traffic has been found to increase towards the Kono District (Table 1). It was also noted that about 452 vehicles pass through Simbakoro in the Kono District, i.e., from 6 a.m. — 7. p.m. and this is a reflection of diamond mining as a major economic activity even though most of it is carried out illegally.

TABLE 1. TRAFFIC VOLUMES OF VARIOUS LOCALITIES ON THE TONKOLILI — KONO ROAD

CHECK POINT	MAGBURAKA		MATOTOKA		MASINGBIN		JAIAMA		BUMPEH	
	PAMPAN BRIDGE		MAKALI		SEWA BRIDGE		SAGBE		SIMBAKORO	
	ABS	%	ABS	%	ABS	%	ABS	%	ABS	%
Cars	88	18.7	92	29.3	129	22.2	111	15.8	968	16.7
Taxis	64	13.5	50	15.9	301	44.8	327	46.5	4,122	71.0
Poda-poda	180	38.2	91	29.0	110	16.4	107	15.2	220	3.8
Lorries	80	17.0	53	16.9	80	11.9	121	12.2	227	4.8
Lightgoods Vehicles	49	10.4	21	6.7	20	3.0	23	3.3	61	1.1
Buses	7	1.5	5	1.6	11	1.6	8	1.1	37	0.6
Unclassified	3	0.6	2	0.2	1	0.2	7	1.0	123	2.1
<b>TOTAL</b>	<b>471</b>	<b>100.0</b>	<b>314</b>	<b>100.0</b>	<b>672</b>	<b>100.0</b>	<b>704</b>	<b>100.0</b>	<b>5,808</b>	<b>100.0</b>
<b>TOTAL AS % OF FLOW PEAK</b>	<b>8.1%</b>		<b>5.4%</b>		<b>11.6%</b>		<b>12.6%</b>		<b>100%</b>	

Source: These figures refer to surveys undertaken by the Kono Road Project team during April, 1972.

The end of the road was found to be busier with taxis carrying chiefly illicit miners. In Table 2 we see that almost half of the vehicles passing Mamodu Check Post<sup>o</sup> have originated from the last chiefdom settlement in the study area; closest the Kono District generated 9.4%, whilst Magburaka and Makeni have 12%. This means that 71.9% of the vehicles passing through Mamodu have travelled less than a hundred miles from places along Tonkolili — Kono Road (Table 2).

<sup>o</sup> Check point for checking people going into the diamond area of Kono District. One is to have a pass to enter this area of Sierra Leone.

It was also found out that at Mamodu Check Point, most of the vehicles passing through were carrying people (66.2%) and these 12.9% were on personal travel, another 12.6% were transporting goods, 6.1% petroleum and 2.2% firewood.

With the availability of figures on origin and destination (see Table 2) it was found out that vehicles carry an average of about 5.1 persons per vehicles and this means a daily outflow to Kono of about 1856 people from which approximately 925 have started their journey outside Kono. From these figure we can see that the daily mobility of people from places along the road and the immediate environs has affected settlements in such areas. People have left their settlements in some of these daily trips to Kono to sell their produce or to mine diamonds.

The increase in the mobility of the population as a result of the new road has had a consequent effect on the development of feeder roads. During the present author's investigation of areas through which the road passes in 1976 well over 142 miles of feeder roads have now been developed.

TABLE 2. ORIGIN OF VEHICLES TRAVELLING TO KONO VIA MAMODU:

Origin	Percentage	Cumulative Percentage
Jaiama	46.6	
Other Kono	3.1	
<b>Total Kono</b>		49.7
Masingbe	9.4	
Makali	0.8	
<b>Total on New Road</b>		59.9
Magburaka	5.4	
Makeni	6.6	
<b>Total with 100 Miles</b>		71.9
Mabonto/Bumbuna	0.8	
Kabala	1.5	
Bombali District	0.7	
Mile 91	0.3	
Kambia District	0.7	
Lunsar	0.7	
Port Loko District	0.7	
Botown and District	2.2	
Other Southern Province	1.5	
Freetown	18.5	
<b>TOTAL</b>	100.00	100.00

(This implies a ratio of two miles of feeder road per mile of the Tonkolili — Kono road with an estimated population of 17,035 persons).



The geographical significance of the Tonkolili — Kono Road on settlement patterns will be examined in the context of the following hypotheses:

- i. That villages along the road have experienced growth.
- ii. That those away from the road experienced decline which increase with distance from the road.

In all 67 villages were surveyed. In each village, the headman was asked about the existence of any disadvantage since the advent of the road. Five of the villages saw no disadvantage, whilst a few cited the prevalence of thieving as a result of freedom of access to their villages. 41 headmen stressed the importance of a quicker, easier and cheaper transport by the new road; whilst six more cited accessibility to markets in order to sell products. Another eight felt the road has brought in traders and two mentioned that the new road brought people to settle down in their communities.

