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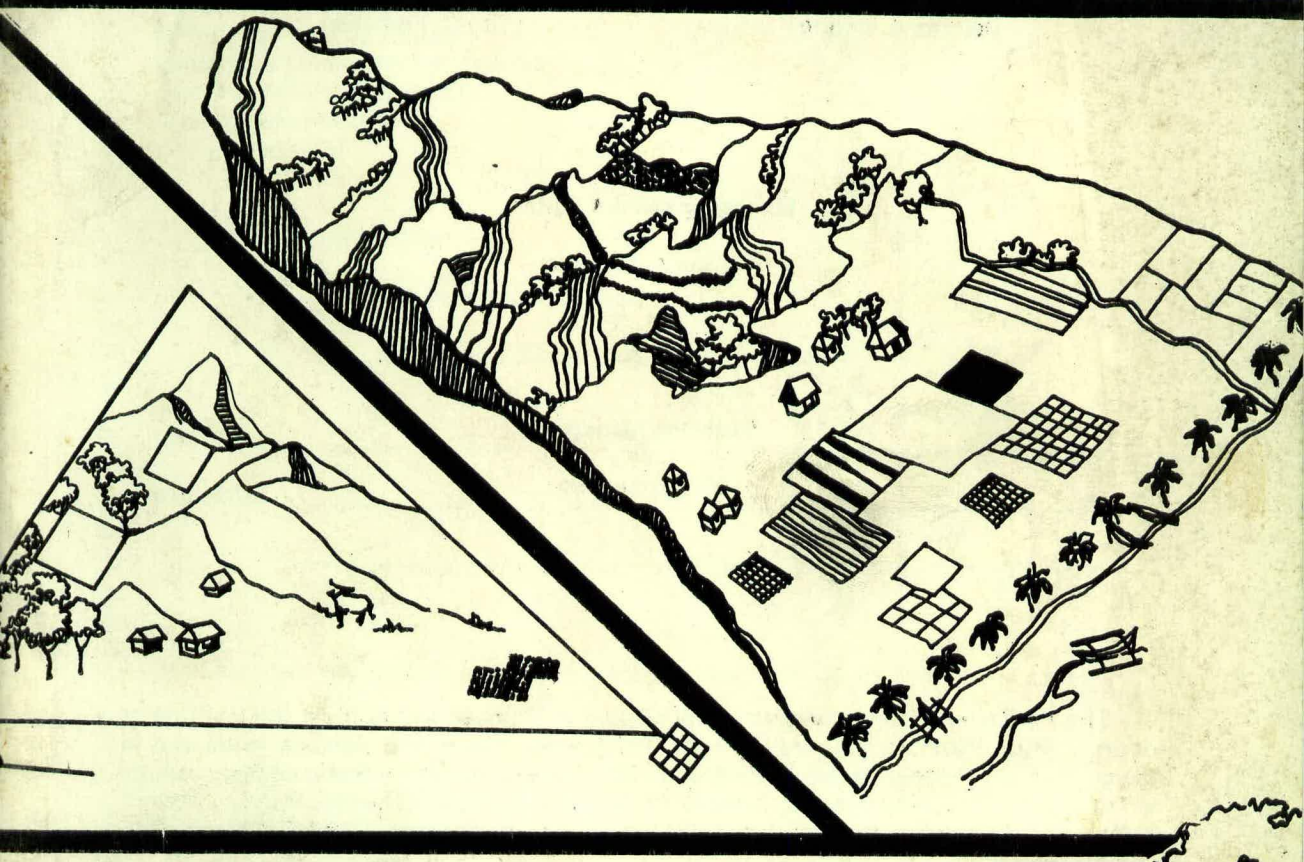

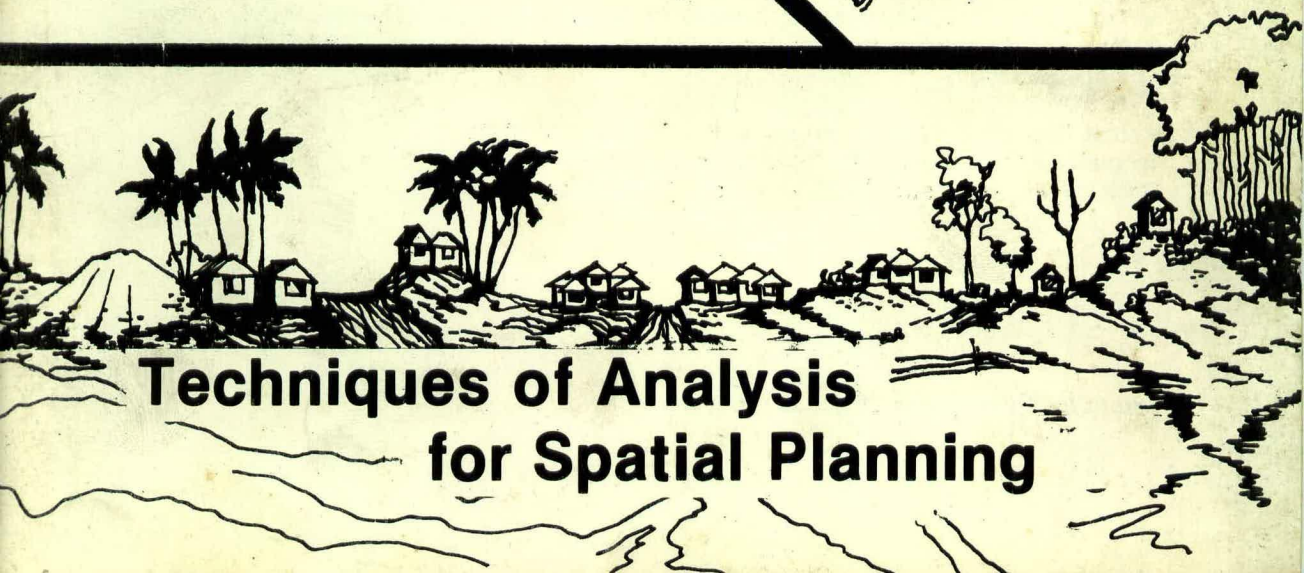

Techniques of Analysis for Spatial Planning

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Frontispiece Courtesy of Dr. Carlos Fernandez II

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RECONSTITUTING THE WEDGE MODEL: A STRUCTURALIST PERSPECTIVE*

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INTRODUCTION TO THE WEDGE MODEL

A landscape appears to be nothing more than a random ensemble of plains, valleys, hills, forests and bodies of water. The disarray has a hidden meaning; it is not a juxtaposition of various physical forms, but rather the coming together in one place of an organized milieu and ecology. Social anthropologist Carlos Fernandez II has shown, on the basis of various studies of Palawan Province, that behind the appearance of chaos presented by the itinerant agriculture of tribal groups, there lies a concealed order. The scattered arrangement of cultivated plots, the different forms of human association for purposes of cultivation, the variety of patterns of distribution, exchange and consumption represent close adaptation to ecological, social and economic possibilities. The landscape is thus a nexus of relationships.

A cross-section shows that behind the physical and social configuration is a conceptual framework which gives meaning to the geography of forms and settlements. That conceptual framework is provided by the Wedge Model.

The Wedge Model is part of the search for previously unsuspected harmonies; it roughly corresponds to Levi-Strauss' "mechanical model,"[1] a conceptual apparatus of the conscious image of society *as it should be.* The Wedge Model explains not only the "how" of social phenomena, but the "why" as well, hence its heuristic value.

The Wedge Model[2] derives its name from the triangular slice of land mass cutting inward, like a piece of a divided pie, from the coast to the forested mountains. The wedge is a concise ecological formation consisting of four development zones: Zone I, the

*This paper is based on a masteral thesis "The Wedge Model of Integrated Area Development: A Structural List Critique of Development Planning and Resource Management," submitted to the Institute of Environmental Planning, University of the Philippines.

[1]When a set of empirical social facts is explained by a mechanical model, it means that the behavior of the social facts tends to an ideal limit; conversely, when a set of social facts is accounted for by a statistical model [the other model prescribed by Levi-Strauss], the behavior of the facts tends to a statistical limit, that is, to the maximum differentiation in behavior.

[2]The elaboration of the Wedge Model here is derived from the following sources: Development Academy of the Philippines, *Palawan Cultural Minorities Assistance Program,* A Project Proposal Submitted to the National Council for Integrated Area Development (Makati, Metro-Manila: DAP Press, 1981), 26-33; DAP, *Mindoro Agro-Industrial Rural Communities Development,* A Report Prepared for the Mindoro Integrated Rural Development Office and the Bureau of Cooperatives Development (Makati, Metro-Manila; DAP Press, 1980), Appendices I, II & III; DAP, *Rural Employment Generation Project,* A Concept Plan Prepared for the Technology Resource Center (Makati, Metro-Manila: DAP Press, 1977), 8-21. Aspects of the Wedge Model found elsewhere are separately footnoted.

coastal flatlands which include major fishing centers, port towns, coconut orchards by the sea, mangrove and river estuaries; Zone II, the *river basins,* comprising river valleys and flood plains; Zone III, the *foothills,* constituting 70 percent of the country's arable lands; and Zone IV, the *upland* forests (See Figure 1). The zones, it must be noted, are the model's units of analysis. The three-sided figure is meant to reflect gradations of production activities, human settlements or land uses by which the bounded area is filled or occupied. The base of the triangle (along the seacoast) is where any of these activities is densest; the apex (pointing toward the forests), where it is scarcest.

Origins of the Wedge

The wedge was "discovered" in Palawan by a rural development team from the Development Academy of the Philippines, led by Fernandez, who observed that frontier settlers initially tended to group together along coastal flatlands, and subsequently settle within watersheds. The settlers undertook diverse economic activities, often of the subsistence type. While settlements tended to cluster, production, distribution and exchange activities ran the length of the watershed from the coast to the forested highlands.

Thus, the first wedge closely hewed to the boundary of a given watershed. According to its proponents the model was perfectly adapted to the highly irregular geographic and topographic features of Palawan; indeed the entire periphery of Palawan was seen as an array of wedges following the courses of the numerous rivers in their abbreviated, swift runs to the sea. This visible pattern carried two implications: the first was that a natural resource area is not necessarily coincident with but almost always extends beyond an administrative area, traditionally the geographic base for planners. The second was that the wedge-shaped layout of the *corridor* of production includes all possible land uses in various combinations—shifting upland farms, sedentary upland agriculture, tree farms and orchards, coconut and sugar plantation, irrigated rice farms, and fishing grounds (both inland and offshore). To these two, it can be added that as a totalizing consequence of the unity of geography and economy, the wedge does not fail to combine all coexistent modes of production. Indeed, it is economically and socially articulated by them. Thus, the Wedge Model surpasses sectoralism and incrementalism in the geography of development.

The geometric shape and orientation of the wedge which specifies the predominant land type also offers a systematic resource management framework. A wedge with a shoreline base would have a predominantly coastal plain topography. A wedge with a mountainous base would have a characteristic vegetation pattern that would be an ecological contrast of a wedge facing the sea. Figure 2 samples the variety of wedge formations that can be carved out from the Philippine countryside topography.

The idea of "framing" the wedge in this manner is to allow the ecological and topographic balance supplied by the model to become the principal factor by which use of resources is gauged. Resource exploitation in this context becomes methodical and judicious.

Against the Path of Least Resistance

The Wedge Model is a powerful heuristic device when ranged against traditional land utilization and development schemes. Indeed, the Wedge Model is intended to challenge the practice of incrementalism in land development. A central statement of the Wedge Model is that the present course of resource management in the Philippines has followed the "path of least resistance." Land development and the establishment of human settlements start with relative ease in the coastal flatlands (Zone I). Exploitation moves laterally until all lowlands are cleared and claimed. While the pressure of demographic movement somewhat eases off, development proceeds steadily to the interior flood plains (Zone II), scurries up the foothills (Zone III) and begins nibbling at the hinterland forests (Zone IV). The path reaches its final point when virgin forests are penetrated.

This development pattern, advancing in concentric *layers* or *bands* defined by land capability and contours, has proved to be an environmental curse. It sets off not simply linear and mono-causal events, but a multi-headed hydra of consequences. Layers of

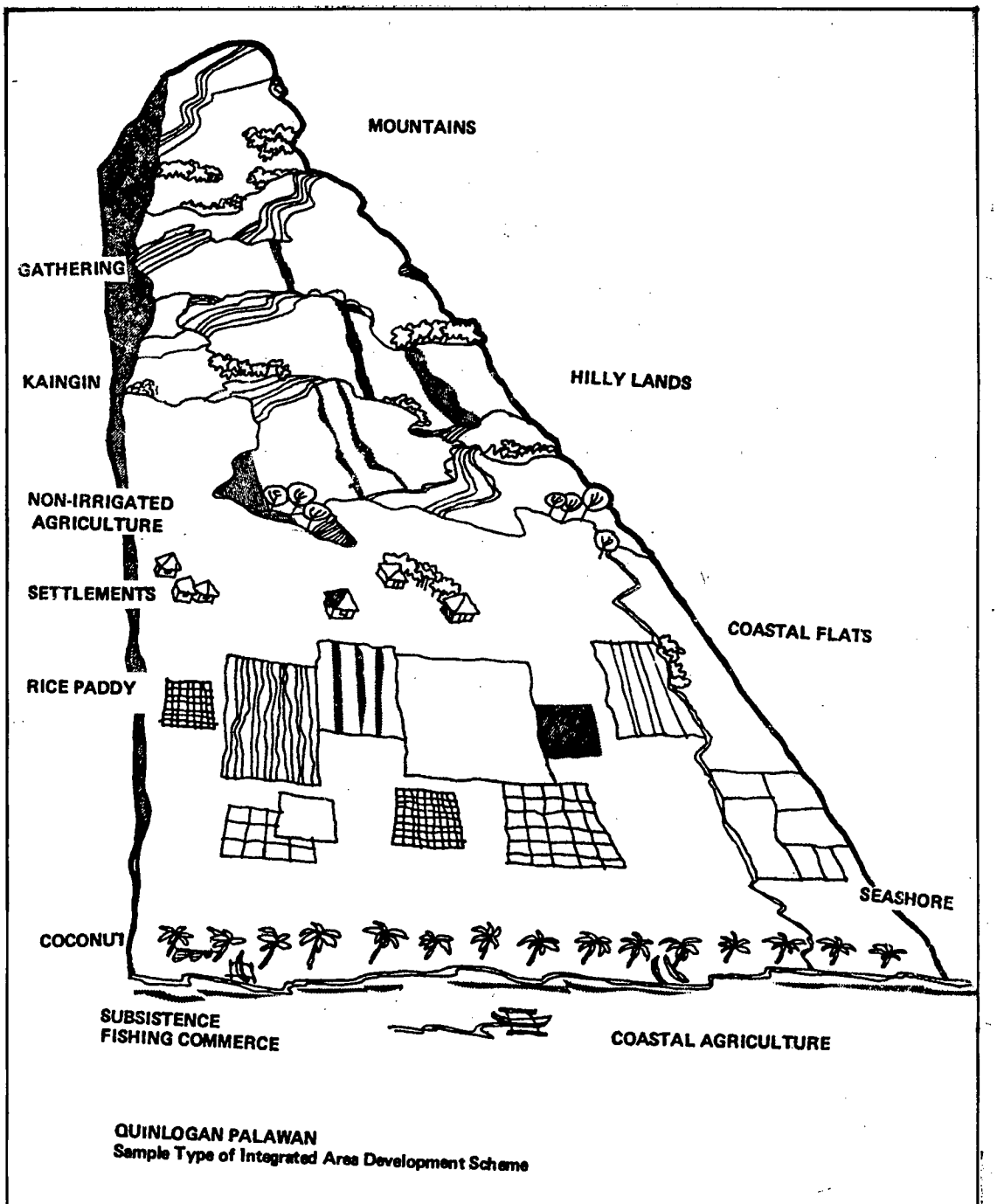

Figure 1—A Wedge for Rural Area Development

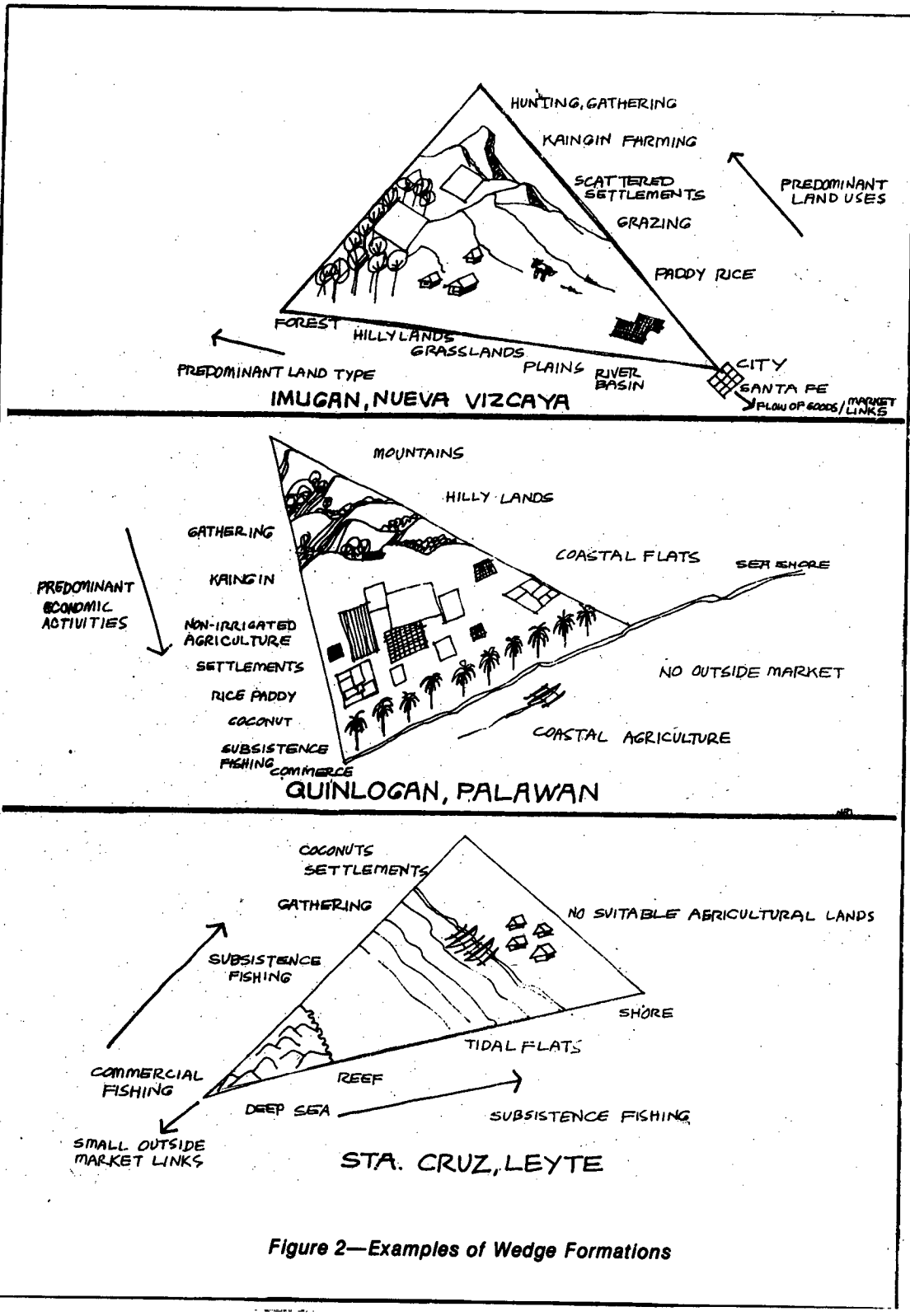

Figure 2—Examples of Wedge Formations

open grasslands and eroded foothills (Zone III) that set in between the lowland irrigated areas (Zone II) and the critical watershed area (Zone IV), literally cast havoc in the flood plains and shallow water fishing grounds below. Large primary lowland paddy areas turn into virtual wastelands because of erosion, sedimentation and teh lowering of the water table.

The band or serial pattern of development leads *ceteris paribus* to a breakdown, the wages of which are dramatically highlighted, by washed down mine tailings and denuded areas blighted by corporate loggers and miners. Central Luzon is instanced since the region's irrigation canals are already silted up, and paddy fields choked up by acidic mining residues, preempting tens of hundreds of prime irrigable lands.

The polycausals linking of these events in the country's rural regions has meant the demographic burgeoning of the lowlands, the river basins and flatlands. The uplands and foothills have been neglected or exploited with scarcely any thought of preserving their productivity or utility value over the long haul. This trend toward the ecological destruction of *any* countryside, Hans Magnus Enzensberger explains,

> . . .can at best be reversed in detail but not in its totality. The crisis will naturally set in motion many processes of adaptation and learning.... The more critical the situation becomes the more desperate will be the attempts undertaken in this direction. They will include: . . .opening up of new sources of energy. . .the development of more intensive agricultural techniques and so on. But each of these steps will cause new critical problems; these are stopgap techniques, which do not touch the roots of the problem. The political consequences are clear enough. The costs. . .will increase explosively. . . The "invisible" social costs. . . are rising immeasurably and are being passed on in prices and taxes to the dependent masses to such a degree that any equalization. . . is no longer possible.[3]

A Lowland Bias

From a long term point of view of rural development, a lowland and monocrop bias in development has critical implications:

1) Prime agricultural lands suitable for irrigated monocrop grain production is limited. Only a fourth of the total arable land in the Philippines is suitable for lowland agriculture. Water conservancy and irrigation system, if ample, could conceivably expand these irrigable areas. Still, over half of the total arable land can only accommodate upland farming. In Palawan, the insistent preference for prime irrigable lowlands by the majority of the rural population (Christian migrants) implies that they crowd it out in *only approximately 10 to 15 percent of the total arable land of the province.* The greater portion (60-70 percent) is good only for upland (non-irrigated) agriculture. The rugged configuration of Palawan—a long, slender island with a mountainous backbone —allows waterways which run short courses to the sea. This spasmodic condition permits only a small, if precarious, irrigation potential which can easily be disrupted and permanently impaired by improper land utilization.[4]

2) Productive lowlands subjected to intensive cultivation are steadily deteriorating through excessive cultivation, leaching, erosion, improper irrigation and use of chemical fertilizers. Large-scale food shortages in the mid-eighties, exacerbated by steady population increases, are not a remote possibility.

3) The lowland areas used for agriculture are being irreversibly converted into housing, industrial and commercial sites. In other words, urban sprawl is engulfing wide sections of the countryside.

4) Potentially irrigable areas have been considerably reduced because of the denudation of critical watersheds, salinity resulting from poor drainage, and depression of the water table.

Thus attempts to increase the productivity of farming lands beyond a certain point lead to ecological imbalance. Unfazed by these initial disequilibriums and ecological onslaughs, countryside development further aggravates the situation by mounting a siege of the uplands.

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[3]Hans Magnus Enzensberger, "A Critique of Political Ecology," *New Left Review 81* (March-April, 1974), 15.

[4]DAP, *Palawan Agro-Forestry Project,* A Joint Project of the Palawan National Agricultural College, The Asia Foundation and the Development Academy of the Philippines (Makati, Metro Manila: DAP Press, 1980), Appendix 4.

The Wedge Model proponents correctly blame traditional colonial agriculture for the lowland bias in agriculture. Colonial agriculture, as the historical precursor, was chiefly geared to export, with substantial subsidiary subsistence production, methods of extensive cultivation and of land rotation, plow and fertilizer then still unknown. This practice "naturally" devastated lands and gradually wasted the foothills until an unprecedented scale of commercial logging offered up the forests to a holocaust of erosion. Thus, the very economic underdevelopment of the country was responsible for a series of qualitative transformations in the structure of its geography and ecology.

Profile of the Countryside

To better understand how the wedge components complement each other, a total geographic panorama of the Philippine countryside, in terms of the four zones, has been constructed by Fernandez and his associates (see Figure 3). It must be remembered that any piece of countryside land can theoretically be cut into a wedge, and that each zone represents a stage of development—social, economic and cultural.

The following describes the historical profile of the countryside:

The first settlements in the country were established in Zone I or the coastal flatlands from where the major fishing centers and port towns emerged. The sea was a bountiful production source, and at the same time served as the main artery and communication link between towns. Sustained high yields of marine products found in the sheltered coves of the continental shelf paved the way for a flourishing interisland trade.

In his book *The Philippines: A Past Revisited,* historiographer Renato Constantino offers a pictorial account of these settlements:

> Most communities were coastal, near coastal or riverine in orientation. This was because the principal sources of protein came from the seas and the rivers, the people relying more on fishing than on hunting for maintenance. Although pork, carabao meat, and chicken were eaten, they were mainly ritual and festival foods. Moreover, people travelled principally by water. The movement of the population was up and down rivers and along the coasts. Trails followed the streams; no roads bisected the countryside, nor were there any wheeled vehicles. Rivers were also the major source of water for bathing, washing and drinking although some communities settled around springs. However, it was in the coastal and near coastal communities more accessible to traders where a higher degree of development emerged. Dealing with traders meant coming in contact with Chinese, Arabian and Indian civilizations. Thus, the coastal communities in Manila, Cebu, Jolo and Butuan attained a higher cultural level.[5]

Human occupation of the coastal flats came in well-spaced, low-density but relatively sturdy and cohesive communities. Constantino writes:

> Pre-Spanish settlements were in the main far from each other, with houses of renewable materials usually aligned along a riverbank or on a shore. There were no houses of stone and no public buildings, indicating a fairly low level of political and social organization. The custom of burning or abandoning a dwelling when a member of the family died suggests that these houses were regarded as temporary shelters rather than lifelong homes. The impermanence was no doubt dictated by the demands of shifting cultivation which was the predominant method of rice culture, although the change to wet-rice agriculture had already been made in the lowlands of Luzon.
>
> Most of the members of the community were related to one another by blood or marriage. Besides kinship, common economic interests and shared rituals formed the bases for community cohesion. The barangay was a social rather than a political unit, each one a separate entity with only informal contacts with other villages.[6]

These settlements were later to serve as staging points for the exploitation of the three other zones.

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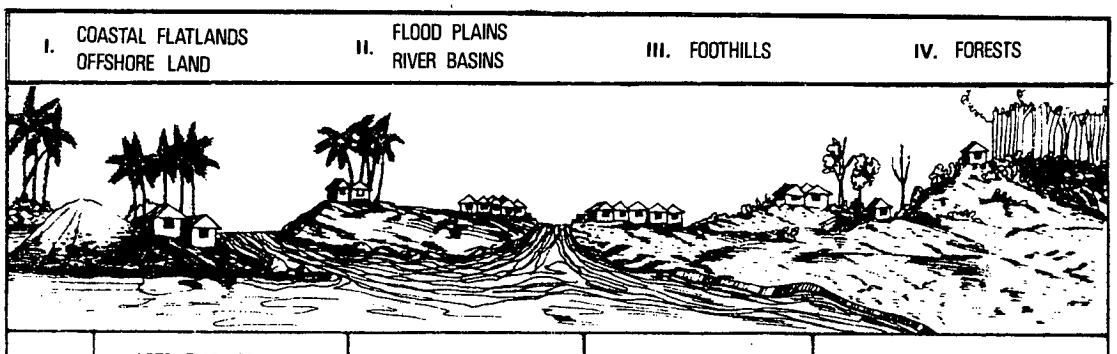
[5]Renato Constantino, *The Philippines: A Past Revisited* (Quezon City: Tala Publishing House, 1975), 27-28.

[6]*Ibid,* 28.

Zone II or river basins along tributaries and naturally-protected bays drew the largest and longest enduring concentrations of human population. The most notable example is Metropolitan Manila. Because of their strategic locations as trade and communication crossroads, these settlements became major commercial entrepots and administrative urban centers.

