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THE GREAT OUTDOORS IS THE LABORATORY IN THE STUDY OF GEOGRAPHY[1]

by

J. XAVIER GONZALES

INTRODUCTION

This thesis can be proven in three ways: by reference to the historical development of geography from its archaic to its modern concept; by reference, both theoretically and in practical application, to the field of inquiry of geography; and finally, by focusing on the relationship of geography to other arts and sciences.

HISTORICAL PROOF

Modern geography had its early beginnings in medieval cosmography, "a fascinating mixture of astronomy, astrology, natural science, natural history, earth lore and history."[2] Concomitant with the progress of science, this aggregate gradually split into astronomy, geology, meteorology, botany, zoology, etc., fields. The remainder of the material after subdivision was collated into a new social science — Geography.

Before the Darwinian revolution, geography served mainly to study the motions of the earth and to measure and describe places and people — a very passive approach, one merely concerned with trivial details and not the how's and why's of origin and development of the physical and hominid landscape.

With the advent of the 19th century, the age of travel and exploration, geographers became more insistent on explaining the natural processes interacting to produce changes within the physical environment. This gave rise to what is now termed 'causal geography'.

In this latter-day century, a new dimension has been introduced into the study of geography: man. The effects of man's actions on the environment, and the nature of his adaptation to varying climatic and topographic conditions are the subject of such fields as Ecogeography, Urban and Rural Geography, and World Regional Geography.

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[1] Term paper submitted as a partial fulfillment towards the completion in the study of Geography 11, under Prof. Dominador Z. Rosell, College of Arts and Sciences, University of the Philippines.

[2] *Physical Geography*: H. Robinson. Macdonald & Evans Ltd., 8 John Street, London. WC1N 2HY. 1971, page 1.

As can be inferred from the foregoing analysis, the great outdoors is and always has been the subject matter/focal point of all geographic enterprise, whether the approach be purely descriptive, or analytic.

THEORETICAL PROOF

By definition, the field of inquiry of physical geography comprises the following:

a. the atmosphere, or envelope of gases and water vapor, which influences solar energy input, temperature, wind and waves, and heat as well as rainfall distribution over the earth's surface.

b. the lithosphere, or the rocky crust of the earth, divided into the land and water hemispheres, with associated topographic features, e.g. plateaus, mountains, hills, valleys, plains, geosynclines, troughs, coral reefs, shorelines, etc.

c. the hydrosphere, or water in the oceans, seas, and upon the land surface in rivers, lakes, streams, gulleys, bays, springs, and waterfalls.

d. the biosphere or realm of living things which interact to great extent with the natural environment.

PRACTICAL PROOF

Let us refer to the elements of the environment as proof of the outdoor appeal of Geography. Our reference here is the field trip to Los Baños and Alabang.

1. Climate

   a. rainfall — nil, but threatening, as evidenced by the presence of thick, grayish cumulus clouds towards the latter portion of the field trip

   b. temperature — fluctuating between the range of 70 and 80 degrees fahrenheit

   c. light conditions — sunny in the morning, due to the lack of cumulus clouds to reflect sunlight and the mere presence of small wisps of cirrus clouds; cloudy in the afternoon due to ubiquity of cumulus clouds, hence lack of penetrating sunlight; also, absence of sunlight in forestry preserve due to shade provided by foliage of tropical rain forest trees

   d. humidity — between 75-95%

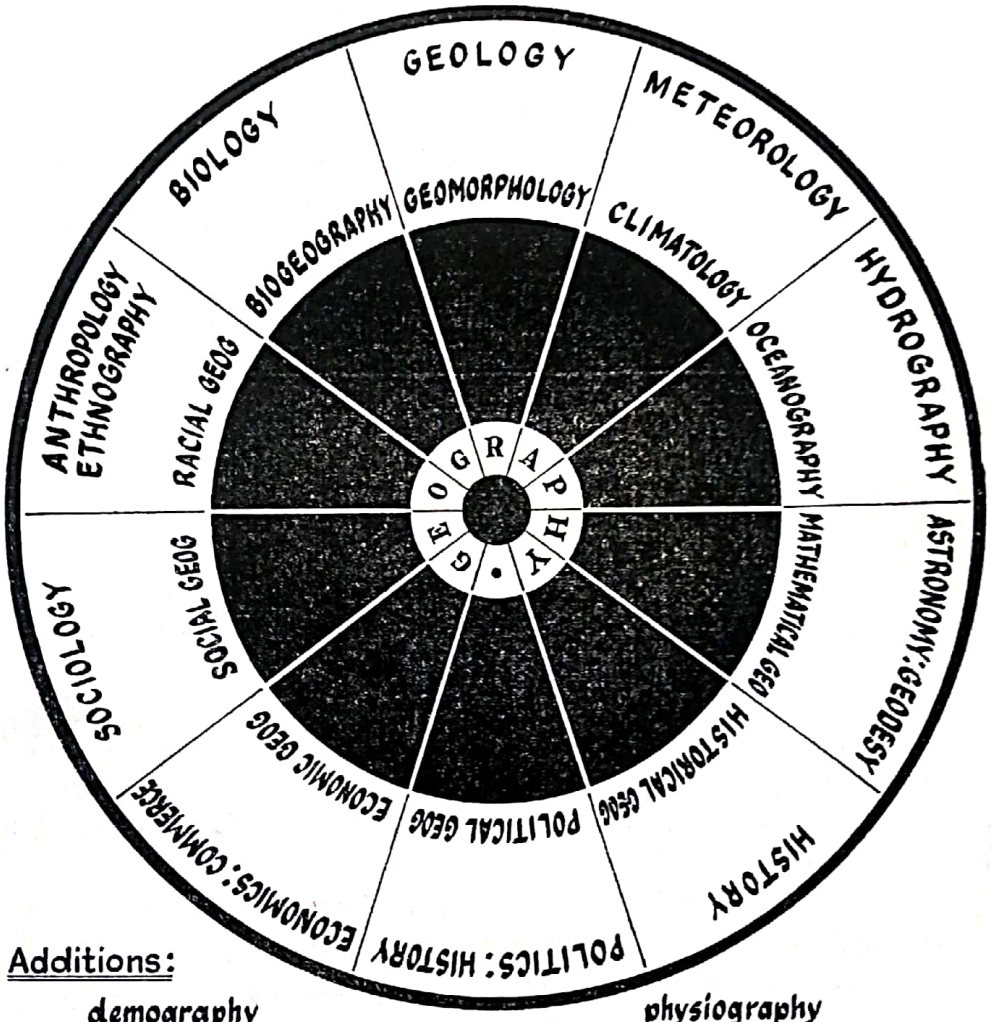
   e. wind — strong noon wind at forestry preserve, as wind from sea traversed floodplains and was forced to rise upon reaching hilly outcrops at Los Baños

2. Landforms

   a. Los Baños hilly outcrops
   b. river valley at forestry preserve
   c. floodplain at IRRI
   d. terraces as a result of mass movement

WHEEL GRAPH OF GEOGRAPHY:

Geography may be regarded as the bridging and integrating subject.



Additions:

demography
urban and rural geography
regional geography
conservation or resource geography
marketing geography
military geography
land use geography

physiography
cartography
pedology
phytogeography
zoogeography
mineralogy
photogrammetry

[3] *Ibid.*, page 2.

e. miniature waterfall at forestry preserve
f. river at youthful stage (according to Davi's scheme of classification)
g. Pasig River floodplain
h. assorted peneplains in and at the outskirts of the Los Baños area

3. Earth Resources

a. land — mostly of soil rather than rocky outcrop composition due to minimal altitude reached in course of field trip (excluding river stream bed)

b. soil types — alluvial soils, occurring in river floodplains and highly suitable to the plantation of agricultural crops (e.g. the plot of land beside IRRI)
— volcanic soils, derived from volcanic ash from the now extinct Mt. Makiling volcano (e.g. the forestry preserve)

c. flora — tropical rain forest in the forestry preserve, brought about by a combination of high temperature and high rainfall, marked by a dense stratum of tall, broad-leaved evergreen trees, with a continuous canopy of interlacing branches, shutting out sunlight from the ground
— dense growth of ground bush along river bank
— mostly secondary forest and/or cogon or agricultural crop vegetation in lowlands
— species of trees readily identifiable by markers (e.g. ipil-ipil) and some species of flowers (e.g. gumamela)

d. fauna — wealth of insects, readily apprent within general area of river (e.g. butterflies, mosquitoes)
— fish, carps and goldfish in particular
— birds of assorted variety at the crowns of trees
— domestic animals at Alabang for productive use, e.g. cows for milking and dairying processes, chickens
— stray dogs
— water buffaloes at rice fields

e. minerals — (not apparent, though area probably contains trace elements of gold, iron, chromium, manganese, copper, and coal, the principal elements found in the Philippines)

In summary then, the theoretical proof shows us that, by definition, the great outdoors, composed of the atmosphere, hydrosphere, lithosphere, and biosphere, is the laboratory of geography. On the other hand, the practical proof reveals to us that in applying our analysis of the subject matter of geography — the elements of the natural en-

vironment — into the spheres of our experience (in this case the field trip), we are, in effect, using the great outdoors to verify our hypothesis of the subject matter of geography. Hence, we are treating it as a laboratory.

PROOF IN REFERENCE TO DISCIPLINES UNDER FIELD OF GEOGRAPHY

Let us refer to certain disciplines where geography is the bridging subject and ascertain whether or not the great outdoors is their field of operation.

