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PHILIPPINE ENERGY POLICY: A DEVELOPING COUNTRY'S RESPONSE TO THE ENERGY CRISIS

by

TEODORO M. SANTOS[1]

THE PROBLEM

The quadrupling of oil prices in 1973 suddenly plunged the world in a state of confused disequilibrium which brought about great misery and apprehension to many oil-importing countries. In addition, the accompanying oil embargo directed against several oil-importing countries made the world realize that a country could lose its oil supply and ruin its economy depending on the wishes of some oil producers. Furthermore, the consequent bloated oil bills of oil importing countries have caused unprecedented balance of payments difficulties with concomitant disruption in economic growth, price inflation, erosion of the terms of trade and foregoing of goods people used to enjoy before. The Philippines was one of the countries most adversely affected by the crisis and its experience and reaction perhaps reflect those of other developing countries which are similarly situated.

This paper presents some of the effects of the oil crisis on the Philippines and the energy policy which the country developed to protect itself against future embargo, shortage or abrupt price increases.

THE OIL DEPENDENCE OF THE PHILIPPINES

The development of the Philippine economy since the 1960's has been characterized by increasing dependence on energy, particularly on imported oil — the main reason why it suffered a lot from the oil crisis.

Four major sectors account for the country's commercial energy consumption, namely, transportation, industry, commercial and residential. During 1965-1975, consumption grew from 36 to 74 million barrels of

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fuel oil equivalent (MMBOE) corresponding to more than seven percent annual growth. About 75 percent of national energy consumption was in the form of gasoline, diesel fuel, kerosene, bunker oil and similar petroleum products while the rest was in the form of electricity. Further details on the structure and volume of energy consumption are shown in Table 1.

TABLE 1. ENERGY CONSUMPTION BY SECTOR, 1965, 1975
[In Million Barrels of Oil Equivalent (MMBOE)]

		1965		1975	
A.	Electric	MMBOE	%	MMBOE	%
	Industry	3.2	8.8	8.0	10.1
	Commercial	2.1	5.7	3.4	4.5
	Residential & Others	2.5	6.8	5.8	7.8
		7.8	21.3	17.2	23.0
B.	Non-electric				
	Transportation	15.6	42.8	27.8	37.4
	Industry	7.2	25.2	22.6	30.5
	Commercial	0.7	1.9	2.4	3.2
	Residential & Others	3.2	8.8	4.4	5.9
		28.7	78.7	57.2	77.0
T O T A L		36.5	100.0	74.4	100.0

Source: Republic of the Philippines, Ministry of Energy, 1978, *Ten Year Energy Development Program, 1978-1987.*
Energy Committee, 1976, "Energy for Development," pp. 4-5.

Among the various forms of commercial energy, imported oil has been the most dominant. Dependence upon oil has increased from 87 percent in 1960 to a peak of 95 percent in 1969 after which it stabilized at around 94 percent of total energy requirements. The bulk of petroleum imports into the country before 1973 originated from the Middle East, mainly from Saudi Arabia. Table 2 portrays how the country's dependence on imported oil evolved over the years.

Indigenous hydroelectric power and coal are the other important sources of energy in the country. Table 2 shows that these domestic energy resources have given way to imported oil since 1960, reflecting the relative price and technical advantages of oil over them.

The increasing dependence of the national economy on imported oil can also be discerned in terms of oil expenditure per unit of national output (GNP). Table 3 indicates that the cost of production in terms of oil has been generally increasing since 1960. For example, 0.66 thousand barrels of oil were needed to produce a million peso of GNP in 1960, whereas in 1976, 1.00 thousand barrels of oil were used to

TABLE 2. PERCENTAGE DISTRIBUTION OF CONSUMPTION BY TYPES OF ENERGY

Year	Coal	Hydroelectric	Petroleum
1960	3.30	9.54	87.15
1961	3.15	8.67	88.17
1962	3.18	8.34	88.47
1963	2.96	8.16	88.87
1964	1.84	7.43	90.73
1965	1.47	6.68	91.85
1966	1.25	6.05	92.70
1967	0.74	6.31	92.95
1968	0.30	5.02	94.68
1969	0.46	3.86	95.68
1970	0.48	5.11	94.41
1971	0.39	5.50	94.10
1972	0.37	5.94	93.68
1973	0.32	5.40	94.28
1974	0.53	5.17	94.30
1975	0.40	4.8	94.8
1976	0.52	5.49	94.0
1977	0.72	5.5	93.8

Source of data: Gonzalo, L., 1977, "Petroleum Consumption in the Philippines: A Macroeconomic Analysis," DAP/PREPF Paper No. 77-11, p. 92, Ministry of Energy, *Ten-Year Energy Development Program for 1975-1977.*

produce the same amount of output. A similar pattern of increasing dependence of production on other forms of energy is shown in the last column of Table 3.

This section shows the strong dependence of the country on energy, particularly on imported oil. The next section, however, will focus on some of the adverse effects brought about by the crisis resulting from the country's dependence on imported oil.

SOME EFFECTS OF INCREASED OIL PRICES

The sudden increase in oil prices in 1973 brought profound and adverse influences into the country. Such effects were manifested in balance of payment deficits, erosion of the terms of trade, high inflation rate and foregoing of consumption of certain commodities.

To a developing country like the Philippines, the most shocking effect of the energy crisis came in the form of suddenly inflated balance of trade deficits, a situation aggravated by the fact that scarce foreign exchange in unprecedented amounts have to be secured to settle international obligations. Table 4 shows clearly that as the price of oil rose, the balance of trade deficits also increased. While in 1973 11 percent

TABLE 3. ENERGY CONSUMPTION — GNP RATIOS (IN THOUSAND BARRELS PER MILLION PESOS)

Year	Petroleum (Thousand Barrels Oil Equivalent)	Total Energy (Thousand Barrels Oil Equivalent)	Gross National Product, Million Pesos (1972 Prices)	Petroleum / GNP	Total Energy / GNP
1960	19,876	21,889	30,151	0.66	0.73
1961	22,502	24,769	32,242	0.70	0.77
1962	24,067	26,481	33,019	0.73	0.80
1963	27,745	30,259	36,383	0.76	0.83
1964	30,279	33,001	37,627	0.80	0.88
1965	34,229	36,870	39,520	0.87	0.93
1966	40,433	42,866	41,240	0.98	1.04
1967	45,460	48,214	43,224	1.05	1.12
1968	50,520	53,207	45,540	1.11	1.17
1969	55,182	58,086	47,967	1.15	1.21
1970	55,193	58,641	50,035	1.10	1.17
1971	60,720	64,638	52,921	1.14	1.22
1972	62,735	66,899	55,526	1.13	1.20
1973	68,722	72,397	60,881	1.13	1.19
1974	64,478	68,150	64,508	1.00	1.06
1975	70,675	74,925	68,291	1.03	1.06
1976	72,799	77,380	72,576	1.00	1.07

Source Basic Data: Ministry of Energy, 1978, *Ten-Year Energy Development Program, 1978-1987*, p. 132.
Note: Petroleum/GNP indicates the cost in thousands of barrels of a million pesos of GNP; total energy/GNP has analogous meaning.

of export proceeds were enough to pay for the country's oil requirements, by 1975 it was necessary to divert 32 percent of export earnings to cover oil imports, certainly to the detriment of other sectors of the economy. What made the trade deficit particularly disturbing was that decisions had to be made hurriedly as to where to get foreign exchange, at what costs and terms, and what expenditures had to be curtailed, knowing that each decision would adversely affect the welfare of certain sectors of society and could therefore bring about serious social and political problems.

TABLE 4. EFFECT OF OIL PRICE INCREASE ON OIL IMPORTS AND PHILIPPINE BALANCE OF TRADE (C.I.F. IN MILLION U.S. DOLLARS)

Items	1973	1974	1975	1976	1977
Cost of Oil Per Barrel (US $)	3.14	10.90	11.52	11.97	12.81
Quantity of Oil Import, million barrels	73.7	65.6	73.2	76.6	79.9
Total Imports	1,790	3,468	3,776	3,953	—
Oil Import as % of Total Import	12.9	19.6	22.1	23.2	—
Total Exports	2,099	2,974	2,610	2,964	—
Oil Import as % of Total Exports	11.0	22.9	31.9	30.9	—
Balance of Trade	309	(494)	(1,166)	(989)	—
Oil Import as % of Negative Balance of Trade	—	138	71	93	—

Source: Ministry of Energy, 1978, *Ten-Year Energy Development Program, 1978-1987*, p. 17.

The country's terms of trade also suffered as a result of the energy crisis. As noted above, the country was able to purchase its oil requirements with 11 percent of its exports in 1973 but had to give away 32 percent of its exports to pay for its oil import bill in 1975. Imported goods other than oil whose prices moved upwards as those of oil likewise contributed to the erosion of the terms of trade. For instance, while the physical volume of imports increased by 12 percent between 1972 and 1976, the volume of exports increased by 30 percent (See Table 5) despite the deficits noted in Table 4, suggesting that the country had to give away 18 percent more goods (at least) to its trade partners to get the same amount of imports it used to get in 1972. Table 5 shows the relative development of exports and imports from 1960 to 1976.

The abrupt rise in oil prices also had negative effects on economic growth and development. Table 6 shows that as the value of imported mineral fuels increased, the proportionate share of capital goods to total imports declined. For example, in 1972, the share of capital and fuel oil in total imports were, respectively, 31 and 11 percent which changed to 22 and 17 percent in 1974. As proportionately less capital goods were taken into the country the costs of raw materials and intermediate goods escalated too, so that their share in total imports increased. These observations suggest that as the prices of oil rose, budgets usually intended for capital (also consumer) goods were diverted to fuel oil and raw materials, thus undermining the country's development effort through capital accumulation and increased production. Of course, the inadequate, high-cost and uncertain oil supply contributed in no small measure to declining production growth.

TABLE 5. IMPORTS, EXPORTS, AND QUANTUM AND VALUE INDICES, 1960-76

Year	Import	Export	Quantum Index		Value Index	
			Import	Export	Import	Export
1960	603.9	560.4	66.0	50.0	45.6	50.6
1961	611.3	499.5	67.8	48.3	47.5	45.0
1962	586.7	556.0	64.1	53.0	45.8	49.9
1963	618.2	727.1	63.8	65.8	48.1	65.2
1964	780.3	742.0	78.0	67.4	59.9	66.3
1965	807.6	768 4	80.3	69.2	62.7	69.2
1966	852.8	828.2	85.4	73.5	67.8	74.2
1967	1,062.2	821.5	101.7	70.9	82.6	72.8
1968	1,150.2	857.7	101.2	75.4	89.7	82.3
1969	1,131.5	854.6	99.1	76.9	89.4	84.2
1970	1,090.1	1,061.7	92.6	88.0	86.6	97.8
1971	1,186.0	1,136.4	99.1	96.4	94.6	101.8
1972	1,229.6	1,105.5	100.0	100.0	100.0	100.0
1973	1,596.6	1,891.2	93.6	107.7	120.5	157.2
1974	3,143.1	2,725.0	110.3	96.2	233.5	233.2
1975	3,459.2	2,294.5	115.8	101.9	254.2	196.4
1976	3,633.5	2,573.7	112.4	130.5	266.2	220.3

Source: National Economic and Development Authority, *1978 Philippine Statistical Yearbook*, Manila, pp. 510-518.
Note: Import and Export, F.O.B. in million US Dollars.

The ills of the energy crisis, however, hit the people directly by the inflation of commodity prices and the erosion of the purchasing power of their incomes. Table 7 shows that prices rose by 104 index points between 1972 and 1977, implying that the same bundle of goods in 1972 costs more than twice in 1977. Consequently, the real wages of unskilled labor declined by about 30 percent during the same period.

TABLE 6. IMPORTS BY END USE: 1960-1976 (F.O.B. IN MILLION U.S. DOLLARS)

Calendar Year	Minerals Fuels and Related Materials	% Share	Consumer Goods	% Share	Capital Goods	% Share	Raw Materials and Intermediate Goods	% Share
1960	59.8	9.01	99.6	15.00	223.3	33.64	281.0	42.33
1961	49.2	7.44	115.7	17.52	210.7	31.90	284.9	43.13
1962	59.8	9.25	102.1	15.80	196.7	30.43	287.8	44.52
1963	61.8	9.09	125.5	18.46	215.0	31.62	287.7	40.84
1964	77.0	8.98	150.4	17.54	281.6	32.84	348.4	40.63
1965	75.7	8.57	185.0	20.94	283.4	32.08	339.2	38.40
1966	84.1	8.98	152.9	16.32	304.8	32.53	395.1	42.17
1967	93.7	8.11	192.0	16.61	415.8	35.98	454.2	39.30
1968	105.8	8.42	168.2	13.39	454.9	36.22	527.1	41.97
1969	106.7	8.62	157.5	12.72	455.6	36.80	518.4	41.87
1970	118.9	9.83	125.5	10.38	413.6	34.21	551.0	45.57
1971	141.2	10.64	169.8	12.79	456.3	34.38	559.9	42.19
1972	148.8	10.80	202.6	14.70	433.8	31.47	593.2	43.04
1973	187.6	10.51	287.5	16.11	490.9	27.51	818.2	45.86
1974	653.4	17.21	470.9	12.40	824.5	21.72	1,847.7	48.67
1975	769.9	18.20	551.4	13.04	1,148.9	27.17	1,758.9	41.59
1976	890.7	19.69	644.2	14.24	1,125.8	24.88	1,863.6	41.19

Source: National Economic and Development Authority, *1978 Philippine Statistical Yearbook*, Manila, pp. 176-517.

Note: *Consumer Goods* include meat, dairy products, fish, cereals, vegetables, beverages, and related items. *Capital Goods* include machineries, transport equipment, scientific and control instruments and parts. *Raw Materials* include mineral fuels, animal feed stuffs, textiles, fibers, chemical elements, fertilizers, explosives, chemicals, base metals, etc.

Hence, while a large segment of the population was living on the margin of subsistence and lower before the crisis, an even larger segment must have been submerged below subsistence after the crisis.

One could have a clearer picture of the magnitude of sacrifices implied above in the following analysis: assuming that the oil prices remained stable at the early 1973 levels, then the Philippines could have had additional $2,579 million dollars worth of goods and services after paying the $927 million oil-import bill for 1974-1977, were there no energy crisis. In other words, the crisis caused the transfer of $2,579

TABLE 7. WAGE RATE INDEX OF LABORERS IN INDUSTRIAL ESTABLISHMENTS IN MANILA AND SUBURBS AND RETAIL PRICE INDEX OF SELECTED COMMODITIES IN METROPOLITAN MANILA: CY 1949 — 1977 (1972 = 100)

Year	Retail Price Skilled Laborer	Real Wage Index Index	Unskilled Laborer
1960	44.0	133.4	107.9
1961	44.7	131.2	108.8
1962	47.9	125.5	105.9
1963	50.9	122.3	105.6
1964	54.8	115.1	98.6
1965	55.9	115.2	102.7
1966	58.7	114.9	104.8
1967	61.8	113.1	103.2
1968	62.0	119.4	112.1
1969	63.2	123.3	115.2
1970	76.2	114.4	111.6
1971	89.2	105.1	104.1
1972	100.0	100.0	100.0
1973	114.5	92.4	90.0
1974	160.0	75.6	72.8
1975	176.1	72.7	72.9
1976	191.0	71.2	72.3
1977	204.2	72.6	71.1

Source: National Economic and Development Authority, *1978 Statistical Yearbook*, Manila, pp. 564-565.

million from the Filipino people to the oil exporters in 1974-1977, an amount equal to the country's export revenues in 1976 (See Table 5). Viewed from another angle, the $792 million additional oil bill in 1977, for example, represents the average annual income of 3.43 million Filipinos[2] which was taken away from the country. If distributed equally to all Filipinos, this incremental oil bill would have increased annual

[2] Calculation assumes a $230 annual per capita income.

per capita income by $18, representing a more than seven percent improvement. Admittedly, this type of calculation is too simplistic to be realistic; nevertheless, it provides some insight into the severity of the problem.

Although the discussion on the effect of increased oil prices is by no means exhaustive, what have been presented are sufficiently alarming to impel the Philippine Government to devise policies that would protect itself and its people against similar shocks in the future.