River valleys and fertile flood plains gave refuge to the highest population densities. Indigenous engineering skills, and technological aspects of plantation technology, coupled with the economics of production, converted large tracts of land into irrigated fields while institutional innovations gave birth to the most elaborated land tenure systems (haciendas)—based on the



ZONES	SETTLEMENT PATTERN SIZE	POPULATION DENSITY SIZE	ECONOMIC RESOURCE BASE	GROWTH AND DEVELOPMENT INDEX
I	• LARGE AND MEDIUM • STABLE • CLUSTERED, NUCLEATED, RIBBON VILLAGE	250 – 1,600 HH HIGH-MEDIUM DENSITY	FISHING / MARINE OF INLAND COCONUTS / SUGAR ORCHARDS	MEDIUM-HIGH
II	• LARGE • STABLE • NUCLEATED, GRIDDEN, CLUSTERED, RIBBON	250 – 5,000 HH HIGH – MEDIUM DENSITY	LOWLAND IRRIGATED RICE, TRUCK GARDENING	HIGH
III	• MEDIUM • STABLE / SHIFTING • CLUSTERED/SCATTERED	40 – 100 HH MEDIUM – LOW DENSITY	UPLAND MIXED AGRO SYSTEMS SUGAR, PASTURE ORCHARDS	MEDIUM-LOW
IV	• SMALL • SHIFTING • SCATTERED	2 – 20 LOW DENSITY	AGRO-FORESTRY KAINGIN HUNTING / GATHERING	LOW

Figure 3—Profile of the Philippine Countryside

expropriation of small numerous small farmers by a rising landowning class and the most specialized cropping system (cash cropping).

"The introduction of machines in agriculture, and the improved means of communication which facilitated the transport of products to the ports," according to Constantino, "were... factors that made plantation agriculture more profitable."[7] Growing trade and market links between farms and urban centers on the one hand, and between the nation and the capitalist world, on the other, once established, became enduring. The result has been that the zone's rural regions remain dependent to date on the economic and political control of urban centers, and metropolitan nations from which policy and decision-making emanate.

The apex of physical development for this area would come in a patchwork of water management and flood control networks, irrigation system, catchment areas and reservoirs.

While grain production under landlordism remains the primary enterprise today, ancillary enterprises such as petty trade, services, small manufacturing, and cottage industries are fairly well developed but scattered, all serving to reinforce the largely unbalanced trade and political links between the rural peripheries and urban cores.

Zone III, or the foothills, has defied exact analysis in both agricultural and ecological terms. Because foothills are in the main ecologically "untamed," they have consequently suffered the greatest degree of wanton destruction. They present a special ecological problem. These areas constitute fully 70 percent of the country's arable land (22 percent is considered prime irrigable lands).

Intruding lowlanders, forced to migrate upwards by lack of fair opportunity in landlord-controlled plains, or by the dwindling supply of lowland tracts, have tried to convert vast forests located in the foothills to crop lands, in the process turning them into veritable wastelands—green saharas infested with *cogon* (imperata) grass. Rapid incursions of lowlanders in search of better livelihood opportunities, who naturally followed lowland technology because it was all that they knew, have resulted in the abbreviation of the fallow cycle (8-12 years), thus preventing the setting in of secondary forest growth. Apart from the magnitude of the area and the rapid rate of its collapse, Zone III is also a critical watershed for the rivers which nourish Zone II, and therefore a crucial factor in maintaining ecological balance in all four zones. Rehabilitation of these areas for intensive cultivation, which is costly, can only be done through irrigation or the restoration of the tree cover.

Human occupation of Zone III shows myriad patterns, from shifting to settled communities, growing mixed crops or monocash crops. The cropping patterns, land uses, variations in terrain and climatic factors help create a varied countryside mosaic. On the whole, occupation of Zone III varies from dense to sparse.

Upland forests in the country, which constitute Zone IV, are among the richest and most productive. However, this impression of immense natural wealth is deceptive, for productivity depends on a fairly limited and fragile source of nutrients, only a tiny portion of which is stored in the thin layer of top soil (the greater portion is in its vegetation). As documented in worldwide literature on forestry, tropical forests thrive, in spite of the lush vegetative canopy, on a very delicate equilibrium which may readily be disrupted. If this fine balance is upset, their structure disintegrates and their productive capacity spirals into irreversible decline. Here the model's advocates reiterate what is fairly common knowledge at this juncture: in the last two decades, primary forest cover receded at staggering rates (only 25 percent of primary forest cover remained as of 1975). The regulatory capabilities of government and the private sector were no match to this galloping denudation. The loss of the forest canopy, although little appreciated, also expedites erosion, induces floods in the lowlands, lowers the land's natural water

[7] DAP, *op. cit.*, Appendix 4.

retentive capacity, increases soil salinization, impairs water impoundment schemes and destroys shallow fishing grounds. The cutting of trees, in a very real sense, triggers off processes that result in staggering losses in the production of rice and fish, two staple items in the Filipino diet.

As it is, human occupation of Zone IV is just like that of Zone III: small, scattered and shifting. Of the four zones, upland forests are the most recently settled. Upland dwellers are in a motley mosaic of tiny, relatively autonomous (autarkic) communities (hill tribes), relying on subsistence economy. The tribal groups, majority of whom now occupy upland forest areas and foothills were *originally coastal rather than hinterland dwellers.* These groups edged into the hinterlands as a result of the influx of Christian migrants who came in droves in search of land, or corporate groups in search of mineral resources. According to Fernandez, this should be a major agenda for planners dealing with national minorities. In attempting to secure permanent habitats and cultivation areas for the tribal groups, they would do well to remember that ancestral tribal lands were not originally hinterlands.[8]

The settlement patterns followed by tribal communities, after decades of displacement, either through force or by avoidance have become relatively stable, especially those settlements by the roadside or close to it. There is still discernible movement, mainly seasonal, of households throughout the island. In the main, however, tribal families lead a settled life.[9]

"We may surmise," says Constantino, "that in these mountain settlements there occurred a return to the old communal relations."[10]

> When people leave different communities to move to a virgin area that has to be cleared for cultivation, there occurs a dissolution of old property relations. Moreover, when such a pioneer settlement must be self-sufficient economically and must rely for its defense on all its members, a more egalitarian social organization is bound to develop.[11]

Nevertheless, on account of unavoidable contact with coastal settlers in the course of time, mountain people have been adapting more intensive, lowland cultivation practices.[12] Indeed, the tribal groups today have shed off some of their agricultural autonomy, and this is reflected in varying degrees of acculturation to the dominant lowlanders depending on their proximity to the latter. Among the remotest groups, from the point of view of physical distance from urban centers, traditional cultural and social institutions remain relatively untouched, while those residing adjacent to the lowlands and the coastal zones have by and large absorbed, if painfully, lowland ways. Needless to say, degrees of acculturation vary considerably within, as much as among, groups.[13]

This does not mean that planning should consist in persuading all upland dwellers, especially tribal groups, to adopt lowland agriculture. If anything, this would prove counterproductive, according to Fernandez. If upland agricultural potential were to be appraised validly and ultimately realized, lowland evaluation techniques such as large-scale and aggregate land use and capability assessment schemes may not prove to be useful.

Fernandez concentrates discussions of the model heavily on the uplands, arguing that they are the gray zone of a planning practice that has distinguished itself on the lowlands. It should be said, of course, that only a planning model which can prove its mettle within the highest zones (with their extremely difficult terrain and more complex social relationships) will provide a serious contribution elsewhere.

Upland Cultivation: Questions of Adaptation

Being a delicate and often capricious technique, it is well to give upland farming a close look. Upland cultivation is characterized by a wide range of crop mixes, and is practised only with fluctuating degrees of success. The soil type, the slope, the climate and the technology employed are variables which, with minor changes, often tilt the production system toward either advances or

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[8]DAP, *Palawan Cultural Minorities Assistance Program,* 7.
[9]*Ibid.*
[10]Constantino, *op. cit.,* 99
[11]*Ibid.*

[12]DAP, *Palawan Cultural Minorities Assistance Program,* 40.
[13]*Ibid,* al-25.

shortfalls. In Palawan, for instance, climate is crucial. Its upland areas are an ensemble of micro-environments of micro-climates.

> The upland areas of Palawan *are not a uniform, homogenous physical setting,* in terms of soil types, slopes, rainfall, drainage, and vegetative cover. Within short distances dramatic variations of any of the above factors are found. Soil types vary considerably as do slopes and rainfall, and consequently drainage and water retention capacity.
>
> .....
>
> The tribal population of Palawan are well aware of these physical variations so much so that in kaingin plots of less than one hectare, close attention is paid to the spatial arrangement of crops.[14]

Palawan's upland farmers have also experienced the importance of observing a centuries-old technology: long fallow periods. For generations, tribal groups relied on extensive and long fallow cycles. A fallow cycle of 8 to 15 years was the mode. In recent years, however, succumbing to the influence of lowlanders, they have turned to a more intensive cultivation and short fallow or permanent field system. The outcome, naturally, was progressing soil degradation, invasion of lands (already cleared) by imperata grass, and low yields. It goes without saying that viability of upland farming rests on a long fallow cycle to ensure the regrowth of the vegetative cover.[15]

Practitioners of extensive agriculture that they were, Palawan's tribes had an innate knowledge of the fertility of soils. They knew intuitively that a ratio exists between cultivated and fallow land, and that if this were disrupted on account of intensive cultivation methods, the entire production system would collapse, and instability would follow. Godelier, speaking of the work of Conklin and Viguer on this matter, might have spoken as well of the crisis faced by Palawan's indigenous groups:

> In a system of extensive agriculture on patches of denshered land there was a *necessary ratio* between land cultivated and land left uncultivated, in order to ensure maintenance of the fertility of the soil and reproduction of the productive system at the same level of efficiency. When this ratio is exceeded, the "equilibrium" of the system is upset, a process of defertilization and deterioration of the soil sets in, yields decline, social difficulties begin. If no solution is found, the vicious circle of extensive cultivation sets in: when yields fall, cultivated areas expand, yields fall. The functioning of the system is thus incompatible with certain rates of population growth, or with the necessity of extending cultivated surfaces so as to produce industrial crops and obtain income in money form. The problem then arises of how to change the system so as to break the vicious circle it engenders and resolve the contradiction between production and consumption, means and needs.[16]

The upland farmers of Palawan are also adept in mixing various crops in the same farm over a period of three cropping seasons, and more importantly, are able to choose soil enriching crops as against soil depletors in order to preserve soil fertility. They are also able to relate cropping to household dietary intake, amount of food surplus, desired degree of commercialization (conversely, extent of subsistence production), and chances of vegetative cover recovery. Far from exhibiting a poverty of technology, upland agriculture readily lends itself to a wide selection of farming systems.[17] It is not adaptation which is significant, although it may contribute some usefulness to upland farming stabilization, but the character of the environment itself. As Godelier notes: "The potentialities of a *milieu* thus constitute alternatives that can be exploited under certain conditions and which always necessitate a conscious effort if they are to be exploited."[18] Such is the nature of the uplands.

Today, according to Fernandez, the existing but attenuated tension between lowland and upland is being given a new twist by the intrusion of corporate interests (including trans-national corporations) in the uplands. The effect is to range both lowland farmer and upland cultivator, in a newfound unity, against the latter. Indeed, this is the emerging pattern of social relations in Philippine uplands: social and economic contestation between two immensely disparate entities. On one side are the poor farmers and tribal people who subsist on what the uplands are: low production levels, simple technology, mixed cropping system, small and

[14] *Ibid,* 17.

[15] *Ibid,* 17.

[16] Maurice Godelier, *Rationality and Irrationality in Economics* (New York: Monthly Review Press, 1972), 309-310.

[17] DAP, *op. cit., 15-16.*

[18] Godelier, *op. cit.,* 307.

intermittent market links, and poor social services due to isolation and varied traditions. On the other side are the big logging corporate farms and mining corporations equipped with the most sophisticated technology in their industry. The operations of these firms have disloged small farmers and tribal people from their only source of subsistence.

The local and foreign business entities can offer almost nothing that coincides with the welfare of the indigenous people. Indeed they contrive only in the interest of profit to disrupt the precariously achieved balance among local groups and their environment. The primitive groups have been the worst victims: they are being driven further into shrinking forests and remote habitats which alone could support the culture and social relationships within which survival was still a possibility. At the same time, corporate intruders are imperilling the natural wealth of the uplands with depletion. The development of the uplands is thus, frontier-exploitative, dealing a severe blow to both its human and natural resource potentials.

Economy, Demography and Ecology

The complex structure spurred by economic specialization and demographic clustering—two inseparable activities within the wedge—are attempts by settlers to adjust to the ecological and economic realities of their surroundings. The tendency to specialize in a definite production activity has a clustering effect on rural dwellers, and gives rise to various modes of production and their attendant relationships. Coastal dwellers unqualifiedly become traders, fishermen, and coconut growers. In irrigable plains, economic logic compels inhabitants to take up paddy cultivation, either in smallholder farms or in landlord-controlled haciendas. In the higher zones, the stress is on shifting and sedentary agriculture. While activities overlap, each cluster, subject to the constraints of the environment, emphasizes and singles out particular productive endeavors. These realities—economic and demographic, plus the ecological base—are the three main determinants used by the model's proponents in taking the wedge out of its geographic context and projecting it into a conceptual model.[19]

To repeat: across political boundaries, but within natural geographic limits, a wedge does relate to a kaleidoscope of *ecological formations* like mountains, hills, river plains, coastal flatlands and sea coasts. Land type also implies vegetative cover (forests, grasslands) and infers an extension into the sea: tidal flats, offshore islands, reefs and even the deep sea.

Demographically speaking, the wedge embraces all human settlements within the triangular formation, be they nomadic shifting cultivators, sedentary scattered farmers, small communities, even municipalities and cities.

A wedge also relates to an assortment of *land uses* or economic activities undertaken within it. In agroforestry settlements, for example, land use varies from upland farms and grazing lands to paddy and institutional uses.

How is the wedge carved out, in the context of the three components? Where should the base and the apex be? The deciding factor seems to be the concentration of productive activities (where productive forces are most intensively congregated), the location of which constitutes the physical and social base of the wedge.

> The base of the conceptual wedge is often oriented to include the predominant land type or land use, as they actually exist. Decisions regarding the relative importance of the three considerations must be made in cases where one of these factors conflicts with another. For example, it might be successfully argued that the broad end of of the Quinlogan wedge should include the uplands with the point directed to the sea, were it not for the fact that most of the economic activities (e.g., farming) of the people occur along the coast and in the broad coastal plain. The uplands, important for watershed potential and as a source of forest products, serve as a supplement to the major productive base of the people. Quinlogan[20] is an example of a conceptual wedge being oriented toward predominating land use (economic formations) rather than predominant land types.[21]

In practice, as much as in theory, the wedge's three components are polycausally linked together. Indeed, the model is characteristically defined as the interrelationship and interdependence of each and every aspect of the environment with each and every aspect of the human society. A change in

[19]DAP, *Palawan Agro-Forestry Project*, 5.

[20]Quinlogan is a community in Palawan province.

[21]DAP, *op. cit.*, 6.

one component will provoke reaction and counterreaction in the other two components.

Nevertheless, a wedge can be made to assume ecological, social or production bias, but mainly as an initial "boundary condition," since ultimately the goal is singular: the reconciliation among the wedge's material, cultural and human elements. A wedge with an ecological slant is geared primarily to recovering the harmony of relationships betwen settlers, land type and land uses. It is only subordinately addressed to production, a factor which is approached on a long term basis. In much the same way, a wedge with a bias toward social structures must give first priority to the preservation of social institutions, progressive indigenous values, and locl wellsprings of indigenous innovation.

The production wedge, on the other hand, presupposes that the area is ripe for an economic change, and opts directly for the systematic rearrangement of economic activities to maximize productivity in the area. In Quinlogan, for example, smallholder farming is the major industry, with over 200 hectares planted to rice, corn, coconut and banana. Secondary occupations include subsistence fishing, livestock and backyard production. It has an abundant supply of rattan and about 100 hectares of its marshes and swamps are potential sites for salt making and milkfish culture. Trading, constricted by limited transport facilities, is carried on with nearby barrios and occasionally with Muslim itinerant traders.

For the model's proponents, a wedge for Quinlogan must have a schematic emphasis on such productive activities. Conceptually, the long axis of the wedge must run parallel to it, with the apex of the triangle pointing to outside market links. Needless to say, the base must cut across the ecological types. The representation of this is the adjusted wedge for Quinlogan. If there is ample evidence that manufacturing is suitable for a production bias, the planner shifts the wedge 90 degrees. In this manner, the base straddles inland across the various land types and settlement patterns, stressing their interdependence and interaction in the development process. The various production activities are well within the adjusted wedge, whose apex points to external market outlets.[22]

Shifting the wedge is said to be not confined to production and marketing considerations. In the case of Imugan, Isabela, ecological equilibrium as a basis for strengthening minority welfare, cultural and legal status must take precedence over (in order to assist) production.[23] The long axis still represents predominance of settlement patterns, topographic patterns and vegetative types. In Imugan, however, there is an inversion of the usual wedge in order to allow the settlements structure to coagulate and gear itself toward institution-building. Specifically, a town center was developed containing all service facilities. Such a centralization was derived from the *poblacion* system: the *poblacion,* as the nucleus of each settlement complex, invariably becomes the principal administrative center. Population "naturally" gravitate toward those centers. Residents in subordinate villages were then encouraged to commute to and from the *poblacion,* or reside near it, in order to take advantage of centralized educational, health and marketing facilities. A surge in population concentration and other urbanization parameters were hoped to be attained with the reemergent wedge.

With the *poblacion* established, the institutional-building thrust is toward the strengthening of local economic organizations through technical and management assistance to enable them to respond effectively to market opportunities. For this reason, trade links were forged with Sta. Fe, an adjoining town.

Participation in the Wedge

The model deeply recognizes the *social nature* of development, and its obligation to be dedicated to the devolution of responsibilities to the communities and villages.

The Wedge Model attaches much significance to community autonomy, under the

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[22] *Ibid,* Appendix 8-9.

[23] *Ibid,* Apendix 8.

proposition that the strength of development lies in the community, not in the government or any exterior force. Direct popular participation in community projects in the context of the cultivation of qualities conducive to development—self help, self-management, self-determination— is an important criterion.

It posits that people in the rural areas are intimately conscious of what is happening to them and their environment, and why. This is intended to belie the prevailing view that technology transfer must always be a top-down undertaking, orchestrated from the summit of decision centers. As recapitulated by Fernandez,

> the model (if you can call it one) is *stark*, but its value is *patent*. Basically, it calls for tempering community approach to development (with the corporate concepts it applies) with a sound resource management scheme, including the social and ecological considerations it implies. It is significant in that it blunts the notion that only the strong arm of the government can get things moving. We can for instance talk about the best use of lands using the best maps that we can crank out—even computerized digitalized maps to explain our views. But if the people cannot understand—*walang mangyayari* (nothing will happen). The other approach is to spread out a Manila paper and give them (the rural folk) a box of crayons and they can give us a map of how their community looks like and how it should grow on paper. And... it can be a very detailed map.[24]

This suggests a strongly participatory methodology, although the Wedge Model does not lay out its institutional ramifications. (There is no mention of what typology of localized planning systems would be observed, or how the indigenization of planning could take place at a much larger scale than the village. Neither is the model precise on how it would relate with larger political and administrative units, considering that the wedge cuts across conventional boundary lines and must somehow confront a higher level decision mainstream. This suggests, in effect, that there are still grey areas in the model that are open for further debate and articulation).

A Repertoire of Planning Uses

The ruling principle of the Wedge Model is the *search for the synthetic ensemble:* each fact, once established, is questioned and interpreted as part of the structural whole. This is its main quality as a heuristic planning tool.

The model, because it is against sectoralism in production, favors viable mixes of productive enterprises within a defined natural area, and under equitable social relationships, in the form of agriculture with fishing, livestock, tree farming, hunting, crafts and so on. Since it calls for a workable integration rather than a spurious distinction between agriculture and forestry, or agriculture and fisheries, it compels project management to be defined in terms of a natural production area, rather than of administrative or political boundaries, with focus on balanced resources management rather than on administrative routines or commodity flows. It also underscores the extension and strengthening of social and economic linkages both within and beyond the village, particularly among communities within the wedge.

The model also fills in a localized lack in social research since it permits detailed studies on land use and land capability at the micro level, undertaken by the residents themselves, in areas where national or regional level classification schemes fail to account for such environment. Otherwise, social analysis consists solely in ridding itself of specifications and details.

It provides more effective measures to ensure the *social soundness* of development projects, reduce social dislocations, and preserve the integrity of village institutions.

Above all, it features detailed planning on the village level. It fosters the strengthening of indigenous mutual aid teams, cooperative work groups and communal production groups as vehicles for large-scale mobilization.

In a manner reminiscent of John Friedmann's agropolitan approach, it likewise creates appropriate planning foundations for introducing industrial elements in a rural setting by encouraging the rise of small enterprises amply protected from the incursions of large-scale, capital intensive firms, and thereby insuring that development will

[24]Carlos Fernandez II, "We are a Bright Nation," An interview, *Daluyan I:* The DAP Review on Development (May-June 1980), 24.

not be skewed in favor of monopolists.

"The wedge... implies an integrated development matrix involving primarily and initially the use of local resources, many of which are interdependent."[25] (Underscoring supplied) Indeed, the model implicitly recognizes various "instances" of levels within the wedge, and the possibility of shifting from a dominant to a subordinate level.

> Long term planning may involve a shift in emphasis from one development activity to another. For example, the long range planner may well decide to shift emphasis in the Quinlogan wedge from upland farming to paddy rice production. By doing so, however, preservation of the watershed would assume greater importance than it would if the upland agricultural base was retained. The shift would require a corresponding shift in support activities.[26]

The Wedge Model is thus a synthetic model. This is its crucial, innovating importance. It has surpassed marginalism, sectoralism, and incrementalism in planning by unifying "discrete" land economics, demography and geography in a concept of development as totality. It aspires to a "global" reconstruction of a scaled-down or micro-social formation. This is its *differentia specifica.*

RECONSTITUTING THE WEDGE MODEL: A STRUCTURALIST PERSPECTIVE

The thrust of local planning has been toward the uncritical acceptance of the rationality of western social and economic science, which, since the last war, has been responsible for the rise of the "modernization" ideology where the West took itself as the absolute point of reference and center of perspective. Modernization borrowed the "universalizing traits" of Parsonsian functionalism, relying on empiricist abstractions (what is true is what is observed) and institutional obstacles to change while avoiding real structural changes.

Since conventional planning is based almost exclusively upon a handful of western societies, it tends to yield development models which do not fit at all the way in which underdeveloped countries actually evolved. In particular, it divides Third World economies a historically into a "modern sector" and a largely residual "traditional sector," and assumes that a "take off" stage will allow them to chart the development path of the now industrialized countries. No connection is made whatsoever between a nation's ills and the larger system outside.

Yet the reality is that the present state of underdevelopment is the result of centuries of participation by nation-states and colonies in the world capitalist system, which today is underpinned by the reciprocal imbalance between the western nations, called the "metropolis," and the disadvantaged countries, called the "satellites." Within the latter, the same unbalanced reciprocity exists between the metropolitan (core) regions and the hinterlands (periphery).

Thus the national system and its economy, because of the dependent nature of its relationship to the larger system, only develops its own underdevelopment. That political, social and economic inequities still prevail—as articulated through the explosive relationships among and within coexistent modes of production with different organizing principles (capitalism, landlordism, subsistence economy, etc.) only means that functional planning has reached an impasse, proof of which is continuing social exploitation and impoverishment, the wastage of national resources, and ecological deterioration.

The task of development planning is to break the crucial junctures of inequitable social relationships which define the social system and connect it to the larger whole. Its threefold mission is to redistribute political power, redistribute wealth and income, and foster self-reliant productivity. To accomplish this, it must rely on mobilization rather than instrumentalist (modernizing) strategies, and on a development model that can mount an effective challenge to the ideology and practice of conventional planning.

The Wedge Model, originally a concise integrated area development model that incorporated all areal resource zones—from coastal plains to foothills and forests—as a unified social and ecological formation, offers such an alternative. If conceptually re-

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[25] DAP, Mindoro Agro-Industrial Rural Communities Development, Appendix 7.

[26] *Ibid,* Appendix 7-8.

constituted, it can provide a superior organizing base for development planning. Its potency as a development model may be reinforced by the structuralist perspective (what is true is what is subjacent) which allows it to realign social and economic relationships as structural complementarities.

Mode of Production Defined

The key to understanding the specificities of socioeconomic relationships by means of which exploitation of the environment becomes possible, is found in the "articulation of modes of production." There are two constituent elements to be explained: "articulation" and "mode of production."

> The notion of mode of production refers... to the combination of material, human and cultural elements, in a systematic relation, through which the exploitation of the environment is possible for a group of human actors. The idea of articulation focuses attention on the social and economic relationships by means of which modes of production with different organizing principles—capitalism, feudalism, patrimonialism, and others which may not so far, have been described—are empirically linked with one another.[27]

More specifically,

> By mode of production" we mean the complex made up of the forces of production (i.e., technical rules, resources, instruments of labor, and labor power) and the social relations of production. Production is the process by which men with their labor power and instruments of labor transform the object of labor (in this case, land) in order to reap some material or economic return. The object of labor and instrument used constitute what we call the means of production, but the process itself requires the participation of men who are brought together in terms of a specific set of social relations. These social relations are principally defined in terms of the ownership and control of the means of production and the social product. Thus in theoretical terms, a mode of production equals the combination of social relations of production and the level of development of the productive forces.[28]

In other words, the mode of production is not a descriptive listing of isolated factors, but a "totality defined by its mutual interconnections."[29]

The Meaning of Articulation

Articulation, on the other hand, signifies expression, linkage and effectivity. Articulation is the linking of different "instances" or levels (e.g., political, social) in a social formation. Indeed, the social structure exists only in and through its articulation. "It is like a play," volunteers Miriam Glucksmann, "whose latent structure cannot be grasped from the individual speeches or characters. The structure can be grasped only from the whole, never from the manifestations which merely hint at it."[30]

Thus articulation refers to the "structure of the social whole." Conversely, the "whole" is to be regarded as an "articulated combination" (of "instances" or levels). Andre Glucksmann says that the elements of this ensemble coexist in mutual definition, such that the whole cannot be reconstituted by a temporal composition that introduces the elements in succession.[31] Unlike in dualist theory, where one mode succeeds another (traditional to modern), entire modes of production under a social formation can coexist and articulate with (as opposed to suceed) one another.[32] Also, whereas the concept of a dualistic society is defined by the fact that all its components are on equal

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[27] Ivar Oxaal, "Introduction," *Beyond the Sociology of Development* ed. Ivar Oxaal, Tony Barnett and David Booth (London: Routledge and Kegan Paul, 1975). 3.

[28] Norman Long, "Structural Dependency, Modes of Production and Economic Brokerage in Rural Peru," in Oxaal, Barnett and Booth, *op. cit.*, 267.

[29] Ernesto Laclau, "Feudalism and Capitalism in Latin America," *New Left Review* 67 (May-June 1971), 32.

[30] Miriam Glucksmann, *Structuralist Analysis in Contemporary Social Thought* (London: Routledge and Kegan Paul, 1974), 149.

[31] Andre Glucksmann, "A Ventriloquist Structuralism," *New Left Review* 72 (March-April 1972), 75.

