

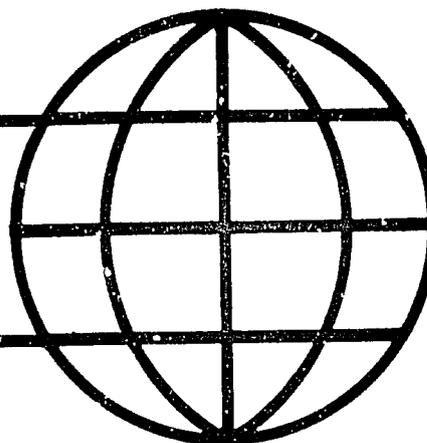
**COOPERATIVE AGREEMENT ON HUMAN SETTLEMENTS
AND NATURAL RESOURCE SYSTEMS ANALYSIS**

THE URBAN FUNCTIONS IN RURAL DEVELOPMENT PROJECT: ^{approach}
ITS APPLICATION IN POTOSI, BOLIVIA

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I. THE URBAN FUNCTIONS IN RURAL DEVELOPMENT APPROACH

Origins and Applications of the Approach

The project entitled Urban Functions in Rural Development (UFRD) was initiated by the Office of Urban Development of the United States Agency for International Development (USAID) in the mid-1970s. The origins of the project stem from a rejection of earlier, generally unsuccessful, approaches to development stressing the role of larger cities in regional growth. Typical of these were "growth pole" strategies which had been an extremely popular approach in the 1960s.

Conscious of the limitations of these strategies, and in response to new directives from Congress, USAID began to search for alternative approaches to regional development which would contribute to a more widespread and equitable pattern of development, directed towards not only those living in cities but particularly towards the poor majority in rural areas. Recognizing the important role played by market centers, small towns and villages in the rural economy, it looked for ways to strengthen the entire system of settlements and to link them with surrounding areas. This approach aimed at providing better access for the rural population to markets, farm supplies, social services and other necessary urban-based facilities, here referred to as urban functions and are understood to be essential to the development of the rural areas.

As an experiment to test the concepts and methods of planning integrated regional development embodied in the UFRD approach, pilot projects were launched in three countries. The first of these was started in 1977 in the Bicol River Basin of the Philippines, where the initial version of the methodology was formulated and tested and a replicable planning process was set up. A second experiment was launched in 1978 in Upper Volta under substantially different conditions. Whereas the Philippines has a relatively extensive data base for planning and analysis and an incipient hierarchy of urban settlements, Upper Volta is a predominantly rural country with very few towns of any size and only rudimentary statistics on the social, economic and physical characteristics of the population.

It was decided that the third application of the UFRD approach should be in Latin America, and after comparing alternative locations in Bolivia and Paraguay, USAID settled on the former. Bolivia was chosen partly because the government had already recognized the need for a better integrated spatial system to achieve more widespread economic development, and partly because the UFRD approach fit in well with a larger Rural Development Planning Program to be carried out in collaboration with the Bolivian Ministry of Planning and Coordination. The Department of Potosi was selected among potential sites since it contains a relatively large number of towns and villages, and since CORDEPO, the local development corporation, was willing to embrace the experiment in its planning process.

This paper briefly describes the UFRD approach to regional planning and its application in the Potosi region. It demonstrates how a comprehensive

strategy of integrated development was formulated based on an understanding of the region by means of the UFRD methodology.

The UFRD Approach to Planning

Three characteristics collectively distinguish the UFRD approach to regional planning from others. First, it focuses on the spatial dimensions of the regional economy rather than the sectoral dimensions, which is conventionally the case. Second, UFRD avoids the often arbitrary distinction between the urban and rural sectors, and instead treats the two as mutually reinforcing elements of a regional economy. Third, the UFRD approach incorporates a detailed methodology for bridging the gap between idea and action, for translating the concept of integrated regional development into specific plans and projects.

Conventionally, regional development plans tend to be made up of sectoral components, such as agriculture, industry, road-building, or education. All too often those engaged in the preparation of plans for one sector are largely unaware of what is being discussed in another sector. But even where a so-called integrated development project calls for inter-sectoral planning and coordination, it is rare that anything more than superficial attention is paid to the urban-rural system and the geographical location of projects. The Urban Functions approach, on the other hand, takes the spatial dimensions of the regional economy as its starting point, and works towards the preparation of plans for the integrated development of selected areas of the region.

This concern with the spatial dimensions of the region's economy is founded on the premise that the spatial structure of the region -- the relationship between urban and rural areas -- is closely related to the pattern of development which occurs there. Empirical evidence in many parts of the world shows clearly that the network of settlements and the links to their hinterlands are key factors in determining how the local economy functions and the manner in which development impulses are transmitted across a geographical area.

