



# PHILIPPINE GEOGRAPHICAL JOURNAL

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## EDITORIAL

Quo Vadis ASEAN?

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The Role of Education and Training Facing Ocean  
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The German Reunification – Three Years Later:  
Geopolitical and Area Planning Viewpoint  
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The Angat Ophiolite, Luzon, Philippines:  
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Agricultural and Development in Rural Areas of Nigeria:  
The Case of the Akwa Ibom State  
*Christian O.E. Enoch*

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## QUO VADIS ASEAN?

The Association of Southeast Asian Nations has been increasing in membership through the years, i.e., from a grouping of five states in 1967 to a total of nine members at present. This attractiveness of the association appears to be an indication of its success and viability. Yet, looking back more closely at its history, the achievements were not actually substantial.

When the Communist forces in Indo-China won in 1975, ASEAN was forced to assess its relations with the rest of the region. The member-states resolved to accelerate and intensify the degree of cooperation among themselves. They agreed on pursuing an industrial complementation scheme and Preferential Trading Agreements. Furthermore, when Vietnam invaded Cambodia in 1978-79, the group felt an ever greater need for concerted action against what they perceived as an expansionist and aggressive design of Vietnam in the region. Perhaps, the response of solidarity that ASEAN has shown vis-à-vis the Vietnamese occupation of Cambodia may be considered its single greatest success so far.

However, with the gradual resolution of the situation in Indo-China and with the entry of Vietnam into ASEAN, the galvanizing effect of an external threat may have disappeared and there may be no more "siege mentality" to hold the grouping tightly together. But again, this political rationale would not be the proper one for the ASEAN in order to achieve solidarity and cooperation. For ASEAN was not established as a security aggragation but as a regional bloc aimed at economic cooperation. Sad to say, ASEAN has been found wanting in realizing this goal. If intra-ASEAN trade as a proportion of total trade can be taken as a measure of the group's level of cooperation, it may be observed that progress has been minimal since this trade has not been increasing.

Notwithstanding the perception by some observers of ASEAN as a successful regional association, ASEAN's achievement of its goal is, by and large, unimpressive and this may be traced to five causes. First, elements of economic complementation and comparative advantage are absent since the members specialize in similar exports—raw materials and intermediate manufactures. Comparative advantage in primary commodities is difficult to achieve in a region marked by uniformity in climatic and other physical geographic conditions. Second, fundamental differences prevail in ethnic composition, religion, language, culture and therefore also in the approach to life and the setting of priorities. Third, since the operating principle in intra-ASEAN interaction is based on consensus, the forging of unanimous decisions is fraught with difficulty. Fourth, and corollary to the above point, there has been observed reluctance among leaders of member-states to make short-term national sacrifices in exchange for long-term regional benefits. Last, the individual economic success of ASEAN states has made it less imperative that regional cooperation be strengthened and institutionalized.

Although it may not be a healthy idea for Asian cooperation and politico-economic stability, a factor that can again refocus ASEAN's attention towards greater solidarity is China's recent territorial adventurism and claims in the South China Sea. Alternatively a more healthy *raison d'être* would be the consciousness of the economic challenge posed gigantic economies of Japan and China. A strong ASEAN internal economy can shield the region against destabilizing external economic forces emanating from the two trading powers or from North America and the European Community for that matter. Among others, this idea can be a potent rallying point among ASEAN members if they do not want to see themselves engulfed and rendered economically and, by extension, politically impotent by these two economic superpowers.



## THE DEVELOPMENT OF GEOGRAPHY IN THE PHILIPPINES<sup>1</sup>

MELITON B. JUANICO<sup>2</sup>

### INTRODUCTION

The discipline of geography, often variously referred to as the "universal science" and the "mother of natural and social sciences," has experienced a cyclical pattern of development from antiquity up to modern times. Periods of growth and prestige alternated with periods of lassitude and prosaism. It appears that geography reflects the changing interests and concerns of man throughout recorded history. This paper will discuss this global cyclical development of geography and use it as a springboard for digressing on the development of the discipline in the Philippines. It may be said that geography has also developed parallel local patterns and expressions reflecting the goals of particular historical periods as well as the interests and values of its practitioners. This historical recounting will include the reasons for geography's low profile in some areas of the world and will be capped later by a discussion of the current status and potential of the discipline and how this status can be enhanced and this potential realized.

### GEOGRAPHY FROM ANTIQUITY THROUGH THE PERIOD OF GREAT EXPLORATIONS

During the Greek Period, geography used to be an important branch of knowledge along with philosophy, history, astronomy and mathematics. It was then known as the "study of the earth," having been derived from the Greek *geo*, meaning "earth" and *graphein*, meaning "to describe" or "to write." It dabbled in cosmology or the physical aspects of the earth and in chorology or the characteristics of regions and their inhabitants. The development of the discipline slackened during the time of the Romans who, unlike the scholarly Greeks, were more interested in conquering lands and building an empire. The development of geography particularly as a science even suffered "the doldrums" during the Dark Ages when the sciences or studies that would undermine the Roman Catholic Church's monopoly on knowledge were stifled. Fortunately, while Europe and the Holy Roman Empire were in intellectual slumber spending their time in fruitless debates on how many angels can stand on the head of a pin, the Arab world preserved the Greek and Roman classics and asked questions especially about their natural world that laid the foundations of modern science (Juanico, 1987: 2-13). We see, for instance, the flowering of knowledge in the great library of Alexandria in Egypt which was headed by Eratosthenes - the "Father of Geography" - and where Claudius Ptolemy prepared an eight-volume atlas called *Geographia*.

With the advent of the Renaissance, geography saw again a cyclical acceleration in its development when an intellectually and spatially inquisitive Europe turned to geography's navigational tools and cultural knowledge in the exploration of the earth. Thus, we see Pigafetta, the Venetian chronicler vividly recording Magellan's voyage and whetting the appetite of monarchs for more voyages. Aside from amassing descriptive data on exotic lands and peoples, geography also tried to be scientific, influenced in particular by the empirical methods of the biological sciences and their eminent practitioners like Charles Darwin and Aldous Huxley. It was Alexander von Humboldt, the German explorer and phytogeographer, who gave geography a truly scientific basis by insisting that the distribution of phenomena over the earth's surface should constitute a specific geographic task. We saw geography's influence even up to the turn of the century when people like Rizal still subscribed to geographic or

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<sup>2</sup>President, Philippine Geographical Society.



environmental determinism as when he attributed the indolence of the Filipinos not only to colonial conditioning but also to enervating effects of the torrid tropical sun. Geography, however, started to decline towards the turn of the century when it could no longer contain its broadening disciplinary content. Geology had to separate from geography when the former accumulated so much knowledge on rocks, fossils, minerals, and earth history and structure. Geography then became one of the victims of the specialization movement that swept the scientific world in the midst of knowledge explosion. Herein lie the seeds of the diminution of its scientific appeal for science feels it can only push the frontiers of knowledge through specialized disciplines.

And so we see in many countries today geography suffering from a loss of prestige like other holistic disciplines. The low image of geography appears true in the Philippines, in the United States and in many other countries. However, in Europe, particularly in France, Germany, Great Britain, Sweden and Russia where geography has a long tradition, the discipline has respectability and focus. So, too, in some countries which have been directly affected by the British educational system during the colonial period and this would include India, Australia, Malaysia, Nigeria, Singapore and Hongkong. In the United States, the discipline has a poor image, despite the fact that over 400 colleges and universities in that country maintain geography departments and that close to 150 departments offer graduate degrees in the discipline (Ulack, 1983:143).

### **Reasons for Geography's Low Profile and Misconceptions about it**

As the reasons for the poor image of geography are discussed, an effort will also be made to dispel some of the "fallacies" about the discipline that are held by non-geographers. One reason for geography's low profile is the perception that it is a new discipline and thus has not had the long exposure that most other disciplines have had. As we have seen, it is actually an old subject that dates back to the Greek Period and which can be proud of a long intellectual tradition. What this obviously calls for is sustained and intensified efforts in promoting the discipline. Perhaps, what is new is the current "revolution" in geography which stresses the scientific or problem-solving approach. For instance, until after the 1940's in the United States, geography was largely a descriptive and taxonomic subject in American institutions until it awakened to the need for going analytical in its methodology. While this exciting change has brought about a spurt of growth in the number of geography students, it has also added to the confusion about what geography is and what geographers do.

This leads to the second reason for geography's weak profile especially in the academe. This refers to the perception that the discipline has a "fuzzy" image with regard to its topical and methodological focus. There is the thinking that geography is a multidisciplinary subject without a coherent center - that it is a discipline composed of a loosely knit group of specializations that do not have much common. This is understandable because of geography's traditionally holistic nature and this holism is seen, for instance, in the "wheel of geography" which shows the compass of its interests (Fig. 1). While science may look askance on this seeming lack of specialization, it is actually the strength of the discipline. It has been noted that there is a current trend in the sciences to revive the interdisciplinary approach in scientific researches. And the reason for this is that problems can be solved in a better manner if the method in analyzing them is not piecemeal or compartmentalized. In the interdisciplinary approach, geography has the ability to reveal the cognitive structure of concepts and therefore to integrate them satisfactorily. In fact, the Spanish philosopher Jose Ortega y Gasset has criticized the tendency towards overspecialization as the "barbarism of specialization." As for the need for rigor, this can also be achieved by geography through specialization in one of the different subdisciplines associated with it. Furthermore, this image of superficiality can actually be circumvented by adopting the spatial point of view as the methodological focus of the discipline.

This spatial viewpoint or methodology can be the distinguishing feature of geography, just as the anthropologists focus on the cultural context, the psychologists on the behavioral context and the historians on the temporal context. Thus, any phenomenon that has variation in terrestrial space is "fair game" for geographic investigation and this is one reason why geography cannot also abandon its interest in other



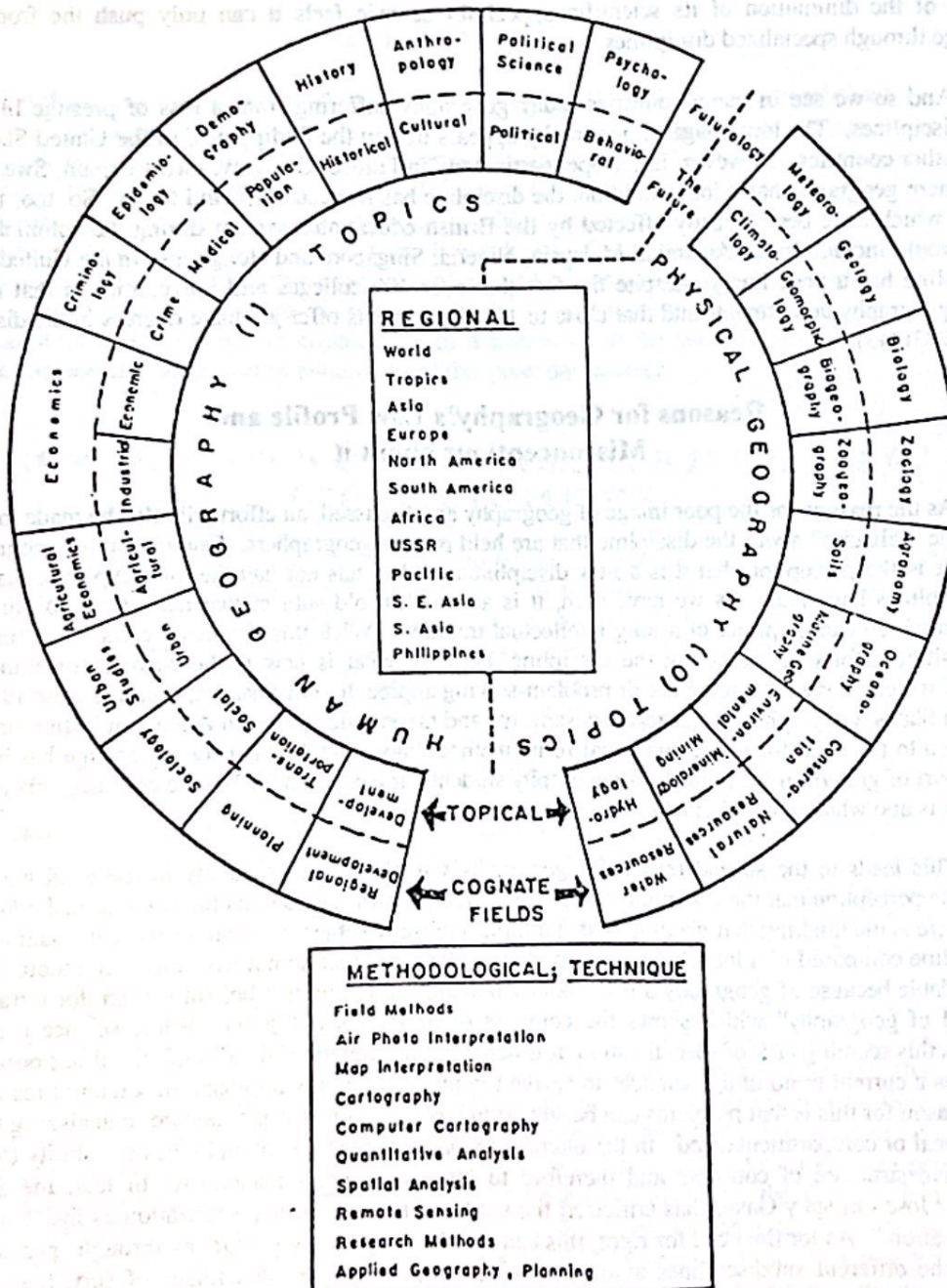


Figure 1. Major, Methodological and Regional Specialties in Geography



topics or disciplines. As one noted geographer observes, while other disciplines like economics and political science may only peripherally ask spatial questions, "it is only geography which realizes that the fact of space is not just an awkward inconvenience in our theories, but a basic organizing principle of existence." (Scully, 1982:12).

A third reason for the geographic field's poor standing is the perception that it is not a rigorous field of study, i.e., it is not a "hard" course like physics, chemistry or engineering. Many still consider geography as idiographic or descriptive that merely compiles vast amounts of non-integrated data. This idea stems from the newness of the nomothetic or analytical approach in geography as well as from the fact that one of the major subject matters of the discipline - spatial or territorial behavior of humans - is difficult to quantify or operational define. However, it must be pointed out that geography has progressed from the descriptive approach to the analytical one, increasingly forcing itself to ask the questions "why" and "how" instead of "who," "what," "when," and "where." In fact, one of the influences in modern geography is quantification where we see statistics, mathematics, calculus and computer-based Geographic Information Systems being used as standard tools not only in physical geography but also in the more subjective realm of human geography.

The fourth reason for the geographic field's poor standing among the disciplines is the perceived lack of employment opportunities and limited chances for social advancement with a degree in geography. Students would rather pursue such more well-known courses as business administration, engineering or architecture for which jobs are more available and where remuneration is perceived to be higher. Actually, the employment field in geography is wide in government, teaching, research, business, military, consultancy and Non Governmental Organization work. Government has traditionally been the source of employment for geography graduates, especially those agencies involved with tourism, city and country planning and with the environment. Large establishments are now creating environmental planning/monitoring units within the corporate structure and geographers have the training to participate in the work of these corporate units.

## DEVELOPMENT OF GEOGRAPHY IN THE PHILIPPINES

This section will deal with the history and development of geography within the academe and outside it and from the Spanish Period up to the present. Like the cyclical development of geography in world history described earlier, the ebb and flow of the discipline in the country will now be discussed.

### Geography in the Elementary and Secondary Schools

It may be observed that during the Spanish Regime the development and propagation of geography was slow and limited. Following the Royal Decree of 1863, for instance, the subjects of General Geography and History of Spain were taught in the primary grades. However, given more emphasis was education for social refinement and distinction such that education was designed for the upper classes and not for the masses (Aldana, 1949:6).

When the Americans came at the turn of the century, geography became an important subject particularly in the public elementary and secondary schools. From 1904 up to the Philippine Commonwealth which was established in 1935, geography was taught as a separate subject under the primary, intermediate, high school and collegiate curricula. Under the primary curriculum, geography was taught first as Geography and later as Homeland. Under the intermediate curriculum, the subject matter was World Geography. Under the high school curriculum, geography was introduced separately as Physical Geography. This was continued until the passage of the Education Act of 1950 whereby Geography was integrated with the several social disciplines into what became the Social Studies in the elementary grades; At the high school level, geography was no longer taught. Later the Social Studies became limited to Geography, History and Civics (GEKASI).



In the case of private schools during the American Period, until 1950, almost the same pattern of curricular offerings found in public school was also observed. In the 1950's, Social Studies was taught from Grade I to VI. Social Life also took over the position of Geography in the typical First, Second and Fourth Year curricula. Later Social Life was exchanged for Economics in the Third Year curriculum. Economics was then taught in the Fourth Year (Fresnoza, 1950: 234-240). The introduction of Social Studies in place of the separate teaching of geography and other disciplines was a result of the rise of experimentation in American education during the first quarter of the century. The Social Studies were supposed to interrelate for the students the understandings of the different social sciences in dealing with social problems (Douglass, 1967: 41-45). Amidst the increase of theoretical content among the social science disciplines, there was a need to select for young minds only those concepts that are relevant to their society or to the goal of socioeconomic development.

Except for a brief period during the Japanese Occupation when Social Studies was dropped from the educational system, the post-war period saw the continued offering of the Social Studies in the elementary levels as an integrating subject for the social sciences. Under the elementary school curriculum, for instance, Social Studies included character education, geography, history, civic, community problems, good manners and right conduct, and Filipino customs and traditions (Martin, 1980: 315). But then it was noted in the 1970's in the United States and in the Philippines that the teaching of geography under the Social Studies umbrella at the elementary and high school level has deteriorated as shown by the poor knowledge of pupils and students of the geography of their country. It was noted that Filipinos and Americans were becoming geographically illiterate and parochial peoples who know little about the world they live in and who may be called peoples who are "lost in place."

The above realization has spurred a move to return to the teaching of geography as a separate subject in the lower educational levels at the start of the 1980's. In 1981, then Minister of Education Onofre D. Corpuz gave geography a boost when he said, "I have already instructed my Ministry Staff ... to reintroduce geography as a separate subject in the school curricula. But they are still fighting where to place it but I insist that it would be in the elementary and also be in the high school" (1981:7). Succeeding educational administrations, however, have not really actualized this plan and the curricular changes that were done involved only a juggling of Social Studies emphasis, with geography merely fused with the other social sciences in one subject.

Thus, presently, we see in the elementary curriculum the following offerings: Civics and Culture from Grade 1 to 3 and Geography/History/Civics from Grade 4 to 6. In the secondary curriculum, we do not even see geography as expressly mentioned, but is only embodied in the following offerings: Social Studies I (focused on Philippines and Government), Social Studies II (focused on Asian History), Social Studies III (focused on World History), and Social Studies IV (focused on Economics) (DECS, n.d.). Looking at the Minimum Learning Competencies in each of the above subjects, it may be observed that the cognitive and psychomotor content in geography is superficial. It begs for a more exhaustive treatment of the geographic knowledge and skills necessary to make a student geographically literate.

### **Geography at the Collegiate Level**

The teaching of geography as a subject in college was started in the 1920s at the College of Education of the University of the Philippines. The course was offered to meet the needs of students pursuing the degree of Bachelor or Science in Education. In the early 1930s, the discipline of geography was transferred to the College of Liberal Arts where it became a part of the Department of Geology under the Chairmanship of Dr. Jose M. Feliciano who was known more as a geographer than as a geologist. The unit of geology grew faster than geography of the mineral industry. More support was extended by the U.S. Assistance Fund for the geology section of the Department.

When the Department instituted the B.S. Geography course for the purpose of producing professional geographers, only two enrolled. Mr. Dominador Z. Rosell was one of the first graduates of the program in 1935 and who later played an important role in promoting geographic education and research in



the country. Before World War II, the subject called Physiology was made a requirement for students taking up the first two-year course in the arts curriculum of the then College of Liberal Arts. The subject, which was essentially a course in Physical Geography, was the contribution of the Department to the education program of the University. It was taught by both instructors in geology and geography. It was later changed to Introductory Physical Science and added, in addition to geology and geography, concepts in physics, chemistry and mathematics (U.P. Department of Geography records, n.d.).

It was in the early 1950s when the Department offered the MS in geography in order to produce qualified instructors and researchers in geography. The teaching staff of the Department was augmented by Visiting Professors from the United States in the persons of Professors McIntyre, Huke, Cutshall and Doerr. In 1953, the Board of Regents passed a resolution authorizing the offering of a Ph.D. program in geography. In order to provide instructional support for this program, scholars were planned to be sent abroad to specialize in geographic studies. It was then Telesforo W. Luna, Jr. who was sent in 1954 as a U.P. Fellow at Clark University and who later obtained a Ph. D. degree in geography in 1957. Dr. Luna became Chairman of the Department from 1972 to 1976. (Salita, 1985) After the separation of geography from geology in 1983, he again took over the chairmanship of the Department up to 1996.

Geography and geology coexisted harmoniously for 45 years under Department, sharing the same facilities but pursuing research independently. During this period, Dr. Domingo C. Salita – a faculty member of the Department – became the Dean of the College of Arts and Sciences after he held the chairmanship of the Department from 1970 to 1972. The time came, however, when the demand for geology graduates rose and with it the disparity in enrollment, faculty and needs of the discipline. Amidst diverging interests and needs, geology and geography broke up in 1983. During that year, the College of Arts and Sciences also split up into three colleges, with the Department of Geography being placed within the College of Social Sciences and Philosophy (CSSP). The rationale for the inclusion of geography within the CSSP lies in the current thrust of geography which is towards the concerns of the social sciences rather than those of the natural sciences (Salita, 1985).

As part of the effort to nurture the new Department of Geography, instruments and book donations were requested from the Federal Republic of Germany. A German professor in geography, Dr. Dirk Bronger, was also sent to the Department to enrich its curriculum and to reinforce the teaching of the Department. After Dr. Bronger, two other visiting professors in geography also came in the 1980s and these were Drs. Richard Ulack and David L. Clawson (Table 1). Foreign scholars who have contributed to the development of geography in the country through research, advising or writing were the following: the German geographers Albert Kolb and Wolfgang Senfleben; the American geographers Donald Fisher, Daniel Doeppers, Joseph E. Spencer, Walter Robb, Frederick L. Wernstedt, Robert Reed, and Donn Hart; the British geographers Terry G. McGee and Terence M. Burley; and the Dutch geographer Canute Vandermeer (Clawson, 1985)

**Table 1. Foreign Geographers with Extensive or Research Experience in the Philippines.**

Experience Category	Name	Years	Institution
Lectures/Researchers in Geography:	Wallace McIntyre	1952 - 1953	UP Diliman
	Robert Huke*	1955 - 1956	UP Diliman
	Alden Cutshall*	1957 - 1958	UP Diliman
	Arthur Doerr*	1958 - 1959	UP Diliman
	Donald Bennett*	1963 - 1964	Far Eastern University
	Dirk Bronger	1975 - 1979	UP Diliman
	Richard Ulack*	1982 - 1983	UP Diliman
	David Clawson*	1984 - 1985	UP Diliman

\* Fulbright-Hays Program Exchange Professors



<p>Researchers in Geography:</p>	<p>Christian Dufournaud 1998 – 1999 UP Diliman</p> <p>Albert Kolb Joseph Spencer Frederick Wernstedt Donald Fisher Daniel Doeppers Walter Robb Donn Hart Robert Reed Canute Vandermeer Wolfgang Senfleben Terry McGee</p>
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Today, the University of the Philippines is the only school in the country with a Department of Geography. Even then, the Department has remained small in terms of faculty, staff and student enrollment. There are currently six faculty members, two administrative staff, and a total enrollment of about 50 student majors. One faculty member is scheduled to come back next year with a Ph.D. degree in geography from Rutgers University. The Department offers BS Geography and MS Geography programs while the Ph.D. program is on hold pending the accomplishment of the University requirements for offering the program. The course offerings under the undergraduate and masteral levels are shown in Table 2. It has been observed that, whereas before a significant proportion of the undergraduate program were transferees from other U.P. colleges for the past few years, now most of the entrants into the program are fresh non-transferees. Students from other colleges are also increasingly enrolled in geography subjects as their cognates. These trends indicate a current awareness of the usefulness of the discipline.

Geography courses but not degrees are not offered in at least 13 other institutions of higher learning in the Philippines, most of them being located in Metro Manila. These courses are usually offered either as required or cognate subjects for certain degree programs. Students enrolled in these courses as well as those at U.P. number about a thousand. The schools offering service geography courses are: University of the East, University of Sto. Tomas, University of Manila, La Consolacion College, College of Holy Spirit, Far Eastern University, Philippine Women's University, National Teachers' College, Philippine Normal University, Ateneo de Manila University, Miriam College, San Sebastian College and Centro Escolar University.

**Table 2. Undergraduate and Graduate Program Curricular Offerings at the Department of Geography, College of Social Sciences and Philosophy, UP Diliman**

Undergraduate Curriculum Offerings	Graduate Curriculum Offerings
Elements of Geography	Field Geography
Physical Geography	Spatial Analysis
Economic Geography	Marine Geography
Economic Geography of the Philippines	Seminar in Geography
Climatology	Applied Climatology
Resource Management and Conservation	Agricultural and Soil Geography
Geography of International Trade	Problems of Economic Geography
Geography of the Philippines	Industrial Geography
Geography of the Tropics	Cultural Geography
Geography of Asia	Population Geography
Geography of Soviet Union	Geography of East Asia
Geography of North America	Geography of South Asia
Political Geography	Geography of Southeast Asia



Quantitative and Spatial Analytical Techniques  
Graphics and Cartography

Seminar in Geography

Applied Geography

Geographic Aspects of Philippine  
Economic Development

Cultural and Population Geography of  
of the Philippines

Environmental Geography

Urban System

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## Geography Outside Academe

In late 1950, Dr. Jose M. Feliciano, then Chairman of the then Department of Geology and Geography, organized the Philippine Geographical Society whose objectives are specifically geographic: "to foster geographic interest and geographic education, and to encourage the application of geographic knowledge in education, government, business and other forms of activity."

On December 8, 1950, 21 people with a love for geography gathered at the Manila Office of Prof. Dominador Z. Rosell, then Chief of the Soil Conservation Survey of the then Division of Soil Conservation of the Department of Agriculture and Natural Resources. The group included distinguished Filipino and American scientists, geographers and businessmen. Since its founding, the Society has had the following presidents: Dr. Jose M. Feliciano, Dr. Charles O. Houston, Prof. Dominador Z. Rosell, Dr. Alejandro Apacible, Dr. Domingo C. Salita, Mr. Antonio Varias, Col. Paterno R. Santos, Dr. Telesforo W. Luna, Jr. and Prof. Meliton B. Juanico. Of these, Prof. Rosell served the longest (Alcaraz, 1981:8-12).

Like the admission rule of the Royal Geographical Society of London, any person with interest in geography and who believes in the objectives of the Society is eligible for membership. Members are classified into Honorary, Life, Regular and Sustaining Members. The Society is registered as a non-stock, non-profit organization with the Securities and Exchange Commission. Over the past few years, membership has fluctuated around the total of 100. The Society has participated in foreign conferences such as those of the International Geographical Union, is affiliated with the National Research Council of the Philippines, and is a member of the Philippine Social Science Council. It has conducted research projects, held seminar-workshops especially for social studies and geography teachers, engaged in book writing projects, held and joined conferences, and participated in advocacy activities on environmental protection and the restoration of geography as a separate subject in schools.

In 1953, the Society launched the *Philippine Geographical Journal*, a quarterly publication aimed at serving: as an outlet for scholarly articles ranging from geographical/spatial to economic topics; as a medium for the expression of professional opinions; and as a journal for reports on activities of the Society and other items of relevance to the geographic discipline. Its volumes usually contain academic articles and, occasionally, editorials, addresses, book reviews, reports and Society and geographical news. The Journal has come out regularly except from 1958 to 1963 when Prof. Rosell, who was then the Editor and Business Manager, left to serve as soil technology consultant to the Cambodian government. Lately, the Journal has been having publishing difficulties due to increased costs in printing services and the withdrawal of financial support of cash-strapped public and private institutions. It has been noted, too, that the proportion of article contribution by geographers is decreasing. We are proud to say, however, that the Journal is internationally and locally circulated, having over 100 foreign subscribers and over 50 local subscribers over the years. The Journal maintains substantial exchanges with other publications around the world and it is the only geographical journal entered in the Serials of the University of Chicago.

## Relevance of Geography to National Socioeconomic Development

It is apparent that much has to be done to improve the image of geography. However, it cannot be denied that geography holds much potential as a tool for national socioeconomic development. There is now an increasing realization and clamor for a more comprehensive and integrated approach in confronting



national problems, particularly in the areas of equitable spatio-socioeconomic development and environmental use and management. For instance, the then Task Force on Human Settlements (1974) observed that "the prevailing spatial distribution of infrastructures and services, housing, cities and urbanized centers, reflect the lack of attention to the integration of spatial elements of development." Or as Corpuz (1981:6) stressed, "GNP and these other concepts are like pie in the sky... and will have no effect on the betterment of human life, unless they are related to the earth's surface where people, agriculture, manufacturing and commerce exist and take place. In other words, they (economic plans) must be geo-based, location-based, they must all be related to geographical space and geographical distribution... In other words, income equity must be accompanied by geographical equity."

An indication of the importance of geography was seen in the early 1970s in the project aimed at delineating the regions of the country. The project was jointly undertaken by the Department of Public Works and Communications, the Presidential Advisory Council on Public Works and Community Development, and the U.P. Institute of Planning (Afable, 1981:1-3). Geographic principles in spatial/location analysis were employed to harmonize the physical features, the infrastructure, the economic conditions, the cultural/ethnic groupings and the administrative requirements of the different regions. The regional delineation currently in use is the result of that study. Another evidence of geography's significance was that, as early as 1977, the government has seen the need to actualize the complementation of economic or sectoral development plans with spatial plans. The result was the publication of the National Multi-Year Human Settlements Plan, 1978-2000 and the Regional Multi-Year Human Settlements Plan (Human Settlements Commission, 1977).

More recently, the National Economic and Development Authority has started preparing the National Framework for Spatial and Regional Development (NEDA, 1977) which is designed to complement the Medium-Term Philippine Development Plan. Here, the understandings and methodologies of geography were liberally used. This spatial framework takes a holistic/geographic view of the land and physical resources as well as socioeconomic potentials and comparative advantages in defining the spatial and regional development vision for the country. Geographers have been consulted, too, in the formulation of the current Land Use Code bill which aims to rationalize land use in the country through a delineation of areas for protection land uses, production land uses, settlements developments and infrastructure development. Spatially conceptualized development plans like CALABARZON, MARILAQUE, MIMAROPA, CARAGA, Northwest Luzon Growth Quadrangle, and BIMP-EAGA are based on the geographic natural units, a subject matter which is studied by the sub-field of geography called chorology, i.e., regional geography.

## SUGGESTIONS ON HOW TO PROMOTE GEOGRAPHY

If there is to be a future for geography in the Philippines, then some suggestions on how to promote the discipline and improve its image are in order. First, a general activity would be an information, education and communication (IEC) campaign that should be initiated by entities concerned with geography. This can be done by the Department of Geography of the University of the Philippines (UP), the Department of Education Culture and Sports (DECS) and the Philippine Geographical Society (PGS). Each can devise its own way of promoting geography, although some of these strategies will be stressed in the following discussion.