THE PHILIPPINE ENERGY POLICY

In response to the challenges and problems brought about by the 1973 energy crisis, the Philippines adopted an energy policy designed to protect its security and stability. No less than President Ferdinand E. Marcos himself articulated its rationale, directions and cost [3].

> The energy crisis of 1973 provided one of the more severe tests in recent times of the nation's economic and political resilience. The overdependence on foreign sources for energy... introduced us suddenly to the threat of supply cuts and unprecedented balance of payment deficits from recurring oil price spirals...
>
> ...The continuous increase in the price of imported oil and uncertainties in the prospects of future supply constantly pose potential obstacles to our drive for economic growth and political maturity...
>
> In the midst of this awakening, we stepped up our efforts to develop and tap our natural resource potentials. We dedicated huge sums as well as human resources to extensive energy development and conservation programs...

The energy policy, therefore, addresses the country's over-dependence on imported oil in order to avoid the disturbing balance of payment deficits arising from oil price spirals as well as the uncertainties in the supply of energy which stifles economic growth and the struggle for political maturity. The policy spells out in unequivocal terms the country's objectives, the strategies by which these may be achieved and the programs and budgetary allocations required to operationalize the plans.

Objectives and Strategies. — The government recognized that its energy policy must support the goals of national security and stability together with economic and social development. The energy policy, therefore, aims to support these goals by [3]:

1. Providing adequate and secure energy supplies in forms that the market requires.
2. Promoting judicious and efficient consumption of energy.
3. Ensuring that levels of supply and utilization activities are environmentally acceptable.

TABLE 8. PLANNED ENERGY CONSUMPTION BY SECTOR (IN MILLION BARRELS OF OIL EQUIVALENT)

	1977		1982		1987		1978-82
	MMBOE	%	MMBOE	%	MMBOE	%	Growth
Transportation	30.3	36.3	40.5	31.9	59.5	31.3	7.0
Industry	34.7	41.6	54.1	42.5	84.2	44.3	9.3
Commercial	6.8	8.1	12.4	9.7	17.8	9.4	10.1
Residential, Others	11.6	14.0	20.1	15.9	28 5	15.0	9.4

Source: M'nistry of Energy, 1978, *Ten-Year Energy Development Program, 1978-1987.*

To achieve the above objectives, strategies are designed to operate on the market forces of demand and supply. The levels of energy consumption are planned in the same way that the levels and forms of energy supply are deliberately structured

Consumption or Demand Policy. — Basic to the demand policy is the planned energy consumption deduced from the planned growth of the different sectors of the economy shown in Table 8. To promote judicious and efficient consumption the following strategies were adopted [3]:

1. The use of the price system to reflect the real costs of energy consistent with existing political conditions.
2. Application of selective fiscal measures in energy consumption.
3. Conversion or development of market to use non-oil energy resources in support of fuel substitution program.
4. Adoption of measures to conserve and utilize energy efficiently.
5. Development of more efficient technologies.
6. Researches on the adaptation of proven technologies to local conditions.

While economic theory suggests that by letting price reflect costs the market will allocate available energy supplies to their various uses, the above strategies point to the application of even more potent though perhaps expensive measures. The current regulation requiring cement and thermal power plants to use as much as 15 percent alcohol as component of gasoline are examples of creating new markets and of forcing conservation of and substitution for oil through government policies which may not be achieved through the normal market operations. Of course, the large tax slapped on petroleum products which even increases every time the price of crude oil rises is another powerful force that would bring actual energy consumption in line with that planned.

Supply Policy: Energy Development Program. — Providing the country with adequate and secure energy supplies subsumes the country's needs as well as its indigenous though lean resource endowment

as shown in the planned energy consumption in Table 9. This energy plan emphasizes the deliberate reduction and substitution of oil by domestic energy resources, namely, geothermal, water, coal, nuclear and nonconventional. The strategies envisioned for realizing the planned supply are as follows [3, 7, 9a]:

1. Accelerate diversification of alternative energy resources as well as intensify the search for domestic petroleum to minimize dependence on imported oil.
2. Diversify the geographical sources of petroleum supplies to reduce the risk of supply disruption.
3. Establish an adequate stockpile of crude oil and oil products.

TABLE 9. PLANNED ENERGY SUPPLY BY SOURCES (IN MILLION BARRELS OF OIL EQUIVALENT)

	1977		1982		1987	
	MMBOE	%	MMBOE	%	MMBOE	%
Total Energy	82.90		127.00		190.00	
A. Electric Generation	20.90	25.2	39.56	31.1	74.13	39.0
Hydro	3.60	4.3	6.60	5.2	23.24	12.2
Oil	17.07	20.6	24.63	19.4	27.12	14.3
Coal	0.23	0.3	1.72	1.3	5.66	3.0
Geothermal	0.00	—	5.61	4.4	8.38	4.4
Nuclear	—	—	—	—	6.43	3.4
Nonconventional	—	—	1.00	0.8	3.30	1.7
B. Nonelectric Generation	62.00	74.8	87.54	68.9	115.87	61.0
Oil	61.42	74.1	82.44	64.9	104.66	55.1
Coal	0.58	0.7	3.60	2.8	4.51	2.4
Nonconventional	—	—	1.50	1.2	6.70	3.5
Oil Share		94.7		84.3		69.4

Source: Ministry of Energy, 1978, *Ten-Year Development Program 1978-1987*, p. 27.

4. Accelerate development of indigenous energy resources with preference geared to renewable resources.
5. Promote energy related researches with emphasis on the adaptation of proven technologies.
6. Establish support infrastructure facilities that will ensure the distribution of energy in appropriate forms and amounts.

In order to translate the planned supply into reality, a national energy development program was instituted. It consists of four major parts, namely: (1) energy resources development, (2) electric power development, (3) rural electrification and (4) development of downstream facilities [3, 7, 9a]. This paper concerns itself mainly with the first part although some aspects of the other are also dealt with.

Energy Resources Development Programs. — Crucial to the country's energy policy is the development of indigenous energy resources [3, 7]. Under this program, (1) oil and natural gas, (2) hydroelectric power, (3) coal, (4) geothermal power, (5) nuclear fuels, and (6) nonconventional energy resources, mainly solar and biomass, will be explored, developed and used. Tentative estimates of domestic energy resources are shown in Table 10.

An important feature of this program is the "service contract" arrangement whereby a firm is allowed to explore and develop an energy resource at its own expense and risk and for which it receives a predetermined share in production (30-40%) after its expenses have been reimbursed, if the venture is successful. Under this scheme the government engages the services of a contractor, whether domestic, foreign, private or public, without jeopardizing the people's interest. In this way private capital and technology, particularly foreign, are able to participate in the energy development program without much political and legal obstacles.

Several government corporations and agencies are likewise engaged in the development of energy resources. The National Power Corporation is charged with the development of electric power while the National Electrification Administration is authorized to bring the benefits of electricity to the rural areas. The Philippine National Oil Corporation and Energy Corporation take charge of the exploration and development of energy resources. The Ministry of Energy orchestrates all development and related activities in the energy sector.

TABLE 10. TENTATIVE ASSESSMENT OF INDIGENOUS ENERGY RESOURCES (IN MILLION BARRELS OF OIL EQUIVALENT, MMBOE)

	Developed	Probable	Potential[1]
Hydro	4.4/year	36/year	50/year
Geothermal	1.7/year	26/year[2]	2.5 million/ year
Uranium	—	10	under evaluation
Coal	—	300	6,000
Petroleum	—	under evaluation	under evaluation
Nonconventional[3]	0.45/year	16	1,430/year

Source: Ministry of Energy, 1978, *Ten-Year Energy Development Program, 1978-1987*, p. 35.

[1] Includes developed and probable.
[2] In fields currently under development.
[3] "Developed" means usage results from government programs only; "Probable" refers to estimates for 1978.

About $350 million are earmarked for the oil and gas exploration program during 1978-1987, although much more may be needed to develop the expected discoveries. Consequently, oil production may rise gradually until it covers 35 percent of domestic consumption in 1990. Actual production from discoveries since 1973 has reached 15 percent of national consumption by mid-1979.

Under the geothermal power development program, a substantial portion of the country's electric power requirements may be derived from heat stored in rocks [3, 9a, 9b]. During the ten-year period, 770 megawatts (MW) are expected to come from this source at an exploration cost of $686 million, excluding the more substantial investments in development and production.

Under the hydroelectric power development program, the government aims to increase installed hydroelectric power capacity from 597 MW in 1977 to 4510 MW in 1987 on a $4.2 billion budget.

Although the coal resources of the country occur in thin, intensely folded and faulted bituminous to sub-bituminous beds, they are planned to cover up to five percent of the country's energy requirements by 1987. During 1978-1987, about $140 million are programmed for exploration apart from the larger expenditures that the private sector is likely to incur for exploration, development and production. The total coal potential of the country has been estimated at 750-1500 million metric tons.

A crash program for developing uranium and other radioactive mineral resources has been made expedient by the decision to put up a 620 MW power plant at the cost of $1.2 billion. This project is already at the advanced stage of development and is scheduled to be on stream in 1982. Despite the $40 million exploration budget, the search for uranium deposits in the country is viewed with considerable pessimism by local geologists not only due to lack of encouraging results to date but also because most of the rocks in the country are unlike those in other places where economic deposits are found.

The last program in the series is non-conventional energy development. This includes the production of alcohol as partial substitute for gasoline, generation and utilization of gases from animal wastes, production of wind mills for pumping water and small-scale electric power generation and the use of solar heat for various purposes. About $24 million are earmarked for research and development in this area, excluding the $446 million budget for the commercial application of technologies generated by the research and development.

Power Development: Generation and Transmission. — The Development of the power sector is the most ambitious and expensive component of the country's energy development program. This envisions growth from 3,084 MW in 1974 to 9,602 MW in 1987. While in 1977 76 percent of power plants were run by oil and oil products and the rest by water, by 1987 only 27 percent of the country's electric power are planned to derive from oil, as water, coal, geothermal and nuclear sources provide the remaining 73 percent (See Table 11).

TABLE 11. TARGET GENERATION CAPACITY BY FUEL SOURCE (IN MEGAWATTS)

	1977		1982		1987	
	MW	Percent	MW	Percent	MW	Percent
Hydro	739	24.0	1,288	28.1	4,406	45.9
Geothermal	3	0.1	548	12.0	768	8.0
Oil	1,880	61.0	2,190	47.8	2,065	21.5
Diesel	462	14.9	498	10.9	498	5.2
Coal-Oil	—	—	55	1.2	1,245	13.0
Nuclear	—	—	—	—	620	6.5

Source: Ministry of Energy, 1978, *Ten-Year Energy Development Program, 1978-1987*, p. 87.

Over the 1978-1987 period, expenditures for power development, including transmission and related infrastructure facilities, amount to more than $8.4 billion, representing more than 62 percent of the energy program's budget for ten years, as shown in Table 12.

Rural Electrification Program. — This program aims to make available to all barrios of the country the benefits of electric power around 1990, a program supportive of the government's goal of countryside development. About $780 million will be required by this program in 1978-1987, excluding the $690 million needed for urban electrification during the same period [1].

The strategy of rural electrification revolves around the organization of electric cooperatives in all parts of the country under the National Electrification Administration. Long term, low interest loans will be extended to these cooperatives to subsidize the construction and operation of electric power distribution systems. At present, only 31 percent of the 6,285 thousand households have access to electric power.

Downstream Facilities Development. — Downstream facilities refer to all activities after resource production up to the point of use. The major projects under this program are: (1) expansion of capacity for oil refinery, storage and distribution; (2) acquisition of crude as well as finished product carriers and the erection of supporting infrastructures; (3) construction of coal handling, storage and transport facilities;

TABLE 12. INVESTMENT REQUIREMENTS OF THE ENERGY DEVELOPMENT PROGRAMS, 1978-1987 (IN MILLION US DOLLARS AT 1978 PRICES)

Program	Value	%
A. Power Generation and Transmission	8,427.28	62.01
B. Resource Exploration and Development	2,331.68	17.16
1. Conventional		
Oil	998.91	7.35
Coal	140.11	1.03
Geothermal	685.85	5.05
Uranium	37.47	0.28
2. Nonconventional Research, Development, Demonstration, and Commercial Application	445.86	3.26
C. Electrification	1,466.55	10.79
Urban	688.33	5.06
Rural	778.22	5.73
D. Downstream Facilities	1,365.17	10.04
T O T A L	13.591.23	100.00

Source: Ministry of Energy, 1978, *Ten-Year Energy Development Program, 1978-1987*, p. 110.

and (4) a petrochemical project. About $1.37 billion are earmarked for these projects in 1978-1987, of which 37 percent will go to the expansion of oil refinery capacity and ancillary facilities and 33 percent to the construction of a petrochemical plant [1].

Existing major downstream facilities consist of (1) five crude oil refineries with a total rated capacity of 303 thousand barrels per stream day; (2) storage for 77 million barrels of crude oil and 14.6 million barrels of petroleum products; (3) ocean-going tankers with a capacity of 309 thousand deadweight tons; and (4) receiving facilities for various tanker capacities, including very large crude carriers.

DISCUSSION OF SELECTED ISSUES

In this section we shall focus on three major issues that arise in the Philippine experience, namely: (1) adverse economic, social, and political effects of the energy crisis; (2) the efficacy of the policy response to avoid a similar crisis in the future; and (3) the costs of the response.

Adverse Economic, Social and Political Effects of the Energy Crisis. — The energy crisis of 1973 was a contrived situation consisting of the sudden jacking up of oil prices, restriction of oil supply, and in a few cases the outright cutting off of the oil supply coming from the

Middle East — a situation which arose out of a political decision rather than from economic scarcity. The essence of the crisis rests on the disturbingly large size and suddenness of the price hike and the realization that one's foreign sources of oil may be lost in an instant.

In the Philippines, the oil crisis unleashed a series of problems with very serious economic, social and political implications. The annual balance of payments deficits of the country has soared from a hundred million dollars or less to more than a billion, suggesting a huge transfer of income from the country to the oil producers and undermining the country's ability to secure vital capital goods and services abroad for its economic and social development. Aggravating the situation was the fact that the prices of imported goods rose considerably more than those of exported goods indicating that the country had to export a greater volume to get the same amount of goods abroad that it used to buy before.

Another problem brought about by the oil crisis is rapid price inflation and the concomitant erosion of the people's purchasing power. The people had to bear double digit inflation which rose to as much as 45 percent in 1974 and causing their real wages to decline. The most adversely affected are those whose incomes fell close to or below the subsistence level of which there are numerous and who for now could not afford the bare necessities that normal living demands.

But the most stunning lesson from the 1973 oil crisis was the realization that the country's oil supply can be cut overnight resulting in the country's economy grinding to a halt. This vulnerability could make the country succumb to external pressures, thereby undermining its political sovereignty and security.

Efficacy of Policy Response. — The fundamental objective of the Philippine energy policy is to promote national security and stability as well as economic and social development. Among others, the possibility that the energy supply of the country can be cut at any time by foreign suppliers is deemed a serious threat to internal security and stability since such situation confers upon other countries the power to control internal economic and political activities. On the other hand, escalating balance of payment deficits concomitant with runaway inflation on account of rising oil prices adversely affect economic and social development. The goal, therefore, is to minimize dependence on foreign energy supply and stabilize energy supply in adequate amounts and at reasonable levels of prices.

The program to develop all domestic energy resources to the fullest and the restriction of energy consumption by raising prices, conserva-

tion and substitution, properly addresses the problem of political security and stability since, if successful, such program could substantially reduce the country's foreign dependence on oil if not make it self-sufficient. At any rate, such programs are the best the country could put up to promote energy independence. However, whether such programs could solve the balance of payments problem and provide the country with stable and adequate energy supplies at reasonable prices is quite doubtful.

The reduction of oil consumption by raising the prices of petroleum products and through various means of conservation and substitution will undoubtedly diminish the imported oil component of the balance of payment deficit. But if in order to effect conservation and substitution mechanisms, spare parts and materials have to be imported, then the source of the balance of payment deficit shifts only from oil to other items. Similarly, the production of indigenous energy such as oil, coal, geothermal and hydroelectric power would diminish oil imports but the capital and services needed to develop them would certainly amplify the balance of payments deficits. In fact, even years before production is achieved expenditures on exploration and development would contribute to the outflow of foreign exchange, in addition to the usual oil imports. There is, therefore, no assurance that the energy development program would alleviate the balance of payment problem of the country.