The diffusion of innovations such as new methods of production, communication, or medical treatment tend to be introduced in the principal city, and from there to be adopted gradually in secondary cities, intermediate centers and eventually smaller settlements. At the same time, the constant migration from rural areas to urban centers tends to concentrate in those places where there are new opportunities for employment and better services and infrastructure. Nevertheless, if there are gaps in the urban-rural system -- large areas where there are no important settlements with adequate infrastructure -- the diffusion of development impulses is impeded, or they may not be transmitted at all.

In the same way, spatial linkages between producers and consumers, or between inputs and outputs, influence the growth of economic activity. Farmers, for example, need access to agricultural supplies to improve their productivity and to markets in order to sell their produce. The lack of access in more isolated areas inhibits the adoption of more appropriate methods of farming, and reduces the incentive to increase production. Similarly, the location of new shops and small factories is determined to a large extent by

the size of the local markets, costs of transport, and agglomeration economies which derive from the proximity of complimentary services and activities. These factors are all related to the pattern of urban settlements and the linkages between them and their rural hinterlands.

The third distinguishing characteristic of the UFRD approach is the emphasis placed upon devising practical methods for translating the concept of integrated development into an investment plan for specific projects. The original UFRD concept paper by Dennis Rondinelli and Kenneth Ruddle included a vocabulary of techniques for spatial analysis based on five general principles.

The first principle declares that any attempt at integrated planning should aim not so much at producing a particular plan, but rather at establishing an ongoing planning process, capable of generating the information that decision-makers need in order to make informed judgments about alternative investment opportunities. Second, the scope of the spatial analysis to be undertaken, and thus the range of data to be collected, should be determined with a clear objective in mind: to facilitate the formulation of policy and the selection of projects. Third, the methods and techniques employed for planning purposes should be those that can be easily applied by local planners, who may not necessarily have advanced technical training in regional science, and which can be clearly understood by those who have to make decisions about the choice and location of projects. Fourth, studies should ideally maximize the use of existing information and embark on the collection of additional data only where this is essential for the purposes of analysis. Finally, given the inevitable constraints on the availability of data at the regional level in developing countries, planning staff should be encouraged to be innovative in adapting techniques for gathering and analyzing information to shed light on pertinent problems.

These principles guided the formulation of a ten-step planning methodology aimed at specific field applications. While particular details vary from case to case, the overall framework is clearly established. In Potosi this took the following form:

- | | |
|-------------|---|
| Analysis | 1) Analysis of Basic Resources; |
| | 2) Analysis of the Settlement System; |
| | 3) Analysis of Linkages; |
| | 4) Study of Accessibility; |
| | 5) Analytical Mapping; |
| | 6) Interpreting the Existing Spatial Structure; |
| Plan-making | 7) Elaborating a Strategy of Integrated Regional Development; |
| | 8) Identifying Projects and Preparing an Investment Plan; |

- Implementation
- 9) Implementation, Monitoring and Evaluation;
 - 10) Creating a Continuous Planning Process.

The first six steps are concerned with analysis, which is used in steps seven and eight for the preparation of plans and projects. Step 1 is intended to provide a quick preliminary overview of the region based on existing information. Steps 2, 3, and 4 examine the three main characteristics of the spatial system - its settlements, the linkages between them, and the population's accessibility to urban functions. The fifth step is devoted to mapping the resulting data and information. The sixth step draws conclusions from the preceding analyses about the existing spatial structure of the region and the constraints and opportunities for development. These form the basis in step 7 for tailoring the details of the UFRD strategy of integrated development to fit the specific characteristics of the region in question; in step 8, for selecting projects and drawing up an investment plan. Steps 9 and 10 are concerned with implementing plans and institutionalizing the process of planning integrated regional development.

II. ANALYSIS OF THE DEPARTMENT OF POTOSI

Data sources and field surveys

Throughout the Potosi project, efforts were made to maximize the use of existing data. Since there was little information on the spatial dimensions of the regional economy, however, the collection of extensive original data was unavoidable. The project team carried out three surveys simultaneously during a five week field trip. The first embraced 112 settlements, which included virtually every place in the department with more than 200 inhabitants and even a few smaller ones. In each settlement the survey team of two people interviewed a group of knowledgeable community leaders to obtain information on the principal economic activities of the locality, the range of services and facilities located there, and the extent of the area served by those establishments. This information was used for the analysis of the system of settlements and their linkages. The second survey, which was based on interviews with some thirty buyers and sellers in each market area, covered the fifteen largest markets in the region. In addition, a rapid classification of traders' stalls, which yielded information on the market's area of influence, the range of goods traded there, and modes of exchange, was conducted. In the third survey, two hundred families in urban and rural areas were interviewed to provide information for the accessibility study on the frequency of visits and journey times to selected functions.