Economic Geography. — By definition, "economic geography is the study of the relation of the physical factors of the environment and of economic conditions to the productive occupations and the distribution of their output."[4] The phrase "physical factors of the environment" refers to the elements of the natural environment or, as we have shown in our practical proof, the great outdoors. Therefore, the field of operation of Economic Geography is the great outdoors.

Meteorology and Climatology. — The elements of Meteorology are: gas, evaporation and water vapor; temperature and stability; clouds and precipitation; and air currents and air masses. The elements of climatology are: the world's climates, namely, the equatorial, tropical, temperate, arctic, and intermediary climates. These are also elements of the natural environment, or the great outdoors, as we have shown. Therefore, the field of operation or laboratory of Meteorology and Climatology is the great outdoors.

Geology. — "The only unchanging aspect of the earth is the fact that it is always changing. The earth has been, and is being, affected by a myriad of interacting processes, and it is the task of geology to describe and understand these processes and results."[5] By this quote, we may clearly infer that the earth is the laboratory of geology. And what is the earth but the great outdoors where physical phenomena operate.

Historical Geography. — To illustrate the importance of geography in history, let us quote James Fairgrieve: "Certainly, it is true that from a study of geography we learn where things are, not towns and mountains and rivers only, but people and conditions; this is one very important part of geography — the part that corresponds to knowing events in history, but it is only a part."[6] It is

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[4] *Economic Geography*: Clarence Fielden Jones. The Macmillan Company, New York. 1954, page 7.

[5] *Fundamentals of Geology*: John J. W. Rogers and John A. S. Adams. Harper and Row, New York, Evanston, and London, and John Weatherhill, Inc., Tokyo. June, 1966, page 3.

[6] *Geography and World Power*: James Fairgrieve. University of London Press, Ltd., Warwick Square, London, E.C.4. 1948, page 9.

clear that the author is acknowledging the importance of geography within the historical context. And by referring to "towns and mountains and rivers", "people and conditions", he is referring to the great outdoors.

Political Geography. — By definition, "political geography is an aspect of human geography and may be roughly defined as the study of the politically organized areas of the earth's surface and of the problems contingent upon such organization."[7] The phrase "areas of the earth's surface" undoubtedly refers to the great outdoors.

Therefore, we have chosen three disciplines from both the arts and sciences sectors, respectively, for a total of six. In all of these disciplines, we have shown that, because geography is the bridging and integrating subject, their field of inquiry or laboratory is the great outdoors.

CONCLUSION

We have utilized four proofs to scrutinize our thesis statement. And for each proof, we have proved this thesis statement convincingly. Therefore, with four coherent proofs to back it up, our thesis becomes unassailable. The great outdoors is indeed the laboratory of geography.

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[7] *Monsoon Asia*: H. Robinson. Macdonald & Evans Ltd., 8 John Street, London. WC1N 2HY. 1972, page 93.

HUMAN RESPONSE TO VOLCANIC ERUPTIONS

by

ARTURO ALCARAZ[1]

Through the various eruptions that the Commission on Volcanology since its establishment in 1952 has had the opportunity to cover, it has been an interesting and fascinating sidelight to its technical work to also observe the human response to this awesome physical phenomenon. The study on this subject could best be undertaken by a sociologist rather than by a volcanologist, so it is hoped that whatever inadequacies will be noted in this exposition would be excused.

The human response to volcanic eruptions may be analyzed within the following time frames:

1. Response to pre-eruption advices on the worsening condition of the volcano.
2. Response during the first few hours of the eruption.
3. Response during the duration of the eruption.
4. Response after the eruption has stopped and during the rehabilitation period.

RESPONSE TO PRE-ERUPTION ADVICES ON THE WORSENING CONDITION OF THE VOLCANO

Release of information by the Commission on Volcanology (COMVOL) to the effect that its surveillance of a certain active volcano indicates growing restlessness which may lead to an eruption, is usually given some degree of prominence by media. However, curiously enough, the information invariably draws more concern from the metropolitan areas rather than from the immediate area of the volcano in question. There the people appear unperturbed, apathetic if not downright skeptical of the alert given. Any move to institute precautionary measures is thus rendered difficult. Why is this so? Perhaps the following suppositions may offer some explanation:

1. That the people residing in the vicinity have learned to live with the volcano;
2. The "bahala na" philosophy of most of us — the oriental sin of fatalism according to Bishop Fulton Sheen;
3. Distorted sense of logic — that if those who watch the behavior of the volcano are around, then it must still be safe to be there too as

[1] Commissioner, Commission on Volcanology, National Science Development Board; Vice-President and Chairman, Division of Geology and Geography, Philippine Association for the Advancement of Science.

they are sure the volcanologists do not want to be injured or killed by the eruption also;

4. Misplaced trust on some local seers or soothsayers who claim that the spirit residing in the volcano is still resting or that it can be appeased by some offerings. Incidentally, when such a "manghuhula" takes the opposite view and forecasts doom, even when the volcano by every scientific observation appears quiescent, there is furor among the local residents and many may unnecessarily evacuate the place; and

5. Lack of indoctrination of the people concerned on the dangers of a volcanic eruption and an inadequate pre-disaster planning.

RESPONSE DURING THE FIRST FEW HOURS OF THE ERUPTION

The degree of human response to the initial phase of the eruption is of course in proportion to the severity of the eruption. If there is a heavy fall of ash, or if the eruption produces fiery mushrooming clouds accompanied by loud detonations, then there is generally panic among the inhabitants. Where before they were timid to follow evacuation measures, when the eruption starts there is an exodus and any well-laid plan of evacuation and of relief goes awry. For a few hours after the eruption starts there is pandemonium; people move around like stampeding cattle, vehicles run helter-skelter in and out of the danger area, and there is momentarily a breakdown of constituted authority. It becomes a matter of every family for itself.

However, as soon as the initial shock wears off, after each family head has had time to set in motion his or her own emergency plan, and after local officials with the help of those from adjoining districts shall have recollected their composures, then gradually a semblance of order issues out the chaos. Hurried plans are decided and mapped out on the spur of the moment by various civic and civil groups. While such impromptu plan-making can be regarded as a good sign that some people are now responding to the situation, still at this stage what becomes glaringly absent is coordination and central leadership. Only when these voids are remedied can we say the panic has been arrested and the conditions normalized to a watchful waiting for the volcanic activity to stop.

What has been described above may be taken as a general behavioral pattern. After the situation shall have been calmed down, however, then individual acts of unselfishness, feats of heroism, laudatory examples of devotion to duty, and stirring accounts of sacrifice come out. Truly the emergency shall have separated the men from the boys, so to speak.

Each will have a tale to tell on how he or his family was saved from the disaster. Invariably, many will see the hand of God in their preservation from harm. So be it. However, it is believed that if each tale of deliverance is closely analyzed, it will be seen that its important ingredient was presence of mind during the emergency.

RESPONSE DURING THE DURATION OF THE ERUPTION

A volcanic eruption could last for weeks if not several months. The evacuees during this period will have to be helped by the government, relatives, or friends. Let us look, therefore, into the response of those who are helped and those who help.

For the evacuees, the general reaction after a few days is perhaps one of the resignation — not a resignation to despair, but a calm acceptance of what to him has been willed by fate. This reaction is perhaps the equivalent of the Italian "que sera sera" — what will be will be. There are no recriminations, no self-pity. And no stoicism either. They will, in other words, more likely than not be their usual selves.

Of course there will be grumblings about the relief rations not being enough, that someone is pocketing or diverting the relief and similar complaints. However, it is suspected that much of these in the past has been politically inspired or motivated. It will be interesting to make a comparison of how it would be now under the New Society.

On the part of those who help, the response is often spontaneous, generous, and sincere. The strong family or household solidarity was the main factor, according to Fr. Carroll and Mr. Parco of the Ateneo de Manila University,[2] that structured the flight behavior of the 1965 Taal eruption refugees. Their survey showed that only about 11 percent had stayed one night or longer in a public evacuation center. The rest stayed with relatives or friends. Nonetheless, the valuable help and assistance rendered by the Philippine National Red Cross and the Social Welfare Administration to the victims could not be over-emphasized.

RESPONSE AFTER THE ERUPTION OR DURING THE REHABILITATION PERIOD

It would seem sensible that after a volcanic disaster, those whose homes were destroyed by the eruption would have second thoughts about going back to their places. Some do, but most go back. It is perhaps because we have a strong feeling of attachment to the place we grew up on, and because the soil in the vicinity of volcanoes is inherently fertile. The rehabilitation of destroyed homes in the affected areas, therefore, recreates the same problems to be faced with in the next eruption of the volcano.

This is a situation the volcanologists would be happy to see resolved. Certainly it would help them sleep better. But, be as it may, the slopes of active volcanoes continue to be habitated and cultivated. After a few years of quiescence, the scarred areas affected in the last eruption shall have been healed by mother nature. The people will soon forget their sad experiences with the volcano and life will again go merrily along. We hope this pattern can change somehow.

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[2] Carroll, John J., S.J. and S. A. Parco. "Social Organization in a Crisis Situation: The Taal Disaster" — Philippine Sociological Society Special Paper, 1966.

HUMAN RESPONSE TO FLOODS AND DROUGHT

by

LEONARDO A. PAULINO[1]

Floods and drought represent extremes in the supply of water. Viewing our responses to the occurrences of and attendant problems posed by these natural hazards would really be answering the question of what we had done when there was either too much supply of water or too little of it. While the words "much" and "little" are relative here, I shall address myself to those experienced quantities in water supply that proved destructive to the agricultural sector, that caused damages to crops and livestock and set back agricultural production and, consequently, slowed down agricultural development.