The impact of the road is best illustrated by the consequent change in population it has generated between 1963 and 1972. Table 3 shows an analysis of 29 selected villages in the Tonkolili District. Seven of the villages were located on or less than one mile from the road, fourteen were found from six to 12 miles from nearest road and one was untraceable in 1963 census. The analysis shows a decline in population which is greater in the road (-20.6%) than in the controlled areas (16.5%). Similarly there is a greater trend of male migration (21.0%) along the road to 15.5% in the Control Areas. The pattern of population was further examined in the Road area. The road area was classified into villages on or less than one mile from the road, and those away from it. It was found out that villages on the road have a population growth of 17.6% whilst those away in the hinterland fell by 25.6% overall and this is more than those on the control area.

It has been evidently seen that there has been a change in the population situation in the study area since the advent of the Tonkolili — Kono Road. This mobility was found to be greater in females (32.8%) than in males (12.0%) especially for villages on the road. This situation is due to the fact that males usually continue to move to the longer urban centers. It is expected that with younger and economically active population prone to migration, the result might show a disparity. However analysis (Table 4) shows that, the economically active population (15 — 50) year old constituted 41.9% of the total population, which is the same percentage for villages near the road, whilst the control area constituting only 39.9%. It is seen that there is a population of young people of less than 15 years of age in all the three sub-areas. The prevalence of emigration has shown a disparity in size in the 0 — 15 year age group and 15 — 35 year age group, but with the latter showing a much longer duration.

TABLE 3. CHANGE IN POPULATION 1962-1972 AS A PERCENTAGE OF THE 1963 POPULATION FOR SELECTED SETTLEMENTS ALONG TONKOLILI — KONO ROAD

AREA	Change in population as % of 1963 population.	Change in Male population as % 1963 Males.	Change in Female population as % of 1963 Females.
Tonkolili Control Area*	— 16.5	— 15.5	— 17.5
Tonkolili Road Area	— 20.6	— 21.0	— 20.1
Villages on or less than one mile from Road	— 17.6	+ 12.0	+ 32.8
Villages more than one mile from road	— 25.6	— 24.5	— 26.7

### TOTALS

SELECTED AGE OF COHORTS	TOTAL	% OF TOTAL POPULATION				
		ROAD	T.R.	T.C.	ROAD	T.R.
0 — 15	501	1,419	1,474	44.7	45.5	48.8
15 — 35	280	849	841	24.5	27.3	27.7
35 — 50	193	456	371	17.1	14.6	12.2
50 +	153	386	351	13.6	12.4	11.6

### RURAL MIGRATION AND CHANGING VILLAGE ECONOMY

In this light, sixteen villages were closely studied in the Kafe Simiria, Samiba and Kunike Chiefdoms (see Figure 1). The villages selected were representative of the three ethnic groupings of Temnes, Limbas and Korankos found in the study area as well as their remoteness (6-14 miles away from the nearest motorable road). In all of these villages as indeed for the whole of the study region, farming is the main occupation and labor is provided by the individual households. Therefore household size tended to be very high in these villages with an average of 12.8 persons, made up generally of 3.2 adult males, 3.8 adult females and 5.8 children.

In an analysis of population change in the settlement under study (Table 5) an annual decrease of 2.6% was noted. The variation in the percentage change of population is from + 39.3% to — 56.3% (1963 — 1974). Large settlement had declined in percentage terms more than small ones which could be attributed to agriculture over-population. When the population change was contrasted against the decrease or increase of individual villages, large villages have decreased in percentage terms more than small ones.

TABLE 4. AGE SEX DISTRIBUTION FOR SELECTED COMMUNITIES IN TONKOLILI DISTRICT

SELECTED AGE COHORTS	M A L E				F E M A L E							
	TOTAL		% OF TOTAL POP.		TOTAL		% OF TOTAL POPULATION					
	ROAD	T.R.	R.C.	ROAD	T.R.	R.C.	ROAD	T.R.	R.C.			
0 — 15	266	764	794	29.6	24.6	26.1	235	655	680	20.9	21.1	22.4
15 — 35	106	326	349	9.4	10.5	11.5	174	532	492	15.4	16.8	16.2
35 — 50	105	237	182	9.4	7.6	6.0	88	219	188	7.8	7.0	6.2
50 — Over	8	214	195	7.3	6.9	6.4	71	171	159	6.3	5.5	5.2

TABLE 5. POPULATION AND SETTLEMENT: A COMPARATIVE ANALYSIS OF CHANGES

Name of Village	1963		1972		1974		1963 — 1974	
	Population	No. of Settlements	Population	No. of Settlements	Population	No. of Settlements	Population	Settlements
Basaya-Banakoro	55	11	60	10			+9%	-9%
Basaya Fonema	Unidentifiable	—	114	16			—	—
Dafariya	52	4	45	5			-13.5%	+25.0%
Dandaya	224	25	312	30			-33.3%	+20.0%
Komboldaya	74	8	70	6			-5.4%	-25.0%
Kondembaia	233	8	183	10			-21.5	-25.0
Mafila	Unidentifiable	—						
Magbanabum	392	—	107	17			—	—
Maradda	410	36	317	27			-19.1	-30.5
Nerekoro	658	56	179	36			-56.3	-35.7
Nonkosokia	171	54	433	63			-34.2	+16.6
Petifu	502	6	92	8			-46.3	+33.3
Petifu Roband	Unidentifiable	57	447	38			-11.0	-33.3
Royema	139	—	76	8			—	—
Sankolia	101	165x	173	183			+18.7	-9.0
TOTAL	3,352	19	2,742	15			+33.7	-21.0