Application of the Methodology

Of the ten steps of the methodology, the first six include methods for analyzing the components of the spatial structure of a region - its resources, the settlements, the rural areas, the links between them - and interpreting the results. The following pages outline how the six steps were applied in Potosi and describe some of the major characteristics that were later used to elaborate a regional development strategy.

1. Baseline Resource Analysis

The first step in the methodology applied in Bolivia was devoted to preparing a socioeconomic, demographic and physical profile of the region. This had two purposes. Initially it was intended to provide a quick preliminary overview based on existing information, which could gradually be amplified and improved as further data became available. Later, it would serve as a data baseline for monitoring and evaluating changes over time in the region's economy and spatial structure. In the Potosi project, this profile consisted of two parts: an inter-regional analysis in which the principal socioeconomic characteristics of the department were compared with those of the other eight departments of the country, and an intra-regional analysis based on a comparison of the component areas of the region, in this case the department's provinces, to reveal the variations within the region.

The inter-regional analysis compared departments in terms of population trends, migration flows, and the composition of economic activity as measured

by labor and capital inputs, the value of output, per capita income and location coefficients. Since data on economic activity were not readily available below the departmental level, the intra-regional analysis focused instead on population and employment characteristics, land use patterns, the geographical distribution of natural resources, and a set of development indicators calculated for each of the fifteen provinces within the department.

(a) The inter-regional analysis

A comparison of Potosi with other departments provided a clear illustration of a familiar paradox. It is a region that provided the greater part of the wealth of the Spanish empire for two centuries; afterwards it accounted for much of Bolivia's foreign earnings. It is today the most backward area of the country and falling still further behind. The source of the wealth comes from mining the rich and abundant mineral deposits, only a small part of which even today has been surveyed, much less exploited. As is often the case, however, mining in Potosi is an enclave activity that has created great wealth for some in distant places, but meager benefits for the local population. Until recently it had generated few forward linkages to related activities, with the result that the industrial sector was practically non-existent but for a few small food and drink establishments. Currently, there is substantial investment from abroad for the construction of large mineral processing plants using capital intensive technology, although given the large sums of money involved, the local multiplier effects are again likely to be restricted.

While rich in minerals, the agricultural potential of this high mountainous region is limited, though far from fully exploited. The cold temperatures, low rainfall and thin topsoil of the altiplano makes stock-raising difficult, while the cultivation of crops is restricted to more fertile plains and temperate valleys located in the east of the department. Despite these natural constraints, the agricultural sector in Potosi has suffered most from negligence, disinvestment and lack of government support. Output per worker in this sector is the lowest in the country and in the period 1970-77 investment actually declined 3.0 percent each year.

With the productive sectors of its economy in such poor shape, it was no surprise to learn that the Department of Potosi exhibits all the characteristics of a backward and lagging region. In 1976, per capita income as measured by value of production was the lowest in the country - at US\$458, compared to highs of \$802 in Oruro, \$767 in Santa Cruz and \$637 for the country as a whole - and in the period 1970-77 output was growing at a laggardly 2.3 percent per annum compared to 6.3 percent for the nation and over 10.0 percent in the frontier regions of the Pando and Beni. Faced with such poor prospects, people have been leaving Potosi faster than any other department in search of jobs elsewhere in the country, a net annual exodus of 6.4 people per thousand between 1971 and 1976.

(b) The intra-regional analysis

Within the Department of Potosi, the principal mining centers are located in the northern province of Bustillos around Llallagua and Siglo XX, around the city of Potosi and the famous Cerro Rico (site of the original discovery of silver in 1545) and in the southern provinces of Nor and Sud Chichas in the mountains around Atocha. The cultivation of crops is confined to a

transitional area of temperate valleys between the highlands to the west and the lowlands further to the east, chief among which are wheat, potatoes, corn, other vegetables and some fruits. On the altiplano itself and the mountains which bound it, together forming the greater part of the Potosi region, farming is restricted to raising sheep and llamas and to a lesser extent growing quinua, an indigenous and highly nutritious cereal. Given the distribution of natural resources, few people have settled in the western provinces, while most of the population is to be found in the eastern part of the department.

As part of the intra-regional analysis, a series of fourteen development indicators were calculated for the fifteen provinces, covering housing, health, education, employment, income, transport and communications. Most of these were derived from the population census or other published statistics; a few were based on information later collected in the survey of urban centers. Provinces were ranked according to each indicator, and an index representing the relative level of development was estimated on the basis of a weighted sum of the ranks.

The evidence shows a close relationship between the level of development and the level of urbanization in the provinces. In general, it is easier and cheaper to provide infrastructure to a people concentrated in a town than to those dispersed in the country. In Potosi, residents of more urbanized areas tend to be better paid, housed, educated, and in better health than those who live in rural areas. Consequently, as might be expected, a breakdown of provincial migration patterns confirmed a general drift from the poorer, more backward, rural provinces to more urbanized areas. In the period 1971-76, the five provinces with the highest proportion of urban population were the only ones to register a net gain in the inter-provincial exchange of migrants, as farmworkers sought new jobs in the mining centers and larger towns.