We need not look too far to recall how we have reacted to the occurrence of floods and drought; both of these natural hazards visited us during the particular crop year 1972-73. Our experiences of the Luzon floods in July and August of 1972 and the drought that spanned from 1972 to 1973 can perhaps serve as bases of these observations.

FLOODS

One easily recalls the devastating Central Luzon floods last year when a good portion of the premier rice region of the country was inundated. The Laguna de Bay waters also rose submerged the Lake towns of Rizal and Laguna. These July-August flood waters took a heavy toll of life and property and disrupted economic activities in the affected areas. The response of the people in the flooded areas had been well described and publicized. For agriculture in particular, the damages wrought to crops, especially palay, and to livestock were tremendous. Coming as it did during the planting season of the major palay crops in Central Luzon, natural remedial action was to replant areas once the water receded. Operation Recovery was then launched to do just what the name of the activity suggested.

The project, however, met with a host of problems. With clogged outlets to the seas, the floodwaters took sometime to drain and seedbeds could not be started; in some places, common seedbeds were made in elevated portions to supply the planting materials around the area. The supply of seeds also caused a problem as this had to be moved from the southern part of the country. With the damaged road system, the movement of agricultural inputs, particularly fertilizers, proved to be difficult. Work animals also fell victims to the floodwaters. Operations Recovery had to avail of the assistance of tractor owners and tractor companies in land preparation. It took sometime for regular activities in the area to normalize; during the adjustment period, however, the rural folks displayed calmness.

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[1] Director, Bureau of Agricultural Economics, Department of Agriculture and Natural Resources.

In the meantime, the response of policy makers was an increased consciousness to look into the causes of the floods. Wanton logging operations had bared good portions of our watersheds and had given rise to the rushing floodwaters. An immediate ban was imposed on the cutting of logs in these areas and the cancellation of logging permits in delineated Luzon watersheds.

Mention was made earlier of the slow drainage of the floodwaters. Illegal dike constructions where these flow out to the sea were found as causes and therefore ordered destroyed. The complete removal of these dikes is probably still unrealized.

DROUGHT

Nature had not been kind to the agricultural sector in crop year 1972-1973. Hardly had we started to normalize agricultural activities in the flood-affected areas of Luzon when dry spells in the Visayas and Mindanao regions were reported threatening the palay and corn areas there. Thus, last year we experienced too much water in one place and too little of it in another.

In a move to remedy the situation and recover palay loses in Central Luzon, Operations Palagad (Second Crop) was implemented for increased palay production during the second semester. The second semester crop normally constitutes only 1/3 of our total palay crop during the year. Because of the limited water supply during the period, activities to repair and rehabilitate irrigation pumps had to be purchased and installed in places that needed water. Operations Palagad fared well for both half of the provinces of the project but the abnormally dry conditions then prevailing did not help the other provinces.

Cloud seeding was also given increased efforts during the drought period last crop year. A committee was created to push the rain making activity with the close cooperation of the Philippine Air Force. The project succeeded in many places and provided partial solution to the drought problem.

FLOODS, DROUGHT, AND THE FARMER

It is believed that farming has to contend with relatively more uncertainties than other ventures as the farmer has no control of nature's elements during his farm operations. With unpredictable weather conditions from year to year, farmers consequently experience unstable income. They realize increased incomes when the weather cooperates and drastically reduced returns when floods or drought prevail.

One solution to the problem of income instability of the farmer would be for him to diversify his agricultural enterprise and thus spread his risks. When one enterprise fails as a result of unfavorable weather conditions during a crop year, the farmer can still recoup his losses from his other enterprises during other parts of the year. At present, studies and trials are being undertaken to determine crop combinations suitable for the different regions of the country. It may, however, take some time for our farmer to practise agricultural diversification as most of them have been accustomed to monoculture over the years.

POSSIBLE POLICY RESPONSES

Mention was already made of the possibility of spreading the farmer's risks over the crop year by agricultural diversification. Perhaps, policy makers in agriculture can lend increased attention to this orientation and enable more stable farm incomes; this would also lessen the impact of production losses in specific crops due to natural hazards on the national agricultural output. Another policy measure that is attracting the attention of policy makers is crop insurance. Sporadic studies have been made of the workability of the scheme to protect Philippine farmers against heavy losses resulting from natural hazards. The results of these studies have yet to be known.

With our renewed drive towards more rapid agricultural development, it is hoped that there be continuing awareness of the problems posed by natural hazards and determined efforts for remedial measures so we can minimize, if not avoid, losses to the economy.

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(Sgd.) DOMINADOR Z. ROSELL
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(Sgd.) ANASTACIO C. RAMOS
Postal Inspector

STORM SURGES ARE A JOINT PROBLEM

by

GEOFFREY W. LENNON[1]

A major seagoing exercise, the Joint North Sea Data Acquisition Programme (JONSDAP '73), will commence on 10 September when an informal grouping of oceanographers from the Netherlands, Belgium, and the United Kingdom, will conduct an intensive observational programme over a period of 40 days in the Southern Bight.

The programme, being coordinated by the Institute of Coastal Oceanography and Tides, aims to optimise the acquisition of marine data from disciplines varying from tidal and storm surge research through circulation and mixing investigations by fisheries interests to studies of marine pollution.

It promises to be the largest marine exercise yet mounted in these waters, involving almost 100 automatically recording current meters, 20 tide gauges on the sea bed and four automatic buoys which will continuously telemeter to shore stations meteorological data and, in certain cases, sea temperature.

IMPORTANT BOUNDARIES

As many as 20 research vessels will help to supplement the automatic records by manual observations and also by conducting dye diffusion, drogue tracking, and turbidity experiments.

In the Dover Straits a determined effort will be made to calibrate the oscillating signal induced in a submarine telephone cable by the flow of sea water through the Channel. Here the sea water can be considered to be an electrical conductor moving in the earth's magnetic field; a small fluctuating voltage differential can be sensed across the line of the cable and this can be used to evaluate mass water transport at this important North Sea boundary.

Other boundaries and significant sections are also receiving attention, notably one north of the Wash, one enclosing the Outer Thames Estuary, a section from Great Yarmouth to Texel, another from Lowestoft to Ijmuiden and also one from Harwich to the Hook of Holland. This reflects a systems approach to oceanographic problems in which observations are not necessarily made in the area of specific interest but rather an attempt is made to enclose the sea under investigation by defining boundary conditions.

The science is then allowed to emerge through a computational model designed to expose and understand the physical science. Several such

[1] Acting director, Institute of Coastal Oceanography and Tides.

model studies will eventually be assisted by the JONSDAP programme. The fundamental aim of the Institute of Coastal Oceanography and Tides is concerned with research into the basis of an operational sea level forecasting system.

CHANGED REQUIREMENTS

The requirements for an advanced knowledge of sea level have changed dramatically with technological development. The introduction of tidal predictions based on sound mathematical principles coincided with the period of history when sail was giving way to steam. Already relieved to a large extent from their dependence on the weather, navigators sought through reliable predictions some measures of independence from the astronomical forces.

The enormous growth in ship size in recent years has brought new problems. Vessels must now navigate many miles (kilometers) through shallow waters with their keels uncomfortably close to the bed: previously such hazards were restricted to the dock sill or estuary bar.

Consequently conventional tide tables, prepared some three years in advance and providing a best fit to conditions to be met at a number of discrete coastal points, are now somewhat less than adequate. The navigator would prefer predictions of tidal progression over both the coastal and offshore regions of shallow seas and even then would like to think that meteorological perturbations of the surface were included.

Meteorological effects on sea level also have significance to the coast dweller. The contribution to sea surface elevations from barometric pressure, wind stress, and the dynamics of weather systems in their passage over sea areas can be spectacular and, when they happen to coincide with a spring high water, can have disastrous consequences, as experienced in the North Sea in 1953.

INCREASING THREAT

As the level of the oceans rises slowly but relentlessly with time, with geophysical processes slowly depressing the earth's crust in southeast England and as the range of the tide inexplicably increases in the Thames, concern has grown over the increasing threat from the storm surge phenomenon to large areas of the east coast, but most particularly in the Thames. This being so, a storm barrier has been designed to provide protection to London by the 1980's.

All these considerations call for a more complete and more accurate understanding of the factors affecting sea level and for an operational forecasting system which will allow the protective schemes to become effective. If this complex system could supplement conventional tide tables with forecasts of sea level in advance of real time over a large area of the southern North Sea, it would provide real benefits.

The conventional numerical basis of computation as applied to sea level, involving harmonic time series analysis for the periodic part, and a statistical approach for the meteorological perturbation, suffers from

serious limitations, particularly in shallow water. So a new technique based on numerical computer models to simulate the sea's motion was developed in the 1950's and it has already had considerable success.

In simple terms, the computer is given the geographical dimensions of the water body under study, usually by defining a rectangular grid, with a water depth prescribed at each point of intersection. Certain conditions are attached to boundary points to represent the peripheral dynamics. For the benefit of the computer an appropriate form of the hydrodynamical equations, which control water movement, is specified and a program prepared for the solution of the equations in a succession of small time increments.

TIME STEPS

Initial values of elevations and streams are specified for a selected time origin and the applied forces of both marine and meteorological origin are supplied over the interval of the study. If for the same period conditions at the open boundaries can be stated, the computer is able to compute the changes which take place in the sea body in each incremental time step. Typically such a model might be required to compute for 5000 mesh points at intervals of 2 or 3 minutes.

