

# Integrated Regional Development Planning: Linking Urban Centres and Rural Areas in Bolivia

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**Summary.** - Highly polarized settlement systems in developing countries reflect and tend to reinforce strong disparities in levels of development between the largest city and other regions and between urban centres and their hinterlands in rural regions. Integrated regional development planning seeks to create a more diffuse and articulated system of settlements in order to diversify the services and facilities available to rural residents, increase their access to town-based markets, new sources of agricultural inputs and non-agricultural employment opportunities, and to provide guidelines for sectoral investment and location decisions. One approach to integrated regional development planning - 'Urban Functions in Rural Development' - was tested in the Department of Potosi, Bolivia, and its results provide insights not only into the methodology of analysis but also into the complex relationships among rural development, patterns of human settlement and processes of spatial interaction.

## 1. INTRODUCTION

The pattern of economic development that has emerged in most of South America during the past 25 years has been highly dualistic. Economic and social progress can clearly be seen in the industrial sectors of most countries and in the largest metropolitan areas - where the bulk of modern industry, infrastructure, services and institutions are concentrated - but pervasive poverty remains in rural areas where nearly 40% of the population lives. Large and growing disparities in income, wealth and access to services and productive resources are evident among different income groups, between urban and rural areas, and between more and less urbanized regions.

The economic dualism that characterizes development in South America is reflected in and reinforced by a polarized settlement pattern. Investment in productive activities, infrastructure, services and facilities has generally been concentrated in the largest cities in the belief that the higher returns in these centres would accelerate economic growth, and the benefits would 'trickle down' and spread out to smaller cities and rural areas, as

happened in many industrialized countries of Europe and North America. But experience has shown that the trickle down effects of concentrated investment have not been as strong as expected in most developing nations. The benefits of concentrated growth have accrued mainly to upper-income groups, skilled labourers, large landowners and other privileged elites in the big cities who can mobilize capital and other resources. Development has failed to filter and spread to the poor in peripheral rural areas. Instead, in many developing countries the economy has become more dualistic: the wide disparity between modern and traditional sectors has increased, and the spatial system has become more polarized. Many countries have 'primate city' structures, in which one major city or region has grown to such a large size and amassed such a large proportion of

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national resources that it dominates the national space economy.<sup>1</sup>

It is now recognized that such an economic and spatial development pattern not only fails to generate growth in rural areas, but drains them of their resources in order to maintain the primacy of the largest cities. It discourages the growth of secondary urban centres and smaller settlements in rural areas, and eventually inhibits further expansion of the national economy, preventing widespread distribution of the benefits of growth.<sup>2</sup>

Historical studies of economic development in both industrially advanced and developing nations have shown that a key to internal economic growth has been the close relationship between urban centres and the countryside, and the emergence of market towns and small and intermediate size cities that stimulate the commercialization of agriculture, facilitate the efficient production and exchange of goods throughout the national economy, provide access for rural people to central places that have sufficient numbers of inhabitants to support a wide range of services and facilities, and that offer off-farm employment opportunities.<sup>3</sup> But in much of the developing world, the spatial system is not well articulated and a hierarchy of different size settlements, performing specialized functions, and linked together in a mutually beneficial system of production and exchange, has not emerged. Thus, there has never been an appropriate spatial structure through which the benefits of concentrated investment could filter down and spread out, or that would generate productive activities in rural hinterlands.<sup>4</sup> Whatever the merits of the original theory of concentrated investment – and there are strong indications that many aspects of it were inappropriate – in most underdeveloped countries the political, economic and spatial conditions required to make the theory work effectively have never been established.

Both international assistance agencies and some governments in developing countries began to recognize during the 1970s that a more articulated and integrated system of cities and towns was needed in rural regions to reduce urban-rural and regional disparities.<sup>5</sup> New approaches to regional development planning – aimed at integrating urban centres and rural hinterlands, building the capacity of towns and cities to stimulate rural economies, and increasing the access of rural populations to town-based services and facilities – were tried in several countries. This paper reports on one method of integrated regional

development planning, the 'Urban Functions in Rural Development (UFRD)' approach, which was tested in the Department of Potosi in Bolivia through a grant from the US Agency for International Development. The paper reviews the problems associated with polarized and unintegrated settlement patterns in South America and especially in Bolivia; describes the concept of integrated regional development that lies behind the UFRD approach; and outlines the methodology used to analyse the spatial system in the Department of Potosi; and summarizes the findings of the analyses and the resulting plans, policies and projects.

## 2. SPATIAL SYSTEMS AND ECONOMIC DEVELOPMENT IN SOUTH AMERICA

Spatial development in much of South America is a reflection of polarized urbanization and dualistic economic growth. Urbanization has spread in most of the continent, but it has been heavily concentrated in a relatively few places. Economic progress in the big metropolises has attracted a steady stream of migrants from poverty-stricken rural areas. Average annual growth rates of urban population have been higher than total average annual population increases in every Latin American country since 1960. Increases in the percentage of population living in urban areas between 1960 and 1975 were dramatic in many countries – rising by 15% or more in Brazil, Colombia and Peru, and by more than 10% in Chile and Venezuela.

But in most South American countries the highly concentrated pattern of urbanization has created 'primate city' spatial structures. In 1975 more than 40% of the urban population of Uruguay, Paraguay, Bolivia, Argentina and Chile was concentrated in the largest city, as was more than a quarter of the urban population of Colombia, Venezuela and Ecuador. In Uruguay, Bolivia, Ecuador, Chile and Venezuela, a third or more of the urban population lived in only one or two cities with more than half a million people, while in Peru 40% of the urban population lived in four cities of that size, and in Argentina 60% in five cities. Moreover, annual growth rates in many leading cities of South America were extremely high between 1960 and 1970, ranging from a relatively modest 2.3% in La Paz to 7.0% in Bogota. During the past two decades, the growth of the urban population in most countries, and of the principal city, has surpassed the growth of GNP (see Table 1).

Table 1. Selected economic and demographic characteristics of South American countries

Country	Y/P	dY	P77	dP	%PU60	%PU75	dPU <sub>1</sub>	dPU <sub>2</sub>
Brazil	1360	4.9	116.0	2.9	46.0	61.0	4.8	4.5
Argentina	1730	2.7	26.0	1.3	74.0	81.0	2.0	1.9
Colombia	720	2.7	24.6	2.1	48.0	66.0	5.2	3.9
Peru	840	2.3	16.4	2.8	46.0	63.0	5.0	4.5
Venezuela	2660	2.7	13.5	3.4	67.0	80.0	4.7	4.4
Chile	1160	1.0	10.6	1.7	68.0	79.0	3.1	2.5
Ecuador	790	3.1	7.3	3.0	34.0	42.0	4.4	4.1
Bolivia	630	2.3	5.2	2.9	24.0	30.0	4.1	4.2
Uruguay	1430	0.8	2.9	0.3	80.0	83.0	1.3	0.4
Paraguay	730	2.4	2.8	2.9	36.0	38.0	3.0	3.3