2. Identification of Settlements

The second step of the methodology examined the system of settlements. The purpose of the analysis was to define the hierarchy of central places in the region and to determine which functions are to be found at each level of the hierarchy. This information was later used to identify gaps in the urban system and in the distribution of functions that may be impeding development. Also included at this stage were a review of the growth of urban centers, an estimate of the minimum population required to support various functions, and an overview of basic infrastructure in urban areas.

Although Potosi is one of the least urbanized regions in Bolivia, it possesses numerous settlements. Between 1950 and 1976 the number of towns with more than 500 people almost doubled from 32 to 60, twenty of which have upwards of 2,000 inhabitants, more than are to be found in the Departments of Cochabamba and La Paz, which have larger populations. The pattern of growth and decline among these settlements is remarkably consistent: with few exceptions, the gainers are the mining centers and the losers are farming towns. An important exception, however, is Pulacayo, which in 1950 was the third largest town in Potosi with a population of 7,700. Over the next twenty six years, it lost 70 percent of its residents as the profitable mineral deposits were gradually

exhausted: a sharp reminder of the changing fortunes of such towns and of their impermanence.

The definition of the urban hierarchy and the classification of settlements at each level of the hierarchy was based on three criteria: the number of different functions to be found in a given place; the nature of those functions, which suggests the relative size of the town's service area; and an index of centrality, which provides a further measure of functional complexity in which functions are weighted inversely according to frequency of occurrence.

In each case the scalogram was used as the method of analysis. This is essentially an inventory, in the form of a matrix, which shows the functions to be found in each settlement. As a preliminary step in constructing a scalogram, settlements are ranked by size of population to the left of the matrix, while functions are grouped by sectors such as infrastructure, social services, and commercial activities along the top. The presence (or absence) of a given function in each place is indicated in the matrix itself. The number of functions in each settlement is found by summing the rows, while the frequency of occurrence of each function is calculated by summing the columns. This done, a revised version of the scalogram is prepared in which settlements are then ranked according to the number of functions they possess and functions are ordered from left to right according to their frequency.

A reduced version of the scalogram for the Department of Potosi is reproduced here and includes the more representative functions of only half of the 112 settlements. An examination of the data suggests that the urban hierarchy in Potosi consists of five tiers.

At the top is the regional center, the city of Potosi, with a population in 1976 of 77,000. Potosi possesses almost the full range of the 58 functions listed, including several which occur only once in the region such as the university, the Prefecture, editorial offices of a newspaper, a television station and regular air service.

At the second level are five towns with an average population of 12,500 which effectively make up three sub-regional centers: Llallagua and Uncia to the north, Uyuni to the west, and Tupiza to the south. Counting Llallagua/Uyuni as a single urban area, these towns possess a similar range of between 43 and 46 functions. Typical of these are hospitals, daily markets, manufacturing industries, commercial banks, rail service, long-distance telephone service, and depositories of the Mining Bank, where independent mining concerns can sell their output to the government.

In terms of functional complexity, there is a wide gap between the second and third tiers of the hierarchy, the so-called rural service centers, which include only eleven settlements with a mean population size of 3,200 and a range of between 20 and 28 functions. Characteristically these settlements contain weekly markets, health centers, vehicle repair shops, some kind of training center, and a daily bus service to other towns. At the fourth level, some 26 places with an average population of 1370 contain from 13 to 23 functions, most typically a post office, high school, doctor's clinic and clothing store. The remaining 70 settlements fall into the fifth category of

non-central places, having twelve functions or less, usually those that serve only the immediate residents, such as drinking water, electricity, a food store or junior school.

A closer examination of the scalogram reveals a weak relationship between the size of a settlement, measured by population, and its functional complexity. Uyuni, for example, with barely a quarter of the 30,000 population of Llallagua/Uncia, has the same number of functions, while Llica and Cotagaita with around 1,000 inhabitants each, have more functions than Catavi, which has seven times the number of residents. A look at the map quickly explains part of the reason: the distance from a given center to its nearest larger-sized neighbor. Thus, Uyuni has no competition for miles around while Catavi is a mere five minute bus ride from Llallagua. Another explanation stems from the favored treatment of mining centers, which are often equipped with basic infrastructure, health and education services, subsidized provision stores and other facilities, occasionally financed by the large private mining companies, but usually by the semi-autonomous state mining corporation, COMIBOL. Another factor is the low level of urbanization. With the majority of Potosinos scattered in small villages and rural areas, the population of a settlement is a poor guide to the number of people from roundabout who use its services and facilities. In such instances it is, therefore, inappropriate to estimate minimum population thresholds for specific functions using the conventional method in which threshold is based only on the number of urban residents.