A second sea model reproduces the conditions of the Southern Bight of the North Sea in a much more detailed scale. The tides are already set up on this model and the meteorological disturbances computed over the shelf are put in this pattern. Within the Southern Bight the meteorological forces continue to be applied and both tide and storm surges are effectively reproduced and allowed to interact one with another. The Thames itself is the subject of yet another model in even greater detail.

All the elements of the system have been evaluated and what now remains is the development of the system itself, to provide the basis of an operational tool. The interfacing and accommodating of the separate requirements and phasing of the meteorological and oceanographic computations is another significant task still to be faced but the system should be available in the early 1980's.

THE KOU-PREY

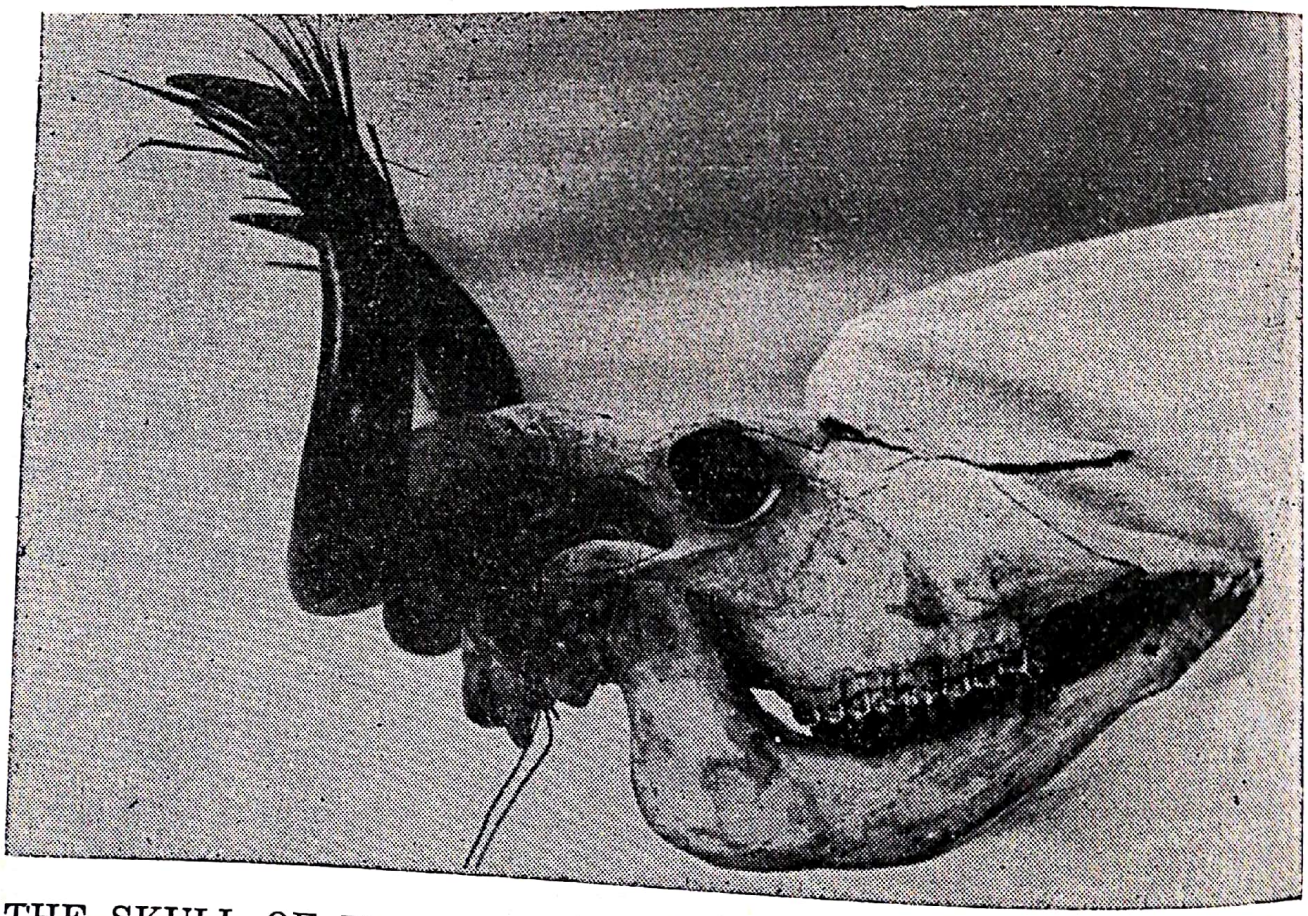
by

VALENTE VILLEGAS[1]

The writer had the opportunity to meet Dr. Suavel at the l'Ecole Veterinaire Nationale d'Alfort, France, who, for sometime had charge of veterinary services in North and Northeast Cambodia and was able to make close observations on the Kou-Prey, *Bibos Suaveli* Urb., a big-sized relatively new species of ox.

The picture herewith is the skull and horns of the animal which Dr. Suavel kindly furnished the writer.

The Kou-Prey's habitat is definitely located "in Cambodia, South Laos, South Annam . . . in Thailand extending to a depth of 40 kilometers in the vicinity of the Dangrecks mountains in the north between Thailand and Cambodia".



THE SKULL OF THE KOU-PREY (*BIBOS SAUVELI URB.*) THE HORNS ARE DIRECTED SIDEWAYS SLIGHTLY DOWNWARD AND TO THE REAR, THEN UPWARD, INWARD AND TO THE REAR. (COURTESY OF DR. SAUVEL)

[1]Professor Emeritus of Animal Husbandry, University of the Philippines.

The writer came across two reports on the Kou-Prey: one by Professor Urbain at the meeting of the Societe Zoologique de France on June 8, 1937, the other in the Bulletin on Comparative Zoology of the College of Harvard, 1940, Vol. 54, No. 6. In the former report, the bull which was killed in the vicinity of Chep village in the district of Cheom Ksan in the Province of Kompong Thom was the subject of discussion. In the latter, the bull killed in Samrong region in the Province of Kratie was reported. Both Kompong Thom and Kratie provinces are in the Kingdom of Cambodia.

The writer had occasion to view the Kou-Prey shown in the moving picture shown by Dr. M. Harold Coolidge at the IXth Pacific Science Congress in Bangkok, Thailand. The species is huge, rangy with deep chest. The horns are long and directed upward but curved.

DISTRIBUTION OF THE WATER BUFFALO IN THE WORLD AND IN THE PHILIPPINES

by

VALENTE VILLEGAS[1]

Asians, it seems, are inclined to think of the water buffalo as being the monopoly of Asiatic countries where the swamp buffalo is used principally for tilling land for lowland rice and the Indian and Pakistan buffaloes, the river buffalo for milking purposes. The fact is that the water buffalo, because of the multi-purpose for which it is adapted had established itself in many other countries to form part of the economy of such countries.

WORLD DISTRIBUTION OF WATER BUFFALOES

Ten countries of the world have over one million water buffaloes each namely:

India — 51,207,922 head (1961)
China — mainland estimated at 28,608,000 head (1965-66)
Pakistan — 8,392,000 head (1960-61)
Thailand — 6,691,000 head (1964-65)
Philippines — 3,633,000 head (1966)
Indonesia — 2,893,000 head (1961-62)
Egypt — 1,646,000 head (1965-66)
Burma — 1,225,000 head (1964-65)
Turkey — 1,216,000 head (1965)
Ceylon — 1,051,000 head (1964-65)

India and Pakistan have definite breeds of the river buffalo, namely, Jaffarabradi or Gir, Mehsona, Murrah, Nagpuri, Nili, Surti, and Ravi, all of them of the milch type which produce much higher yields of milk than the swamp buffaloes. The latter's milk have higher butterfat test than that of the river buffalo breeds.

Countries with less than a million water buffaloes follow: Laos 719,760 head (1966); Cambodia 637,000 head (1965-66); Union of Soviet Socialist Republics 498,000 (1965-66); Taiwan 273,000 head (1965-66); Malaya 243,999 head; Iraq 224,000 head (1967); Republic of Vietnam 733,200 head (1965-66); Iran 372,427 head (1960-61); Bulgaria 147,000 head (1963-64); Northern Territory, Australia 100,000 to 150,000 head (1965); Brazil 89,000 head (1967); Romania about 80,000 head (1965-66); Borneo 67,000 head (1965-66); Yugoslavia 59,000 head (1965-66); Greece 54,959 head (1964-65); Italy 43,000 (1965-66);

[1] Professor Emeritus of Animal Husbandry, University of the Philippines.

Afghanistan 21,000 head (1962-63); Sarawak 8,000 head (1965-66); Albania 4,700 head (1964-65); Trinidad and Tobago between 4,000 and 5,000 head (1967); Syria 2,000 head (1964-65); Guam 1,000 head (1964-65); Hungary 879 head (1965-66); and Surinam 117 head (1966).

POPULATION AND VALUE OF WATER BUFFALOES IN THE PHILIPPINES

In 1949, the carabao population in the Philippines was 1,818,530 head valued at P300,159,660; in 1951, the corresponding figures were 2,343,540 valued at P414,118,530; in 1953, 2,510,110 valued at P439,683,-590; in 1955, 3,379,110 valued at P417,050,000; in 1957, 3,584,130 valued at P451,140,440; in 1959, 3,773,000 valued at P454,756,600; and in 1961, 3,452,000 valued at P613,726,300.