Second, the DECS can offer a purely geography subject at the primary level although still within the Social Studies scope and sequence framework. Presently, exposure to geography at this level is very inadequate. At the high school level, either Social Studies I or II should include a substantial coverage of Philippine geography and natural resources. There appears to be much emphasis on history even though nationalism can also be heightened by consciousness of the material national patrimony.

Third, effort should be exerted to promote the specific skills or methodologies with which geography can easily be identified. These should be the practical or "marketable" skills that will increase the demand of geographers in the public and private sector. These skills can include: computer and manual



cartography, including skills in Geographic Information System (GIS) and remote sensing; locational and spatial analyses; aerial photograph and map interpretation; preparation of Environmental Impact Assessment (EIA); field methods; and quantitative methods. This means a radical revision of the collegiate curriculum away from such descriptive subject like regional geography and toward subjects that deal with the prime deficiencies in Philippine development - inattention to spatial/regional equity and to ecological integrity.

Fourth, state universities can start experimenting with the offering of geography degrees at the undergraduate and masteral levels. Perhaps, this can be included in their mandate through legislation as well as administrative and executive orders. Since state schools are subsidized, they can start the experiment at less risk compared to the private institutions. However, they will have to offer a "new" geography focused on the marketable skills mentioned above. This strategy will create a cadre of professional geographers who should be encourage to pursue a masteral degree in geography so that they can train teachers to teach the discipline at the elementary and high school levels. These recommendations appear to be the moves that need to be undertaken posthaste.

In conclusion, it is apparent from the evolutionary exposition of this paper that geography has a significant role to play in our socioeconomic development as well as in the personal enrichment of the individual through its spatial and holistic methods of analysis. The cycle of attention and neglect in the history of ideas is again bringing space and holism to a new crest of importance and respectability. Geographers would be well-advised to ride this crest of attention if it is to prosper. Otherwise, the warning of two geographers may well be apropos in this regard: "The present is a time of great challenge and opportunities for the geographical profession. The challenge lies in the fact that the topics with which geographers have been concerned... have now become matters of great public importance... if geographers do not respond they will find that others adopt a role which they have traditionally regarded as theirs" (Coppock and Sewell, 1975).

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## THE ROLE OF EDUCATION AND TRAINING FACING OCEAN SUSTAINABLE DEVELOPMENT<sup>1</sup>

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### INTRODUCTION AND RATIONALE

More than ever before, peoples of the world have started to realize that indeed we live in a global village surrounded by a common ocean environment. We know and accept that some loss of habitats and amenities in this environment must accompany developments that are essential and acceptable; that a fisherman's share of the catch must decrease as more boats and nets join the fleet. But we also know that runaway depletion should not be acceptable and is unnecessary. We also recognize the root causes of degradation of our coastal and ocean environment which are:

- imbalance between rapid population growth and dwindling resources;
- improper regard of the true value of these resources;
- high consumption rate (overconsumptive lifestyle);
- our institutions encourage to degrade, rather than conserve; and
- lack and improper use of knowledge required to solve the problems.

When these root causes are translated into effects, environmental problems result, creating issues which are no longer the monopoly of science to address, but need sociocultural and institutional considerations as well. In developing regions, an explosive population growth coupled with rapidly dwindling resources is bringing about short-term economic development mostly at the expense of the ocean environment. This fact has aggravated the social and economic conditions of the greater portion of the population making ecological concerns serious socio-economic issues. Today these issues bring about problems with far-reaching effects that go beyond socio-political boundaries. Indeed, for the past decades, we have ignored these effects and their warning signs in the condition of our environment, suggesting that we are moving in the wrong direction and that there are few, if any, short-cuts back. We have been rapidly foreclosing options for the future, possibly by overshooting limits (Catton 1982).

While economic growth has improved income and increased employment opportunities, it has also resulted in adverse environmental changes that are threatening human health and the functional integrity of the ocean ecosystems. While economists and businessmen are saying that we are at the peak of our economic development, there is an overriding view worldwide that this level of growth that characterizes the 20<sup>th</sup> century cannot be sustained.

### Nature, Objectives and Approach Of This Paper

I commended the UNESCO Working Group on Marine Science Education, the World Commission on Environment and Development (WCED) and the United Nations Conference on Environment and Development (UNCED) of June 1992 in garnering technical academic and political consensus on the need for sustainable development. Here, I use their views as my springboard, though I am far less comprehensive. As a contributor to this seminar, I have ensured that the following account is not only compatible with those of the other contributors, but likewise mutually reinforcing. I deliberately retained certain overlaps with their papers. This is to emphasize the point that no matter what the approach,

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we reach the same two conclusions: (1) "...that it is no longer acceptable to make economic growth as conventionally perceived and measured, the unquestionable objective of economic development policy"; and (2) that proper, responsive, and holistic education, complimented by training, is a key to the solution of our coastal and ocean environmental woes.

On behalf of IOC, and adopting the approach from Agenda 21, Chapter 17, this background paper aims to *provide some useful insights* on the role of ocean education training in: (1) the integrated management of the coastal areas, deep-ocean, and small islands; (2) defining areas of cooperation between the Intergovernmental Oceanographic Commission (IOC) and the International Geographical Union (IGU); and (3) designing a mid-term cooperative programme between the two organizations. These insights are in the form of principles, perspectives, and challenges useful in guiding actions. As the implementation details of the proposed IOC-IGU initiative (education and training in integrated coastal management, manual preparation, and databank development) will be tackled at the Sagres meeting, no attempt has been made here to consider these aspects in great detail. The ultimate goal is to input into the joint effort and develop a common vision for an ocean science wherein natural and social sciences and research and education interact and compliment each other effectively.

### A VIEW OF THE WORLD'S COASTAL ZONE

Coral reefs, seagrass beds, mangroves, and marshes are among the world's most important -and most endangered- ecosystems. They are the major life support and protective ecosystems of the world's coastal zone. Thence, they perform a wide spectrum of biological and physical functions which are the bases of their environmental and economic roles. They nurture the sea and protect the land. They provide vital breeding grounds and habitats for fish, shelter for coasts from the effects of storms, and they inhibit erosion. Nearly two thirds of all fish caught throughout the world are hatched in mangroves and tidal areas. Roughly 80% of all commercial species of fish and shell fish in the tropics depend on coral reefs, seagrass beds, or mangroves as critical stages in their life histories. This feature alone justifies a strong research effort on the world's coastal zone. In the tropics, the marked dependence of coastal municipalities upon their marine resources makes the improvement of marine environmental quality a policy objective common to these countries in the region. Worldwide, fish production from the wild is leveling off or is reaching its biological peak of about 100 million tons and there are few new fisheries resources which can contribute to any substantial increase.

Another special significance of the coastal zone is that it is the focus of intense urban and industrial pressure. Its natural resources are critical to the livelihood base of the people, and in this area, many historical and cultural resources are found. For developing countries, the oceanic realm may be of equal if not greater importance to people but for most of these countries, this portion of the oceans is 'untouchable' and virtually unknown.

### KEY COASTAL AND OCEAN ISSUES

The key issues confronting the oceans can be placed under three broad categories: *biophysical issues; sociocultural issues; and institutional/policy issues.* This categorization, however, is artificial as these issues are interconnected and interdependent. If they are separated in this paper, it is only for convenience in presentation to facilitate ease in their understanding.

#### Biophysical Issues

The priority biological issues confronting the coastal and oceanic zones of the world are:

- degradation of ecosystems and habitats;
- declining water quality and pollution;



- declining coastal fisheries;
- endangered marine species and coastal wildlife;
- coastal hazards including ocean storms and flooding; and
- implications of sea level rise.

In fisheries, there is simply too much investment in boats and gear, too many fishers, and too few fishes to be harvested. In addition, coastal fisheries in many parts of the world are in the verge of collapse due to overfishing and poor management. In the tropics the situation is acute as more and more fish stocks are increasingly overfished and their habitats destroyed. Coastal fisheries continue to serve as the 'sink' for surplus labor displaced from land-based activities.

The increasing demand for fish was brought about by three factors: population growth; increase in disposable income; and increase in the relative preference for fish over other foods (Chua 1994). That year, the supply of fish permits an average kaput consumption of 12 kg/yr. It is much higher now. But projected population increases will make it impossible to maintain current patterns and levels of fish consumption without substantial production increases. Of the projected increase worldwide, from the present 4 billion by the year 2000, Asia will have at least 3.2 billion people living in our already congested environment (WB 1990). As early as 1991, FAO estimated that another 30 million tons at current prices will be needed to maintain this level and pattern of fish consumption. Without increases in supply, consumers will have to bid against each other for the limited supply, causing prices to rise. As a result, there will be a shift in consumption of fish, skewing the allocation away from poorer sectors of society. Real income in the developing world is increasing. This will continue to put an upward pressure on demand for high quality fish for the domestic market, increasing consciousness among affluent nations to consume healthy food, as fish is widely recognized and promoted as a healthy source of animal protein.

Meanwhile, considerable changes in the fisheries sector have taken place: technological advancements, increased public awareness of environmental and natural resource uses, and increased support from donors and policy makers for environmental and natural resource management. The sector could have responded to these changes with more effective management. Unfortunately, it has remained largely inept, management interventions are typically myopic, and short-term measures relieve symptoms rather than treat causes. Furthermore, in most developing countries, the sector in isolation as a small inconsequential offshoot of the agriculture sector (e.g. Philippines). The low profile of fisheries is reflected by its relatively small budgetary allocation in these developing countries.

Present sea temperature in the East Asian seas are expected to increase by 1°C (Chou 1994), the resulting enhanced evaporation and increased precipitation or rain likewise expected to affect water salinity. With the increase in precipitation, more nutrients will be washed out to sea which can either have positive or negative effects for seagrass and coral communities depending on the actual load. With erosion enhanced, current patterns in nearshore areas where the communities abound will be altered, with its adverse effects on the breeding and nursery functions of the ecosystems.

A rise of sea level within the predicted range of 20 cm by the year 2025 is likely to be insignificant compared with man-induced influences on the coastal environment. Nevertheless, there would be substantial negative impacts on the seagrass and coral communities because these would be subjected to inundation, increased frequency and severity of storms and wave surge, increased rates of shoreline erosion, modification of dynamic coastal physical properties, and damage to, or reduction of, shoreline protective structures and facilities.

## Sociocultural Issues

The priority sociocultural issues in coastal zone management are:

- poverty and conflict, especially over the use of, and loss of access to, natural ocean resources;
- rapid population growth;
- limited involvement of resource users;



- low credibility of the government (loss of people's trust); and
- lack of a shared vision.

There is lack of effective mechanism for allocating scarce resources among competing users, arising from unclear or unenforceable property rights (for example, decade-long struggle between inshore fishers using traditional fishing gear and commercial trawlers operating in the same fishing grounds for the same target commodity -shrimp). The resolution of this problem requires a better understanding of its root causes and their effects, as well as clear perspective of the community, its socioeconomic and cultural characteristics and the application of economic incentives or disincentives. Many of these actions go beyond the realm of the fishery sector (Fallon and Chua 1990).

The coastal zone in most developing nations are densely populated. In Southeast Asia alone, more than 200 million people (about 60% of the population) live close to the shore (Chua 1991). UNCED projects that by the year 2000, between 60-70% of people in coastal nations will reside within 60 km from the shoreline and over two-thirds will be in developing countries. In short, the coastal zone will be densely populated and urban centers will proliferate along the coastlines, with its concomitant intensified degrading activities. There will thus be an intense competition for land and water resources for fish production.

There exist certain misconceptions which have misguided man's interaction with his environment. People have an unclear perception of what the ocean environment is in relation to themselves, the view being often anthropocentric, not sociocentric nor naturalistic. In addition, development is predicted largely upon environmental exploitation, not its protection, as the latter is not yet a perceived social need but an expensive and time-consuming activity. Environmental preservation and the pursuit of economic goals are considered in conflict with one another because they are based on two incompatible basic principles: the ecological principle of 'stability', as a precondition of the sustainability of ecological systems, and the economic principle of 'growth', as the inherent logic of economic systems. The important point about these different viewpoints is that they will remain divergent so long as groups have different interests and different sources of information and knowledge.

Taken for granted partly because of the limited involvement of the people in planning and management, a 'shared' vision for the ocean environment is nowhere in sight. For the last decades, countries have made vision statements which changed as rapidly with the change in the administration. More importantly, these visions have been formulated largely without incorporating what the people want their environment to be, hence, the results are almost parochial statements that alienate the people, making them feel that they do not 'belong'. With the scenario, how can one expect them to actively participate in government project?

### **Institutional/Policy Issues**

The priority institutional/policy issues are:

- low level of institutional capability for coastal area management (especially at the local level, the capacity to implement sound policies is very limited);
- government's inadequacy to address the problem of dealing with commercial operators and implementing existing rules and guidelines;
- lack of mechanisms to limit free-access nature of some resources;
- lack of national policy on strategic development of the zone; and
- poor performance of science and researchers.

Political interference and mismanagement is a 'normal' ingredient in any development effort in less developed countries (Fortes 1995). These results from misguided priorities arising from meager information base, lack of expertise, political favoritism and inefficient bureaucracy in the face of a dire lack of financial resources. In many instances, new committees of Ministers or Secretaries are set to address the



issues. But these are with no new powers, no new funds, a laundry list of responsibilities, and a requirement to file a quarterly report. This type of activity just continues the old pattern of 'words for deeds' which is the administrative handmaiden for the path to resource exhaustion. The much needed but least felt 'political will' to support the new movement of coastal environmental protection is locked in the traditional bureaucracy and political elite in the region. Unfortunately, mitigative efforts being undertaken by the government and private sectors are insufficient, ineffective and largely socially unacceptable.

Pertaining to the poor performance of researchers and scientists, it is interesting to note that Asian countries that rank high in S and T performance – the basis of economic growth – have also done more in managing their resources (Lacanilao 1995). This is because in these countries, any projects that conflict with social benefits and environmental integrity are often excluded or given up. In Singapore, it has never been a part of economic policy to sacrifice a sector of society or environment in any development strategies. In Thailand, workers have stopped using tires for artificial reefs (AR's) since 1988; but in the Philippines, their unregulated deployment continues without studies.

In Southeast Asia, government policies to conserve the coral reef have been too few and too late and are the result of a failure in political governance. On the other hand, grassroots demonstration projects have shown that communities themselves can create and implement effective conservation programs with minimal assistance from the government (Clark 1989). In the case of the protected areas programme, one could politely describe it as transitional, less politely, as chaotic. In the Philippines at present, we have a system of 'paper-parks' at worst, without any system whatever for its 160 marine protected areas. In the absence of a coherent program, the future appears to depend less on the Environment Department's plans and policies and more on NGO and local strategies and upon the energies of a few motivated individuals. Where there is light today it is in the area of the latter two.

It is no wonder then that in October of last year (1997), world bodies affiliated with UNESCO, made the pronouncement that six years after Rio, the world's environment has become even more degraded. Indeed, the benefits to be derived from the commitment made by member states during those few fateful days in Brazil have not trickled down to the sectors which actually do the damage – the greater majority, the poor inhabitants of the coastal zones of the world, and the few elite who disregards environmental imperatives solely for monetary profit. While governments have not been remiss in offering solutions to improve the solution, these solutions give short-term benefits to select groups and degrade the environment at society's cost. Unless there is a substantial change in the national legislative agenda, the lack of national commitment to support and encourage the development of ocean science and ethics will remain a major deterrent to economic and environmental sustainability in the future.

## **ROLE OF IOC IN SUSTAINABLE COASTAL AND OCEAN DEVELOPMENT**

The work of the IOC, over the three decades since its inception, has focused on promoting marine scientific investigations and related ocean services, with a view to learning more about the nature and resources of the oceans. This has laid the foundation towards an expanded role of the IOC in meeting new challenges. In meeting these challenges, the IOC now focuses on four major themes:

- develop, promote and facilitate international oceanographic research programmes to improve our understanding of critical global and regional ocean processes and their relationship to the sustainable development and stewardship of ocean resources;
- ensure effective planning, establishment and co-ordination of an operational global ocean observing system to provide the information needed for oceanic and atmospheric forecasting, for oceans and coastal zone management by coastal nations, and for global environmental change research;
- provide international leadership for education and training programmes and technical assistance for systematic observations of the global ocean and its coastal zone related research; and
- ensure that ocean data and information obtained through research, observation and monitoring are handled and made widely available.



Hence as the bastion of the oceans, the IOC today is situated at the crossroads of science, culture, communication and education. While the resolution of all the problems in these areas are not within the scope of its mandate, the IOC, nevertheless, has the major responsibility to alleviate if not solve those aspects which deals directly with the ocean environment. This is especially true because its role has evolved from simply and largely as a scientific and research advisory body of member states, to that of a development catalyst, and mobilizer. It has to be the catalyst of change in ocean concerns. But it cannot be one, if its activities proceed under the banner of 'business as usual'. There is thus the need for IOC to more effectively liaise and seriously coordinate with other agencies with mutual concerns. Before it can be effective in this process, IOC should undertake a reappraisal of its relevance to the world and member states it is mandated to serve; it has to undergo an 'introspective cleansing', it needs to know what it can and cannot do, hence, the need to formulate strategies to strengthen the institution both from within and without. And no other period in the history of the world is more meaningfully timely than NOW when we celebrate the 1998 International Year of the Ocean.

### **EDUCATION AND TRAINING IN THE CONTEXT OF IOC's MANDATE**

Explicit in IOC's third theme but underlying all four, the development of national capabilities in marine sciences and services through education and training is high in its agenda. This is largely in the context of the programme entitled **Training, Education, Mutual Assistance, and Capacity Building (TEMA)**. Interwoven with the other objectives of the IOC, TEMA is aimed at filling the gaps in marine science knowledge and operational techniques in the field. Members of the IOC work in a global partnership to conduct research and strengthen networks regionally and globally. The Commission is a catalyst to stimulate and coordinate a range of specific assistance activities. IOC also advises other international agencies on how to help increase marine science capabilities in developing countries.

To develop and apply knowledge on the ocean environment and its resources, education and training are essential. It is mainly through the prerequisites of education and training of scientists and technical support staff that ocean research can be undertaken and the results added to the body of knowledge necessary for proper understanding and decision-making. Over the past several decades, there has been rapid development and growth of ocean science and its applications. The marine science and technology community is estimated to be ten times larger than it was some 20 years ago. Studies of the deep sea, coastal processes and climate-related events, to name just a few examples, have accelerated in response to improvements in knowledge and research techniques. Recent technological advances, notably in electronics, remote sensing and computer, are changing the way marine research is being carried out. The measure of the resulting scientific contributions to applications is best from the high volume of current marine resource exploitation and management activities like mariculture, ocean engineering, marine fisheries, coastal restoration, and pollution control.

As a consequence, education and training programs in ocean science, in related sciences and ocean engineering, need continual adaptation and updating in order, on one hand, to incorporate the new knowledge and technology, and on the other hand, to keep abreast with the changing potentials concerning marine resource exploitation and the impact of human activities upon the ocean environment. This is all the more important in view of the additional responsibilities that coastal nation are assuming under the new ocean regime embodied in the Law of the Sea.

### **TRENDS AND PERSPECTIVE IN OCEAN EDUCATION AND TRAINING**

Any effort for collaboration in ocean-related science need to consider the current trends and perspectives in these science. Doing so would put into proper context the actions undertaken and in the rightful place their consequences. Hence, in a workshop held as early as 1988 on marine environmental education for the year 2000 and beyond, UNESCO came up with certain programs and recommendations which are currently the basis of regional and international efforts to address common coastal and ocean



environmental problems. Some relevant details, extracted from responses of participants to certain theme questions, are presented below:

- The new direction of efforts in marine science is towards basic research, academic instruction, data storage and management, marine science application, and marine science management;
- The developing occupational areas that require exclusive or partial expertise in marine science can be foreseen as developing towards the year 2000 include:
  - management of coastal zone and its resources;
  - marine parks and protected areas;
  - management of planning and information;
  - mariculture of macro- and microflora and fauna;
  - environmental toxicology, pollution monitoring and control;
  - tourism and marine archaeology;
  - coastal engineering, seabed geological survey and offshore mining;
  - development of new products of marine origin;
  - remote sensing interpretation and application;
  - meteorology and climatology;
  - marine pharmacology and biogeochemistry
  - marine species taxonomy;
  - marine law, maritime geography;
  - waste management, environmental management and protection; and
  - coastal and ocean administration;
- In addition to specialization in biology, surveying, engineering, navigation, economics, there would be a need for additional subjects which will serve to integrate the marine and human ecology involved in coastal and offshore activities;
- Ocean science by the year 2000 will be more interdisciplinary in approach but with a solid foundation in the traditional science subjects of zoology, botany, chemistry, physics, geology, and mathematics, with molecular biology as becoming by then one of these basics;
- While personal computers will progressively become a standard part of the student kit, there would be as strong a move to avoid the temptation of using only electronic media as a teaching method and retain personal interaction between teacher and student at all levels;
- With distance learning, it is agreed that so long as the recipient has had the benefit of sound basic education and training and also has the opportunity for periodic refresher courses, distance learning and computer-based instruction will become important components of education in the future. However, they must concentrate on the development of interpretive skills.
- To deal with the enormous growth of information, the developing CD-ROM technology was viewed with hope, since it will vastly increase the capacity for storing data but it will also heighten the need for better access, standardized analysis, etc. Libraries will play an essential role;
- The main obstacles will be: shortage of funds for teaching and research, of trained personnel; low salaries for staff; lack of access to needed technologies; weak technical support infrastructures; barriers between disciplines; resistance to innovations in long-established educational institution; increasing capability and decreasing prices of computer technology encourage educational administrators to wait and see'; multiplicity of computer languages and systems; limited number and availability of research vessels; the high cost of marine research and the relatively low priority given to marine science; lack of innovation in curriculum development; poor public appreciation of ocean resources and environment; rapid obsolescence of computer technology; relatively small number of teachers and researchers with the necessary ability to promote interdisciplinarity and foster an integrated management approach.



## EDUCATION AND TRAINING: DEFINING THE JOINT IOC-IGU PROGRAMME

### Guiding Principles and Assumptions

Certain potential areas of cooperation between IOC and IGU have initially been identified. What is needed is to look at them critically so that all priority issues common to both organizations could be effectively addressed. At this point and in defining the role of education and training in the joint IOC-IGU programme there are certain principles and assumptions which need to be considered. They guide the formulation of a program of education and training on coastal and ocean resources management. A basis for orienting institutional and national education and training programs to respond to future needs, they also form the basis of and unify the classroom and field activities prescribed in regular school curricula. These principles include:

- Human beings are part of ecosystems, and they shape and are shaped by the natural systems;
- The sustainability of ecological and social systems are mutually dependent so that a shared vision of desired human and environmental conditions should be developed;
- It is through an ecological approach that the biological diversity, ecological function, and defining characteristics of natural ecosystems are recovered and maintained;
- It is desirable to integrate the best science available into the decision-making process, while continuing scientific research to reduce uncertainties;
- The best approach to coastal zone management is that which acknowledges that ecosystems are interconnected and institutions characteristically heterogeneous in time and space and which integrates sustained economic and community activity into the management of ecosystems; and
- In the implementation of ecosystem management principles, coordination between government and non-government sectors should be encouraged.

### Strategies

Very relevant to the current IOC-IGU joint initiative, and in order to overcome future obstacles, there is a need for education and training programmes: to make education and training materials available in more languages; for more teacher workshops and research centers in key regions; more intellectual stimulation and a sense of mission in those involved in marine science; public awareness on the relevance of ocean science to the welfare of mankind; more public relations activities to stimulate government willingness; for establishment of few centers of excellence guaranteed to maintain staff and facilities of the highest level, establishing its own specific range of skills and knowledge adjusted to local needs and also provide the necessary facilities for training and retraining of educators from other institutions.

For ocean education and training to be more effective, there is the need for a greater public awareness of the increasing importance of the marine environment and its resources for society at large. Improved awareness was seen as the key to a greater commitment by governments and international organizations. In the longer term, sound management of the marine environment depends on an educated community in which members understand the importance of a mix of conservation, development and wise utilization of natural resources.

The world-wide concept of the ocean environment and marine resources as common property should first be established. The science needs to develop and nurture an ocean ethic that views the oceans as a resource in need of our stewardship and not simply a commodity. Through the UNCLOS, increasingly a demand is voiced in favor of the principle of 'open oceans' and there is a need for ocean policy shared by all countries. It is important for the future security of countries that management skills are developed to allow sound negotiation on rights with more powerful international partners and that the strategies of management of marine resources be developed on the basis of mutually agreed conditions between different countries.



While a steadily increasing number of programs now addresses coastal area and resource management, significant deficiencies remain with regard to education, teaching and training. There is a need for training in: coastal processes; disruption of coastal equilibrium; land-sea and ocean-atmosphere interaction; water pollution and management. There is also the need to establish coastal zone management and planning courses in university curricula.

With regards to educational techniques, the following are important: computer-aided learning and expert systems; remote sensing imagery; distance teaching, and multimedia learning packages. Instruction using such techniques should be complementary to using more traditional methods.

Practical training at sea, in the laboratory and in the library (training through research) is a particularly important part of any marine science curriculum. Marine parks, aquaria and museums have a useful role to play in training specialists and educating the general public. Networking arrangements would allow the sharing of training and education experiences facilities. The establishment of national and regional networks among institutions and scientists for cooperation and information exchange is particularly useful in promoting marine science development.

Impressive information networks exist in the developed world and in theory they could be used by developing country scientists. But this does not happen, either due to lack of funds, knowledge, hardware, or others. Local and regional networks should be established first. Otherwise, the use of larger information networks - from where most of our locally generated information is excluded - will occur to an extremely low speed and profit. Horizontal communications should come first. As the situation stands now, a totally vertical (developed-developing countries) system is trying to impose itself. This is a critical point for the year 2000.

In addition, we need to realize that we are dealing with resource systems, i.e., interaction between the resource and its user, within the framework of constraints and opportunities. Hence strategies which are **constituent-driven and issue-based** are needed to outline initiatives aimed at achieving, in the long term, a more efficient and sustainable **supply management** of the coastal and ocean environment and its resources, and to arrive simultaneously at more effective and, also, sustainable delivery to its users (**demand management**).

The structure framework of the proposed strategies hinges on three perspectives: (1) looking at the environment sector at three levels, i.e., local level, where field operations are carried out; central government level, where policies are made; and international level of external support agencies or ESAs; (2) considering this structure in both the short-term (for example, coastal villagers rehabilitating a degraded seagrass bed or operating a cooperative) and the long-term (strengthening educational institutions to build a nation's capacity for the environment sector); and (3) focusing the approach at the ecosystem level, not on the population or any other lower level in the biological spectrum. These strategies are designed to fit into the current governmental structure of member states in a manner that causes the least disruption of present institutional alignment. They and their usefulness are adapted to changing economic and social conditions. Although past practices are being modified, they have not yet been fully adapted to the new requirements resulting from the changes. The system approach is adopted in order to emphasize the nature, components, responses, and interconnections between these ecosystems. The adoption of this theme is based on the compelling reason that any significant introduction or removal of any substance or energy which is not inert to biological processes in an ecosystem must cause changes in its structure, dynamics, and energy flow.

For the realization of substantial positive feedback from these strategies, the above perspectives, in turn, are dependent upon the following assumptions which need to be satisfied: there will be a substantial positive change in the national legislative agenda; national commitments will be assured to support and encourage the development of coastal and ocean science and management in member states; a consensus will be reached on strategic approaches needed to ensure long-term sustainability of environment sector programs and projects; and an honest and sincere acknowledgment by IOC and IGU on what they can and cannot do given the limitations and finiteness of resources.



Obviously, many actions need to be undertaken simultaneously, but the above strategies (and recommendations given below) are restricted to those which the IOC and IGU can do best either by themselves or in collaboration with other concerned agencies and institutions. Certainly, some of these strategies are familiar, but the fact that they are again reiterated and emphasized signals that major and urgent actions still need to be taken in these respects. In accordance with present thinking in capacity building and institutional development, the recommendations on education and training (and research) here proposed are clustered under the evolving role of the IOC as **facilitator/promoter**.

### Areas of IOC – IGU Cooperation

This paper expresses a general agreement with the four potential areas of cooperation between IOC and IGU as proposed by the latter. Comprehensive and receptive to the needs of the times, these are:

1. education and training – focusing on tools and curricula able to optimize interdisciplinary approaches;
2. sustainable ocean uses – focusing on the holistic presentation of coastal uses and the analysis of conflicts between uses;
3. interaction/valuation of land-sea uses – focusing on the feedbacks between physical, ecological and social processes; and
4. data management – focusing on the integrated processing and use of different types of data and their multi-media-based presentation.

It likewise agrees with IGU's proposed projects which are aimed at integrating natural and social approaches, probing the potential links between research and education, and optimizing the use of Geographical Information System (GIS). Hence, education and training will be emphasized and undertaken in the following proposed cooperation project between IOC and IGU:

1. Interdisciplinarity in integrated coastal management (IICM);
2. Manual on fundamentals in integrated coastal management (MFICM);
3. Manual on coastal and small island ecosystem management (MCSIEM);
4. Manual on coastal Geographical Information System (MCGIS); and
5. Coastal GIS data bank (CGISDB).

In relation to IICM, I acknowledge with admiration as well as apprehension, the efforts made by IOC to initiate the programme, **Integrated Coastal Area Management (ICAM)**. This is where IOC could play a major role in the collaborative effort. This role IOC has initiated, hence, in particular, I recognize: (1) IOC's encouragement for more interaction among its scientific programmes and the socioeconomic aspects; (2) its decision that a coordinator be designed in the IOC Secretariat; (3) its realization of the need to streamline its coastal zone-related activities and possibly develop a harmonized and focused coastal zone programme distinct from IOC activities and with separate funding; (4) its acknowledgement of the importance of a regional approach to ICAM; and (5) its sponsorship of activities dealing with the integration of science in management.

Education and training on the part of IOC have critical contributions to the success of IICM. These contributions are realized via formal and non-formal means, focused on ensuring that the following major features of the integrated approach are considered:

- addresses well-defined issues;
- directs research at questions of direct relevance to resources management;
- multisectoral, multi-agency and multi-disciplinary;
- creates opportunities to link planning to implementation;
- involves those affected by management schemes in all phases of the strategy; and
- promotes sharing of experience among rescue managers.



In addition, education and training on the part of IOC could help ensure that the joint IICM will have the following characteristics: has continuity; has defined boundaries; has institutional identity as, for example, an independent organization or a network of organizations; integrates all uses of the coastal zone, including actual and potential; is culturally and spiritually responsive; and is gender sensitive.

Education and training will be undertaken to formulate detailed management plans for selected issues, specifying the objectives for management; general policies; strategies to solve issues using regulatory and non-regulatory techniques; use of national and local approaches in varying scales; actions for each strategy; and institutional structure for implementation.

Education and training will ensure that the management plan give allowance for evaluation, adjustment and readjustment, considering the processes involved and outcome indicators, and conditions for successful management programs.

Lastly, education and training will gear up all concerned to meet the challenges coastal states must face in order to manage coastal and ocean environments. These challenges include:

- Inclusion of the coastal areas and their resources in national, regional, provincial and local planning;
- Development and implementation of holistic plans on the environment, resources, and population with active participation of both private and government sector;
- Focus on ecodevelopment which strengthens and addresses sustainability and requires environmental impact statements in all critical coastal activities;
- Institutionalization of ecological knowledge for use in management;
- More attention to the importance of resource-user and women participation in planning and management;
- Implementation and rigorous enforcement of effective regulations and supporting incentive schemes to promote sustainable uses of coastal resources;
- Increasing awareness of coastal populations regarding their critical dependence on the continued productivity of coastal resources;
- Provision of alternative livelihood to affected coastal populations through community organizing, environmental education, and capability-building;
- Consideration in coastal area management of the implications of possible climate change and sea level rise;
- Committed political leadership, strong advocacy by grassroots, and relevant contribution from scientists;
- Development of management strategies that consider community perceptions and customs, e.g. traditional use rights and practices; and
- Recognition and acceptance of a new paradigm of economic development where natural resources are sustainability used over - long frame time (intergenerational equity) and where benefits hit the mass base of marginal coastal populations.