3. Analysis of Linkages

Empirical evidence in many parts of the world shows clearly that the diffusion of social and economic development is closely related not only to the form of the urban hierarchy but also to the network of linkages which tie settlements together and connect them to their rural hinterlands. After analyzing the hierarchy of settlements in step two, the next stage of the methodology was to examine a range of physical, economic, and service linkages. Among these are road and rail links, production and marketing linkages, linkages related to the delivery of health and education services, technological linkages associated with energy and communications, and public administration linkages related to local government offices. This analysis helped to reveal which components of the spatial system were better articulated, and which others were poorly integrated or largely isolated. Information about physical linkages, such as roads, long-distance telephone lines, or electric power is usually available from the responsible public agency. But to describe most other kinds of linkages - those for production, marketing or services - it is necessary to find out, for example, where sellers are located and where their buyers come from. Similarly, information must be gathered for producers and consumers, teachers and students, doctors and patients. In Potosi, such information was acquired through surveys of settlements.

The main picture to emerge from this analysis was based on linkages, the the department is made up of four quite distinct sub-regions centered on Llallagua/Uncia in the north, the city of Potosi in the middle, Uyuni in the west, and Tupiza in the south. This was consistent with the findings of the scalogram analysis. Each of these centers stands at the top of a network of linkages which includes lower levels of the settlement hierarchy and surrounding rural areas.

Given the severe physical terrain of the region, the most important factor influencing linkages between places is the road system. There are no paved roads in Potosi, and few all weather dirt roads, the main ones connecting Potosi with Oruro to the northwest, Sucre to the east, and Villazon to the south, and Llallagua/Uncia with Oruro and Sucre. The linkages between towns lying along these routes are clearly stronger, while those areas of the Department with poor road connections to the city of Potosi are likely to depend more on other regional centers outside the Department, the northwest on Oruro, the northeast on Cochabamba and Sucre.

Another feature which emerged from the linkage analysis is that despite poor roads, limited public transport, and the widespread reliance on llamas and mules for shipping goods, people travel enormous distances. To some extent this is due to the absence of facilities in nearby towns, especially agricultural supply stores, for example, which are found in only half a dozen places in the entire department. But it is also due to the poor standard of services, particularly education and health care. It is commonplace for children in rural areas to move far away from home in search of a full curriculum high school. Similarly, while medical stations and health stations - the former supposedly staffed by doctors, the latter by nurses - are scattered liberally in all parts of the region, few are functioning properly due to the lack of staff, supplies or equipment. Thus, prospective patients prefer to travel farther to a city with a larger facility to ensure better attention.

4. Accessibility Study

The analysis of settlements and linkages provided the overall dimensions of the urban-rural system of the region. In an attempt to define the effective service area of a town with greater precision, a new step in the methodology was introduced in the Potosi study. This was an accessibility model designed to measure the level of access of the population to specific services and functions and to evaluate alternative solutions for improving physical access.

The level of access is measured in terms of two factors. The first represents the convenience of travelling to a given service or facility, which is high in those zones where there are many establishments within easy reach, and declines as the number of establishments falls and the travel time increases. The second factor represents the relative importance of the function, on the assumption that some (for example, markets) are more crucial than others (a civil registrar's office) in the daily life of the local residents. Relative importance is based on observed travel patterns, and is estimated in terms of the average frequency of visits and the average time of travel and the proportion of the population that normally uses that function. For the purposes of evaluating alternative solutions for improving access, the model includes a third factor, the population of a zone, to arrive at the zone's total accessibility.

In order to construct a model, a fair amount of data is required. In Potosi much of this was culled from existing sources and from the survey of settlements, but the need for information on travel patterns led to the separate survey (mentioned earlier) of some two hundred families in urban and rural areas.

This household survey yielded a wealth of information on the relationship between journey times and frequency of visits to twenty-five functions, including health and education facilities, several kinds of shops and stores, public offices, and services for mining and agriculture. Not surprisingly, schools emerged as the function visited most often, with an average journey time of fifteen minutes. Next most frequent were visits to the grocery store, once or twice a week with an average travel time of about half an hour; to markets, nearly three times a month with a mean two hour journey time; and for cooking and heating fuel, twice a month at about an hour and twenty minutes.

Among different functions the distance decay relationship, reflecting the drop off in frequency of visits as journey time increases, varied widely. It fell off most rapidly in the case of grocery stores, more gradually for other kinds of shops and stores, still less for markets, and hardly at all for hospitals, health centers, and agricultural supply services. Based on the method adopted here, the most important function turned out to be the market, followed by the grocery store, fuel store, pharmacy, junior and senior high schools, and post offices. By this reckoning local health facilities and agricultural supply stores appear among the least important functions, due to the small number of visits. However, this reflects the existing scarcity of such establishments, rather than an estimation of their inherent value.