In the remoter villages, the population remained stable (only 8.0%) than those near the road. In all the villages more males have migrated for all adults and for adults 10 — 35 age group, it is 75.8 per 100 females.

In all 363 adults have been found to be absent from the 16 villages (223 men and 140 women). This is about 21.6% of the resident adult population in which adult male absentee is 28.3%, of resident males. Therefore 61.4% of the absentees were male and 66.1% fall in the age group 10 — 30 years and a further 21.5% were in the range 3 — 40 years.

The consequence of this situation is that a significant proportion of the potential agricultural labour force has left these villages. This on the average is 1.5 persons per household. This makes a gross reduction of 14.5 to a net figure of 12.8 due to migration. About 66.1% of all absentees have gone to urban centres and only 33.9% to other rural areas. This trend of migration to urban centres is even higher for males (70.8%) whilst 48.3% of female migrants have just moved within local areas (24.1% for males). Two centres have attracted migrants, the diamond mining areas of Kono (32.0%) and Freetown the Capital (11.0%).

The high migration rates especially from the adult males have no doubt affected agriculture. In fact the study showed that only 19% continued with farming in their destination areas. The impact of the migration of people from rural areas on the rural economy can be seen in the duration of absence of migration in farming whilst at home and in their new places. About 77.6% of all absentees have left their homes before 1972 and only a very small 14.6% revisited their homes. The proportion is even less in the case of males where an alarming 44.6% rarely visit their villages after migration. In fact traces of such a situation could be seen from the length of visits by migrants (61.9%) who only stay for a month or less.

In all the 16 villages 22.1% of males between 10-40 years have migrated. According to Berg (1965) this is a reasonable situation in West Africa where migration rates are between 10 and 45% for 15-45 years old.

It has been found out that the labour requirements to cultivate one acre of inland swamp are greater by 17.1% than to cultivate one acre of upland rice (86 man day/acre against 73).

This means that there is a considerable labour input needed especially with the prevailing traditional methods that are used. However, with a predominantly male migration, the effect on the farming economy has been serious. Men are needed in brushing felling and clearing (March and April) on upland rice farms and continues in May in the case of swamp cultivation. A German Survey Team worked out that 20 working days per unit of labour per man were needed to work an acre of upland rice in Northern Sierra Leone. From this it could be concluded that

an average farm household of 12.8 could provide 92 man-day/month and 45 man-day of this is male. With these calculations the average household would be able to brush, burn and clear four acres of upland rice farm. Of course, local labour groups (Kabotho) would alter the situation and provide 1 or 2 days work on a family's farm.

The 4 acres cultivated by the average family unit would produce 3600 lbs. of husked rice. This is however, a little smaller than the computation of the average household of 12.8 persons which is estimated at 34 lbs. Thus there is very little surplus for sale to provide some of the cash needs of the farmer. In case where the farmer has to retain some of the produce as seed rice for the following year's farming (1 bushel/acre = 59 lbs./acre) there is little or nothing left for sale. It was therefore because of this situation that a deficit of 447 tons of milled rice was found wanting in the Tonkolili District in 1973, even though the region has a below average population density of 68 persons per square mile and a high percentage of rural population (96.2%) in the District.

### CONCLUSION

The absence of an agricultural policy with an integrated infrastructure and other developments have accelerated emigration from this predominantly rural area. Under the hypothesis presented earlier, there is an apparent decline in population between 1963 and 1972. This is greatest in villages near the road and not in communities on the road. It can be concluded that whilst the new road has tended to generate population mobility especially to the road, the development of linear patterns of road settlement is a current phenomenon.

The road has not generated the expected non-farm employment along its route. It has certainly facilitated frequent travel to Kono, Freetown, Makeni and Magburaka and thereby moving people out of this already poor region. In terms of government's expenditure of Le 11.9 million, its feasibility for development purposes is rather questionable. Whilst the road has attracted settlements even though on a small scale, its influence on the migration of people from areas away from it has provided serious consequences for both agriculture as well as the general pattern of villages. I went to the Tonkolili District in 1973. Even though the region has a below average population density of 68 persons per square mile, there is a high percentage of rural population (96.2%) in the District.

The author wishes to acknowledge with gratitude general encouragement from Mr. M. B. Gleave and Dr. A. C. Gatrell, both of Department of Geography, University of Salford, Salford, England who also read through the original draft and made useful suggestion.

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