It should be noted that education and training cuts across all programmes and projects. They are an essential element in the realization of products of all the endeavors. Hence, they should be a part of these endeavors. The emphasis placed on education and training in the five projects as proposed should be taken only as a pragmatic means to focus and economize the limited resources.

## **REGIONAL APPROACH TO OCEAN EDUCATION, TRAINING, AND RESEARCH**

The wide range of research capabilities that exists among member countries in IOC and IGU is a major deterrent to an integrated management of the region's coastal and marine environments. There is a need for a regional cooperation via education and training in this section. The following recommendations as guides to future actions may be useful:



### **Establish Regional Centers with Networks for Capacity Building in Order to Promote the Exchange of Successful Models and Experiences and Act as Knowledge Bases for Policy Development.**

These centers should aim at building national capabilities by assisting sectoral assessments and institutional development, reviewing programs and managerial capacities within existing educational, training and research establishments, facilitating and jointly undertaking supportive research, and aimed at target groups at all relevant levels within governments and to some extent also outside; these activities should be predominantly on-the-job and hands-on, making use of real-life case studies and simulations, developing cross-sectoral thinking and promote the need for effectiveness. The centers could be attached to existing institutions with excellent track records, ensuring mutual support, but should maintain their autonomous status in order to facilitate their regional activities.

Given the largely similar and specific operational and field conditions among the countries within regions and the difficulty in translating experiences from other continents, more effort should be invested to encourage the exchange of experiences and successful examples and models among these agencies and countries. However, this initiative should not detract from the value of cooperation and twinning with institutions from other continents.

### **Mobilize and Focus Research Capacity**

It is essential that research policy be developed and research management improved to upgrade the information generation and delivery systems to the grassroots. However, the research capacity in most member states is underfunded, underutilized, and is often poorly focused. Successful conservation and development depends on strengthening the capacity of local individuals, communities and institutions to implement these initiatives. But this is effective only in the government encourages and supports research that explores and refines processes that involve local communities and institutions as full participants in all analysis and decisions. As the latter are grounded on values, there is a critical need to identify and analyze economic and other incentives at the international, regional, and local levels. The overriding priorities for the future are to ensure that the development of resources is sustainable, and that, once developed, such resources are managed within an integrated framework.

Indigenous research capacity should be strengthened with these priorities in mind, so that optional use can be made of existing facilities. Whenever possible, the work undertaken should be field-oriented and should cover both technical and social aspects. Particular attention should be given to the following:

- Protection of the resources systems as their destruction threatens the breeding and nursery grounds and habitants of many ecologically and commercially important species.
- Physical and biological processes involved in water and nutrient fluxes and their relation to land use and climate, and to appropriate technologies for the protection, conservation and sustainable use of marginal areas with vulnerable and fragile ecosystems;
- There is also encouragement to be gained from the Palawan case (Philippines) where deforestation was shown to be uneconomic through innovative economic analysis (Hodgson and Dixon 1988); the authors predicted the sediment output from a logging operation and its impacts on coral reef-based tourism and fisheries. The impact were shown to have devastating economic consequences for these two industries;
- An alternative to identifying new and perhaps more costly sources of supply, is to increase effective supply and value derived from the fishery by reducing postharvest losses and improving postharvest handling. As fisheries supply became scarce and prices rise as a consequence, there will be greater demand for better postharvest management;
- The greater awareness of the need to integrate conservation and development, along with changes in conservation techniques necessitates that we have to focus attention to the critical importance of expanding and improving upon methods currently used to manage and protect the coastal and



marine environments, especially through the development and refinement of sustainable-use systems (e.g. restoration ecology);

- For fisheries, the most important future action bear on the supply side of the fisheries equation, therefore, improving, enhancing, and rehabilitating fishery areas and fish habitats should be at the top of the agenda. Increasing fishing power and capability have been inapplicable since fish stocks became overexploited in the early 1980's. In fact present thinking is to reduce the efficiency of commercial large-scale fishing to keep more artisans in business;
- Carrying capacity study is worth pursuing. The concept implies that there are limits to resources or, in tourism, to visitor use of these resources. Thus, it becomes an effective measure of sustainability; and
- Habitant interconnectivities: the dynamic interactions between the oceans, rivers, land and atmosphere should be taken into account in order to make maximum use of the coastal and ocean environments and their resources.

### **Reach a Regional Consensus on Strategic Approaches to Ensure Long-Term Sustainability of Ocean Environment Sector Programs and Projects.**

Members states have to recognize and address the pressing need to improve the performance of key agencies and institutions and their regional extensions, where the demand for a better environment is greatest. Initially and for purposes of pragmatic systematization, the region needs to look at capacity building in the coastal marine environment sector at three levels: local level, where field operations are carried out; central government level, where policies are made; and international level of external support agencies. In addition, the region should consider the strengthening process in both the short-term (i.e., coastal villagers operating a fish cooperative) and the long-term (i.e., strengthening educational institutions to build a nation's capacity for the environment sector). It should look at the 'enabling factor' in the strengthening process, the role of community-based organizations, of the private sector and NGO's. The region needs to adapt the strategies and their usefulness to changing economic and social conditions.

### **Adopt Integrated and Intersection Approaches at All Levels**

Towards the 1990's, after decades of disciplinary research, we have begun to move into a multidisciplinary mode, with various disciplines working separately on the same issues. To resolve the complex environmental and developmental problems we now face, an interdisciplinary approach is needed wherein disciplines work cooperatively on the same issues.

New problems are becoming increasingly complex and demand intersectoral coordination. At present responsibilities for policy making and implementation are generally dispersed among several agencies or offices, hence, certain mandates are not clearly allocated to an agency or office, there is overlap in competence, hence, when something goes wrong, the entire sector suffers. Integrated management allows multisectoral development to proceed with the least unidentified setback. It seeks to reduce the social costs associated with sectoral activities accruing both inside and across sectors (Scura et al. 1992).

The coastal marine environment, together with all the other aquatic and terrestrial environments, should be developed and managed as a unit rather than along sectoral lines since they are all interconnected by biophysical processes and human impacts. This often occurs because of lack of insight. This necessitates a management system that identifies and characterizes issues and problems, selects management strategies, formulates management plans and executes management actions.



## **Help Create Conditions that Will Facilitate Long-Term Commitments**

In contrast with project implementation, capacity building always requires a long-term programmatic approach. In order to arrive at the construction and management projects and infrastructure, intellectual, institutional, and managerial capacity must first be "built". Because of the inherent unpredictability of people and institutions, such programs must provide sufficient flexibility. Both local institutions and ESAs providing assistance should adapt their administrative and financial procedures in order to facilitate longer term commitments (with time spans of typically 10 years).

## **Create and Strengthen International Capacity to Manage Shared Environments**

Major biodiversity resources are shared by neighboring countries. Hence, they face identical technical, managerial and socioeconomic problems, such as habitat loss and progressive pollution. Other opportunities for cooperation as in the field of power generation, flow regulation and flood mitigation, and ecological and climatological data collection, improves management of vulnerable ecosystems and the prevention of pollution. The IOC and IGU, in coordination with other concerned organizations and institutions, could play a major supportive role in controlling encroachment by international poachers into the exclusive economic zone (EEZ) and develop policies for the optimal exploitation of that zone.

## **Promote Active Participation of Local Communities**

Coastal habitants can best be preserved and protected by the local communities as they possess profound knowledge of the environment are the key users of its resources. It has been shown (Valdez and Rosier 1995) that Philippine policies and programs for managing mangroves is improved by involving the community and avoiding conflicts with the stakeholders. Community-based management exists in the Philippines, but traditional practices soon break down with the intrusion of economic incentives and modern technologies. While there are efforts to revive community-based management, we must make sure that the accrued societal benefits outweigh short-term gains. There must be strong political will and sufficient economic incentives to sustain community efforts.

Use indigenous management structures, experiences and sociocultural values with specific attention to gender issues, in order to arrive at a sound understanding of the potentials of the communities, their true demand, and to endure their full commitment. Very little is known about which indigenous experiences offer potential and can be applied more widely both to support and implement programs. Some projects have failed because of insufficient understanding of the socioeconomic determinants - local traditions, knowledge - base and sociocultural values of people - by planners, or because no use was made of the opportunities offered by proven indigenous practices.

## **Endure Institutional Practice of Disseminating, and Using High Quality, Accurate Data for Decision Making**

It is alarming to note that 'pseudoscience' is wantonly being disseminated and used in the management of natural resources. There is a need to improve the quality of natural resources information and data through peer-reviewed research, upgrade extension materials by selecting primary publications, and increase public support through science literacy programs. The purpose is primarily to reach policy and decision makers with enough and correct information as bases for decisions.

If we are to assess honestly the contribution of research to the natural resources sector, the contribution of scientists has not been as substantial or significant as expected. In fact, many that have led to substantial changes in resources development came from branches of science, e.g. in fisheries development in Asia, the introduction of synthetic netting, outboard motors, cold storage and refrigeration.



On the other hand, scientists have contributed significantly to the knowledge of assessing natural stocks, understanding environmental conditions and the biology of many marine organisms. Similarly, scientists in both public and private sectors have made modest contribution to aquaculture development of several commercially important species, development of artificial feeds, vaccine and farming technologies. Biotechnology has been increasingly applied to improve the quality of fishes and to create new hybrids and clones. Nevertheless, researchers have been less effective in the area of management, thus, falling short of a substantive contribution to resolving pressing environmental issues.

### **Provide Access to International Knowledge Bases and Data Networks and Develop Regional Equivalents**

Regional cooperation should be enhanced or further explored to improve access to library materials (journals, books, current contents), electronic information systems (e-mail, databases), and international networks of scientific and professional associations.

## **THE IOC-IGU JOINT PROGRAMME AND PROSPECTS FOR SUSTAINABLE COASTAL AND OCEAN DEVELOPMENT**

Worldwide, the last decade was characterized by a growing trend towards a market approach to coastal and ocean resource use regulation, greater efforts to integrate ocean environmental considerations in overall development planning, and greater participation of the coastal inhabitants and stakeholders in planning, monitoring, evaluation, and implementation of marine environmental programs. In this endeavor, the role of education and training has started receiving greater impetus. This is because the importance of the oceans and their resources in the ecology and economy of the region has greatly increased and there are indications that this trend will continue even beyond the year 2000. As the last two decades have shown, the rapid industrialization and economic development in most countries in the region are causing an enhancement in coastal and offshore activities that inevitably will lead to a concomitant development in marine science and its teaching. In general, further economic growth will increasingly depend on the utilization of both coastal and offshore resources and this case will serve as a stimulus for the contiguous countries to invest in the improvement of their own marine science programs.

Through education and training within the purview of the IOC-IGU initiative, the community needs to develop and nurture an ethic that views the seas and its users as an integrated resource in need of stewardship and not simply as a commodity. The extent to which scientific input and local community participation in marine environmental protection and resource management can be fostered will be a significant factor in determining the quality of the marine environment and the availability of its resources in the future.

Coupled with strategic roles in IOC and IGU have to play as an ocean policy advocate, facilitator and mobilizer, the institutional strengthening process via education and training should focus on the key considerations in the pursuit of the hallmarks of the conservation movement which are multi- and inter-disciplinarity; sustainable use; and community participation. The attainment of these objectives should be along pragmatic lines. The current situation dictates that use of the limited resources must be optimized, projected activities must build upon the strengths of those undertaken or ongoing, at the same time learning from their weaknesses, and there must be a wide and open consultation process. Underpinning all these activities are data and information acquired, disseminated, and utilized using methodologies that adhere to the rigors of the highest quality standards.

From a broader perspective, the goal of education and training is to acquire a competitive advantage. This capacity is function of the interaction among the macroeconomic situation, the industrial structure, the socio-institutional structure and the techno-scientific infrastructure. In this paper, emphasis is placed on the role of education and training and development of the last component. In general, the technological and scientific infrastructure in many developing countries is characterized by scientific



isolation, low quality and low volume of research and development (R & D) institutes, low public spending on R & D, lack of private spending on R & D, and weak relationship between scientific community and the 'market'. Subjected to enormous political pressures and decision and stiff international competition, their competitive ability for funds and opportunities is diminished because of the above factors.

In consideration of all the above, and unless there is a striking change in policy within the majority of developing countries, the lack of national commitments to support and encourage the development of adequate infrastructures and promote advancements in ocean affairs will remain a major deterrent to ocean environmental sustainability. In this regard, education and training have a critical role to play.

## CONCLUSION

Building upon past and present experiences, and considering the benefits expected from the joint IOC-IGU initiative, it is becoming clear that education and training has three definite roles:

1. To provide guidelines in the management of knowledge (This is accomplished by: adding new knowledge; enhancing knowledge; and establishing what can and cannot be known given the available resources and constraint in these resources);
2. To effect a change in attitude and way of life of people (stakeholders); and
3. With the first two, to address societal needs, especially through the provision of sound advise to management.

I commend the IGU for such a comprehensive and well thought of proposal. I agree with the areas where IOC and IGU have the potential for cooperation as well as the projects which would give substance to these areas of cooperation. But my part being focused on education and training, I may not at this early stage, be able to input directly and substantially into the identification and prioritization of the activities for mutual implementation. The best that I can do is to provide the philosophy, the principles, the perspectives and challenges which guide all actions. Indeed it is almost a routinary mechanical process to implement a project, once this is approved and funds made available for its implementation. But what is often difficult and ignored is a serious consideration of the philosophy and principles that underlie the actions. Here we should recognize and acknowledge the three essential elements of true education: cognition (which generates knowledge); experience (which produces the skills); and *ethics* (which effects a change in attitude). Where all three intersect in an individual resides the change we want in improving our environmental efforts. Science may have generated the knowledge and skill we need in these efforts. But these will not be effective without the compliment of ethics (and vice versa). This is the key to that paradigm shift we so often speak about. This should also be the philosophy behind any IOC-IGU joint initiative.

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## THE GERMAN REUNIFICATION - THREE YEARS LATER: GEOPOLITICAL AND AREA PLANNING VIEWPOINTS

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### HISTORICAL RUN OF EVENTS

The surprising and unexpected reunification between the old Federal Republic of Germany (F.R.G.) and the former German Democratic Republic (G.D.R.) on October 3, 1990 was a lucky chance for Germany. However, in the euphoria of the unification process nobody could foresee the vast economic, financial, administrative, social and psychological problems that would arise from the merger of the two so diverse political systems after 41 years of German division. The western part had a free and liberal democratic political system with a market economy and free enterprise, and the eastern part had a socialist proletarian dictatorship with a centrally planned economy. Two possible alternatives existed for the execution of the German unification. One is, it could have been accomplished by applying Article 146 of the Basic Law (constitution). This would have required the convocation of a Constitutional Assembly in order to promulgate an entirely new Basic Law for the unified German. The possibility of a gradual unification done step by step according to Article 146 of the Basic Law, which was initially favored by the leftist opposition parties, did not find application. Two is that ruling coalition between the Christian Union parties (CDU/CSU) and the Liberal Party (FDP) under Chancellor Helmut Kohl clearly favored the other variant of a quick unification as fast as possible by accession according to Article 23 of the Basic Law. In this Article 23, it is stated that "other parts of Germany" can join and "come within the purview of the Basic Law." The German unification was a hundred percent annexation of the eastern part of the country and resulted in the complete liquidation of the former G.D.R.

The events of the unification process were fast and drastic (see Appendix 1). On October 7, 1989, the former strongman and dictator of East Germany, Erich Honnecker, still presided over the 40th anniversary of the founding of the German Democratic Republic with some difficulty. Eleven days later he was deposed by the Central Political Committee of the Communist Party (SED). His successor, Egon Krenz, likewise was a typical representative of the old system and did not realize the signs of the time. After a period of only 48 days he likewise had to leave office. After the failure of the short interval era of Krenz came the demise of the East German Communist Party, with the Communist Party being transformed and renamed into P.D.S. ("Party of Democratic Socialism"). In the second half of 1989, the East European satellite states of the former Soviet Union namely, Hungary, Poland and Czechoslovakia, slowly drifted away from the Soviet Union and thousands of East Germans escaped through the German embassy in Budapest to the West. The opening of the Berlin Wall on November 9, 1989 dividing Germany on a 500-km long boundary for 28 years and the sudden freedom to travel for East German citizens provided an entirely new situation which the old regime could not cope with. A power vacuum existed and it was not before November 13, 1989 that a new politician, Hans Modrow, former Communist Party chief in Saxony, was elected as prime minister of East Germany. He was likewise a leader of a short transition period. Only free democratic elections could form a new political basis for the future development of East Germany and for the urgent demand of a possible reunification.

For the first time, free and democratic elections were held in East Germany on March 18, 1990. The election result was a big surprise, because it brought an almost absolute majority for representatives of Christian Democratic parties, which were assembled in the "Democratic Alliance". The CDU received 40.8% of the votes, i.e., almost double the amount that the SPD received with 21.9%; however, representatives of the reform groups (<Bündnis 90>) were the actual losers with only 2.9%. The PDS or former Communist Party could score a *succes d'estime* with 16.4% of the votes. As a consequence of the

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election victory by the CDU-East, the newly formed government under the prime ministership of Lothar de Maiziere could only be a transitional government with the aim of achieving the total unification of the two German States. An important step in this direction was the monetary, economic and social union between the Federal Republic and the G.D.R. which took effect on July 1, 1990. It introduced the popular West German Mark in East Germany and launched a process of economic revolution in the G.D.R. with the result that the survival of an independent East German State was made impossible. The People's Chamber created an additional legal precondition for the unification by recreating the original regional structure of the G.D.R. with five new States which were abolished by the Communist Party in 1952 in favor of the 15 centrally administered districts (<Bezirke>).

On July 22, 1990, the five new States of Mecklenburg-Vorpommern, Brandenburg, Saxony-Anhalt, Saxony and Thuringia were founded which have been called since then "the new Federal States" after reunification. A voluminous Unification Treaty (<Einigungsvertrag>) was negotiated between the West German government represented by Dr. Wolfgang Schauble and representatives of the G.D.R. represented by Dr. Günther Krause who laid the legal foundations for the unification. The Unification Treaty was passed on August 31, 1990. As a consequence of the bankrupt economic system in the East and the pressure of the East German population for change, the Eastern side had little bargaining power to gain acceptance for specific East German interests or to retain the "achievements" of the former G.D.R. The highly celebrated German unification effected on October 3, 1990 created a new enlarged Germany. However, the original unification euphoria soon turned into a unification frustration (<Vereinigungsfrust>), because a large number of problems could not be solved satisfactorily, a problem that still persists today.

## UNIFICATION PARALLELS WITH REGARD TO WORLD HISTORY

Almost synchronously with the unification of Yemen in Southern Arabia, Germany is the first case in world history where a free capitalistic-style system was united with a dictatorial Marxist system in a democratic way based on free elections. There is not a single precedent in contemporary history on which German politicians could rely when executing the unification process. The end of World War II and the following East-West confrontation between the former Soviet Union and the USA - commonly known as "Cold War" era - left behind five divided countries: Austria, Germany, Vietnam, Korea and China.

The case of Austria can hardly be compared to Germany. When Austria's sovereignty was restored on May 15, 1955 through an international treaty between the four Allied powers, the political and economic division of Austria between the Soviet and Western spheres of influence was never so marked as in the case of the two German states. In no time at all, two independent Austrian states came to exist and the same currency was used in the different occupation zones in Austria. In Vietnam's case, it was divided after the Geneva Conference of 1954 but was formally united on July 2, 1976 after the victory of North Vietnam and the Vietcong over South Vietnam and her American Allies in the Third Indo-China war. However, the unification was based on Communist measures of coercion and a thousandfold violation of human rights.

With regard to Korea and China both are not yet ready for unification since their problems are different from Germany. One main difference is the population disparity. Whereas it should have been an "easy" task for "prosperous" West Germany with a population of 61.7 million people to integrate the 16.6 million East Germans after unification, the population disparity in China and Korea is by far more adverse. The Republic of Korea (South Korea) had a population of 43.6 million people, whereas the D.P.R. of Korea (North Korea) had only 22.2 million people. Many South Korean politicians say openly that they are against unification with the northern part according to the German model. The costs are gigantic and are estimated at between 200 and 500 billion US\$ for the first five years. Whereas the G.D.R. was a highly industrialized country ranking 15th in the world scale with regard to industrialization, and



had the highest standard of living in the Eastern block, North Korea is almost bankrupt and economically completely isolated from international trade. The German model is likewise unsuitable for the Chinese reunification between the Mainland (People's Republic of China) and Taiwan (Republic of China). The island position of Taiwan and the absence of any land boundary between the "two" Chinas complicates the merger. The 21 million people on Taiwan would be swallowed by the roughly 1.2 billion people on the Mainland in case of reunification. In prosperous Taiwan, the determination to unite with the "poor" compatriots on the Mainland is steadily diminishing, since more and more indigenous Taiwanese are toying with the idea of "Independence" and "Separation from China".

An interesting parallel case, however, is the unification of Yemen on May 22, 1990, which is only five months before the German unification took place. The Arab Republic of Yemen (North Yemen) became independent on October 30, 1918 after the collapse of the Osmanic Empire (Turkey) following World War I. Yemen today is a western-oriented, conservative Islamic Arab country. On the other hand, the P.D.R. of Yemen (South Yemen) received its independence from Great Britain only on November 30, 1967 and afterwards became a satellite state of the Soviet Union with a Communist-Marxist system. Superior North Yemen with a population of 9.3 million people dominates weaker South Yemen with a population of only 2.3 million people. Once nationalized, landed property and means of production in South Yemen are increasingly and massively acquired by North Yemen capitalists. Conservative Islamic conceptions of value and thought as well as the Islamic Sharia Laws are forced upon the united Southern part. The emancipation of women has been abolished in the South and the vested right of work during the Communist period has been turned into mass unemployment in the South. However, South Yemen has huge deposits of oil reserves which could alter the balance of power in the future.

## GEOGRAPHY OF FEDERALISM AND THE FIVE NEW STATES

The Federal Republic of Germany is a democratic and social federation of 16 States (<Länder>) (Fig. 1). Federalism in Germany has a long historical tradition in what is called "particularism" (<Kleinstaaterei>). The political fragmentation of Germany into mini-states goes back to the Middle Ages and lasted until the foundation of the Second German Empire under the domination of Prussia in 1871. In contrast to the historical expression of the German federation during the monarchy from 1871 till 1918 and again during the Weimar Republic from 1919 till 1933, the division of the West German area units into originally 11 States (also called "the old States") has been arranged in a completely new manner. This was based on the claim of power by the four Allied occupation forces after World War II through the fragmentation of the dominating State of Prussia. Indeed, Federal laws are prevailing over State laws as a general rule (<Bundesrecht Bricht Landesrecht>), however, the execution and administration of law, as well as the organization of judiciary, is largely done by the State governments.

When Germany was united in 1990, the Federal principle was simply transferred to the area of the centrally administered G.D.R. (ultimately there were 15 administrative districts or <Bezirke> in the former G.D.R.), by reviving the original five East German States which existed in the first East German constitution until 1951. Thus, the five States of Mecklenburg-Vorpommern, Brandenburg, Saxony-Anhalt, Saxony and Thuringia were recreated and they are now known as "the new Federal States" in everyday usage. They are equipped with the same or similar political institutions, constitutions and political parties as in the West. The foundation of the five new States was carried out on July 22, 1990.





Figure 1. Federal Republic of Germany



**Table 1.**  
**The Federal States in Comparison to their Economic Strength (1992)**

State	Area in sqkm	Population in %	Economic Strength In billion US\$	(GDP) in %
Baden-Wurttemberg	35 751	12.5	277.3	15.2
Bavaria	70 554	14.5	308.8	16.9
Berlin-East	889	1.6	15.3	0.8
Berlin-West	889	2.7	63.6	3.5
Brandenburg	29 053	3.1	23.6	1.3
Bremen	404	0.8	22.0	1.2
Hamburg	755	2.1	75.1	4.1
Hesse	21 114	7.3	181.2	9.9
Mecklenburg-Vorpommern	23 598	2.3	16.6	0.9
Lower Saxony	47 364	9.4	164.1	9.0
North Rhine-Westphalia	34 071	21.8	422.4	23.2
Rhineland-Palatinate	19 846	4.8	82.7	4.5
Saar	2 570	1.3	24.2	1.3
Saxony	18 338	5.7	39.9	2.2
Saxony-Anhalt	20 443	3.5	26.4	1.5
Schleswig-Holstein	15 731	3.3	58.5	3.2
Thuringia	16 251	3.1	20.8	1.1
New States (including Berlin-East)		19.5	142.6	7.8

GDP = Gross Domestic Product

As indicated in Table 1, all the new Federal States are weak States with regard to their population size and economic power. For the foreseeable future, they will remain dependent on contributions from the Federal government and the Western States. Starting from 1995, the equalization of financial burdens between the rich and the poor States in Germany will be extended to the five new States. The assimilation in status between the old and the new States is a precondition for the adjustment of the standard of living between the various German States. The German Constitution stipulates a uniformity of living conditions all over Germany. When the German unification was accomplished in 1990, a big chance for a "Redistribution of German States" was missed, as Article 29 of the Basic Law stipulates. It is an aim of the German area planning policy to regroup the Federal States in order to create new efficient political units according to Central Place theory principle is imperative, however, this opportunity has been missed. With regard to the new States, the same critique is justified concerning the area pattern. They have been created under pressure of time and they are a compromise solution based on historical precedence. According to their economic power, they are extremely weak and the percentage of the gross domestic product was only 1.3% in Brandenburg, 0.9% in Mecklenburg-Vorpommern, 1.5% in Saxony-Anhalt, 2.2% in Saxony and 1.1% in Thuringia (total Germany = 100%) in 1992. By reducing the number of Federal States in East Germany to only three, more efficient political units could have been created in post-unification Germany. The following three criteria should be applied when regrouping the States:

- a) Approximately equal population size and similar economic capacity;
- b) Ethnic, historical and cultural similarities; and
- c) Requirements of regional planning and areal policy.



A large number of suggestions for a possible reorganization of German States has been made already. In this connection, the recommendations of Münchheimer (1954) should be mentioned. He suggested that for a reunified Germany only seven States (with their capital and seat of government) should be created instead of the present sixteen States namely:

- 1) Baden-Württemberg (Stuttgart);
- 2) Bavaria-Franconia (Munich);
- 3) Brandenburg - Pomerania (Berlin);
- 4) Hesse (Frankfurt; headquarter: Mayence);
- 5) Lower Saxony-Northmark (Hamburg; headquarters: Hanover);
- 6) Rhineland-Westphalia (Düsseldorf); and
- 7) Saxony-Thuringia (Leipzig).

Other research proposals for the realignment of States have been suggested by E. Ernst (1993) and W. Rutz, et al. (1993) recently. An attempt for the amalgamation of two States has been made in Berlin to combine with the umland of Brandenburg. Article 5 of the Unification Treaty of August 31, 1990 states that regarding the possible regrouping in the region of Berlin/Brandenburg, the provisions of Article 29 of the Basic Law should not apply; i.e., the two States of Berlin and Brandenburg should not lose financially in case of amalgamation. Another big problem is the reorganization of administrative districts (< Kreise >) and local communities in the East. The impending administrative reform in the East with the aim of creating more units is a tremendous task which will occupy regional planners long beyond the year 2000. The North-South dividing line concerning wealth and prosperity, which separates the rich Southern States of Baden-Württemberg, Bavaria and Hesse in West Germany from the "poorer" North, can be likewise noticed in the eastern part. The comparatively rich States of Saxony and Thuringia are in contrast to the poorer States of Mecklenburg-Vorpommern, Saxony-Anhalt and Brandenburg. The introduction of the new five-digit postal code system for All-Germany on July 1, 1993 was also a consequence of the unification, since the old four-digit postal code numbers of the West overlapped with that in the East.

### **THE RELOCATION OF THE GERMAN CAPITAL FROM BONN TO BERLIN**

The old empire had a large number of chief cities and metropolitan cities, but no center. Later during the German particularism, many royal residencies were created. The cities of Frankfurt and Weimar as a counterpart to Berlin are the most known examples. Frankfurt, as a rival city to Berlin and the "cradle of democracy" in Germany since the time of Paul's Cathedral, has been degraded to a Prussian provincial city since the 1866 war against Austria. Weimar as the "cultural capital" of Germany and the city of the great poets of Goethe and Schiller, was the venue of the Constitutional Assembly in 1919. ("Weimar Republic, 1918-1933"). When the Federal Republic of Germany was founded in 1949, West-Berlin was eliminated as a choice for capital because of its special political status - the sovereignty over Berlin rested with the four Allied Powers until 1990. Also, its insular location in the middle of "enemy territory" surrounded by the G.D.R. made Berlin unsuitable as a capital. Therefore, the provincial city of Bonn became the provisional capital of the Federal Republic until re-unification. But there is no doubt that Bonn has always been the City of Konrad Adenauer. On the other hand, the capital of the G.D.R. was East Berlin in disregard of the quadripartite statutes.

Article 2 of the Unification Treaty of August 31, 1990 states: "The Capital of Germany is Berlin. However, the choice of the seat of Parliament and government will be decided after restoration of German unity". Although the decision for Berlin has been taken, the resolution is translated into action only half-heartedly and reluctantly. Until now the decision to move to Berlin is a highly controversial issue in domestic policy. The parliamentary debate of June 20, 1991 introduced four alternative bills concerning the choice of the seat for Parliament and government namely;



- 1) Completion of German Unification (Berlin motion)
- 2) Federal solution for a separation of functions between the capital of Berlin, the parliamentary and government seat of Bonn and the new Federal States (Bonn motion)
- 3) Consensus motion (Geissler motion), and
- 4) Designation of Berlin as the capital and seat of Parliament and government (Berlin motion of the P.D.S.).

With a very narrow majority of only 337 votes against 320 votes, the <Bundestag> decided after a debate of 11 hours to relocate the seat of Parliament and government from Bonn to Berlin and the removal should be undertaken within a period of 12 years. Fig. 2. The <Bundestag> therefore rejected a motion that was tabled across party lines to adopt a divided capital 600 km apart with dispersed administrative office functions as in the case of the Netherlands (Amsterdam/The Hague), South Africa (Capetown/Pretoria) or Taiwan (Taipei/Taichung). However, the <Bundesrat> (Parliamentary body representing the States) decided on July 5, 1991 to remain at Bonn. The advantages and disadvantages for Berlin as the headquarters of Parliament and government are obvious and these are discussed below.

One disadvantage of Berlin is the huge costs involved in moving the capital to it especially in terms of establishing a large number of new buildings for Ministries and the transfer of more than ten thousand civil servants. The Federal Minister of Finance estimates the removal costs at 13 billion US\$ within a period of eight years if secondary costs are not included. However, proponents of Bonn sum up the estimated removal costs at over 90 billion US\$.