Will the development of indigenous energy resources lead to adequate, stable and reasonably priced energy? Perhaps the most promising domestic resources are hydroelectric, geothermal, oil and coal. As experience has shown, hydroelectric power depends to a large extent on rainfall so that a long dry season or drought could plunge those who are dependent on it into a crisis. In addition, the cultural minorities whose ancestral homes are drowned on account of the hydroelectric dams could also cause disruption in the generation of electric power.[3]

Geothermal resources, though apparently abundant, may cause uncertainties in power supply because there are many uncertainties in the technology, e.g., it cannot be determined how long a deposit will last, and how well the corrosion and scaling of pipes can be controlled. The considerable nuclear capacity planned may also be subject to the uncertainties in the occurrence of accidents which may cause the shutdown of the plant, as happened in the Three Mile Island Plant of Pennsylvania (March 1979) where overheating of the nuclear reactor which caused the leakage of radioactivity resulted in the closure of the plant and of similar plants elsewhere.

[3] Bigornia, J., 1979, "Sincere Dialogue can Avert Trouble by Northern Luzon Tribes," *Bulletin Today* (Jan. 21, p. 6), states that 22 villages in the Mountain Province — Kalinga Apayao region joined in a pact to stop the construction of two big dams across the Chico and Pasil rivers by means ranging from boycotting the construction through armed harassment.

Since the prospect for economic uranium deposits in the country is dim and considering that uranium is a politically sensitive commodity and that there are very few suppliers and much lesser processors into fuel, the probability of price manipulation and supply disruption due to cartelization or monopolization is therefore much greater than in the case of oil. For example, while the price of oil quadrupled from 1973 to 1974, the price of uranium oxide correspondingly rose by more than six times.

Despite the government's efforts towards energy self-sufficiency, prices could remain relatively high for at least two reasons: first, most domestic energy resources appear to be of low economic quality, are still undiscovered and undeveloped, and require technologies which are still evolving, hence giving rise to high cost products. Second, policy and economic efficiency require that prices reflect actual costs and world energy conditions to avoid wastes in energy allocation.

The Costs of Policy Response. — The energy development program of the Philippines for 1978-1987, the country's response to the 1973 oil crisis, is highly capital intensive. It calls for the allocation of $13.6 billion, of which $2.0 billion will come from the private sector and the rest from government coffers (See Table 12). Such a sum represents four to five years export income of the country (See Table 5), implying that about half of the export earnings during the period may be funneled to the program. In fact, a more careful analysis will show that if the exploration for oil, coal and geothermal resources is successful the actual expenditures needed to produce the desired products will be substantially higher than those appropriated for the program.

Investing $13.6 billion in energy development would mean so much amount lost to other higher priority areas that create more job opportunities, produce more food, provide more equitable income distribution and promote education and technology transfer. For example, if the 1978-1987 energy development budget were to be channeled to more labor intensive industries, it could create more than two million new jobs (assuming ₱50,000 investments are needed to create a new job). The development program also means that the country would have to follow a very rigorous program of managing its economy and paying its debt according to the prescription of its creditors, or else default in paying with all the unpleasant consequences it connotes.

All these costs and sacrifices could only reduce the country's oil dependence from 95 to 70 percent in ten years (See Table 9). Notwithstanding these sacrifices, it appears unlikely, as already noted, that the

price of domestic energy could be substantially lower than the prevailing world prices or the supply could be free from disruption. In effect, the costs of the country's energy policy can be viewed as the costs of partially safeguarding national security and sovereignty.

CONCLUSIONS

The 1973 energy crisis brought into the Philippines grave economic, social and political problems which elicited policy responses requiring continual sacrifices.

Large balance of payments deficits, erosion of the terms of trade, double digit inflation and slow down in production are among the adverse effects of the crisis. However, the realization that the country's energy supply can be cut off anytime by some foreign countries which could result in economic collapse has been perceived as the most serious threat to national security and stability. To defend the country against these problems a capital intensive energy policy was adopted.

The country's energy policy is mainly directed at minimizing dependence on imported oil by deliberately reducing energy consumption and substituting domestic energy resources for imported oil. Due to the inherent nature of domestic energy resources their development requires substantial investment and the resulting supply may even be subject to uncertainties of weather, technological development and social acceptance of induced changes. If fully implemented the policy could partially reduce dependence on imported oil but the adequacy and stability of energy supplies as well as their prices being lower than those prevailing in the world markets are not assured.

Whether the country's energy policy could solve the perennial balance of payments problem or not is doubtful. This is so because large expenditures are required by the energy resources development program for the purchase of capital goods and expert services abroad in addition to the usual oil import bill. Only a major breakthrough in oil exploration and development could alleviate the oil-derived component of the balance of payment deficits.

Since price inflation and the creation of the country's terms of trade depend at least partly on the rate at which oil prices rise and since the energy policy cannot influence such changes favorably, then there is no assurance that the energy policy of the country can solve these problems.

Finally, the diversion of huge resources to domestic energy development and to escalating oil imports bills will adversely affect the growth of production since the influx of capital goods, services and materials to non-energy sectors will consequently diminish.

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ENVIRONMENTAL SCIENCE, ENVIRONMENTAL STUDIES, EARTH SCIENCE AND PHYSICAL GEOGRAPHY: A COMPARATIVE REVIEW

by

J. L. McArthur[1]

Recent partitioning of knowledge about the terrestial environment has created a variety of new subjects such as environmental science, geoscience, and earth science. It is instructive to consider the relationships between these rather fashionable newcomers and physical geography at a time when the role of physical geography in the context of both an evolving human geography and, more pertinently, an increased interest in the more general aspects of the natural, and particularly the physical environment by a wide range of natural sciences is being increasingly questioned (e.g. Chorley 1971). This critique attempts to define these relationships by reviewing the contents of some traditionally popular and some more recently published textbooks in the general field. Some initial comments on the nature of physical geography provide a perspective for these reviews.

THE NATURE OF PHYSICAL GEOGRAPHY

Physical geography has traditionally studied Man's physical environment: the solid rocks, the shape of the land surface, the configuration and extent of the oceans, the enveloping atmosphere and tropospheric processes, the soil and the mantle of vegetation (e.g. Monkhouse 1954, 1965). These 'elements of physical geography' link the subject to the earth (physical) sciences of geology, geomorphology, climatology, pedology and hydrology, and also to some of the biological sciences. Such a physical geography is often prescribed as part of an introduction to geography ('the physical basis of geography') and may range within the limits of a purely descriptive account of world distributions of natural phenomena and climates with little concern for processes to a presentation of the simpler content of the earth sciences with no concern for distributions. Of particular note in the latter approach is the overlap with elementary physical geology which traditionally includes substantial sections on weathering (often including an introduction to soils), geomorphological processes and landforms, and the oceans as well as the

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more discrete topics of rocks and tectonism (e.g. Holmes 1944, 1965; Longwell and Flint 1955; Longwell, Flint and Sanders 1969).

At a more advanced level, the term 'physical geography' embraces the more specialized subjects dealing with aspects of the physical environment that are studied as part of geography. Physical geography thus comprises geomorphology, biogeography and climatology, and any other course of study in a geography department that is not part of 'human geography'.

A more recent view of physical geography is as a systems-oriented study of the total natural environment providing both a coherent and necessary basis for more specialized studies in related natural and social sciences and also an essential link between the natural sciences. This view has been recently championed by Chorley (1971) and Chorley and Kennedy (1971) and involves the definition of relevant systems, the description of system morphology and the enunciation of mass and energy flow within and between such systems. For example, at the planetary scale, such a physical geography would comprise a study of the global subsystems of the atmosphere, hydrosphere, lithosphere and biosphere with the emphasis on mass and energy transfers at the solid-fluid interface. It is clear that this approach is capable of providing both a framework for explanation and an integrative structure for physical geography.

The origin of this 'new physical geography' seems to be in the investigations into geographic zonality, based on the energy and water balances of the earth's surface, by the Russian geographer M. I. Budyko (1956) and the importance of such work was soon recognized in the West. C. W. Thornthwaite, in his presidential address to the Association of American Geographers in 1960 (Thornthwaite 1961) urged that geographic theory should be reshaped on the basis of heat and moisture exchange following developments in the USSR. He drew attention to the General Resolution of the Third Congress of the Geographical Society of the USSR (1960) which had noted that

> ...the problem of the heat and moisture balance has now acquired great significance for the development of the theory of physical geography... uniting the whole system of geographic scientific disciplines and permitting transition from the descriptive methods of studying the geographic envelope of the earth to more precise quantitative methods ascertaining the physical essence of the interactions between natural processes and phenomena...

It is apparent, however, that in the West there has been resistance to the rigour required by this approach and that, as a result, other subjects in search of new, non-traditional subject matter to satisfy their own changing paradigms are on the brink of usurping 'the new geography'. It is in this context that the evolution of textbooks in physical geography is best viewed.

TEXTBOOKS IN PHYSICAL GEOGRAPHY AND RELATED FIELDS

The number of texts addressed to the subject matter of physical geography is increasing at an accelerating rate and both the approaches adopted and the quality of the works are highly variable. Scrutiny of the sequence of texts from A. N. Strahler gives an insight into the hybridization of the earth sciences and traditional physical geography in the North American context and sets a useful standard for comparison. Furthermore, in view of the large range of Strahler works now available, a comparison of the subject matter of these texts is timely.

The Strahler Textbook Lineage. — The changing content of successive editions of A. N. Stahler's **Physical Geography** reflects well the conservatism of North American introductory courses in physical geography. The first edition (1951), which ran to a fifth printing in 1958, encompasses much of the traditional field of physical geography with sections on fluvial, glacial, coastal, aeolian and structural landforms, elementary meteorology and world climates and the Great Soil Groups. Also included are chapters on the geographic grid and map projections. This edition, like its successors, notably and symptomatically was designed for students unfamiliar with the natural and physical sciences. The second edition (1960) was expanded with additional chapters on soil moisture, ground water and surface runoff, but plant geography was not included until the third edition was published in 1969. The third edition also incorporated advances in fluvial geomorphology made some 20 years earlier (Horton 1945) and developed by Strahler himself (1957). The fourth edition (1975) maintains the traditional structure and content of earlier editions with the addition of rather tentative sections on global balances of radiation, heat and water. It is interesting to recall that these were first introduced to geography in 1956, again some 20 years prior to being incorporated into an introductory text.

In 1965, the first edition of **Introduction to Physical Geography** appeared. This was published to service a one-semester rather than a two-semester course in physical geography and was based on the parent book **Physical Geography**. Condensation involved deletions of peripheral material concerning certain aspects of astronomy, geophysics, geodesy and map work and some new sections on plant ecology and the distribution of natural vegetation anticipated these modifications in the third edition of **Physical Geography**. Changes in further editions of **Introduction to Physical Geography** (second edition 1970, third edition 1973) mirrored further updating of the parent work.

Paralleling the evolution of Strahler's geography texts and apparently an outgrowth from them were his contributions to the emerging subject of earth science. In 1963, the first edition of **The Earth Sciences** appeared. The editor, in the introduction to this text, states that this

is 'a textbook written expressly to satisfy a long-felt need for an authoritative modern text treating the broad and ever-expanding spectrum of the Earth Sciences' and the author adds in the Preface that:

> The writing of this book has been prompted by [the] conviction that major redistribution of emphasis is long overdue in the introductory course offered as part of the general education of the college student by... the departments of geology throughout the United States. The teaching of the full spectrum of the earth sciences should be recognized as the responsibility of each geology department within the larger field of the natural sciences.

The Earth Sciences has parts on The Earth as a Planet, The Atmosphere and Oceans, The Solid Earth, Landscape and Soil, and appendices include Map Projections and Isopleth Maps. Although resembling **Physical Geography** in having sections on world climates and world soils and covering topics such as Illumination of the Globe, Atmospheric Processes, and Geomorphological Processes and Landforms, additional chapters on Earth Magnetism, The Solar System, Oceanography, and Rocks and Minerals distinguish **The Earth Sciences** as a more comprehensive introduction to the subject matter of the earth sciences if not to the sciences themselves. It nevertheless contains a large component of traditional physical geography and it may be noted, therefore, that the trend in North America to teach what was essentially physical geography in geology departments as part of a 'general education' began in the early sixties.

A second edition of **The Earth Sciences** was published in 1971. Among other changes was 'a substantial move in the direction of unification of the earth sciences... by introducing concepts of radiation, heat and water balances of [the] planet'. This was perhaps the first attempt in a textbook to realize the earlier hopes for physical geography expressed by geographers such as Thornthwaite.

Strahler made a further move in the direction of unification of the earth sciences with the publication of **Planet Earth: Its Physical Systems Through Geologic Time** (1972). Its distinctive, primary aim was not just the collating of facts from the earth sciences, but the 'system-level of understanding' of air, land, water and energy. Chapter headings have a refreshing and novel impact — Sun-Earth-Space Energy System, Particle Flux System, Kinetic Energy System of Masses in Motion, Transport Systems, — and the content is satisfactorily in agreement with the book's primary aim. Although the chapters on The Geology of Planetary Space and Geologic Systems Through Time are not directly relevant to physical geography and there is no treatment of vegetation or the spatial distributions of other natural phenomena, **Planet Earth** has many excellent chapters on the subject matter of

physical geography that not only describe the basic structure and dynamics of the major planetary systems but also incorporate interesting and important material from research papers that is rarely encountered in textbooks. Perhaps the reason why this challenging text does not appear to have received the attention it is due stems from its level of presentation which is somewhat above introductory level, especially for the average geography student, and it is fair though disappointing to acknowledge that **Planet Earth** was written 'in response to demands by students, faculties, and the informed public for a new set of priorities in science education and research' rather than for geographers. The epilogue, entitled Man as a Geologic Agent of Change on Planet Earth, anticipated the fuller treatment given to such matters in **Environmental Geoscience**, which also incorporates a considerable amount of material from the main body of the text.

In 1973, Arthur Strahler was joined by Alan Strahler in the production of **Environmental Geoscience: Interaction Between Natural Systems and Man** and this was quickly followed by **Introduction to Environmental Science** (1974). Environmental science, according to these authors, may be subdivided into 'environmental geoscience', which deals with physical phenomena, and 'environmental ecoscience' dealing with biological phenomena. Although **Environmental Geoscience** has short sections on the biosphere, **Introduction to Environmental Science** treats the 'ecosphere' more fully, with chapters on energy and mineral cycling in ecosystems, aquatic ecosystems and terrestrial biomes. That analysis at the systems level was attempted in these texts is obvious from the part headings: Energy Systems of the Atmosphere and Hydrosphere, Energy Systems of the Lithosphere, Energy Systems at the Fluid-solid Interface and Flow of Energy and Matter in the Biosphere. However, the criticism of Clayton (1973) that **Environmental Geoscience** (and by extension the common part of **Introduction to Environmental Science**) 'nods obediently in the direction of systems, but... [not] much use [is made] of the principles elsewhere in the text' is valid although it is difficult to agree with Clayton that Environmental Geoscience is a 'traditional approach to geology (sic)'. Nevertheless, the emphasis in these texts on environmental processes and problems and the reasonably rigorous introduction to radiation, energy and water balances are commendable. It is evident that the omission from these texts of sections on the geographic grid, map projections and world distributions of natural phenomena and climates indicates that they were aimed at the emergent courses in environmental science rather than that the content of physical geography had evolved along the lines recommended by the visionary physical geographers of the earlier decade.