In 1970, the carabao population in the Philippines, was 4,555,700, of which the largest concentration was in Southern and Western Mindanao amounting to 959,100 head, or 21 percent of the total population in the Philippines. Next was in Western Visayas, amounting to 672,200 head, or 14.8 percent. Eastern Visayas, had 626,700 head, or 13.8 percent; Central Luzon had 514,900 head, or 11 percent; Southern Tagalog had 453,200 head, or 9.95 percent; Bicol had 440,700 head, or 9.71 percent; Cagayan Valley had 420,900 head, or 9.2 percent; Northern and Eastern Mindanao had 324,000 head, or 7.1 percent; and Ilocos had 144,000 head, or 3.2 percent.

TO UNDERSTAND VOLCANOES, STUDY THEIR GASES

by

G. J. LLEWELLYN[1]

Following a quiescent period of 2000 years, on 23 January 1973 the Icelandic island of Heimaey became the scene of eruptive activity. Vestmannaeyjar, Iceland's most important fishing center, is situated on Heimaey and although the eruption has caused no loss of life, the evacuation of the island due to fire risk and building collapse has been an economic disaster.

Thus we have a very recent reminder of the unpredictability with which volcanoes can unleash their destructive energies. Many attempts have been made to find a pattern in the activity "cycle" of volcanoes solely on the records of past eruptions. However, without knowledge of the geophysical and geochemical underlying each volcano's eruptive mechanism, such predictions have only academic interest.

If the object of prediction is the prevention of damage to life and property, for contingency plans to be prepared, knowledge of the site of the impending activity and the magnitude of the eruption is essential.

GENERAL CLASSIFICATION

Each volcano has its own special modus operandi and although classifications into five or six different types have been made, these are of necessity generalized. The classes of eruption are usually named after a typical volcano (for example, Strombolian) and are useful in as much as they indicate the type of scientific monitoring which may yield data relevant to the understanding of the volcanic mechanism.

This data may be geophysical or geochemical in nature; that is, it will contain either information about earthquakes, deformation of the volcanic edifice and changes in magnetic or electric fields or information about the composition and temperature of volcanic gases.

Of the types of geophysical data available, seismic recordings have been most frequently used, as shallow earthquakes and tremors nearly always precede eruptions. A number of attempts have been made to relate the seismic activity to the kinetic energy expended in eruption and Takeshi Minakami, the Japanese volcano physicist, successfully implied an empirical relationship to predict the kinetic energy of the 1958 eruption of the Asama volcano.

The Japanese live under constant threat from 31 active volcanoes and since 1965 Minakami has led a team of physicists from Japanese universities working to gain seismic data which may lead to the prediction of eruptions on a general scale.

[1] Bradford University, northern England.

THE INSTRUMENT FOR THE REMOTE MEASUREMENT OF VOLCANO GAS EMISSION VELOCITIES SET UP ON THE MEDITERRANEAN ISLAND OF STROMBOLI IN 1972.

ACIDIC LAVA

Eruptions of the Hawaiian volcanoes appear to be preceded by a swelling of the shield-shaped volcanic edifice — and the amount of the swelling can be indicated by a tilt meter on the shield. This method was used to predict the 1959 eruption at Kilauea Iki.

While the subterranean movement of Basaltic lava is detectable acidic lavas move very slowly and the instruments to measure any geophysical parameters changed by this movement (magnetic field, ground conductivity and so on, need to be sensitive to an almost unattainable degree. Thus, for the "acidic" volcanoes, a different approach must be made and this is through examination of the gases issuing from volcanic vents.

Professor Haroun Tazieff of Bradford University has been one of the leading researchers in the field of gas analysis volcanology and is convinced that only gases emitted at high temperature and high velocity from eruptive vents are closely related to the mother magma of the volcano. Such gases are relatively uncontaminated by their environment prior to escape into the atmosphere and so contain accurate information on composition, temperature, and pressure.

With low temperature gases which issue from vents, "fumaroles", within the region of activity, conventional methods can be used to measure temperature, emission velocity and partial pressure and it is fairly straightforward to collect discrete samples for laboratory analysis. However, the high-velocity eruptive jets usually contain molten lava which solidifies to produce a hail of volcanic bombs and under such conditions, conventional methods of contract measurement are not applicable. Remote measurement techniques have to be developed.

VELOCITY METER

As a joint project between the French Atomic Energy Commission and the school of Control Engineering at Bradford University, northern England, an instrument for remote measurement of emission velocities is being developed. The instrument is based on the principle of velocity measurement by cross-correlation of signals derived from two locations of known separation along the flow being considered. In the case of hot jets, infra-red emissions are collected by reflector telescopes and converted to electric signals by infra-red sensitive cells.

The electronic signals contain information about turbulence patterns in the jet and these patterns are convicted between the two locations A and B as defined by the telescopes. The time taken for a pattern to convect between A and B — the transit time — is found by seeking the maximum value of the averaged product of the two signals for a number of different delay times.

A prototype instrument system was taken to Mount Etna, Sicily by Tazieff's team in June 1972. Unfortunately the continuous activity — a feature over many years prior to the 1971 eruption — had ceased and during the 1972 visit all that could be observed was the effusion of vast clouds of gas.

Such low temperature emissions were unsuitable for the use of the velocity measuring instrument and a smaller expedition was despatched to the nearby island of Stromboli. This volcano is in a continual state of activity, with three eruptive jets or fire fountains playing intermittently in its central crater, reaching a height of 100 m and forming an awesome spectacle when accompanied by jet-engine like roars.

INFERENCE POSSIBLE

Over a period of two hours during the night of 9 June infra-red signals were recorded for 19 "blows" of the central of the three jets. Because of the difficulty in transporting equipment to the ridge and the short duration of the stay only one set of records was obtained and due to a partial electronics failure the results were not as expected.

However, it seems it is possible to infer from the cross-correlograms obtained that the jet contained a component with a maximum velocity of 30 m/second. The prototype instrument is now being modified for the 1973 expedition to Etna/Stromboli and it is hoped that in its more sensitive form the instrument will be effective on lower temperature fumarolic emissions.

The Science Research Council has provided the research studentship under which the work at Bradford has been carried out and the Royal Society has funded the instrumentation and travelling expenses as part of their Etna research programme.

ENERGY FROM INDIGENOUS CARBONACEOUS MATERIALS[1]

by

VEDASTO R. JOSE[2]

INTRODUCTION

Energy from carbonaceous materials is old stuff. Man discovered the use of fire because of wood and ever since, the major source of energy has always been carbonaceous material, i.e., wood, oil, coal, etc. However, I propose to leave out in this discussion, mineral oils. For until we discover petroleum, we cannot call it an indigenous carbonaceous material. This field, even without touching on mineral oils, is still too broad, and I intend to give only a summary of what we can possibly do by way of developing the hitherto unexplored, neglected, fields of research and development before the energy crisis.

How much deposit of carbonaceous materials do we have in the Philippines? In 1971, the estimated deposit of coal was about 120,000,000 metric tons, of which roughly 30,000,000 MT is considered coking — meant mainly for the metallurgical industries. We do not have reliable figures for forest and agricultural waste products, e.g., wood, bagasse, coconut coir dust, etc. Unlike fossil fuels, we cannot consider the latter as "deposits" because they vary according to production and ways of utilization.

DIRECT UTILIZATION OF SOLID FUELS

Let us start with the direct utilization of solid carbonaceous fuels. Foremost, here, is the possibility of developing the so-called "Energy Forest" or by a more attractive name of "Fuel Plantation". As the name signifies, we plant the wood and we harvest the fuel. Since wood is replenishable, we have a perpetual supply of fuel. What could be a more simple and attractive proposition than that. But will it work? A study has been made on this and briefly the conclusions are: (1) about 350 sq. miles of pulpwood forest will support a 400 MW electric generating station even if only 0.4 percent of the solar energy incident upon it is converted to fuel value; (2) a 0.7 conversion can easily be achieved by double cropping or by more densely planted forest lands grown on shortened cycles without drastic changes in plant species or production methods

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[1] A paper presented at the Symposium on Energy Resources of the Philippines on December 7, 1973, FNRC Auditorium.

[2] Acting Science Research Chief, Industrial Research Center, National Institute of Science and Technology, NSDB, Herran, Manila.

used; (3) conversion to one percent should be achievable within a few years of more research and development; (4) the estimated cost of harnessing solar energy by this method is about $400/KW, compared to about $100,000/KW and $5,000/KW for photovoltaic and photo-thermal methods, respectively.

The many advantages cited on the energy forest over other types of fuels are as follows:

1. fuel derived is essentially sulphur free;
2. the by-products of combustion, (e.g., carbon dioxide, water vapor, and ash) are directly reusable on the land as a source of factors essential to plant growth. This factor appeals to the environmentalist;
3. there is no alteration in the heat balance of the earth. The energy released when woody material is burned will have been collected directly from the sun during the relatively recent past. Fossil fuels, on the other hand, raise the temperature of the earth when they are burned because the energy they release was "withdrawn from circulation" millions of years ago;
4. the operation and maintenance of the power station, being a conventional type, is relatively simple; and
5. the fuel supply is perpetual; its supply will continue as long as the planet earth supports life.

In short, then, the energy forest has advantages over other means for harnessing solar energy because living plants serve as their own energy accumulator which is protected by the plants' natural protective mechanism.

AGRICULTURAL AND FOREST WASTES

Sawdust, rice hulls and coir dust are possible as fuel for household and industrial use. The aim of this project is to develop these materials into a useable form of fuel as a source of heat energy. The large scale use of saw dust, for example, still remains a major problem. Economical disposal of this mill waste is a growing concern of the wood industry. Coupled with the control measures that have been adopted by the government in order to conserve our oil supplies, the use of these wastes as substitute to oil, LPG or bunker oil, is most welcome.