Country	% Urban population in largest city		% Urban population in cities over 500,000		Number of cities with over 500,000		Annual growth rate of main city 1960-1970
	1960	1975	1960	1975	1960	1975	
Brazil	14.0	16.0	35.0	50.0	6	12	6.4
Argentina	46.0	46.0	54.0	60.0	3	5	3.0
Colombia	17.0	24.0	28.0	48.0	3	4	7.0
Peru	38.0	39.0	38.0	39.0	1	1	5.1
Venezuela	26.0	27.0	26.0	34.0	1	2	5.5
Chile	38.0	43.0	38.0	43.0	0	2	3.1
Ecuador	31.0	30.0	0.0	52.0	0	2	5.9
Bolivia	47.0	45.0	0.0	45.0	0	1	2.3
Uruguay	56.0	53.0	56.0	53.0	1	1	4.7
Paraguay	44.0	45.0	0.0	0.0	0	0	3.6

Sources: World Bank, *World Development Report 1979* (Washington: World Bank, 1979); World Bank, *Urbanization Sector Working Paper* (Washington: World Bank, 1972).

Y/P: GNP per capita 1977 in US\$; dY: % annual growth rate of GNP 1960-1977; P77: population 1977 (millions); dP: % annual growth rate of population 1970-1977; %PU60: % of population in urban areas (> 20,000) 1960; %PU75: % of population in urban areas 1975; dPU<sub>1</sub>: % annual growth rate of urban population 1960-1970; dPU<sub>2</sub>: % annual growth rate of urban population 1970-1975.

The dominance of the largest cities was clear in 1970: Bogota had grown to more than twice the size of Colombia's next largest city; Caracas was more than three times the size of Maracaibo; and in Peru, Argentina and Uruguay, the national capitals had ten times the population of the second-ranking cities.<sup>6</sup>

The emergence of the primate city structure in these countries has been at the expense of the growth of secondary cities, which are few in number, and which have expanded slowly by comparison. Secondary cities have not been widely enough distributed in space, nor well enough integrated with each other or with smaller towns and rural villages in their hinterlands, to act as catalysts for development in other parts of the country.<sup>7</sup> In every South American country, except Bolivia, Colombia and Paraguay, less than 10% of the population lived in cities with between 100,000 and 500,000 people in 1970. While the largest cities in Latin America had been growing

rapidly during the 1960s, middle-sized cities lost population in Ecuador, Venezuela and Argentina, and grew relatively slowly in Brazil, Colombia and Paraguay. In 1970 more than half the urban population of Venezuela and more than 40% of the urban population of Ecuador, Paraguay, Chile and Peru, lived in towns with less than 100,000 people (see Table 2).

In poorly articulated and unintegrated spatial systems, market towns and small settlements are usually widely scattered and under-equipped to provide services in rural areas. The few that exist are usually only weakly linked to each other or to larger and more functionally diversified centres. Thus marketing networks that could integrate rural areas economically and socially cannot easily emerge. Rural inhabitants are scattered in small settlements that are not large enough to sustain commercial activities, provide off-farm employment or meet the service needs of the poor.

Table 2. Per cent of total and urban population living in cities in four urban class sizes and number of cities in each class in 1970

Country	Population under 100,000			Population 100,000-499,000			Population 500,000-999,000			Population 1,000,000 or more		
	% Total	% Urban	No. of cities	% Total	% Urban	No. of cities	% Total	% Urban	No. of cities	% Total	% Urban	No. of cities
Brazil	19.6	36.6	n.a.	6.6	12.3	25	3.8	7.1	5	23.5	43.9	6
Argentina	9.3	13.2	n.a.	10.2	14.5	11	11.9	16.9	4	39.0	49.6	1
Colombia	16.5	29.9	n.a.	14.2	25.7	16	7.4	13.5	2	17.0	30.9	2
Peru	22.6	49.0	n.a.	5.0	10.8	5	0.0	0.0	0	18.4	39.9	1
Venezuela	39.5	51.7	n.a.	9.6	12.6	5	6.6	8.6	1	20.7	27.1	1
Chile	36.7	49.8	n.a.	9.7	13.2	3	0.0	0.0	0	27.3	37.0	1
Ecuador	16.1	43.0	n.a.	0.0	0.0	0	21.3	56.9	2	0.0	0.0	0
Bolivia	5.6	17.2	6	12.7	39.1	3	14.2	43.7	1	0.0	0.0	0
Uruguay	31.3	37.1	n.a.	0.0	0.0	0	0.0	0.0	0	53.0	62.9	1
Paraguay	17.1	47.8	n.a.	18.7	52.2	1	0.0	0.0	0	0.0	0.0	0

Sources: Kingsley Davis, *World Urbanization 1950-1970*, Vol. I, Tables B and C; Government of Bolivia, Instituto Nacional de Estadística, *Censo Nacional de Población 1976* (La Paz, INE, 1978).

### The case of Bolivia

Among South American countries, Bolivia is in some respects the exception in not having an exaggerated primate city structure. This is not because the country adopted a different strategy of economic development, but rather because the processes of industrialization and urbanization are still at an early stage. Data from the 1976 census indicate that 33% of the country's 4.6 million people live in cities with more than 20,000 inhabitants, of which there are only 10; some 10% reside in the 95 towns with a population between 2000 and 20,000; while the remaining 57% are scattered in smaller settlements and rural areas. At that date, the largest city, La Paz, had a population of 650,000, two-and-a-half times the size of the second city, Santa Cruz (257,000), and three times the third-ranked Cochabamba (205,000). After these three cities, there are only seven others with more than 20,000 people. Only one or sometimes two are located in each of the country's nine Departments, with the exception of the Pando which has none.

The low density and the wide dispersion of the predominantly rural population in Bolivia, coupled with the relative sparsity of functional central places - market towns, small cities and intermediate size regional centres - has been recognized by policy-makers as an obstacle to transforming the economy and accelerating rural development. In a recent five-year plan, for instance, it was pointed out that:

The majority of urban centers are not organically

integrated to their respective rural areas. . . This indicates that such centers do not completely fulfill a dynamic role for their respective areas of influence because they do not function adequately as marketing centers and as centers for the diffusion of cultural and technological innovation. Nor do they possess the economic and social infrastructure for the support of the production and adequate functioning of their respective *campesino* communities.<sup>8</sup>

Furthermore, most of the secondary cities and market centres that do exist in Bolivia cannot easily act as catalysts for rural or regional development in the near future. Not only are they not 'organically integrated' with their rural areas, but due to the mountainous terrain they are poorly connected with each other. Large areas of the country, not only the sparsely settled lowlands but also the more densely inhabited valleys and highlands, are isolated. This creates a fragmented settlement system, and compounds the difficulties of integrating regional and national development. The USAID mission in Bolivia points out that 'approximately 80 per cent of the rural population is concentrated in the highlands (30%) and valleys (50%) which together constitute 30 per cent of the country's land area. In these regions, long distances between agricultural areas and markets, and the rugged topography result in high costs for transportation, communication, energy and social services'.<sup>9</sup>

The lack of access among the rural population to basic services and facilities is clearly reflected in social and economic statistics. More than 60% of Bolivians are living in what the World Bank has defined as 'absolute poverty'.