The publication in 1976 of A. N. and A. H. Strahler's **Elements of Physical Geography** bears witness to the fact that the role of physical

geography is still seen by many in the United States as providing, in a one-semester or one-quarter course, an overview of global physical environments for students who are following general education programmes in non-science fields. **Elements of Physical Geography** sets out to stress the ways in which the natural environment influences man and the material is purposely treated descriptively, with a minimum of technical terms. This book is in some ways an update of **Introduction to Physical Geography**, although there are some basic changes. Although of very similar length, **Elements of Physical Geography** uses a larger type and so there is considerably less material than in **Introduction to Physical Geography**. New topics include The Flow of Energy and Materials in the Biosphere (an introduction to ecosystems), and a large section on global 'environmental regions' usefully synthesises the climate-soils-vegetation complex of major world zones, including comment on opportunities for and restraints on expanded utilization by man. Treatment of traditional material is generally less detailed than in **Introduction to Physical Geography.**

Principles of Earth Science (1976) was the first Strahler text to incorporate the term 'earth science'. This text, like those serving physical geography, was designed to be used by students without a strong background in science in a short course providing an overview of earth science. The main thrust of **Principles of Earth Science** is towards increased understanding of a wide range of planetary phenomena spanning the lithosphere, hydrosphere and atmosphere, but there is no attempt at analysis at the systems level. Chapters on Astrogeology, The Solar System, and Stars, Galaxies and the Universe are included to introduce students to basic astronomical facts and to the results of the United States space programme.

The latest text in the Strahler lineage is **Geography and Man's Environment** (1977) which purports to be 'a new concept in geography textbooks' in both content and structure by virtue of the 'interweaving' of environmental problems and issues with the principles of science necessary for their understanding. The format is reminiscent of **Physical Geography Today** (1974) and **Living in the Environment** (1975) inasmuch as the text is visually stimulating and interspersed with interest-essays, and it is conceivable that the success of the latter, in particular, may have motivated the production of the latest Strahler work.

Geography and Man's Environment is, by its title, clearly aimed at geographers. It covers much of the traditional content of physical geography but the emphasis on, and organization around environmental topics has meant both a less detailed treatment of traditional subject matter and a less formal and less structured presentation. Units on Air Pollution Meteorology, Environmental Impacts of Ground-water Withdrawal, Mineral Resources, and The Impact of Chemical Pollutants on

Ecosystems are examples of material that augments the traditional fare. In essence, whereas **Elements of Physical Geography** aimed to elaborate the ways in which the environment influences Man, **Geography and Man's Environment** examines the manner in which man has affected the environment. There is little doubt that the text has been tailormade for a ready market and that on many North American campuses the new environmental studies has replaced the old physical geography in general studies programmes.

Environment science, environmental studies, physical geography and earth science. — Before considering the content of some texts by other authors, it is advantageous to summarize the differences between environmental science, environmental studies, physical geography and earth science in the context of the Strahler works. A. N. Strahler in **Environmental Geoscience** adopts the definition of environmental science provided by the National Science Board of the United States of America (1972).

> Environmental Science is conceived... as the study of all the systems of air, land, water, energy, and life that surround man. It includes all science directed to the system-level of understanding of the environment, drawing especially on such disciplines as meteorology, geophysics, oceanography, and ecology, and utilizing to the fullest the knowledge and techniques developed in such fields as physics, chemistry, biology, mathematics, and engineering.

A branch dealing with only the physical environment is termed by Strahler 'environmental geoscience'. The main characteristics of environmental science are its systems orientation and its concern for the environment of man. Environmental studies, in contrast to environmental science, is a term usefully employed to describe a general introduction to environmental problems. Increasingly included as part of a 'general studies' programme, it makes little attempt to analyze the structure or dynamics of natural systems, although it may include an introduction to relevant natural processes.

Physical geography remains as a comprehensive introduction to the terrestrial or earth environment, seeking in particular to describe, classify and explain the spatial variability of natural phenomena. In their latest work, Strahler and Strahler label a physical geography with 'environmental emphasis', that is, an emphasis on environmental problems, 'environmental physical geography'. This could be expected to differ from environmental geoscience in its lack of concern for a systems-level treatment although, as already observed, **Environmental Geoscience**, is not, in fact, distinguished by its systems level of analysis.

The term 'earth sciences' is clearly a collective term for sciences dealing with the physical components of the terrestrial environment.

What then is earth science? As defined by the contents of **Principles of Earth Science** it is a body of knowledge concerning the lithosphere, hydrosphere and atmosphere of the planet Earth and about the Earth's space environment. In other words, it is a mega-science embodying the findings of the earth sciences rather than a new scientific discipline. An introduction to earth science such as **Principles of Earth Science** is essentially physical geology augmented with an atmospheric component — and this turns out to be a truncated physical geography with an expanded section on the solid Earth in place of the biogeography.

Some Other Notable Textbooks. — A popular and well-known physical geography textbook by G. T. Trewartha and co-authors was published in its third edition in 1977. **Fundamentals of Physical Geography** retains the traditional focus on 'the primary elements of the earth environment and their interrelations' — the atmosphere and the weather and climates it supplies, water in the seas and on the lands, the solid Earth and its dynamic surface, and the natural vegetation and soils of the lands — with an emphasis on the description and explanation of spatial variation of such elements. The 'systems approach' is claimed by the authors as a major innovation, but, as for many other recent textbooks, the recognition that the atmosphere, lithosphere, hydrosphere and biosphere are interacting planetary subsystems characterized by a throughflow of matter and energy does not constitute a systems level of analysis. It is noteworthy that there is a chapter on The Earth's Crust, which includes sections on geological structures and the theory of plate tectonics, in recognition of the role of tectonism in accounting for the variability of the Earth's surface.

In response, presumably, to the growth of introductory courses in earth science in United States geology departments, the Foundations of Earth Science series was launched by Prentice-Hall in the late 1960s. This series was planned 'to provide brief, readable, up-to-date introductions to all aspects of modern Earth science'. The first three of the series, **Earth Materials** (Ernst 1969), **The Surface of the Earth** (Bloom 1969), and **Structure of the Earth** (Clark 1971), cover traditional fields of physical geology, and historical geology is also treated with titles such as **The History of Life** (McAlister 1968, 1977) and **Geologic Time** (Eicher 1968, 1976). As well as these texts on the solid Earth, introductions to the sciences of the fluid Earth are included in the series, for example **Oceans** (Turekian 1968, 1976). **Atmospheres** (Goody and Walker 1972), and **Weather** (Battan 1974), and a volume on **Earth Resources** (Skinner 1969) has run to the second edition (1976). These well-produced and up-to-date texts are, more or less, introductions to the various earth sciences or branches of the earth sciences. They are notable for introducing methods as well as subject matter and may better be considered,

therefore, as introductions to the earth sciences rather than as foundations of earth science.

A series of similar format, though not of similar approach or content is the Brown Foundations of Geography Series. Physical geography is served by **A Geography of the Atmosphere** (Hidore 1969, 1972), **A Geography of Plants and Animals** (Laubenfels 1970), **A Geography of Soils** (Basile 1971), and **A Geography of Landforms** (Vann 1971). Although the fragmentation of the traditional field of physical geography has advantages in some circumstances, it clearly denies the concept of physical geography as a coherent subject comprising the study of interacting systems. It is interesting to note that the opening sentence of **A Geography of Landforms** states that **'the study of Landforms is a part of the general field of Geography'**, and also that the following sentence names this study as Geomorphology and classes it as a branch of earth science.

A large number of comprehensive earth science texts were published in the early seventies to cater for the new environmental component of a general education. Among these were **The Earth: Our Physical Environment** (Donn 1972), **Dynamic Earth: An Introduction to Earth Science** (Lepp 1973), and **The Earth: An Introduction to the Geological and Geo-Physical Sciences** (McAlister 1973). All these were written by geologists and all have sections, of variable quality, on the Earth in space, the solid Earth and the fluid Earth, and, more or less explicitly, examine the interactions occurring at the fluid-solid interface so far as physical processes are concerned. Thus, the geomorphological and atmospheric components of traditional physical geography have their place in these books, although are not treated with any distinction.

Finally, two texts may be cited for their explicit attempts to consider the subject matter of physical geography within a systems framework, the first by both title and content, the second by title rather than text. **Physical Geography: A Systems Approach** (Chorley and Kennedy 1971) is unique in representing 'an attempt to crystallize an attitude to that part of reality with which physical geographers have been involving themselves' by unreservedly attempting 'to show how the phenomena of physical geography can be rationalized and perhaps made to assume new significance and coherence when treated in terms of systems theory, statistical analysis, cybernetics, and other modern interdisciplinary approaches to the features of the world'. That this volume does not present the totality of information traditionally subsumed under 'physical geography' in no way detracts from its importance for the development of the subject. In this book, the medium is the message. **Physical Geography: Earth Systems** (Hidore 1974), in contrast, treats systematically, rather than at a systems level of analysis, the atmosphere, hydrosphere, geosphere, biosphere, and 'regional systems' (tropical, mid-latitude, and polar and highland environments).

SUMMARY AND CONCLUSIONS

The main aim of reviewing the contents of the selected text books has been to trace the development of new trends in organizing and teaching knowledge about man's environment rather than to provide overall assessments. Furthermore, concern has been for changes in the elementary, planetary-scale approach characteristic of introductory courses rather than for developments in the individual specialities comprising physical geography at more advanced levels.

It appears that texts in physical geography have, albeit somewhat belatedly, incorporated major advances in the theory, techniques and philosophy of the relevant earth sciences, and have tentatively tested the market with a physical geography incorporating energy and moisture fluxes in the earth-atmosphere system and using a systems approach. However, this evolving physical geography has been eclipsed by the bourgeoning interest in environmental studies resulting from an increased awareness of environmental and resource problems. This has occurred because physical geography, at least in North America, has primarily been part of a general studies programme and courses relating to environmental problems are seen to have greater relevance in this context.

Environmental studies bear little relationship to environmental science which is concerned with the system level of understanding of the environment and requires a knowledge of, and at least basic expertise in, a range of traditional sciences. Energy and moisture balance climatology undoubtedly has much to contribute to environmental science as well as providing the basis for a unified and intellectually satisfying physical geography.

It seems to have escaped the authors of many physical geography textbooks that energy and moisture gradients are responsible for virtually all natural processes and that the major controls of the spatial variability of natural phenomena are the differential budgets of solar and heat energy and the availability of water. An introductory physical geography based on these concepts, and stressing the hydrological cycle and planetary circulations of air and water as the key transport systems that maintain a quasi-steady state of the planet's sub-systems, provides both a self-contained introduction to the Earth's physical environment that is based on fundamental processes and also a solid foundation for subsequent courses in the various branches of advanced physical geography. Furthermore, such a physical geography is well suited to a systems approach. The interlocking endogenetic systems involving both energy and mass also enter into a physical geography concerned with the fundamentals of the terrestrial environment, of course, but these are relatively passive components on a geographical time scale.

Elementary earth science, in introducing the basic facts and processes of the atmosphere, hydrosphere and lithosphere, has a considerable overlap with traditional physical geography and appears to have been successfully established in North America as a part of geology. Still remaining for physical geography, however, is the opportunity to provide a unified, coherent and necessary treatment of the major terrestrial systems on a planetary scale, enunciating their structure, kinetics, interrelationships and present states. Such an approach forms a sound basis for a rigorous study of the spatial variability of natural phenomena and also for the investigation of man's modification of these phenomena. The question is whether this 'new physical geography' will be replaced by the less rigorous and more fashionable environmental studies that apparently better serve the needs of the majority. If so, the concomitant loss to geography will be the more able students.

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"THE ELEVENTH COMMANDMENT"

Thou shalt inherit the holy earth as a faithful steward conserving its resources and productivity from generation to genera ion. Thou shalt safeguard thy fields from soil desolation, and protect thy hills from overgrazing by the herds, that thy descendants may have abundance forever. If any shall fail in this stewardship of the land, thy fruitful fields shall become sterile stony ground or wasting gullies, and thy descendants shall decrease and live in poverty or perish from the face of the earth."

Walter C. Lowdermilk

REVOLUTION WITHOUT IDEOLOGY: DEMOGRAPHIC TRANSITION IN EAST ASIA[1]

by

THOMAS D. ANDERSON*

Quietly, a process of great potential import for the world of the future is taking place. This is the acceleration of demographic transition in East Asia. Called the Chinese Culture Realm, the region consists of China, Japan, the Koreas, Taiwan, as well as Hong Kong, and is the most heavily populated of all major world areas. It is the home of an estimated 1130 million people, or roughly a fourth of mankind.[2]

Although here the annual absolute increase in population continues to surpass that of all other regions, the most rapid large-scale transformation of demographic pattern in world history is being accomplished. As of 1976, the collective natural rates of population increase were reported to be lower than those of the United States in the 1960's.[3] Such an abrupt and massive modification of traditional customs is as unprecedented as it was unexpected. Yet in spite of a frustrating lack of reliable demographic data from China and North Korea, nearly all population authorities acknowledge the trends, even while they disagree about details.

THE CONCEPT OF DEMOGRAPHIC TRANSITION

Demographic transition is a concept derived from experiences in Western Europe during the later stages of the evolution from pre- to post-industrial societies. In pre-industrial Europe the demographic pattern was one of high fertility and high mortality. A vivid example from the period is that of the legendary opera tenor, Enrico Caruso. Born in 1873 as the eighteenth child of his parents, he was the first to survive infancy[4]. Not all circumstances in that era were so tragic but in order to offset high mortality rates, a high rate of fertility was a rational response. Because the two rates so nearly balanced, annual

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[1] An earlier abbreviated version of this paper was presented at the Annual Meeting of the East Lakes Division of the Association of American Geographers, Michigan State University, East Lansing, Michigan. 15 September 1978.

[2] Data are adapted from: Population Reference Bureau, *1978 World Population Data Sheet* (Washington, March, 1978).

[3] Population Reference Bureau, Inc., "A Decade of Growth: World Population in the 1960's," *Population Profile*, June 1972, p. 2.

[4] *Baker's Biographical Dictionary of Musicians*, rev. Nicholas Slovinsky (New York: G. Schirmer, 1958), p. 258.

population increases were usually of a low level and a measure of stability existed.

In Western Europe, industrialization, economic and medical advances served to reduce mortality rates by about 1900,[5] but high fertility rates, deeply rooted in tradition, persisted at least a generation longer. The result was the rapid increase in numbers that in recent decades is termed the expanding phase of demographic transition or popularly, the population explosion. As the benefits of industrialization diffused more widely and especially with growing urbanization, social and economic factors contributed to a lowering of fertility.

This produced the third phase of the process wherein low rates of both fertility and mortality prevailed. Lester Brown estimated the natural rate of increase in Western Europe in 1975 at 0.32 percent, for example.[6] Thus both the first and last stages of demographic transition are marked by comparatively low rates of increase. The significant difference is that the completed phase is not marred by the tragic cost of young lives that characterizes the first. Because of the linkage in European experience with industrialization, widespread industrialization and urbanization have been thought essential to the achievement of demographic transition.

Demographic processes in other nations and regions thus have been viewed in the light of past events. Demographic transition has been accepted as a desirable goal but its achievement was believed subject to constraints not easily bypassed. One such constraint was the need to attain high rates of economic growth in order to stimulate the transition. Another was the long period of time believed necessary. It was assumed that at least two generations would be subject to gradually diminishing rates of increase and slow cultural modification before transition entered its last phase. For regions already densely settled and without the colonial resources that enriched industrializing Europe or access to comparatively empty lands to which the sudden surpluses of people could migrate, enormous population stresses were assumed to be unavoidable.

This interpretation of the preconditions and specific character of demographic transition has been subject to increasing challenge by scholars with field experience in developing areas.[7] Recent events in East Asia accentuate such doubts and have stimulated reassessment of the prevailing wisdom about the processes of demographic change. Most

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[5] Don E. Dimond, "The Limitation of Human Population: A Natural History," *Science*, 187: No. 4177, February 21, 1975, pp. 713-21, 720.

[6] Lester R. Brown, *World Population Trends: Signs of Hope, Signs of Stress*, Worldwatch Paper 8 (Washington: Worldwatch Institute, October, 1976), Appendix A, p. 33.

[7] These views are summarized in Michael S. Teitelbaum, "Relevance of Demographic Transition Theory for Developing Countries," *Science*, 188: No. 4187, May 2, 1975, pp. 420-425.

of the fresh views begin with the premises that contemporary pre-transition societies are not European in culture and the 1970's are not the 1880's. By the same token, East Asia differs culturally from other developing areas, including South and Southeast Asia.

RELEVANT EAST ASIAN CULTURAL FACTORS

The most significant regional features are cultural. Race is not a divisive factor because except for the isolated Caucasoid Ainu in Japan all native peoples are classed as Mongoloids. Northern China provided the dominant culture hearth and despite variations along the margins, certain culture characteristics spread throughout the realm. These include material elements, such as use of chop sticks, integration of human waste into agriculture, and persistence of ideographs for written language.