[32] Aidan Foster-Carter, "the Modes of Production Controversy," *New Left Review* 107 (January-February 1978), 47-77.

footing;

> the articulation of the structure prevents any equality of the levels, conceived as parallel expressions of the same principle of unity; among the levels some will play "major roles" and others "minor roles." Hence the two notions of "dominance" to govern this hierarchized structure. The "dominant instance" designates the different levels of the structure which may successively play the major roles; "dominance in the last instance" designates the relations of production (the economic base) in so far as they govern every mode of production "in the last instance."[33]

It is in this context that "articulation of the modes of production" has a concrete meaning. It expresses the relation between the economic base (dominance in the last instance) and the other "instances." Not only are they linked together, but the dominant instance (such as the political) may *give expression* to the economic.[34] Articulation implies that the diverse modes of production which come to reign over a social formation form part of a unified whole. The idea of articulation offers a structural explanation of the relationship between the modes of production and suplies a process of development which considers the compounded effects of several modes of production.

Overdetermined Contradiction

In a similar way, the term "contradiction" can be used to describe this transformatory relationship. But this contradiction is not a simple opposition between two mutually exclusive components. Rather, because of the inseparability of interactions within the system, contradictions exist in an "uneven and combined" way in all levels in the system's hierarchy. There is no one-to-one relation between cause and effect; hence the contradiction is said to be "overdetermined." The contradiction is "determining and determined in one and the same movement by the various levels and the instances of the social formation it animates."[35] According to philosopher Jean Piaget, the notion of overdetermination is the sociological counterpart to multiple and irreducible forms of causality in physics.[36] All systems, Godelier remarks, are "mixed" contradictory realities made up of objects and relations that cannot exist separately.[37]

Whatever is considered, articulation or contradiction, the nature of the social formation reflects not only the dynamics of the "modern sector" (capitalism) but also those of the "traditional sector" (pre-capitalist mode)—precisely it is constituted by their articulation. In this context the advanced sector is not always the historical hero—the conjuncture of economic hope and social deliverance—and pre-capitalist formations are not always the passive victims and formless villains. It is thus logical to argue, as Hutton and Cohen do, that the articulation of the dominant mode of production will remain unconsummated with certain vestigial structures remaining relatively intact, like those of hinterland groups. The processes of development and underdevelopment in which peasants, smallholders and tribal groups are entangled today are the outcomes of the unbalanced interactions of economies over time. People find themselves in a variety of economic circumstances today because of the irregular economic histories of their regions. The coexistence of agriculture, trade, hunting and gathering, pastoralism, and the exchange of human and natural resources, according to Hutton and Cohen, signifies that there were considerable variances in early economies, and also wide irregularities in the range of contacts between such economies and the outside world. What pre-capitalist economies possess in common, across these changing episodes of history, is the role they have come to play in the international division of labor, and their peripheral position relative to the world economy; in other words, their shared experience of under-

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[33]Andre Glucksmann, *op. cit.*, 76.

[34]Foster-Carter, *loc. cit.*

[35]Quoted in Glucksmann, *Structuralist Analysis in Contemporary Social Thought*, 106.

[36]Jean Piaget, *Structuralism*, trans. and ed. by Chaninah Maschlev (New York: Basic Books, 1970), 126.

[37]Godelier, *op. cit.*, 258-259.

development.[38]

> Different levels of the totality are thus considered to have their own time-scale related to each other in different ways at different moments. The relationship between one social formation and the one that follows it is to be understood in terms of displacement rather than the gradual unfolding of an innate development potential. Each element has its own history and time scale and the resultant structure must be viewed as a more or less conjunctural unity of different and separate histories. There is no general time base or general conception of time which can comprehend this structural history.[39]

In all societies, one structure or another is at the forefront of the social scene as the dominant one. Moreover, while any level on component other than the economy may assume the dominant role, the economy is still dominant in the last instance. Dominance here consists, following Glucksmann, in setting limits to the independence of subordinate levels or instances. Moreover, the articulation of the structures accounts for the specific role performed by any of them in relation to the rest.

The Economy: Dominance in the Last Instance

The concern at this juncture is the dominant structure in the last instance, the economy. To begin with, to understand the character of particular social systems, the nature of a particular economic system embodied in the social system must itself be understood.[40] The social system is said to be indissolubly joined to its related economic system. However, the coalescence is not a conventional cause-and-effect correspondence, where non-social factors emanate directly from the economic base. The relationship between the economy and society is multicausally joined together and hence, immensely complicated.

> On the one hand, the non-economic structures cannot emerge from the economic relations—the causal role played by the economy cannot be presented as the birth of the superstructure out of the womb of the infrastructure. On the other, the non-economic structures are not mere phenomena accompanying economic activity and playing only a passive role in social life, whereas economic relations alone function as active causes, producing more or less "automatic" effects.[41]

The economic here refers to the production, distribution ar.d consumption of material goods within a particular society.[42] Since the study of the Wedge Model involves an analysis of the dominant countryside formation, or precapitalist structures, it would be useful to categorize the economy in terms of the following patterns, as prescribed by Claude Meillassoux.[43]

(1) the social organization of production;

(2) the purposes of production—that is, whether for use or for exchange;

(3) the social control of production surpluses and relations of production;

(4) the processes of reproduction of these formations, both endogenous and exogenous; and

(5) the alternative uses which exist for time which otherwise is given to production.

Since all structures are ensembles of mixed realities made up of social relations that cannot exist independently of each other, it is useful to elaborate on the articulation of modes of production.

Taking social relations of production as the main criterion, several main agricultural modes can be identified in a typical wedge: the traditional hacienda in Zones I and II, the smallholder private property type and the sharecropping type (of which there are several variants) in Zones I, II and III, and the indigenous or tribal community type in Zone IV. Since most of the wedge's regions are fairly heterogenous in terms of production systems, an analysis of the economic structure of any one area would normally involve

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[38]Caroline Hutton and Robin Cohen, "African Peasants and Resistance to Change: A Reconsideration of Sociological Approaches," in Oxaal, Barnett and Booth, *op. cit.*, 121-122.

[39]Glucksmann, *op. cit.*, 109.

[40]John Clammer, "Economic Anthropology and the Sociology of Development: 'Liberal' Anthropology and its French Critics," in Oxaal, Barnett and Booth, *op. cit.*, 209.

[41]Godelier, *op. cit.*, 92.

[42]*Ibid*, 23.

[43]Hutton and Cohen, *op. cit.*, 122.

consideration of each of these modes and of how they intertwine. Although a particular mode of production tends to be associated with a certain type of settlement and land tenure system, it is important to recognize that several modes (both advanced and backward) will usually thrive together within the same context.

Nevertheless, in the main, the modes can be reconstituted into two major, opposing modes: precapitalist and capitalist. In Palawan, for example, the Quinlogan wedge may be interpreted as the articulation of two complementary but antagonistic modes: one being subsistence (as a mode of production *sui generis:* fishing, paddy, upland farming), the other corporate capitalism (mining, agribusiness).

Lowland Modes

At the broadest level, paddy cultivation in organized haciendas represents the most pervasive mode, constituting the base of underdevelopment in the countryside: the expansion of surplus extraction concurrent with the growing impact of trade (principally export), without the mode of production itself being transformed, and hence without allowing the evolution of the productive forces (labor skills, for example) which are indispensable for stepping up agricultural productivity. The outcome is

> the intensified use—indeed "using up"—of labor power, as well as of natural resources, but without an offsetting acceleration of the social productive forces which could make for a correspondingly (or more greatly) increased productiveness of labor power and increasingly effective use of natural resources.[44]

Indeed, with the development of agricultural skills undermined, labor input is low and inefficient, giving rise to a condition where farm work practices are not only labor-intensive, but, in Myrdal's term, "labor-extensive"[45] as well. In this explosive situation, where labor power is at once exploited (used up) and underutilized (underdeveloped), the only possible outcome is to arrest an "internal" dynamic of development within export agriculture, and ensure that any commercially inspired dynamic from "outside" would perpetuate an economic standoff. "To the degree that an area is 'incorporated' within the market," thus Brenner remarks," its economy is increasingly strangled; to the degree to which trade (later) declines, the economy stagnates."[46]

In lowland communities, the mode of production is based not only on the exploitation of large haciendas, but also on the smallholder system combined with various sharecropping arrangements, and a small but significant agribusiness sector characterized by private ownership of the means of production, wage labor and commercialized agriculture. Furthermore, a detailed scrutiny of rural population units "uncovers" various types of exchanges occuring between these systems (labor, capital and technology transfers). Such relationships are further consolidated by a number of non-economic exchanges, for instance, taking part in religious *fiestas,* political activities, as well as family and kinship links.[47] Long elaborates:

> The smallholder family production system found among tenants on the traditional hacienda caters for the material means of subsistence for peasants whilst at the same time enabling the haciendero to extract surplus labor from them. Similarly, the coexistence of large commercial farms, based on a capitalist or semi-capitalist mode of production, and smallholder agriculture tends to generate a series of exchanges between them: peasants become temporary wage laborers for landowners of the district and may sometimes become bound to them through debt relations (i.e., they borrow money or acquire seeds, fertilizers, or equipment on credit)... Socioeconomic exchanges of this kind, which involve individuals who depend primarily on different

[44]Robert Brenner, "The Origins of Capitalist Development," *New Left Review* 104 (July-August 1977), 71.

[45]Gunnar Myrdal, *Asian Drama: An Inquiry into the Poverty of Nations,* Condensed by Seth S. King (New York: Vintage Books, 1972), 256.

[46]Brenner, *loc. cit.*

[47]Long, *op. cit.,* 270.

> modes of production, seem especially likely to persist in zones where agricultural production is characterized by relatively low levels of capitalization and high production risks....[48]

This suggests, according to Brenner, that the act of reproducing the social relations of production for one mode depends on the continuity of other social relations of production found in other modes.[49]

A Subsistence Network in the Uplands

As one moves to the uplands, the economy simplifies into a subsistence patchwork of labor, land and product transactions in a contained system of community life which is paradoxically, socially more complex. The less complex a society's economy, the less it should be viewed as a field of autonomous activity ruled by its own laws. The upland (tribal) society is a total system of relationships "which encompass the material as well as the juridical, religious and artistic dimensions."[50] The hallmarks of subsistence economies are the pervasive social control of production and distribution, and security of subsistence livelihood through resource allocation and social right to receive aid in time of need. Primitive economies are said to be *Gemeinschaft* rather than *Gesselschaft*.

The unit of production—the social organization involved in the making of goods—is dependent on, and drawn from, other forms of social life. Primitive communities have no specialized organizations whose only concern is production. Moreover, there are no lasting social units based solely on productive undertakings. It is the ties of kinship which structure families, clans, and kindreds. They are often the bonds around which economic activities are organized. Sometimes territorial closeness may induce the formation of local production "detachments." And the indigenous political edifice often serves as a mechanism for creating production units. As Godelier says unswervingly: "The forms of internal correspondence vary with each type of society, since in some cases kinship relations and in others political relations really function as production relations, and are both infrastructure and superstructure."[51]

Additionally, there is an economic component to each non-economic activity because realizing it involves directly or indirectly, the use of material means. In the upland societies of Palawan, the existence of kinship bonds between a donor clan and a recipient clan implied the reciprocal exchange of labor and products. "Consequently, that which is economic," Godelier concludes, "is an aspect of the operation of activities that are non-economic: kinship, religion, politics, the acquisition of knowledge, and so on."[52]

The social unit is simultaneously the economic unit. Production and distribution are just two of the many things these societies do. A proliferation of productive units that structurally take after each other, all doing the same multipurposed work, is typical in upland Palawan. Harsh constraints plague these productive units with respect to the type of labor they are able to recruit, the capital they are able to command, and the ways in which they may distribute their product. A capital market does not exist, and the communities are rarely self-sufficient completely. Yet they must also market their craft produce. (Robbed of productive land by conquest and encroachment, generations of tribal societies have retreated into autarkic subsistence, although lately they have experienced a growing gap between their production and their needs. Hence the need to produce for the market.)

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[48] *Ibid*, 271.

[49] *Ibid.*

[50] Octavio Paz, *Claude Levi-Strauss: An Introduction*, trans. by J.S. Bernstein and Maxine Bernstein (Ithaca, New York: Cornell University Press, 1970), 9.

[51] Godelier, *op. cit.*, 97.

[52] *Ibid*, 22-23.

A striking example of productive units derived from social grouping and only partially exposed to economic activity are the basket-weaving communities in Palawan and Mindoro. These communities are composed of craft guilds. Each guild is engaged in the production of baskets for sale, with virtually the same technology. Each guild looks like every other in its productive organization.

A Composite of Varied Productive Systems

The wedge is thus a composite of various productive systems whose genealogy starts from the kinship dominated economy to the largely autonomous and abstract capitalist form. The study of upland economies rooted in tribal social relations is crucial in this respect. Godelier observes that as society develops, family links disengage from both the conditions of production and the circulation of goods as commodities and this separation gradually comes to dominate the countryside where family economy and vestiges of village solidarity continue to thrive longest.

> With capitalism, the internal correspondence between the economy and kinship seems to give way more and more to an external, independent relationship, although in fact the new functions of the family stand in a relationship of internal correspondence with the new conditions of production. Moreover, insofar as the capitalist mode of production develops, in societies that vary widely as regards to race, culture, etc., the relations between economy, kinship and religion seem to grow more and more external.[53]

In the plans he formulates and the approaches he adopts, the typical planner spontaneously and matter-of-factly injects the western biases of textbook theories. He is "naturally" inclined to treat social factors, such as kinship and religion as "exogenous" variables, and to seek an "autonomous" economic rationality. For it is clear that conditons do not fit the ordinary stereotype of western economic analysis which takes for granted that the bulk of economic enterprise is transactional and that production and exchange can consequently be subjected to rational economic calculations. Hence, the drawbacks the planner meets with, and the pejorative indictment he casts on the irrationality of "native" behavior. "Only an economic theory that systematically takes account of the structure of the social relations implied in each type of economy," Godelier writes, "can become a comparative theory"[54]—and it may be added, a development planning theory.

The economic enterprise of a society, whether primitive or modern, agricultural or industrial, rural or urban, is the ensemble of operations which enables people to procure, distribute, and consume the material means of satisfying their individual and collective needs. An economic system is therefore a synergy of three substructures: production, distribution, and consumption. Furthermore, if the nature and hierarchy of needs are crucial in determining what is produced, distributed and consumed, then the economic must be viewed as organically fused with the other activities—political, religious, cultural, and familial. Along with the economic, these other pursuits constitute the content of social life. It must be remembered, however, that it is the economic which supplies the material means for the realization of the social.[55]

Production and Consumption

The centerpiece of economic activity, *production,* refers to all the operations aimed at procuring for society its material means of existence.

> So defined, the concept of production opens out to all possible forms of operation of this kind, those that are characteristic of economies of food-gathering, hunting and fishing, in which a territory is "occupied" and the

[53] *Ibid,* 97.

[54] *Ibid,* 98.

[55] *Ibid,* 263.

> resources needed are "found" there, and also those that are characteristic of agricultural and industrial economies, in which what is needed is "produced" by "transforming" nature. An economic system may, moreover, combine food-gathering, hunting agriculture and craft work. *Historically,* many societies have evolved from an occupying economy to an economy that transforms nature (underscoring supplied).[56]

According to Godelier, producing signifies a "mix" of certain rules (T), resources (R), instruments of labor (I), and men (M) in order to obtain a product (P) that can be used socially. The functional combination of the factors of production (R-I-M) depends on the nature of the variables and the possible ways of mixing them.[57] Such combination "is carried out within the setting of what are called 'production units.' These may be the small family holding, the village community, an industrial enterprise, etc. The setting... depends on the nature of the work undertaken and of the means ravailable (I, K) to undertake it."[58] For example, a major bottleneck in upland farming in Palawan is labor. During any given cropping season, the household labor force could scarcely cope with the labor requirements of a one-hectare upland farm. On the average, an upland family, in which the father is under 35 years of age, has but one full time hired laborer, with the mother and other children providing part-time assistance.[59]

In a natural economy,the production unit is at the same time the consumption unit—to quote Chayanov. Thus, the consumption of the factors of production—resources, equipment, labor—is nothing more than the actual process of production, the existence and continuity of which it guarantees. Consumption falls under the social prescriptions governing appropriation of the factors of production. It functions within the fabric of the production units.[60] Often the basis for establishing consumption units is kinship. The nuclear family, the extended family, the clan, the tribe and the community may all be the receptacles of consumption, depending on circumstances. For Godelier, all the "values" of the social systems are expressed in consumption, for example in the preferences (taste) and prohibitions affecting food. "Once again, 'the economic' does not possess all of its meaning and purpose entirely within itself."[61]

The Social Meaning of Maximization

Production is of course oriented to maximization, whether for profit or for subsistence. In industrialized economies, maximizing for profit is a pervasive rational attitude, an absolute way of seeing things. In primitive societies, maximum production is idle talk unless it is seen in an essentially social context. It is meaningless without reference to the hierarchy of needs and functions (for example, religious, "prestige") religiously observed among tribal groups. In tribal societies, the maximum is the level that is socially necessary for the subsistence of all members. To illustrate: subsistence activities that may take up most of the time of men equipped with outdated tools may require only half of this time when they use modern equipment. The time "gained", however, will in all likelihood be devoted not to producing surpluses but to increasing extra-economic activities—festivals, rituals, travels. This choice between different uses of their time reflects a ranking of the values observed by tribes in their many activities.

In the communities of Palawan, none is likely to be ignorant of the formula for maximizing monetary gain. Yet, to paraphrase Godelier, the ends that each one seeks to maximize are goals to which value is assigned to spheres other than absolute economic statistics.

> Every man endeavors to pass through the entire cycle of communal offices, civil and religious, that will confer on him an important rank in the group's hierarchy. Every man therefore practices a complex set of forms

[56] *Ibid,* 263-264.
[57] *Ibid,* 264.
[58] *Ibid,* 266.
[59] DAP, *op. cit.,* 17-18.
[60] Godelier, *op. cit.,* 217.
[61] *Ibid,* 278.

> of behavior, cooperating and competing with the other members of the group, allowing for the prestige and wealth of his family and marriage connections.[62]

The intentions or ends notwithstanding, the drive to maximize production is said to be a *willed rationality:* it is seen in the *purposive acts* by which individuals combine means in order to attain their ends. In "ecological" terms, willed rationality is manifested in how a social system carves its environment. When people introduce a technology of production, they make use of the potentialities of a milieu, and try to assume mastery, whether in rudimentary or in complex ways of the components making up this milieu, in the attempt to extract from it the maximum it could yield. For profit maximizers, willed or intentional rationality easily translates into control and accumulation of resources, including, *ipso facto,* the resources of those maximizing merely for self-sufficiency. "The capitalist form of economic rationality differs fundamentally from the forms of rationality of primitive societies in that in it the structure of the field open to social competition is such that the struggle for control of the factors of production plays the decisive role. . . ."[63]

Technological Dependence

Control by its very nature generates dependence and underdevelopment in tribal communities. Because of corporate capitalism's superior technological stance, the stimulus to change often originates outside the communities and tends to subordinate the production structure of large sections of each community to the new innovations. This superiority frequently consists of sophisticated technology. To Godelier, the potentialities of a milieu are harnessed through the techniques of production. The more backward the technological level of a social group, and the more naive the economic structure, the fewer options exist for an exonomic decision, and the lower is the production ceiling (maximum) that the society will be able to reach. "The fluctuations of this maximum depends very much more upon the variations in constraints external to the system than upon internal variations within it," so writes Godelier.[64]

The insertion of a "foreign" technology, with its unchallenged sophistication, logically jacks up the level of maximum production. But here production no longer serves subsistence purposes, but profit. This new level of development of productive forces alters the productive relations, forcing the indigenous community into a condition of subordination.

Godelier offers a succinct example of how dependence could arise, in the shift from subsistence to surplus, using Hackenberg's study of the economic alternatives offered to the Pima and Papago Indians by their habitat—the desert of central Arizona. The alternatives were drawn according to a progressive gradient of technological intervention in the given conditions of the *milieu,*

> a gradient that arranges in logical order: (1) Hunting and food-gathering, (2) Marginal agriculture, (3) Pre-industrial agriculture, (4) Industrial agriculture. In the 17th century the Papago, living in dry mountain valleys, drew 75 percent of their resources from hunting and food-gathering, whereas for the Pima, in the basin of the Gila River, the corresponding figure was 45 percent. The rest of their resources was obtained—to a greater extent by the Pima than by the Papago—from marginal agriculture which exploited with a very simple technique, the fertility of the soil maintained by the rain and the natural irrigation of the Gila River. Among the Pima, in contrast to the Papago, the fields were permanent and the way of life was that of fixed settlement. The differences became much greater when the Pima went over to pre-industrial agriculture. By coordinating their efforts they improved their hydraulic system. The introduction of wheat, a winter grain-crop, by the Spaniards completed the cycle of harvests and ensured the subsistence of the communities, thanks to agriculture, all through the year. Consequently, the Pima were now completely freed from their former dependence on hunting and food gathering The Papago,

[62] *Ibid,* 388.

[63] *Ibid,* 293.

[64] *Ibid,* 308.

> on their more arid territory, were never able to produce agricultural resources in sufficient quantity to replace hunting and food gathering. The white men introduced industrial agriculture, producing cotton. They brought the Gila River under control by building dams and big reservoirs. This meant effecting a far-reaching change in the *milieu,* which presupposed the use of machines and a market economy to give an outlet for the produce. This potentially the Pima, and *a fortiori* the Papago, had been unable to realize.[65]

Here, the less complex its production apparatus, the more the efficacy of a technological system will have to rely on the diversity of the natural conditons in which the society functions. However, it may be that the available knowhow and skills (culture) lack versatility. The deft use of human resources. There are thus no resources *per se* adapted only to certain types of utilizable resources. Thee are thus no resources *per se* but only possibilities provided by nature at a specific juncture of the development, of society.

Such limitations mean that the few economic aternatives that society could still autonomously develop, narrow down (and then vanish) almost automatically upon the intrusion of an outside technological force. Of course, the society acquires new possibilities, new maximum levels, but it can only claim them at a huge social cost to itself.

Completing the State of Dependence

Thus far, the analysis has been carried at the level of willed, or intentional rationality. By going deeper, however, by approaching the level of unconscious, or unintentional rationality, the state of dependence is completed and reinforced. The steady erosion of economic options is seen to be not only ruinous but *irreversible.* According to Godelier, Hackenberg points out that

> when the Pima adopted the cultivation of wheat and went over to a system of permanent agriculture, they greatly transformed, without knowing it, the wild flora and fauna of their environment, the basis of their old economy of food gathering and hunting. After a certain time, any return to these old forms of economy became, first difficult and then impossible. The Pima had thus destroyed one of their economic possibilities, and cut off all retreat in that direction.[66]

Sociologist Mary Hollnsteiner, for all her functionalism, gives a similar, "unconscious" account of a local situation:

> As urban-oriented institutions penetrate the countryside, they carry with them models of behavior complete with matching value sets. Coming face to face with traditional ways of coping with the environment, they tend to overwhelm these ways and yet fail to provide the alternatives that make the shift functional. To cite a simple example, when people who once wove their own cloth adopt industrially manufactured cloth as superior to their product or as more prestige-giving, they stop weaving. Looms fall into disrepair and the weaving skill dies out altogether. Yet not everyone can afford to buy ready-made clothing from the outside. Having lost their capacity over time for weaving, however, and thereby forfeiting the option of renewing their apparel themselves, they have little recourse but to let the store-bought clothing deteriorate right on their backs. By giving up traditional strategies in favor of the promise contained in innovations from outside sources, and subsequently discovering that access is limited to only a few, the remainder have no fallback position since the older survival mechanism has already been dismantled. Thus, although a select few may have benefitted from the innovation, the rest become substantially poorer in the process.[67]

Sometimes, the very success of an alternative system presages its own failure. When intensive agriculture took over from slash-and-burn cultivation, a higher rate of production became possible. But beyond a cut-off point, this technological advance created "anomalies" which violated conditions for the steady functioning of the system, or at least the rules that were previously holding the system effectively lost their weight under the new conditions. In the

[65] *Ibid,* 307-308.

[66] *Ibid,* 389.

[67] Mary Racelis Hollnsteiner, "Between Subsistence and Modernization," *Daluyan:* The DAP Review on Development 4 (November-December 1980), 25.

Masagana 99 supervised credit program, for example, new institutional arrangements disrupted the self-sufficient nature of production by making the producer heavily dependent on foreign technological inputs and loan financing. The working of a system is thus only the articulation of number of external and internal conditions and the consequences of the interplay of their elements at various time-space junctures. The evolution of a system, according to Godelier, may, under certain conditions, unleash contradictions that are incompatible with the retention of the essential structures of the system, and reveal the limits to the possibilities of the system's "invariance."[68]

Invariance: Limits and Possibilities

The components of the system, or rather their relations, are said to be invariant when they are unaffected by "endogenous" or "exogenous" factors. This invariance or unchanging pattern has its limits. Beyond a certain point, changes in the variables of a system induces corresponding shifts in the relation between these variables. When the relationship is altered, the system must evolve toward a new structure.[69] Godelier explains the changes further through the dialectic between "structure" and "event."

> A structure has the property of tolerating and "digesting" certain types of event up to a certain point and time when it is the event that digests the structure. A social structure can thus dominate an evolution and contradictions both internal and external up to a certain point which is not known in advance and is not a property of the "consciousness" of the members of society defined by this structure but a property of their social relations, both conscious and unconscious.[70]

Members of society retaliate by consciously "integrating and neutralizing" the event or structure that threatens or injures their social system.[71] In Palawan, upland tribes try to accommodate conflict with the Christian settlers by absorbing some of the technology and culture of the latter, to be sure a painful and attritious process of acculturation.

If a contradiction is incompatible with the invariance of a system, resolution is not necessarily arrived at in terms of the mutation and destruction of the existing system. Tribal communities in Palawan, for instance, are characterized by a non-violent ethos which prescribes living in harmony with nature, supra-nature and other people. Encroachment of tribal lands by Christian migrants and corporate groups, as well as "institutional" intrusion by way of development programs disturbed the mode of existence of these communities and create contradictions between them and outside influences. But they can only resolve such conflicts in a non-violent way.

> Where conflict with other groups is imminent they opt to leave their lands and residence rather than court open confrontation. Efforts to exert control over them in the form of regulations, taxes and other bureaucratic prescriptions have forced them to leave and seek new homes. Even in cases where areas have been specifically set aside for them (reservations or service centers), the tribal groups are known to have expressed dissatisfaction in or dissent with "assistance programs" (especially if tinged with a shade of authoritarian tactics) by simply leaving the area. This has been PANAMIN's experience in most of its service centers in Palawan, especially Itulos, Tagnipa, Ransang and Napsan.[72]

There is yet another example. When demographic expansion reaches crisis proportions in the community (the crisis being defined in terms of man-land ratio), it can break up and relieve the contradiction by hiving off offspring communities around it. This assumes that there is plenty of land available around the community. Such solution preserves the economic system and even multiplies it. Indeed, the expanded community comes to be institutionalized by kinship. The *kaingin* farm families learn to live in extended kin clusters occuping ad-

[68] Godelier, *op. cit.*, 310.
[69] *Ibid.*
[70] *Ibid.*
[71] *Ibid*, 311.
[72] DAP, *op. cit.*, 12.

joining farm lands. Each cluster includes eight to 15 families, with varying sizes of farms. The *kernel* or *core* families in the cluster, who settled earliest or ahead of the others often stake claims to the best and largest land parcels. Latecomers, either descendants or migrants, settle on the outlying areas, but retaining political allegiance or loyalty to the local headman. In a few cases, a few splinter groups look back to the kernel group as mother community for political affiliation, economic links as well as ritual ties. The kaingin cluster, while relatively stable, nontheless retains a certain degree of fluidity in organization because of the rules of marriage (exogamous): men marry out and reside, at least initially, with the wife's family (matrilocal).[73]

The community has not only expanded; its land resource management scheme has become elaborate: certain resource areas, the forests and adjoining grasslands (ecozones) are already marked off as claimed by certain individuals. Hence, the gathering of rattan, almaciga, and honey come under rules of tribal "concessions" through a system of *public verification.* Once individual holders surrender their rights to use the resources, usufruct rights are transferred to other community members.[74]

When hiving off is impossible, the contradiction has to be resolved on the spot by extracting more from the same area and shifting to more intensive forms of cultivation. Some Palawan tribes who were driven from their original area and confined to their places of refuge, in order to survive, were obliged to exploit a limited territory intensively. They shortened the fallow period, however, thus giving birth to a new contradiction. Soon the fertile soil gave way, inaugurating low yields and with it, increasing impoverishment.