A sound disadvantage is the self-complacency of political bosses who all own huge luxury villas in Bonn and which they would lose by moving to Berlin. In terms of advantages is geographically located in the middle of Europe, approximately 500 km apart from Cologne in the West and Warsaw in the East. A second advantage is that Berlin is the cultural and economic pivot between East and West and has developed a strong repercussion on the East (Poland, Russia, Baltic States) and the North (Scandinavia). Berlin as a capital would be a strong economic and psychological promotive factor for the new Federal States. Third, historical reasons are preeminent since Berlin grew up as a capital of a small frontier, the Mark Brandenburg, whose function it was to defend the Eastern borders of medieval Germany. For more than two hundred years it was the capital of the electorate of Brandenburg, then the capital of Prussia, and capital of the German "Reich" for 74 years, as well as capital of the G.D.R. for 41 years. Fourth, Berlin can make use of huge empty areas along the former Berlin Wall (for example the Potsdam Square and the Quarter along the River Spree) for new construction and city redevelopment until the next century. Fifth, when Berlin's application for organizing the Olympic Games of the year 2000 failed (in favour of Sydney), the City needed a tremendous boost for the development of the entire region of Berlin-Brandenburg.

So far, no definite timetable for moving the seat of Parliament and government has been announced. The year 1988 is envisaged; however, in view of empty public treasuries this target date is wishful thinking. The City of Bonn will be compensated for the loss of functions with a sum of indemnity of 1.1 billion US\$. The arrangements also stipulate that Bonn will retain the <Bundesrat> as well as 6 to 7 Federal ministries. As a measure of decentralization, a large number of specialized Federal agencies are located outside of Berlin, such as the "Central Bank" and the Federal Railway" at Frankfurt; the "Federal Constitutional Courts: at Karlsruhe, the "Federal Labour Court: and the "Federal Social Court" at Kassel, the "Federal Fiscal Court", the "Federal Audit Office" and the "German Patent Office" in Munich, the "Federal Postal and Telecom Office" at Mayence, the "Federal Office for the Protection of the Constitution" and the "German Convention of Municipal Authorities" at Cologne, the "Federal Criminal Investigation Office" and the "Federal Statistical Office" at Wiesbaden, and the "Federal Information Service" at Pullach. It is envisaged that some of these agencies will be transferred to the new States, but the civil servants are reluctant to move. It can be assumed that Berlin as the seat of Parliament and government will not be fully functioning before the year 2000. After all, the <Reichstag> has been rebuilt and renovated long before the unification has been anticipated; however, before the Parliament can move, the working quarters of the members of the <Bundestag> have to be constructed. A shining example has



# BERLIN



Figure 2. Berlin

Legend : The Federal Capital and future construction in the center : (1) the future Parliament in the Spree-Bow with the "Reichstag", (2) Ministerial gardens, (3) House of the Ministries, (4) Palace of the Republic; Center of the Museum Island with pleasure grounds and Marx-Engels-Square, (5) Comical Opera House, (6) State Opera House, (7) Humboldt University, (8) Red City Hall, seat of the Berlin Senat, (9) Crown Prince Palace, (10) former Central Bank, (11) Nikolai Quarters, (12) former Mint, before: Ministry of Culture, (13) State House, before: Ministerial Council of the GDR, (14) Potsdam Square and Leipzig Square, (15) Cultural Forum with Philharmonic Hall.



been set by the Federal President, Richard von Weizacker, when he transferred the presidency to Berlin residing at Cassle Bellevue in 1993. Later, in January 1994 he also moved his private residence to Berlin and gave the New Year's reception for the Diplomatic Corps for the first time in Berlin. More than a hundred foreign embassies will finally have to move to Berlin, but developing countries will find it difficult to pay high rents for new offices. Completely undecided is the fate of the "Palace of the Republic" in East-Berlin. Despite high concentrations of asbestos in the former House of the People's Chambers of the G.D.R., many experts are of the opinion that pulling down the building is not mandatory. But critics say that a symbol of socialism should be removed! The construction of a newly built "Ministry of Foreign Affairs" on the site of the "Palace of the Republic" would be double the cost of renovation.

## ECONOMIC CONSEQUENCES OF THE UNIFICATION

The euphoria of the reunification has vanished. The actual difficulties of economic restructuring of the centrally planned economy into a social market economy are apparent now. The huge problems the German economy is facing now (recession, structural problems, high incidental wage costs, excessive taxation, record governmental indebtedness, mass unemployment, shrinking outlets for export goods, etc.) are not only a consequence of the unification. Ex-Chancellor Helmut Schmidt outlined the situation with a slogan: "Out of the model Germany?" The costs of unification are much higher than originally anticipated. The financial transfer from West to East is estimated at more than 90 billion US\$ for this decade only. In order to raise these huge amounts of money, a solidarity pact was adopted (see Appendix 2) and the taxes for the ordinary consumer were massively increased. Three important increases in taxation were made since 1993. The Value Added Tax (VAT) was raised from 14% to 15% in 1993. For 1994, the petroleum tax for petrol and diesel oil were increased considerably. For 1995, a surcharge of 7.5% will be levied on the income tax and corporation tax. In addition to these large tax increases, many small local rates and duties were raised. During the general elections of December 1990, the ruling government coalition between the Christian Union and the Liberals campaigned under the slogan "No tax increases now!" However, they failed to keep their promise. Before World War II the German heavy industry was located almost totally in the Western part of Germany, especially in the Ruhr District mining and industrial center, whereas the Eastern part was predominantly agricultural. Then during the Communist era of the G.D.R., large industrial collective combines have been artificially created which are now after unification, not competitive any more in the world market. The following are the structural and locational problems of the eastern economy:

- 1) **Obsolescence of most factories, farms and public enterprises:** Most production units in East Germany are antiquated, not competitive and are troubled by low productivity. Without heavy subsidies from the government, most companies would collapse and go bankrupt.
- 2) **The production of East German companies in former times was exclusively oriented towards East European markets of the former COMECON:** With the collapse of the Soviet Union and her East European satellites, most of the foreign markets were lost. In former times, the payment was made by transfer-ruble or through barter-trade. Today, Russia and Eastern Europe have to spend hard currency which is scarce.
- 3) **Low productivity of East German firms is the main problem:** Labor costs in East Germany drew up to 61% of the West German level in 1991. They reached 82% of the West German level in 1993 and were supposed to match the West German standard in 1994. However, it becomes more and more apparent that a 100% adjustment of the wage level to West German standards would lead to a total collapse of the East German economy with many firms going bankrupt.
- 4) **Denationalization and transfer into private ownership:** The most ingenious and at the same time controversial set-up of executing the transfer of ownership in the German unification process is the founding of the <Treuhandaanstalt> or "Trust Holding Corporation". It was set up by the



former East German government on March 1, 1990 as a "public institution to hold state-owned property in trust". Originally the <Treuhandanstalt> administered roughly 8000 companies in order to convert them into the legal form of joint-stock companies.

In the beginning of 1994, roughly 200 companies of the originally 8000 have been left over for privatization. A big problem are the old debts carried over from the G.D.R. period. Although these debts have been devalued at a rate of 2:1, the companies are still encumbered with debts. No clear objectives have been given to the gigantic institution of <Treuhandanstalt> by the political leadership. However, it was originally envisaged that "rehabilitation and restructuring measures". High mass unemployment in East Germany forced the <Treuhandanstalt>, however, to adopt a more cautious shift of the two aims. In view of the precarious financial situation of most East German companies, the main task of the <Treuhandanstalt> was to secure or to increase liquidity. Article 25.4 of the Unification Treaty of August 31, 1990 allocated an amount of 16 billion US\$ borrowed money for this purpose. West German as well foreign investors hesitated to buy former state-owned firms because of insufficient infrastructure and unclear legal problems. When transferring companies into private ownership, the <Treuhandanstalt> was faced with the problem of value assessment, for which no reliable criteria existed.

- 5) Mass unemployment: At the beginning of 1994, All-Germany had the highest unemployment figure after World War II with more than 4 million people out of jobs. In January 1994, the unemployment rate was 8.8% of the working force in West Germany and 17.0% in East Germany (for comparison: in October 1992 it was 6.1% in the West and 13.4% in the East, respectively). The German economic miracle had collapsed as a result of recession, structural problems, record taxation, high labor costs and massive immigration of foreigners to Germany. The economic conditions applying to the locality of Germany have become too expensive. The problem of unemployment is most aggravating in East German. It is estimated that only 20% of the industrial job positions there can be actually saved, i.e., roughly 700,000 of the former 3.5 millions jobs in the industrial sector. Particularly women are the big losers in this transformation process and they are the first to lose their jobs. Besides official unemployment, there is also hidden unemployment and "zero-employment", i.e., workers are still paid and kept on the payroll sheets, but they actually have no work any more. Many jobs in East Germany today are artificially subsidized through work creation programs (<Arbeitsbeschaffungsmassnahmen>).
- 6) Return of nationalized housing property to the original owners: The biggest mistake that has been done in the process of unification is the decree to return land and housing property that has been nationalized or expropriated by the Communist regime. This should be given back to the original owners, according to the principle "Return of property has priority before compensation". However, they have to pay a small sum into an indemnity fund. This rule of retransfer of landed property to the original owners does not apply to any property expropriated during the Soviet occupation period between 1945 to 1949. Another exception are large commercial premises or building sites which are acquired for investment purposes, especially to establish industrial, commercial and trade premises. As a consequence of this wrong decision, almost 2 million applications for return of property are pending in the East and it is assumed that it will take ten to fifteen years to clear these property disputes. Lengthy court proceedings are anticipated. But nobody will invest money in a property whose proprietorship is unclear. It would have been imperative to compensate the original owners or heirs according to the market value of the property on the day of unification, instead of giving it back to them. For those who opted for compensation in form of money, this very low and the compensation is based on the standard value of 1935 according to the "Claim of Compensation Law" of April 1993.
- 7) Economic deficiencies: As a consequence of the German unification, the rates and taxes as well as communal dues and social contribution increased rapidly. In 1992, Germany had the second-highest tax and social benefit/deductions in the world (after Sweden). The international comparison shows that 43.7% of the Gross Inland Product of Germany goes to taxes and social



benefits; for Sweden: 50.6%; France: 43.6%; Switzerland: 35.9%, Great Britain: 33.4%, USA: 30.7%, and Japan: 29.3%. The tax burden and social deductions of the average citizen have become unbearable in Germany. In 1993, the contribution to the pension fund has been raised. In 1994, the premiums towards compulsory unemployment insurance have increased, and in 1995 a compulsory insurance for old age care will be introduced.

- 8) To safeguard the locational advantages of a united Germany, the following measures would be imperative : a) Wage and salary increases should not go beyond 2% in 1994; b) The cost of living should remain stable and public inflation should be reduced; c) Interest rates should go down from the present 6% to 4.5%; d) No more increase of taxes and communal dues; and e) For new job-seekers, lower entrance tariffs should be agreed and these people should be compensated for their loss of earnings by larger tax deductions.

### ENVIRONMENTAL DEGRADATION IN THE EAST

While in the old Federal States measures for environmental protection have been strengthened for the last ten years or so, there is an environmental crisis in the new States. The impairment caused by environmental influences is a result of the insufficient energy supply based on cheap lignite coal and obsolete technology. We find several environment problem areas of different types and gravity in the East. The environmental party <Die Grünen> (or "Green Party") in West Germany shaped the environmental consciousness of the nation in the nineteen/seventies; however, their ultimate success in Federal politics was achieved only during the general-elections of March 6, 1983 where the "Green Party" received 5.6% of the votes and took their seat in the <Bundestag> for the first time. Here, they articulated their critique of the industrial growth fetishism and its adverse ecological consequences. However, the Communist government in East Germany completely ignored the environment and a wasteful exploitation of nature was pursued. The following factors aggravated the environmental destruction in the Eastern part:

- 1) The energy supply in the former G.D.R. was based almost exclusively on lignite coal of inferior quality which was extracted in open-pit mines in Middle Germany and Lower Lusatia region. The East German brown coal had a high content of sulphur and water, with the result that entire regions sooted up, leading to injuries to health.
- 2) The most commonly used automobile in East Germany was a car of the model "Trabant". This vehicle with a two-stroke engine used a cheap two-stroke mixture of petrol and oil with incomplete combustion and a penetrating bad smell. This combination of stack gas from coal heating and exhaust from two-stroke engines created a very specific bad smell, which in common parlance is known as "G.D.R. frowst".
- 3) The triangle between Luena-Buna-Bitterfeld is the area of heavy petrochemical industry in East Germany. This area of Leuna, Schkopau, Bitterfeld and Boehlen with chemical combines is one of the polluted regions of Germany since most industries used to discharge the exhausts into the air without filtering it. As a result of this, many cases of chronic skin diseases, heavy breathing and cancer can be found in this region. Around 95% of all East German factories would have to close down when West German pollution standards would be applied.
- 4) The uranium mining in the Ore Mountains (<Erzgebirge>) of Aue and Annaberg-Buchholz has left behind huge radioactive contaminated waste dumps. The uranium mining in the post was under Soviet control and the East German government had no influence on mining methods not tolerated by the environment. The Soviet mining company "Wismut" dominated the entire region. It will probably take several centuries to clear the area from radioactive waste materials.



- 5) Military bases and training areas of the former National People's Army of the G.D.R. and the Soviet Forces stationed in East Germany are another heavy polluter. At the peak of the "Cold War," almost 4 million Soviet Russian troops were stationed on East German soil. However, the last Russian soldier must have left Germany by July 1994. They are leaving behind a huge area, especially in the State of Brandenburg, contaminated with war material trash, ammunition dumps and oil residual waste. Germany and Russia reached an agreement that the Federal government will not have to pay for the released real estate of Soviet military property but, on the other hand, Germany has to shoulder all the costs of rehabilitation and redevelopment measures.
- 6) The construction of sewerage and water treatment plants is a priority task of the East German environmental policy. During the Communist period all the waste material of factories and private households was discharged into the rivers without purification. The river Elbe near Dresden used to be one of the most polluted rivers of Europe. The textile industry of Saxony and Thuringia with many dye-works was particularly a heavy polluter of rivers.
- 7) In the old days, the refuse of the affluent West German society was exported to East Germany for hard currency and huge dumping grounds in East Germany are evidence of what was called "garbage tourism" (<Mülltourismus>). The most controversial refuse pit was situated at Schönberg near Schwerin.
- 8) The damage done to the forest in East Germany as a result of pollutants is much higher than in West Germany. In the States of Saxony, Thuringia and Mecklenburg-Vorpommern, around 50% of all the forests are damaged; in Berlin around 29%, in Brandenburg around 33%, and in Saxony-Anhalt around 34%. Despite the high density of traffic in West Germany, the West German equivalent is only around 16%. Naturally, this is also a result of the prevailing west-wind direction in the middle of Europe which carries smoke and other pollutants from West to East. Since 1990, the new Federal States have been incorporated into the program of forest damage assessment which is carried out by the United Nations Economic Commission for Europe (ECE) since 1986. Article 34 of the Unification Treaty of August 31, 1990 governs and controls environmental protection and promotes the uniformity of the ecological living conditions at a high level.

In February 1991, the Federal Minister for Environmental Affairs introduced an action program of "Ecological Renewal" (<ökologischer Aufbau>), in order to implement measures of environmental protection immediately. Alongside this emergency program for environmental protection, a sum of more than 10 billion US\$ was made available in order to build the necessary infrastructure. The German Federal Foundation for Environment (<Deutsche Bundesstiftung Umwelt>) and the Federal Ministry for Research are involved in the development of rehabilitation measures. Crucial areas for redevelopment are the heavily polluted regions of "Mansfelder Land" (potassium mining area), the extended area of Leipzig/Halle/Merseburg (petrochemical industry), the upper valley of the Elbe River (machinery and electrical industry), the coal mining and energy region of "Lusatia" (<Lausitz>) with brown coal open-pit mining, as well as the region of Greater Rostock (ship-building industry). Fig. 3 shows the "Ecological Redevelopment Areas" of the new States.

## POPULATION MIGRATION AND THE STREAM OF REFUGEES

With a population of over 80 million people the Federal Republic of Germany is now the largest society among the countries of the European Community. On the day of unification, March 3, 1990, West Germany had 63.5 million people and East Germany had only 16.1 million people, respectively. However, the population growth trend in both German States was very different. In 1950, the old Federal Republic had just under 50 million people while the G.D.R. had 18.4 million. Forty years later, the population of West Germany increased by almost 14 million, whereas the G.D.R. had 2.3 million people





Figure 3. Ecological Redevelopment Areas of East Germany



less. Until the "Wall" was built on August 13, 1961 by the Communist regime, around 3 million East Germans escaped to the West in order to flee from Communist arbitrary rule and tyranny and participate in the West German "economic miracle" (<Wirtschaftswunder>). It is commonplace to say, without the existence of a "Wall" across the whole of Germany that the former G.D.R. would have been depopulated within a short period. However, people were essential for building a socialist society in the East. Only a few hundred thousand were lucky to resettle from the East to the West during the 28 years of the existence of the Wall. These were mostly people bought by the Federal Republic for hard currency, mainly political prisoners, dissidents, and unproductive old people. Immediately before the opening of the Wall on November 9, 1989, there was another massive refugee wave through the German embassies in Hungary and Poland. This massive migration from the East to the West continued after reunification. Due to "push" and "pull" factors, many migrants were attracted by the high standard of living in the West. For example, the East German wage level is only 82% of the Western wages, whereas the cost of living is almost the same (except for rents). Another migrational "push" factor is the mass unemployment of entire regions in East Germany.

### SOCIAL PROBLEMS IN A UNITED GERMANY

The work of bridging the social and human differences which the German unification has brought about is a monumental task. The German politicians solemnly promised to adjust the living conditions in both parts of Germany, in other words, to raise the standard of living and the quality of life in the East up to the West German level. However, it becomes more and more apparent that the disparity between East and West will continue to exist during the next ten years or so. On the day of unification, the German chancellor Helmut Kohl had promised flourishing industrial regions in the East. Due to economic recession and structural problems, the pace of change has slowed down. In East Germany today, unemployment is widespread and entire industrial regions have become desolate. Early retirement, social degradation, zero-employment and "foreignization" are catchwords to characterize the precarious situation in present Germany. During Communist rule in East Germany, the basic necessities were provided by the government from cradle to grave, so to say, although at a very low level. Now the East Germans have to be successful in a highly competitive pluralistic society that is quite alien to them. Young people can cope with the change, but older people have great difficulty in adjusting to the new way of life. Women are particularly the big losers of the unification. During Communist times, almost all women were working and had their own income through work. Today, East German women are pushed aside into the unwanted role of "housewives" and the "care of children". Women-specific achievements in East Germany, such as equal rights for women and women emancipation, or a legal claim of a kindergarten place or the women's right to decide about abortion have been largely abolished in post-unification Germany. The new social values of a consumer-oriented society have caused a lack of orientation among the young generation in East Germany. Many young persons, therefore, have turned to nationalistic and racist ideas and actions against foreigners, asylants and persons resettled from Eastern Europe. Place names such as Hoyerswerda, Rostock or Moelin are examples of violence against foreigners in Germany, especially against Vietnamese and Turkish people. Another big problem is the rise of crime in post-unification Germany, especially among the unemployed youth and teenagers.

Another unpleasant consequence of the unification is the increase of accidents and road casualties in East Germany, because roads in East Germany cannot cope with the rapidly increasing density of traffic there. Although the physical wall has been pulled down, the mental "Wall" in the minds of the people is still existing. The label "Ossi" for the East Germans and "Wessi" for West Germans is still in everyday usage. Many East Germans mourn after the "old days of the G.D.R." and a new word of "Ostalgie" (nostalgia of the East German times) has been coined. A deep-rooted frustration has penetrated the Eastern society, commonly known as <Einigungsfrust>. Present-day politics has failed to solve the impending problems and lack of enthusiasm among voters is deep-rooted in post-unification Germany.



## MISTAKES AND LOST OPPORTUNITIES OF THE UNIFICATION PROCESS

It is still too early to make a final assessment and valuation of the unification process. This can be done only by historians after an adequate lapse of time. However, the following observations can be made summarizing the unification process:

- 1) The international support of the reunification through the 2 + 4 treaties (the two German States and the four Allied victorious powers) was a masterpiece of German diplomacy and foreign policy under the Ex-Foreign Affairs Minister Hans-Dietrich Genscher. The international guarantee of the Polish Western border (the so called "Oder-Neisse line") by Germany and connected with this the renunciation of recovering the Polish Eastern territories that were lost after World War II, was a precondition for gaining approval by the four victorious powers of the German reunification. On March 4, 1991 the Soviet Union was the last of the four powers to ratify the "2+4 Treaty". March 15, 1991 was the day when All-Germany gained her full sovereignty.
- 2) Another assumption is also undisputed that the original idea of the ruling coalition parties to accomplish the German reunification and the adjustment to the conditions of Western Germany without sacrifices of the population has proven to be wrong. The hypothesis that the thriving West German economy could finance the reconstruction of the Eastern part through private investments was a major mistake or misjudgement. The "free market forces" have largely failed to fulfill its role and it is the government that must come to the rescue of the rotten East German economy by financing the unification.
- 3) The appropriate pace and speed of the unification process is one of the most disputed factors among experts. There are two schools of thought on this. One is that the ruling coalition government under Chancellor Helmut Kohl opted for a quick and sudden reunification by sacrificing jobs in the East and accepting the destruction of East German businesses. In this case he was greatly supported by the industrial magnates of the West who wanted to dump their products on East German markets as quickly as possible. The other option was a long-term gradual rapprochement between the two German States and a gradual reunification step by step. This option was favored by the opposition parties of the SPD and "Bündnis 90/Die Grünen". Only the PDS, the successor to the Communist party, wanted to preserve the independence of the G.D.R.
- 4) With the German economic and currency union of July 1990, the decision was made to ameliorate the transformation process as much as possible for the East Germans by means of a tremendous West German financial effort. The two-to-one exchange of East for West German marks was really a concession disproportionate to the actual state of the east German economy, although many citizens of the G.D.R. felt somehow cheated anyway.
- 5) The German unification was a hundred percent annexation or incorporation of the G.D.R. into the Federal Republic. When the unification treaty of August 31, 1990 was negotiated, the former East German government under Prime Minister Lothar de Maiziere (CDU-East) was almost bankrupt and had very little bargaining power to gain acceptance for East German interests. The German unification should have been used to rectify the many shortcomings in the Western society. Certain elements that proved to be superior in the East, should have been adopted or retained in the unified Germany.
- 6) The central sin of omission of Helmut Kohl's government was its failure to seriously prepare the West Germans for the inevitable sacrifices of reunification.



- 7) Among the less tangible accomplishments of unification also was the rapid adoption of the Federal Republic's legal and administrative systems, even though that eliminated the possibility of the East evolving something uniquely its own and perhaps temporarily better suited to its specific circumstances.
- 8) Article 5 of the Unification Treaty suggests the review and amendment of the Basic Law in the context of German unification within a period of two years. The Basic Law which was promulgated in 1949 needs to be amended and the unification would have been a welcome opportunity for restructuring Germany's constitution in order to meet present-day requirements. The following aspects should have been included in an amended Basic Law: a) More direct democracy in the form of citizens' initiatives and participation in order to break the monopoly of political parties and to work against the lack of political enthusiasm. The Federal President should be elected directly by the people and not by an anonymous body of the Federal Assembly in the future. b) The adoption of State objectives and targets in the Basic Law would be mandatory. These State objectives should include: equal rights for women; respect of ethnic, cultural and linguistic minorities; protection of the environment; the non-suable right of work; and, last but not the least, the right to a home. c) The reorganization of the territorial units according to Article 29 of the Basic Law, in order to create large and efficient Federal States.
- 9) The creation of the mammoth enterprise <Treuhandanstalt> for the administration, restructuring and transfer into private ownership of large state-owned enterprises (VEB) needs a critical assessment at a later time.
- 10) Another serious conflict is the problem of coming to terms with the past (<Vergangenheitsbewältigung>) for the East German society, and the restitution of expropriated property. The biggest mistake of the German unification has been the ruling to return landed property (houses and land) that have been nationalized by the Communist government to the original owners, instead of paying compensation to them. This ruling is often unfair and prevents or delays necessary investments in East Germany.
- 11) The burden of financing the German unification has been unequally distributed. The ordinary consumer and average tax payer has to pay for it, whereas those who derived huge profits from the unification got away with it without any extra taxation. For instance, the German automobile industry made a windfall profit by dumping millions of new cars on the newly opened East German market. West German mail-order firms such as "Neckermann", "Quelle" or "Otto-Versand" sold almost everything to the East German population, since very few retail shops existed immediately after reunification.

Last but not the least, with reference to the unification process, the question has been repeatedly raised whether a new political entity or a new Germany has been created by joining together the two parts that have been divided for more than forty years. Unfortunately, this is not the case. It is the old Federal Republic with the addition of five new States and a population that has a different historical background. Germany is certainly not a model case for other divided countries.



**APPENDIX 1**

**HISTORICAL BACKGROUND**

May 23, 1949	Promulgation of the Basic Law (Constitution) in the Federal Republic of Germany
October 7, 1949	Founding of the German Democratic Republic
June 17, 1953	National uprising in the German Democratic Republic and suppression by Soviet troops
August 13, 1961	East German government starts to build the Berlin Wall
December 10, 1971	Award of the Nobel Peace Prize for the late Chancellor Willy Brandt for his "Eastward Policy"
December 11, 1981	Visit of Chancellor Helmut Schmidt in the G.D.R.
October 7, 1989	40th anniversary of the founding the G.D.R.
October 18, 1989	SED-Secretary-General Erich Honnecker is deprived of his power
November 9, 1989	Opening of the Berlin Wall, freedom of travelling for citizens of the G.D.R.
March 18, 1990	First democratic elections for People's Chamber in East Germany
July 1, 1990	Taking effect of the monetary, economic and social union between the Federal Republic of Germany and the G.D.R.
July 22, 1990	Foundation of five new states in East Germany: Mecklenburg-Vorpommern, Brandenburg, Sachsen-Anhalt, Saxony, and Thuringia
August 23, 1990	The People's Chamber of the G.D.R. announces the accession of the G.D.R. to the purview of the Basic Law
August 31, 1990	Unification Treaty-Law dealing with the treaty between the Federal Republic of Germany and the G.D.R. concerning the unification of Germany
October 3, 1990	Unification Day
October 14, 1990	Elections for State parliaments in the five new Federal States
December 2, 1990	First General Elections for the Bundestag in a united Germany. The Christian Union and the Liberal Party receive a majority and form the new Federal government again
June 20, 1991	The Federal Parliament decides with a narrow majority to move the Parliament and government seat from Bonn to Berlin
January 1, 1993	The unified Common Market between the 12 member states of the European Union takes effect
May 28, 1993	Passing of the Solidarity Pact between the Federal and State governments concerning the future financing of the German unification
July 1, 1993	Introduction of a new Postal Code System for a united Germany
October 16, 1994	Second General Elections for the Bundestag in a united Germany



APPENDIX 2

**THE SOLIDARITY PACT - AGREEMENT BETWEEN THE FEDERAL  
AND STATE GOVERNMENTS CONCERNING THE FUTURE  
FINANCING OF THE GERMAN UNIFICATION\***

In May 1993, the <Bundestag> (Lower House of Parliament) approved with a high majority vote the solidarity resolutions within the framework of the Federal consolidation program, which had been agreed before with the State governments and the opposition SPD in March 1993. This also includes a new schedule of the equalization of financial burdens (<Finanzausgleich>) between the States to be effected in 1995 and envisages an expenditure reduction of 2.3 billion US\$ for 1993, 5.6 billion US\$ for 1994, and 6.5 billion US\$ for 1995. The Federal government will shoulder the inherited financial burdens (<Erblasten>) of the unification process amounting to 22.7 billion US\$. This includes costs of the "Treuhand" holding company, credit funds for liquidation proceedings and old housing debts. The share of the Federal government for the turnover tax (V.A.T.) will be reduced from 63% to 56%, and the share of the State governments will increase from 37% to 44% to be effected starting in 1995. If supplementary allocations and investment subsidies are included, the Federal government will shoulder the expenditure of 32.0 US\$ for the reconstruction of the five new states in 1995. Starting from 1995, a solidarity surcharge of 7.5% will be levied on the wage tax, income tax and corporation profits tax. The surplus income for the government is estimated at 17 billion US\$ for 1995. As a consequence of the Federal Constitutional Court judgement, the living subsistence minimum (for single people: 6365 US\$ and for married people: 12,730 US\$ in 1993) will be exempted from income taxation. Additional savings are envisaged with respect to salary adjustments for civil servants by controlling the abuse of funds and contributions of Federal Employment Office. As a result of these measures, the supplementary budget of the Federal government will rise by 7.3% or by 13.6 billion US\$ to a total of 277.6 billion US\$ for 1993. The new indebtedness increased from originally 23 billion US\$ to 41 billion US\$. The rate of the insurance tax will rise by 2 percentage points to 12% effective of July 1, 1993, which will result in an additional income of an estimated 394 million US\$ for 1993. The property will double from 1/2% to 1% in 1995, however, the amount of free allowance exempt from tax, will be raised from 42,400 US\$ to 72,730 US\$ per person. This means an expected additional income of 606 million US\$. Additional measures include the reduction of tax support for housing construction of old buildings according to paragraph 10 of the income tax law to limit the cost of acquisition to 90,900 US\$. This will lead to additional receipts of 100 million US\$. When taxing pensions and retirement benefits the portion of taxable income will be raised from 29% to 32%, if payment of these pensions commences with 60 years of age. The Federal as well as the State governments will give the additional income from the withholding tax on interests to the disposal of the new States in 1993. An additional 940 million US\$ from contributions of the Federal and State governments is credited to the "Fund of German Unity" in 1993. The <Bundesrat> (Upper House of Parliament) also passed this Federal Consolidation Programme unanimously on May 28, 1993.

\* For currency conversion a uniform exchange rate of 1 US\$ = 1.65 DM has been applied in this paper, although the actual exchange rate ranged from 1.50 DM in 1990 to 1.75 in 1994 to the Dollar.



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## THE ANGAT OPHIOLITE, LUZON PHILIPPINES: LITHOLOGY, STRUCTURE, AND PROBLEMS IN AGE INTERPRETATION

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### INTRODUCTION

The Angat ophiolite forms part of the southern Sierra Madre range of Luzon, Philippines where detailed geologic/tectonic studies are still in initial stages. Isolated localities in this vicinity were studied by Irving in 1974 and Corby in 1951, but Karig (1983) was to first recognize that the Angat sequence is a distinct, albeit structurally dissected, ophiolite. It is bordered to the west by sedimentary rocks of the Central Valley Basin (Gonzales et al., 1971; Tamesis et al., 1982), which are also in contact with the more extensively studied Zambales ophiolite to the west (Hawkins and Evans, 1983; Karig, 1983; and Fig. 1). The Zambales ophiolite probably represents a terrane of different age and origin than the Angat ophiolite. This has led Karig (1983) to infer that the two terranes are joined by a major suture zone that is covered by the successor-basin sediments of the Central Valley. The area east of the Angat ophiolite is even more structurally complicated. Haeck and Karig (1985) and Karig et al. (1986) report highly folded and faulted Cretaceous-Neogene sedimentary rocks, melange zones, and various arc-related intrusive and volcanic rocks.

The highly variable geologic suites and their complex structural relations in this region further strengthen the current thinking that the Philippine Archipelago is a collage of allochthonous terranes which Karig (1983), Karig et al. (1986), Fuller et al. (1983), Hawkins et al. (1985), McCabe et al. (1985), and other workers have suggested may be in the intermediate phases of microcontinent evolution. This paper summarizes the results of geologic mapping in the Montalban quadrangle (121° - 121°15'E, and 140° 40' - 140° 50' N) and discusses important, previously undescribed geologic relationships within and around the Angat ophiolite. Our data illustrate that component terranes in this evolving microcontinent such as the Angat ophiolite, pose problems that need to be carefully addressed before far-reaching tectonic conclusions can be reached.