The regional peoples hold in common non-material aspects of traditional culture of greater significance for understanding recent change. Religion within the region placed emphasis on moral principles as opposed to ideology, with forms of Buddhism distributed most widely. Generally, societies were controlled more by a system of ethics than by laws. In China the dominant pattern emphasized concrete reality, especially human relations, in contrast to other-world concerns as in the Indian Culture Realm. Temporal power was pre-eminent and although an emperor was conceded divine sanction, in terms of obedience, the state came first and religion second. National attitudes differed in detail in Japan and Korea but a similar theme was present.

Widely accepted was the role of the extended family. In rural areas this family was an integral productive unit and the center of personal loyalty. Discipline was maintained by an age hierarchy, with veneration of the elders a paramount factor. Women held inferior status and arranged marriages precluded personal choice as to partner or age of consent. Care of the young, sick, and aged was accomplished within the familial entity with little recourse to outside agencies.[8]

Also part of the regional sense of values was a high status given to education. Literacy rates traditionally were low and scholars were few, but the role of advanced learning was accorded great respect. Such a common predisposition toward formal education facilitated its rapid acceptance when it was eventually provided by modern governments.

A regional cultural feature of very great importance was a sense of national consciousness.[9] Although provincialism was firmly established, early and periodically successful central governments contributed

[8] An account of these circumstances in modern times may be found in: Jack C. Potter, *Capitalism and the Chinese Peasant* (Berkeley: University of California Press, 1968), p. 161.

[9] David Kornhauser, *Urban Japan: Its Foundations and Growth* (New York: Longman, 1976), p. 21.

to widespread national identification. Despite sectional diversity, there was little question about who belonged to the Chinese, Korean, or Japanese cultures. Even the Taiwanese have a national identity, it is just that the Chinese — both Kuomintang and Maoist — have not been willing to grant it political expression. For the others, a political state now exists, except in Korea where there are two, each claiming authenticity.

A BRIEF HISTORY OF DEMOGRAPHIC TRANSITION IN EAST ASIA

Demographic transition within the region began after WW II and somewhat differently in each East Asian nation. The process began first in Japan. Here attainment of the third phase was accomplished rapidly but not as a specific consequence of the modernization process. Industrialization, urbanization and general literacy had become a common part of Japanese culture by the 1930's. Military and economic expansionism, however, served as incentives for retention of the steady rates of population increase that had accompanied the period of modernization which begun in the 1870's. Population in the home islands grew from about 35 million in 1872 to roughly 72 million in 1940.[10] Defeat in WW II caused the return of several million overseas civilians. This event, in conjunction with the spurt in births accompanying military demobilization, contributed to a population surge that produced a total of 89 million by 1955.

Governmental concern with the impact of such rapid increase upon a nation suddenly confined to the home islands began early after the war's end and was translated quickly into popular action. Here the cultural factors of practicality, homogeneity, social discipline, and nearly universal literacy were decisive. Abortion was legalized in 1948 and other forms of birth limitation were made readily available to a densely-settled people possessed of a high level of technology. Between 1947 and 1957 the birth rate was halved, to 17 per 1,000.[11] This dramatic transition has not halted growth, which dropped to one percent annually by 1955, but it has introduced a measure of stability that has enhanced planning and economic adjustments to the moderate increase. Japan has ranked among the world's most advanced nations in terms of low rate of natural increase for over two decades.[12] In this East Asian nation where tradition has always been strong, a demographic transition was accomplished in less than a decade.

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[10] Data are from *Population Census of Japan*, 1970, Vol. 1, p. 4.

[11] Robert Guillain (trans. from French by Patrick O'Brian, *The Japanese Challenge* (Philadelphia: J. B. Lippencott Company, 1970), pp. 96-99.

[12] Edward F. Denison and William K. Chung, "Economic Growth and Its Sources," pp. 67-151, p. 67, in Hugh Patrick and Henry Rosovsky, *Asia's New Giant: How the Japanese Economy Works* (Washington, D.C.: The Brookings, Institute, 1976).

In both Taiwan (Republic of China) and South Korea (Republic of Korea) public concern about high rates of population increase was first expressed in the early 1960's. On Taiwan, the government initiated a ten-year plan of action designed to reduce the rate of increase from 2.9 percent to 1.9 percent by 1975, a goal that was reached on schedule. Although the birth rate stagnated near that figure for several years following, a major social change had been achieved. During 1973, the government acted to limit to only the first three children the dependent's subsistence allotment paid government employees, a move clearly intended to reimitate the downward trend in births.[13]

The South Korean experience was very similar. There the birth rate decreased from 2.9 percent to about 2.0 percent between 1960 and 1970.[14] A pause in the trend toward decrease similar to that in Taiwan has prevailed since, and the target of 1.5 percent by 1976 has not yet been reached. A Ten-Year Family Planning Program, 1962-1971, involved increasing efforts by the Ministry of Health and Social Affairs. Non-governmental national and international family planning agencies also supplied a major impetus.[15] South Korea and Taiwan are examples of conditions, wherein fast-paced modernization provided the sort of widened educational and economic activities that influence individual decisions toward reduced family size.

Demographic conditions in North Korea (Peoples' Republic of Korea) are known only poorly. The Population Reference Bureau offers data for 1974 that suggest a rate of increase of 2.5 percent annually, a figure little different from that of 1965.[16] The U.S. Census Bureau provides an even higher figure of 3.1 percent for 1974.[17] North Korea thus appears to represent a late starter in the regional trend toward demographic transition. Its population is about 17 million as compared with over 36 million in South Korea, however, a factor that minimizes the effect of the apparent unconformity.

Decreased growth rates in all of the above nations would be encouraging but not of major significance if the demographic situation within China (People's Republic of China) were unchanged. But in fact, drastic alterations with respect to birth rates have taken place there. Unfortunately, judgments with respect to Chinese demographic conditions can be only inferential due to the absence of reliable data. For example, two reputable sources produced estimates of the national popu-

[13] C. H. Yen, C. M. Yang, and Y. T. Wang, "Taiwan," *Studies in Family Planning 5*, No. 5, May, 1974, pp. 165-169.

[14] In Jaung Whang, "Integration and Coordination of Population Policies in South Korea," *Asian Survey*, Vol. 14, No. 11, November, 1974, p. 985.

[15] Population Reference Bureau, *World Population Growth and Response 1965-75: A Decade of Global Action* (Washington, April, 1976), pp. 84-86.

[16] Population Reference Bureau, 1976, p. 120.

[17] Bureau of the Census, *World Population 1975: Recent Demographic Estimates for the Countries and Regions of the World*, ISP-WP-75 (Washington: U.S. Department of Commerce, June, 1976), p. 94.

lation in the early 1970's that differed by more than 100 million. (U.S. Department of Commerce, 1972: 930 million and Worldwatch Institute, 1975: 823 million.)[18] Despite this fundamental statistical deficiency, all evidence points to remarkable reductions in usual family size.

Because of uncertainty regarding population totals, as well as those for recorded births and deaths, estimates of growth rates differ. None describe trends toward change prior to 1953. Official Chinese data indicate a growth rate increase from about 2 percent in 1952 to 2.3 percent in 1957,[19] whereas the United Nations and the U.S. Census Bureau produced the figure of a 2-percent rate of increase for 1965.[20] The latter figure suggests that demographic transition had begun by that date. This earlier beginning notwithstanding, Lester R. Brown of Worldwatch (1976) concludes that declines in fertility in China in the 1970's were without precedent. In his view, the rate of natural increase in China declined from about 1.8 percent in 1970 to 1.1 percent in 1975. Indeed, R. T. Ravenholt of USAID estimated a 1975 figure of 0.8 percent![21]

The earlier decreases in Japan, Taiwan and South Korea combined with recent events in China are reported to have accomplished a regional decline in natural increase from 1.85 percent in 1970 to 1.18 percent in 1975.[22] Because the rate of decrease in China has been so precipitous in recent years, this figure is presumably even lower in 1979.

FACTORS CONTRIBUTING TO REGIONAL BIRTH RATE DECLINES

These reductions in average family size were accomplished in essentially similar ways. The basic mechanisms were delayed marriage, increased use of contraceptive devices, sterilization, and abortion. In China, delayed marriage began with the Marriage Law of 1950. Legal sanction was denied women under 18 years and men under 20.[23] This law remains unchanged but official announcements have urged increasingly older ages. These exhortations progressed from 20 for women and 25 for men in the late 1950's, to 23 and 26 in the late 1960's and even 25 and 30 years of age by the mid-1970's. (It must be emphasized that premarital sex is severely frowned upon.) Students and government workers were most subject to official coercion but the pervasive influence of Chairman Mao evidently had its effect upon rural peoples as well. Similarly, later marriages have become customary in the other nations of the region, but in a less regimented fashion. Government propaganda on this issue

[18] Brown, Appendix B, Table A, p. 35.
[19] Nai-Ruenn Chen, *Chinese Economic Statistics: A Handbook for Mainland China* (Chicago: Aldine Publishing Company, 1976), p. 136.
[20] Growth rate estimate adapted from *Population Reference Bureau*, 1976, p. 75.
[21] Brown, Appendix B, pp. 34-35.
[22] Brown, p. 33.
[23] Michael L. Rosenzweig, *And Replenish the Earth* (New York: Harper & Row, 1971), p. 65.

has occurred in Taiwan, South Korea and Japan but it is not the sole voice. There, other factors appear to have major roles in influencing personal choice and official persuasions are secondary.

Contraceptive devices have been made available generally within East Asia, either from private or official sources. Abortions are legal throughout the region, as a rule in modern, sanitary clinics. Sterilization of male and female is also available to the general populace but is not generally favored.[24]

More fundamental to the success of family planning programs than mere access to the techniques has been the ability of different nations to provide incentives for birth limitation. In Japan, South Korea and Taiwan the combination of economic opportunity, social mobility and higher education that has been part of modernization elsewhere in the world is present. Under these conditions the basic motivation is economic expansion in these three nations for a decade or longer suggest that motivations similar to those operative in other developed areas would have contributed to demographic transition even without governmental intervention. But there seems little doubt that public funds and official incentives have also been important factors in the rate of acceptance by the young populace of these radical departures from traditional folkways.[25]

Again, conditions differ in China. In addition to being the world's most populous nation, it was one where traditions of family were extraordinarily strong. On the other hand, under Chairman Mao China was and perhaps still is the most disciplined society extant. The enormous personal influence of Mao in this matter was supplemented by a system of official controls of personal actions nearly unprecented in world history. Rosenzweig[26] reported proscribed discussion groups in the early 1950's that focused on the proper roles of women and sex. Women were to work hard, educate themselves, delay marriage, and after marriage to limit births. To have more than four children was to risk social ostracism, a cruel punishment in a land where the right to change residence is closely regulated.

Rather than lone reliance on public exhortations and voluntary compliance, social coercion was applied through close surveillance and threats of loss of status and privileges. The program was unequivocal and direct; people knew that they were not supposed to have large families and generally were influenced by that knowledge.[27] Because a whole genera-

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[24] Kyung Shik Chang, "Korea (South)," *Studies of Family Planning* 5, No. 5, May, 1974, pp. 152-153 and Jessica Blockwick, "Chinese See 'Attitude' as Birth Control Key," *Interaom*, Vol. 5, No. 11, November, 1977, p. 12.

[25] A similar assessment but with a different order of significance is the theme of: Amy Ong Tsui and Donald J. Bogue, "Declining World Fertility: Trends, Causes, and Implications," *Population Bulletin*, Vol. 33, No. 4, October, 1978, 56 pages.

[26] Rosenzweig, p. 64.

[27] Blockwick, pp. 1 and 12.

tion has reached maturity under these conditions it is hardly surprising that the pace of decrease in birth rate has accelerated over the past few years.[28]

A vital element in the success of family planning programs in East Asia has been a sharp drop in mortality. Lester R. Brown supplies the estimate that for the region, mortality in 1975 was less than eight per 1,000, the lowest of any major world region![29] This high rank reflects in part the fact that a dominantly young population is present, but it also is evidence of a drastic drop in infant mortality. Official inducements to limit births are understandably more eagerly accepted under conditions where parents have considerable confidence that their children will survive to maturity. A major part of family planning propaganda has been appeals to consider the future well-being of each child, a motivation that strikes a responsive chord among parents in all cultures. In East Asia, economic and social advances have combined to make such appeals credible. Access by the general population to modern medical treatment is provided by each of the nations in the region and has had a significant effect on health levels. Conditions for child-birth especially are improved.

Effective communication and transportation now lessen the impacts of crop failures, particularly in China. Nutrition is adequate generally if not always of higher quality than in the past. In the non-Communist nations, improved nutrition has been achieved largely by means of increased production and importation of food, braced by surging economic conditions.[30] In China and North Korea the principal medium has been more equitable distribution, implemented by strict rationing. Chinese food production increases have roughly matched population growth since 1949 but drought and floods cause periodic shortages. Grain has been imported regularly by China since 1961, mainly wheat from Argentina, Australia, and Canada. It may be assumed that increased population totals will exacerbate this need in the future.[31]

A central thread in all these social changes is the general emancipation of women. It began first in Japan where one of the earliest

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[28] A cautionary note regarding the role of these trends was expressed by Dr. Lawrence A. Hoffman of the University of Toledo. Professor Hoffman was one of a group of American geographers who traveled in China as guests of Chinese geographers in summer, 1977. He reports private conversations in which Chinese professionals agreed that outside metropolitan zones of influence the impact of many of these social changes has been less great. Even higher officials spoke in terms of generations when describing the attainment of objectives. (Personal correspondence, May, 1978.)

[29] Brown, Appendix A, p. 33.

[30] One source reports that in South Korea the average daily caloric intake rose from about 1500 in 1946-47 to 2700 by 1970-71. Paul W. Kuznets, *Economic Growth and Structure in the Republic of Korea* (New Haven: Yale University Press, 1977), p. 93.

[31] This matter is treated in detail in Kuan-I Chen and Robert T. Tsuchigana, "An Assessment of China's Foodgrain Supplies in 1980," *Asian Survey*, Vol. 16, No. 10, October, 1976.

stipulations of the U.S. Military Government following World War II was voting rights for women. This innovation was quickly broadened to include more fundamental social and economic aspects of life.[32] Equal participation by women at every level of society was also a major goal of the Chinese Communists and has become a feature in the "New China" invariably remarked by foreign visitors. Although less widely noted, there also has been major progress in this regard in the Koreas and Taiwan. The basic elements involved are increased career opportunities and a greater range of personal options for women. Under these conditions, multiple child bearing has become the choice of a diminishing minority of women, even in those nations where forms of official coercion are not a compelling factor.

IDEOLOGY, CULTURE AND MODERNIZATION

The spectacular progress of demographic transition in East Asia raises questions and perhaps provides lessons with reference to developing nations elsewhere. Of great importance is evidence that a dominantly rural nation such as China can effect basic changes in its demographic structure within the span of a generation. A questionable conclusion from this accomplishment, however, is that the regimented approach employed there represents an obligatory model, a viewpoint especially associated with Robert Heilbroner.[33] An alternative interpretation is offered below.

What is particularly striking about the process of demographic transition in East Asia is that it began and is proceeding under a variety of political conditions. The ideologies and political systems involved are diverse. In civil and political terms they range from Japan, where access to individual human rights ranks among the freest in the world, through restrictive military dictatorships in South Korea and Taiwan to North Korea and Post-Maoist China, where personal repression is among the world's most severe. In terms of economics, the internationally-oriented economies of Japan, South Korea, and Taiwan contrast vividly with the efforts toward self-sufficiency that have characterized China and North Korea. Despite these differences, striking progress towards societies where individual lives are valued and rates of population increase are low is present everywhere.

Search for an explanation of these circumstances leads to a focus upon culture. Involved are peoples with a clear sense of national consciousness, bolstered in Japan and the Koreas by a high degree of cultural homogeneity. Even in China regional diversity has been largely within the context of a central Chinese identity. Only in Taiwan is there con-

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[32] Robert King Hall, *Education for a New Japan* (New Haven: Yale University Press, 1949), pp. 418-423.