Life expectancy at birth is about 52 years, and 220 in every thousand children die before the age of five, one of the highest child mortality rates in Latin America. Nearly 60% of the adult population is illiterate. Only one-third of school age children in rural areas were attending school in 1977, and three out of four of them drop out by the third grade. Rural areas lack qualified teachers – the pupil/teacher ratio there is nearly three times higher than in urban areas – and curricula are considered to be of low quality. Severe and persistent health problems in rural areas are attributable in part to pervasive poverty, but also to the lack of available health care services.<sup>10</sup> The USAID Mission in Bolivia provides this profile of the living conditions of the rural poor:

The average nuclear family has five members. It lives in an adobe dwelling with no basic sanitary facilities and consumes only 77% of its minimum daily caloric requirements and only 44% of its minimum daily requirements of protein. Full time electric service is available only in or near the eight major cities and towns and principal mines. . . . Only 1% of the rural population has access to piped water and 11.2% of the total population to sewage systems. The nationwide death rate is 15 per thousand and the mortality rate for children under one, often considered the best indicator of a country's health status, is 158 per thousand, the highest in South America.<sup>11</sup>

Although successive Bolivian governments have expressed a commitment to policies for socially equitable economic growth, little real progress can be made without a settlement system that is more conducive to meeting the basic needs and increasing the productivity and income of the rural poor.

### 3. THE CONCEPT OF INTEGRATED REGIONAL DEVELOPMENT

In response to similar problems and conditions in many other developing countries, the Office of Urban Development of the United States Agency for International Development (USAID) began a search for alternative regional policies that would promote economic growth with greater social and geographical equity. Out of this came the impetus for applying the concept of integrated regional development planning and for formulating an operational planning process applicable in developing countries.

Rejecting the 'growth pole' approach – which advocated the concentration of capital-intensive industries in selected urban centres, and which had been assessed as a failure in many countries –

the staff of the Office of Urban Development sought a means to strengthen the nationwide system of urban settlements in such a way as to promote a more equitable pattern of development, and to better serve the rural population. They saw the importance of creating a network of intermediate size urban centres, small cities and market towns for accelerating rural development, and pointed out that 'in addition to being loci of opportunities for off-farm employment, urban centres provide marketing, storage, processing, and supply credit, health, educational and other services to the rural areas they serve'.<sup>12</sup>

A study prepared for the Office of Urban Development in 1976 set out in detail the concept of integrated regional development.<sup>13</sup> It observed that if more widespread and equitable growth is to occur in developing countries, settlement systems must be created that are capable of stimulating economic activities in rural areas, providing greater access for rural people to town-based markets, services, facilities and productive activities ('urban functions'), facilitating the spread of development from existing urban centres and increasing the productive capacity of people living in rural areas. Experience suggested that without a well articulated and spatially integrated hierarchy of settlements it would be difficult, if not impossible, to promote agricultural development in rural areas and to link the economies of cities and their rural hinterlands. Without accessible markets offered by an integrated and geographically dispersed system of intermediate and small cities, farmers lack incentives to increase their output, modernize their technology and adapt consumer products to local needs and demands. Without an integrated system of settlements it would remain difficult and costly for the government to provide services and facilities required to fulfil basic human needs and increase the productivity and income of the rural poor.

The same study further proposed a general framework for analysing regions to determine the existing degree of articulation and integration of settlements and the strength of linkages between urban and rural areas.<sup>14</sup> It noted that functional analysis of regional settlement systems could help determine the types of urban services and facilities needed at each level of the spatial hierarchy and the means for providing improved access for the rural poor to functions located in urban centres of different sizes. The study pointed out, however, that any analytical framework would have to be modified in application, tested in

a number of countries, and adapted to the special conditions and needs of different regions within countries. This adaptation and testing of the methodology each time it is applied would be essential to take account of the scarcity of data and the general unreliability of statistics in rural regions of most developing countries, and the need for analytical techniques that could be easily applied to planners without advanced technical training, and that could be understood by local decision-makers.

(a) *Testing the methods and concepts of integrated regional development planning*

With these considerations in mind, the Office of Urban Development launched the project, called 'Urban Functions in Rural Development', which was conceived as an experiment to test the concepts and methods of integrated regional development planning in three initial locations. The first pilot project was undertaken in the Bicol River Basin of the Philippines, where a methodology was formulated and tested, and a planning process established that could be adapted in other parts of the Philippines and in other developing nations.<sup>15</sup> A second experiment was done in Africa 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 settlements that could be analysed, Upper Volta is a predominantly rural country with few towns and only rudimentary statistics on social, economic and physical characteristics of the population.<sup>16</sup>

The third application of the UFRD methodology has recently been completed in the Department of Potosi in Bolivia, as part of the USAID Mission's Rural Development Planning Project, which is being carried out nationwide in collaboration with the Bolivian Ministry of Planning and Coordination and the Departmental Development Corporations. Bolivia was chosen as the third location, due among other factors to the government's recognition of the need for an integrated spatial system to achieve more equitable economic development, and the compatibility of the project with the USAID mission's overall programme for technical assistance. The Department of Potosi was preferred among other potential sites since it contains a relatively large number of towns, and CORDEPO, the local development corporation, was willing to provide staff and resources to undertake the project and to

incorporate the experiment in its planning process.

The Urban Functions in Rural Development (UFRD) project clearly matched the needs expressed in the national Five-Year Plan, and the technical assistance programmes of the USAID Mission. Given the emphasis on the development of market towns, the Urban Functions in Rural Development methodology was seen to be particularly appropriate as a way of identifying potentially viable market centres, determining the needs for services and other facilities, and locating investments to increase the access of rural inhabitants to the wide variety of functions that can be supported by settlements of that size. It could also provide a planning framework for strengthening the administrative and financial capability of the Departmental Development Corporations.

(b) *The analytical approach to integrated regional planning*

Preliminary experience with testing the methods and techniques of spatial analysis for regional development planning in the Philippines yielded some general principles for guiding the application in Bolivia.<sup>17</sup>

First, any effort at integrated spatial development planning should seek to establish a continuing process of spatial analysis useful for regional development decision-making and for project identification, formulation and selection, rather than simply producing a periodic plan.

Second, the design of the spatial analysis should be problem and policy oriented; that is, the analyses should seek to identify problems of rural people, local officials, private entrepreneurs and others, and use those problems as the basis for determining which data should be collected about the settlement system in order to solve or ameliorate the problems. Long-range, comprehensive plans for regions are rarely useful for problem solving. The spatial analyses should be used as a form of policy analysis and for preinvestment studies, as well as the basis for longer-range regional planning.