Contradictions as Spurs of Development

Some contradictions are intrinsic ingredients of a social formation, and are the driving forces of its development in certain historical periods.

> Thus, under the *ancient regime,* peasants and lords were both opposed to each other and in solidarity with each other. The contradiction between them *did not rule* out their unity like the contradiction between a master and his slaves.[75]

Long corroborates by pointing out that the existence of several modes of production (both capitalist and non-capitalist) expediently offers the peasant family in a smallholder system avenues to extra income or resources to cover various production and non-production expenditure. The agricultural capitalist also benefits from this arrangement, for the retention of a smallholder mode ensures that he can get a steady supply of transient labor whenever he needs it.[76] Possibilities of growth abounded in the contradiction of the landlord-peasant relationship, "at least so long as the lords were still entrepreneurs of production and had not yet become almost exclusively mere 'drawers of ground rent' and a parasitical class."[77]

In certain cases, the socioeconomic system can develop swiftly without being hamstrung by acute contradictions. For example, shifting cultivators and upland agriculturalists are not naturally inclined, neither are they required, to become lowland cultivators. All they have to do is to *skip* the contradiction.

> In many cases (if not all), upland occupants are erroneously labeled as agriculturalists, (when) "they are better and more validly considered as craftsmen, with kaingin as but one of their many crafts. Apart from farming, they process wood, they are first rate craftsmen and engineers." Given these skills, complemented by small, mobile, fluid social groupings, and relatively high level

[73] *Ibid,* A1-24.
[74] *Ibid,* A1-25.
[75] Godelier, *op. cit.,* 312.
[76] Long, *op. cit.,* 271.
[77] Godelier, *op. cit.,* 312.

of eye and hand coordination and manual skills, "they can very well skip being peasants and move right over to small rural industries."[78]

Indeed, Palawan tribes, driven by their very resistance to lowland ways, have mainly passed over monocrop grain production in favor of forestry-based "industrial" undertakings to which they are positively pre-adapted.

However, contradictions are rather varied and, complicated in upland areas of the wedge, allowing for their more intricate ways of resolutions. In the lowlands, however, the major contradictions are polarized in a singular landlord—peasant relation, and resolving them means *surpassing,* or abolishing the system.

However, "a system is at the optimum of its functioning during the period when the compatibility of the social structures that compose it is at its maximum."[79] But this is an extreme point, and corresponds only to a conjuncture in a system's evolution (such as when the peasant-landlord contradictions are acting as an internal dynamic of positive development). The more likely cases are when social relationships form a jigsaw puzzle of acute contradictions. In these events, the task of development planning is to "dominate the contradictions" of the moment and find the necessary transformations. Land reform, for example, is the required transforming instrument to break-up the peasant-landlord relation. In primitive societies, planners must tread between the bareness of social surfaces and the penetrating richness of social substance. The arabesque pattern of life in the uplands is complicated in the diversity and fluidity of interpersonal ties and kinship bonds, but simple in the meager institutional resources by which such ties are organized. The task of the planner is neither to polarize these contradictions nor force them underground, but to locate "entry points" (for projects and development programs) which pragmatically account for all such contradictions.

Distribution and Exchange

Much like production and consumption, distribution as a whole, also "distributes" the material means needed for the realization and practice of the non-economic activities of social life—politics, religion, culture. "Here, too, the economic is internal to all-non-economic activity, and constitutes *an* aspect of *every* human activity and reciprocally, the non-economic activities are linked organically with the economic activities to which they give meaning and purpose."[80]

It is the distribution apparatus which as certains how a given society appropriates and uses the resources of production as well as the output, the social product. How the resources and products are appropriated, is subject to rules which define the rights which members of society have relative to the use of such resources and products. The rules governing the appropriation of the factors of production (land and raw materials) can assume a variety of forms. The usufruct rights to the land by the Palawan tribes, with right to hereditary use of plots, has already been instanced.

Perhaps of critical import in the appropriation of resources is when competition over distribution of resources takes place. *Social inequality* may arise, and become institutionalized when a minority earns exceptional rights of control over the factors of production: control of land, rights over labor services, and so on. In Palawan, the hiving off of daughter communities has forestalled domination over the use of resources; expansion deters dominant groups from creating areas of influence over the tribal lands. Should inequities finally develop, one role of development planning is to discover how the transition to new forms of domination has taken place, in which "the old principles of reciprocity and redistribution either disappear or no longer play the same role."[81]

The dispositions of products (goods and services), like the appropriation of the fac-

[78]DAP, *op. cit.,* 13.
[79]Godelier, *op. cit.,* 313.
[80]*Ibid,* 272-273.
[81]*Ibid,* 294.

tors of production, cannot be understood outside the social context which provides the impetus for their movement. By now it should be clear that all transactions imply underlying social relationships. What is termed "socially-guaranteed existence" is arranged both through factor resource and product disposition. Its cost, predictably, cannot be based on western-style calculations.

A Calculus of Relative Values

In an economy with simple technology and productive units which are multipurposed and plucked from other forms of organization, a close calculation of the costs of the use of time, resources, and labor are arrived at only through the logic of the social structure—through a calculus of relative values—and not in terms of variations in a singular measure such as productivity. This inability to mathematize the costs and benefits of economic activity is reinforced by the fragmentary use of money as the medium of exchange. The circuits of exchange are only loosely linked together. Among the tribes of Palawan, there are different kinds of exchange of goods, and each kind is limited to its particular circuit. Some goods can be exchanged only for subsistence items, others only for luxury items, and still others for items which confer status and prestige. Indeed,

> In primitive societies, goods are classified in distinct and hierarchically ordered categories, and their exchange and circulation are strictly compartmentalized. It is in general impossible and unthinkable to exchange an article *for* any other article at all, regardless. The economic structure of primitive societies is thus... "multicentric," unlike capitalist economies centered upon a market.[82]

The "multicentric" character of the economic structure is expressed in two ways: one, resources and products are sorted in groups, the items in one group freely exchangeable with each other, but not with items in other groups. Some items may not be exchangeable at all. Typically, "subsistence" items form one of more exchangeable goods, and "prestige" items, others. Two, each commensurable group of factors and products may be transacted by a typical socioeconomic procedure (reciprocity or redistribution). Each procedure is a manifest expression of the special social obligation which prompts the transaction to take place, as well as the permissible proportions at which goods of equal value may change hands. Each factor component may enter alternative "production lines" through any of the institutional routes, the channels being structured social relationships.

Socially-Defined Utilities and Significances

This social control and hierarchical disposition of goods is the outcome of the role they play in the context of the dynamics of distinct social relations—kinship, politics, religion—each of which is invested with a social meaning. Through their implantation into these many different functions, goods and money assume multiple and hierarchically-arranged[83] *utilities* and *significances.* Consequently, because the disposition of goods, as well as the use of currency and other economic phenomena are directly regulated by the relation between all the components of society, it is harder to analyze theoretically the economic laws of primitive societies because they are socially pluridetermined.

> The compartmentalizing and hierarchical ordering of goods which govern the behavior and competition of individuals, by giving expression to the special dominant role played in a given society by relationships of kinship and marriage or by political and religious relationships, express the *dominant aspect* of the social structure. It is this nature and the role played by the various social structures in a particular society that explains the way individuals behave, and not vice-versa.[84]

For an indigenous group, the significance of an all-purpose currency cannot be matter-of-

[82] *Ibid,* 287.

[83] *Ibid,* 44.

[84] *Ibid.*

factly inculcated, since it had little meaning and imperative in their own social system. Moreover, the introduction of this currency is perceived as a threat to their social system, and would have to be resisted. Herein lies one of the features of primitive societies that generate reciprocal imbalance between upland economy and the relatively more advanced lowland economy.

Arghiri Emmanuel has suggested that a central feature of the relationship between rich and poor countries is that they stand in a relationship of *unequal exchange.* This idea can be transposed to the unbalanced reciprocity between the relatively developed lowlands and the backward uplands. This notion of unequal exchange involves a process of a social definition of what constitutes a "fair price" for a product. To begin with, fixing of farm prices, which derives from the generalization of commodity production on the scale of society as a whole, is supposedly undertaken to stimulate production or improve the market. But this piece of western rationality is of little consequence in Asia, according to Myrdal, because it is extra-economic coercion (landlord-peasant relation) which is the major instrument for extracting agricultural output.[85] This being the case, the "agency of the price system" is justified only by its role in the process of one social system's domination of another (e.g., landlord mode of production vis-a-vis the upland system). Since for example, the tribal producer is under no compulsion to maximize either his money gains or his satisfactions (by relating his income to the price of commodities for scale) on account of a "socially guaranteed subsistence," the price of his product is completely at the mercy of middlemen[86] and monopolies. Relying on their economic power, the latter fix the prices of tribal crafts and agricultural goods —the terms of trade, so to speak—entirely at their own will and with no ceiling save that which they fix among themselves through competition.

When tribal produce are made available for sale this does not come about through an impersonal pricing mechanism, therefore, but through the "price" paid on primitive labor. The crux of Emmanuel's argument, when applied to tribal economics, is that the exchange value of a commodity produced in a backward region is primarily ascertained by the value which is endowed on labor used in the process of production. Thus the low incomes of upland tribes are not derived from the bedrock-low prices which are being paid for their products. Rather, the converse is the case. The low price which a commodity commands on the market is the result of low incomes which are paid to labor.[87] In short, there is nothing technological or necessary about relative pricing of commodities, or in the last analysis, of labor. Pricing is an element in the disposition of goods which emanates straight from the social relationships holding sway over the actors in a given historical situation. Social conditions, price evaluation, and economic power must thus be treated as inseparable elements in the analysis of movement of goods and services.

Distribution and exchange thus have no "universality" applicable to both peasant or primitive economy and western commodity economy.

> One and the same reality may take on different and unexpected significances through belonging to different social wholes. Once again, the structure gives a meaning to the elements that compose it, and if one's method is a good one it is not the same element that has to be sought in several structures, in order to prove functional identity, but the *same relation between the elements* of one structure and those of another.[88]

It is this character and the role of the social structures that planning has to explain and translate into concrete alternatives.

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[85]Myrdal, *op. cit.*, 247-248.

[86]According to Alejandro Marroquin, the function of the buying agencies is facilitated through a typical network of middlemen to gather up the products through small purchases and then deliver them to their respective agents in bulk quantities. Cited in Frank, *op. cit.*, 138-139.

[87]Tony Barnett, "The Gezira Scheme: Production of Cotton and the Reproduction of Underdevelopment," in Oxaal, Barnett and Booth, *op. cit.*, 190.

[88]Godelier, *op. cit.*, 299.

A Progression Toward a Market Economy?

What has to be taken up now in detail is the claim that in many instances, economic development historically "transforms" peasant and tribal economies by propelling them from being "marketless economies," through the stage of being "economies with peripheral markets" to their climax, "economies in which the market principle is dominant." Such a progression is treated almost matter-of-factly in development programs, as for example, in the Palawan Cultural Minorities Assistance Program:

> The overall design for upland development, including both tribal and lowland occupants, is envisioned to have essentially a dual thrust, adequate and long term production for household requirements on the one hand, and cash-earning activities on the other. The upland areas of Palawan, while producing mainly for household and intra-local needs are now increasingly participating in the intra-local and external market networks. Within the upland areas, farmers simultaneously participate, with varying degrees of success, in varied productive subsytems, such as subsistence swiddens, cash crop swiddens, orchards, tree plantations, some pasture areas, secondary forest regeneration with tree and foodcrops, utilization of forest products, and hunting of game.[89]

Moreover, "there is a marked trend toward crop specialization, specifically grain and cash crops to the increasing neglect of other non-marketable crops" and that "labor-saving and yield-increasing techniques have been introduced (improved crop varieties, non-human power sources, use of soil tillers, commercial fertilizers),"[90] in an effort to consolidate the hold on the market through increased production. In fact, Palawan seems now to be a checkerwork of "natural" marketing zones which link together the villages. People in upland villages journey to the market town, in festivals and holidays to buy household necessities and to sell farm produce and crafts. Analysts like Fernandez II have turned this everyday experience into theoretical terms, showing how the villages are linked together via marketing centers which act as points of economic exchange for the specialized products of the different villages as well as for town-made goods. They also bring the villagers into social contact and interconnection over and above the requirements of subsistence and trade.

The crucial question however, is whether the seed of the "market principle" which comes to penetrate the fabric of the entire society in pre-market institutions develops by means of its own forces, isolated from any other structure save that of exchange. Of course, under certain circumstances trade, even under subsistence conditions, could create a windfall of profits to trigger large-scale production. An example is if the thinly spread demand of a locality or community were concentrated into the hands of monopolies in a few specialized centers, or, if a large "lateral extension" of the enterprise took place, for example by conquest or colonization—a fact which indisputably proves that the market principle only evolved through the monopolies' violent intervention against the previous mode of production. In either case, however, the outcome has been dependence, or the development of underdevelopment in the subsistence zones. What is needed, therefore, is a fresh perspective which can explain how social relationship in subsistence economies influence the growth (or resistance to it) of the market. Needless to say, the explanation must avoid the self-defeating view that market and non-market economies stand in a relationship of reciprocal exclusion, a situation which is neither factual nor conceptually tenable.

Socially-Determined Market Transactions

To start with, in market-dominated economies, whether integrated or small-scale, the market is the centerpiece: market purchase and scale govern transactions involving large proportions of land and labor as well as goods and services. Market sale of labor products determine livelihood prospects for most people. Market prices integrate production. Labor and land move into and out of different production lines in response to profit (and other income) alternatives, as indicated by market prices. In such economies, the commercial exchange function of money (as medium) is the most

[89] DAP *Palawan Cultural Minorities Assistance Program*, A1-5.

[90] *Ibid*, A1-6.

important; the other commercial uses of money expedite market deals. The same money is used for non-commercial contracts. Moreover, unlike the partners to reciprocal and redistributive transactions, buyers and sellers in the market share no social tie which compels them to engage in the market transactions. Terms of trade may be haggled out without social disruption, both parties to the exchange being socially free to seek their own maximum material advantage.

In Palawan, whatever market exchange there is, is usually confined to a limited range of product items transacted by face-to-face buyers and sellers in market places. Moreover—and this is crucial—the market exchanges are usually peripheral. Most sellers do not acquire the bulk of their livelihood, and buyers the bulk of their daily used goods and services, via the market place sales and purchases. In Palawan, fully 90 per cent of the produce in the upland farms is for home consumption. The remaining portion is split between trading and ceremonial expenditures.[91] Unlike the price mechanism in a market integrated economy, prices set in the agricultural market place do not serve to reallocate factors among production lines because basic livelihood is carried on outside the market mainstream. It is true that market exchange is prevalent in tribal Palawan as a marginal pattern in upland communities where the more important output and factor flows are provided for via reciprocity and redistribution. But, it will be a serious mistake to assume that the norms of market rationality operate. There can be no businesslike attitude toward economic affairs, in a situation where capitalist social relations of production scarcely exists, in spite of the fact that market exchange is widespread.

The plain reason why the subsistence orientation of family productive units should survive is that

> the peasant does not perceive the existence of a secure system of distribution of goods and facilities necessary for family livelihood based on money-exchange, and this perception generally corresponds to the real situation. The crisis is not in the long life of the subsistence systems, but in the dysfunctional straddle between these and a reliable money-market system.[92]

Production for Subsistence

In order to explain subsistence production fully, it is necessary to divide the discussion into two aspects: the "production for subsistence" side and "production for the market" side. The simplest case for production for existence[93] is that "agricultural self-sustaining formations" have all the necessary means to satisfy the basic social, economic and other needs of their members,[94] a point insistently stressed by Meillassoux. Others like Brenner, however, prefer a more expanded view, defined directly in terms of the members' faint relations with the market.

> In precapitalist modes of production, there is always production "for use" in the sense that the individual production units have direct (non-market) access to the means of subsistence, even if a large amount of what is produced is traded on the market. In essence, it is surpluses above necessity (possibly proportionately large surpluses) which are traded. Since it is not means of production and means of subsistence required for reproduction which are being traded (circulated), the market—specifically other competitive producers on the market —can have only a limited impact on production, its character or the amount produced.[95]

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[91] *Ibid*, 18.

[92] Andrew Pearse, "Metropolis and Peasant: The Expansion of the Urban-Industrial Complex and the Changing Rural Structure," *Peasants and Peasant Societies* ed. Teodor Shanin (Middlesex, England: Penguin Books, 1971), 73.

[93] For a definition of *Subsistence,* it is necessary to cite Godelier: "The optimum of production of subsistence goods in a primitive society... does not correspond, here any more than elsewhere, to the *maximum* of possible production, but this optimum expresses the 'social necessity' of this production, its relative 'social utility,' compared with the utilities of the other purposes, accorded different values, that are recognized as 'socially necessary' and are based on the actual structure of social relations." See Godelier, *op. cit.,* 290-291.

[94] Meillassoux, quoted in Clammer, *op. cit.,* 217-218.

[95] Brenner, *op. cit.,* 50.

Now, it would seem that if subsistence goods enter into social competition only indirectly, according to Godelier, there is no point for the members of society to continue producing these goods beyond the limit of their socially necessary wants.[96]

> By excluding these goods from competition and ensuring relatively equal access by everyone to the use of them (the land being, moreover, excluded from any competition between the members of the group), the group safeguards the survival of its members and its own continuity.[97]

Moreover, because the production structure does not require maximum use of available factors of production, the self-sustaining communities are under no compulsion to produce at the highest level of efficiency. In order to survive they could directly supply their own basic (subsistence) needs on there own plots without recourse to the market. "With the means of production and especially the means of subsistence in the hands of direct producers," Brenner adds, "there is no compulsion to exchange in order to reproduce, no pressure/necessity to compete, thus no requirement to accumulate especially by way of innovating in order to survive."[98] Disclosures of "inefficiency" do not determine change and improvement; in fact, the availability of more highly productive methods of production apparently evokes no emulation in the heartland of subsistence economies.

This "social limit" on incentives to enhance the productive forces accounts for the generally snail-paced development of such societies and the near absence of competition animated by a "true spirit of enterprise." For competition only begins

> beyond the level of problems of subsistence, and involves not the loss of physical existence but only the non-attainment of social status. Consequently, one might seek to explain that subsistence goods, when they enter into social competition on the occasion of ceremonial feasts, must acquire the "scarcity needed" for them to play this role, and that this scarcity is created by an exceptionally large accumulation of them that must inevitably result in their destruction, their economic non-use. This "purposeful waste", far from being "irrational" economic behavior, would then possess its necessity in the actual content of social relations.[99]

In fact, the existing system of productive relations based on subsistence largely determines what is "rational" for individual producing units. The tenacious peristence of subsistence methods tends to block off the emergence of "post-subsistence" social-productive relations, at least by way of maximizing initiatives. And even to the degree that an effective productive organization might emerge it would not necessarily last. For the communities' survival is not a function of their relationship to the market. Their economic decisions, made in terms of subsistence, do not depend on economizing least-cost choices in work arrangement enforced by economic necessity.

It makes no sense to assume that the emergence of the market would lead to an "exchange consciousness" among the agricultural self-sustaining communities, and that this, in turn, would create, by the profit-maximizing behavior of individuals, more efficient social-productive relations which could suffuse throughout the economy on account of their preeminence on the market.

Production for the Market

Now, to look at the dialectic opposite of subsistence, which is production for the market. Cash crops promise higher financial returns but entangle the upland communities in the risks of the fluctuating market. Yet, they cannot exactly abandon the benefits derived from the market. Thus Eric Wolf writes:

> Preceding cycles of cash crop production have enabled [the producer] to buy goods and services which he cannot afford if he produces only for his own subsistence. Yet an all-out effort to increase his ability to buy more goods and services of this kind may spell his end as an independent agricultural producer. His tendency is thus to rely on a basic minimum of subsistence production to expand his cash purchases only slowly.[100]

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[96] Godelier, *op. cit.*, 290.

[97] *Ibid*, 289.

[98] Brenner, *op. cit.*, 49.

[99] Godelier, *loc. cit.*

[100] Eric Wolf, quoted in Andre Gunder Frank, *Capitalism and Underdevelopment in Latin America* (New York: Monthly Review Press, 1969), 133.

There is yet another significant countertendency: the self-sustaining communities' inclination to diversify rather than specialize, in order to produce as many as possible their basic necessities—precisely to avoid market dependence. Their option is to jack up output for market purchases "merely by extending and intensifying their labor, thus applying to themselves the methods of extracting absolute surplus labor."[101] Brenner adds that at the same time, the extent to which new comsumer goods might actually be regarded as necessities may involve long and dawn out processes.[102] Indeed, peasants become especially vulnerable to competition only when they resort to the market for improved tools. Brenner paraphrases Rosa Luxemburg in this respect: The peasants' control over agricultural production could not immediately, and only with great difficulty, submit to capitalist domination.[103]

Wolf cites instances in which self-sufficient agricultural communities in Latin America were caught up in speculative booms of crop production for foreign markets, only to find their market gone overnight. Such disappointments have compelled most of them to revert to subsistence. "Redfield has recognized aspects of this problem in his category of the 'remade folk'... which were once in the mainstream of commercial development, only to be left behind in its poverty stricken margins..."[104] It is this ready access to the means of subsistence and production, providing reentry in case of market failures, which blocks off the working of pressures on self-sustaining production units to maximize surplus as well as to compete in the market.

As a result of lack of pressures to develop the productive forces in order to increase income, let alone enforce the widespread adaptation of innovation, development cannot be weaned away from subsistence labor. Indeed, the obtaining social relations under the impact of trade tend to install a stagnant, often regressive, pattern of overall societal development. Ironically, the development of exchange,[105] as it bears on production, through the prism of social relations, tends precisely to choke off the very development of the division of labor which it engendered in the first place. The double paradox is that subsistence economies, or self-sustaining communities, because of their *raison d'etre*, are able to perform roles that market forces eschew in the underdeveloped countries: social security. For Meillassoux, the cheap cost of labor in these countries is extracted from the superexploitation, not only of the labor from the wage-earner himself, but also *of the labor of his kin* group.[106]

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[101] Brenner, *op. cit.*, 74.
Relationships of exploitation are not mediated by the market exclusively, according to Lehman. So are those of self-exploitation, if Chayanov is right:

> "The degree of self-exploitation is determined by a peculiar equilibrium between family demand satisfaction and the drudgery of labor itself.... It is obvious that with the increase in produce obtained by hard work and the subjective valuation of each newly gained rouble's significance for consumption decreases, but the drudgery of working for it which will demand an even greater amount of self-exploitation will increase.... As soon as the equilibrium point is reached continuing to work becomes pointless... Thus the objective arithmetical calculation of the highest possible net profit in the given market situation does not determine the whole activity of the family unit: this is done by the internal economic confrontation of *subjective* evaluations." (Quoted in Basile Kerblay, "Chayanov and the Theory of Peasantry as a Specific Type of Economy," in Shanin, *op. cit.*, 152-153).

See David Lehman, "Agrarian Structures and Paths of Transformation," *Journal of Contemporary Asia* 7 (1977), 80.

[102] Should the producer become largely dependent on purchasing food and consumer goods, because the old arrangements within which he works have been removed from him to a very considerable extent, he faces the dangers of shortfalls in production for his own subsistence and that of his family.
See Barnett, *op. cit.*, 197.

[103] Brenner, *op. cit.*, 74.

[104] Wolf, quoted in Frank, *op. cit.*, 132.

[105] Exchange describes the social relationship between those who produce a product, or supply a factor of production, and those who purchase that product or that factor. See Barnett, *op. cit.*, 199.

[106] Meillassoux, quoted in Clammer, *op. cit.*, 218.

A Second Look at Subsistence

It must be pointed out that subsistence is not all backwardness. "On the contrary, this situation expresses the *conscious control* that primitive or ancient societies habitually exercise over themselves, a control that quickly disappears with the development of commodity production."[107] Autarky without a market means that they could not be made liable to capitalist-type penalties for failure to modernize; and consequently, that they could not be displaced by capitalist forms of labor control/reward to labor, despite their inefficiency. Indeed, to cite Meillassoux, "the grafting onto them of production for external markets can only bring about their transformation into class societies, or it will fail, or such communities are (or should be) dissolved and replaced by a new type of unit."[108]

Two points are clear from this discussion. First, in dealing with present day wedge formation, it would be advisable for development planners to avoid treating production for subsistence and production for the market as diametrically opposed stages of development. Rather, they must allow for the dialectical interaction of the two types of production relations within the same community and realize that from the point of view of the community both kinds may constitute not two alternative responses, but a single articulation. This means that a synchronic analysis of the market is not enough. Second, planners must look for the appropriate mechanism which made such changes possible.

Conclusion

The Wedge Model shows that development does not necessarily have to break out in the most developed zones, but at the weakest points (Zones III & IV), and this weakness is caused by the working of *all* the structures of society, not just its economic contradictions alone. This weakness does not become a timely conjuncture unless development planning can take advantage of it in order to establish an operational bridgehead.