[33] Robert L. Heilbroner, "Second Thoughts on the Human Prospect," *Challenge*, Vol. 18, No. 2, May/June 1975, pp. 24-26.

flict in this regard. The factor of overall cultural affinity appears to play a large role. The fact that separate nations within a culture realm defined on the basis of historical ties demonstrate comparable adjustments to changing conditions ought not to be surprising, despite current ideological dissimilarities. Although the precise mechanisms and the timing reflect contemporary differences, societal reactions give evidence of fundamental culture traits of regional compass.

As noted above, concern with concrete reality and the preeminence of political power were traditional. Thus official strictures combined with demonstrated personal advantages lessened resistance to modification of ancient customs. A predisposition for education and the habit of industrious labor aided economic expansion and industrialization, as did the aforementioned docility in response to official edicts.

A general sense of cultural security, reinforced by widespread ethnocentrism, made easier the acceptance, modification, and improvement of appropriate technology developed elsewhere. Peoples of East Asia tend to take from the rest of the world what is useful to them on their own terms with slight sense of inferiority or deference to its foreign origin. It seems evident that this quality has been as much operative with respect to demographic matters as with scientific and political ones.[34]

SOME IMPLICATIONS OF DEMOGRAPHIC TRANSITION

Regardless of whether or not the preceding efforts toward explanation are valid, the question remains: what will be the future effects of demographic transition in East Asia? Despite growth rate reductions the region continues as the world's most populous. Even at one-percent growth rate, absolute annual increases in the region would exceed 10 million, the equivalent of another Chile or Hungary each year. Population dynamics teach that even should zero population growth be attained by 1980 (an impossible prospect), somewhat more than 600 million people would be added to the region before growth stabilized.[35] Thus assuming a continued precipitous decline in rates of increase, the minimal expectation is an ultimate population stabilized around two billion. For a region where food stresses exist now, this is a grim prospect.

The linkages between demographic change and economics can be important. Demographic transition, for example, produces not only a lowered growth rate but also an altered age structure. In a given population there are fewer children and more aged members. The average age of the work force rises as its relative numbers decrease. Despite increasing infusions of technology, maintenance of high agricultural yields

[34] This concept is introduced in Thomas D. Anderson, "Colonial Mentality: A Geographic Variable in International Relations," *Ohio Geographers: Recent Themes*, Vol. 6, 1978, pp. 17-18.

[35] Rosenzweig, p. 39.

in China continues to depend upon labor-intensive methods. In the celebrated "two-legged" approach to progress, the traditional leg is predicated upon the availability of many hands. The changing age structure of the population will diminish the magnitude of this important productive resource, perhaps at a faster rate than the provision of replacement machines and chemicals.

In Japan's modern industrialized society, demographic transition in combination with traditional ways has given rise to a different sort of economic dilemma. A paternalistic role by major industries has long been part of Japanese society. Workers joined companies when young and were guaranteed lifelong employment and increasing compensation in exchange for productive loyalty. The seniority wage-scale system contributed greatly to post-WW II economic recovery and to subsequent rapid expansion. But since 1972 this system has become less efficient. A key reason is that by 1985, 80 percent of the labor force will be over 30 years old. This problem will worsen in time. Increasingly higher labor costs and lump-sum retirement grants will lessen the enterprises' competitive position, especially on the world market so essential to Japan. A basic premise of the Japanese system was of a labor force with a pyramid-shaped structure. But the post-war baby boom followed by rapid birth decline has resulted in an age structure that more and more resembles an inverse trapezoid when graphed.[36]

On the other hand, much encouragement can be drawn from the events. Fundamental social and economic changes have improved the immediate prospects of nearly all the region's inhabitants, regardless of political system. It is difficult to imagine a greater demonstration of the benefits of what has become known as modernization, or of its nearly universal appeal. Such achievements increase popular support for the idea that the basic needs of society are subject to human management. At the same time, they weaken the arguments in favor of any single political route into the future.

SUMMARY AND CONCLUSIONS

What seems clear is that a massive social process of profound impact is transforming the demographic character of the nations of East Asia. The changes started about 1950, spread quickly, and continue with accumulating inertia. Because they began and are sustained by a general modification of personal motivations, continuation of the conditions that created these motivations seems a prerequisite for future political stability in the various nations. Overall, a rising level of prosperity appears less essential than does provision of basic subsistence; security for the

[36] Adapted from Maki Yamada, "The Japanese Way," excerpted and translated from *Nihon Keizai Shimbun* by *Atlas World Press Review*, Vol. 25, No. 6, June, 1978, p 4.7.

young, sick, and aged provided from public rather than familial means; and a broadened range of occupational options for both sexes and all classes. Governments that fail to meet these expectations are likely to face unmanageable pressures as the demographic trends give evidence of being irreversible.

For those in other parts of the world, realization of the scope of these internal cultural changes will enhance understanding of the region. It is particularly important that former images be discarded and that future policies be based upon the new cultural realities. For persons concerned with the general human condition, gratifying social improvements have been made. But the lessening of old problems is matched roughly by the addition of new ones. Demographic transition stands both as a cause and a result of far-reaching political, social, and economic changes in East Asia. Its significance should be part of our view of the world.

AN ENVIRONMENT "OF CRITICAL IMPORTANCE

Almost half our population lives near the margins of the ocean or the Great Lakes. The near-shore environment is thus of critical importance. This environment is being modified rapidly, by human activities, in ways that are unknown in detail but broadly are undesirable... Deliberate modification of the coastline, such as channel dredging for marinas, shoreline modification for beach stabilization and filling in marsh areas for developmental purposes, pose serious problems. These modifications are occuring in estuaries which are important natural resources for recreation and food production. These areas are the nursery grounds for many marine organisms. How severely these and other environmental alterations affect the biota is unknown. — "Effective Use of the Sea," report of panel on Oceanography, President's Science Advisory Committee, June 1966.

IRREPLACEABLE

Estuaries "are rich in fish and wildlife; they are an invaluable and irreplaceable source of enjoyment for recreation, sport and commercial fishing and for their natural and primitive beauty. However, because of the rapid expansion of cities, urban areas and commercial enterprises, these valuable estuarine areas are rapidly disappearing from the face of this earth on this continent. And once they disappear, they are gone forever... It is our responsibility to act now to save our remaining estuarine areas..." — Congressman John D. Dingell of Michigan, March 6, 1967.

The above statements were taken from The Conservation Foundation Letter, 1250 Connecticut Avenue, N.W. Washington, D.C. 20036 (May 22, 1967).

MUNICIPAL POPULATION PROJECTIONS: A PHILIPPINE CASE STUDY

by

DAVID M. KUMMER[1]

INTRODUCTION

The basic concept of this essay is that making population projections at the municipal level should not be viewed as a mechanical-technical exercise; rather, it should be seen as an attempt to understand why and in what direction demographic change is taking place. It is an intellectual exercise which should be sensitive to the realities of the developing community and placed primarily within the local context. Each municipality has a unique past and will have a unique future: projection techniques which ignore this aspect of municipal development may not be appropriate for development planning at the local level. As the National Census and Statistics Office (NCSO, 1975b, p. 1) has pointed out, "social and economic development programs, priorities and policies have to be fitted separately for each area requirement and must be planned individually in the light of their differences." This essay is an attempt to analyze how municipal population projections are affected by migration, particularly in-migration.

This approach to the problem is given some urgency due to the nature of development planning in the Philippines. Now that development planning is a requirement at the local level, the need for correct population projections is great because these will form the basis of any development plan. The NCSO has recently made population projections for all the municipalities in the Philippines (NCSO, 1975b); however, it shall be the contention of this paper that these projections may be inadequate for municipalities which are experiencing or are expected to experience substantial in-migration, particularly those near the Metro-Manila Area (MMA).

The need for an approach which is sensitive to local reality and can adapt to rapidly changing demographic situations is underscored by the fact that NCSO projections are considered to be official and therefore should form the basis of municipal development plans. As Gerardo Sicat

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says in the forward to **Population Projections of Cities and Municipalities in the Philippines, 1970-2000** (NCSO, 1975b):

> The population projections were based on authenticated information and the most recent available data. The results have to be interpreted only in the context of the data and methodologies used.
>
> Approved by the NEDA [National Economic and Development Authority] board, the population projections are deemed official although they will be subject to revisions as soon as more recent data come into light. It is hoped that the needs of government and private planning agencies for sound bases of development policies and programs will be met adequately by this publication.

Unfortunately, for reasons to be discussed below, the techniques used by the NCSO cannot adequately take into account significant migratory flows. In fact, the NCSO is aware of this (see below). Therefore, our purpose is not to criticize the population projections of the NCSO; rather, it is to approach population projections in municipalities which may be confronted with migration on an individual basis.

Our examination shall be centered on Imus, Cavite, a second class municipality of approximately 50,000 people, about 20 kilometers south-southeast of the heart of Manila. The author had the pleasure to live in Imus from March to September, 1978 while he was a member of the Municipal Development Staff.

The analysis will proceed in six steps. First, we shall pose four questions: (1) What is the past and present demographic situation of Imus? (2) What demographic changes in Cavite and the MMA may affect Imus? (3) What national and other developmental considerations may affect Imus? and (4) What are the present NCSO projections for Imus? Then we shall present our new projections and a summary and conclusion.

IMUS: PAST AND PRESENT

The NCSO (1975a, p. 1) census data for Imus since World War II is presented in Table One:

TABLE 1. POPULATION AND POPULATION GROWTH IN IMUS, CAVITE SINCE 1948[1]

Date	*Population*	*Intercensal Growth Rates*[2]
1948 (October 1)	23,685	
1960 (February 15)	31,660	2.585 percent
1970 (May 6)	43,686	3.200 percent
1975 (May 1)	48,566	2.140 percent
		1948-1975=2.738 percent

[1] Source: NCSO, 1975a, p. 1.

[2] All calculations are by the author and may differ slightly from NCSO calculations due to rounding off and the use of slightly different time periods.

Several comments are possible at this point:

(1) The growth of Imus' population between 1948 and 1975 (2.738 percent) was slightly lower than the national average (2.997 percent).

(2) The growth of Imus' population slowed considerably in the first half of the 1970s to 2.140 percent from the 3.200 percent growth rate achieved in the 1960s.

(3) The growth of Imus' population in the 1970-1975 period was lower than the national average (2.660) and significantly lower than the provincial average (3.849 percent).

The last two points raise an interesting question: Given the close proximity of Imus to the MMA and the extremely high growth rate exhibited in the MMA since 1945 (to be discussed below), why was the growth rate of Imus not higher than the observed 2.140 percent in the first half of the seventies? The answer could provide some basis by which to project the population of Imus in the immediate years to come. Although several possibilities will be suggested, the lack of a clear-cut answer to this question will hinder our efforts at projection.

Also, the dependency ratio for Imus is only 0.54 (NCSO, 1975a, p. 11). This is to be contrasted with a dependency ratio of 0.87 for the Philippines as a whole (NCSO, 1979, p. 3) and 0.77 for Cavite (NCSO, 1975a, pp. 8-9). A dependency ratio of approximately 0.35-0.40 is typical of low fertility countries and Imus' ratio certainly seems unusual in the Philippine context. We shall refer again to this statistic later in the analysis.

The Surrounding Demographic Environment

Table 2 and Maps 1, 2 and 3 will help in our analysis of Imus' demographic situation within Cavite Province. As previously mentioned, for the period 1948-1975, Cavite had a growth rate of 3.336 percent, while Imus had a growth rate of 2.738 percent. More significantly, however, between 1970 and 1975 Cavite had a growth rate of 3.849 percent, while Imus only had a growth rate of 2.140 percent. Moreover, the Cavite growth rate in the seventies represents an increase over the sixties, while the growth of Imus in the seventies represents a decrease from the sixties. It is the low growth rates vis-a-vis Cavite and municipalities in Cavite which requires explanation. Of the 22 municipalities in Cavite, Imus ranked 16 in terms of growth between 1948 and 1975 and 18 between 1970 and 1975. In other words, it appears that Imus has not shared in the relatively rapid population growth that has characterized Cavite since 1948.

A look at Maps 1 and 2 will indicate that the municipalities which have experienced the highest rates of growth are almost all situated in the northeast section of Cavite; in other words, those municipalities nearest to the MMA are growing the fastest. Alternatively, the munic-

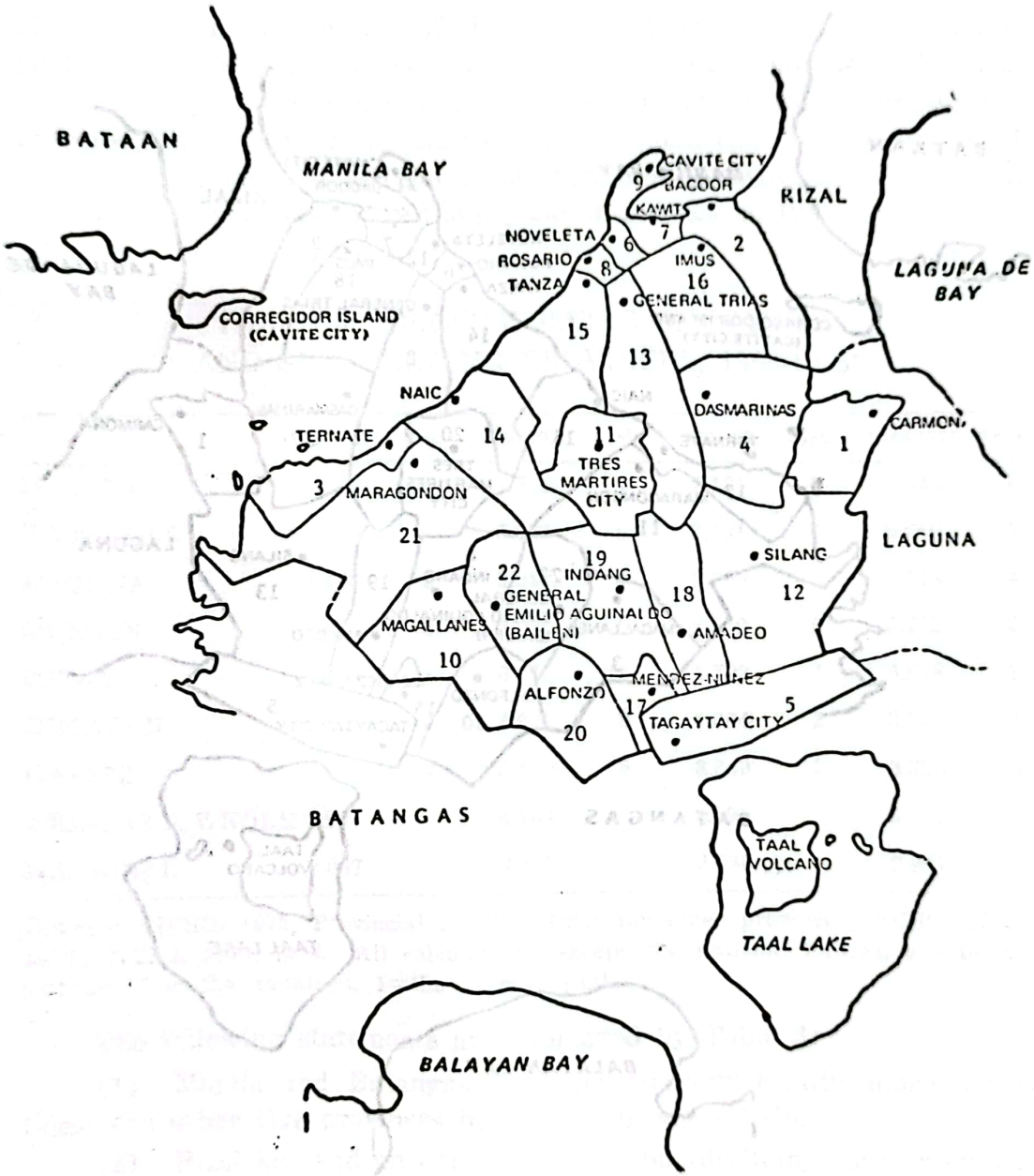
TABLE 2. INTERCENSAL GROWTH RATES FOR THE MUNICIPALITIES OF CAVITE, 1948-1975[1]

	1948-1960	Rank[2,3]	1960-1970	Rank[2,3]	1970-1975	Rank[2,3]	1948-1975	Rank[2,3]
CAVITE PROV.	3.260		3.169		3.849		3.336	
IMUS	2.585	15	3.197	11	2.140	18	2.738	16
ALFONSO	3.581	3	0.125	22	3.100	10	2.149	20
AMADEO	2.517	18	2.077	17	2.120	19	2.273	18
BACOOR	2.561	17	5.783	2	5.136	2	4.273	2
CARMONA	3.429	6	9.165	1	20.443	1	8.665	1
CAVITE CITY	4.023	3	3.200	10	1.713	21	3.269	9
DASMARIÑAS	2,356	19	4.237	3	4.906	4	3.553	4
GEN. AGUINALDO	3.381	7	3.399	9	-3.586	22	2.043	22
GEN. TRIAS	2.703	14	3.134	12	3.269	8	2.975	13
INDANG	2.107	20	1.927	18	3.108	9	2.225	19
KAWIT	2.907	10	3.841	7	3.518	7	3.380	7
MAGALLANES	2.739	13	2.918	15	5.046	3	3.238	10
MARAGONDON	1.472	21	2.406	16	3.107	11	2.119	21
MENDEZ-NUÑEZ	3.797	4	0.749	20	2.338	15	2.342	17
NAIC	5.446	2	0.313	21	2.267	16	2.849	14
NOVELETA	3.035	9	4.063	5	2.829	12	3.390	6
ROSARIO	2.769	12	3.826	8	3.818	6	3.371	8
SILANG	3.074	8	3.070	13	2.816	13	3.024	12
TAGAYTAY	2.849	11	4.143	4	4.184	5	3.515	5
TANZA	2.566	16	2.963	14	2.702	14	2.744	15
TERNATE	7.363	1	1.021	19	2.142	17	3.901	3
TRECE MARTIRES	n.a.[4]		3.875	6	1.938	20	3.234[4]	11

[1] Source: NCSO, 1975a, p. 1.
[2] 1=highest growth rate
[3] All calculations are by the author.
[4] n.a.=not available: the overall growth rate is for the 1960-1975 period.