Third, the methods and techniques used in integrated spatial development planning should be those that can be easily applied by local planners who do not have advanced technical training in regional science, and that can be clearly understood by the decision-makers who must select and choose locations for projects. Regional planning studies done to influence

annual budgets and short-term investment decisions cannot depend on time-consuming data collection and highly sophisticated research techniques, which are usually unnecessary and often irrelevant for public decision-making. The techniques of analysis chosen for integrated regional development planning should be relatively easy to apply, and not require sophisticated equipment or high levels of skill and training, neither of which are usually found in abundance in rural regions. If the methods are to be institutionalized in the planning and decision-making processes of the Departmental Development Corporations, they should be of the type that can be applied manually or with easily acquired and operated equipment such as desk calculators. If they are to be understood by private businessmen, prefects, governors, mayors and others who do not have advanced training in spatial analysis, they should involve relatively simple calculations and be presented in the form of descriptive statistics, maps, charts and other visual devices.

Fourth, as much existing data as possible should be used in integrated spatial analysis. Each regional analysis should begin with a quick reconnaissance of existing or previously collected data, and the collection of new data should be limited to areas in which significant 'information gaps' appear.

Finally, integrated regional development analysis should use a combination of analytical methodologies – both 'hard' statistical analysis where appropriate data are available, and 'soft' survey, interview or case study methods to obtain information that has not already been accumulated. The staff of the Departmental Development Corporations were encouraged to be creative in developing and adapting analytical methodologies suited to the conditions of the region. To the extent that the output of the analysis is to be used for immediate problem solving and project identification rather than for scholarly research, the staff was urged to use the most effective means of obtaining information, and to cultivate and use their knowledge of the region in arriving at conclusions and judgements about crucial development issues.

### (c) Definitions

The Urban Functions in Rural Development project uses the term 'urban function' in three ways. First, *settlements* that are central places are themselves considered to be urban functions.

Market towns, small cities, regional centres and metropolitan areas play important roles in regional economic and social development. Their number, geographical distribution and functional complexity, are crucial factors in regional planning. Second, the *linkages* among settlements in a region are functions that must be strengthened if access to services and facilities located in central places are to be extended and social, political, economic and physical interaction among centres of different sizes and specializations are to be enhanced. Three types of linkages are especially important: (1) those between a central place and its surrounding hinterland; (2) those among central places within a region (internal); and (3) those between central places within a region and places outside (external). Finally, the *services, facilities, and institutions*, located within settlements are functions.<sup>18</sup> Some serve only the residents of the place in which they are located and are referred to as local or residential functions; others serve a larger market or the residents of other settlements and are called basic or central functions.<sup>19</sup>

Regions that have a well-developed hierarchy of central places – settlements of different sizes with different combinations of central functions – are considered to have more *articulated* spatial systems. For various reasons such as a unique location, an important natural resource base, or large numbers of people with particular kinds of skills, some settlements achieve a larger concentration of some functions than others, and are considered to be *functionally specialized* communities. They may be industrial, commercial, administrative, mining or agricultural marketing centres in which a large percentage of local residents are employed in producing goods or providing services of a particular type. Strong trade linkages usually develop among such highly specialized centres.

Those regions in which all, or nearly all, of the population have easy access to at least one central place, in which the service areas of the larger centres 'overlap' with each other and encompass the service areas of smaller centres, and in which the central places of different sizes are physically linked with each other in such a way as to allow their populations to interact, can be considered *integrated*.<sup>20</sup> The degree of integration in a spatial system depends on the degree of articulation in the settlement hierarchy, the distances among centres, the effective access that people have to other centres, and the diversity and magnitude of functions within centres. Thus,

integration is primarily determined by the amount of interaction that takes place among settlements within a region. In turn, integration is an indicator of the degree to which a region has a viable internal economy and participates in mutually beneficial interaction with external regional or national economies.

There are few, if any, absolute standards for measuring these characteristics of a regional system. All are relative concepts and must be defined within the social, economic, physical and cultural context of the societies in which they are examined. Spatial and economic factors are closely related in the development of regions in nearly all societies, however, and affect each other over time. The degree of articulation and integration of the spatial system depends on past rates and patterns of economic development, which in turn have been influenced by the interaction of people, the performance of activities and the flow of resources in geographic space. Thus, over time, the pattern of economic development in a region strongly influences the pattern of spatial development, which shapes the future rate and direction of economic growth and the distribution of its benefits among people and places within the region.

#### 4. METHODS OF ANALYSIS FOR INTEGRATED REGIONAL DEVELOPMENT PLANNING: THE APPLICATION IN POTOSI

The methodology used in the Urban Functions in Rural Development project in Bolivia followed closely the principles of applied policy analysis outlined earlier and consisted of 10 steps or phases. This 10-step framework was not intended to be rigid, but to be modified, expanded or contracted to suit local conditions, available resources of manpower and money, and the purposes for which it is being used. The Potosi regional development corporation, CORDEPO, was responsible for both the field analysis and the subsequent preparation of investment plans, and it is intended that it should also act as the chief coordinating agency for the execution of those plans.

Efforts were made to maximize the use of existing data, but since there was little information on the spatial dimensions of the regional economy, the collection of extensive original data was unavoidable. In Potosi, 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 covered the 15 largest markets in the region, based on interviews with some 30 buyers and sellers in each one, and a rapid classification of traders' stalls, which yielded information on area of influence, the range of goods traded there and modes of exchange. In the third survey, 200 families in urban and rural areas were interviewed to provide information for the accessibility study on the frequency of visits and journey times to a group of 25 functions.

Of the 10 steps of the methodology, the first six include methods for analysing the components of the spatial structure of a region - its resources, the settlements, the rural areas, the links between them - and interpreting the results. Steps seven and eight deal with the policy implications of the spatial analysis, the identification of projects and the allocation of investments. The final two steps are concerned with evaluation procedures, and creating an ongoing planning process for integrated regional development.

##### (1) *Baseline resource analysis*

The first of the analytical steps of the methodology applied in Bolivia was devoted to preparing a socio-economic, 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 principle socio-economic characteristics of the Department were compared with 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 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 labour 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 focussed 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 15 provinces within the Department.

(a) *The inter-regional analysis*

A comparison of Potosi with other Departments provided a clear illustration of a familiar paradox: a region which for two centuries provided the greater part of the wealth of the Spanish empire, and more recently much of Bolivia's foreign earnings, is today the most backward area of the country and falling still further behind.<sup>21</sup> The source of the wealth comes from mining the rich and abundant mineral deposits, originally silver and later tin and other metals, only a small part of which even today has been surveyed, still less exploited. But as is often the case, mining in Potosi is an enclave activity that has created great wealth for some in distant places, but meagre benefits for the local population. Since the largest mines were nationalized in 1952, the sector has suffered from poor management and underinvestment, to the point where the costs of production now exceed many other competitors.