The reason why the wedge could be a pivot of change in the country is that it is a means of destroying old planning conceptions (through its incorporation into the structuralist worldview). Development planning needs to discover strategic points of this sort—instruments of social policy that dispute the monopoly of progress claimed by the established ideology of functionalism. Because the Wedge Model represents *a new and superior organizing* principle for integrated development planning (a testing ground for implementing structural changes within a manageable geographic unit that is replicable everywhere), it should be able to mount effectively a challenge to this monopoly. The strength of the challenge to the legitimacy of functionalist predominance will depend directly on the extent to which the wedge concretely embodies the commonweal. Initially the Wedge Model will no doubt find itself greatly inferior to established models at the political plane—it will have to compete for this by accepting a "form of struggle" which tends to extend its active social base to underprivileged groups, and which tends at the same time to undermine the sociological as well as administrative force formally at the disposal of functionalist planning. □

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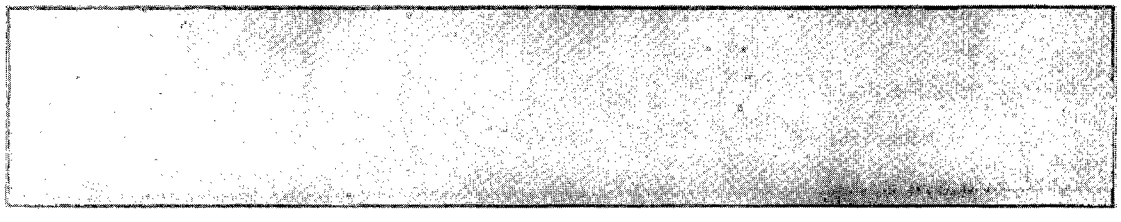
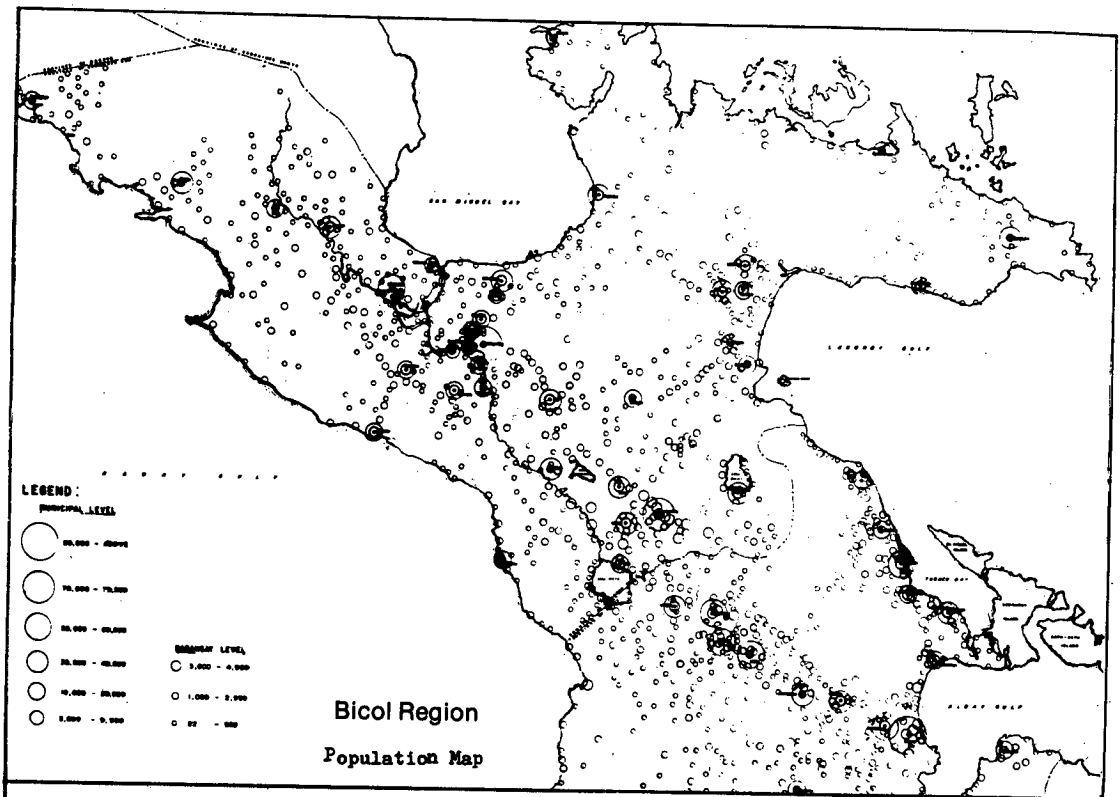
[107] Godelier, *op. cit.*, 290.

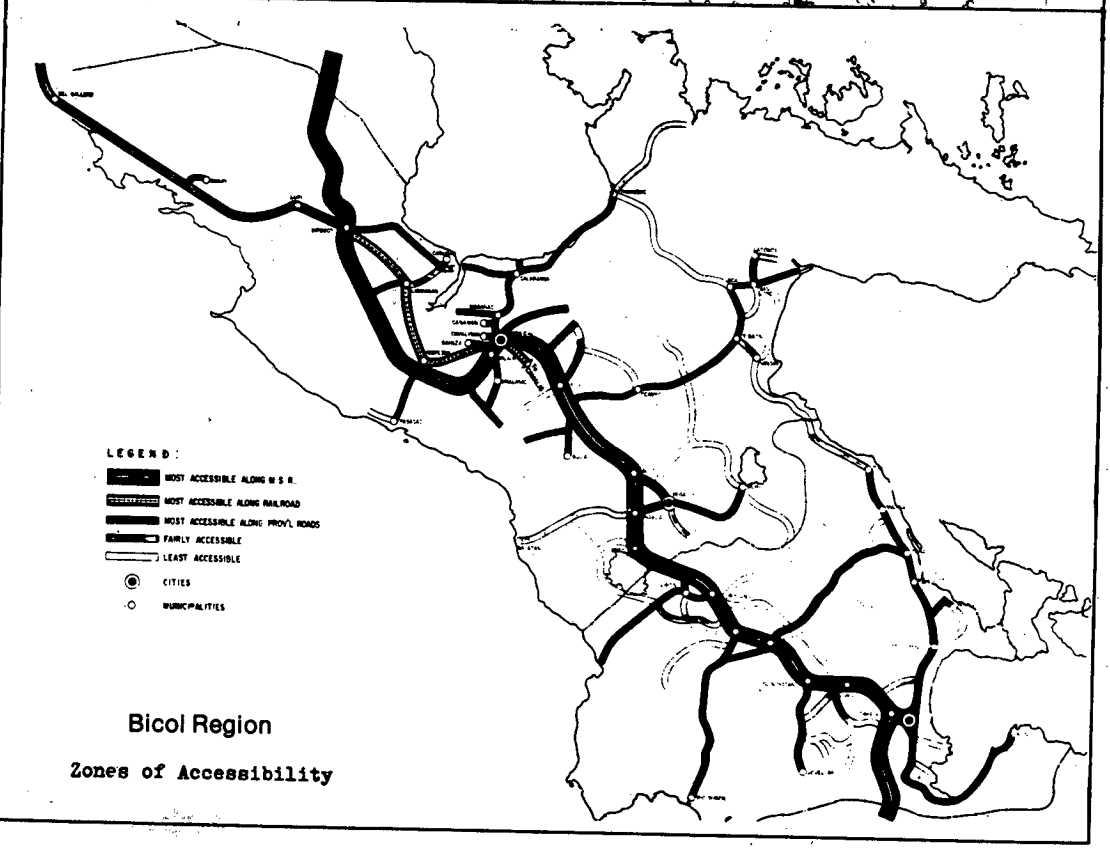
[108] Meillassoux, quoted in Clammer, *op. cit.*, 217-218.





Bicol Region

Population Map



Bicol Region

Zones of Accessibility

The Design and Application of a Manual Scalogram Method for Spatial Analysis in the Bicol IAD Area *

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Background

In 1968, a United Nations team studying the Bicol region concluded that it was a "partly stable and partly downward transitional area".[1] Indeed at that time, the region's per capita Net Domestic Product was the lowest in the country; Bicol's share of both total value-added and total employment in large manufacturing establishments was the lowest of all regions. Its annual rate of population growth indicated a sizeable percentage of population out-migration, plus half a dozen other major "symptoms" of an economically depressed area.

To reverse this "downward transitional" trend, the Bicol River Basin Development Program (BRBDP) was initiated. In February 1973 a Bicol River Basin Council was established under Executive Order 412. In 1974, a six-year project was outlined to develop institutional capabilities and initiate the implementation of capital development programs. An evaluation of the Program, conducted jointly by the GOP (Government of the Philippines) and the USAID, in June 1975 indicated the institutional development process to be well underway. On April 28, 1976, President Marcos signed Presidential Decree 926 mandating the BRBDP to accelerate the planning and facilitate inter-agency implementation of and to monitor an "integrated multi-project area development program" in the Bicol region.[2]

Using an integrated area development (IAD) approach, the BRBDP was to 1) increase per capita income, 2) achieve an equitable distribution of wealth and 3) attain self-sufficiency in food in order to improve the quality of life of the people in the area.[3]

In particular,

"The BRBDP development strategy is to build up the physical infrastructure, improve essential services, improve land tenure arrangements, increase agricultural productivity and encourage private investment in agribusiness and rural-based industries. The strategy also takes into account urban-rural linkages, spatial integration and how urban functions support rural development."[4]

The BRBDP Comprehensive Plan explicitly recognized the potential of "space as a venue for integration."[5] Following this, an Urban Development activity was incorporated in the BRBDP Comprehensive Plan. The activity was "to develop a hierarchy of urban services and facilities that shall reinforce Basin Development Programs and respond to the area's residents' social needs."[6]

In November 1976, the BRBDP conducted an Urban Functions in Rural Development Project with a grant from the USAID to develop a policy plan that would strengthen the contribution of urban centers to rural devel-

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*This paper is based on the author's masteral thesis bearing the same title, which he submitted to the Institute of Environmental Planning, Univrsity of the Philippines in July, 1981.

[1]Frank Z. Martocci, "Physical Regional Planning in the Philippines," United Nations Development Program, Manila, 1968, p. 60.

[2]USAID/Philippines, Bicol IRDP 1977-1981 Project Paper.

[3]BRBDP Comprehensive Development Plan 1975-2000, Program Office, Camarines Sur, July 1976, p. ii.

[4]USAID/Philippines, op. cit., p. 8.

[5]BRBDP, op. cit., p. 72.

[6]*Ibid.*, p. 146.

opment in the Bicol River Basin. Among its specific objectives was "to analyze the spatial system of... the Bicol River Basin."

By May 1977, however, the GOP project staff reported that: "an evaluation of existing data in the Bicol Basin showed substantial limitations which precluded the use of most of the methodologies suggested by the Rondinelli and Ruddle Report.[7] In particular, factor analysis and the indicators of concentration or dispersion would not be utilized by the staff due to the absence of the precise data required."

Problems and Purpose

With this prevailing lack of useful and practical methodologies for use in data-insufficient areas as a background, this paper addresses the problems of formulating a manual method of determining hierarchy, complexity and centralities of central places; demonstrating the applicability of such a method in the Bicol Integrated Area Development Region; and establishing the validity and comparability of the method to the accepted computerized Guttman scaling technique. The resolution of these problems, hopefully, will generate a contribution to the currently narrow range of methodologies for spatial analysis in low to modest technology areas.

Conceptual Framework

Although Integrated Area Development (IAD) planning is now accepted as a proper approach to regional development, IAD projects today are predominantly exercises in sectoral planning and lack the element of spatial integration. By spatial integration is meant that economic and social development can be made more equitable and perhaps efficient if hierarchies of settlements can be identified upon which investments can be focused in varying degrees depending on the range of institutional support and locational centrality proferred by such settlements.

Spatial integration is usually expressed in a spatial framework plan. The formulation of such a plan, however, is preceded by spatial analysis which deals with the assessment of patterns of settlements, their functional importance, their linkages and other features. The lack of the element of spatial integration in IAD planning earlier mentioned can be essentially attributed to the dearth of adaptable methodologies for spatial analysis and planning. Manual methods, the most practical for rural areas, are extremely few and fewer still are known and accepted as useful planning tools.

Methodologies for Central Place Studies

Rondinelli and Ruddle, in their book *Urbanization and Rural Development*[8] offer at least fourteen alternative methodoloies for the analysis of central places. Of these, however, only three are direct methods for arriving at indications of spatial hierarchy, centralities and thresholds. These three are: 1) Factor analysis, 2) Guttman scaling and 3) (manual) scalogram analysis. The other methodologies are of a supplementary character, i.e., either to expand spatial analysis to account for related social or economic factors or to refine the main central place analysis.

While most analyses of centrality involve the study of static elements *factor analysis* tries to account for the dynamic elements that either enhance or retard the development of central places. Among the more frequently used methods of factor analysis is the determination of changes in rates of growth of choice factors as they relate to levels of centrality. This form of decomposition analysis is common not only in the study of central places but also for identifying causal relationships between sets of economic or social phenomena.

The factors which are pre-identified are most often those whose changes through time are easily measurable; e.g., demographic characteristics of settlements, labor

[7]This report provided the conceptual framework of the study.

[8]Dennis A. Rondinelli and Kenneth Ruddle, Urbanization and Rural Development, A Spatial Policy for Equitable Growth, Praeger Publishers, New York, 1978, pp. 186-187.

force real estate values and the like. Such factors are then analyzed in terms of their probable contribution to the growth or deterioration of central places.

The *Guttman scaling technique* is a computerized, cumulative scaling method which establishes that the more an item is present in greater quantity, the more different items a place has accumulated. The technique requires non-quantitative "presence-absence" (binary) data on services, goods, institutions, etc., for its use. Guttman scaling has been described as "a shortcut method to correlation analysis". "The different items which fit into the scale must correlate with each other in order to be scalable."[9]

The technique itself produces an array of "cases" in a hierarchical order showing the accumulated "items" in each case. In spatial studies, the "items" are functional attributes of central places or locations which are the "cases". To produce a scale, the Guttman scaling process arranges and continually re-arranges, alternately, the data of cases and items. At the same time, it maximizes a separation of "Is" (presence) and "Os" (absence) into opposite corners of a binary input matrix. Zeros inter-spersed with ones and vice versa are interpreted as errors or scale deviations. The process of re-arrangement continues until an acceptable scale is arrived at. A coefficient of scalability based on the amount of deviation present within the scale measures the degree of acceptability of the scale. (Such a coefficient should not be less than 0.65 to be acceptable).

Once an acceptable scale is arrived at, the scaling technique transforms the dichotomous presence or absence of items into a quantitative measure: the scale score. The scale score is simply the total frequency of present scaling items in each case. Thus quantified, standard statistics can be used and correlations with other available data can be made.

Although the conceptual framework of Guttman Scaling—the "Structural-Symbolic Theory"—espoused by Dr. Frank W. Young[10] is significantly different from Central Place Theory, that technique finds wide adherents from spatial analysis. In addition, H.E. Voelkner lists several other advantages of the methods.[11]

1. It presents an identification of a sequence in the accumulation of technology, facilities, practices or organization of a given spatial network. "The sequence of accumulation would be important for planning and policy especially if it implies an inherently linked sequence in the development process of an area.[12]
2. "The cumulative sequence shown in the scale also implies orderliness of the structural growth process; actual deviation from the sequence may mean some degree of deviation from the growth process."[13] That is, if a central place places high in the scale but still misses a certain item (e.g., high school), it may be inferred that the item is wanted by the place but can not be obtained due to economic or political reasons. This is a "hint" then for planners to inquire into such an indicated need and perhaps catalyze the acquisition of the missing facility.
3. In conjunction with No. 2 above, the Guttman scale assumes that each item in the scale implies the presence of items below it in scale rank. Hence, the scales identify packages of items (i.e., services, facilities, goods) for every level in the hierarchy of cases (i.e., places or locations). The planning im-

[9]H.E. Voelkner, "Shortcut Methods to Assess Poverty and Basic Needs for Rural Regional Planning," (Mimeographed), United Nations Research Institute for Social Development (UNRISD). Geneva, Switzerland, May 1978, p. 17.

[10]For a thorough discussion of this concept, H.E. Voelkner refers us to T.D. Graves et al., "Historical Inferences from Guttman Scales: The Return of Age-Area Magic" Current Anthropology, Vol. 10, No. 4, October 1969.

[11]H.E. Voelkner, "Shortcut Methods...", pp. 28-32.

[12]*Ibid.*, p. 28.

[13]*Ibid.*, p. 29.

plication is that normative packages of items (i.e., services, facilities, goods) for every level in the hierarchy of cases (i.e., places or locations) can be identified for levels of central places in a desired hierarchy.

4. The printed scale printout of the Guttman scales "can be read directly as a bar graph table of distributions and properties from the bottom upwards for cases... and from right to left for items..."[14]
5. The Guttman scales identify, at a glance, the position of a place relative to all other places in a subject region.
6. Finally, Guttman scale scores "if taken literally as 'height of development'... can be used for a simple manual development contour-mapping to visualize a micro-regional development topography,"[15] that is, isopleth maps.

The manual scalogram or graphical method has apparently seen more progress in India rather than in Western countries. This may be attributed to the fact that computer technology is invariably accessible to developed countries. Needless to say, the reverse is true for developing countries like India. It is interesting to note, however, that English and American spatial planners such as Gerard Rushton and H. Benjamin Fisher have largely contributed to the development of manual scalogram techniques in India and Indonesia.

The graphical method is really a manual derivative of the Guttman scaling technique. Like the Guttman, the method "produces a two-way ranking of settlements and institutions in a region."[16] Unlike the Guttman, however, it does not discard "non-discriminating" or non-scaling items ("errors" in the Guttman scale) but includes all items in the scalogram.

"The (manual) scalogram provides a visual description of the... settlement and institutional hierarchy that is easy to read and useful as a reference in analyzing numerous issues for planning."[17] Moreover, as Voelkner observes: it can "...systematically process and measure qualitative data which previously permitted only intuitive analysis."[18]

Rondinelli[19] points out that "it can also process quantitative data that are error-prone or not statistically reliable by using only their qualitative content for which the error margin is low, and can serve as a substitute for quantitative analysis when reliable statistical data can not be collected quickly or economically."

"Among the potential uses of the scalogram in regional planning are the following:

a. "It can be used to categorize settlements into levels of functional complexity and determine the types and diversity of services and facilities located in central places at various levels of a hierarchy.
b. "The scalogram shows rough associations among services and facilities in specific locations and potential linkages among them.
c. "The scalogram indicates the sequence in which settlements accumulate functions and the implications for sequencing complementary or catalytical investments.
d. "By reading any column, the ubiquity of a service or facility, and its distribution among settlements can be easily seen.
e. "The array of items in the scalogram, analyzed in conjunction with a map showing locations of functions and their distribution and with population-service criteria, can be used to make determinations about the adequacy of services and facilities in the region.

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[14] *Ibid.*, p. 30.

[15] *Ibid.*, p. 31.

[16] C.P. Andrade, Jr., et al., *op. cit.*

[17] H. Benjamin Fisher, *op. cit.*

[18] H.E. Voelkner, "The Structural Complexity Growth Model & Scalogram Analysis of Development and Human Eco-Systems" (unpublished paper, 1974, mimeographed), p. 16.

[19] D.A. Rondinelli, "Spatial Analysis for Regional Development," pp. 28-29.

f. "Missing" or unexpectedly absent functions are clearly identified and investigations can be made into the reason that settlements at that scale level do not have the services or facilities, and decisions can be taken about the appropriateness of investing in those functions.
g. "Unexpectedly present functions are also identified, and the reason for the appearance of services and facilities in those settlements can be determined.
h. "Rough indicators of population threshold size needed to support various services and facilities can be determined from scalograms that show the population sizes of settlements in which functions currently appear.
i. "The scalogram can be used to make decisions about appropriate 'packages' of investments for settlements at different levels in the spatial hierarchy."

It may be noted that most of the advantages given are the same for the computerized Guttman scale. Moreover, the manual scalogram is easier to construct and interpret, requires no sophisticated training or computer facilities, and can be easily updated and revised using either "windshield surveys" or good aerial photography. In addition, as it will be reported later in this paper, the manual scalogram is not limited by computer capacity, hence, can be constructed for as many settlements and as many items as any planning region has.

There are other disadvantages of the Guttman scalogram.

> "The Guttman scales calculated by a computer programme presented two major problems for analysis in the Bicol River Basin. First, the functions that seemed to be of most interest for rural development—farm-equipment repair shops, vocational schools, credit unions, rural banks, farm supply stores, etc.—did not scale and were eliminated from the scale scores by the computer. Second, the computer output was difficult to understand and could not easily be presented to show the distribution of functions by place. The computer version required detailed explanation and interpretation, which technically untrained policy-makers—at least those attending the Bicol technical workshops in which the method had been presented—found difficult to understand. Nor did they immediately see its relevance."[20]

A Manual Method for the Analysis of Centrality, Functional Complexity and Hierarchy of Settlements

The greater practicality and ease of the manual scalogram method became almost immediately obvious to the project staff of the UFRD as the project progressed. The UFRD, in the pursuit of its analyses, eventually designed a manual scalogram and centrality index formula that at least in the rural conditions of the Bicol basin, proved more helpful, if not superior, in certain respects to the computerized Guttman scale.

The method itself was adapted from the scalogram method developed by Fisher and others in India and Indonesia. The specific procedure is as follows:

1. On the left side of the worksheet, list settlements as rows in descending order of their populations;
2. Across the top as columns list the institutions found in the region in order of their decreasing ubiquity;
3. Draw row and column lines so that the worksheet becomes a matrix in which each cell represents an institution that may appear in the settlement;
4. Fill in with a dark color all cells which represent an institution actually found in a settlement.
5. Reorder the rows and columns so as to visually minimize the eight holes appearing in the dark pattern found in the upper left. The scalogram is complete when no shifting of a settlement row or institution column can reduce the number of holes in this pattern.
6. The final order of settlement rows identifies a ranking of settlements which can be interpreted as an ordinal centrality score.

Essentially, centrality is a concept of relative importance—importance in terms of functions offered in a place vis-a-vis other places (and their functions) in a planning region. For instance, Naga is more important than Pili since its range of proferred services

[20] *Ibid.*, p. 27.

and goods is much more than Pili's and thus, Naga is said to have more centrality than the town of Pili. To arrive at some quantitative index for centrality, a method was devised adopting Marshall's[21] centrality index. Using the scalogram and following Marshall's procedure, the process of assigning weights is guided by the ubiquity (the weight will be less) or rarity (the weight will be more) of the item in question. In this process, the problem of "errors,"[22] to use Guttman terminology, or "leakages" to use Marshall's term, is dealt with by using Marsall's argument that it is a fact that the presence of rare items in an otherwise lower scale center does contribute to its centrality in the real world.

A basic feature of the index of centrality offered by Marshall is the assumption that "the amount of centrality contributed to a place is proportional to the number of establishments of that function in the entire system having a combined centrality value of 100." It is argued that the exclusive consideration of items alone does not violate the essence of the assumption which is *proportionality.* Even if Marshall's technique is modified by disregarding the count of each type of item, the resulting values of attributes will reflect contributions to centrality that are proportional to their position ubiquitous or rare and the degrees between them) in the functional hierarchy. Thus the values of items will constitute a hierarchy corresponding to the hierarchy of functions. The measure of centrality of a place which is the sum of values of each item in the place will, therefore, reflect the importance (in terms of position in the functional hierarchy) of the items it contains. The procedure is as follows:

1. Reproduce the scalogram with cases arranged vertically and items (functions) norizontally;
2. Total each row and column;
3. Using the assumption that the total number of functional attributes (items) in the entire system has a combined centrality value of 100, determine the weight or "location coefficient" of the functional attribute by applying:

$$C = t/T$$

where C = the weight of the functional attribute
t = combined centrality value of 100
T = total number of attributes in the system

4. Add one block to the table and enter weights computed;
5. Reproduce another table similar to that in Step 1 displaying the weights calculated in Step 3 and the total centrality values;
6. Sum the weights of each row to produce the indices of centrality.

The following Table (1 and 2) illustrate the calculation of the centrality index.

Determining Grouping in the Hierarchy

As mentioned earlier, Guttman scales or the scalogram already furnish us with quantitative data depicting the functional complexities of centers in the basin area. Any exercise in Guttman scaling, however, invariably results in too many scale steps or levels in the hierarchy. As a matter of fact, these initial levels are usually condensed to arrive at a more manageable hierarchy. Apparently the standard procedure for condensing levels is to identify the breaks in the steps where such breaks establish discrete stratifications among the cases (settlements) involved. Since in many instances, the selection of these cut-off points involve subjective knowledge of the centers in question, especially in the instances when you have too many steps (e.g., a previous Guttman scale of 54 municipalities in the basin produced 36 steps!) and ambiguous breaks, the procedure is, in practice, quite arbitrary. The scalogram more or less displays the same characteristics and is fraught with the same problem.

[21] John U. Marshall, *The Location of Service Towns,* Toronto: University of Toronto Press, 1969.

[22] "Errors" simply put are items that appear in places where according to Guttman estimates should not appear, or vice-versa.

Table 1. Calculating for Weights of Functions

Functions

Place	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*Total*
A	1	1	1	1	1	1	1	1	1	1	10
B	1	1	1	1	1	1	1	0	1		8
C	1	1	1	1	1	1					6
D	1	1	1	1	1	1		1			7
E	1	1	1	1	1						5
F 1	1										4
F	1	1	1	1							3
G	1	1	1								3
H	1	1	1								
Table No of Functions	8	8	8	6	5	4	2	2	2	1	46
Total Centrality	100	100	100	100	100	100	100	100	100	100	
Weights	12.5	12.5	12.5	16.6	20	25	50	50	50	100	

Table 2. Calculating for Centrality Indices

Value of Functions

Places	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*Centrality Index*
A	12.5	12.5	12.5	16.6	20	25	50	50	50	100	349.1
B	12.5	12.5	12.5	16.6	20	25	50		50		199.1
C	12.5	12.5	12.5	16.6	20	25					99.1
D	12.5	12.5	12.5	16.6	20	25		50			149.1
E	12.5	12.5	12.5	16.6	20						74.1
F	12.5	12.5	12.5	16.6							54.1
G	12.5	12.5	12.5								37.5
H	12.5	12.5	12.5								37.5
Total Centrality	100	100	100	100	100	100	100	100	100	100	1,000*

*Does not sum up to 1,000 due to rounding.

Faced with this the project staff thought it better to utilize a simple criterion offered by Marshall: "that, for any two adjacent groups of centers, the between group difference in centrality must be greater than, or at least equal to, the within-group differences."

It is noteworthy to add that once a successful delineation of the levels in the hierarchy have been made on the basis of the criterion above, results must be checked against at least two other inherent criteria of hierarchical structuring: 1) the total number

of places in any level must be less than the total number of places in the following lower level or inversely, the total number of places in any level must be more than the total number of places in the next ranking level; 2) the average number of services and facilities for any level should be less than the average number of goods belonging to the next lower ranking level or again inversely, the average number of services and facilities preferred by any level should be more than the average number of services and facilities preferred by the next higher ranking level.

Essentially, the simple methodology described herein would generate 1) an indication of the hierarchy of settlements in a given area; 2) an indication of the functional complexity of the centers, and 3) measures of the centralities of places and their distribution in the subject area.

The first objective expressed above would be achieved by the simple completion of the scalogram where the rankings of "cases", i.e., settlements, shall itself exhibit the hierarchy of settlements in the given area.

The second objective can be indicated by the "mix" of "items", i.e., functions found to exist in each case. These mixes of items are shown as blackened spaces on each row of the scalogram. Inasmuch as these functions themselves exhibit properties of rarity or ubiquity, their presence or absence along the row corresponding to a given case or settlement would indicate the functional complexity of any subject settlement.

The third objective is fulfilled by the calculation of centrality indices for each case. These measures should provide an indication of the relative importance of settlements vis-a-vis each other. That is, the greater the centrality index, the indication is, the greater the relative importance of the case having such an index.

In all these, however, no claim is made that the methodology described above generates definitive or conclusive assessments of the hierarchy, complexity or centralities of a given spatial pattern. The methodology is basically a means to draw some basic indications from a subject spatial system. Needless to say, it must be used in conjunction with other applicable methods to complete a fairly accurate profile of a given spatial system.

Application and Findings

The initial design conceived for analyzing the various settlements in the Bicol basin followed the approach indicated by Rondinelli and Ruddle in their "Urban Functions in Rural Development" Report. Specifically it called for the determination of the settlement hierarchy through Guttman scaling or factor analysis, supplemented by coefficients of concentration, localization and deviation, localization curves or location quotients, indices of segregation and dissimilarity, gap shift-share or simple descriptive statistics.

However, an evaluation of existing data in the Bicol Basin showed substantial limitations which precluded the use of most of the methodologies suggested by the Rondinelli and Ruddle Report. In particular, factor analysis and the indicators of concentration or dispersion could not be utilized by the staff due to the absence of the precise data required. A more decisive argument was the assertion of the need to utilize simple methods that can easily be learned and applied in low to modest technology areas in anticipation of the replication of the study in other depressed regions or countries.

It was decided then to rely on the manual scalogram analysis supplemented by the Guttman scaling of some selected settlements. From the manual scalogram, a hierarchy of settlements in the Bicol River Basin was to be drawn, centrality indices were to be computed and thresholds of functions extracted. Guttman scaling was to serve primarily as a consistency checking device.