### LITHOLOGY

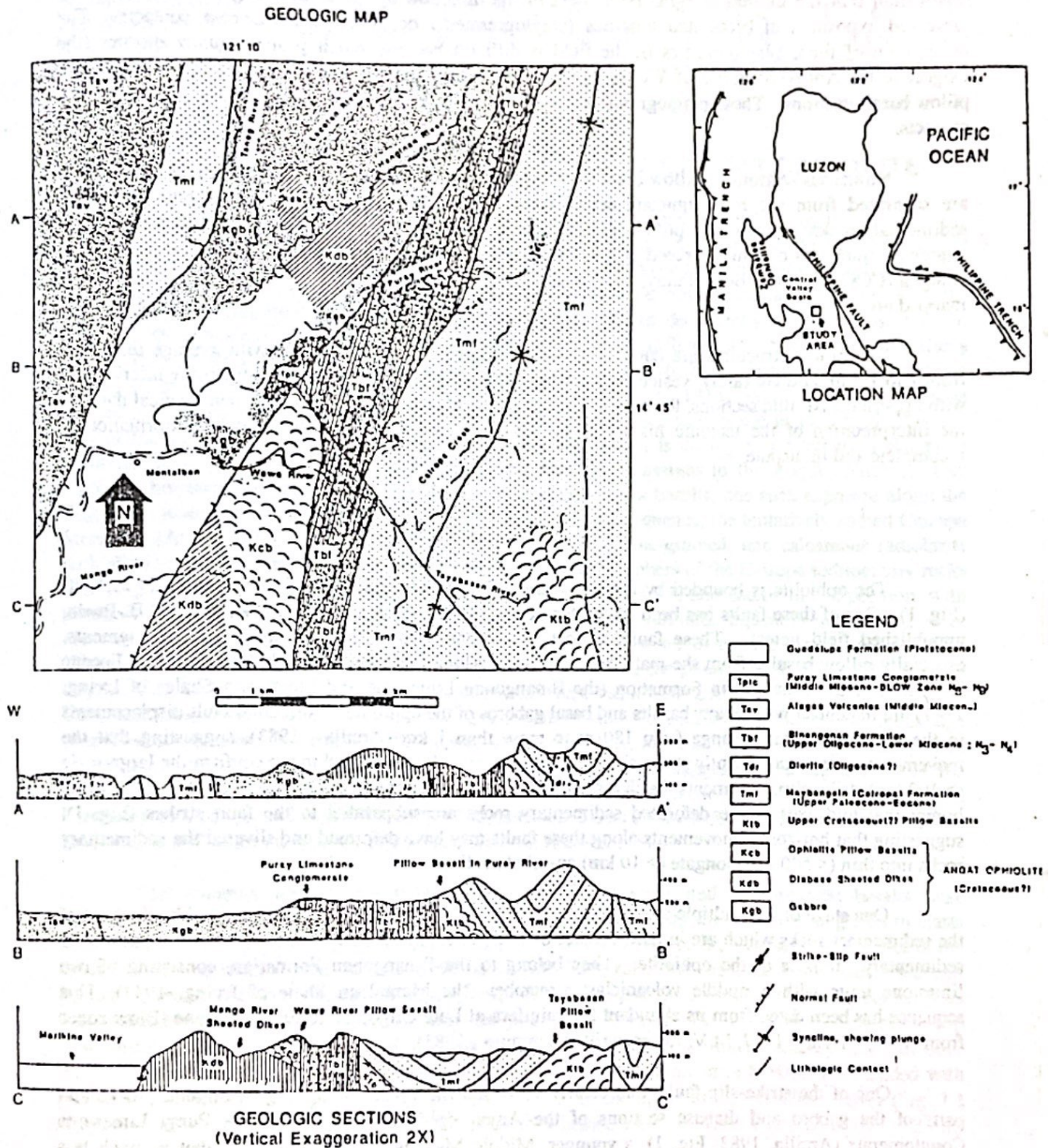
Pending further work, the Angat may be classified as a partial ophiolite, because no ultramafic exposures have been recognized. The mafic constituents mapped so far are layered gabbros that represent the deepest exposed part of the ophiolite, and higher-level gabbro norites and olivine gabbros of varying textures (Balabac Gabbro Formation of Arcilla, 1983). Layers and banding in the gabbros have an average trend of N25-30° E, dipping 50-60 SE. The exposures of layered gabbros are limited, and commonly pass upsection into more dominant isotropic or massive gabbro.

Diabase sheeted dikes, 15-100 cm. thick, are well exposed along the Mango, Lacotan, and Hanginan rivers. The majority of the dikes trend NNE (N10-15° E), and dip 70-83° NW (see Fig. 1). This dominant trend was interpreted by Karig (1983) to denote the general orientation of the ophiolite as a NN-trending body with a < 20° SE dip, orthogonal to the dikes. A number of the dikes are preferentially chilled at their eastern borders. A careful statistical study of the hundreds of sheeted dikes exposed,

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**Figure 1.** Geological sketch map of the Montalban area showing areal distribution of the igneous suite of the ophiolite and other rocks in contact with it. The geologic sections show the structural relationship of the gabbro, diabase and contiguous pillow basalt portions of the ophiolite with faulted younger sediments. The Wawa pillow basalts are the source of the best radiolarian age data for the Angat ophiolite (undifferentiated Cretaceous).



especially along the Locotan and Hanginan Rivers, is required before we conclude from this initial observation that the chilled margins point west in the direction of the extinct ridge. Minor but well-preserved exposures of brecciated tonalites (plagiogranites?) occur at gabbro-diabase contacts. The recognition of these plagiogranites in the field is difficult because much younger quartz diorites (the Oligocene [?] Antipolo diorite of Wolfe, 1972) are intruded into parts of the ophiolite, including the pillow basalt sections. These plagiogranite sections, however, appear to be limited to the gabbro-diabase contacts.

Numerous sections of pillow basalts are exposed, some contiguous to the sheeted dikes, but most are separated from the main igneous mass of the ophiolite by faults and strongly folded younger sedimentary rocks. Some of the pillow basalts are well preserved, and display classical pillow structures, aggregate thickness of which exceed 300 m in some sections. Important localities include the Wawa, Nangka (COGEO), Boso-Boso, Puray, and Tayabasan rivers, as well as the Pahinaan River outside of the mapped area.

The pillow structures are commonly flat-cylindrical, elongated bodies with average diameters from 1 to 1.5 m, and are rarely vesicular. Thin-bedded volcanoclastic radiolarites, commonly interlayered with uppermost basaltic sections, form an important source of paleontologic and sedimentological data for the interpretation of the tectonic history of the ophiolite; unfortunately, the available information is incomplete and in dispute.

## STRUCTURE

The ophiolite is bounded by long, straight, sub-parallel, high angle faults trending N to NNE (Fig. 1). One of these faults has been traced for nearly 140 km (Oca and Potenciano, 1963; H.B. Ruelo, unpublished field notes). These faults dissect the ophiolite complex, separating mafic fragments, especially pillow basalts, from the main ophiolite body. Along these faults, highly folded Oligo-Miocene sediments of the Binangonan Formation (the Binangonan Limestone and Montalban Shale of Irving, 1947) are in contact with pillow basalts and basal gabbros of the ophiolite. Horizontal fault displacements in the sedimentary rocks range from 180 m to more than 1 km (Arcilla, 1983), suggesting that the movements were predominantly strike-slip. However, regional data are lacking to confirm the large-scale (> 100 km) strike-slip movements that Karig (1993) suggested for the Angat ophiolite. The synclinal and homoclinal fold axes of the deformed sedimentary rocks are subparallel to the fault strikes (Fig. 1), suggesting that horizontal movements along these faults may have deformed and slivered the sedimentary rocks into thin (< 500 m), elongate (> 10 km) en-echelon slices.

One stage of the multiple deformational history of the ophiolite can be constrained by the ages of the sedimentary rocks which are in fault contact with it. These sedimentary rocks *do not* form part of the sedimentary carapace of the ophiolite. They belong to the Binangonan Formation, consisting of two limestone units with a middle volcanoclastic member (the Montalban Shale of Irving, 1947). This sequence has been dated from its abundant foraminifera at Late Oligocene to Early Miocene (Blow zones from N<sub>3</sub>-N<sub>4</sub> - Irving, 1947; M.V. Reyes, written commun., 1983).

One of the strike-slip faults that clearly deformed the vertically-dipping Binangonan rocks and parts of the gabbro and diabase sections of the Angat ophiolite also borders the Puray Limestone Conglomerate (Arcilla, 1983; Fig. 1), a younger, Middle Miocene biocalcirudite unit that is much less deformed, dipping no more than 20°. This suggests that one major phase of deformation along these faults occurred during Early to Middle Miocene time. Renewed vertical movements along these faults may have occurred as late as the Pleistocene, when block faulting displaced PlioPleistocene tuff units and formed the Marikina Valley (Irving, 1947; Arcilla, 1983). There is a reversal in the sense of normal faulting within the Marikina Valley block; its southern part moved down, whereas the northern part was tilted upward, exposing the layered gabbros of the ophiolite (Fig. 1). However, the Pleistocene normal



faulting alone cannot account for the extensive unroofing that the ophiolite has undergone, and we interpret the more intense Miocene strike-slip movements as primarily responsible for the present structural configuration of the ophiolite. This Miocene strike-slip deformation has also been documented east of our mapping area (Haeck and Karig, 1985; Karig et al., 1986). Several stages of pre-Miocene strike-slip faulting were also delineated by Haeck and Karig (1985) in the southern Sierra Madre, but these deformation could not be traced into the Montalban area.

### AGE AND SEDIMENTARY CARAPACE OF THE ANGAT OPHIOLITE

The foregoing discussion of structures also poses problems in evaluating the sedimentary carapace of the ophiolite, which, in the absence of reliable radiometric data, provides the minimum age of the ophiolite. Unfortunately, the sedimentary covers have been eroded off the pillow basalt exposures which are contiguous to the sheeted dikes. In other pillow basalt exposures that are separated from the main ophiolitic mass by faults, volcanoclastic sedimentary rocks do directly overly pillow basalts. However, there is some confusion as these sedimentary rocks have different ages and lithologies. Karig (1983) considered a Late Cretaceous, (Maastrichtian) calcareous turbidite sequence (the Kinabuan Formation of Ocampo and Martin, 1967; see also Reyes and Ordonez, 1970; Hashimoto et al., 1979) as the sedimentary carapace of the ophiolite, even though this sequence as exposed in Pinugay Hill to the east of our mapped area is related to a pillow basalt unit which is clearly separated from the main ophiolitic body; this is the basis for the Late Cretaceous age he assigns to the Angat ophiolite. Our mapping, however, has also revealed several other separated pillow basalts; one such exposure along the Tayabasan River is overlain by a nearly 1 km thick volcanoclastic sequence, the tentatively named Cairopa formation (Arcilla 1983; Fig. 1). The base of this sequence is fine-grained, non calcareous radiolarite with abundant basalt-derived clasts. The middle volcanoclastic members of the Cairopa sedimentary rocks overlying the radiolarites in Tabayasan River are predominantly basaltic and dacitic in composition, with interlayered basalt and dacite flows. Its numerous coarse and fine turbidite sequences interbedded with red volcanoclastic shales also indicate slumping during its deposition in a deep marine environment (Siringan, 1987). The age of the radiolarite, and consequently of the pillow basalts they underlie, is in dispute; C.D. Blome (USGS, unpublished data) recently reported a well-constrained Late Cretaceous age from radiolaria found in this section, while an earlier study suggested an Early Cretaceous age (unpublished Philippine Bureau of Mines report, 1986). However, fossil and sedimentological data taken from the Cairopa sequence in Tayabasan River by Siringan (1987) suggest that a big portion of the volcanoclastic sequence overlying the radiolarite is stratigraphically equivalent to the Eocene Maybangain Formation of Ocampo and Martin (1967). Whether there exists an unconformity between these Eocene sedimentary rocks and the Upper Cretaceous radiolarite is unresolved.

The complex relationships between the sedimentary rocks and the ophiolite basalts were confirmed when W. Schoell et al. (pers. commun., 1987) recently recognized *microline* grains in clasts of a member of the Late Cretaceous unit the Karig (1983) considered to be the sedimentary carapace of the ophiolite; yet, no nearby granitic provenance is known. This rules out the Late Cretaceous Kinabuan Formation (or at least part of it) as the original sedimentary carapace of the Angat ophiolite, but suggests that allochthonous slices of sediments may be juxtaposed close to the ophiolite. The strike-slip movements described by Karig et al. (1986) might possibly explain this potentially allochthonous relationship. At present the only age date available from a single radiolarite horizon interbedded with pillow basalts that are clearly contiguous to sheeted dikes of the ophiolite in the Wawa River (Fig. 1) suggests a cretaceous age, but undifferentiated as to whether Early or Late Cretaceous (C.D. Blome unpublished data).

These age conflicts arises from differing sediments over basalts suggest that some pillow basalts may not be contiguous to the sheeted dikes of the ophiolite, and may reflect subaqueous volcanic episodes unrelated to ophiolite formation. This indicates that age and setting data derived from sediments over basalts should be viewed with caution, especially in structurally disturbed ophiolite sequences. The



Zambales ophiolite is not as structurally complex as the Angat, but we would like to suggest a re-examination of its commonly accepted Eocene age, which was drawn mainly from sedimentological and biostratigraphic studies on the Aksitero Formation that is considered to be its sedimentary carapace (Garrison, et al., 1979; Schweller, et al., 1983, etc.). Most of the observed outcrops of the Aksitero Formation do not *directly* overlie pillow basalts, but instead overlie basalt rubble or basaltic breccias, which are thought to be derived from, or still form part of, the pillow basalt sequence of the Zambales ophiolite. In the Angat ophiolite on the other hand, even though sedimentary rocks *directly* overlie pillow basalts, problems still abound. The actual ages of the basalts in both ophiolites are obviously critical for evaluating the regional tectonic scenarios of Karig (1983), Stephan, et al. (1986), and other workers. If, for example, the Angat ophiolite is proven to be Eocene, the buried strike-slip suture zone invoked by Karig (1983) to explain its contact with the Zambales ophiolite may not be necessary, or will need modification. If the Angat is shown to be much older (e.g. Early Cretaceous), then the Angat terrane will be a very interesting area for accretion studies, in as much as sediments located east and west of it suggest its allochthonous character. Without discounting future paleontologic work, which is also difficult because fossils are also swamped by the abundant volcanoclastic content of the rocks, reliable radiometric dates from the mafic segments of the ophiolite itself are badly needed.

Even if the age of the sedimentary carapace of the Angat ophiolite is still controversial, the generally volcanoclastic nature of sedimentary sequences related to the ophiolite supports a possible back-arc origin for the Angat ophiolite supports, in accordance with models for sedimentation in back-arc basins (e.g., Karig and Moore, 1975; Karig, 1983).

Paleomagnetic studies that have been started in the Angat terrane (Fuller et al., 1983; Almasco and Fuller, 1984; McCabe, et al, 1987), and have already been used in some tectonic scenarios (e.g. Karig, 1983) should also be strongly qualified by the structural complexity and paucity of reliable age dates for the Angat ophiolite.

## INITIAL GEOCHEMICAL DATA

The chemical analysis performed for us by J.W. Hawkins (Scripps Institution of Oceanography) and summarized in Table 1, are the first available geochemical data from the Angat ophiolite pillow lavas and sheeted dikes. Two samples (LUZ519A and LUZ519B) were taken from chilled margins of sheeted dikes in Mango River and one sample (LUZ517A) comes from a pillow basalt which is contiguous to the dikes. Two of the samples (LUZ516B and LUZ516C), come from pillow basalt exposure which are separated from the main ophiolitic mass, and there is still uncertainty whether these were originally contiguous to the ophiolite.

The silica contents of most of these "basalts" are rather high, averaging 53.05%, with one sample having as high as 60.24 % (sample LUZ516B). From their silica content alone, they might be called andesites, but trace-element content (J.W. Hawkins, written commun., 1986) suggests that these could be extensively fractionated basalts. Trace-element values do not plot uniformly in discriminant diagrams (Figs. 2-5), however, suggesting that different basaltic magma types may be involved.

While these initial geochemical data support our finding that there may be different sets of pillow "basalts" in the Angat, one problem that needs to be addressed is how to discern geochemically between fractionated ophiolite lavas and those pillow lavas which are structurally dissected from the ophiolite and may be unrelated to ophiolite formation. Identification of the basalts that genuinely belong to the ophiolite is obviously important in identifying the sedimentary carapace of the ophiolite, from which setting and tectonic data may be obtained. Additional geochemical data on a wider set of samples from the Angat ophiolite and proximal volcanic rocks, used jointly with existing field data, could help discriminate between different basalt types or even arc-andesites, as some "basalts" have unusually high



**Table 1. Chemical Analyses of Angat ophiolite samples**

Oxides	LUZ-516B	LUZ-516C	LUZ-517A	LUZ-519A	LUZ-519B
<i>Major elements (wt. %)</i>					
SiO <sub>2</sub>	60.24	57.96	56.03	54.31	53.05
TiO <sub>2</sub>	1.33	1.43	1.06	1.95	1.93
Al <sub>2</sub> O <sub>3</sub>	15.68	15.83	18.38	13.64	13.57
FeO	10.90	13.06	11.82	12.22	13.21
MnO	0.22	0.26	0.21	0.31	0.30
MgO	3.52	4.60	3.38	7.76	7.91
CaO	4.31	3.27	5.09	5.91	5.14
Na <sub>2</sub> O	4.46	4.25	4.83	3.78	4.72
K <sub>2</sub> O	0.14	0.20	0.35	0.05	0.05
P <sub>2</sub> O <sub>5</sub>	0.13	0.12	0.11	0.06	0.13
Total	100.93	100.98	100.26	99.99	100.01
<i>Trace elements (ppm)</i>					
Ni	11	10	3	35	32
V	311	295	280	346	345
Ba	4	25	30	<1	<1
Sr	56	66	90	77	66
Rb	2	3	5	<1	1
Zr	95	96	88	146	145
Y	41	34	16	48	46
Nb	5	8	9	8	11
<i>Elemental ratios</i>					
Ti/V	25	29	226	33.8	33.5
FeO <sup>+</sup> /MgO	3.10	2.84	3.49	1.57	1.67
(Mg/e <sup>2+</sup> ) x 100	41.85	44.0	38.9	58.6	57.2
K/Rb	581	553	581	415	415
K/Ba	290	66	97	415	415

**Notes:** Major elements were done by electron microprobe on glasses made from whole rock samples. Trace elements were done by X-ray Fluorescence (XRF) on powdered rock samples. Splits of the same material were analyzed for major elements. Samples were also crushed in alumina mortars and grinders to avoid metal contamination. The samples were collected in February, 1986 at the laboratories of Scripps Institution of Oceanography, La Jolla, California.

**Sample Locations** LUZ516B and LUZ516C were taken from pillow "basalt" rinds in Pinugay Hill, where the Kinabuan formation outcrops immediately to the east. These samples represent the farthest pillows (eastward) from the main igneous mass of the igneous mass of the Angat ophiolite is still unresolved. LUZ519A and LUZ519B were taken from chilled margins of sheeted dikes in the Mango River; these samples are undoubtedly part of the Angat ophiolite. LUZ517A were taken from a well-preserved pillow basalt exposure in COGEO, Rizal which we interpret as still part of the Angat ophiolite.

silica contents. The occurrence of arc-andesites is also entirely probably since some much younger andesites (e.g., the Middle Miocene Alagao volcanics; Gonzales et al., 1971) have been mapped in the southern Sierra Madre. Further geochemical discrimination may also be necessary to distinguish quartz diorite intrusions from true plagiogranites, which if present, could yield radiometric dates with which to resolve the age problem of the Angat ophiolite.



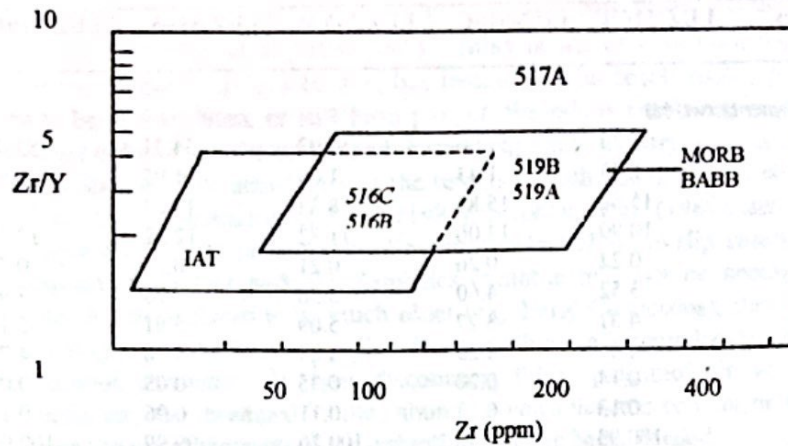


Figure 2. Discriminant diagram showing plots of initial Angat ophiolite geochemical data. MORB - mid-ocean ridge basal; BABB - back-arc basin basalt; IAT - island-arc tholeiite. Fields from Pearce and Norru

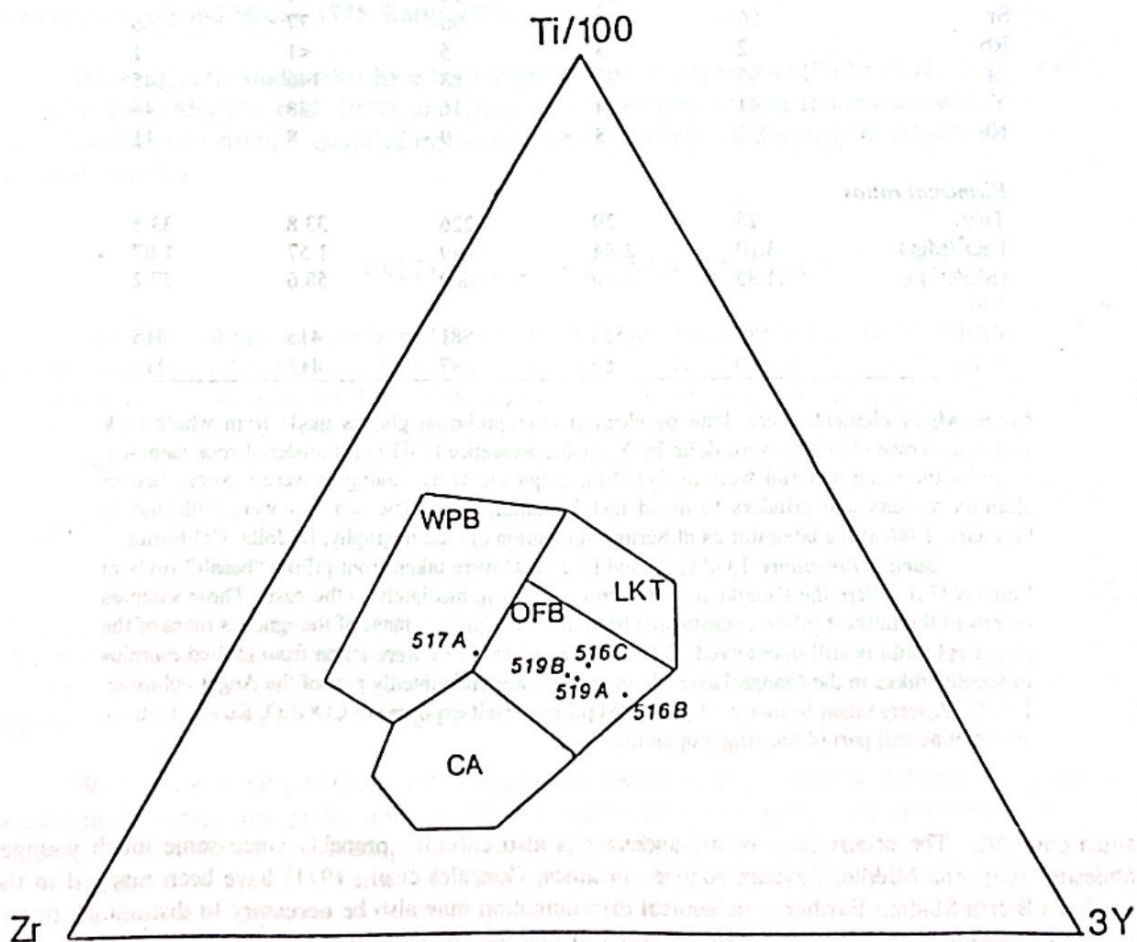


Figure 3. Discriminant diagram showing plots from initial geochemical data of the Angat ophiolite, which suggests that basalts related to the ophiolite may have different tectonic environments of formation. WPB - within-plate basalts; LKT - low-potassium tholeiites; OFB - ocean-floor basalts; CA - calc-alkaline. Fields from Pierce and Nony (1979)



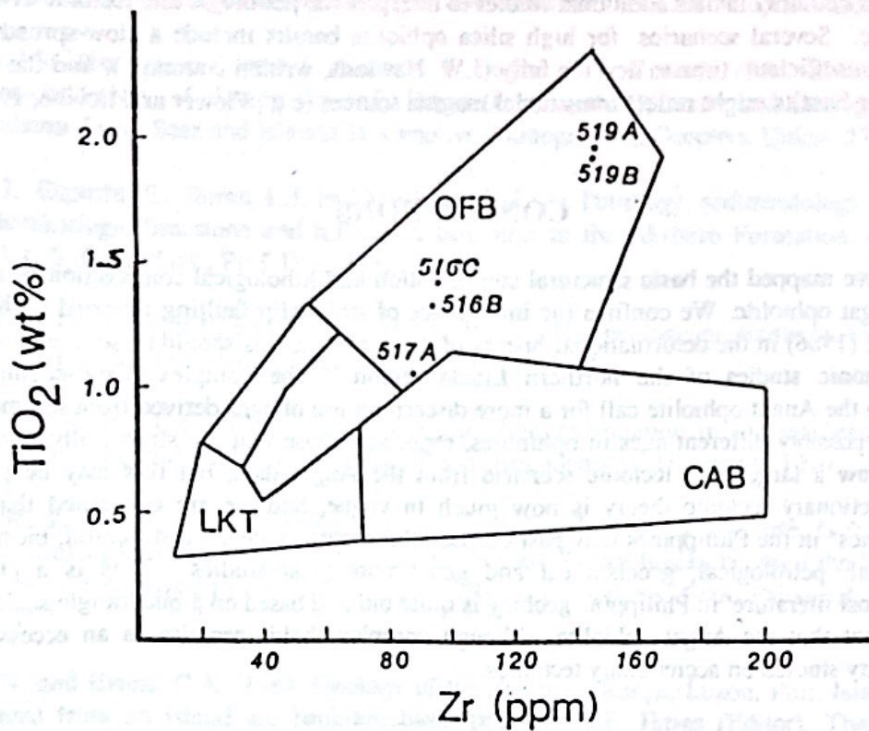


Figure 4. TiO<sub>2</sub>Zr plot, showing that the Angat basalts could all be ocean floor basalts, contrary to other discriminant diagrams used (e.g. Fig. 5). OFB – ocean-floor basalts; CAB – calc-alkaline basalts; LKT – low potassium tholeiites. Fields from Pearce and Norry (1979).

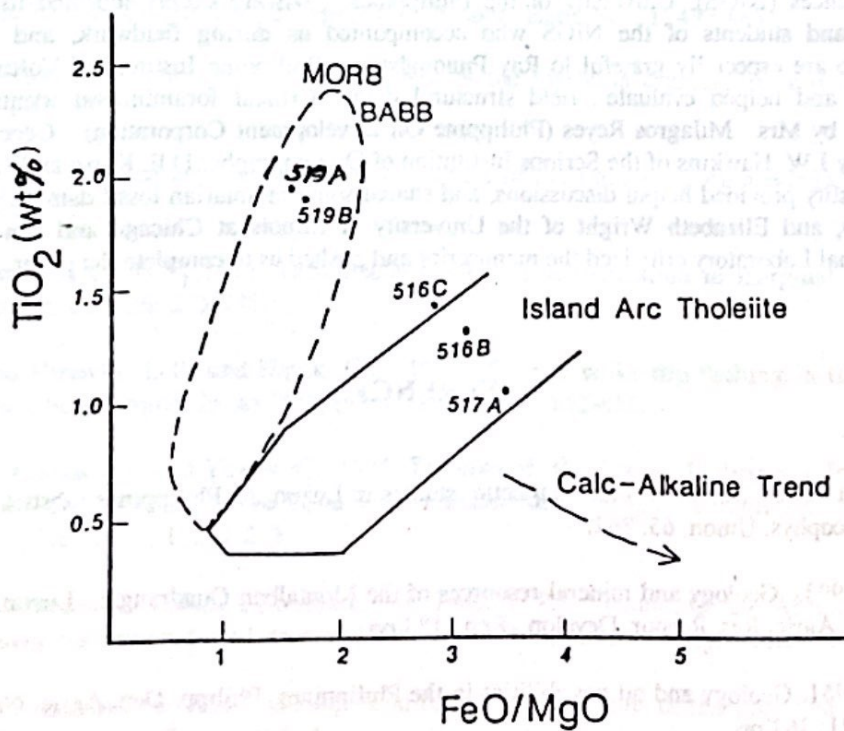


Figure 5. Geochemical plot in discriminant diagram used by Hawkins and Evans (1983), which suggest that both arc and ocean floor basalts could be found in the Angat ophiolite.



The very limited amount of geochemical data presented here does not permit far-reaching conclusions, but certainly invites additional studies to interpret the petrologic and tectonic evolution of the Angat ophiolite. Several scenarios for high silica ophiolite basalts include a slow-spreading back-arc ridge that had insufficient time to develop fully (J.W. Hawkins, written commun.), and the geochemical variations in the basalts might reflect transitional magma sources (e.g., Flower and Levine, 1987).

## CONCLUSIONS

We have mapped the basic structural configuration and lithological composition of an important part of the Angat ophiolite. We confirm the importance of strike-slip faulting reported by Karig (1983) and Karig et al. (1986) in the deformational history of the ophiolite; this should be seriously considered in the future tectonic studies of the northern Luzon region. The complex basalt-sedimentary rock relationships in the Angat ophiolite call for a more discerning use of ages derived from sedimentary rocks over basalts of possibly different ages in ophiolites, especially those that are structurally disrupted. It is tempting to draw a large-scale tectonic scenario from the Angat data, but this may be premature at present. Accretionary tectonic theory is now much in vogue, and we are concerned that reports of "accreted terranes" in the Philippines may past outpace the necessary detailed structural, biostratigraphic, sedimentological, petrological, geochemical and geochronological studies. This is a clear danger, inasmuch as most literature in Philippine geology is quite old and based on a quadrangle scale. However, we are confident that the Angat ophiolite, although complex, holds promise as an accessible are for multidisciplinary studied on accretionary tectonics.

## ACKNOWLEDGEMENTS

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## R & D ON HIGH VALUE FRUIT CROPS

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### INTRODUCTION

Considerable progress has been made in the production of fruit crops. Old notions and concepts, even scientific information, are being replaced by new findings. For example, the long-held view that feeder roots are at the canopy drip-line has been superseded by data obtained from studies using radiotracers. A few of these new knowledge are now used widely by growers such as flower induction in mango and pineapple using potassium nitrate and ethephon, respectively. However, much of the technology are yet to become part of the routine operations of Filipino fruit growers. A few of the findings are completely unknown outside of UPLB. There are many reasons for not adopting the technology - capital, tradition, social inhibition, uncertainty, and sheer stubbornness - but the most important is know-how. Growers may be completely unaware of the existence of the technology or his knowledge about it is inadequate.