As may be deduced from the location coefficients in Table 3, which are based on the value of production in 1976, the mining sector

dominates the economy of Potosi. However, 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, most of which lies at over 10,000 feet, 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. Nevertheless, 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 1970-1977 investment actually declined 3.0% 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 1970-1977 output was growing at a laggardly

Table 3. *Selected characteristics of the departments of Bolivia*

Department	P76	%PR	dP	%M	Y/P	dY	Ag	Min	Ind
Potosi	657.7	71.0	0.99	-0.64	458	2.3	0.64	3.00	0.27
Chuquisaca	358.5	78.4	1.23	-0.59	515	5.8	1.82	0.40	0.73
La Paz	1465.0	52.4	2.07	-0.11	619	5.6	0.58	0.80	1.26
Cochabamba	721.0	62.3	1.79	-0.12	694	7.1	1.29	0.10	1.20
Santa Cruz	710.7	47.3	4.09	+1.49	767	8.0	1.23	0.80	1.00
Oruro	310.4	48.9	1.84	-0.51	802	6.0	0.41	2.30	0.93
Tarija	187.2	61.1	2.28	+0.74	681	11.7	1.58	0.50	0.80
Beni	168.4	51.8	3.28	-0.61	595	13.0	2.41	0.00	0.40
Pando	34.5	89.4	2.88	+0.96	698	12.8	1.23	0.00	0.60
Nation	4613.5	58.3	2.05	-	637	6.3	-	-	-

Source: CORDEPO, *Funciones Urbanas en el Desarrollo Rural: Resultados del Estudio en Potosí*, Vol. 1 (Potosi: CORDEPO, 1981).

P76: population 1976; %PR: % of population in rural areas (< 2000); dP: % annual population growth rate 1950-1976; %M: % annual migration rates 1970-1976; Y/P: GDP per capita in US\$ 1976; dY: % annual growth of product 1970-1977. Location quotients measured by value of product, Ag: agriculture; Min: mining; Ind: industry.

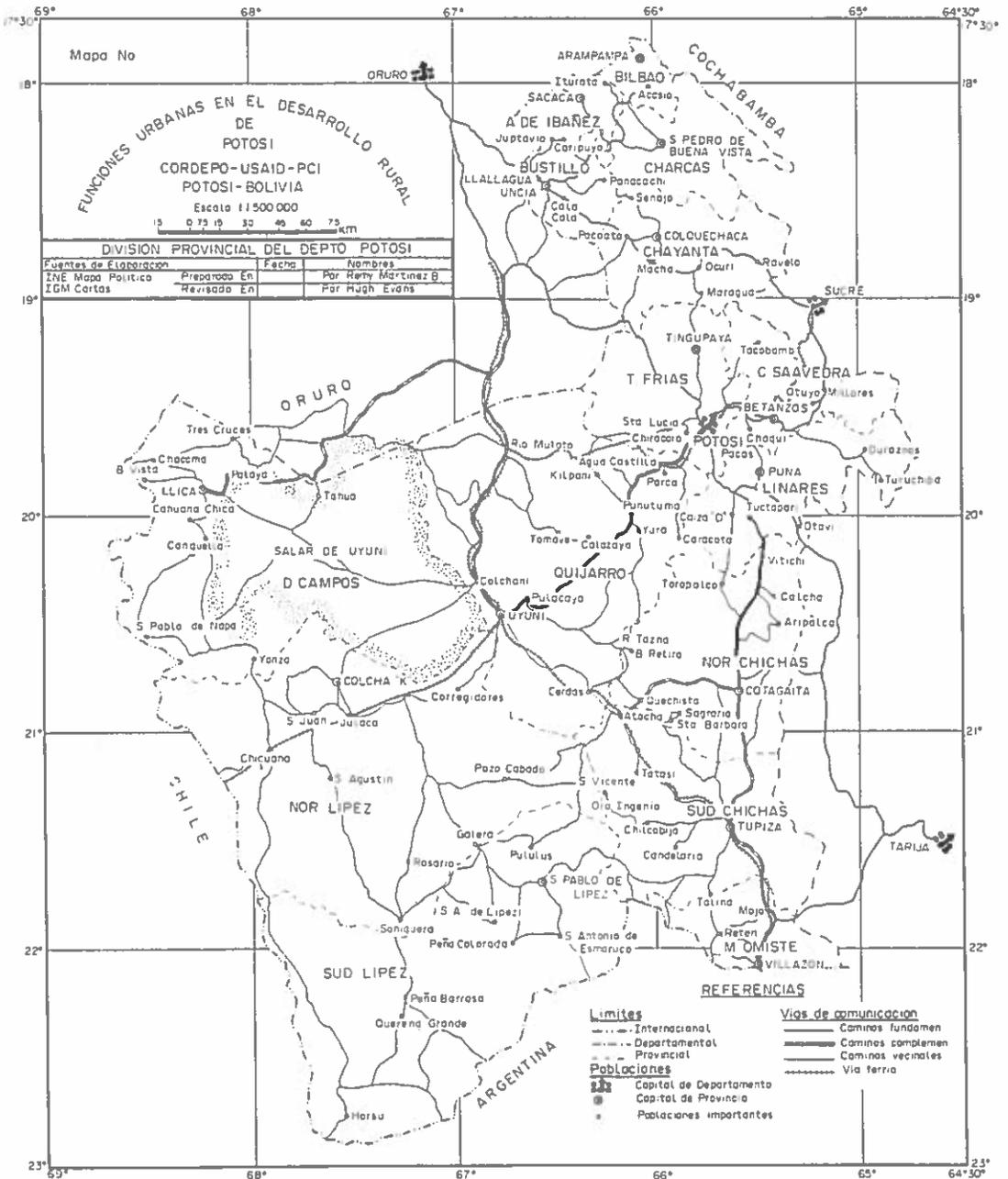


Figure 1. The Department of Potosi.

2.3% per annum compared to 6.3% for the nation and over 10.0% 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, most of them going to Santa Cruz, Cochabamba and Tarija. This heavy out-migration, coupled with high mortality rates, resulted in a population growth rate for Potosi of barely 1.0% p.a. during the 26-year period between censuses, which compares with 2.05% for the country, and is again the lowest of all Departments. Thus, as a proportion of the national total, the population of Potosi declined from nearly a fifth in 1950 to a seventh in 1976. With only 15.3% of its 658,000 inhabitants living in urban areas, defined as those with more than 20,000 people, and a further 13.7% living in towns in the category of 2000–20,000, Potosi also emerges as one of the least urbanized regions of Bolivia, some 71.0% remaining in small villages or rural areas, which again reflects the almost total absence of manufacturing industries, and the general scarcity of alternative job opportunities in urban areas.

(b) *The intra-regional analysis*

Within the Department of Potosi, the principal mining centres are located in the north in the province of Bustillos around Llallagua and Siglo XX; in the centre 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 (see Figure 1). 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 the greater part of the Potosi region – farming is restricted to the raising of sheep and llamas, and to a lesser extent the growing of quinoa, an indigenous and highly nutritious cereal. Given the distribution of natural resources, few people have settled in the western provinces, as few as one person to 5 km<sup>2</sup> in Sud Lipez, while most of the population is to be found in the east of the Department, particularly Bustillos (41 inhabitants per km<sup>2</sup>), Frias (36) and Saavedra (23).