The FORPRIDECOM conducted an exploratory study on the development of the household stove using sawdust as fuel. Results indicated that sawdust in its loose state was impractical for this purpose. The major setback was the feeding of the material to the combustion chamber. However, in briquetted form, it could be a suitable fuel for the stove. The work that will be instituted will include also designs of furnaces and burners for industrial use capable of firing other solid waste materials.

Charcoal making has been with us for decades and producers from the barrios rely on the age-old method of open pit firing. This method may not require any capital investment. It is, however, wasteful and

could be a source of atmospheric pollution. The NSDB will start looking into the technology of charcoal production, and the design and fabrication of efficient kilns. Two methods, the batch and continuous process, will be developed and their possible integration with a gas producer.

Another aspect of the program is promotion work. This includes the holding of seminars; training and apprenticeship on the various aspects of charcoal production; conduct of dialogues with charcoal producers to effect an efficient and well organized industry; and to encourage the use of charcoal as fuel for domestic purposes.

Charcoal production, as a controlled activity, would intensify and improve management and utilization of forest resources without endangering the environment quality and basic functions of forest. Perhaps, the most important role this program could play would be the generation of employment opportunities for our people.

INDIRECT UTILIZATION

If we limit the subject of indigenous carbonaceous materials to solids, then we can arbitrarily mean "indirect utilization" as no more than the conversion of the solid fuel to liquid or gaseous fuels.

Invariably, processing of solid fuels to a more convenient form requires energy. Hence, it is obvious that the net amount of energy available must necessarily be less than the original. This is something that even some of the most serious researchers overlook-especially those in the field of "fuel cell" research.

The reason we chose to use the gaseous or liquid form is due mainly to the ease and efficiency of their combustion process, whether this be chemical or electrochemical. However, we also sacrifice the over all economy and the convenience of handling. It seems that nature always sets a boundary for us.

PRODUCTION AND UTILIZATION OF PRODUCER GAS AND GASEOUS BY-PRODUCTS OF CARBONIZATION

Coco Gas. — Two concurrent projects in progress, one at NIST and another at the U.P., deal with the production of gaseous fuel from coconut coir dust. A practical prototype pilot carbonization plant at the U.P. has been evaluated and preliminary results show that gas rich in hydrogen can be produced. Further research on the kinetics of the solid-gas reaction is in progress. These results are very interesting considering that coal or wood pyrolysis produces but a small quantity of hydrogen. This led the research team to propose using this gas fuel to run gasoline engines. Further development work will be required, e.g., on the improvement of the design of the carbonization retort, and modification on the design of the gasoline engine to make them operate on coco gas fuel.

There is a corollary project to this: why not use the coco gas, since it is rich in hydrogen, for the hydrogenolysis of coal, wood waste or, for

that matter, garbage to produce fuel oil? Or why not catalytic synthesis of liquid fuel from coco gas at high temperature and pressure? These ideas will be explored and laboratory tests will start very soon.

Producer Gas from Coal or Charcoal. — This will remind us immediately of the time when trucks were run by the so-called "charcoal fed". The idea dates back to World War I when Europe had its first energy crisis.

What, perhaps, we will do here is to expand our work not only to produce a fuel gas generator for internal combustion engines, but also to produce an efficient, portable type and simple to operate, gas generator for the housewife, as possible substitute for LPG in her home cooking.

For industrial purposes, i.e., for power and steam generation, mechanical drying, etc., we have to look into the gasification of wood, coconut shells and husks, coal and coke. Two possible designs — an up draft for coal gasification and a down-draft for gasification of forest and agricultural wastes — will be studied. The U.P. College of Engineering has done preliminary work along this line under an NSDB-Assisted project.

Coconut Oil as Fuel. — Experiments with vegetable oils as fuel for semi-diesel and diesel engines were carried out as early as World War I in France, Russia and Argentina. Most of the research work involved the use of soybean, cotton seed, and peanut oils. Perhaps the most outstanding contribution to the field of vegetable oil fuel are those of Castellanos of Argentina and Baker and Sweighent of Georgia Technology.

The conversion of coconut oil to motor fuels has not been explored deeply, as yet, except for the reference on the work of Seigio Petraff and Anthony Prats.

The chemical and physical properties of coconut oil relevant to its use as possible motor fuel are as follows: the chief constituent of regular oils are the 16 and 18 carbon acids, but coconut oil is unique in that it consists of esters of much shorter carbon chain acids, the 12 and 14 — myristic and lauric. It has, therefore, a high content of low molecular weight fatty acids. The oil has a low melting point (about 70°F) and this is due not to the relatively high unsaturation, but rather to the low molecular weight of its glycerides.

Coconut oil has a narrow plastic range. — It passes from liquid to a brittle solid within a range of few degrees. Since its unsaturation is quite low, the oil is quite resistant to rancidity. However, free fatty acids are very noticeable since these are sufficiently volatile and soluble.

The research team assigned to work on this project will concentrate their efforts on the removal of impurities in raw coconut oil, the improvement of the NIST pilot plant on the production of methyl esters and the testing of the products and by-products in commercial internal combustion engines. Testing will also be extended to blending of coconut oil with standard liquid fuels.

Alcohol as Motor Fuel. — No less than the Chairman of the NSDB has once been directly involved in the testing of alcohol to run military vehicles. It appears, here, that the problem is not the applicability of alcohol as motor fuel — because it has already been shown that it works — but its economic production.

A research team is now involved in the search of local raw materials, other than sugar, as possible source of alcohol. Although the process of converting carbohydrates to simple sugar is quite simple, the research team will have to contend with the most critical stage, i.e., the fermentation process. This is the bottleneck, and whether the process is economic or not, only time will tell.

ECONOMIC CONSIDERATION

We should really leave this topic to economists. However, as part of a community of researchers given the task of solving what happens to be a problem economic in nature, we can ask questions and venture opinions relevant to our work.

What, for example, is the real purpose of this crash program on "Energy Resources Development?" Will this be a mere stop-gap, a palliative, to solve our immediate needs for energy? Will all these research programs be relegated to low priority areas once oil starts flowing in, once more? Or are we flexing our muscles for a more ambitious program of self-reliance, so that, one day, we will be only partially dependent on imports for our fuel requirements?

I would like to believe the government is all for a self-reliance posture. This is, however, easily said than done. A cursory look at our light and heavy industries, save the cottage industries, leads one to conclude that we are too western-technology oriented. There is nothing basically wrong with this for as long as we live on and maintain an ideal free-trade economy. We have, perhaps, enough manpower and technical knowhow to run our industries — this is not the same as saying that we can establish these industries from our own raw materials and local talents.

This leads us directly to some of the problems in our research program. Perhaps, a typical example will make this clear and let us base it on the premise that eventually we want a "self-reliance energy posture". Consider the energy that can be derived from coal. If a full program of research and development is implemented, then we will have to go into: beneficiation and blending of raw coal; carbonization of processed coal; recovery of by-products of carbonization; processing of the by-products; conversion of coke into producer gas; and utilization of the tar, heavy and light oils, coke, gas, ammonia, etc. Let us assume that we have solved all the technical problems — which are not too difficult, anyway — and we are now ready to put up an integrated by-product coke oven plant? Can we call this a viable project? Some will say that it is, and they justify this by arguing that the produce may be more expensive than outright importation but "the money stays here."

This argument may not be entirely correct. We succeeded in transferring — but not in adapting — western technology. Going back to our example, the project's viability will depend not only on our capacity to produce our energy sources but also in our capacity to produce the equipment for their production.

The hard-currency cost of operating coke ovens is substantial throughout the world, largely because the more specialized refractories are available in quantity only from hard-currency areas.

Replacement parts for machines produced in hard-currency areas generally require hard-currency, as do a number of other maintenance materials.

Chemicals which must be introduced into by-product recovery equipment are often available in quantity only from hard-currency areas.

Coal chemical by-products provide substantial hard-currency savings (equal to the cost of importing the same by-product materials from abroad). However, the combination of hard-currency maintenance costs and hard-currency by-product recovery costs has been found, in some instances, to outweigh the hard currency savings made possible through domestic production of coke by-products.

In short, if we import all our equipment, we will have to worry about (1) maintenance materials, (2) periodic replacement of major portions of facilities, and (3) materials and supplies introduced for recovery of by-products.

It sounds, therefore, inconsistent in trying to be self-reliant on a certain produce but not on its means of production. And this, I believe, is true for any research or industrial projects.

Before I conclude, I would like to touch a little on fuel-cell research. This field cannot escape our attention because it is one of the most — if not the most — important subject of investigation on fuel research. Yet, it is also the field where no one wants any part in it. Its beauty lies in its theoretical possibility.

The ultimate goal of this undertaking is to produce a fuel cell run by solid indigenous carbonaceous material. If this were successful, its economic impact will, perhaps, parallel that of the Industrial Revolution. But from the status of our technology level, in spite of the claims from certain quarters, we are still very far from realizing even the simplest (and very expensive) hydrogen-oxygen cells. Why this is so, the arguments presented above, apply. We will be well off, if we leave fuel cell research alone.

Adaptive technology on indigenous materials should serve a good guideline.

NEW ZEALAND: PAST, PRESENT, AND FUTURE — A REVIEW AND A LOOK AHEAD[1]

by

L. D. B. HEENAN[2]

The study of population has no precise disciplinary boundaries, and so this review offers a broad perspective on a field of enquiry which has claimed attention since the early days of European settlement in New Zealand.