The institutions or items selected eventually numbered sixty four.[23] These were chosen with the intent to single out institutions that could be grouped together under broad functional categories and within these, constitute rough hierarchies themselves. Several institutions that do not ordinarily "fit" into the rough hierarchies were deliberately introduced to test their capacity

[23]The items were selected from a complete inventory of establishments in Camarines Sur province. This inventory is seen in: Agapito Tria, *Municipal Inventory,* SSRU-BRBDP, Naga City, 1976.

to scale. The selected items are enumerated below under eight functional groupings:

Economic Functions/Institutions

1. Shopping center/supermarket
2. Regular public market
3. Appliance store w/without installment sales
4. Farm supply and agro-chemical store
5. Banks and financial establishments other than rural banks
6. Rural banks
7. Manufacturing and processing plant other than cottage industry
8. Cottage industry.

Social Services

1. Nursing school
2. College
3. Vocational school
4. High School
5. Private hospital
6. Government hospital (operational)
7. Private clinic
8. Drugstore

Communication

1. Airport
2. Port
3. Train station
4. Bus station
5. Newspaper publication
6. Radio station
7. Telephone
8. Telecommunications establishment (teletype)

Physical Facilities

1. Functioning power plant
2. Piped water supply
3. Hardware supply store
4. Farm equipment repair facility
5. Subdivision
6. Surveyor
7. Construction supply store
8. Auto repair shop

Recreational Facilities

1. Bowling alleys
2. Gymnasium/auditorium
3. Cinema with daily runs
4. Night club
5. Playground with facilities
6. Cockpit
7. Cinema with less than daily runs but with at least once-a-week shows
8. Concrete paved basketball court

Personal Services

1. Optometry/optical shop
2. Xerox copying services
3. Photo studio
4. Restaurant
5. Memorial parks
6. Funeral parlor
7. Hotel
8. Lodging houses

Community Organization

1. Credit union or credit cooperative
2. Cooperative
3. "Paluwagan"
4. Labor union
5. Professional organization
6. Civic organization
7. Sports association
8. Farmers' association

Extension and Protective Services

1. Security agencies (private)
2. PC station
3. Red Cross
4. Firetruck
5. Bureau of Animal Industry
6. Bureau of Agricultural Extension
7. Bureau of Plant Industry
8. Department of Local Government and Community Development

Against these 64 items, the discrete settlements in the 54 municipalities of the Bicol River Basin were to be arrayed for scalogram analysis. In the case of the Basin's settlement structure, presumably all that was to be done was to arrange all the cities and poblacions against the identified items and undertake scalogram analysis. This, however, did not prove the case.

First, the cities and poblacions were not the only discrete settlements in the basin. Secondly, even these cities and poblacions were not discrete urban areas but were administratively defined areas which encompassed rural barrios (villages) some distance from the city's built-up area. The staff, therefore, decided to identify a sample of discrete settlements in the area. This sample consisted of discrete urban areas—cities and poblacion—as well as large barangays selected on the basis of population size: 1) the project staff identified the barrios with populations equivalent to 50 percent or more of the smallest poblacion in the area; 2) these barrios were then located on existing muni-

cipality maps where the scales in terms of "built-up areas", i.e., the area where concentration of structures existed; 3) both in the instances when such scales were not shown in the map or when they were actually reflected in the map, field inspections were made to ascertain whether the built-up area was comparable to the municipal center's built-up area following the criterion: the barrio's built-up area should at least be half (50%) as large as the smallest municipal center's (poblacion) built-up area measured in square kilometers.

It is noteworthy to add that the built-up areas were thus defined on the basis of structural contiguity, disregarding political boundaries. For instance, Naga City and the contiguous poblacion of Camaligan were considered as one built-up area. In other words, a continuum of built-up areas encompassing two or more towns or barangays (barrios) without any physical break (in terms of houses or buildings) between them were defined as one.

This effort resulted in the identification of 121 built-up areas which were subjected to both scalogram and Guttman scaling against the 64 items previously mentioned. Results gave the staff its first impression of the hierarchy of the basin's structure. To say the least, it indicated that the initial hypothesis of the entire study, that is, that the basin's spatial system lacks articulation, was accurate.

Even with the very fruitful results of the Guttman scaling exercise, however, discussions by USAID, TOP consultants and the project staff showed an anxiety regarding the relatively arbitrary selection of the sample. This anxiety mainly focused on the fact that the scope of analysis did not explicitly include all settlements from the major centers to the smallest discrete barrio. A total evaluation of the settlement structure was implied, it was argued. The staff, therefore, decided to proceed with its earlier decision to construct a manual scalogram and undertake hierarchy and functional analysis considering as much as possible all settlements in the basin. A listing of all cities, polacions and barrios was made. The built-up area delineations were retained and added to them were all other barrios in the basin. The number of settlements so determined was 1,419. Since no computerized Guttman scaling program could handle such a large matrix only a manual scalogram effort was undertaken. The result was an extremely large scalogram, as shown in Fig. 1.

The Guttman Scaling Results

The result of the Guttman scaling process for 121 municipalities, i.e., those with the greatest number of functions, without the introduction of the centrality index method, was not sufficient to allow for a discrete stratification of settlements. However, it showed the extent of functional complexities of the municipalities and city areas in the Bicol River Basin. The results are shown in table 3.

Legaspi, Naga and Iriga areas are shown as the most complex. At the other end, we see the settlements of Tierra Nevada (Tinambac), Mananao (Tinambac), May-anao (Tigaon) and Caraycayon (Tigaon) as the least functionally complex. The scale steps likewise show to a certain extent the levels of complexities.

Because the scale scores do not immediately present us with discrete stratifications which would be the mark of a hierarchy of complexity levels, the centrality index method was applied on the Guttman scale (including its shadow scale).[24] The main design was to enlarge the complexity scores of the municipalities and city areas in order to draw out the fine differences between these cases and on that basis allow discrete stratifications to emerge.

The result shows a very pronounced hierarchy of settlements,[25] led by the same first three settlements of Legaspi-Daraga, Naga-Camaligan and Iriga City. The second level, however, is now composed of more municipalities than the second level cluster produced by the Guttman scale alone. The third level of settlements defined by applying Marshall's criterion is composed of a very

[24] In the Guttman scaling process, the process of alternately rearranging items and cases results in the discarding of items which do not "fit". These are relegated to a "shadow" scale.

[25] Marshall's criterion on the breakdown of scale steps were used in the determination of scale steps.

Figure 1—Scalogram Showing Centrality of Settlements

Table 3

Selected Guttman Statistic "Built-Up" area largest scale 121 settlements vs 41 "discriminating" items[1]

B.U.A. Name	Guttman[2] Scale Score	Difference bet. scale score	Guttman[3] scale steps
1. Legaspi/Daraga	41	0	33
2. Naga/Camaligan	40	1	32
3. Iriga	39	1	31
4. Tabaco #1 (Pob)	34	5	30
5. Goa#1 (Pob)	32	2	29
6. Poblacion (Tigaon)	31	1	28
7. Pili #1 (Pob)	29	2	27
8. Nabua #1 (Pob)	27	2	26
9. Baao (Pob)	25	2	25
10. Poblacion (Sipocot)	24	1	24
11. Barangay 1&2 (Guinobatan)	24	0	24
12. Libmanan #1 (Pob)	23	1	23
13. Poblacion (Camalig)	23	0	23
14. Oas (Pob) (Pob)	23	0	23
15. Tinambac (Pob)	22	1	22
16. Lagonoy #1 (Pob)	22	0	22
17. Poblacion (Tiwi)	21	1	21
18. Calabanga #1 (Pob)	20	1	20
19. Pio Duran #1 (Pob)	19	1	19
20. Poblacion (Ragay)	18	1	18
21. Buhi #1 (Pob)	17	1	17
22. Ocampo (Pob)	17	0	17
23. Pasacao #1 (Pob)	17	0	17
24. Sto. Domingo #1 (Pob)	16	1	16
25. Del Gallego #1 (Pob)	16	0	16
26. Canaman #1 (Pob)	15	1	15
27. Malinao #1 (Pob)	14	1	14
28. Canaman (Pob)	13	1	13
29. Poblacion (Libon)	13	0	13
30. Bato (Pob)	13	0	13
31. San Jose #1 (Pob)	13	0	13
32. Bombon (Pob)	13	0	13
33. Minalabac #1 (Pob)	12	1	12
34. San Jose-San Agustin-Cadlan, Pili	12	0	12
35. Polangui #1 (Pob)	11	1	11
36. Balatan (Pob)	11	0	11
37. Milaor #1 (Pob)	11	0	11
38. San Fernando (Pob)	11	0	11
39. Poblacion (Gainza)	11	0	11
40. Poblacion (Ligao)	11	0	11
41. Magarao (Pob)	10	1	10
42. Malilipot (Pob)	10	0	10
43. Bacacay (Pob)	10	0	10
44. Jovellar (Pob)	10	0	10
45. Sangay (Pob)	9	1	9
46. Bula (Pob)	9	0	9
47. Manito (Pob)	9	0	9
48. Caratagan, (Pio Duran)	9	0	9
49. Garchitorena (Pob)	8	1	8
50. Poblacion (Pamplona)	8	0	8
51. Poblacion (Lupi)	8	0	8
52. Cabusao (Pob)	7	1	7
53. Poblacion (Siruma)	7	0	7
54. Poblacion (Presentacion)	6	1	6
55. Nagas-Cale, Tiwi	5	1	5
56. Banga Caves (Ragay)	5	0	5
57. La Purisima-Sto. Domingo, Nabua	4	1	4
58. Danao, (Polangui)	4	0	4
59. Catabangan, (Ragay)	4	0	4
60. Sinuknipan, (Del Gallego)	4	0	4
61. Barcelonita, Cabusao	4	0	4
62. Manguiring, Calabanga	4	0	4
63. Burabod, Lagonoy	4	0	4
64. Tamban, (Tinambac)	4	0	4
65. Ombao, (Bula)	4	0	4
66. Naangas, (Presentacion)	4	0	4
67. Impig, (Sipocot)	4	0	4
68. Tierra Nevada, (Tinambac)	4	0	4
69. Quipayo, Calabanga	3	0	3
70. San Gabriel, (Pamplona)	3	0	3
71. Cambalidio-Banao, Libmanan	3	0	3
72. Bananghawan-Mariroc, Tabaco	3	0	3
73. Buyo-Matacla, Goa	3	0	3
74. Salugan, (San Jose)	3	0	3
75. Magurang, (Polangui)	2	1	2
76. Tinago, (Ligao)	2	0	2
77. Sta. Justina, (Buhi)	2	0	2
78. Sagrada Familia, (Buhi)	2	0	2
79. Antipolo, (Buhi)	2	0	2
80. Fabrica, (Bula)	2	0	2
81. Cagbunga-Dahilig, Gainza	2	0	2
82. Sanbang, Calabanga	2	0	2
83. San Antonio-Mambulo, Libmanan	2	0	2
84. Carangkang, (Magarao)	2	0	2
85. San Antonio, (Milaor)	2	0	2
86. Himaao, (Pili)	2	0	2
87. Caroyroyan-Tinangis, Pili	2	0	2
88. Pamukid, (San Fernando)	2	0	2
89. Estancia, (Malinao)	2	0	2
90. Buyo, (Manito)	2	0	2
91. Tambo, (Buhi)	2	0	2
92. Mananao, (Tinambac)	2	0	2
93. Ilawod, (Guinobatan)	1	1	1
94. Pantao, (Libon)	1	0	1
95. Colacling, Lupi	1	0	1
96. San Roque, (Daraga)	1	0	1
97. San Roque, Tabaco	1	0	1
98. Caranan, Pasacao	1	0	1
99. Bonga, (Bacacay)	1	0	1
100. Cotmon, Camalig	1	0	1
101. San Antonio, Tabaco	1	0	1
102. Palsong, Bula	1	0	1
103. Baligang, (Camalig)	1	0	1
104. Masarawang, (Guinobatan)	1	0	1
105. Muladbucad, (Guinobatan)	1	0	1
106. Antipolo, (Minalabac)	1	0	1
107. Nato, (Sangay)	1	0	1
108. Sagpon, Daraga	0	1	0
109. Malinao-San Isidro, Libramanan	0	0	0
110. Guijal, Caramoan	0	0	0
111. Sogod, (Bacacay)	0	0	0
112. San Vicente, (Jovellar)	0	0	0
113. Balogo, (Oas)	0	0	0
114. San Francisco-Misericordia, Sto. Domingo	0	0	0
115. Hiwacloy, (Goa)	0	0	0
116. Maypalay, Goa	0	0	0
117. Sipaco-Himanag-Lagonoy	0	0	0
118. Dalupsan, (Pasacao)	0	0	0
119. Vito, (Siruma)	0	0	0
120. Carangcan, (Tigaon)	0	0	0
121. May-aras, (Tigaon)	0	0	0

[1]Discriminating items refers to items establishments where the amount of deviations is not more than the scale score is termed as non-discriminating items and are relegated to the shadow scale.

[2]Scale score—a quantitative measure derived from a scaling technique which transforms the dichotomous or items.

[3]Step—a settlement's position in the order of complexity levels.

much lesser number of municipalities compared to that defined by the simple Guttman scale (14 compared to 99). Obviously, the centrality index helps to present a stronger basis for defining a hierarchy of settlements in the Bicol Basin area.[26]

Differences in ranking are marked especially for the lower level settlements. This may be attributed to the application of centrality indices even on "shadow items". Items considered as "non-discriminating" (shadow items) were included in the computation of scores and therefore in the ranking according to centrality. Such shadow items are not considered in the determination of Guttman scale scores.

The Manual Scalogram Results

The manual scalogram analysis was applied on all 1,419 settlements using 64 items. The centrality index method was applied to the resulting scalogram to draw out a more discrete hierarchy of settlements.

The result of the manual scalogram technique without considering centrality indices was different from that when the indices were generated. The ranking of municipalities was altered considerably, in the sense that several settlements shifted from different hierarchical levels. The results of the analyses are presented in Table 4. For parsimony, only the top 56 settlements are presented.

Two municipalities shifted from the fourth level of the unweighted manual scalogram to the third level on the weighted one. The shifts may be clearly seen in Table 4, which summarizes the effect of the weighting process on the ranking in the manual scalogram.

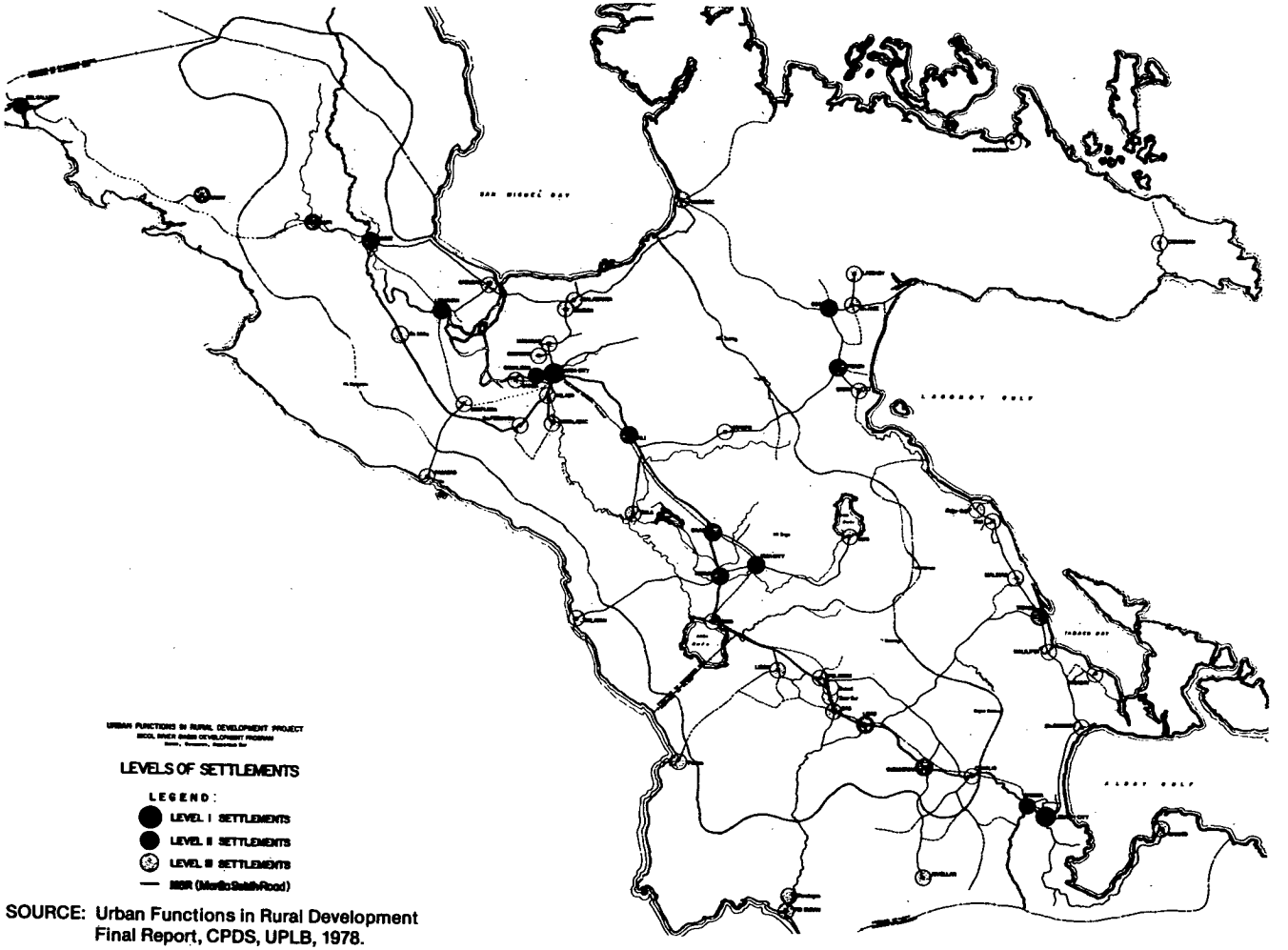
The difference is definitely attributable to the implcit incorporation of the ubiquity/rarity factors with the application of the centrality indices. The Guttman accounts simply for the number of functions appearing in a settlement, regardless of the rarity or ubiquity of the function.

TABLE 4

Comparative Rankings of 56 Settlements, Weighted and Unweighted Guttman Scale Scores.

	No. of Function	Rank	Level	Centrality Index	Rank	Level
Naga/Camaligan	61	1	1	383	2	1
Legaspi/Daraga	60	2	1	422	1	1
Iriga	54	3	2	298	3	2
Tabaco/Poblacion	51	4	2	237	5	2
Pili/Poblacion	50	5	2	239	4	2
Libmanan	41	6	3	125	7	3
Guinobatan	39	7	3	116	8	3
Goa	38	8	3	106	9	3
Ligao	38	8	3	129	6	3
Nabua	36	9	3	100	11	3
Baao	36	9	3	100	11	3
Tigaon	32	10	4	99	12	3
Sipocot	30	11	4	102	10	3
Calabanga	29	12	4	82	13	4
Camalig	27	13	4	63	18	4
Tiwi	27	13	4	72	16	4
Canaman	27	13	4	78	15	4
Sto. Domingo	26	14	4	56	21	4
Buhi	26	14	4	52	23	4
Tinambac	26	14	4	60	19	4
Libon	25	15	4	57	20	4
Balatan	24	16	4	66	17	4
Ocampo	23	17	4	35	32	4
Ragay	23	17	4	41	28	4
Lagonoy	22	18	4	80	14	4
Polangui	21	19	4	46	25	4
Oas	21	19	4	56	21	4
Del Gallego	20	20	4	44	26	4
Bato	20	20	4	34	33	4
Pasacao	20	20	4	55	22	4
San Jose	19	21	4	39	30	4
Caramoan	19	21	4	29	34	4
Milaor	19	21	4	43	27	4
Malilipot	18	22	4	27	36	4
Sangay	17	23	4	21	40	4
San Fernando	17	23	4	25	37	4
Minalabac	16	24	4	24	38	4
Bombon	16	24	4	25	37	4
Bula	16	24	4	28	35	4
Pio Duran	15	25	4	40	29	4
Garchitorena	15	25	4	28	35	4
Bacacay	15	25	4	36	31	4
Pamplona	14	26	4	18	41	4
Manito	14	26	4	15	44	4
Magarao	14	26	4	24	38	4
Gainza	14	26	4	17	42	4
Malinao	14	26	4	18	41	4
Lupi	13	27	4	22	39	4
Maguran	13	27	4	51	24	4
Cabusao	12	28	4	21	40	4
Pantao, Libon	11	29	4	27	36	4
Jovellar	11	29	4	14	45	4
Caragatan, Pio D.	11	29	4	13	46	4
Cale, Tiwi	11	29	4	16	43	4
Danao, Polangui	11	29	4	18	41	4
Iraya, Oas Norte	10	30	4	16	43	4

[26]Specifically, it helps to meet two of the criteria set for judging whether a system of places constitutes a hierarchy: 1) discrete stratification and 2) successively fewer places in successively higher orders.



SOURCE: Urban Functions in Rural Development Final Report, CPDS, UPLB, 1978.

Figure 2—Levels of Settlements as Determined by Complexing Indices

SOURCE: Urban Functions in Rural Development
Final Report, CPDS, UPLB, 1978.

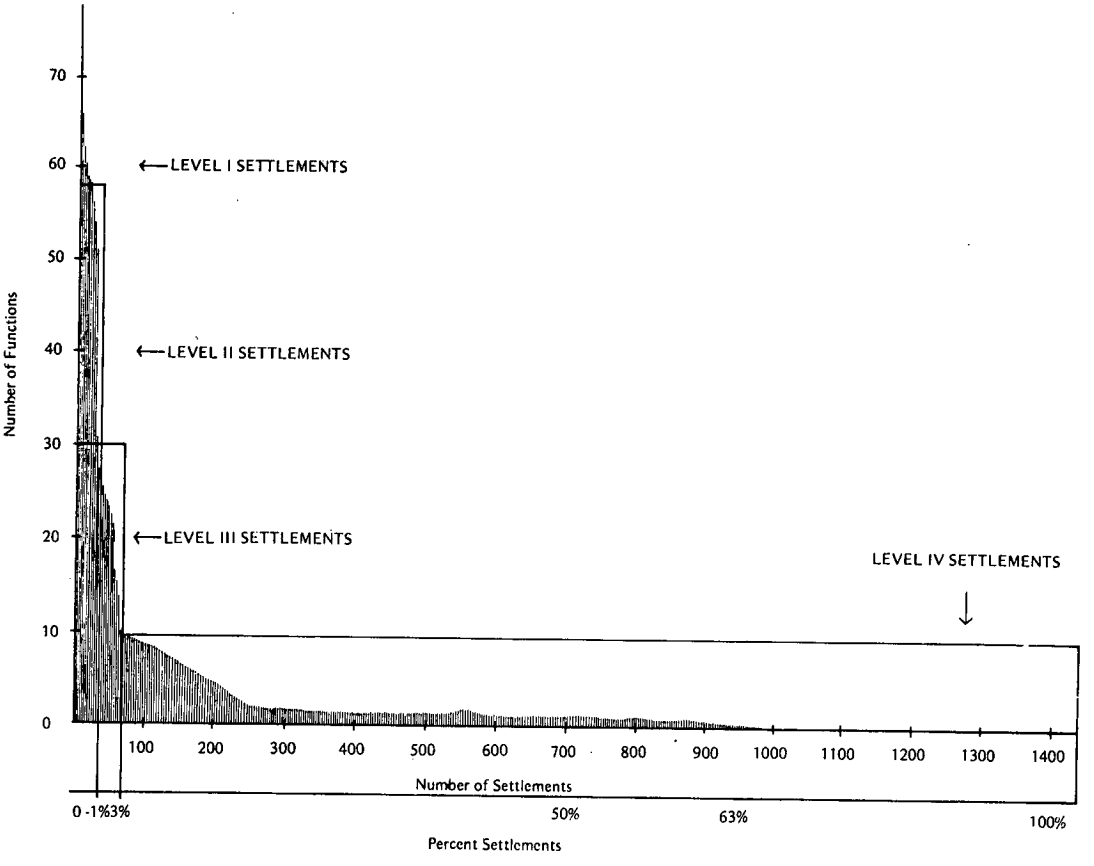


Figure 3—Distribution of Functions
Albay-Camarines Sur as Drawn from the Scalogram

Comparison of Results

In general, the results of the Guttman scale and the manual scalogram were similar. Of particular interest is the similarity of the unweighted Guttman scale results to the unweighted manual scalogram results, and of the weighted manual scalogram results to the weighted Guttman scale results. This is quite obvious when the resulting tables and scales are compared.

Three major differences, however, may be identified: first, the inclusion of Iriga City in the first level settlement cluster in the Guttman scales; secondly, the lesser number of third level settlements in the scalogram; and thirdly, the clearer isolation of secondary provincial centers in the manual scalogram.

The significance of these differences is that the results of the manual scalogram seem to be closer to reality than that of the Guttman.

The market system clearly indicates the primacy of Naga City as a provincial center with Iriga serving as a "supplementary" center specifically for the Rinconada area. The market system likewise shown Tabaco having the same supplementary market center function as Iriga. It is on this basis that the manual scalogram results more clearly delineate secondary provincial centers.

The differences may be attributed to two facts: first of all, the process of alternately rearranging items and cases in the Guttman scale results in the discarding of items which do not "fit", thus producing gaps in the scale. It is precisely these items that often make a settlement more important as a "center". Secondly, the Guttman scale used only 121 settlements as cases while the manual scalogram took all 1,419 settlements. The difference in the number of cases definitely affects the weighted results. Specifically, the number of cases affects the numerator in the computation of the centrality index, C = t/T, where t = the number of cases where items appear, and T = 100. Thus, while the value of t for the scalogram ranges from 0 to 1,419, the value for the Guttman scale ranges only from 0 to 121. However, since it is the comparison of ranks and differences between values in the ranking ladder rather than the values per se that is important, the effect of this computational weakness is quite trivial.

Correlation Analysis

To determine the degree of correlation between the results of both, methods a rank correlation[27] was undertaken. Correlations were made between both weighted and unweighted results. Below are the results of the analysis.

Rank correlation between Guttman scale scores and manual scalogram scores.

	Unweighted	Weighted
Coefficient of rank correlation (r_s)	0.963	0.795
Variance (^{2})	0.018182	0.018182
Standard deviation ( )	0.13484	0.13484
Z test value (Z)	7.14	5.89

The Z value of 7.14 suggests that the observations are highly associated with each other. Thus we may say that results of the manual scalogram procedure shows a high degree of correlation with that of the Guttman scale. With the correlation values between weighted scale scores, the value of r_s, although lower, is acceptable. The z value of 5.89 likewise suggests that the observations are highly associated with each other. Thus we may say that the results of the weighted manual scalogram procedure show a sufficient degree of correlation with that of the Guttman scale.

Conclusions and Implications

The apparent lack of enthusiasm in conducting spatial analysis side by side with sectoral analysis is due largely to the dearth of practical methodologies. Many of those available—gravity modelling, Guttman scaling, factor analysis and the like—are computer-based and are rarely understood or appreciated beyond the technicians who utilize them.

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[27] Using Spearman's equation for the determination of rank correlation coefficient:

$$rs = 1 - \frac{6 \Sigma d^2}{n (n^2-1)}$$

where d denotes the difference between ranks of X and Y.