As part of the intra-regional analysis, a series of 14 development indicators were calculated

for the 15 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 centres. 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 (see columns 3 and 5 of Table 4). As was pointed out earlier, it is easier and cheaper to provide infrastructure to people concentrated in a town than to those dispersed in the country. Furthermore, city dwellers have greater access to better health and education facilities, and to town-based jobs in manufacturing, commerce and other service industries that pay higher wages than agriculture. In Potosi, residents of more urbanized areas tend to be better paid, better housed, better educated, and in better health than those who live in rural areas.

A breakdown of migration patterns at the provincial level confirmed the general drift from the poorer, more backward, rural provinces to more urbanized areas. In the period 1971–1976, 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 centres and larger towns. On the other hand, in terms of migration to and from Departments outside Potosi, only the frontier province of Omiste showed a net gain, no doubt due to the position of Villazon as a staging post and point of departure for Argentina, a pattern also found among the towns of northern Mexico along the border with the United States, such as Tijuana, Mexicali and Ciudad Juarez.

(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 centres, an estimate of the minimum popu-

Table 4. Selected characteristics of the provinces of Potosi

Province	Population 1976	Density (people/km <sup>2</sup> )	% Population in urban areas (> 1000)	Income per capita US\$ 1976	Development index
Frias	122,810	35.9	63.0	678	78.4
Omiste	20,651	9.1	60.7	861	72.6
Bustillos	91,418	40.9	61.3	609	66.6
Sud Chichas	51,115	6.5	54.9	688	73.3
Quijarro	38,723	2.7	31.6	580	58.2
D. Campos	5567	0.5	18.4	410	66.0
Nor Chichas	47,965	5.3	16.2	389	50.8
Ibañez	22,635	10.9	6.0	156	41.5
Chayanta	88,969	12.7	4.3	231	36.9
Linares	53,481	10.4	4.2	207	48.9
Saavedra	54,113	22.8	4.1	270	48.6
Sud Lipéz	4149	0.2	0.0	473	41.8
Nor Lipéz	9162	0.4	0.0	384	46.8
Bilbao	9683	15.1	0.0	217	49.4
Charcas	32,302	10.9	0.0	191	34.5
Department	657,700	5.6	31.1	477	

Source: CORDEPO, *Funciones Urbanas en el Desarrollo Rural. Resultados del Estudio en Potosí*, Vol. 1 (Potosí: CORDEPO, 1981).

lation required to support various functions, and an overview of basic infrastructure in urban areas.

#### (a) *The growth of settlements*

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, 20 of which have upwards of 2000 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 centres 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 7700. Over the next 26 years, it lost 70% 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.

#### (b) *The urban hierarchy*

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, the data for which was collected through the survey of urban centres. 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 this time 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, which includes the more representative functions but only half of the 112 settlements, is reproduced in Figure 2. An examination of the data suggests that the urban hierarchy consists of five tiers (see Table 5). At the top is the regional centre, the city of Potosi, with a population in 1976 of 77,000 which



Table 5. *Characteristics of settlements at each level of the urban hierarchy*

Level of settlement	Place	Range of functions	Range of centrality index	Population of Department (%)	Average population size
I Regional centre	City of Potosi	56	674	11.7	77,334
II Sub-regional centre	Uyuni Tupiza Villazon	43-46	209-381	9.5	12,522
III Rural centre	Llallagua/Uncia Siglo XX Colquechaca Catavi Betanzos Puna Kilpani Atocha Cotagaita Quechisla R. Tazna Llica	20-28	87-156	5.4	3238
IV Local centre	26 places	13-23	46-92	5.2	1371
V Villages	70 places	0-12	0-84	4.8	457

Source: CORDEPO, *Funciones Urbanas en el Desarrollo Rural: Resultados del Estudio en Potosí*, Vol. 1 (Potosí: CORDEPO, 1981).

health centres, vehicle repair shops, some kind of training centre, and a daily bus service to other towns. At the fourth level, some 26 places with an average population of 1370 meet at least two of the three criteria for a local service centre, containing anywhere 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 12 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 1000 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 centre to its nearest larger-sized neighbour. Thus Uyuni has no competition for miles around, while Catavi is a mere five minute bus ride from Llallagua. Another explanation stems from the favoured treatment of mining centres, 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. A further 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 based only on the number of urban residents.<sup>22</sup>

### (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.<sup>23</sup> After analysing the hierarchy of settlements in step two, the next stage of the methodology was to examine a range of physical, economic

and service linkages, chief among them road and rail links; production and marketing linkages; those 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, for producers and consumers, teachers and students, doctors and patients. There are many ways to collect such information, but a simple method, used in Potosi, is through a survey of settlements.

The main picture to emerge from this analysis, was that the Department is made up of four quite distinct sub-regions centred 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, with the exception of the fifth second tier town, Villazon, which is here shown to be less important as a service centre for the surrounding population due to the proximity of the more conveniently located town of Tupiza.

As expected, given the severe physical terrain of the region, the one factor that influenced more than any other the intensity and direction of 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 north-west, 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 centres, the north-west on Oruro, the north-east 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 with greater precision the effective service area of a town, a new step in the methodology was introduced in the Potosi study, an accessibility model designed to measure the level of access of the population in different zones of the region to specific services and functions.<sup>24</sup> This model can also be used to evaluate alternative solutions for improving physical access, for example by building facilities in new locations vs upgrading roads to existing facilities.

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 (markets, for example) are more crucial than others (say 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, 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 the model a fair amount of data is required. In Potosi much of this was culled from existing sources, some came from the survey of settlements, but the need for information on travel patterns led to the separate survey described above of some 200 families in urban and rural areas.

Table 6. *Weighting functions for the accessibility model*

Function	Observations	$N_j$	$T_j$	$P_j$	Weight
Market	179	32	2.15	1.00	68.8
Grocery store	100	73	0.54	1.00	39.4
Cooking and heating fuel store	151	24	1.39	1.00	33.4
Radiocommunication and t'phones	17	15	1.33	1.00	(20.0)
Pharmacy	141	5	2.03	1.00	10.1
Junior school	159	200	0.27	0.16	8.6
Banks	11	12	1.34	0.49	(7.9)
Junior-high school	82	196	0.29	0.13	7.4
Post and telegraph office	94	10	0.73	1.00	7.3
Mineral processing plant	6	44	1.22	0.13	(7.0)
Shoe and clothing store	180	2	3.04	1.00	6.1
Silo or farm produce storage	3	2	4.40	0.60	(5.3)
Mining Bank depository	8	12	3.24	0.13	(5.1)
High school	43	200	0.25	0.10	5.0
Training centre	6	200	0.30	0.08	(4.8)
Hospital or health centre	224	3	1.56	1.00	4.7
Domestic appliance store	103	1	3.80	1.00	3.8
Farm produce processing plant	48	3	1.95	0.60	3.5
Hardware store	65	1	3.32	1.00	3.3
Farm tools and equipment store	60	1	4.85	0.60	2.9
Seeds and fertilizer store	51	1	4.61	0.60	2.8
Prefect/mayor/civil registrar	133	2	1.03	1.00	2.1
Doctor's clinic or nurse's post	146	2	0.92	1.00	1.8
Police station or magistrate	84	4	0.35	1.00	1.4

Source: CORDEPO, *Funciones Urbanas en el Desarrollo Rural: Resultados del Estudio en Potosí*, Vol. 2 (Potosí: CORDEPO, 1981).