Because topical emphasis in the literature have varied considerably during this time, however, the approach adopted here is basically chronological. Thus dominant themes are traced through three convenient periods (Table 1).

The earliest extends to the century's turn, a second spans the years from that point to about 1945, leaving the post war decades as the final period.

Emphasis throughout is on published studies, but by and large major trends are reflected in the titles and content of unpublished work, particularly university theses.

References cited in the text are necessarily highly selective, and much of the information is drawn from material in a recently published bibliography (see Population Publications section of *News*, Vol. 2, No. 1, p. 37) (HARGREAVES and HEENAN 1972).

BEGINNINGS: 1838-1900

An early, if not the earliest, substantive statement on New Zealand population appeared in Banister's 1838 account of aspects of Maori society, which also included estimates of the number of Europeans then present in the colony. From that year to about 1900, three major themes dominated what might be described as the demographic literature. *First*, much was written on the causes and consequences of an apparent decline in size of the Maori population. (BANNISTER 1838, FENTON 1859).

A *second* major theme focussed on mortality. This emphasis is hardly surprising in a situation where high rates of sickness and death were of considerable social and economic significance, especially in the towns. Important national studies (NEWMAN 1882, ADAMS 1898) and a few local studies (DEC 1872, DE LAUTOUR 1887/88) on non-Maori mortality were undertaken. Then, in 1895, LESLIE published the first non-Maori life table for the years 1880-1892.

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[1] Reprinted from: *Asian Population Programme News*, Vol. 2, Nos. 2 & 3 (combined issue), 1973.

[2] Senior Lecturer in Geography, University of Otago & ECAFE population correspondent; M.A., Ph.D.

TABLE 1

WRITINGS ON NEW ZEALAND POPULATION 1830-1970

Classification	GENERAL POPULATION				MAORI POPULATION				Row
	-1900	1901-45	1946-59	1960-70	-1900	1901-45	1945-59	1960-70	Totals
Source Materials	—	—	1	2	—	—	1	2	6
General Population Studies	9	10	15	15	—	3	7	10	69
Trends in Pop. Growth	—	4	15	4	15	6	3	1	48
Spatial Aspects — General	2	9	15	48	1	5	10	13	103
Mortality	29	36	13	30	3	6	1	6	124
Fertility	—	9	6	6	—	1	1	—	23
Marriage, Divorce, Family	—	2	1	5	—	—	1	2	11
Internal Migration	—	—	2	16	—	—	—	4	22
Age-Sex Structure	—	4	15	8	—	—	—	—	27
Policy — General	—	1	1	—	—	—	—	—	2
Demographic — Economic Interrelations	—	21	212	126	—	3	5	14	381
Immigration — Emigration	5	61	75	79	—	—	—	—	220
Ethnic and National Minorities	1	7	11	28	—	—	—	—	47
Other	—	—	—	—	—	—	—	1	1
Column Totals	46	164	382	367	19	24	29	53	1,084

Source: Hargreaves and Heenan 1972.

Major preoccupations of the time were with the miasmatic theory of disease causation, and a search for conclusive statistical evidence on mortality to verify the official view, supported by those of medical climatologists, that New Zealand was one of the healthiest countries in the world.

A *third* theme concerned the question of "aliens," a term largely synonymous with the immigrant Chinese, the economic problem they were perceived to pose, and their legislative status in New Zealand society. From several viewpoints this last issue has not yet been completely resolved; but during the closing decades of the nineteenth century the Chinese were the subject of intense debate, much of it subjectively conceived and expressed in highly emotive language (STEWARD 1871, REEVES 1895).

THE DEVELOPING YEARS: 1900-1945

Early in the new century a number of novel features emerged in the literature and several noteworthy changes in theme became progressively more evident. Within the first decade there appeared what seem to represent the first erudite analyses of age-sex distribution (SEGAR 1900, 1903) and fertility (SEGAR 1900, BARCLAY 1903).

Articles on Maori population for a time became fewer, and from the 1890s their content suggested a dawning realization that a Maori demographic and social renaissance was possible.

Fuller participation of Maoris in educational and public health systems developed primarily for the European populace was urged as a means to that end, in particular by leading members of the Young Maori Party (NGATA 1893, POMARE 1909, BUCK 1924).

Mortality remained a major area of demographic enquiry during the years to 1945. By 1900 the germ theory of disease causation had gained universal acceptance at the expense of the popular miasmatic doctrine on which the medical climatologists had based much of their largely impressionistic work. Moreover, the emphasis earlier placed on general mortality and epidemic-type diseases was increasingly supplanted by much more specific problem-oriented studies on infant, maternal, and cause mortality, mainly cancer and tuberculosis, though interest in these diseases overlapped the century's turn by a decade or so.

Irrational cult. — Supporters of the cult of "white" supremacy in New Zealand society continued to publish from time to time their irrational views perpetuating the "yellow peril" — alien bogey crystallized in the acts and writings of Terry and others (TERRY 1904).

After the Seddon era, however, the general position assumed in literature on the "aliens" lost much of its sense of urgency and became rather more objective, the year 1927 marking publication of the first really scholarly appraisal of the New Zealand Chinese (HALL 1927).

Indeed with the passage of the years this theme was pushed more and more into the background by a growing volume of literature preoccupied with interrelated problems of fertility, immigration and the population growth rate.

To some extent this development reflected concern at a persisting shortage of farm workers and of skilled labor in a rapidly growing urban society. Results from the 1926 census confirmed this centralizing trend, and stimulated several lively exchanges on economic and social aspects of rural depopulation and accelerating urbanization, in the publication *New Zealand Highway.*

Although both trends were temporarily restrained during the depression period, the question of population distribution later became a major concern of the Dominion Population Committee (THORN 1946).

Immigration debated. — But in the literature from the 1920s to the early 1940s the whole question of immigration became a central issue in the debate on implications for future population growth and national development drawn from deepening interrelated trends of economic depression and low fertility.

The latter had in fact elicited comment as early as the century's turn (SEGAR 1900, CHAPPLE 1903, BARCLAY 1903). And so economic stagnation and imminent population decline became popular clichés in demographic writings of the period, particularly in the 1930s.

Variety of attitudes. — A variety of attitudes was adopted to the demographic problem. Strong sectional interests, among them the manufacturer and the Chamber of Commerce, repeatedly pleaded for a greater inflow of settlers: some espoused a more liberal immigration policy. This last and similar views faced virulent opposition from proponents of the "white race in peril" attitude adopted by the vociferous White Race Movement and the Anti-Asiatic League.

If a consensus existed, it was that increased immigration was in the long-term national interest. It was widely held to offer the only means of ensuring continued population expansion. Put another way, immigration was looked upon as a way of averting what at that time were perceived as daunting socio-economic consequences likely to be generated by the stationary or diminishing population foreseen by the economists (BILLING 1935), and others (NEALE 1934), following the unprecedented fall in fertility to below replacement level during the early 1930s.

This particular problem, the long down-swing in the birth rate, was regarded by some as an insidious threat to the intellectual quality of the New Zealand population. A case along these lines was put very early in the century (CHAPPLE 1903). To other observers declining fertility represented a weakening of the nation's moral fibre (SINCLAIR 1944).

In such moralistic discussions considerable prominence was given to the propriety of the contraceptive practices and criminally induced abortion apparently underlying the falling birth rate (RILEY 1930, MCMILLAN 1937).

These three factors were held to characterize the process of moral decay and were therefore condemned.

Also involved in the wider debate was a psychological factor. New Zealand must "Populate or perish," for a larger population would "fill the vacant spaces" and satisfy the long-felt need for national security. More New Zealanders would likewise assure survival for a small country geographically remote from its major political, economic and cultural connexions in Western Europe, and situated under the threatening shadow of over-crowded Asia.

EMERGENT MATURITY: THE POSTWAR YEARS

The postwar phase began auspiciously with the appearance in 1946 of the *Report of the Dominion Population Committee* (THORN 1946), which was to a considerable extent complemented by publication of a second timely volume, *The Future Population of New Zealand* (CALVERT 1946). Both documents made an assessment of past population growth and geographical distribution as a guide to likely future demographic development. Although each looked forward, Calvert in the more definitive terms, to a period of stronger growth, both substantially underestimated future replacement rates. Even while their reports were being composed, fertility was advancing rapidly to the remarkably high level at which it remained until the early 1960s.

But one study or the other, in some cases, both, identified a number of problem areas which were soon to become important issues in the literature. One was continued urbanization, and within that, a strong tendency for the centralization of population in a few main centers.

This trend raised the question of decentralization of tertiary and secondary employment, which later became linked in turn with the wider issues of regional development.

Another interrelated set of problems clearly foreseen concerned immigration, the housing shortage, and the scarcity of labor induced by the decline of fertility in the inter-war years.

The nation was also forewarned of social and economic pressures likely to be generated by predicted expansion in the numbers of children and Old people, and by the growth of Maori population.

Pessimistic Assertions Confounded. — In the event, therefore, high fertility, resurgent immigration and a rising growth rate totally confounded the pessimistic assertions and psychology of imminent demographic disaster which has been commonplace in the literature of the inter-war and war years. Instead, themes connected with problems arising form strong forward growth became a major element in postwar writings on New Zealand population.