While the results varied widely among different functions, two conclusions are clear. First, overall accessibility throughout the Potosi region is extremely poor: if "effective" service is defined as 50 percent or more of the level of access that is observed in urban centers, then less than 20 percent the population is adequately served. Second, the better served areas with higher levels of access are those lying adjacent to the main roads within close reach of the larger urban centers. As roads deteriorate and distances increase, levels of access fall off sharply, to the point where many areas have little or no access at all to some functions, especially in the northeast and much of the west of the department.

5. Analytical Mapping

Given the emphasis in the UFRD methodology on the spatial dimensions of regional development, an essential activity that complements each stage of the analysis is the representation of as many of the results as possible in a series of maps. The visual format of the map, using transparent overlays all drawn to the same scale, makes it easier to pick out general trends, to relate one set of information to another, and to draw conclusions about the existing spatial structure of the region. Later on it also facilitates the process of designing packages of related projects in specific areas.

To provide clarity and emphasis, it is preferable to prepare separate maps for each kind of information. To start with, one needs some good basic reference maps, showing topographical features, accurate and up-to-date information on roads and railways, political divisions and administrative boundaries, and especially the aerial accounting units of the population census. Of particular importance for later stages of project identification are a series of maps showing natural resources, soil types, crop patterns, and land uses, though much of this information is difficult to obtain. At the same time, as each

stage of the analysis is completed -- on the settlement system, linkages and so forth -- sets of maps can be prepared summarizing the results. This speeds the the learning process of the project team, and makes it easier to explain their work to colleagues and other professionals involved in the planning process.

6. Interpretation of the Existing Spatial Structure

Step six of the methodology drew together the strands of the previous analyses in order to derive conclusions about the existing settlement structure of the region and what this implies for planning future development. Planners need to know specifically which areas of the region are better articulated, and which others are weakly integrated into the urban-rural system, or have poor access to town-based services. It is helpful to borrow loosely some ideas from central place theory, particularly the notion of a hierarchy of urban settlements, each with its surrounding market area. In a region such as Potosi, where assumptions of a flat plain and homogeneous distribution of resources are so obviously violated, the real world situation is unlikely to bear much resemblance to the neat regularity predicted by theory. Nevertheless, the concept of a hierarchy of central places and graduated market areas, or functionally economic areas, matched against empirical findings, helps to identify spatial and functional "gaps" in the system: areas which lack urban service centers where the model suggests they might be expected, and functions which are absent in towns where the scalogram analysis suggests they might be found.

Although for planning purposes the region of Potosi is synonymous with the political unit of the department, in terms of its functioning as an economic unit, many peripheral areas of the department are more closely tied to outside regional centers, particularly the northwest with Oruro, the extreme north with Cochabamba, the northeast with Sucre, and parts of the west with Calama in Chile. Within the region, four sub-regions are clearly discernible. However, due to the large distances involved, the influence of Uyuni as a sub-regional center in the west weakens to the south and on the far side of the salt flats in the province of Daniel Campos. At the third level of the hierarchy, the situation becomes patchy. Many areas adjacent to good roads have reasonable access to rural service centers, and thus may be regarded as integrated into the urban-rural system. However, many other areas lack rural service centers, and hence should be defined as poorly integrated, in some cases not at all. At the fourth level of the hierarchy, the local areas, the system is particularly weak, due to the dearth of small towns equipped with adequate facilities to perform the role of local service centers.

In short, while it may be said that some elements of an articulated spatial system are in place in the Potosi region, principally along the main roads, many pieces are missing. Large areas are poorly integrated; some are quite isolated. The process of urbanization is still at an early stage and few towns possess the infrastructure necessary to function as service centers. Most serious of all, the widespread lack of adequate secondary roads means that most towns are weakly linked to their rural hinterlands.

III. ELABORATING A REGIONAL DEVELOPMENT STRATEGY

The foregoing analyses point to a number of conclusions with implications for development policy. First of all, it is quite clear that despite the presence of considerable mining activity, which generates a major contribution to the country's foreign exchange earnings, the Department of Potosi is the most backward region of the country, and falling further behind. It has the lowest per capita income, the highest level of infant mortality, and the slowest growing population. As is so often the case, the mining sector proves to be an enclave that generates few benefits for the local inhabitants. On the other hand, the agricultural sector, which still absorbs the majority of working population, has suffered from underinvestment and widespread neglect which in recent years has led to an absolute decline in the value of production. It is clear, therefore, that in order to achieve a more widespread and equitable pattern of development within the region, support of the rural sector has to be the cornerstone of development policy.