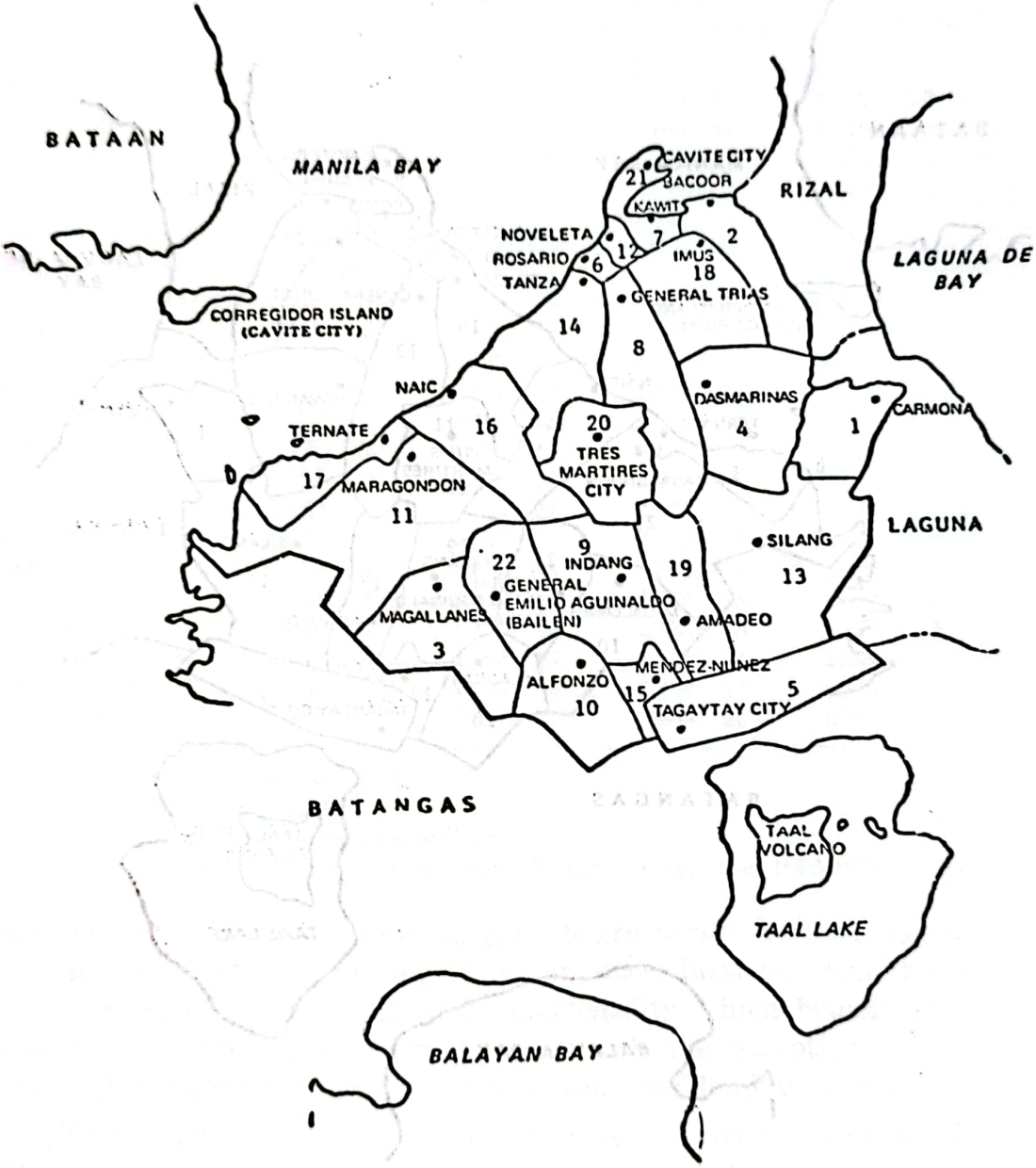
ipalities with the lowest rates of growth are mostly to be found in the central and southwest portions of the province, farthest from the MMA. What is remarkable is that every municipality which bounds on Imus has had a higher rate of growth and, with the exception of General Trias, this higher rate of growth has been considerably higher.

The result of these past growth trends is clearly seen in Map 3. The only municipalities in Cavite with population densities greater than 1000 people per square kilometer are located in the northeast portion of the province. By way of contrast, the population density of Imus is less than 500 people per square kilometer (since the boundaries of Imus are presently in dispute, we cannot be more specific). It is also interesting to note that of the six municipalities in Cavite with population densities greater than 1000 people per square kilometer, three border on Imus and the other three are very close to it.



MAP 1. INTERCENSAL GROWTH RATES FOR THE MUNICIPALITIES OF CAVITE 1948-1975

(NB: 1 equals the highest rate of growth)



MAP 2. INTERCENSAL GROWTH RATES FOR THE MUNICIPALITIES OF CAVITE 1970-1975

(NB: 1 equals the highest rate of growth)

Table 3 represents the intercensal growth rates for Manila proper and six surrounding provinces — Batangas, Laguna, Quezon, Rizal, Bulacan and Cavite. The data indicate that the area as a whole (Manila and the six provinces) has grown significantly faster than the nation. Also, the population growth rate of the area is increasing and the absolute and percentage difference between the national rate and the MMA rate is increasing. Since urban areas have a lower natural rate of population increase, the difference in the two growth rates can only be explained by internal migration (international migration is negligible). It would appear that over one-half of the population increase in Rizal is the result of migration (Kim, 1972, p. 219).

TABLE 3. GROWTH RATES OF MANILA AND SURROUNDING PROVINCES, 1948-1975[1]

	1948-1960	Rank	1960-1970	Rank	1970-1975	Rank	1948-1975	Rank
MANILA	1.294	7	1.535	7	2.131	7	1.544	7
BATANGAS	2.575	6	3.052	6	2.191	6	2.686	6
LAGUNA	3.448	3	3.931	4	2.809	4	3.513	4
QUEZON	4.023	2	4.083	2	2.570	5	3.772	2
RIZAL	7.119	1	6.774	1	5.702	1	6.678	1
BULACAN	2.729	5	4.071	3	4.664	2	3.590	3
CAVITE	3.260	4	3.169	5	3.849	3	3.336	3
AREA AS A WHOLE	3.599		4.164		4.191		3.927	
NATIONAL	3.057		3.011		2.785		2.997	

Sources: NCSO, 1975, Provincial census results for other provinces; NCSO, 1975a, p. 1; NCSO, 1979, p. 4. All calculations, except the national figures, are by the author. For the rankings, 1=the highest rank.

The following statements are supported by Table 3:

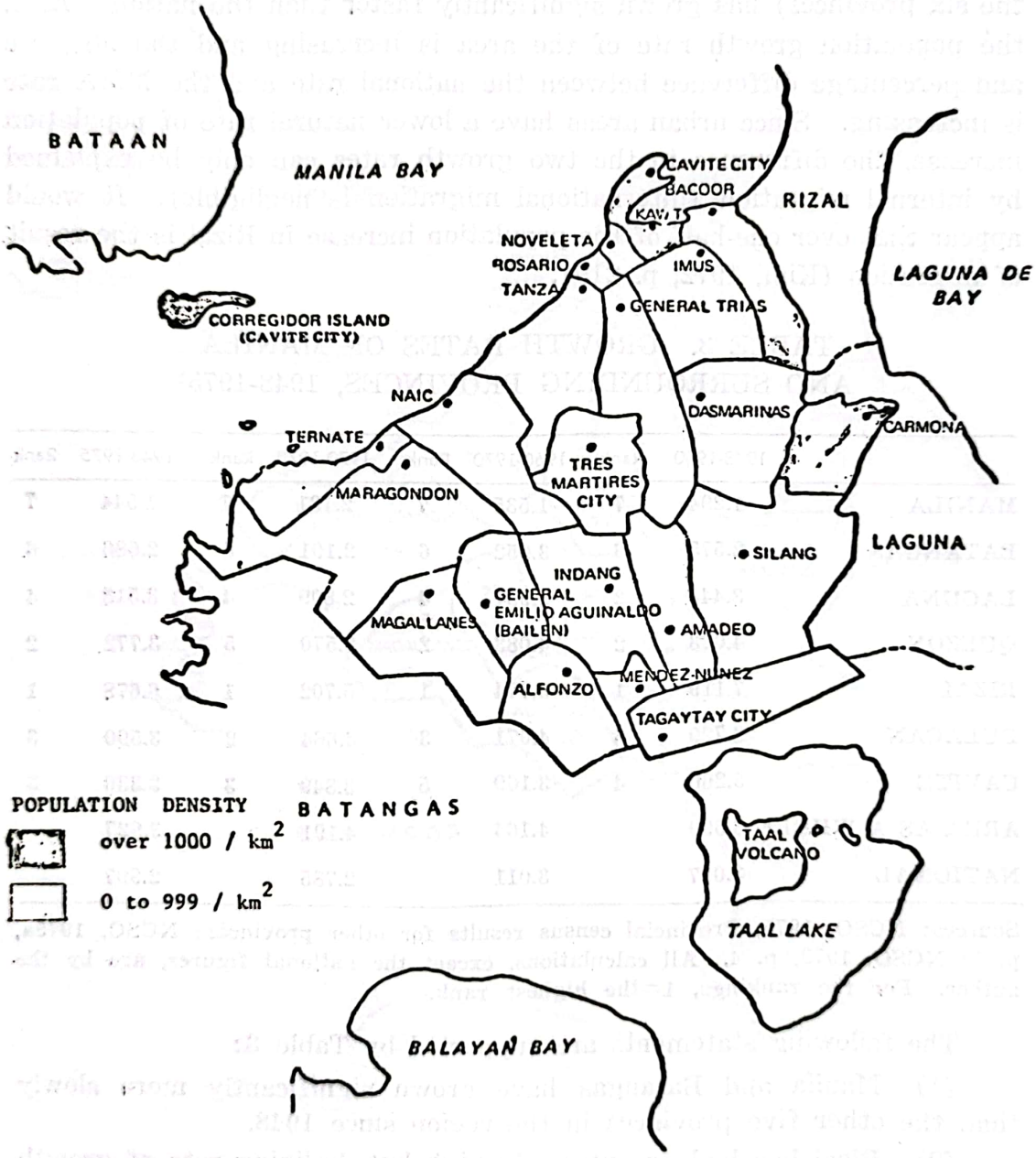
(1) Manila and Batangas have grown significantly more slowly than the other five provinces in the region since 1948.

(2) Rizal has had an extremely high but declining rate of growth since 1948.

(3) During the 1970-1975 period, Bulacan and Rizal had the highest rates of growth.

(4) Compared to the 1948-1970 period, the growth rates of Laguna, Batangas and Quezon all slowed down considerably in the seventies.

(5) The growth of Cavite in the seventies was considerably higher than in the previous periods and, in fact, for the first time Cavite surpassed Quezon and Laguna.



MAP 3. POPULATION DENSITY BY MUNICIPALITY CAVITE: 1975[1]

As a tentative explanation of the data presented in Table 3, I would suggest the following:

(1) Manila did not expand rapidly eastward in the seventies due to the natural barrier of the rugged terrain in Quezon.

(2) From 1960 to 1975, Manila's major directions of growth were north to Bulacan and south to Rizal, and

(3) The high rate of growth of Cavite in the seventies can be explained by its proximity to Rizal. While Rizal is still growing rapidly, it would appear that there has been an overflow into Cavite. This would explain the rapid growth of Kawit, Bacoor, etc., in the northeast corner of Cavite.

A.E. Perez (1978, p. 55) has pointed out:

> Of the 132 existing migration streams and counter-streams between the 12 regions of the country, only 12 consisted of more than 50,000 persons, and these 12 movements together accounted for about 50 percent of all inter-regional migrants. Six of these streams had southern Tagalog as their area of destination; five streams originated in the Visayas. The biggest stream was that from the city of Manila to southern Tagalog and especially to the neighboring province of Rizal (234,926 persons) which received 48 percent of all out-migrants from the city of Manila, or 9 percent of all interregional migrants in the country. This large proportion underlines the magnitude of the process of suburbanization which has been taking place around the metropolis.

However, if this is the case, we are still left with the difficult task of explaining Imus' low rate of growth vis-a-vis the surrounding area.

One possible explanation is that most of the rapid growth in Cavite was concentrated in those municipalities which border on Rizal and Laguna simply because they were the closest areas available. The municipalities along Manila Bay between the MMA and Cavite City would show fairly rapid growth due to the "pull" of Cavite City and the availability of public transportation. Also, the rapid growth of Carmona and Dasmariñas is, to a large extent, illusory because major resettlement projects were placed in these municipalities. If this is the case, then the slow growth of Imus can be explained by the fact that the population pressures emanating from the east (Rizal in particular) have not yet reached it and the population pressures from the north have by-passed it.

Another factor to consider is that Imus appears to be better off in terms of income than most municipalities (personal observation of author) and, therefore, its natural rate of population growth may be low. This consideration is supported by the low dependency ratio previously mentioned. Furthermore, the economic opportunities in Manila may have

led to some out-migration from Imus. Therefore, a tentative conclusion regarding the slow rate of growth of Imus would include the following factors: (1) A low natural rate of growth; (2) some out-migration; and (3) the population pressures from the Manila area having not yet reached Imus for geographic and economic reasons.

Whatever the explanation for Imus' population growth in the seventies, it should be obvious that Rizal is still growing rapidly, that Cavite (particularly the northeast corner) is growing rapidly, and Imus has yet to share in this rapid growth. It should also be obvious that the geographic situation of Imus places it right in the middle of the population pressure emanating southward from Manila. The fact that this population pressure has not yet been felt in Imus is comforting because it gives Imus time to plan; whether or not it can remain untouched in the future is problematical.