In this paper, an attempt was made to present a simple manual scalogram technique and to demonstrate its utility in the rural areas. Indeed, the manual scalogram method shown here can be claimed to possess the advantages required of a method to be utilized in rural, low technology areas. First, the manual scalogram technique is simple to learn and requires no sophisticated equipment. In fact, the personnel who applied the scalogram in the Bicol project did not undergo any special training to learn the method. The only equipment they used were ordinary hand calculators for the computation of centrality indices. Second, the data requirements of the method are extremely few. The whole range of its data requirements are the following: 1) a listing of the settlements ("cases") to be covered by the analysis; 2) a listing of the functions or establishments previously chosen as functional indicators; and 3) information as to the presence or absence of such functions in the settlements being analyzed. As information regarding rural settlements are normally available, the only data that have to be generated are the "presence or absence" of the functions or establishments. In the Bicol experience, such data were generated utilizing local government offices within one month for the settlements of an entire province. Indeed, the parsimony in data requirements and the facility in generating such augur well for the utility of the method in data-starved areas. Third, the entire data-generation activity costed no more than ₱1,500.00 per municipality. Such costs however, can be drastically reduced if it were the municipality itself doing a scalogram analysis and relying on its own local government network.

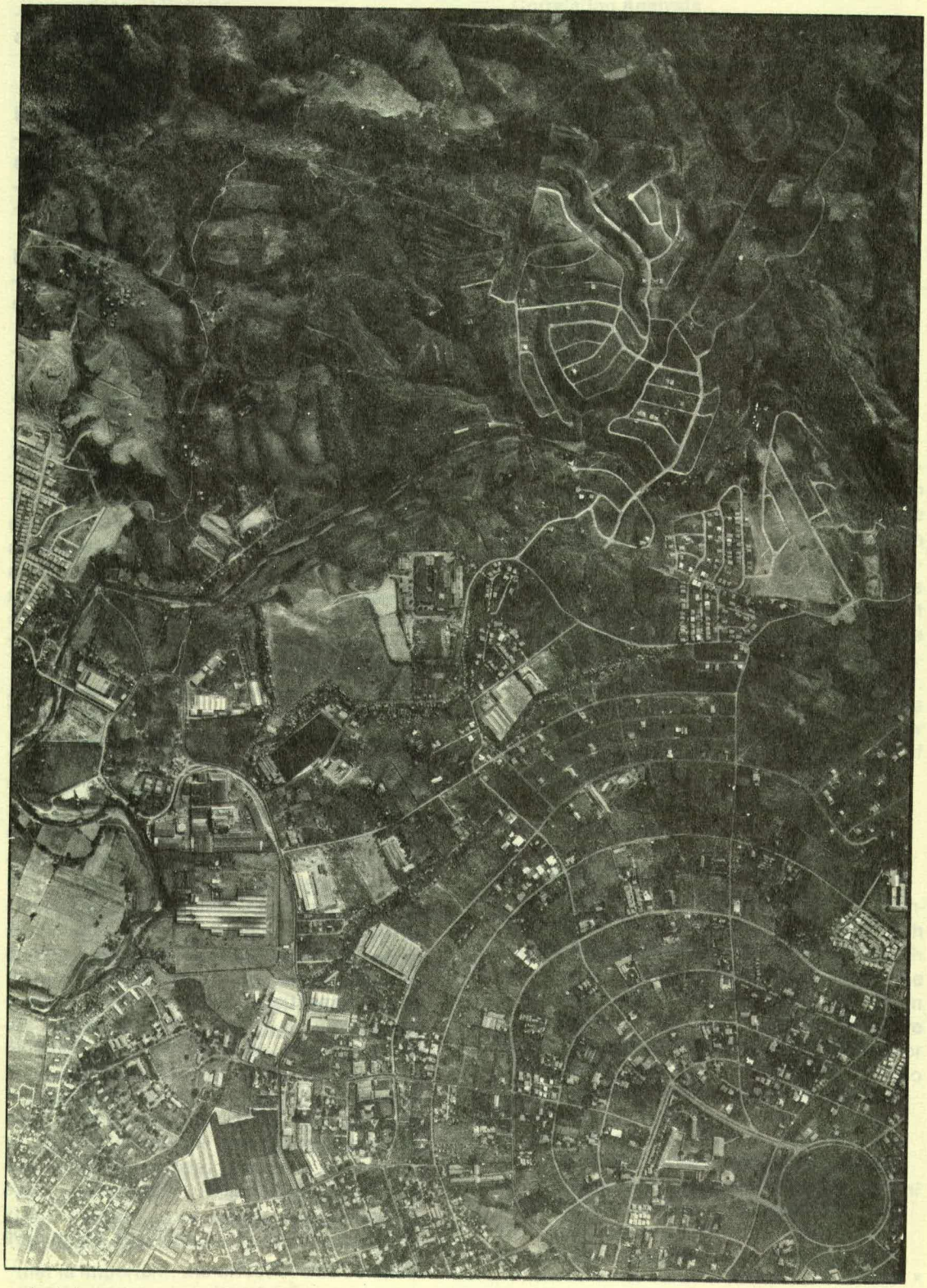
Despite the practicality and versatility of the scalogram, it cannot by itself be a complete source of information and insight into a subject spatial system. Like any technique, the scalogram needs to be analyzed in conjunction with or supplemented by other means of data analysis, if a comprehensive spatial planning exercise is to be undertaken. This, of course, means that information other than the "cases" and "items" and basic population data required for the construction of the scalogram needs to be generated. Such information will undoubtedly require other types of analytical methods to draw meaning and insights from.

It can be safely concluded, then, that:

1. a manual (graphical) scalogram method for determining central place hierarchies, complexities and centralities has been designed and is available for utility in low-technology areas such as our rural areas;
2. the method has been pilot-tested and found to be not only practical but necessary in the spatial analysis of the Bicol River Basin;
3. the method has been reasonably evaluated vis-a-vis another accepted computerized method and found acceptable and even superior in some respects.

These conclusions mark a substantial step towards the effort to imbibe current regional planning activities with a spatial analysis and planning dimension. The notice that is served is really for a point that needs no belaboring: the scalogram method is simply one technique out of the many that a comprehensive spatial analysis requires. In this respect, perhaps, some implications for further study can be identified.

The discussion of central place theory, if anything, pointed to many other aspects of spatial analyses not covered by the scalogram method proferred in this study: central place system analysis, functional linkage analysis, threshold analysis, to mention but an important few. The first, of course, refers to the determination of the unique members of delineated central place systems. The second, functional linkage analysis, deals with the assessment of the type and degree of functional linkages between and among central places and hinterlands. The last deals essentially with minimum service populations or "lower limits of goods." All these analyses, as far as their requirements arose during the UFRD study called for more organized, though practical methods of analyses. The UFRD pursued those through time-consuming and expansive surveys or subjective analyses, relying on local, key-informant information. Admittedly, more simple, practical but scientifically acceptable methods of analyses would have been more welcome.



Aerial photograph showing intensifying built-up areas from the mountainous to the flat lands.

ECO-ENGINEERING ANALYSIS FOR LAND-USE PLANNING

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Training Center for Applied Geodesy
and Photogrammetry
UP College of Engineering

Introduction

Awareness of environmental problems and knowledge of their possible causes are very essential in planning the development of an area, especially if activities to be undertaken will have great impact on the ecological balance of the community. Many hectares of agricultural and other rural lands in the Philippines particularly near the cities have ben converted to urban uses. These areas are used as sites for housing, industries, shopping centers, schools, and other activities. The shortage of suitable land for buildings and other structures around many cities in the country is forcing consideration of the use of steeply sloping and rolling land and natural hillsides without properly studying their suitability and without considering the consequent problem that development may bring to the ecology of the area. This situation suggests that studies should first be made before utilizing rural lands into more intensive uses. One of such studies is eco-engineering analysis which is the subject of this paper.

Eco-engineering analysis involves the ecological study of an area through which various physical aspects such as nature, landscape, space and natural resources (soils, water, vegetation, wildlife) are evaluated for appropriate use while simultaneously conserving the environment and maintaining the area's diversity and ecological equilibrium. The environment is analyzed by first identifying the phenomena or factors by which it is constituted, i.e., climate, geology, physiography, soils, vegetation, hydrology, wildlife and existing human use of the area. This is graphically represented in inventory maps.

The next step is to compile a series of derived maps in which the characteristics of the natural phenomena and processes are shown, how these affect and can be affected by human use. Thus, the geologic map can be transformed into separate or composite maps showing aquifer areas, mineral resources and structural bearing capacities. The physiographic regions can be broken down into slope categories. From a map showing various soil types, another one can be drawn showing potential areas for agricultural production, suitability for foundations, erosion hazards, and other types of information. The vegetation map can be transformed into a map showing, for example, agricultural land, undisturbed natural vegetation, and location of rare species.

The final step in eco-enginering analysis is to make a synthesis of the data leading to the production of a suitability or capability map for land use based on criteria established for selecting areas appropriate for each type of land use. This is done by adopting the "convergence area approach" wherein the derived or interpretative maps are superimposed with one another to determine where all the categories converge. The areas of convergence will be areas of prime suitability for that land use. In similar fashion, areas of lesser suitability and eventually those with severe constraints for that land use can be established. The process is then repeated for each prospective land use. At this stage it may also be determined how and at what cost such constraint can be overcome if desired.

Activities necessary to transform the natural resources of the area into new habitable and recreative country side values should

be such that they will be in harmony with the landscape's ecological conditions as well as within production energy capacity. That is, fitting engineering works into surroundings.

Aerial photographs will constitute the principal tool in obtaining primary data on the characteristics of the landscape. Photo interpretation techniques is used in extracting data from aerial photographs. The method is fast, economical and accurate. The information gathered from aerial photograhs will be supplemented and/or verified with ground truth information.

Methodology

An eco-engineering analysis of a given area will require preparation of three types of maps. Basic inventory maps are the first set of maps that should be prepared, or acquired, if they are already available. Easiest to obtain basic inventory map is the climatic map which shows the various types of rainfall distribution in the area. Soil maps showing various soils types in terms of texture, depth, parent rock, and fertility for all of the provinces in the Philippines are available. Many provinces have published soil survey reports which are very helpful in assessing different types of soils for development. The whole Philippine Island has a geologic map which can be utilized in interpreting the underlying rock formation and its characteristics. Provincial geologic maps are also available for some provinces. An elevation map which will show ranges of elevation of various parts of the study area can be prepared from an existing 1:50,000 scale topographic maps. Similarly, a slope map can be drawn by interpreting the contour lines depicted on the topographic map. The accuracy of the slope map prepared from a topographic map depends on the contour interval and scale. For provincial and municipal development planning and existing topographic maps in the Philippines are suitable for eco-engineering analysis of the area. Present land use maps may be prepared with the use of recent aerial photo coverage. The present land use map should show different types of natural and introduced vegetation, human settlements and infrastructure facilities such as roads and other man-made features. It is also necessary that a stream network maps be prepared from the interpretation of topographic maps and/or aerial photographs.

The second set of maps for eco-engineering analysis is called derived or interpretative maps. These are maps derived from basic inventory maps. Maps showing the sources of water and the potential impounding reservoirs can be derived from geologic maps, a stream network map and a rainfall map. The basic inventory soils, geologic, and climatic maps can be integrated and analyzed to produce a natural hazard map. This map will show areas with soil erosion hazard, landslide hazard, flood-prone and fire prone areas.

The third set of maps required is known as criteria maps. Each basic inventory map should be transformed into a criteria map. A criteria map will now indicate the areas suitable for a specific land use type. For example, if one criterion used in selecting the area suitable for lowland rice production is land with slope ranging from 0 to 3 percent, then the criteria map derived from basic *slope inventory map* should show only areas with 0 to 3 percent slope. The criteria map is useful particularly if the basic inventory map or the interpretative map is too complicated because of many delineations. A separate criteria map may not be necessary in cases where basic inventory maps do not have many delineations, or if use of *color* or *symbols* can already emphasize areas suitable for a particular land use.

Criteria maps constitute the working map and should be printed on transparent overlay with common scale in order to conveniently trace the convergence area and produce the final land suitability map for a specific type of land use.

One of the most important aspects of selecting area suitable for a certain type of land use is the setting of valid criteria for that type of land use. This is the aspect where technical knowledge and experience related to the specific type of land use are required. It is on this phase where much of the "thinking" is done since the accuracy of the land suitability map depends almost entirely on the criteria established for selecting areas appropriate for specific types of land use.

Recommended Criteria for Determining the Suitability of the Land for Certain Use Type

A. Residential Development with Public Sewage Disposal

The cost of excavation, bearing strength of the soil supporting the foundation, soil drainage, both surface and internal, flood hazard, topography, shrink-swell behavior of clay and depth to bedrock are all important factors to consider when subdividing the land for residential development.

Some important criteria to consider in selecting areas for homes and small buildings are as follows:

1. Soil
   - low to moderate shrink-swell behavior.
   - not less than one meter depth to bedrock.
   - not extremely stony.
2. Slope
   - should not be greater than 15 percent slope.
3. Depth to seasonal water table
   - not less than one meter in depth to water table.
4. Flood hazard
   - area should never be flooded.
5. Land use
   - forested area should be avoided.
   - prime agricultural land should not be developed for residential purposes.
   - not within an industrial estate.

B. Community/Secondary Roads

Factors influencing construction and maintenance costs of community/secondary roads are depth to water table, flooding hazard, load-bearing capacity of soil, stoniness, depth to rock, and topography.

Most important criteria used in selecting road corridors are as follows:

1. Depth to high water table
   - should not be less than 50 cm.
2. Flood hazard
   - no more than once in 5 years.
3. Depth to bedrock
   - not less than 50 cm.
4. Slope range
   - slope range of 0 to 8 percent is ideal
   - slope should not be greater than 15 percent
5. Load bearing capacity of soil (AASHO Rating)
   - A-1 to A-3 is ideal
   - A-4 to A-5 is moderately suitable.
6. Stoniness
   - avoid stony land or rubble land
7. Landform
   - avoid flood plains with many river scars and unstable soil condition
8. Land use
   - existing forest area should be avoided, if possible.

C. Picnic and Play Areas

The areas intended for picnic and playground should provide adequate space for limited running or unorganized games, picnic table and fire places. Soils should be capable of supporting and maintaining trees and grass under this use, with very little site preparation needed. The landscape for the site should be attractive.

Criteria use in selecting picnic and play areas are:

1. Soil
   - sandy loam is ideal
   - silt loam is moderately suited
2. Slope
   - should be less than 8 percent slope with maximum set at 20 percent slope
3. Inherent erodibility
   - slight to moderate
4. Depth to seasonal high water table
   - should not be less than one meter
5. Flood hazard
   - never or seldom flooded
6. Stoniness
   - none to very stony
   - avoid rubble land

Land Suitability Map

The criteria map for each of the basic inventory map—soils, slope, vegetation, water resources, and others, are superimposed with one another to determine the areas where all categories converge. The convergence areas constitute the areas suitable for

that land use. In order to avoid the difficulty of tracing the convergence areas, it would be necessary to superimpose only two or at most three criteria maps at a time, until all the maps have been considered. Fig. 1 shows the diagrammatic presentation of land suitability mapping.

The final map is the suitability map. This is the map that shows all the areas suitable for the particular land use type. Areas where all the categories converge represent the areas of prime suitability. Moderately suitable area can also be established by using a combinatioin of only few, perhaps only two factors. Eventually those with severe constraint for that land use can be determined. The process is then repeated for each prospective land use.

An Illustrative Case: A One Square Kilometer Area in Novaliches

The result of the study of one square kilometer (100 has.) area in Novaliches is presented to illustrate the eco-engineering approach in determining which portion of the 100 hectares is suitable for residential development with public sewage disposal. The residential area includes houses and their accessory units and neighborhood facilities such as schools, church, recreational and shopping center.

The factors considered in developing the area for residential use are elevation, stream network, slope, geology, soils and existing land use of the study area.

A residential area is usually located in elevation that will not be subjected to flooding but not too high to adversely affect the construction of infrastructures support and/or subject the inhabitants to unfavorable weather condition such as strong wind and rain. Except Baguio and most towns in the Mt. Province, residential areas in the Philippines are situated in relatively low elevation because many flat lands occur at this elevation concomitant with good accessibility and good source or conveyance of water. Figure 1a shows the elevation map of the area extracted and enlarged from 1:50,000 topographic map with 20 meter contour elevation interval. The portion of the area suitable for residential development using elevation alone as criterion is presented in Fig. 1b.

Stream network of the area indicates the availability of surface water from stream flow. Interpretation of stream network gives indication as to the susceptibility of the area to flooding. Dwelling units should not be constructed along the drainageway as they will obstruct the natural flow of the creeks and may expose the area to flash flood. The complete stream network in the one-square kilometer study area in Novaliches is shown in Fig. 2a. Figure 2b identifies areas suitable for residential development based on the analysis of the stream network.

In general, residential areas are developed on relatively level land, not subjected to flooding. The steepness of the land is one of the most important factors considered in residential subdivision development. Although most residential sections are on level areas many developers locate their subdivisions in rolling, undulating and even steep slope for aesthetic value. Figure 3a shows the slope inventory map of the study area while Figure 3b is the portion of the 100 hectares study area suitable for residential development based on slope.

Soils of the study area were studied on the basis of texture, depth, parent rock, and other factors, which can be interpreted in terms of foundation values, internal drainage, erosion susceptibility and soil fertility level. The soil map of the study area is presented in Figure 4a with portions rated suitable for residential development shown in Figure 4b.

The geology of the area was mapped on the basis of rock type underlying the granular materials (soils). This is important since type of rocks affect the bedrock foundation and the availability of ground water for domestic use. The geology map of the project area is presented in Figure 5a. The portion of the area suitable for residential development on the basis of underlying rocks is shown in Figure 5b.

In developing the area for residential subdivision it is very important to consider the existing use of the land. Prime agricultural land such as existing high-yielding rice production area should not be converted to residential use. Likewise, it would not be ecologically favorable to destroy the forest area for residential subdivision. Strips along national highways and superhighways should not be considered for future infra-

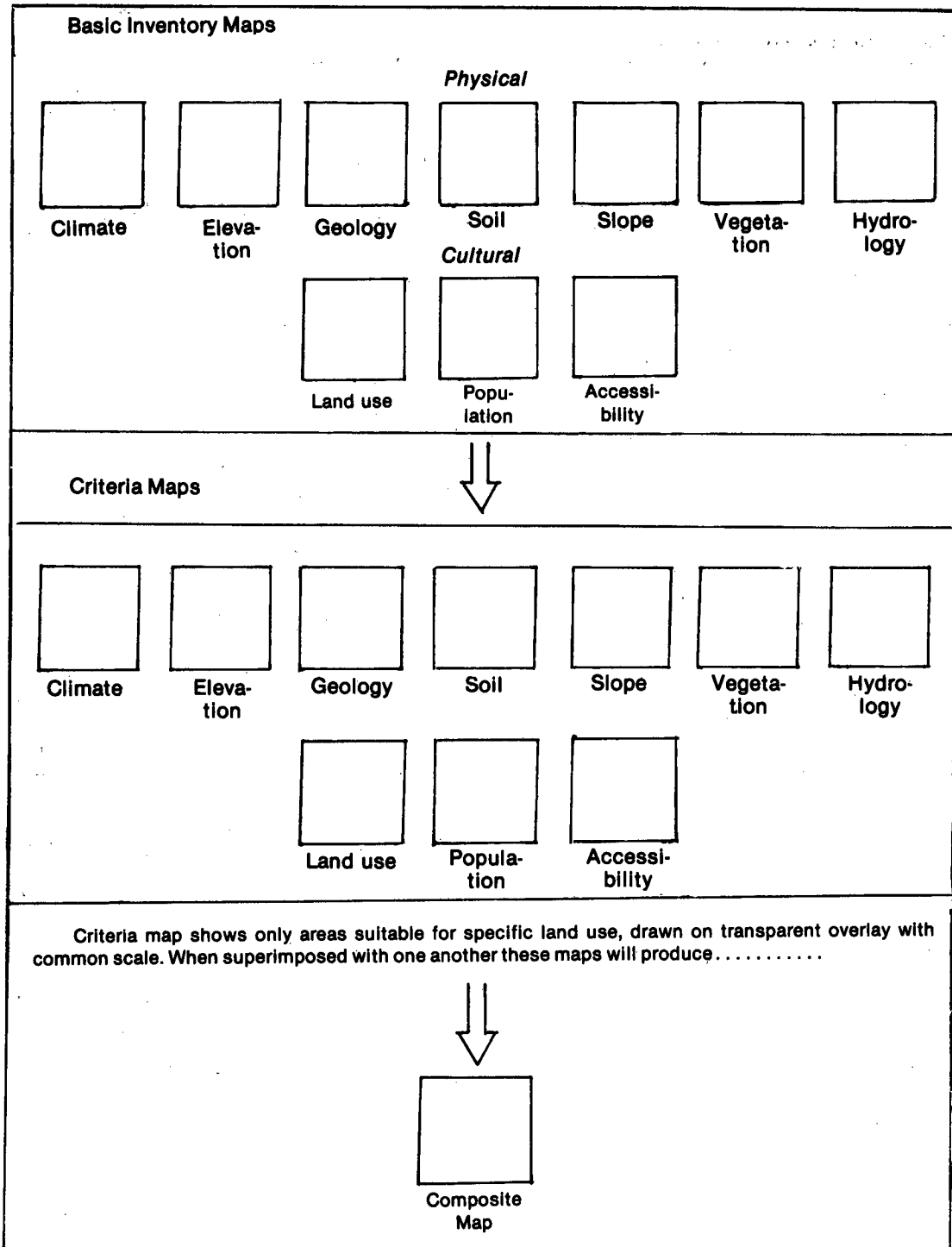


Figure 1—Diagrammatic representation of land suitability mapping using eco-engineering approach.

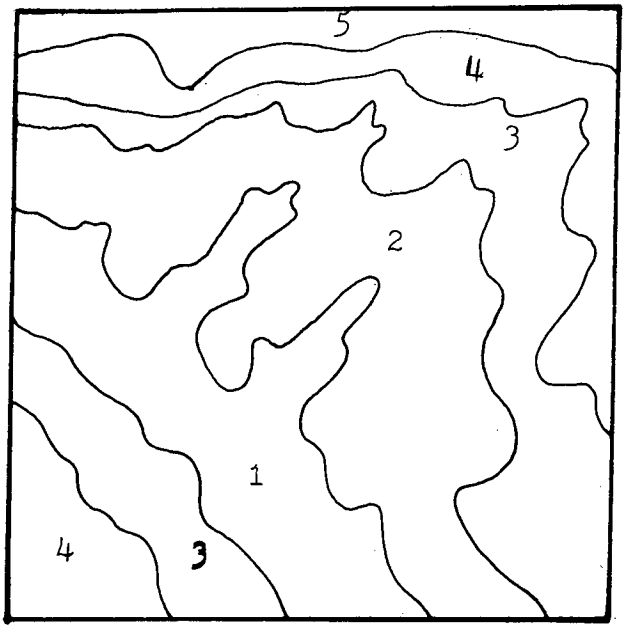


Fig. 1a. Ranges in elevation in meters above sea level. 1—0—50;2—50—100;3—100—200;4—200—500;5—Higher than 500.

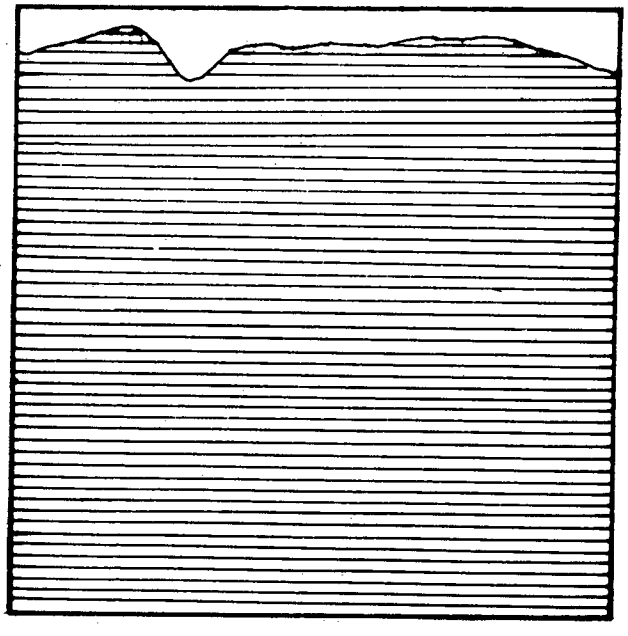


Fig. 1b. Areas suitable for residential development based on elevation (hatched).

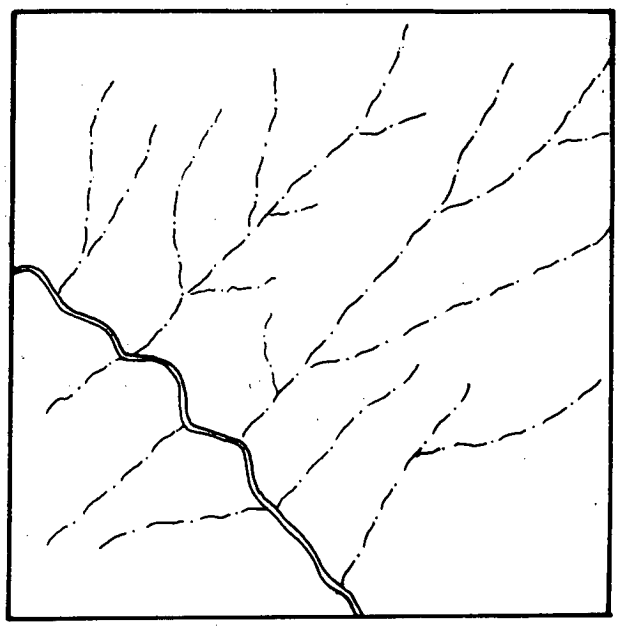


Fig. 2a. Stream network. Intermittent stream permanent stream.

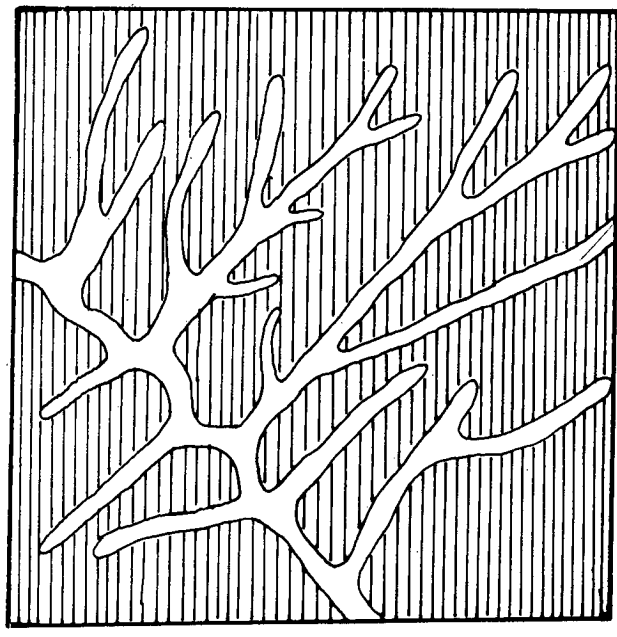


Fig. 2b. Areas suitable for residential development based on stream network (hatched).

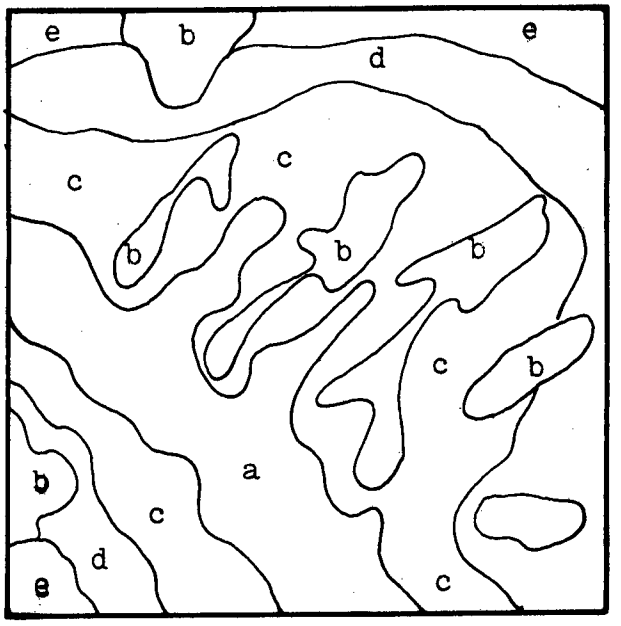


Fig. 3a. Slope map in percent steepness of land. a—0—3%; b—3—9%; c—9—18%; d—18—30%; e—more than 18%.