As an aid to the dissemination of information, the fruit cop exhibits at the 20<sup>th</sup> Founding Anniversary of the Department of Horticulture, UPLB-CA were focused on some recent advances in fruit crops research and development. The founding Anniversary was held with the theme, "High value crops". This paper is a slightly revised version of the manuscript mimeographed and distributed during the celebration on April 14-17, 1994.

### CROP IMPROVEMENT

#### *Mango*

'Carabao' mango is grafted to traditional "Pahutan" rootstocks. The resulting plant is robust. When full-grown, a grafted "Carabao" mango is 11 m tall and 14 m wide, on the average. Grafted trees with diameters of 17 m have been measured. Owing to this vigorous growth and large canopy spread, the recommended distance of planting is 14 x 14 m, giving a population of nearly 50 trees per hectare. There is a very large space wasted at the beginning. Much more trees can be grown during this early stage but once canopies close in, management becomes difficult.

Dwarfing rootstocks can slow down considerably the growth of "Carabao" mango trees. This will allow high density cultivation for a much longer period. Ordinarily, high density planting follows a scheduled systematic removal of trees. With a dwarfing rootstock, the schedule could be delayed considerably and some rows may be retained during the later years of the orchard. The Philippine experience on dwarfing rootstock is recent and data are insufficient to recommend the technology but, abroad, other crops are being grown commercially on dwarfing rootstocks.

Citrus. The local citrus industry was once flourishing especially in Batangas where the crop was a major source of livelihood. In the late 1950's and early 1960's, the citrus industry began to decline and from there on has never been able to recover. From Batangas, citrus growing moved to other provinces where for sometime citrus was grown in a relatively disease-free environment. Soon, plants suffer the same fate as the plantings in Batangas.

The decline has been attributed mainly to tristeza virus and leaf mottling diseases. Its rapid spread is due to the inability of growers to control the insect vectors but more importantly to the use of infected



planting materials. Growers are never sure of budded seedlings purchased from commercial nurseries although the plants may look normal.

Healthy seedlings can be produced by using scions obtained from desirable mother plants which are declared free from diseases by an indexing procedure. Citrus indexing has field and laboratory aspects. An experienced person examines closely a selected mother plant for the symptoms of tristeza and leaf mottling. He collects leaf samples for screening in the laboratory using diagnostic kits developed under local conditions. The disease-free scion is grafted onto a rootstock raised inside a screen cage that prevents infection due to insect vectors. Mother plants are indexed regularly at 2 to 3 month interval. This is expensive but repeated indexing can be limited. The resulting disease-free grafts 2nd raised inside screen cages. When new shoots have arisen, the meristems are shoot-tip grafted onto disease-free rootstocks. The screen caged grafts are dependable sources of disease-free scions. Alternately, the grafts may be raised to maturity inside the screen cage and serve as mother plants of scions for conventional budding.

## PROPAGATION

### *Banana*

Banana is traditionally propagated by corm and sucker. Corm is easier to handle and unharmed by strong winds to which suckers are susceptible. Also, large corms maybe chopped into seedpieces to produce more than one planting material. Despite these advantages, small scale growers do not use the latter. Banana produces many suckers but not all types - maiden, sword, water peeper - are suitable for seedling purposes. Only sword suckers are recommended but few are available per hill and where a large number of planting material is required, this becomes a limiting factor in establishing a banana plantation.

Tissue culture is an alternative to the traditional method. This is a rapid technique of mass propagation which has the added advantage of producing disease-free planting materials. The major steps consist of: decontamination by washing in soap and water and soaking in commercial bleach; shooting of proliferation through inoculation into a culture medium; sub-culturing by inoculating shoot sections into the proliferation and rooting media; hardening at room temperature; potting and keeping plants in a shady area; and field planting.

### *Pineapple*

Pineapple is propagated traditionally by shoots arising from the stem (sucker), peduncle (slip), or fruit (crown). Suckers are most robust and mature earlier than the other shoots but are too few to be useful in establishing a pineapple plantation. Slips are more numerous, at par with the larger sucker in yield, and is regarded as the best planting material. However, the most important and widely cultivated cultivar, the "Smooth Cayenne", is not prolific in producing slips, and use of Ethephon to induce flowering reduces its slipping ability. Crowns are not used in the Philippines as planting materials.

The relative scarcity of propagation materials limit the potential of the Philippine pineapple industry. Tissue culture offers a new way of mass-producing planting materials. Sections of the tissue at the leaf base near the axil are grown in a culture medium and these will give rise to new plants. This is true regardless of the type of leaf. Many such sections can be taken per leaf and thus the leaves of the crop plant, sucker, slip, and crown put together are sources of a great number of tissue for mass propagation.

### *Citrus*

Rehabilitation of the citrus industry demands replanting with disease-free seedlings. Traditional planting materials consisting of bud-grafted (or budded) seedlings could not meet the requirement because scion buds are obtained from mother plants in the fields and these are grafted onto rootstocks raised in open nurseries. Both mother plants and rootstocks are easily infected by the tristeza virus and leaf mottling



organisms through their respective vectors. These pathogens are the main causes of citrus decline in the Philippines and elsewhere.

In shoot-tip grafting, rootstocks are raised under aseptic conditions. Seeds, which are regarded generally as virus-free, are sterilized with sodium hypochlorite, rinsed with sterilized distilled water, and germinated without seedcoat and testa in a culture medium. Scions are the meristematic dome obtained from new shoots of plants raised in screencages that protect them from insect vectors. Meristem scion may also come from field-grown trees, but the mother plants must have been indexed and declared disease-free. Mass production of disease-free seedlings is possible with shoot-tip grafting which is also a fast method because rootstocks are only 15 to 30 days old compared to 3 months old rootstock in traditional budding.

### ***Mangosteen***

Mangosteen is highly regarded as one of the most delicious fruits worldwide. It is a high-value crop and one of the most expensive in the local markets. Despite the lucrative income that it offers, mangosteen has not advanced to the status of a major fruit crop. Mangosteen is a slow-growing crop. Plants are established from seeds and trees come to bearing many years after planting. Both contribute to a very long gestation period which discourages growers from putting up a mangosteen plantation.

Recent studies showed that mangosteen can be grafted with a fairly high degree of success. Research is in progress but asexual propagation always shortens the bearing age of other crops and with mangosteen the first fruiting occurred 3 years after planting. It will now be a more attractive proposal for investors to get into a mangosteen business.

## **ESTABLISHMENTS**

### ***Fruit Crops***

In the old system of establishing perennial fruit crops, trees are planted very far from each other. Plants that arise from seeds used grow very large. Only a few such trees can be accommodated per hectare. These huge seedling trees now comprise the greater portion of tree plantings in the country, and are the mainstay of some fruit industries as the mango. The advent of asexual propagation at the turn of the 20<sup>th</sup> century enabled the establishment of trees with higher population per hectare at a spacing of 14 x 14 m which has become the traditional spacing for mango. In recent years, the space between trees has been reduced further but trees remain relatively few compared to high density planting.

In the modern way of orchard establishment, the suggested spacing for mango is 4 x 6 m giving a population of 417 trees/ha. A high density banana plantation has a population of 2,000 plants/ha. Kalamansi may be started at 1 x 1 m from the traditional 20,000 (0.5 x 1 m) plants/ha, pineapple is now grown at 40,000 plants/ha in small holdings. Up to 75,000 plants/ha is grown in large-scale cultivation of pineapple.

## **FERTILIZATION**

### ***Fruit Crops***

It is a long-held view that feeder roots are located at the canopy drip line. Production recommendation in the past suggest to apply fertilizers (and water) along this imaginary line around the trunk in shallow holes or candles. The method used then consisted of the tedious and destructive sampling and quite inaccurate because of the likelihood of cutting and losing some roots while digging and pulling them out.



Radiotracers have been used to establish that feeder roots are close to the trunk and near the ground level. Farmers should now abandon the canopy, less than 1 m from the trunk, and no deeper than 30 cm depending on the species.

### *Pineapple*

The fertilizer requirement of pineapple is large. For N alone, it will cost the grower about 6,500.00/ha by 1993 prices of urea. Leaf analysis can save the grower from spending on fertilizer. If the level, for example, of N in the leaves of current plantings is below a standard the grower should apply N. A higher level means that he can dispense with fertilization this growing season. The standard is referred to as the "critical level" which is defined as the concentration of nutrient in the leaf below which yield will decline. The critical level of an element is specific to a location and each grower must establish this in his particular farm. A change from one cultivar to another means that he must establish the critical level in each cultivar. There is a specific sampling procedure requiring "D" leaves or the four longest leaves taken at about flowering time. The critical level approach presupposes that growth is a function of individual elements rather than their interaction or a combined effect of many factors.

The new approach called DRIS (Diagnosis and Recommendation Integrated System) is a mathematical approach which establishes nutrient norms based on leaf nutrient levels obtained from high-yielding populations of pineapple. DRIS is independent of location, cultivar and sampling procedure but the main difference from the critical level approach is the ability of DRIS to rank the elements according to the severity of their deficiency and to incorporate the concept of nutrient balance in determining yield.

## IRRIGATION

### *Fruit Crops*

Much of the water applied to fruit trees by flooding is wasted. This method irrigates non target plants and therefore encourages excessive weed growth which in turn harbors harmful insect pests. It maintains a humid environment which is conducive to the growth of disease-causing micro organisms.

Fruit crops' consumptive use of water is large under hot tropical climates where evapotranspiration is high and trees are robust. For example, about 1,000 liters of water is suggested weekly for a full-grown grafted mango. A hectare of trees planted 14 x 14 m will require weekly about 50 m<sup>3</sup> of water. Much more is required by high density orchards.

Drip irrigation can reduce greatly the volume of water and eliminate the problems associated with losses, weeds, insect pests and diseases. This is an answer to the rising concern over the scarcity of water nowadays because of drought, increasing consumption by man and his activities, and competition with other uses of water. The initial cost of investment is high but not very much different from the cost of putting up a conventional system. Both flooding and the drip system will require engines to pump, store and deliver water. The network of canals in flooding will be replaced by a network of pipes. Emitters will be the final component of the drip system instead of the circular canal around tree trunks. Both systems will require a source and reservoir of water. The maintenance of pipes and emitters free of clogs is equivalent to the weeding and cleaning of the canal system.

## FLOWER INDUCTION

### *Pineapple*

In the Philippines, pineapple flowers naturally in November and December. Fruits harvested all in summer, flood the market, making prices unprofitably low. To produce off-season fruits, pineapple is



induced to flower. The traditional method is by pouring a solution or dropping a corn-size granule of  $\text{CaC}_2$  to the "heart" of the plant. This method results in 75% flowering. The active ingredient is acetylene which is released upon contact of  $\text{CaC}_2$  with moisture. Acetylene is a synthetic substance and is not a growth regulator but physiologically-active because it is an analog of ethylene - the hormone. Ethylene is not a component of  $\text{CaC}_2$  and there is no conversion from one another within or outside the plant tissue.

The more effective ethylene was once used commercially to induce pineapple flowering but it is a gas and therefore difficult to apply. The problem has been solved with the advent of ethephon, a water-soluble formulation containing ethylene as active ingredient. From the original local work that reported 85% flowering with 1,000 ppm Ethephon, the concentration has been reduced to one-half, then 240 ppm by adding urea to the Ethephon solution. A further reduction of concentration to 25 ppm is possible, without losing effectivity, by adjusting the pH of the solution to 9.0. Application is best done in the afternoon. Following is a comparative cost-benefit analysis assuming that : (1) prices are 1993 levels, (2) population is 40,000 plants/ha, (3) 40% small and 60% large fruits are harvested, and (4) farm prices of small and large fruits are P 4.00 and P 8.00, respectively.

Item of Comparison	$\text{CaC}_2$	Ethephon
Flowering intensity (%)	75	90
Yield (fruit/ha)	30,000	36,000
Flower inducer		
Price	20.00/kg	280.00/300
Amount/plant	5 g	0.005 ml
Amount/ha	200 kg	200 ml
Cost (P/ha)	4,000.00	187.00
Urea		
Price (P/bag)	-	300.00
Amount/plant (g)	-	1.0
Amount/ ha (kg)	-	40
Cost/ha (P)	4,000.00	187.00
Lime		
Price (P/kg)	-	5.00
Amount/plant (g)	-	0.05
Amount/ ha (kg)	-	2.0
Cost/ha (P)	-	10.00
Cost of Application/ ha(P)	320.00	320.00
Cost of all other inputs (plowing, harrowing, planting, planting materials, fertilization, etc.) (P/ha)	69,960.00	70,740.00
Total cost (P/ha)	74,280.00	71,497.00
Gross income (P/ha)	192,000.00	230,400.00
Net Income (P/ha)	117,720.00	158,903.00
Added benefit due to technology (P/ha)	41,183.00	

### Mango

The lack of interest in mango as a commercial crop in the past was owing to its irregular flowering habit which makes it an unrealizable source of income. On its own, the "Carabao" mango, for example, may not flower at all. Some very good examples familiar to almost every road traveler to Manila from the South are those mango trees left and right of the Expressway. These trees are way beyond the bearing age but not flowered naturally over the years. This is the situation in many places in the country.



Occasionally, a mango tree is able to flower but it is often sparse, resulting also in a few fruits at harvest time. The natural flowering of mango takes place in December and January. Fruits are harvested 4 months later in April and May, flooding the markets and making prices unprofitably low.

For three reasons - lack of flowering, sparse flowering, and seasonal flowering - the mango must be induced to flower. The grower's answer to these problems of irregular flowering was smudging, a traditional practice consisting of building smoky fires and allowing the dense smoke to pass through the foliage. The ethylene in the smoke brings about flowering. Smudging is dangerous because it is done in November and December, the onset of the dry season when weeds become a fire hazard. It is a tedious practice requiring 14 days of continuous smoking. The long, labor-intensive activity is expensive where family labor is not available. Smudging is highly weather-dependent. It is usually hard to have 14 wind-free days at smudging time because of the northeast monsoon. In recent years, November and December have become rainy months. Smudging was abandoned in 1978, not much due to its disadvantages but because of a new, cheap, more effective, and profitable technique called potassium nitrate spraying.

Potassium nitrate was discovered as an effective flower inducing agent in 1969 or 1970 but become known to the public only in 1974. By 1978, it was already widespread. Today, every commercial mango grower, in one way or another, is spraying potassium nitrate.

## PEST CONTROL

### *Fruit Crops*

There is a mounting objection to the use of pesticides because of the hazards they pose to man and his environment. Pesticides are most dangerous in the form they are widely used - as spray solutions that easily spread in the surrounding, contaminate non-target objects, and get quickly into the systems of man, animals and other organisms.

There are methods that employ pesticides as non-spray materials such as "trapping," an old technique given a new look in the Philippines. The objective of trapping is to kill the male insect by luring it with a poisoned attractant inside a contraption. By annihilating the male, build-up of the pest population is prevented and where no reintroduction occurs, the fruit fly can be eradicated. Trapping is environment-friendly because the insecticide is used in very small amounts and is so prepared that the risk of spread and exposure is greatly reduced. Trapping is an important technique because the target pest, the Oriental fruit fly (*Dacus dorsalis*), is a serious problem in the production of many fruit crops. Commercial traps are available but growers themselves can prepare an inexpensive one.

### *Mango*

An answer to the mounting objection to the use of pesticides is a practice called "bagging". Cebuano were first to bag mango fruits and the practice remained confined to Cebu for many year. It crept in slowly to nearby provinces and was brought by Visayan migrants to Mindanao. Lack of know-how is one reason why the practice is recent in Luzon. Experiments were therefore conducted in Rizal, Laguna and Quezon in the early 1980's. Bagging was tested semi-commercially in the mid-1980's in Batangas, Cavite and Pangasinan. It was in Zambales, however, that the practice became widespread commercially with the importation of Cebuano baggers by a group of mango grower in Candelaria. Bagging will not protect the mango tree, leaves and flowers but it is a "cure-all" method of controlling the pest (and diseases) from fruit set to harvesting. Bagging offers many other advantages: it (1) increases yield, (2) reduces cost of pesticide spraying, (3) minimizes hazards and pollution due to pesticides, (4) enables accurate and quick estimation of yield, (5) provides cushion when packing fruits, and (6) generates employment. These are obvious and easily observed benefits that growers will discover. Soon, bagging will be a widespread practice in the Philippines despite the objection that pesticide companies will, naturally, put up to protect their interests.



## DETERMINING SOIL SUITABILITY FOR AGRICULTURE AT A REGIONAL SCALE: THE CASE OF SOUTHEASTERN TANZANIA

S. HATHOUT AND J. ROMANOWSKI<sup>1</sup>

### INTRODUCTION

Geographic Information System technology enables the spatial integration of many data sets. The authors have chosen to illustrate this means of determining agricultural soil suitability for the southeastern portion of Tanzania. The choice of the data sets always restricted not only by availability but also by the difficulty of combining the various factors in an appropriate model. This latter constraint is greatly eased by available microcomputer capabilities. The entire operation was goal-driven: to provide the planners with a readily available map of soil suitability of an accuracy adequate for a regional scale and capable of improvement.

Agricultural development in Tanzania has been traditionally of a local, subsistence-driven character, based on generational trial and error experience. Modern state planning holds possibilities of enhancing the agricultural output by means of rather centralized planning for which the local wisdom is relatively ill suited. The traditionalists can usually tell where farming is or was good but not where it may be profitably developed. A regional-scale soil suitability map is likely of much greater use for such planning. In a country where food shortages are common, every means of enhancing the production of food should be employed.

### METHODOLOGY

The authors used an IBM microcomputer and the MAP (Map Analysis Package) software by Tomlin (1983). The basic product of the exercise was a set of maps, one for each of the data sets used and one for the synthesis of the factors into "soil suitability."

The exercise also allowed for determining the major limiting factors (among those chosen) with respect to agriculture, and their spatial extent.

Southeastern Tanzania (Figure 1) was chosen because it lends itself well to a spatial analysis of soils at the regional scale and because it is considered to have much potential for further agricultural development. The data sets were obtained from a study by Hathout (1973). These data sets were classified into "highly significant" and "less significant" categories. The basis for this classification was dominance of the factor in terms of spatial extent and in terms of cost.

The highly significant factors are: a) *topography*, ranging from suitable (level terrain), through moderately suitable (undulating, gently sloping), to unsuitable (steeply sloping); b) *drainage*, ranging from suitable (good drainage, no mottles), through moderately suitable (imperfect drainage, some mottles); c) *erosion*, ranging from suitable (no evidence of erosion); through moderately suitable (presence of sheet erosion) to suitable (presence of gully erosion); and d) *fertility*, (see Figure 2) ranging from suitable (fertilizer needs not be used), through moderately suitable (fertilizer needs to be used) to unsuitable (evidence of severe salinity, alkalinity, or acidity). The high impact on soil suitability is indicated in Figure 3.

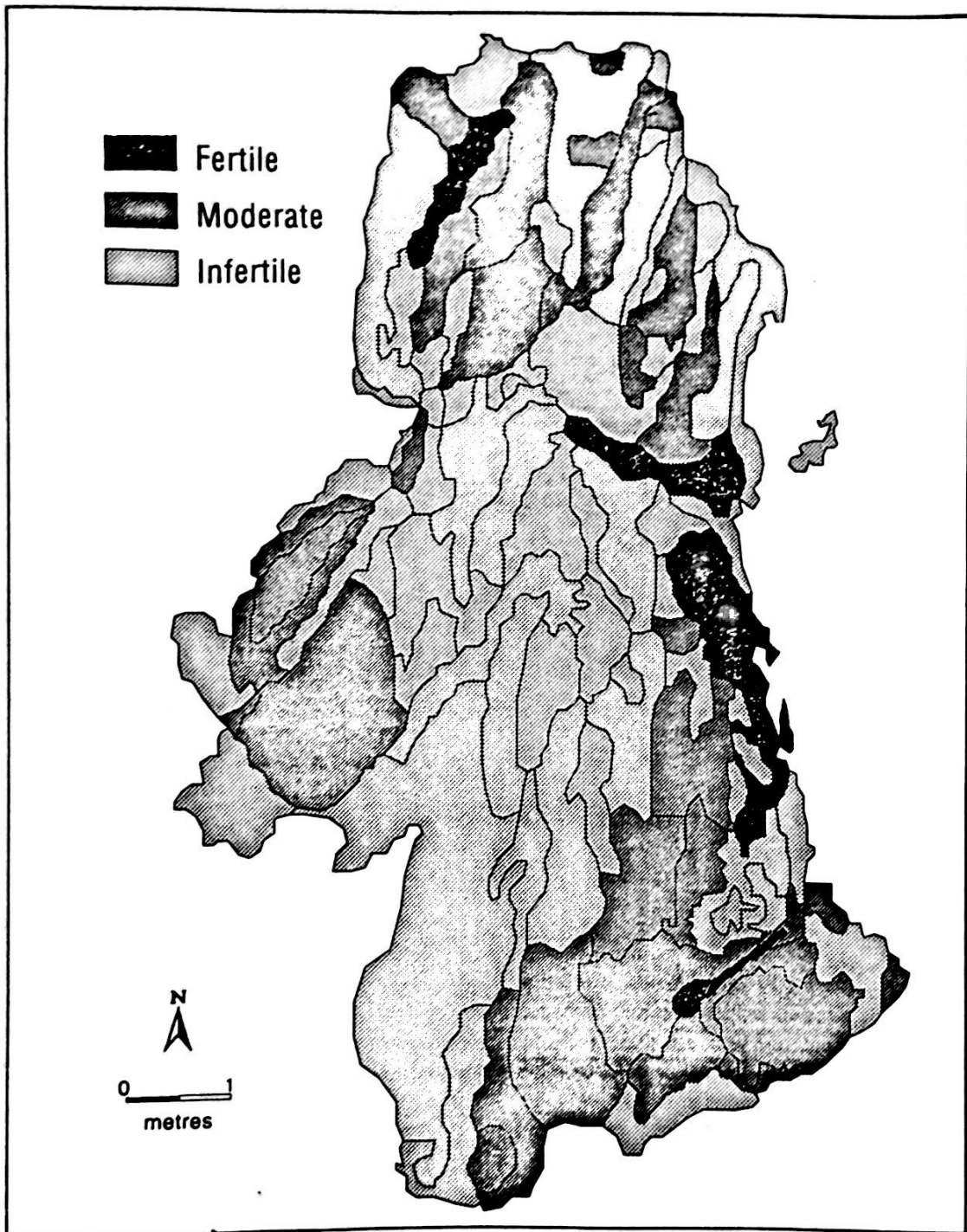
<sup>1</sup> Departments of Geography, Universities of Winnipeg and Manitoba, Winnipeg, Manitoba, Canada.





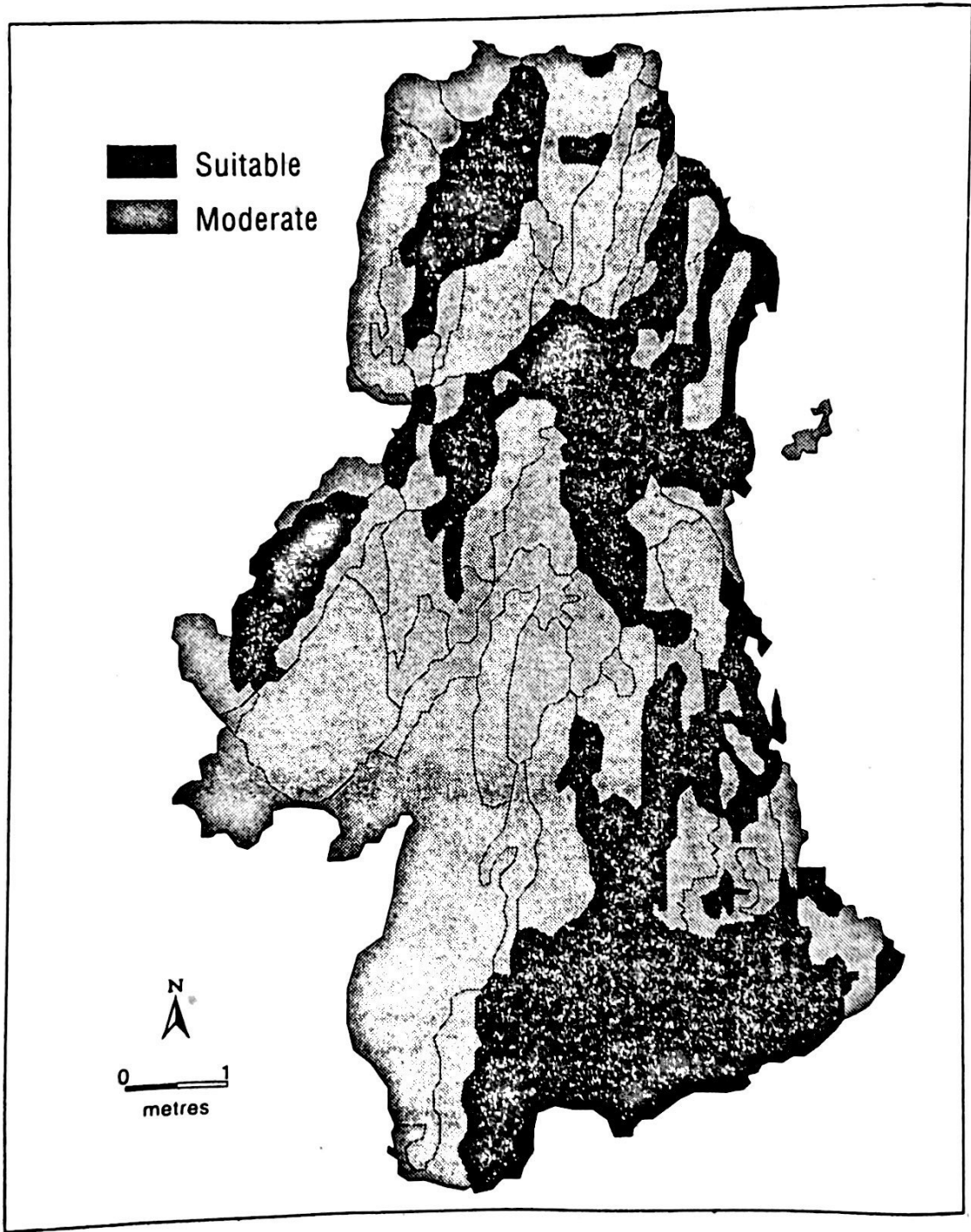
Figure 1. Southeastern Tanzania





**Figure 2. The Soil Fertility Factor**





**Figure 3. High Impact on Soil Suitability**



The factors classified as "less significant" impact generally less than 60% of the studied region and/or are less costly to correct for. These factors are: e) *stoniness*, ranging from suitable (no stones visible), through moderately suitable (coarse gravels present) to unsuitable (presence of large boulders or rock outcrops); f) *water availability*, ranging from suitable (over 1000 mm of annual rainfall or permanent sources of water) through moderately suitable (500-1000 mm if annual rainfall or temporary sources of water) to unsuitable (less than 500 mm if annual rainfall or no sources of water); g) *soil phase, (depth)*, ranging from suitable (well-developed soils with epipedon above illuvial horizon) through moderately suitable (epipedon layer above bedrock) to unsuitable (no epipedon soil layer); and h) *water-holding capacity*, ranging from suitable (low sand content), through moderately suitable (mixed sand and clay) to suitable (high sand content). The low impact on soil suitability is indicated in Figure 4.

According to Hendler (1977), a land capability determination consists of five steps. A preliminary analysis of the problem, area, and data available (1) leads to the choice and digitizing of the chosen data sets (2) This allows the production of single factor maps, one for each data set (3) which in turn can be synthesized into various synthetic maps (4) which finally yield the desired land capability map (5).

We have chosen the eight soil capability factors listed above, scored them, and allocated their score values on a GIS grid. The scoring of the factors was 1 for unsuitable, through 2 for moderately suitable to 3 for suitable. The cells of the GIS grid were 10 Km sq. in extent, an adequate density for a regional scale soil map (Hansen and Tessar, 1976). The system allows for change in scoring values, in factor inputs, as well as in spatial detail (provided the input data is available). There is thus a built-in competence for learning through feedback from experience.

A soil map published by Hathout (1983) provided us with a soil suitability scale of seven classes, ranking from 1, very suitable, through 7, unsuitable. This scale is provided in the legend of Figure 2. The very suitable class had all eight factors score in the very suitable (high) rank. The suitable class (2) had the four highly significant factors score in the very suitable rank. The moderately suitable class (3) had only the less significantly factor score at the very suitable rank, with the other scores falling in the moderately suitable rank. The fairly suitable class (4) had no more than two highly significant factors score at the suitable rank and no more than two less significant factors score at the unsuitable rank. The class of low suitability (5) had only the less significant factors ranked unsuitable. The class of very low suitability (6) had no factors at the suitable rank and no more than two highly significant factors at the moderately suitable rank. The unsuitable (7) class had all factors rank unsuitable.

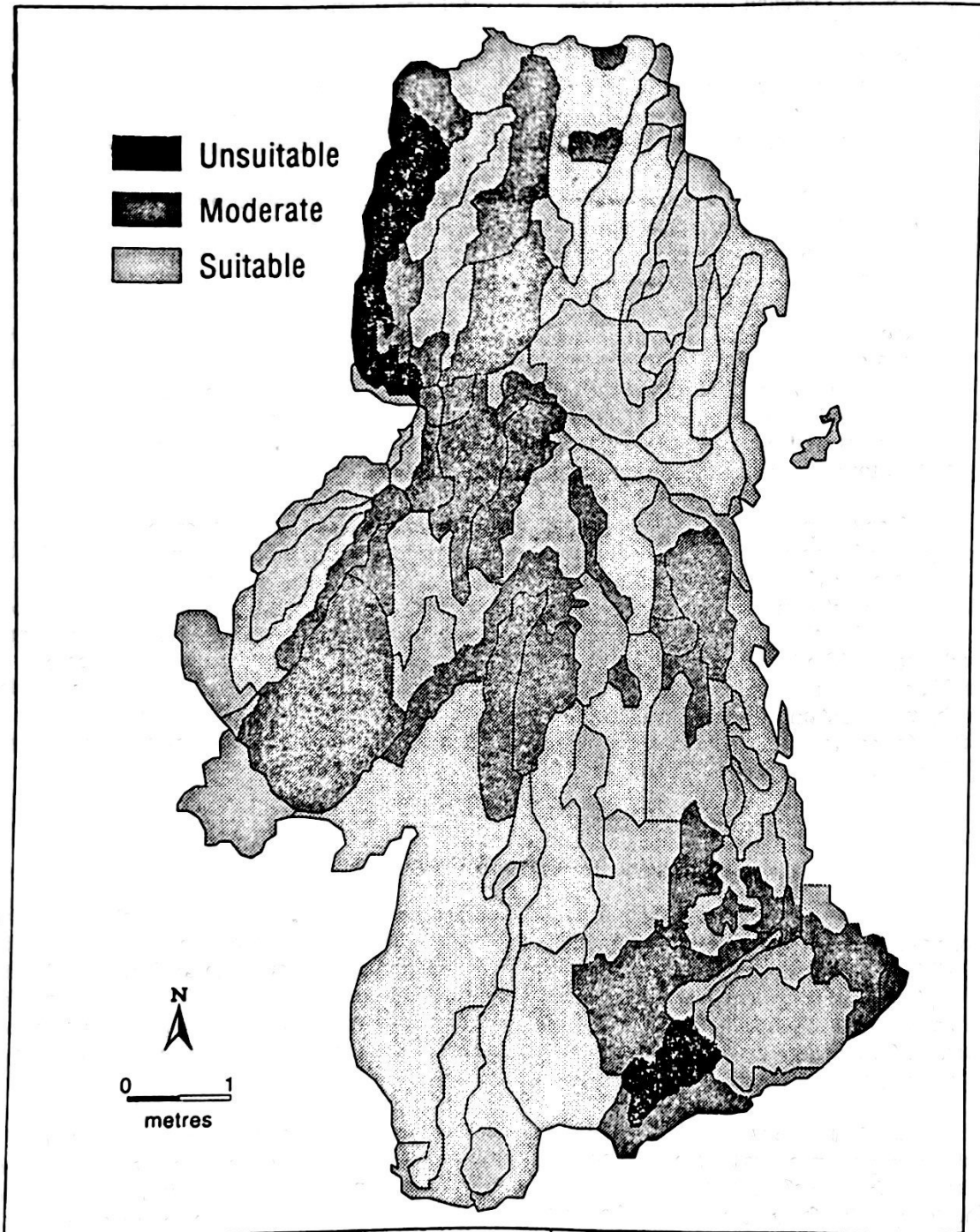
## CONCLUSIONS

Figure 5 is the printout of the soil suitability exercise, using all eight factors and classifying their products into seven suitability classes as outlined above. A similar exercise had been done by McFarland (1982) for Boone Co., Missouri. On our map (Figure 5) each grid cell covers 10 km sq. The map identifies a complex suitability pattern where the areas of higher suitability are scattered and of limited extent while the areas of lower suitability are more extensive. The complexity of the pattern suggests that regional planning for agriculture should be based on a more detailed suitability map. Figure 4 does, however, indicate where higher suitability areas merit closer scrutiny.