$N_j$  = average number of visits per year to function  $j$ ;  $T_j$  = average time in hours of journeys to function  $j$ ;  $P_j$  = proportion of the population that normally uses the function  $j$ ; weighting factor  $W_j = N_j \times T_j \times P_j$ . Figures in (parentheses) should be interpreted cautiously due to insufficient observations.

This household survey yielded a wealth of information on the relationship between journey times and frequency of visits to 25 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 – informants almost invariably claimed that their children never missed a day during the term – at an average journey time of 15 minutes (see Table 6). Next most frequent are 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 20 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 centres, 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 junior-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 utility.

While the results varied widely among different functions, two conclusions are clear. First, overall accessibility throughout the Potosí region is extremely poor: if 'effective' service is defined as 50% or more of the level of access that is observed in urban centres, then less than 20% of the population is adequately served (see Figure 3). 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 centres. 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, such as markets, hospitals and high schools, especially in the north-east and much of the west of the Department.

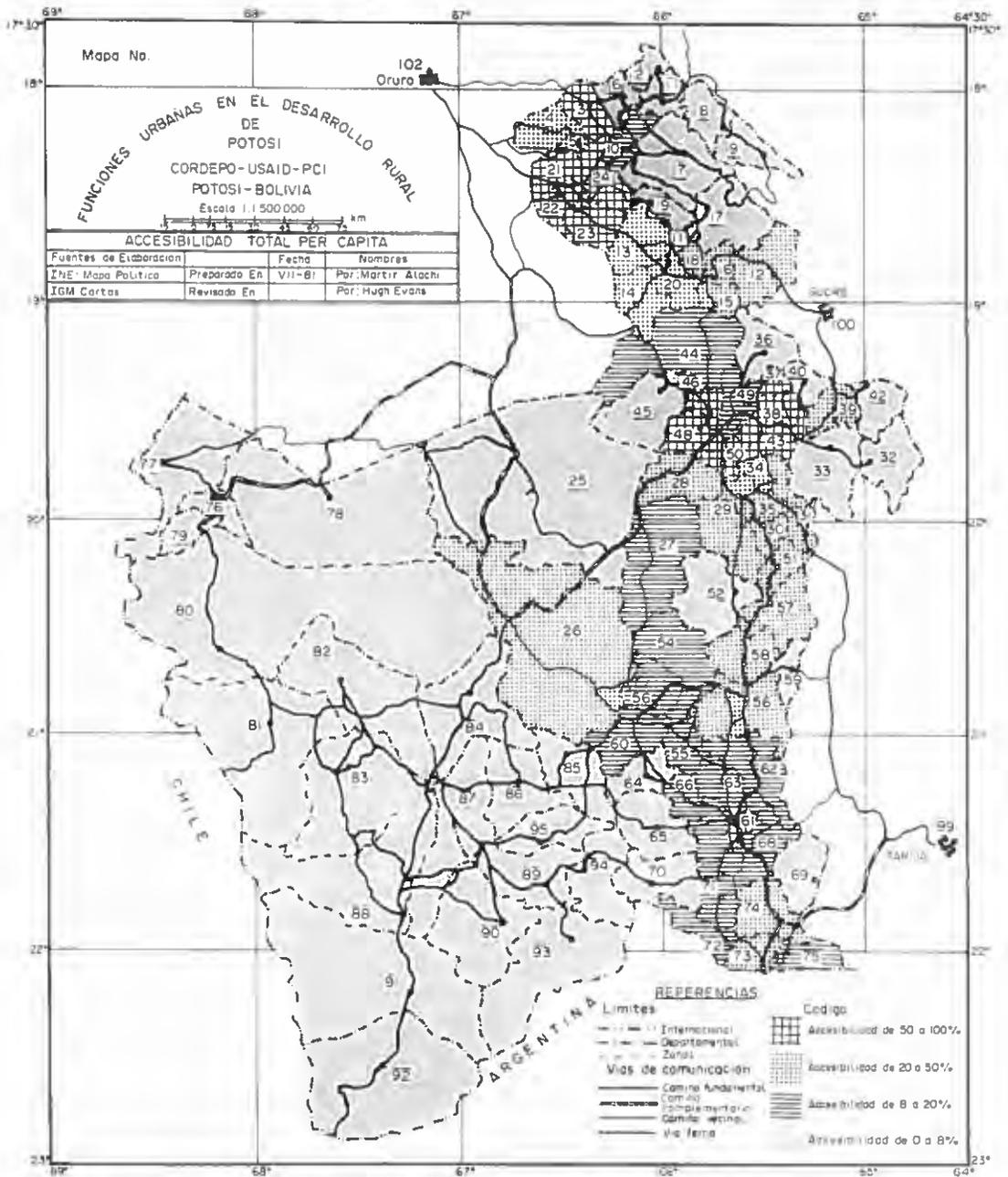


Figure 3. Total per capita accessibility by zones.

### (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 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 centres where the model suggests they might be expected; and functions which are absent in towns where the scalogram analysis suggests they might be found.

An interpretation of the spatial structure of the Potosi region is represented in Figure 4. For planning purposes the region of Potosi is synonymous with the political unit of the Department, although in terms of its functioning as an economic unit, many peripheral areas of the Department are more closely tied to adjacent regional centres, particularly the north-west with Oruro, the extreme north with Cochabamba, the north-east with Sucre, and parts of the west with Calama in Chile. Within the region, as was noted earlier, four sub-regions are clearly discernible. However, due to the large distances involved, the influence of Uyuni as a sub-regional centre 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 centres, and thus may be regarded as integrated into the urban-rural system. However, many other areas lack rural service centres, including some of the more densely populated parts of the north and middle, 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 centres.

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 centres. Most serious of all, the widespread lack of adequate secondary roads means that towns are generally weakly linked to their rural hinterlands.