Second, the analysis of health, education, and other welfare indicators for the provinces of the department shows a close relationship between the level of development and the proportion of the population in urban areas. Incomes are higher in urban occupations like manufacturing and commerce than in agriculture, and town-dwellers have better access to amenities such as schools, health care and basic services. Moreover, the provision of such services to a population concentrated in towns is obviously easier and less costly than to households scattered in rural areas. This implies that a second component of development strategy should be to encourage the concentration of the rural population in small and medium-sized settlements.

Third, an analysis of the growth and decline of settlements reveals that with few exceptions it is the mining towns that have gained and the farming towns that have lost, a pattern that closely reflects the relative priority accorded at the national level to mining and agriculture. At the same time the scalogram analysis showed that seven of the eleven third-tier settlements of the urban hierarchy, so called rural centers, and almost half the fourth tier, or local centers, are mining towns, even though proportionally they represent a much smaller fraction of the total number of towns and villages. Much of the infrastructure and social services found in these mining towns has been provided by COMIBOL or other large mining corporations, while the provision of such amenities to farming communities has been largely ignored. It is clear that there is an urgent need to redress this imbalance by increasing investment in social infrastructure in selected towns and villages serving the farming population.

Furthermore, it is evident from an examination of the distribution of other urban functions that there is a widespread lack of the infrastructure and services required for agricultural production, such as irrigation, storage facilities, farm supply stores for seeds, fertilizers, tools, and equipment, as well as mills and other plants for processing farm produce. This once again reflects the low priority previously given to agriculture in the region, and the weak demand for such facilities due to the low level of income of most

farmers. It is clear that future development policy should pay particular attention to the provision of such infrastructure.

Finally, the studies of linkages and accessibility demonstrate the paramount importance of feeder roads in connecting rural communities to their nearby urban service centers, not only as a means of increasing access for the rural population to the services found there, but also as a way of enlarging the potential market areas of smaller towns, thus inducing the location of prospective manufacturing and commercial activities there. This in turn serves to generate new employment opportunities, providing an incentive for the rural population to concentrate in these settlements. Hence, high priority should be given in future plans to improving the integration of outlying and poorly served rural communities.

To all intents and purposes, therefore, the initial framework posited in the UFRD approach of spatially integrated development appears to be valid in the Potosi region, and to be closely compatible with the viewpoint of local planners. The following pages describe how this framework was translated into the global and spatial strategies for the regional development plan for the Department of Potosi.

The Global Strategy

According to this plan, global or macro-level policy embraces two sets of objectives, one at the national level, the other at the regional level. The set of national objectives derives from an argument that Potosi's plight of poverty and backwardness is due to two factors, both of which can be attributed to national policies. The first of these arises from the country's long-established policy of development based on the export of raw materials, first silver, and now tin and other minerals. The second factor is the continued subjugation of the region in face of other national priorities, which has resulted in the exploitation of the region's riches for the benefit of other parts of the country, notably the so-called "central axis," comprising the cities of La Paz, Cochabamba, and Santa Cruz.

Faced with this predicament, the five year development plan written by the CORDEPO planners lays down three objectives to be attained at the national level. First, national development plans should no longer disregard regional priorities, but should address them directly. Second, the present de facto policy of preferential treatment for a few selected regions should be replaced by a national policy of regional development that strives for the complementary development of all regions in harmony. Third, the central government should support such a policy by providing permanent financial and technical assistance to the responsible agencies to allow them to carry out mutually agreed priorities for the social and economic development of each region.

At the regional level, two objectives are specified, both of which are clearly concerned with equity: to maximize the growth of the local economy in order to reduce the gap in income levels between the nation and the region; and to reduce the even wider gap within the region between the welfare and living standards of urban and rural inhabitants.

To accomplish regional objectives, the plan proposes a four-point strategy of supporting agriculture as the cornerstone of regional development, coupled with efforts to promote industries related to agriculture, to provide the infrastructure and services necessary for facilitation of the production and marketing of agricultural goods, and to encourage the concentration of the rural population in selected towns and villages.

The arguments behind the choice of agriculture as the cornerstone of development policy have been alluded to before, but bear additional comment. It is not an obvious choice in a region where the principal economic activity has always been mining, and the agricultural potential of the region is not rich by comparison to other parts of the country; but the economic reasons are compelling. The agricultural potential of the region may not be as great as other parts of the country, but it is often underestimated, and has only partially been exploited. Due to the widespread lack of roads in many areas, much of the farming is at subsistence level, yet there are considerable possibilities for producing surpluses to be marketed in nearby towns and cities. Moreover, despite the predominance of mining, the principal means of livelihood for the majority of the workforce is still agriculture. Thus, if the objective is to improve the welfare of the rural poor, it becomes imperative to focus development efforts on the farming sector.