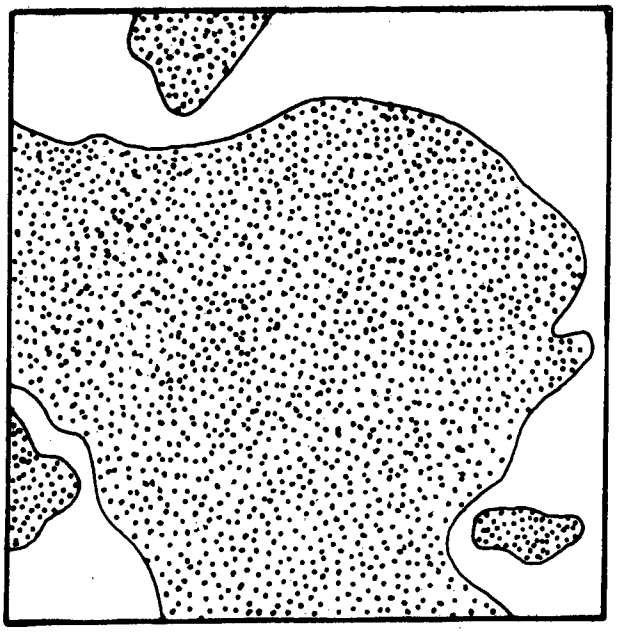


Fig. 3b. Areas suitable for residential development based on slope (dotted).

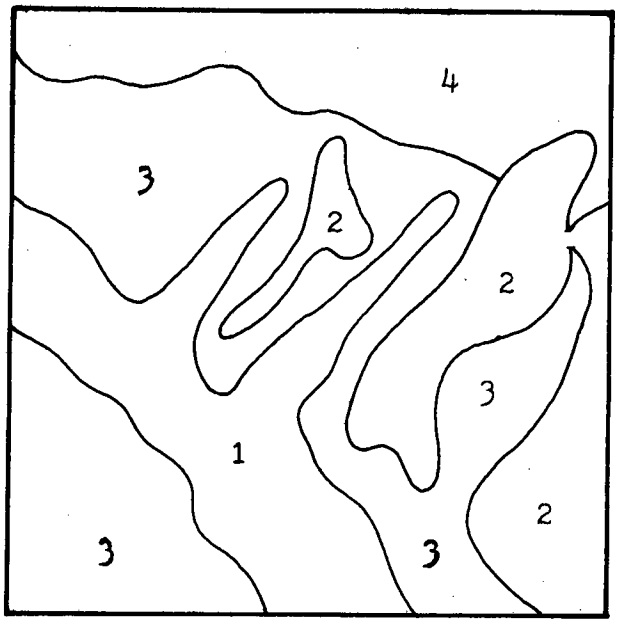


Fig. 4a. Soil texture and depth of top soil and subsoil.
1—silt loam, 50-100 cm. deep
2—clay loam, 50-60 cm. deep
3—clay loam, 30-50 cm. deep
4—clay, less than 30 cm. deep.

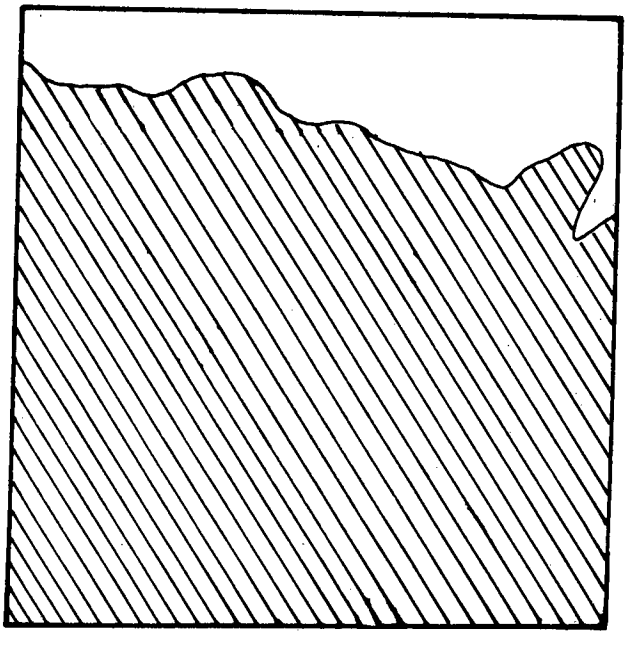


Fig. 4b. Areas suitable for residential development based on soil properties (hatched).

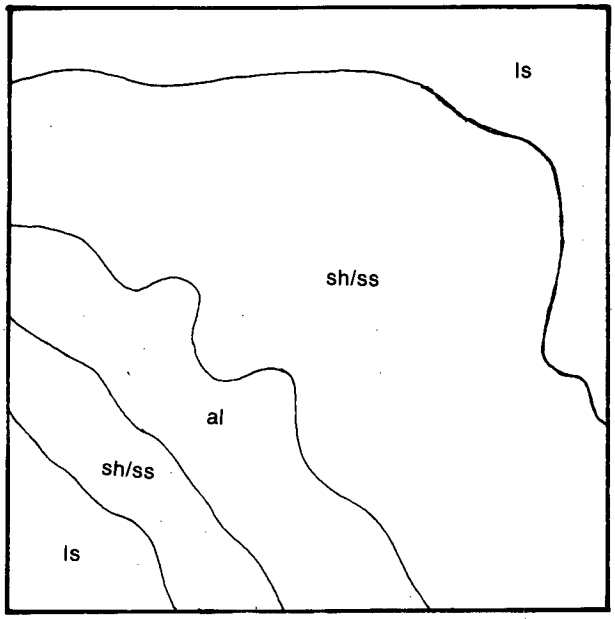


Fig. 5a. Underlying rock structure.
sh/ss — shale/sandstone
al — alluvial deposit
ls — limestone

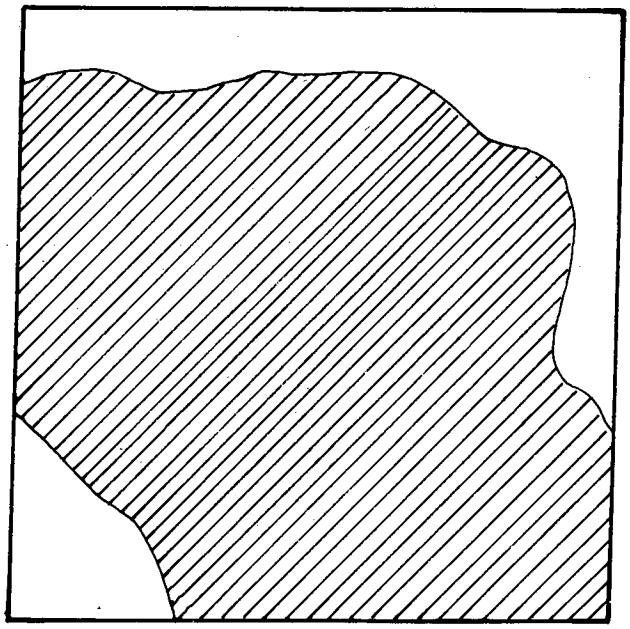


Fig. 5b. Areas suitable for residential development based on underlying rocks (hatched).

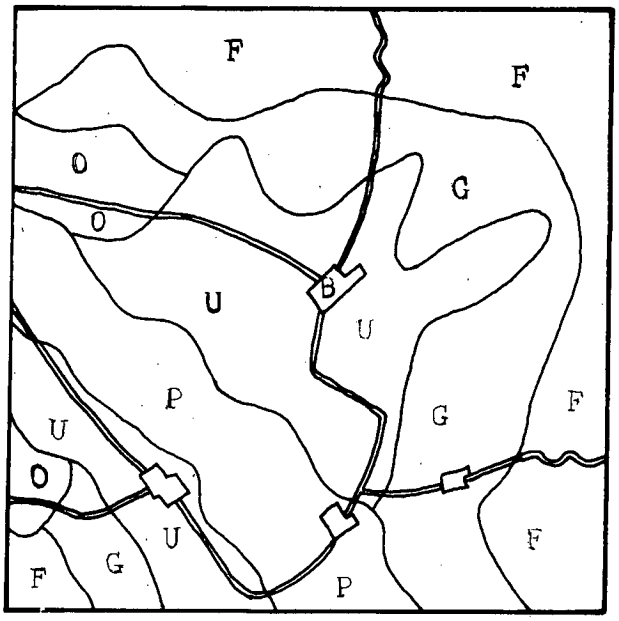


Fig. 6a. Land Use

P — paddy rice area
O — mixed orchard
U — cultivated upland crops
G — grasses, shrubs, brushes
F — forest vegetation
B — villages

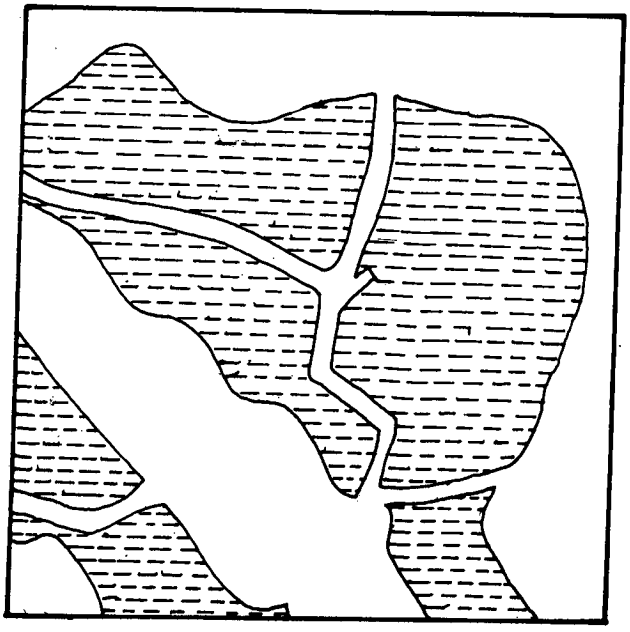


Fig. 6b. Areas suitable for residential development based on land use (hatched).

structure expansion. Based on the above factors a land use map of the area was prepared (Fig. 6a) to determine which portions of the land should be avoided for residential development. Figure 6b shows the areas suited for subdivision based on existing land use.

Identification of Areas Most Suitable for Residential Development Based on Interactive Effect of All Factors

Figures 1 to 6 show the area suitable for residential development based on the analysis of individual factors considered—elevation, stream network, slope, soils, geology and existing land use. But like any other use of the land, the selection of an area for residential development must be made on the basis of interaction of many factors. Virtually all activities imposed on land is affected by more than one factor and it is not wise to consider each factor singly. In any project the combined effect of several factors is the basis of making a decision.

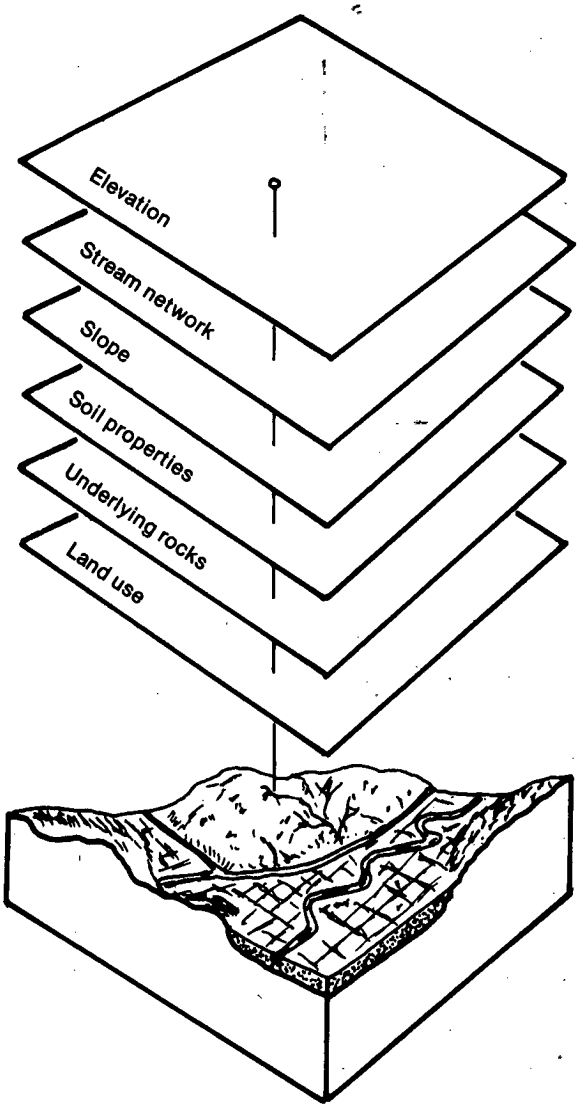


Fig. 7a. Superimposed suitability maps.

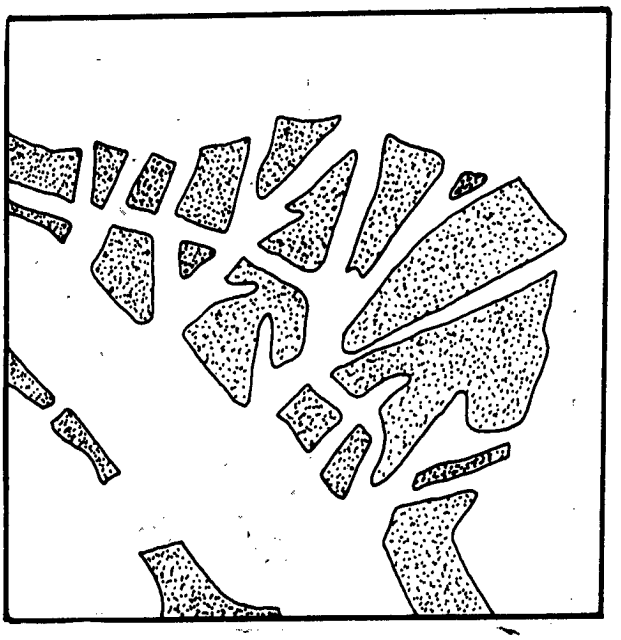


Fig. 7b. Areas suitable for residential development based the interactive effects of six factors—elevation, stream network, slope, soil, rocks, and land use.

Following the production of suitability maps for residential development (Fig. 1b to 6b) through analysis of the effects of individual factors, a composite map was prepared which synthesized the influence of all the factors. Figures 1b to 6b were superimposed with one another and placed over a light table (Fig. 7a). Areas where all favorable categories converge represent the area suitable for residential development (Fig. 7b).

This methodology is still being tested and modification of some aspect are being done to suit the development planners of developing countries like the Philippines. □

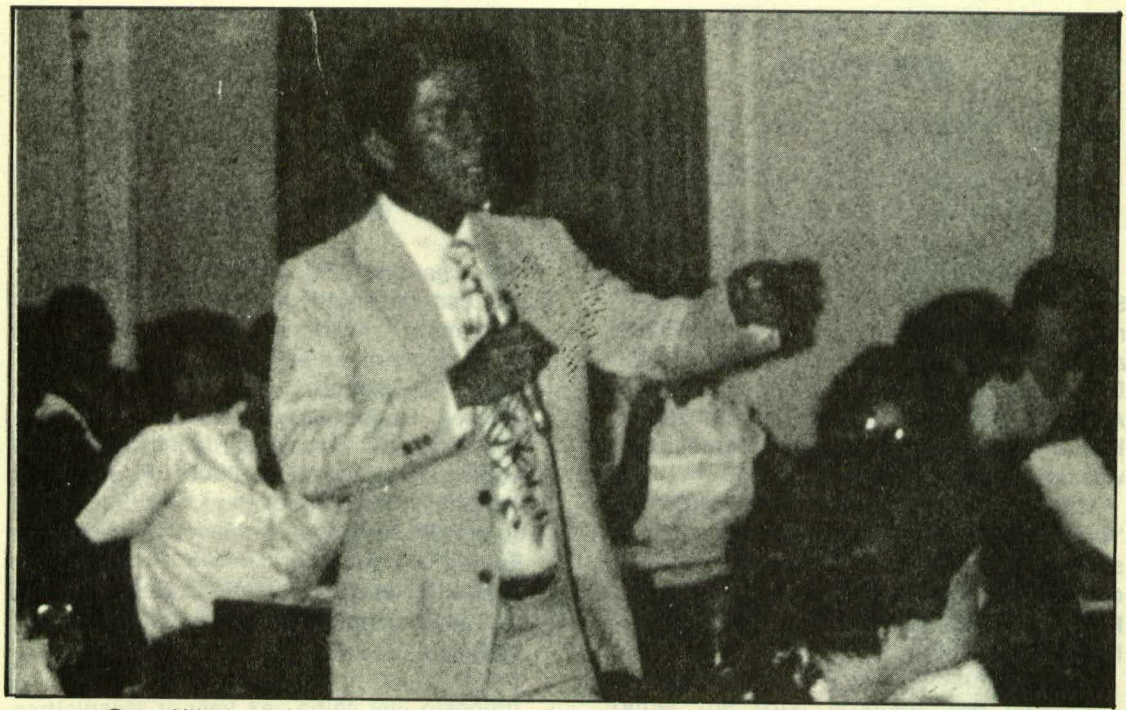
PLANNING NEWS

Dean Viloria Participates in Three Conferences

Dr. Leandro A. Viloria, dean of the Institute presented papers in the conferences he attended in the last quarter of 1981. In August, he presented at the UNESCO/RIHED Regional Conference in "Environmental Education in ASEAN Universities and Its Transfer," a paper entitled "Human Settlement Issues as Forces for Environmental Education Development." In his paper, he described the experience of IEP in designing and conducting its graduate studies and in-service training programs over the last 12 years.

In the Fourth Pacific Science Inter-Congress held last September in Singapore, he again presented a paper entitled *"Planning the Growth of Regional Cities in the Philippines: The Case of Metro Cebu."* The paper is a case study on the involvement of some faculty members of the Institute as consultants in the preparation of a comprehensive land use and transportation plan for Metro Cebu.

In November, he attended the HSD-ISS seminar on "Rural Development and Regional Planning in the 80's: Challenges and Priorities" held at the Asian Institute of Technology, Bangkok, Thailand. The paper he presented in this seminar is about rural development and regional planning in the Philippines.



Dean Viloria stresses a point in one of the conferences he attended as presentor.

PLANNING NEWS

MURP
Nine Receive Master's Degree in Planning

The U.P. Institute of Environmental Planning graduated two students in October 1981 and seven students in summer, 1982, under the Master in Urban and Regional Planning Program (MURP).

Eduardo T. Gonzalez and Mabini E. Arevalo, Jr., both with regional location theory as their field of specialization, successfully defended their theses entitled, *Wedge Model of Integrated Area Development* and *An Evaluation of a Method of Ecological Assessment for the Planning of a Sub-Region,* respectively.

The other new planners are: Victoria A. del Rosario, Roslyn M. Arriola, Harold J. Dacumos, Lourses N. Pagaran, Guido D. Torres, Gloria C. Viduya and George C. Villanueva.

Of the nine graduates, four specialized in Urban Planning and the rest in Regional Planning.

6-Month SCURP Winds up

The closing ceremony of the six-month Special Course in Urban and Regional Planning (SCURP) was held on 22 March 1982 at the Ipil-Narra Room, Manila Hotel. Dr. Arturo C. Corona, Commissioner for Appeals, Adjudication and Legal Affairs, Human Settlement Regulatory Commission, was the guest speaker.

This year's course had for its theme "Land-Use Planning," with Lubao, Pampanga serving as the laboratory town. The special course is under the supervision of Prof. Mehretab Tekie, Director of Training of the Institute.

Dr. Leandro A. Viloria, Dean of the Institute awarded the certificates to the twenty-two successful participants composed of: Relio B. Acero, Lilia H. Alconera, Virginia B. Auza, Carlomagno T. Castillo, Jr., Elizabeth B. Cruz, Godofredo A. dela Cruz, Edna M. Fabro, Daisy S. Fernandez, Joselito I. Gurrea, Aubrey M. Legaspi, Voltaire P. Legaspi, Herman T. Manaligod, Ramon S. Pacatang, Johnny R. Pamuspusan, Madona H. Peñalba, Erlinda G. Porral, Fernando B. Punzalan, Jr., Daniel C. Rañola, Benjamin C. Rosillo, Heidi C. Tan, Reinerosa S. Tinoco, and Mario I. Vergel de Dios.

PLANNING NEWS

IEP Completes 4th Planning Bibliography

The UP Institute of Environmental Planning announces the completion of its fourth *Annotated Bibliography of Philippine Planning.* The completion provides a compendium of local information sources in urban, regional and environmental planning and development available during the period 1975 to 1979. The 384-page bibliography consists of references to selected books and pamphlets, articles in journals, theses and dissertations, seminar/ conference papers and proceedings and legal documents. It is provided with a general index to allow access to the text by author, subject and title.

Launched in 1968, the bibliography series is designed to assist in meeting the local information needs of planners and other social scientist. Copies may be obtained at cost from the IEP Research and Publications Program. For inquiries, please call IEP (RPP) 97-16-37 or 97-60-61 local 653. □

Back from Japan

Rosario D. Jimenez, professor of the Institute is back from Japan after attending a Group of Training Course in City Planning. The course sponsored by the Japan International Cooperation Agency (JICA) and the Ministry of Construction of Japan through the Colombo Plan was held from August 22 to November 1, 1981. The course is part of the Technical Cooperation Programme of the Japanese Government for developing countries. Its objectives are to introduce participants to a general view of city planning in Japan and to exchange opinions and experiences through lectures, discussions and workshops. Observation tours allow the participants to visit key cities and planning projects in Japan.

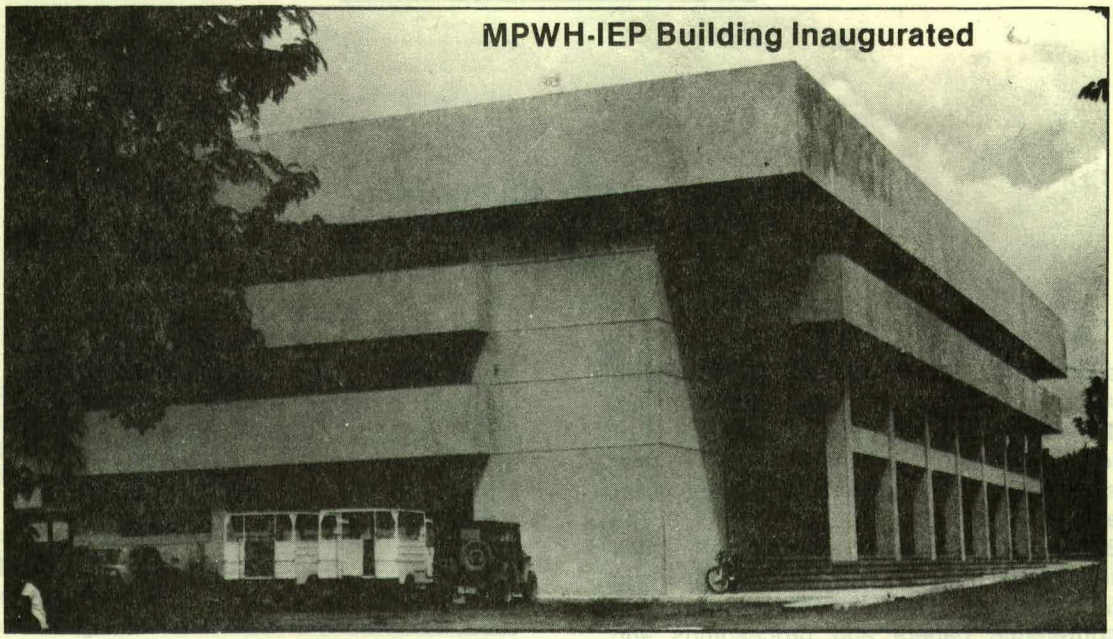
Idle lands to be Used for Housing

President Marcos created a Land Investment Trust through LOI 1117, ordering that all idle lands bought or foreclosed by the government be put in trust with the Ministry of Human Settlements. The Ministry will in turn determine which of these lands can be used for housing and development and which can be sold or exchanged for other assets through urban renewal program of the Ministry.

The urban renewal program is part of the face lifting of Metro Manila and aims to make idle lands productive and to replace old buildings with housing or commercial centers.

The project will start in Jose B. Laurel St. from Nagtahan bridge to Ayala bridge, and along Roxas Boulevard, from the Manila International Airport to the Rizal Park. This project will be financed by selling bonds and securing loans from local and foreign banks. Under the trust program, the MHS will guarantee the housing loans.

PLANNING NEWS



MPWH-IEP Building Inaugurated

Inaugurated last December 1 on the Diliman campus was the Ministry of Public Works and Highways-funded MPWH-IEP Building. Gracing the occasion as principal sponsors were UP President and Mrs. Edgardo J. Angara, Deputy Minister Aber P. Canlas, Dr. Oscar M. Alfonso, and Atty. Myrna S. Feliciano. Fr. Manny Gabriel blessed the new building.

Mrs. Gloria M. Angara cuts the ceremonial ribbon during the inauguration of the MPWH-IEP Building.

About the Contributors

EDUARDO T. GONZALEZ, MURP '81, is a fellow of the Development Academy of the Philippines (DAP). He belongs to DAP's community management and development group, where he is research coordinator of the project development and technical studies division. He is editor of *Daluyan,* DAP's quarterly review on development. Previously, he handed the Academy's publications program and the training and education program of the Foreign Service Institute. He had served briefly as consultant to the Ministry of Natural Resources.

Gonzalez, a member of the Pi Gamma Mu international honor society, graduated from the Harvard University public enterprise policy program in 1981. He finished geodetic engineering at the University of the Philippines where he was formerly editor of the *Philippine Collegian.*

JUNIO M. RAGRAGIO,JMURP'81, is a staff officer at the Development Bank of the Philippines (DBP) serving as assistant to Vice Chairman Don M. Ferry. At the same time he serves as treasurer of the DBP Management Corporation and Director of various DBP-assisted corporations.

He was a consultant to various government as well as private agencies. He was previously the coordinator for spatial planning in the "Urban Functions in Rural Development Project." The manual graphical method discussed in his article was earlier presented in a project conference in his report entitled: "The Design for the Identification of the Hierarchy, Centrality and Thresholds of the Central Place Systems in the Bicol River Basin."

ROMEO C. BRUCE, is a professor in Photo Interpretation in the Training Center for Applied Geodesy and Photogrammetry of the UP College of engineering. He holds the degrees of B.S. Agriculture from the University of the Philippines, M.S. Agronomy from the University of Illinois and a Ph.D. in Agronomy and Soil Science from University of Hawaii. He also had extensive training abroad in soil mapping, land classification and an advance course in air photo interpretation and remote sensing in Cornell University.

He has actively served as land-use planner and consultant in remote sensing and photo interpretation to public institutions and private enterprises here and abroad. Many of his research work have been published.

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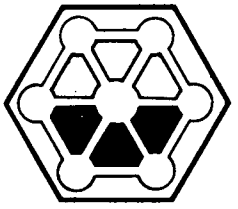

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