Table 1 shows the grid-cell totals of the scores of the eight factors used in our exercise. Fertility and topography appear as the major determinants of unsuitable soils while erosion and drainage appear to be more indicative of moderate suitability. The fertility factor can be enhanced by means of fertilization. The topography factor which must be considered as the principal limiting factor in agriculture in Southeastern Tanzania.

The fertility factor is not without its conceptual difficulties. Figure 2 is the printout of the scores of the soil fertility factor. We get an extensive interior of infertile soil fringed by a more equitable mix of factor scores. The high fertility score is based, however, on the observation that no fertilizer is applied. This is of itself not necessarily evidence of soil fertility. It might equally be evidence of cultural





**Figure 4. Low Impact on Soil Suitability**



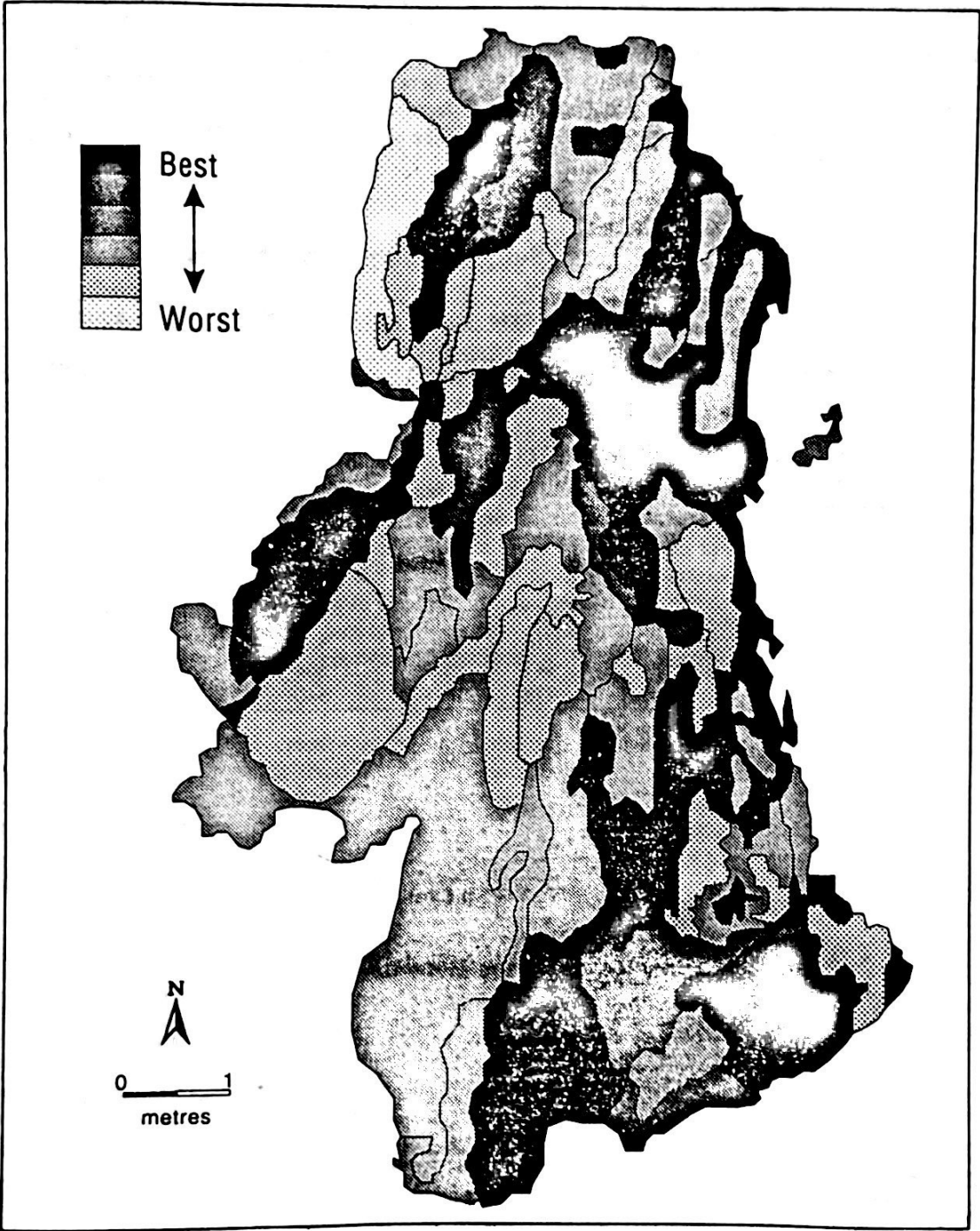


Figure 5. Soil Classes in Southeast Tanzania



backwardness or ecologic poverty. This may explain why many of the areas ranking high in the fertility factor nevertheless rank low in the cumulative factor score.

As stated at the outset, Tanzania is a poor and underdeveloped country. There is much traditional knowledge which is useful at the local level but information useful for central planning is scanty and of diverse quality. Our exercise indicates what can be done with the data which do exist. While the product of the exercise may be far from satisfactory, it was produced quickly and at a minuscule fraction of the cost which traditional soil evaluation would have entailed. There is nothing to stop the concerned authorities from continuing to tamper with the array of data sets, factor scores, and suitability classes until a much more satisfactory product is achieved-still at a fraction of the alternative costs. The usefulness of remotely sensed data is particularly promising in this regard.

**Table 1. Soil Capability Factor Scores**

Suitability Level	Unsuitable	Md. Suitable	Suitable
Soil Factors	No. Cells	No. Cells	No. Cells
High Value:			
Fertility	1329	816	135
Erosion	144	1837	279
Topography	1338	690	252
Drainage	114	1740	426
Low Value:			
Water-holding capacity	467	225	1588
Soil phase	716	535	1029
Water availability	441	504	1335
Stoniness	738	540	1002

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## DEFINING CONDUCTIVITY OF PANEL SURVEY IN THE CONTEXT OF DEVELOPING COUNTRIES

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### INTRODUCTION

#### Background

Transportation systems in urban areas in developing countries consist mainly of competing formal and informal public - vehicle system. Further, affluence induced by economic development has consequently increased motorization in urban areas as in Singapore, Kuala Lumpur, Bangkok, Manila and Hong Kong. Singapore and Seoul have ventured on mass rapid transit; while metropolitan areas like Metro Manila invested on light rail transit (LRT) systems. Similar modes of transport are being planned in Bangkok, Kuala Lumpur and Jakarta. These are the among the issue that confront transport planners in this part of the world. To address these issues in developing countries, a variety of urban - wide transport planning studies were conducted over the past three decades. Urban transport planning processes that had been applied in developed countries were adopted to developing countries in the developed countries were not similar to those in the developing countries, there were flaws in the adaptation of these planning processes. One significant difference is that urbanization and development in developing countries as in Asia grow is that urbanization and development in developing countries during their period of urbanization. At present, urbanization in developing countries averages 3.5 to 6 percent. In this regard, the impact of such growth and swift pace of urbanization on people in the Third World is more than that in developed countries when they experienced urbanization. People's behavior and life styles changed rapidly and dynamically.

Current conventional cross - sectional planning methods have inefficient in meeting the requirements of planning brought about by new developments in the developing countries. Analysis and forecast of travel demand given the complex composition of the transport system in developing countries could not be met by these conventional methods. Furthermore, they need analytical tools that can accommodate the impacts of changes (especially over time) in the policy variables that planners and policy - maker consider. Changes in formation (or pattern) of population, employment, residential relocation and mobility, and work places are among the points that need to be examined in transport policy making and assessment. Disaggregate analysis were tried in metropolitan areas such as Metro Manila, Johore and in some parts of Latin America. However, these methods were again found to be ineffective in responding to the rapid changes in people's behavior over time. Villaroman (1988) stated that effects of time and the presence of a new mode need further analysis and improvements in modeling techniques. What is needed is an approach that can provide better understanding of the changes in people's travel behavior. Another feature of such an approach is its potential to analyze and examine the impacts of introducing new modes of transport such as the mass transit system and the effects of responsive transport measures such as the TDM and TSM schemes.

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In this regard, a method that can analyze the effects of transport policies and measures on people's behavior given the rapid and continuous changes in the region is essential. A tool that may seem attractive in meeting these requirements is one that can handle data from the same samples obtained over time. With such an analytical method, urban transport planners in developing countries can meet the requirements of planning given the rapid changes in the region. An approach that fits these needs is panel analysis - an existing literature on this field, there are several theoretical merits that tend to justify the attractiveness of panel analysis. The ability of panel data to provide multiple observations on the impacts of changes over time conform to the essentials of urban transportation planning in growing metropolitan areas in developing countries. However, before panel analysis can be introduced in the developing countries, it is essential that the potential of carrying out a panel survey be determined given the conditions in the region. Likewise, more importantly, since panel analysis is an advanced and complicated analytical tool that requires accurate data, the quality of the panel data has to be ascertained. These issues have to be taken before the practical viability of applying panel analysis can be examined. This paper would try to present a synopsis of a study done with regards to the potential of panel survey.

### **Objectives And Organization Of The Study**

The study hoped to ascertain the potential of carrying out a panel survey and examined the quality of panel data in developing countries give the rapid changing environment in the region. As such, conductivity of panel survey is defined in this study as the potential of carrying out a panel survey in an area and the ability to obtain good quality panel data. For this end, the principal objective of the study was to examine the conductivity of panel survey. In particular, the conductivity of panel survey would be gauged by:

- a) examining the potential of carrying out a panel survey essential for panel analysis and identify the problems associated with the conduct of the survey;
- b) determining and evaluating the quality of the data in developing countries; and
- c) proposing countermeasures on how to improve the potential of conducting panel survey and obtain good quality of panel data with the hope of enhancing the conductivity of panel survey.

The study on the conductivity of panel analysis was divided into four parts:

- 1) Examining the Potential of Conducting the panel Survey with Metro Manila as the Case study (chapter 2);
- 2) Analysis of the Quality of Panel Data (chapter 3); and
- 3) Concluding Remarks (chapter 4).

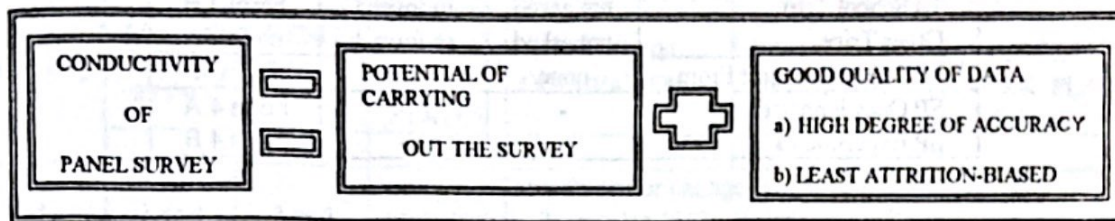
## **EXAMINING THE POTENTIAL OF CONDUCTING PANEL SURVEY WITH METRO MANILA AS THE CASE STUDY**

### **The Metro Manila Panel Survey**

As referred to earlier, the study tried to ascertain the conductivity of panel survey in developing countries. Conductivity is defined here, as shown in Figure 1, as the potential to carry out a panel survey and obtain good quality of data in terms of accuracy and less bias due to attrition (the rate of samples dropping from the waves of the survey). This chapter will discuss the panel survey and examination of the potential of survey while the next chapter focused on the analysis of the quality of panel data.



**Figure 1. Definition of Conductivity of Panel Survey**



**Study Area and Survey Design and Conduct**

A three - wave panel survey was conducted in Metro Manila, the capital region of the Philippines having an area of sq. kms. with a population of 7.80 million as of the last census in 1990 (roughly 13.0 % of the national population). The initial wave of the survey was conducted on the first quarter of 1987 along the present LRT line 1 corridor, while the second wave was in the second quarter of 1990 in the same corridor and augmented in the latter part of the year to include the proposed LRT line 2 corridor. The third wave was in the second quarter of 1992 covering both LRT corridors. The purposive - quota - proportional sampling (i.e., with respect to income distribution and density) was employed in the first wave so as to have proper representation of the population in the area as much as possible. A list of the 1987 wave samples was prepared together with their corresponding home addresses, name of household heads and members, sex and age of members for the 1990 wave along LRT line 1 corridor. The list prepared for the 1992 wave was from both LRT line 1 corridors of the 1990 wave. In the conduct of the latter surveys, those on the list were priority. In cases where those on the list were not available new members of an household were interviewed. New households interviewed as replacements of those not covered were done using the same sampling method as in the first wave.

Basically, the sets of questionnaire for all the three waves were the same. The questionnaire sets for the first two waves contain three forms: household (HH) information, individual - interviewed information and trip information. Table 1 shows the differences in the design of the questionnaire sets of the three waves. In the 1992 survey, apart from the above forms, a fourth form was added where RP and SP questions on the proposed LRT line 2 were incorporated. The 1987 wave asked only to-work trips while the latter waves asked all trips of members interviewed. An urban planning consulting firm was tasked to hire the necessary personnel of the three waves of the panel survey. The survey was in the form of a personal interview (door-to-door) survey. The survey was from 15:00-21:00 on week-days and 8:00-17:00 during week-ends to cover as many working members as possible.

**Table 1. Differences in the Design of the 1987, 1990 and 1992 Questionnaire Sets**

ITEMS	1987	1990	1992
No. of Forms	2	3	4
Household Information Form	Form 1	Form 1	Form 1
Household Income Bracket		modified	as in 1990
Telephone Number/s	not asked	was asked	was asked
Length of Residence	not asked	was asked	was asked
Household Member Form	Form 2	Form 2	Form 2
Target Member Samples	working	all members	all members
Member Income		modified	as in 1990
Length of Stay at Given Work Place or Address	not asked	was asked	was asked



Trip Information Form	In Form 2	Form 3	Form 3
To Work trip	included	in form 3	Form 3.A
To School Trip	not asked	in form 3	Form 3.B
Other Trips	not asked	in form 3	no form
RP-SP Questionnaire Form	none	none	Form 4
SP Questionnaire	-	-	Form 4.A
SP Experiments	-	-	Form 4.B

### Results Of The Survey And The Panel Data Sets

The results of the three waves of the survey are given in Table 2. Then the covered household and member samples were initially matched so as to institute the samples. Since the first wave was along LRT 1 while the latter waves were along LRT 1 and 2 the 1987 samples were matched. The matching keys were: a) household level - address, family names and length of residence at given address, and b) individual level - exact names of respondents, sex and age. Table 3 summarizes the outcome of the initial matching and implied that the two matching sets have almost the same degrees of matching in both household and member levels. However the 1987-1990 set has slightly higher matching. The matched member samples were further matched according to the consistency in their civil status, changes in occupation, employment and work place and the final panel members as given in table 4. The consistency of the further matching took into consideration the logical changes that could have occurred given the time difference between waves. The classification of the matched sample members as indicated in the table implied that those categorized as panel members were those with the most logical and appropriate matching as specified in Table 4. From Table 5, the number of matched members has declined in both sets. Percentage-wise, the 1987-1990 set has more accurate matched (or panel) members than the 1990-1992 set.

**Table 2. Results of the Survey**

WAVE	NO. OF HOUSEHOLDS COVERED	NO. OF MEMBERS INTERVIEWED
1987	899	1487
1990	1261	4126
1992	1167	4029

Note : a) Only working household members in 1987 wave while all members in the other waves

b) 1990 March : 872 HHs 3039 members (LRT 1)  
1990 Aug. : 295 HHs 1087 members (LRT 2)

1990 Wave : HHs 4126 members

**Table 3. Results of Matching**

A. Hhold Level	'87-90	'90 - '92
No. of Households	892 (100.0%)	631 (50.0%)
HHs Matched	447 (50.1%)	631 (50.0%)
Unmatched HHs	445 (49.9%)	630 (50.0%)
B. Member Level	'87-90	'90-92
No. of HH Members	1437 (100%)	4029 (100.0%)
Members Matched	514 (35.8%)	1308 (31.7%)
Unmatched Members	923 (64.2%)	2818 (68.3%)



**Table 4. Criteria for Defining Category**

Category	AGE DIFFERENCE		CHANGE IN CIVIL STATUS	CHANGE IN OCCUPATION	CHANGE IN EMPLOYMENT	CHANGE IN WORK PLACE
	87 - 90	90 - 92				
1	3 or 4	2 or 3	consistent	no change or change is less than 3 years for 1987 - 90 or 2 years for 1990 - 92		
2	-1 to 2 5 to 8	-2 to 1 4 to 7	consistent	----- same as above -----		
3	< -1 > 8	< -2 > 7	consistent	----- same as above -----		
4	< -1 > 8	< -2 > 7	consistent	change had occurred and more than 3 years for 1987 - 90 2 years for 1990 - 92		
			not			

**Table 5. Panel Members**

Category	'87 - '90	'90 - 92
1 Panel	245 (48.3%)	410 (36.2%)
2 Likely Panel	157 (31.0%)	370 (32.7%)
3 Less Likely	37 ( 7.3%)	166 (14.7%)
4 Not Panel	58 ( 13.4%)	185 ( 16.4%)
Total	507 (100%)	1132 (100%)

The next section discusses the examination of the potential of the panel survey in Metro Manila.

### A Look At The Potential Of Panel Survey In Metro Manila

On the outset, the results of the survey showed that the potential of conducting the panel survey in Metro Manila is likely. However, there was a low turn-out at the individual level than at the household level. Nonetheless, comparing the household acceptance rates at second wave of the Metro Manila panel to some panels in the developed countries as shown in Table 6, it could be observed that the acceptance rates are parallel to those in the developed countries. Despite the low individual matching rate as just mentioned, it could therefore be surmised that at the household level, the panel survey could be carried out. The constraints or difficulties met during the 1990 March wave are summarized in Table 7. These difficulties met during the 1990 March wave summarized in Table 7. These difficulties were likewise observed in the 1992 wave.



**Table 6. Comparison of Household Acceptance at Wave 2**

SURVEYS	INTERVAL	ACCEPTANCE RATE
Dutch Panel	.5 - year	58.45%
Cardiff Panel	.5 - year	48.91%
Puget Sound Panel	1.0 - year	56.30%
Metro Manila 1987 - 90 Panel	3.0 - year	50.11%
Metro Manila 1990 - 92 Panel	2.0 - year	49.95%

It could be surmised that some of the constraints listed on the table are similar to those panel surveys in developed countries. For instance, household samples that could not be located, sample refusing the survey and certain strata of the society (i.e., lower or higher income group, older people, etc.) were found to be among the problems of panel surveys in developed countries. Kitamura and Bovy (1987) examined the relationship of certain characteristics of the people to the attrition rate and the above constraints were mentioned. The implications of these findings indicate that the difficulties can be associated to the timing and duration of the waves of the survey, and more importantly to the supervision and performance of the personnel involved in the survey (especially the interviewers). In as much as some of these difficulties or factors are similar to those in developed countries, it showed that these can be considered as the common problems associated with panel survey. In this regard, proper and feasible countermeasures have to be instituted to increase the potential of conducting the panel survey. These countermeasures have to address the means on how to attain more panel samples notably at the individual level so as to boost the matching rate not only at the household level but also at the individual level.

### **Proposed Countermeasures To Improve The Potential Of Panel Survey In Metro Manila**

Based on the results of the panel survey in Metro Manila and from existing panel surveys in developed countries, appropriate countermeasures to improve the performance of the panel survey in developing countries can be instituted. These propositions (Table 8), if properly implemented, can boost the factors affecting the potential of panel survey in developing countries. The countermeasures could be grouped as follows: a) measures on how to improve design of the survey, b) measures in making the conduct of the survey effective and simple, and c) those pertaining to proper supervision and training of survey personnel. Based on the results of the March 1990 and 1992 Surveys, the measures on how to enhance the performance of the panel survey data can be done through ameliorating the design of the questionnaire, proper sampling, appropriate survey personnel. Likewise, the timing and duration of the waves of the survey must also be considered. Another way to have an efficient survey organization is to tap a company experienced in survey activities in handling the survey. Panel surveys in developed countries shoed the advantages of employing experienced organizations for the panel survey.



**Table 7. Constraints During the 1990 March and 1992 Survey**

A. During the 1990 March Survey Dry - Run	
CONSTRAINTS	ACTION TAKEN
Many households refused the survey	New households were interviewed
Many households transferred residence	— same —
Households could not be located	— same —
Original household members not at home at the time of interview	Interviewers made appointments if possible or interview other members of the same households
Difficulty of classifying occupation and employment sector	Wrote actual occupation or employment sector
Many Chinese households rejected the interviews	New households were interviewed in the same zone or area
B. During the Actual Surveys	
Could not locate households on the list since some households share one house or address	
Many households at squatter areas (of the survey area) were relocated	
Difficulty in locating addresses of households because street names were changed in some zones or areas	
Interviews not finished due to:	<ul style="list-style-type: none"> <li>a) respondents in a hurry</li> <li>b) short interview time</li> <li>c) respondents not cooperative</li> </ul>

### Chapter Summary

This chapter described briefly the design and conduct of the panel survey in Metro Manila and the examination of the potential of carrying out the panel survey in the context of developing countries. The results of the survey and the examination of the potential of the panel survey implied that it is possible to carry out such a survey in Metro Manila. This is particularly true at the household level. However, at the individual level, the panel survey was not so satisfactory. The household acceptance rate at the second wave of the Metro Manila panel is comparable with those in the developed countries. Likewise, the difficulties met were among those considered in the other panel surveys. Thus, to further improve the survey and enhance its potential, appropriate countermeasures were suggested. It is hoped that these measures could be instrumental in alleviating the problems of the panel survey and boost its potential notably at the individual level. The succeeding chapter discusses the second aspect of the conductivity of panel survey - analyzing the quality of the panel data.





**Table 8. Proposed Countermeasures to Improve the Potential of Panel Survey in Developing Countries**

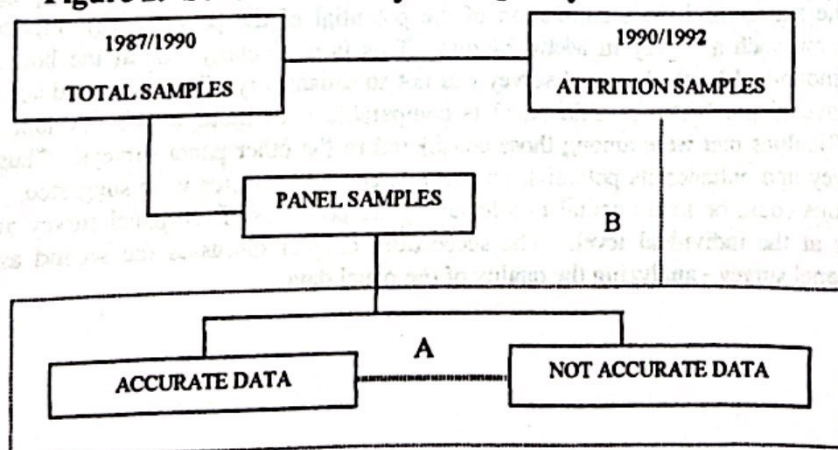
PURPOSE	SUGGESTED COUNTERMEASURES
To improve the design of survey	<ul style="list-style-type: none"> <li>• Incorporation of the above suggestions on the design of the survey</li> <li>• Careful planning and consideration of the characteristics of the area</li> <li>• Putting emphasis on the conduct of dry-runs prior to the survey and consider improvements on the design</li> <li>• Inclusion of a language or dialect to which samples are familiar</li> <li>• Establish an efficient coding, encoding and checking system</li> </ul>
To make the conduct and performance of the survey more effective and simple	<ul style="list-style-type: none"> <li>• Carrying out of the pre-surveys and dry-runs to eliminate any possible problems in actual survey</li> <li>• Establish an efficient survey organization</li> <li>• Proper and appropriate training of survey staff from supervisors, enumerators to coders and encoders</li> <li>• People concerned shall be well aware of the survey and its objectives</li> <li>• The timing and interval of the waves of the panel should be at the same period of the year</li> <li>• The duration of the respective waves should correspond to the time needed to cover the desired samples and tasks for the survey</li> </ul>

### ANALYSIS OF THE QUALITY OF PANEL DATA

#### Foreword

Most of the recent panel studies have been concentrated on the usefulness of panel survey and analysis of the bias of panel data due to attrition rate (the rate of samples dropping from the panel). However, not much has been done on assessing the quality of panel data especially in developing countries since this is the first attempt to initiate such endeavor. The approach in assessing the quality of panel data is shown in Figure 2. As given in Figure 2, the quality of panel of panel data is analyzed by examining the accuracy of panel data and attrition. The two panel data sets would be used in this analysis. As in the previous chapter, suitable countermeasures on how to improve the quality of panel data would be the goals of this chapter.

**Figure 2. Scheme of Analysis of Quality of Panel Data**



NOTE: A - ANALYSIS ON ACCURACY  
 B - ANALYSIS ON ATTRITION



## Analysis Of The Accuracy Of Panel Data

### Analytical Approach

The accuracy of panel data would be analyzed by looking at the factors that affect the accuracy of data. This was done by examining all the socioeconomic attributes of the panel sample members and comparing the significance of the accuracy of the data. The comparative analysis of the data sets from the two panels was done by looking at the following: a) which among the data sets yielded highest proportion of samples with high level accuracy; b) which data set revealed the significance of accuracy; and c) interpretation of the influences of the changes in socioeconomic attributes on the accuracy of data. The significance of the cumulative proportion of samples based on the degree of accuracy of the data sets were compared using t-test analysis of significance of the categories defined for the accuracy of data. The t-test analysis of two samples is employed here because it can explain the significance of the ratio of accuracy between the two data sets. The values of the respective t-values were computed using the following formula:

$$| \text{T-value} | = \frac{P_A - P_B}{\frac{P^* (1 - P^*) (A/N_A + 1/B)}{n^A + n^B}}$$

where:  $P_A = \frac{n^A}{N_A}$ ,  $P_B = \frac{n^B}{N_B}$

$$\text{and } P^* = \frac{n^A + n^B}{N_A + N_B}$$

- $n^A$  = sample size of proportion to be compared at data set A
- $n^B$  = sample size of proportion to be compared at data set B
- $N_A$  = total sample size for data set A
- $N_B$  = total sample size for data set B

Looking first at the influence of the time interval between the two sets of waves from Table 5, it could be observed that despite the three-year interval of the 1987-1990 panel compared to the two-year interval of the 1990-1992 panel, the degree of data accuracy of the former time period is the last cumulative category, the two time periods share the same level of accuracy. These were reflected by the t-values of the respective cumulative categories. Hence, at the outset the 1987-1990 possessed pronounced higher accuracy of data than the 1990-1992 time period. Among the five household attributes identified, two were found to have significant effects on the accuracy of the panel data. These are residential district and household vehicle ownership attributes. The other three attributes seemed to show indifference on the accuracy of data. With respect to the residential districts of the samples, only the 1990-1992 data set was compared and examined since in the 1987-1990 data all the household samples reside in the district along LRT line 1 corridor.

### Results Of The Analysis Of Accuracy

From the item on the influence of the item interval between the two sets of waves from the Table 9, it could be observed that despite the three-year interval of the 1987-1990 panel compared to the two-year interval of the 1990-1992 panel, the degree of data accuracy of the former time period is greater than



the latter at the first cumulative categories. These were reflected by the t-values of the respective cumulative categories. Hence, at the outset the 1987-1990 possessed pronounced higher accuracy of data than the 1990-1992 time period. Among the attributes identified, for attributes were found to have significant effects on the accuracy of the panel data. These are residential district, household vehicle ownership attributes, occupation and individual member income. From the Table 10, it can be seen that those households residing in districts along the present LRT line 1 corridor produced definite accuracy of data compared to those households residing along the proposed LRT line 2 corridor. One possible reason that could cause this difference in the accuracy of data is that the label of supervision and performance of the interviews assigned in both LRT corridors is not the same. This implies that those along LRT line 1 may have proper supervision and performance than along LRT line 2. The second attribute that showed differences in the accuracy of data, as mentioned, is the household vehicle ownership. Table 10 also implies that those households without vehicles are likely to produce good quality of data than those having vehicles.

**Table 9. Accuracy of Data - Effect of Time Period**

Time Period	Categories (Cumulative %)			
	1 (1)	2 (1+2)	3 (1+2+3)	TOTAL
1987 - 1990	48.3	79.3	86.6	100.0
	245	402	439	507
1990-1992	36.1	68.8	83.5	100.0
	410	780	946	1132
T-Value	4.65	4.36	1.60	

**Table 10. Accuracy of Data - Pooled 1987-1990 & 1990-1992 Data Set**

Factors Influencing Accuracy	Level of Comparison	Categories (Cumulative)			
		1 (1)	1 (1+2)	3 (1+2+3)	TOTAL
Residential District (1990-1992 data only)	Along LRT 1	44.4	75.3	87.0	100.0
		352	597	690	793
	Along LRT 2	16.9	54.0	75.7	100.0
		409	779	945	1130
	T-Value	8.70	7.07	4.72	
Household Vehicle Ownership	None	34.8	62.2	94.4	100.0
		262	468	710	752
	One or More	15.5	86.8	95.4	100.0
		48	269	295	310
	T-Value	7.52	-9.10	-0.74	
Occupation	Working	43.7	73.1	84.2	100
		291	487	561	655
	Not Working	37.6	71.5	84.7	100.0
		360	684	811	957
	T-Value	2.46	0.73	-0.23	
Individual Income	Below P4000	46.5	76.8	85.8	100.0
		216	357	399	455
	P4000 & up	38.7	65.3	80.4	100.0
		77	130	160	199
	T-Value	1.84	3.06	1.75	



Table 10 indicates that working members are more likely to give higher degree of data accuracy than non-working members. As for the individual monthly income, those household member samples with income below 4000 pesos showed more accurate data than those having 4000 pesos and above. This is shown by the number of samples in category 1 and t-test values. Albeit these findings, looking further at the t-test values of the respective attributes, the household attributes showed more significant difference in the accuracy of data than at the individual level. From the examination of the influence of attributes on the accuracy of data, it could be stated that socioeconomic attributes can be considered as factors in examining the accuracy of panel data. Likewise, between the two panel data sets, the 1987-90 panel has more accurate data than the 1990-1992 panel.