Studies on various aspects of the national demographic pattern have continued to account for a large share of the literature. Subject matter has ranged from total growth and growth by age cohorts (FRANKLIN 1972) to general compositional characteristics, and, in particular, components of demographic expansion, specifically mortality (LESSOF 1949,

POOL 1967, LANCASTER and DONOVAN 1967, ROSE 1972), and fertility (JACOBY 1958, BRAAE 1968, BASAVARAJAPPA 1969), including illegitimacy (MISSEN 1969).

Immigration Seen as an Economic Issue. — Immigration came to be conceived largely as an economic issue in the context of a full employment situation, skilled labor needs, pressure on the housing market and the general course of economic development. Interesting cost-benefit type studies have appeared on economic aspects of immigration and population growth (BELSHAW 1952, GOULD 1964, MONETARY and ECONOMIC COUNCIL 1966).

Nevertheless, the social issues involved have not been entirely neglected (BROWN 1960). Those seeking a larger volume of immigrants and/or intent on urging the formulation of a less restrictive policy position have tended to represent vested interests (e.g. manufacturers). Others have based their case on the cultural enrichment to be derived from an increased inflow of non-British stock, including Asian (ROY 1966).

Concern for Demographic Situation. — Perhaps the most impressive change to emerge in the postwar literature has been the much greater concern shown for the demographic situation within the country. This development remained more or less incipient until the late 1950s, but since then study of specific internal problems has represented an increasingly large share of the published literature.

The shift in emphasis developed along a front which broadened and deepened quickly. Gross population distribution and associated patterns of growth and change were favoured topics during the earlier part of the period. And from 1947 the official publications, the *Half-Yearly Survey and Monthly Review of Employment* (both absorbed by the *Labour and Employment Gazette* from 1951), began what has become an important series of short articles and notes on internal patterns and trends in employment, immigration, and related aspects of population. Such items account for most of the writings classified in Table 1 under the title "Demographic Economic Interrelations."

Then, in the early 1950s, the Department of Statistics initiated an important continuing series of statistical papers on national projections for the total population. These cover such aspects as age sex structure, the labor force, working life, and net family formation.

EXPANSION OF MAORI POPULATION

The vigorous postwar expansion of Maori population and the interrelated social and economic issues this raised have claimed much studious attention, particularly in the 1960s (Table 1). Territorial mobility (ROWLANDS 1971), urbanization, sickness and death (ROSE 1972), the labour force, components of growth (POOL 1967) and education have received varying degrees of treatment.

Emergent maturity is also expressed in a growing appreciation of the relevance of the past pattern of demographic evolution in New Zealand. With one or two conspicuous exceptions, however, notably Perry's work on marriage-distance relationships in North Otago (PERRY 1969), and Franklin's penetrating essay on process and the element of

structural change in national demographic development over the period 1901-1961 (FRANKLIN 1965), much of the published literature in this sphere has tended to concentrate on the spatial distribution and change in number of people rather than qualitative and dynamic components of composition.

Regional and Local Patterns. — Nevertheless, from about the mid-1950s, there has been an expanding flow of recent time. Thus regional and local patterns of population growth, distribution, migration, age-sex structure and employment have received summary and necessarily superficial treatment in the various volumes comprising the *National Resources Survey*. Studies in greater depth have been made of rural-urban, interurban, and within rural variations in territorial mobility, fertility, general and cause mortalty, and age-sex structure, either covering the country as a whole or major sections of it (FRANKLIN 1958, MCCASKILL 1964, HEENAN 1968, QUINN 1950).

Although earlier sociological studies had implicitly if not explicitly demonstrated the value of the ecological concept in the study of population (CONGALTON 1954), it appears to have Franklin's early work on rural and urban age-sex structure which stimulated a lasting interest in this approach (FRANKLIN 1958).

Much research effort has since been directed towards elucidating demographic structure, process and change within the larger urban centres. Hence data from a variety of sources have been used in studies of intra-urban population growth, mobility, distribution, age-sex structure, and the sex ratio, as well as fertility, health problems, death, and ethnic composition. Indeed, the wider study of immigrant national and ethnic minorities has become a strong independent line of enquiry with a clear sociological bias (THOMSON and TRLIN 1970). To a considerable extent this may also be said of the elderly component in the population (KING and CALVERT 1970).

Territorial Mobility. — A most significant development in the 1960s was the emergence of territorial mobility as a distinct area of investigation. But in this sphere data deficiencies are likely to remain a severe problem, at least until pertinent material becomes available from the 1971 census. A number of studies on estimates of net migration, with all their limitations, have nevertheless served the useful purpose of shifting the emphasis in this field away from the impressionistic and have facilitated a more definitive approach. Hence broad insights have been obtained into territorial mobility among local authorities spread over the whole country (MCCASKILL 1964) or large parts of it (HEENAN 1968).

Deeper insight into the spatial process of movement, direction and distance moved, and the nature of differences between migrants by occupational class has been forthcoming from numerous published and unpublished discourses using samples of migrants related to a unique place or region (KEOWN 1971).

The small amount of work so far completed in the closely related field of residential perception suggests a most promising line of research which calls for further detailed study (JOHNSTON 1971). Over-all, both movement of Maori population (ROWLANDS 1971) and migration to,

from and within specific urban centres appear to have received favored treatment. On the other hand, comparatively little is known about territorial mobility among rural folk (CANT 1967), indeed about most aspects of rural population, and especially the farm component.

Increasing theoretical orientation. — With relatively few noteworthy exceptions, of particular note being E. P. Neal's long series of scholarly papers on demographic matters published mainly during the inter-war years, the more important basic research on New Zealand population has been accomplished since 1945, and mainly after 1960. But much, perhaps, most, of the more substantive work has in the past been of a descriptive, impressionistic and discursive character. This weakness has become much less apparent in the years since 1960, and there are signs of an increasing theoretical orientation.

Need for Pure Demographic Research. — Even so, there exists a considerable need for further pure demographic research and environmentally concerned population enquiry based on rigorous empirical foundations comparable with those found in two recent doctoral theses. Each makes a significant contribution to furthering our understanding of the New Zealand population structure, trends within it and process of change at work. The reference is to Pool's dissertation on the growth of Maori population from 1961 to 1969 (POOL 1964), and Vosburgh's more recent analysis of social and demographic influences affecting the structure of the New Zealand family over the period from 1886 (VOSBURGH 1971).

There is indeed wide scope for further fundamental research. From the substantive literature reviewed above, one is able to glean little information about many important aspects of New Zealand population. To some extent this situation reflects the youthful stage in the development of the social sciences in New Zealand; it also reflects, among other factors, long-standing deficiencies in the kinds of information made available from the vital registration and census systems.

Obvious gaps in Population Knowledge. — The following appear to be some of the more obvious gaps in present knowledge on New Zealand population. Although national levels and trends in fertility are fairly well documented, a large question mark surrounds most behavioral aspects of fertility. This is so, for instance, whether material is sought on inter-group differences, other than the more readily observed rural/urban, Maori/non-Maori, etc., differences, on general and group specific attitudes to completed family size, or, in the case of contraception, on the extent of firm knowledge and effective usage, as an approach to the problem of assessing the needs of various sections in the society, and social factors influencing contraceptive practices and achieved fertility levels.

Turning next to territorial mobility, the primary process underlying the internal redistribution of population, one finds that much detail remains to be supplied about where New Zealanders move, who moves, and why they do so. There is also little understanding of the significance of differential mobility for the social structure and economic development in both sending and receiving areas. Another highly relevant area of needed research is interrelationships between regional demo-

graphic structure and over-all regional development as both a social and an economic process. And, not least, little serious research effort has yet been diverted to the problem of future population - its growth rate, size, structure, and distribution.

A further matter of concern is the organization and objectives of demographic researches in this country. Hitherto the greater part has been conducted in the universities and by government departments on an ad-hoc basis. Although in the past some informal liaison has been maintained at an interpersonal level, there appears to have been little concerted formal co-ordination of research effort, between individuals, disciplines, institutions or government departments.

Avoidance of Duplicated Research. — In these circumstances, the possibility of needlessly duplicated research would seem to be very real. If the best use of available data resources, scarce research expertise, and so on, is considered to be a desirable objective in the national interest, there would appear to be a strong case for some kind of organization charged with a degree of overall responsibility in the population field.

Indeed the Dominion Population Committee, reporting, in 1946, recommended the creation of a secretariat, attached directly to Cabinet, to be responsible for a continuous study of population movements. Franklin has recently restated the case (FRANKLIN 1972). He has argued that there are sound economic and social reasons why we should plan for a very slowly increasing population on the eve of the twenty-first century. But at the present point in time, government has not got its disposal either the knowledge of the instruments with which to achieve this kind of growth objective.

Complementary Role: Looking to the Future. — A central organization along the lines indicated might well have responsibilities other than the limited task of continuously monitoring critical components of growth. For instance, it could usefully maintain a record of data resources and of research being undertaken throughout the country, and it could well act in an advisory capacity to the appropriate departments of government on matters affecting the kinds of information collected by and made available from the census and the register of vital events.

It might also be endowed with the capacity to initiate basic research into those areas of population growth, distribution and structure which are of national concern. This work could be done for the purpose of the organization itself or for those of, say other government departments, either by using its own personnel or through contracts accepted by outside individuals and institutions. In this respect the work of the suggested office of population studies, with its national, policy-oriented interests, would presumably complement rather than duplicate or supersede research in the universities and other institutions, and the strong programmes in basic research established in some existing government departments.

Important among these are the specialized studies on health problems and mortality undertaken by the Department of Health and the work on population projections conducted within the Department of Statistics and Education.

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