NATIONAL AND DEVELOPMENT CONSIDERATIONS

A significant fact to consider when discussing the spread of Manila is the national government's avowed intention to stop it and to foster regional growth centers away from Manila. The 50-kilometer rule regarding new factories is an indication of this policy. Whether or not the national government will be successful in this attempt and can, in fact, slow down the rate of migration to the MMA is open to question. It will be successful only if significant regional development takes place and given the long period required for the construction of infrastructure and manufacturing facilities, it may be some time before there is any substantial impact on the rate of growth of the Manila area. As previously mentioned, while the rate of growth of the nation's population is slowing down, during 1948-1975 the rate of growth of the area under consideration continued to increase. It will be difficult to reverse this trend quickly and, therefore, continued significant in-migration to the provinces surrounding Manila should be expected. In the words of Concepcion and Kintanar (1974, p. 16): "The question, of course, is not whether urban growth will continue, but whether the rapid momentum of recent decades will be maintained. The answer would seem to be in the affirmative." The authors present two reasons why rural-to-urban migration will continue: living standards are perceived as being higher in urban areas and it is becoming progressively easier to travel from rural to urban areas. The national government is aware of this possibility — of the nine definitions of the MMA presently in existence, two include Imus and two others include municipalities which border on Imus (World Bank, 1977, pp. 66-67). In short, there are serious doubts that programs at the national level can significantly reduce the rate of growth of Manila and contiguous areas in the short run. Such a change is long term in nature and contingent upon the successful development of competing urban centers — a difficult process at best.

Present development plans for Imus include the following: completion of a large San Miguel-Creusot Loire (SM-CL) metal pipe plant, the construction of a new hospital, construction of a new market and present ongoing municipal projects such as concreting of roads and construction of feeder roads. While it is certain that the new hospital and the SM-CL plant will attract people to Imus, it is unclear how significant this attraction will be. Until evidence to the contrary is available, it seems reasonable to assume that these projects will slow down out-migration by providing employment for those already in Imus and result in some in-migration.

More relevant is the extent to which Imus will encourage industrialization. A strong commitment to industrialize will certainly result in substantial in-migration (even though the underemployed and unemployed workers in Imus could provide much of the needed labor force, the problem of in-migration would remain). A related concern is the fact that industrialization is dependent upon a reliable power, communication, and transportation network. Programs (national and local) to provide this needed infrastructure would certainly increase the probability of industrialization. Two additional points are worth mentioning. First, the national government's intention to improve the road system in northern Cavite to candle the tourist trade will certainly make Imus more accessible and, second Governor Remulla has recently announced that two of his priority projects for Cavite are to improve its communication and power systems.

In short, national government programs to curb migration into the MMA will not take effect for quite some time and Imus' local development plans are progressive and will most likely encourage industrialization. These two factors should guarantee that Imus will experience in-migration in the years to come.

NCSO PROJECTIONS

The NCSO projections were made in 1970 and revised in 1973. They would appear to be inadequate for two reasons. First, the 1975 census indicates that they are wrong and, second, the methodological approach upon which the projections were made is incapable of taking into account significant migration.

The population of Imus was 43,686 in 1970 and the low, medium and high projections of the NCSO for 1975 were 50,931, 51,201 and 51,476 respectively (NCSO, 1975b, pp. 56, 133, 211). The actual population of Imus in 1975 was 48,566. The discrepancy was caused because the low, medium and high projections of the NCSO assumed growth rates of 3.12, 3.22 and 3.33 respectively for the 1970-1975 period when, in fact, the actual growth rate was 2.14. The actual increase in population was 4,880, while the projected low increase was 7,245. In other words, the projected low increase is approximately 48 percent greater than the

actual increase. Therefore, it would appear that the 1975 census throws doubt on the validity of the NCSO projections for Imus' purposes. In effect, the NCSO projections assume that Imus' higher rates of growth would occur at the beginning of the 1970-2000 period; what appears to have happened is that these higher rates of growth (if, in fact, they do occur) have been delayed (for whatever reasons).

A more fundamental objection concerns methodology. As previously noted, Sicat has said the NCSO projections are based on a specific technique (the ratio method) used under certain assumptions and their results must be interpreted within this context. The NCSO (1975b, pp. 2-3) describes the technique as follows:

> The basic method used in projecting the population of geographic subnational areas of the Philippines assumes that the ratio of the population in each province to the country's total population or the population in each city or municipality to the total population of the province will change according to a specified pattern at the same rate as it did in the past or at some rates estimated on other grounds.

As a result, "the ratio method is fairly mechanical and depends heavily on the regularity of past trends" (NCSO, 1975b, p. 2). The two most rigid assumptions needed to make the ratio method work would appear to be the assumed regularity of past trends and the assumed linear decline in the growth rate to zero within a specified time period.

Since migration will play havoc with these two assumptions, it would appear that the ratio method is unable to produce reliable projections for an area which may experience substantial in-migration. The NCSO is aware of this possibility and very openly discusses the implications for its projections (NCSO, 1975b, pp. 12-13). However, since it would be impossible for the NCSO to undertake a detailed demographic analysis of every municipality in the Philippines, it would appear that the best path (especially for municipalities which are experiencing or expect to experience in-migration) is for the local communities themselves to undertake such a demographic analysis. This would necessarily involve an awareness of and sensitivity to past and present demographic trends. It would treat the municipality as an entity having unique characteristics and place the analysis firmly within an historical context. In short, it would be an intellectual attempt to comprehend the nature and direction of demographic change within the community. It is to this task that we now turn.

In the population projections which follow, explicit assumptions concerning migration will be made. This would appear to be more realistic because for Imus to plan while ignoring the fact that the MMA exists and is expanding southward is only to invite problems.

TABLE 4. ASSUMED ANNUAL GROWTH RATES IN POPULATION FOR IMUS, 1978-2000[1]

Period	Low	Medium	High
1978-1979	2.25	2.40	2.50
1979-1980	2.25	2.60	2.80
1980-1981	2.25	2.80	3.00
1981-1982	2.25	3.00	3.40
1982-1983	2.25	3.20	3.80
1983-1984	2.25	3.40	4.20
1984-1985	2.25	3.40	4.20
1985-1986	2.20	3.40	4.20
1986-1987	2.20	3.20	4.00
1987-1988	2.00	3.20	4.00
1988-1989	2.00	3.00	3.80
1989-1990	1.80	3.00	3.60
1990-1991	1.80	2.80	3.60
1991-1992	1.60	2.80	3.40
1992-1993	1.60	2.60	3.40
1993-1994	1.50	2.60	3.00
1994-1995	1.50	2.40	3.00
1995-1996	1.40	2.40	2.80
1996-1997	1.40	2.20	2.60
1997-1998	1.40	2.00	2.40
1998-1999	1.40	2.00	2.20
1999-2000	1.40	1.80	2.00

[1] Growth rates presented are for illustrative purposes only.

OUR PROJECTIONS

The following low, medium and high projections of population are "guesses" and are meant to be instructive, not definitive. This is simply an exercise to demonstrate how various assumptions regarding in-migration will effect the projected population figures. The **low projection** is based on the recent history of Imus and the assumption that its rate of growth will continue to be below the national average and will not experience any in-migration worth mentioning. The **medium projection** is based on the assumption of a moderate but slowly declining migration. **The high projection** is based on a period of rapid in-migratoin (similar to though not as high as Rizal Province's experience) which slowly declines. It should be obvious that the three sets of assumptions just presented do not preclude others being made.

The population of Imus was 48,506 in May, 1975. If we assume a growth rate of 2.14 during the 1975-1977 period (a continuation of the

1970-1975 growth rate) and an increase to 2.25 in 1977-1978 (due to the start of construction on the SM-CL plant), that means that the population of Imus in May, 1978 was approximately 51,807. This will be our base population figure. The different assumptions regarding the projections are presented in Table 4 and the projections in Table 5. Table 5 also includes the NCSO projections.

One interesting aspect of the two sets of projections (NCSO's and the set offered here) is that for the year 2000 they are relatively close. However, for our purposes, this aspect is not outstanding; what is important is the path Imus takes to get to 2000. While it is true in a very general sense that the differences between the two sets of projec-

TABLE 5. POPULATION PROJECTIONS FOR IMUS, 1979-2000[1]

	Low	Medium	High
(Actual)			
1975	48566 (50931)	48566 (51201)	48566 (51476)
(Assumed Actual)			
1978	51807	51807	51807
1979	52973	53050	53102
1980	54165 (58232)	54430 (59524)	54589 (60815)
1981	55383	55954	56227
1982	56629	57632	58138
1983	57904	59477	60348
1984	59206	61499	62802
1985	60539 (65225)	63589 (68331)	65523 (71456)
1986	61871	65752	68275
1987	63232	67856	71006
1988	64497	70027	73347
1989	65787	72128	76653
1990	66971 (71791)	74292 (77707)	79412 (83627)
1991	68042	76372	82271
1992	69131	78510	85068
1993	70237	50552	87961
1994	71291	82646	90599
1995	72360 (77346)	84630 (86941)	93317 (96616)
1996	73373	86661	95930
1997	74400	88567	98425
1998	75442	90339	100,787
1999	76498	92145	103,004
2000	77569 (82567)	93804 (96693)	105,064 (111,160)

[1]NCSO projections are in parentheses.

tions decrease through time (in absolute and percentage terms), the NCSO projections indicate much higher population levels in the 1979-1990 period — the time period of importance to Imus now. This difference can be explained by the fact that the NCSO projections assume a higher base population and higher rates of growth in the beginning of the 1978-2000 period. The result is a substantial difference in the time paths of the two sets of projections. For planning purposes, this difference is significant. In the words of Kim (1972, p. 223):

> In the provinces where the population increased because of migration, the proportion of population in young adult ages tends to increase because of age selectivity of migrants... The provinces which gained population through migration therefore require an accelerated economic growth rate in order to provide more job opportunities for newly migrating persons and would have to build additional housing and schools for dependents of migrants.

For example, for the year 1980, it might mean the difference between five new school rooms or ten. In economic terms, rapid population growth in the beginning of the period makes it more difficult to provide needed social services and infrastructure.

SUMMARY AND CONCLUSIONS

Our analysis has indicated that the MMA is expanding quite rapidly northward and southward and will most likely continue to do so in the near future. Also, we have seen that the northeast corner of Cavite is the most rapidly growing portion of the province and this is most likely the result of its proximity to the MMA. Furthermore, within the context of national and local development plans, it appears reasonable to expect increased population pressure on Imus in the near future. This raises the difficult problem of having to plan for an area which may experience substantial in-migration; in particular, population projections based on the ratio method simply will not be adequate for planning purposes.

While it should be obvious that the NCSO projections are inadequate for Imus' planning purposes, the projections presented here are not meant to be definitive. Rather, they were used to demonstrate the effects of various assumptions regarding migration and the subsequent influences on the population projections. However, it would appear that the approach is correct because it is quite possible that Imus will see much in-migration in the near future. In fact, this approach should be useful to all communities surrounding the MMA and other rapidly growing urban centers in the Philippines.

Our major conclusion, at least for communities surrounding the MMA, is that population projection should not be seen as a mechanical projection of past population trends but, instead, should be viewed as a continuous inteilectual effort to place present demographic trends into an historical framework.

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VIGNETTE OF PHILIPPINE GEOGRAPHY

Focus on Leyte

by

DOROTHY M. CORPUZ

The provinces of Leyte and Southern Leyte comprise one of the islands in the Eastern Visayas group of provinces which make up Region VIII. The other provinces of the region are Northern Samar, Eastern Samar, Western Samar and Biliran Sub-Province. The capital of Region VIII is Tacloban City. The island of Leyte has two cities — Tacloban and Ormoc which together have 49 municipalities and 1,435 registered barrios.

Leyte and Southern Leyte as an island is the eighth largest island of the country with a total land area of 6,268.3 square kilometers which is two percent of the entire country's land area. It lies at the geographical heart of the Philippine archipelago. It is surrounded by waters of the San Bernardino Strait and Carigara on the north. The narrow waters of San Juanico Strait in the northeast separate the province from the island of Samar. The present administration built the San Juanico Bridge, the longest bridge of the Philippines which now connects the two islands of Samar and Leyte. San Pedro Bay and Leyte Gulf are in the east of the island, Sogod Bay and Surigao Strait are in the south and Caniago Channel and the Visayan and Camotes Seas are in the west.

The irregular shape of the island runs 214 kilometers from north to south and is 75 kilometers at its widest girth. A range of rugged mountains, reaching a maximum height of 1,219 meters, divide its entire length. It is often cited that this natural barrier is a major obstacle in the development of the island.

Leyte has two valleys, Leyte Valley and Ormoc Valley, latter having as its center Ormoc City which has a rich volcanic soil appropriate for forest vegetation and agricultural crops.

Agriculture is the main economic activity of the island, with sugarcane, rice, coconut and corn as principal crops. Abaca and tobacco as secondary crops are produced on a commercial scale. Cultivated as staple food crops are sweet potato, cassava, gabi and banana.

Fishing is the traditional economic activity. The waters of Carigara Bay, Samar Sea, and the Leyte Gulf are good fishing grounds which

provide the province with numerous marine products. It was only recently that the government gave its serious support to the development of this industry.

The island used to be a major source of timber for the country until its forests were dissipated by indiscriminate logging. About 200,000 hectares of its area is covered with forests; most of these are found in the vicinity of the central mountain ranges. The commercial forests yield large quantities of yakal, narra, guijo, tanguile, lauan, apitong and molave. Reforestation projects are going on at Mata-ob and Pampon areas.

Leyte and Samar have shared a long history, both islands having witnessed the arrival of the first Spanish Expedition to the Philippines. Ferdinand Magellan first landed on the tiny island of Homonhon off the coast of Samar while Limasawa, an island off the coast of Southern Leyte, was the site of the first Catholic mass ever celebrated in the country. These two islands were known to the early Spaniards as the provinces of Ibabao and Tendaya, and administered as one province under the jurisdiction of Cebu. In 1735, Leyte and Samar were separated from Cebu and formed into one province, with Carigara, in Leyte, as the capital. In 1768, the two Waray provinces were constituted as separated. Leyte's capital was transferred to Palo, then to Tanauan, and finally, in 1860, to Tacloban.

Before the arrival of the Spanish Expedition, the people of Leyte were already well organized, politically as well as socially, under the barangays ruled by datus and rajas. There was a flourishing trade with the Chinese, Japanese, Siamese, Cambodians and Sumatrans.

The Leyteños during the pre-Hispanic era were a very romantic and highly idealistic people. They were also adventure-seekers and were ferocious fighters and even today they still possess these character traits.

Leyte was not considered ideal by Spanish colonizers as the gateway to the islands for their hispanization campaign. Firstly it was now the place where Lapu-Lapu repulsed Magellan's military aggression. Later, there was Banacao, who led a religious uprising against the settlement established by Miguel Lopez de Legaspi in the place. Still much later, at the height of the Filipino revolution against Spain, there was General Vicente Lukban and his army who occupied Leyte and Samar and drove the Spaniards, setting up a revolutionary government in 1901 thereafter.

The struggle of the Filipinos against the Americans saw Leyte as one of the major battlefields. The American occupation witnessed the rise of a number of Leyteños to national politics. Jaime de Veyra, writer

and historian, was one of them, who, in 1906 was named the first Filipino governor of Leyte and member of the first Philippine Assembly and the nine-man Philippine Commission. Another Leyteño was Norberto Romualdez who became one of the Seven Wise Men who drafted the first Philippine Constitution.

World War II proved once more that Leyte is a strategic location in the Pacific Area. It was on the beaches of Palo where young General Douglas MacArthur, Commander of the American forces in the Pacific, began the campaign to recover the Philippines from the Japanese Imperial Army, after making the promise "I shall return."

After the war nothing much was left of the province except the rusty hulls and scrap metals which were once parts of the American and the Japanese war machines. They served as a reminder of the role the province played during World War II.

A succession of provincial governors has failed to raise the province from backwardness and poverty. Such men as Governors De Veyra, Demetrio, Eñage, Lopez, De la Cruz and Torres were men of vision and integrity. But they were supposedly handicapped by a system over which they had no control — a highly centralized bureaucracy.

After a long period of depression, the day came in 1967 when the young brother of the First Lady, Madam Imelda R. Marcos — Benjamin Romualdez — was elected governor of the province of Leyte. The island of Leyte was at this time divided into Leyte and Leyte del Sur. With Gov. Romualdez' incumbency, the economy of the province and of the island began to pick up. Leyteños can live better today with more promises in the future because of an integrated development program which aims for a well-balanced growth all over the island.

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