### Examination Of The Factors Causing Attrition

Another consideration that needs attention concerns bias of the data due to attrition. Attrition is the general term for household samples that leave the panel at the succeeding waves of the survey. Usually the problem of attrition is associated with either of the following: a) possible increase in respondents not answering or returning the questionnaire because they are required to join in more than one wave of the survey; b) difficulty of locating the households (or respondents) in numerous waves of the survey due to residential relocation or mobility; c) problem brought about by dissolution of households; and d) potential drop in reporting accuracy because of "panel fatigue" - due to participation in multiple waves of the survey.

The factors that tend to cause the attrition in the Metro Manila panel could be examined through looking at the breakdown of the households from the first wave that were not interviewed in the second wave. These factors could be summarized as: a) households no longer in the survey area, b) samples from the first wave refusing the survey, c) households could not be located, and d) households not in given address. Table 11 below summarizes the breakdown of households not interviewed. The factors that tend to influence the attrition rate in the Metro Manila panel were comparable to those observed in the panel surveys in the developed countries, particularly the Dutch panel. This is specifically evident for the first two factors cited earlier. The last two factors - households could not be located and /or not in given address - seem to be characteristics found in Metro Manila and in the developing countries in general.

Finally, examining the household attributes that showed differences with those that tend to be in the panel and those not in the panel or potential to cause attrition, Table 12 could provide a glimpse for the 1990-1992 panel. This panel was examined for attrition since it showed lower number of panel samples than the 1987-1990 panel. The table showed among the attributes examined, five were found to differentiate the samples as likely panel and attrition samples. To see whether the effects of the differences on the composition of the panel and attrition samples are significant, chi-square test of the attributes was made. The results of the chi-squares of the five household attributes are oriented in Table 13. The summary of the findings and chi-square tests showed that the attributes of those households which have the tendency to be panel households would seem to be: a) large household size, b) middle-income, c) permanently residing in the area, or d) at least with two private vehicles. The characteristics of those households which would likely be in the attrition household samples are: a) small households size, b) lower income or higher income or c) not permanent residents of the area.

As for the attrition samples, so far a) the number of employed members in the household, and b) the inclusion of squatter households on initial waves are contributing elements. These observations thereby tend to support the earlier findings that for the 1990-92 waves, a) the unemployed members are likely to produce good data since they normally are in their houses at the time of the survey especially housewives and students, b) affluent households (notably Chinese households) have the tendency not to join the panel survey; c) since squatter households are considered as not having permanent residence and most have low income levels, they are more likely to be in the attrition household sample; and d) the rate



of attrition effects the quality of data indirectly because of the bias on the composition of the household samples.

**Table 11. Breakdown of Households Not Interviewed**

Causes	1987 - 1990
Transferred Residence	154 ( 34.61%)
Refusing the Survey	124 ( 27.86%)
Could not be Located	116 ( 26.07%)
Not in Given Address	51 ( 11.46%)
<b>TOTAL</b>	<b>445 ( 100.00%)</b>

**Table 12. Household Attributes Examined for Attrition**

Attributes	Showed Distribution Between Panel and Attrition Samples
Household Size	0
No. of Males	0
No. of Employed Members	0
No. of Unemployed Members	0
No. of Members w/ Driving License	0
Household Income	0
Length of Residence	0
Vehicle Ownership	0

**Table 13. Results of Chi-Square Tests**

Attribute	Chi-Square	D.F.
Household Size	13.35	9
No. of Employed Members	52.89*	10
Length of Residence	4.12	5
Household Income	2.17	6
Vehicle Ownership (A)	50.32*	4
Vehicle Ownership (B)	4.81	3

( 0.05 significance level)

Hence, from these observations, it is imperative that to minimize, if not eliminate the influence of attrition on the panel data, careful consideration must be taken in the design, planning and conduct of the panel survey in Metro Manila. This way, not only can the conductivity of panel survey be enhanced but the influence of attrition could possibly be gauged. The examination of the quality of data showed that the conductivity of panel survey in Metro Manila is indeed possible. The good performance of the 1987-1990 data sets supported this result of the analysis. However, the shortcomings of the data sets and the surveys, especially for the 1990-1992 waves, necessitate further improvement of the surveys and quality of the data. Hence, there is indeed a need to overhaul the design and conduct of the surveys. In this regard, the



following section will cover possible countermeasures on how to further enhance the conductivity of panel survey in Metro Manila (and in developing countries in general).

### Countermeasures To Improve The Quality Of Panel Data In Developing Countries

Thus far, from the findings on the accuracy of data and the factors and composition of the attrition, it could be stipulated that the conductivity of panel survey in Metro Manila is possible. As already mentioned elsewhere to further improve the conductivity of panel survey, it is essential that: a) the quality of panel data be enhanced, and b) the influence of attrition on the quality of data be minimized. In this regard it is important that improvements have to be done on the survey itself - from the design, planning and conduct of the survey. In order that the accuracy of panel data be improved and bias due to attrition be minimized, the socioeconomic attributes of the samples should be incorporated in the design and conduct of the survey. The countermeasures are to be based on the results of the analysis just presented and from existing studies of panel surveys in the developed countries. Table 14 summarizes the general features of the countermeasures and their intentions. It can be seen that, as in the potential of carrying out the panel survey, the suggested countermeasures could be grouped as follows: a) measures on how to improve design of the survey, b) measures in making the conduct of the survey effective and simple, and c) those pertaining to proper supervision and training of survey personnel.

**Table 14. Proposed Countermeasures to be Considered**

PURPOSE	SUGGESTED COUNTERMEASURES
To achieve accurate data	<ul style="list-style-type: none"> <li>* Purposive-quota-proportional sampling</li> <li>* Standardized questionnaire set</li> <li>* Waves of the survey shall be on the same season or time of the year</li> <li>* Well established and prepared survey manual and instructions</li> <li>* Experienced and properly trained enumerators and supervisors</li> <li>* Establishment of an efficient coding and encoding system</li> </ul>
* To lower attrition rate	<ul style="list-style-type: none"> <li>* Increase samples on groups where attrition rate is higher</li> <li>* Proper conduct of the survey</li> <li>* Tapping enumerators familiar with certain socioeconomic groups</li> <li>* Establish rapport with samples</li> <li>* Promotion of an incentive scheme to attract and maintain panel samples</li> </ul>

### Chapter Conclusion

This chapter attempted to render an approach on how to examine the quality of data and strengthen the conductivity of panel survey in Metro Manila and in general for growing metropolis in developing countries. It was found that by setting a definition for matching the samples is one means in describing the quality of data and hence the conductivity of panel survey especially in the context of developing countries (in Southeast Asian region). Factors influencing the quality of data (accuracy and attrition) were also examined. These factors ranges from, socioeconomic attributes of the households to the characteristics of the individuals in explaining the accuracy of data and attrition were imminent then a high proportion of match samples would be meaningless. Hence, the potential of carrying out a panel



survey is likewise influenced by the quality of data. Therefore, to further enhance conductivity of panel survey, appropriate countermeasures need to be instituted to improve the quality of data by correcting the accuracy and minimize the influence of attrition bias.

### CONCLUDING REMARKS

This paper presented an attempt to examine the conductivity of panel survey in developing countries with Metro Manila as the case study. As such, the study rendered an approach in analyzing both the potential of conducting a panel survey and quality of panel data in the context of developing countries. By doing so, it tried to provide a definition of the conductivity of panel survey in developing countries - conductivity of panel survey, in developing countries, is described as the potential to carry out such a survey that can produce better quality of data that are accurate and maintain less bias due to attrition. Although the results of the Metro Manila Panel Survey showed some degree of potential in carrying out such a survey in developing countries (especially at the household level), the panel data generated necessitated the need to evaluate the quality of the data. This insinuated that with respect to the examination of the quality of panel data, not only the performance of the survey and attrition be assessed but also the potential of carrying out the panel survey and the accuracy of the panel data. This is essential especially in developing countries.

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## **APPLYING THE PEOPLE'S SCIENCE AND AGRARIAN POPULISM FOR PROFITABLE SMALL-SCALE AGRICULTURAL AND DEVELOPMENT IN RURAL AREAS OF NIGERIA: THE CASE OF AKWA IBOM STATE**

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### **THE PROBLEM**

Today, Nigeria is placing much emphasis on the use of modern agricultural techniques and equipment such as biological research and mechanization, settlement and plantation schemes to increase agricultural productivity. Such schemes include: The National Accelerated Food Production Programme of the early 1970s, the River Basin Development Authorities of the late 1970s, the Green Revolution of the 1980s and the Directorate of Foods, Roads and Rural Infrastructures (DFRI).

All these programs had subsidized credit schemes to rehabilitate failing cash and food crops in the nation. These projects were colossal failures in spite of huge governmental or public investments (Madunagu, 1984: 115).

Many reasons can be cited for this failure, two of which are explained here. The schemes bypassed small-scale farmers in favor of large-scale or state-run plantation or settlement schemes, thus ignoring the use of the "people's science and agrarian populism." Also, the instability associated with the Nigerian political system produces unstable agricultural policies in the nation. Each Federal Government leadership abandoned the agricultural program of its predecessor and so the programs were not given any opportunity to mature and/or get improved upon. Agriculture in the nation is doomed and Nigeria cannot produce enough to feed her population.

The main objective of this study is to establish that the notion of the "people's science" which relates to the broader sets of arguments about agricultural change--sometimes called 'agrarian populism' - if adopted will transform agriculture through appeal to the peasant economic interests and cultural values, leading to the improvement of the existing peasant institutions and systems of production. Specifically, the main features of agriculture in Nigeria during the colonial era and post-independence era will be reviewed as background to the problem of why Nigeria has not been able to produce enough for her hungry millions. Finally, the research will end by stressing that the first essential step towards increased agricultural productivity is understanding what is needed towards agricultural system of Nigeria, the socio-economic aspects of the transition from subsistence to the desirable commercial agriculture, and how to bring this about with particular reference to Akwa Ibom State.

### **BACKGROUND TO THE PROBLEM**

#### **Agriculture During the Colonial Era**

Botanical gardens were the focus of initial efforts by colonial administrations to develop agriculture. These gardens, e.g., those at Ebute Meta near Lagos and at Calabar, were connected to an empire-wide network for the exchange of planting materials as coordinated by the Royal Botanical Gardens at Kew (Brookway, 1979). Colonial botanical gardens were intended to facilitate the transfer of new or improved cash crops to chiefs, traders and wealthier peasant farmers interested in establishing

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small plantations. These official colonial policy efforts were marginal rather than central to the development of cash-crop production in the early colonial period.

The major nineteenth century expansion of palm production in Eastern Nigeria and the development of cocoa in Western Nigeria depended almost entirely on indigenous initiative (Berry, 1975; Crowder, 1982; Hill, 1963; Hogendorn, 1978). In some cases, this applied to the first introduction of exotic planting materials and techniques. For example, the Yoruba-freed slaves returning to Lagos from Brazil introduced the technique for making cassava meal known as *garri*. This was one of the most important innovations in African food processing techniques of the time. This development brought with it the widespread cultivation of high yielding "bitter" varieties of cassava hitherto unfit for human consumption because of high content of hydrocyanic acid (Agbola, 1968).

Government initiative had greater impact on forest control, exploitation and conservation of timber, rubber and forest reserves. In the 1900s, attention began to be given to agricultural research and extension. In 1920s, government adopted the Caribbean Policy Model with concentration on cash crops with little or no thought for indigenous food supply (Sampson and Crowder, 1943). Later, the Indian Policy Model which placed greater emphasis on peasant food crop and farming system was introduced in Nigeria by Faulkner (ibid). However, the Caribbean Policy Model was dropped because of:

- a) clear evidence of smallholder capacity for rapid agricultural change in the cocoa belt of Western Nigeria (Berry, 1975) and the opening of the groundnut cultivation in Northern Nigeria (Hogendorn, 1978).
- b) a major famine which struck Northern Nigeria because of the shift of resources into groundnut cultivation (Shenton and Watts, 1979; Watts, 1983); and
- c) failure to establish American Allen long staple cotton in Nigeria.

In 1907, Lever Brothers' attempts to acquire land in Nigeria for oil palm plantations met with a rebuff by Governor Hugh Clifford. He argued that peasant farmers had proved adequately adaptable to market demands for export crops, and that alienation of land on a large scale to European business interests threatened insurmountable political difficulties (Hopkins, 1973).

Subsequently, part of the task of the Department of Agriculture was to elaborate Research and Development (RD) policies supportive of the pro-peasant alternative. The approach adopted embraced food crop production as well as cash and tree crops. Shifting agriculture was the major focus, and later the "rotational bush fallowing" (Faulkner and Mackie, 1933). Careful research was needed and undertaken to understand thoroughly how such farming systems operated, and to ascertain viable alternatives to the restoration or maintenance of soil fertility via bush fallowing. In the Southern forested areas, the major emphasis was placed on a series of experiments with green manures and planted fallows. In Northern Nigeria, interest centers on attempts to introduce a system of mixed farming involving ox-plowing.

The Annual Report of the Agriculture Department notes the judgement of Lord Hailey's African Survey (1938: 1) "that shifting cultivation was less a device of barbarism and more a concession to the nature of Africa's soil." On soil management in Nigeria, the Nigerian peasant farmers were attempted from the mismanagement commonly levelled against the farming communities by environmentalists. Hailey, (1938: 1103) wrote:

Erosion in Southern Province is to a large extent controlled by the traditional native system of cultivation which is to grow crops on mounds made by throwing up the top layer of soil so as to bury the weeds and grass in addition to mixed cropping... so that the land is rarely left without vegetal cover. Investigation has shown this system to be sound and the policy of Agricultural Department is to foster it.



The geographer L. Dudley Stamp went even further, arguing that soil conservation techniques practiced by peasant farmers in Northern Nigeria were so sensible that they might well become a model for farmers in more "developed" parts of the world (Stamp, 1938).

It could hence be summarized that agriculture during the Colonial Era 1900-1960 had these features:

- a) The government encouraged peasant farmers to increase their production per hectare.
- b) Marketing boards were established to stabilize prices of cash crops.
- c) In 1949, government began to involve itself in the production processes - farm plantations and settlements were established. As Wells (1966: 38) noted, "Government directed projects... could not be said to be in any way successful."

### AGRICULTURE DURING POST - INDEPENDENCE ERA

In 1960, Nigeria attained her independence. From this time on, Nigeria continued to dish out "generalized and vague" objectives of agriculture without success. This situation continued right into the 1970s, 1980s and 1990s. Nigeria, among other things, had lost sight of the farming techniques of indigenous farmers - the people's science and agrarian populism.

#### *The research questions are now posed:*

- a) How can total agricultural output and productivity per capital be substantially increased in a manner that will directly benefit the farmer and provide for the growing urban sector?
- b) What is the process by which traditional low productivity subsistence farms are transformed into high productivity commercial enterprises?
- c) Do Peasant farmers stubbornly resist change or are they acting rationally within the context of their particular environment?
- d) Are economic incentives sufficient to elicit output increase among rural peasant farmers?
- e) Are institutional and structural changes in rural farming systems necessary?

These and other questions and explanations will receive attention when the model "The people's science and agrarian populism" will be applied to Akwa Ibom State Agricultural Development.

### THE PEOPLE'S SCIENCE AND AGRARIAN POPULISM

The notion of "people's science" relates to a broader set of arguments about agricultural change, sometimes termed "agrarian populism" (Richards, 1985: 15). Agrarian populism was important among Russian Socialists in the late nineteenth century. The populist approach sought to transform Russian agriculture through appeal to peasant economic interests and cultural values, and through the improvement of existing peasant institutions and systems of production.

Populism was also a significant force in late nineteenth century agriculture in the United States (Hofstadter, 1969). Whereas Russian agrarian populism was an intellectual program in support of the peasantry, American populism was a political movement organized by small and medium scale



farmers themselves. Thus populism was a strong and successful force among "family farmers" in the cotton belt and the prairie lands.

In Africa, the term populism has been used to describe peasant movements directed against colonial and capitalist penetration and to characterize a number of "idioms" of "nationalists" politics (Kilson, 1967; Saul, 1969; Worsley, 1969). The term has also been used in a programmatic sense as a rallying call for pro-rural, pro-peasant, development strategies (Fannon, 1968; Kofi, 1980; Williams, 1976). A revived interest in agrarian populism in this second sense reflects the depth of the current food production crises in Africa and the apparent ineffectiveness of orthodox initiatives for dealing with this problem in Nigeria in particular.

### **CRITICAL EXAMINATION OF EARLIER AGRICULTURAL RESEARCH AND DEVELOPMENT POLICIES**

As has been mentioned earlier, one of the main objectives of agricultural research and development was to improve the general level of living through increase in farm income, increase in agricultural output and productivity through mechanized agriculture. But mechanized agriculture has its features. Mechanized agriculture demands that large tractors be used to "increase" farm output per worker and the area under cultivation. This needs more and more land to be brought under cultivation but then in Akwa Ibom State of Nigeria there is that inhibitive land tenure system. If and when cooperative farming is introduced to bid the land tenure system there are other problems associated with mechanized agriculture and these are:

- a) Mechanized agriculture is presently difficult to finance on a self-supporting basis;
- b) Tractor plowing requires increasingly heavy subsidies because the cost of tractor hiring is astronomical;
- c) Total output level compared with total investment may not be encouragingly rewarding;
- d) There is generally no land suitability survey conducted to back up mechanized agriculture;
- e) There is usually the flow of labor from the farm to other sectors of the economy;
- f) The general mismanagement of State resources are usually invested to boost initial stages of mechanized agriculture; and
- g) These schemes were not married with indigenuous traditions and practices, otherwise known as "People's Science and Agrarian Populism." The native environment possesses a specific set of challenges well understood by local farmers, but less understood by science. Little progress was therefore made while agricultural planning agencies thought exclusively in terms of "technology transfer" (reliance on ideas and techniques that had proved successful in other parts of the world (Richards, 1985: 13).

These among other reasons, may have been responsible for the failure of the vaunted national programs of the 1970s and 1980s and which ran well into the 1990s.

Reference can be made to earlier programs such as Tangayinka groundnut scheme and Niger Agricultural Project at Mokwa in Central Nigeria as object lessons in how not undertake agricultural development. Here, among other problems, the equipment were inappropriate for local soil conditions



and were exceptionally difficult to service. Tractors cultivated larger areas than farmers had labor to weed (Baldwin, 1957). They were to fail.

### **AKWA IBOM STATE: INSPIRATIONS FROM POPULIST ARGUMENTS**

This paper draws inspiration from populist arguments for Akwa Ibom State as follows:

- a) Akwa Ibom rural population is scattered and poor. It is also inventively self-reliant. The degree of isolation and poverty is in many ways such as to foredoom strategies attempted in Europe, North America and Asia without sufficient and wise integration of the people's science. As already testified in the literature, the peasant or small-scale farmers have as their most precious resource their inventive self-reliance. Agricultural development initiatives in Akwa Ibom State should try to maximize the utilization of this resource.
- b) Small-scale farmers in Akwa Ibom State are capable of making changes in their own interest which are potentially of benefit to the society as a whole. Thus, the most effective and rapid rates of agricultural changes will occur in Akwa Ibom when State resources are used to back up changes that small-scale farmers are already keen to make. This backing can come to farmers in the form of loans, equipment, fertilizers, pesticides, weedicides, etc.
- c) Although recent rural development programs have placed some interest on small-scale farmers, the results have so far failed because such attempts have not seriously addressed the issue of popular participation in project design and the development of new technologies.
- d) Arising from the above, there are inappropriate innovations and or support for agricultural development being offered to inappropriate groups in the farming community. As such, project inputs fail to work as intended or they end up in the hands of non-farmers (merchants, transporters, civil servants and politicians), who may use such farm inputs like loans to buy cars, marry wives or build status houses. They may also sell off agricultural equipment and fertilizers to satisfy their inordinate ambition.

The main concern of this study is with the ecological aspect of the populist case, and more specifically to argue succinctly that the populist approach is a good and perhaps the most effective way to foster the resource management and biological skills upon which Akwa Ibon agricultural revolution might rest.

### **AKWA IBON STATE: APPLICATION OF PEOPLE'S SCIENCE AND AGRARIAN POPULISM**

In this section of the study, a few principles or considerations on which small holder agriculture in Akwa Ibon State may rest will be discussed. These principles or conditions include:

#### **A. Ecological Principles:**

This makes for complex ecological relationships which the farmer always seeks to emulate as in intercropping -- a successful management strategy. Ecologically, Akwa Ibon may be divided into three zones:

- (i) The coastal zone with marshy soils around the riverine areas of Eket, Oron, Ikot Abasi and the lower banks of the Cross River in Itu and Uruan.



- (ii) That flat low-lying forest zone comprising Abak, Etinan, Ikono, Ikot Ekpene, Uknafun and Uyo.
- (iii) The undulating grounds and the high hills of Itu and some parts of Ikono.

As smallholders (present farmers), the people of Akwa Ibom State are able to manage the soils in their ecological zones to produce such food crops like yam, cassava, maize, cocoyam, rubber, cocoa and wine palm trees.

Sometimes, because West African farmers tended to "ride with" rather than "override" these natural diversities in their ecological zones, it was assumed that their local adaptation to rainfall intensity, soil texture and erosion risks were ancient and primitive. Today, peasant farmers can no longer be castigated for wasteful "burning" of vegetation, merely plow deeper, or lazily mixing their soils together in an arbitrary and unhygienic manner. These techniques have now been seen NOT as evidences of the "backwardness" of peasant agriculture but as principles with considerable development potentials (Steiner, 1982). The same arguments hold for farmers and farming conditions in Akwa Ibom State.

#### **B. Rainfall Seasonality:**

In Nigeria, as in all West Africa, annual rainfall variability measure in terms of standard deviations from mean annual totals may not be very impressive. From the farmers' point of view, the key issues are the dates of the beginning and end of the rainy season and the variability of rainfall at those times (Jackson, 1977). In Akwa Ibom this variability is usually high with a mid-season break (the little dry season in and around August). Akwa Ibom suffers from negative moisture balance in the dry season when evapotranspiration runs in excess of rainfall in November to April and this affects the cultivation cycle.

Local peasant farmers are quite sensitive to the problems associated with rainfall seasonality. They develop the ingenuity of observing the shift in wind directions and the formation or scarcity of clouds. They observe the behaviour of plants (shedding their leaves or leafing), bird song indicators, and others, to help them decide on their farming activities. They know that good burning increases soil fertility and inhibits weeds and insect activity. A poor burn entails extra work on piecemeal chopping up and piecemeal burning. For effective agricultural output, the farmers plant in time, select their cover crops, decide on their mulching technique and weed control. They develop their techniques of erosion control and soil management for increased productivity. For example, in sections of Oron, Eket, Mkpato Enin and Ikot Abasi Local Government Areas where the water table is near the surface as well as around the alluvial deposits at river mouths and estuaries, the peasant farmers know when to plant and when to harvest before the ground water comes in. They also know the correct species selected for successful intercropping and other farm methods.

#### **C. Shifting Cultivation:**

A majority of small-scale farmers in Akwa Ibom practice some form of shifting cultivation, somehow referred to as "land rotation following." Shifting cultivation involves clearing and burning natural vegetation, cultivating the cleared area for a season or two, then moving to a new plot while the old one regains its fertility under natural vegetation regrowth. In Akwa Ibom, the cultivation-fallow cycle is now between 4-5 years. The biomass of a newly cleared and felled bush area is burnt as a means of liberating plant nutrients.

The early attitude to shifting agriculture was negative. People thought it was a bad system-exploitative, untidy, misguided and unscientific (Richards 1983: 50). But shifting cultivating has some ecological knowledge associated with it. It also has some managerial skills that it demonstrates and which must be integrated into the "populist" strategies for agrarian change. They include:



**(i) The System Approach:**

This approach assumes that shifting agriculture is an integrated set of practices constituting a distinct type of "farming system." A balanced assessment of shifting agriculture now considers the ecological relationships involved in the system, and is based on mapping out the interactions between soils, plants, atmospheric variables and human labor. Key operations include the attempt to measure energy inputs (solar radiation and human labor), to trace nutrient flows within the systems, and to measure output.

**(ii) Fertility Management:**

This is associated with the fallow period, intercropping and crop rotation practices adopted by the farmers. The farmers' intentions are to save labor, to spread the risks failure and to limit pest and disease attack.

In Akwa Ibom, intercropping is carried on with yam, cassava, fluted pumpkin, coca yam and peas combination and during fallow, pigeon peas and other legumes may be planted as cover crops to sustain the system. Intercropping ensures better and more reliable yields (Agibola Taylor, 1977; Baker and Yusuf, 1976). It guarantees a smoother labor input profile as farming communities are experiencing selective loss of young people through rural out migration (Zachariah and Conde, 1981). It also makes for better control of pests, weeds and diseases. Because inter-cropping provides a wide range of foodstuffs at a time-staples, protein crops, vegetables, hunger breakers like maize, long duration and drought resisting crops such as cassava, sauce ingredients, farmers are attracted to it.

**(iii) Conservation and Soil Physical Properties:**

Early criticism to shifting agriculture centred on the idea that it was wasteful-it wasted vegetational resources that might be returned to the soil more effectively (if slowly and laboriously) through composting, and it exposed soil to physical damage. It is now apparent that shifting agriculture, far from encouraging a wasteful attitude to soil resources, has provided farmers with good, practical education in the more important principles of soil management. From the point of view of fertilization, the peasant farmer in Akwa Ibom emphasizes on "ash." From the point of view of soil conservation, there is enough evidence that the farmer is well abreast of many of the key issues involved. It is now emphasized in shifting cultivation that soil physical properties are important in the maintenance of sustained yield, and modern soil science confirms that this emphasis is well-placed. For example, shifting cultivators "scratch" the surface of the soil instead of "cultivating deeply" and it is now considered to have merit for soil conservation and research into new and modified systems of "minimum tillage" has been actively pursued at IITA (International Institute of Tropical Agriculture) (Lal, 1979a, 1976).

We can agree with Ahn (1970: 150) that in popular literature and some introductory books and articles, it is often implied that one has merely to apply fertilizers to the soil in order to get better crops. Development projects in West Africa operate on this assumption and farmers are supplied with fertilizer without sufficient extension advice. But local conditions vary too much for this prescription approach to work effectively. Better use of fertilizer requires a much more open-ended approach, with, in all probability, farmers doing much of the necessary experimentation for themselves.

A thorough understanding of the legacy of shifting agriculture in Nigerian farming systems suggests that the right kinds and experience to sustain such experiments are already present and widespread among small-scale farmers in Akwa Ibom State. Rather than concentrate on selling a "package" of "soil medicine" to farmers, the challenge for "populist" agricultural development is to establish a thorough-going and self-sustaining program of improved soil management, drawing strength and initial impetus from the skills, experience and experimental ability already present within the farming community.



*What this system therefore needs in order to succeed are:*

- a) Popular participation in project design through education, orientation and awareness. This can be organized by resident agricultural extension staff. Here, the use of the fertilizer, new scientific inputs like maize hybrids, rice, cassava, palm trees, rubber, cocoa, fruit trees, and new techniques and other research findings could be discussed and demonstrated. We are aware that the newspapers and radio programs in the State try to create this education. The T.V. and cinema films should also be organized for farmers and intending farmers to help increase agricultural productivity.
- b) There is need for better control and management (disbursement) of agricultural inputs in the State. Today, project inputs like fertilizers, pesticides and agricultural loans fail to work as intended. They end up in the hands of non-farmers (merchant, transporters, civil servants and politicians, etc.) who really have nothing to do with agriculture. There should be checks and balances entrenched in the system to ensure equity and accountability in the procurement and distribution of agricultural inputs and loans. Loans should be supervised when given out.
- c) This agricultural populist program will succeed with some social overhead capitals like:
  - (i) Roads: Good roads and effective communication system to aid transportation, distribution and circulation of agricultural inputs and outputs are needed.
  - (ii) Banks: The State is now rich in rural and community banking services. These banks should provide low interest and controlled loans to aid the development of agriculture under the populist program.
  - (iii) Rural Electrification: The State has a dynamic rural electricity program. Food preservation and processing in rural areas may depend on successful rural electrification. Rural electrification should be carried to the nooks and corners of the State.
- d) Government should be discouraged as shown by the failure of her efforts to boost agricultural output, from embarking enhanced productivity. When supportive policies, incentives and social overhead capitals are there to boost the application of the people's science and agrarian populism, the peasant or small-scale farmers will produce for the State.
- e) The State Ministry of Agriculture working in close collaboration with the Faculty of Agriculture of the university of Uyo, Uyo, should evolve a research tradition for the farmers of this State. Such research will establish and produce maps of land and soil capability for the State as well as improve upon and domesticate our various undomesticated crops, trees and vegetables. These crops include: afang, editan, utasi, udara, meme, nkarika, etc. (Enoh, 1990: 178).

With idea that Akwa Ibom State should resort to the "People's Science and Agrarian Populism" by mobilizing indigenous skills, technology and resources to plan for profitable small-scale agricultural development and the need to become more self-sufficient, food production dictates increased productivity of both land and labor. In Akwa Ibom State agriculture is not merely an occupation or a source of income; it is a way of life. Farmers are closely attached to their land and devote long, arduous days to its cultivation. Any change in farming methods must bring changes in the farmer's way of life. The introduction of biological and technical innovations must be adapted to the natural and economic conditions, the attitudes, values and the abilities of the mass of producers. These people must understand the suggested changes, must be willing to accept them and must be able to carry them out. It is on these grounds that this research introduces and encourages the formation of the People's Agricultural



Cooperative Organization (PACOS) in Akwa Ibom State These Cooperative Organizations will be the base for the introduction of biology and technical innovations into agriculture. They will pool their resources effectively, abolish or bid the land tenure that has been rather inhibitive to the development of large-scale agriculture in the State. These People" Agricultural Cooperative Organizations acting within the populist philosophy, will embark upon mechanical and commercial agriculture to bring about profits, social security, unemployment insurance when agricultural yields have been increased.

## CONCLUSION

One of the major developmental problems facing Nigeria today is the problem of increasing agricultural productivity in order to be able to feed her teeming millions. The agricultural programs of the 1970s, 1980s and the 1990s continue to fail in this direction because of political instability in the nation in which each federal government instituted seeks to place her name and identity on agricultural project under various names without stabilizing or concretizing its predecessor's project, but more particularly because attempts at agricultural improvement were based on technology transfer i.e., reliance on ideas and techniques that had proved successful in other parts of the world. Such schemes by passed the people's science and agrarian populism which appeals to the peasant economic interests and cultural values. Akwa Ibom State is rich in these peasant economic interest and cultural values which include among others, the ecological principles of the State, rainfall seasonality, shifting cultivation with its systems approach, fertility management, intercropping, and conservation of soil physical properties on which agrarian development should recognize, and adopt. This populist approach when backed by:

- a) popular participation in project design through education, orientation and awareness;
- b) better control and management of agricultural inputs and outputs;
- c) provision of good and effective social overhead capitals such as roads, banks, electricity, potable water and research tradition, will bring about profitable small-scale agricultural production, while government should be discourage from going into agricultural production directly.

In time, Akwa Ibom State should be able to establish Akwa People's Agricultural Cooperative Organizations (Akwa PACO) which will embark upon biological and technical innovations to bring about mechanical agriculture and increased productivity within the populist philosophy.

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