This may appear to be an argument for greater equity, but there are other considerations relevant to longer term national objectives for economic development. Bolivia is a poor country with a small population and an incipient industrial sector. Efforts to encourage domestic manufacturing founder because of the lack of a local market sufficiently large to permit significant economies of scale. Before Bolivian industry can grow, or create new employment opportunities to absorb surplus labor from agriculture, it is essential to raise income levels of the majority of the population in order to expand effective domestic demand. Since most of the people are still living in rural areas, this can only be accomplished by a broad-based policy for rural development, which is thus not merely desirable for equity reasons but an essential precondition for the longer term economic prosperity of the country.

If agriculture is to be the cornerstone of development policy, the promotion of related industries is crucial to stimulate and diversify demand for local farm produce. With potatoes, corn, and wheat as the main crops, followed by other cereals, vegetables, some fruits, and animal products, there are ample opportunities for storage and packaging facilities, mills, slaughterhouses, and other small scale labor-intensive food processing operations.

Agricultural production is unlikely to increase without overcoming the extensive deficiency of farm-oriented infrastructure and services, and complementing this with other basic necessities for rural inhabitants. The provision of infrastructure is to include, where appropriate, irrigation works, technical assistance, credit, production and marketing cooperatives, and above all rural feeder roads. To improve the rural population's access to social services, it is intended to rationalize and upgrade the present distribution of schools, health facilities, and other basic amenities.

The promotion of new industries related to agriculture in small and middle-sized settlements also serves other goals. The prospect of better jobs,

coupled with the policy of upgrading the provision of infrastructure and services in selected towns and villages, is designed to provide the incentives necessary to encourage the rural population to resettle in the smaller urban centers. The increased urbanization of the population is expected in turn to facilitate the diffusion of developmental impulses and to act as a catalyst in exposing farmers to more modern methods of production.

The Spatial Strategy

Thinking through the implications of the spatial analyses in line with the UFRD approach to integrated development led to the identification of two key elements in the spatial strategy: the articulation of the urban-rural system, and the integrated development of component areas of the region based on their productive potential.

1. The Articulation of the Urban-Rural System

The first element of the spatial strategy, the articulation of the spatial structure, is designed to strengthen the hierarchy of central places, particularly the small and intermediate-sized settlements; to improve the linkages between them and their surrounding communities, in order to integrate isolated or peripheral areas; and to provide the necessary facilities in each center to support agricultural production and to meet the basic needs of the predominantly rural inhabitants.

Strengthening the urban hierarchy means selecting towns and villages which have the potential to act as rural and local service centers in those areas which at present lack such places. In Potosi, the selection of these centers is based on three factors: the economic potential of the locality and its longer term prospects for continued growth and prosperity; its links to both other towns outside the area to the surrounding communities it is intended to serve; and though less critically, the existing range of functions to be found in the settlement. Particular attention is paid to reinvigorating some of the traditional farming towns which in recent years have suffered decline.

Improving linkages means constructing or upgrading main roads between the larger towns in the region, and also building feeder roads to connect service centers to their surrounding rural communities. This is intended not only to raise levels of access for the rural population to amenities located in urban service centers, but also to expand the potential market size for manufacturing and commercial establishments located there. It also becomes much easier for farmers to transport their goods to market, and this is expected to provide a major incentive to increase production.

Strengthening the urban hierarchy also means installing new urban functions in service centers where they are missing, and rationalizing the distribution of existing facilities, which in some cases could mean that certain establishments may be eliminated.

2. The Integrated Development of Component Areas

While sectoral strategies focus on the vertical coordination between projects in the same sector, the integrated development coordination of component

areas of the region is oriented towards the horizontal coordination of projects in the same area. These component areas are defined along the lines of the functional economic areas identified in the foregoing spatial analysis. The purpose is to promote the social and economic development of a given area as a whole, which implies a package of related actions to increase production, raise productivity, facilitate marketing, and improve the health and welfare of the inhabitants.

However, the starting point for this element of the strategy is the exploitation of the productive potential of each area, which is taken as the sine qua non of development, the economic base on which the long term prosperity of the inhabitants depends. The design of the project package thus begins by identifying the main economic activities of the area, and figuring out the infrastructure and services needed to support these activities, such as irrigation, credit, technical assistance, storage and market facilities. Alongside the actions in support of production, the package also includes other projects designed to take care of community needs for education, health care and other basic amenities.

In Potosí, the concept of designing packages of projects for specific areas, as opposed to the more conventional approach of individual projects in each sector, introduced a new perspective on the allocation of investments. Whereas before, the discussion had always been in terms of sectoral needs and priorities, now for the first time in distribution of resources in different parts of the department was taken into account explicitly: planners and decisionmakers were able to consider instead the options of giving priority to specific provinces or areas of the region.