### (7) *Formulation of a strategy of integrated regional development*

The relationship between analysis and

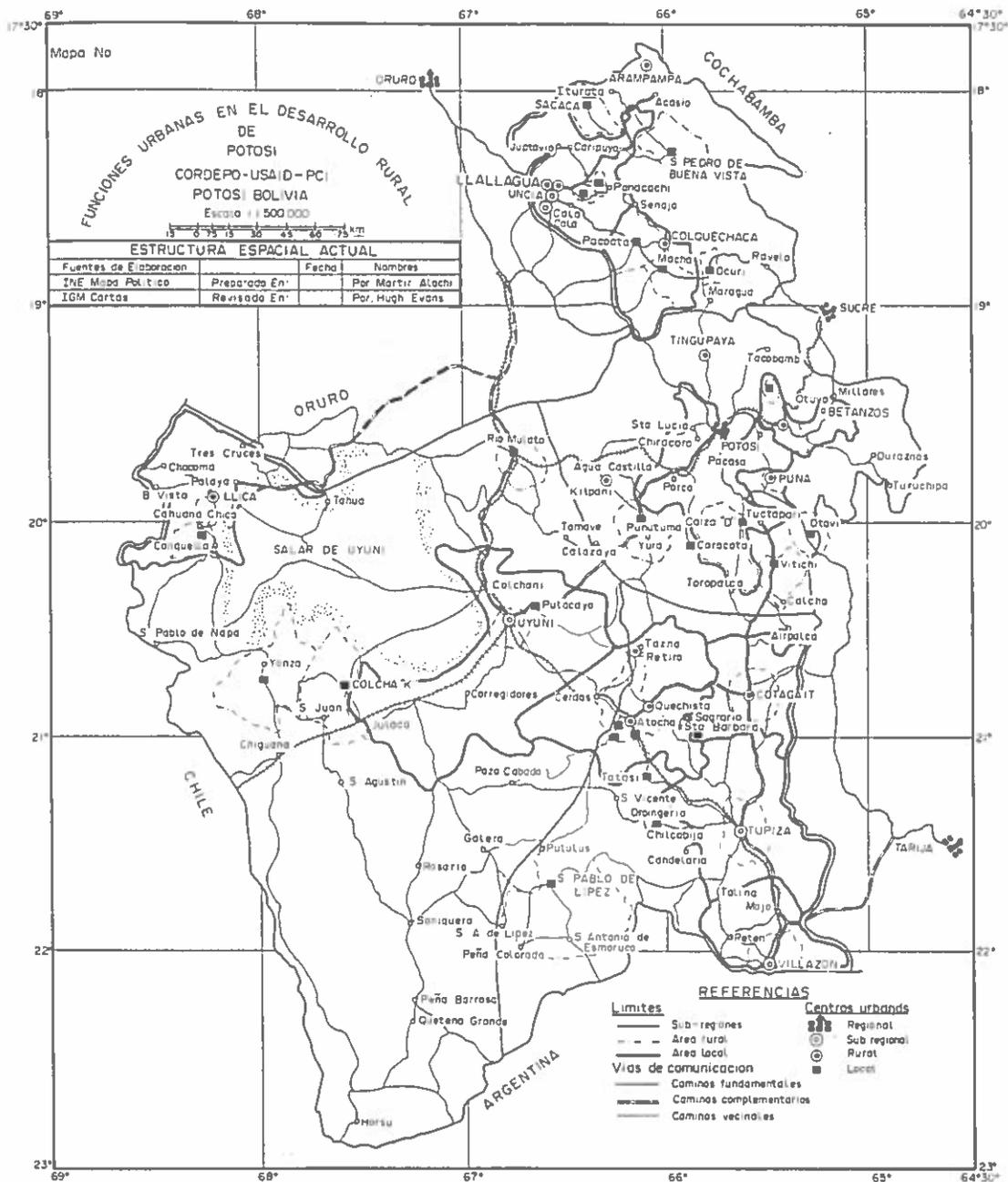


Figure 4. The existing spatial structure.

strategy in the methodology presented here differs from common planning practice. Often strategy is derived from analysis, whereas in this case the broad outlines of the policy of integrated development are based on accumulated prior experience, and serve to define the scope and focus of the analysis. In step seven, the conclusions reached from the preceding analysis provided the inputs for fleshing out the details of the strategy in light of the specific characteristics of the region.

Other considerations, however, have to be taken into account. In the case of Potosi, the development corporation – like many other planning agencies – had taken into account only global and sectoral dimensions of development: agriculture, mining, industry and so forth. Thus, spatial planning was introduced as an additional complementary activity, the horizontal dimension of a matrix in which sectoral planning represents the vertical dimension. Thus the process of working out the details of the strategy of integrated development required extensive coordination among the planning staff to ensure the compatibility and consistency of plans and projects.

At the global level, it was agreed that the cornerstone of regional development policy should be agriculture, not an obvious conclusion in a region where the principal economic activity has always been mining. However, there were two strong reasons for this conclusion, one economic, the other political. First, despite the predominance of mining, the majority of the work force, about 58% in 1976, is still engaged in agriculture. Second, public intervention in the mining sector is virtually the exclusive preserve of the national mining corporation, COMIBOL, which acts to all intents and purposes as an autonomous fiefdom, largely impervious to outside pressure. Thus the regional development corporation's scope for action in a sector that is regarded as of national concern is severely circumscribed.

In the process of thinking through the implications of the strategy, two key elements were identified: the articulation of the spatial system; and the development of areas based on their productive potential. The first element addressed the problems of strengthening the hierarchy of central places, particularly the small and intermediate settlements, and of improving the linkages between them and their hinterlands in order to integrate isolated or peripheral areas, and to provide better access for the rural population to markets, social services and other functions located in urban centres. The second element took the notion

of the functionally economic area as the basic building block of the planning process, in which the exploitation of the productive potential of the area is taken as the *sine qua non* of development, the economic base on which the long-term prosperity of the inhabitants depends.

#### (8) *Identification of projects and formulation of an investment plan*

A key objective of the UFRD methodology was not to generate new data, illuminating analyses, or cogent strategies – necessary as they may be – but to yield an investment plan based on a coherent set of projects that would contribute significantly to the social and economic development of the region, and would benefit the rural poor in particular. Given the policy framework outlined in step seven, the identification of projects was carried out on two levels: at the level of the region to identify critical elements such as key links in the road network for articulating the settlement system, and at the level of functional economic areas. In the second case, information on the productive potential of the area provides the starting point for a package of coordinated projects designed to increase production, raise family productivity, facilitate the marketing of surpluses, and improve the provision of basic infrastructure and services; in short, all the essentials required to raise income and standards of living.

The location of specific components of the package – such as roads, markets, warehouses, agricultural supply services, schools and health centres – was determined in light of the foregoing spatial analysis, and the hierarchy of urban centres in the area. Where there were gaps in the urban system, the selection of towns to fill the role of rural and local service centres was based on three criteria: the economic potential of the town and vicinity; its geographical location *vis-à-vis* the surrounding population it was intended to serve; and less importantly, the range of infrastructure and functions which it already possessed.

Since the funds available for investment are invariably less than required, the areas in which project packages should be implemented first have to be determined. Although the final choice often reflects exogenous factors, such as political considerations and the interests of outside funding agencies, project packages need to be scheduled, costed, and ranked so that those involved may make informed decisions.

For each project package, therefore, staff prepared a timetable showing the sequence of component activities, starting dates and estimated implementation times. They calculated the costs for each of the first few years, and made a preliminary *a priori* evaluation of the package in terms of benefits, costs and number of anticipated beneficiaries. Areas were ranked in order of priority taking into account both efficiency and equity considerations, the former represented for example by estimated benefits or benefit/cost ratios, the latter by development indicators as estimated in step one of the UFRD methodology, and size of population. In addition, a geo-political factor was included, reflecting national concerns for populating scarcely settled frontier zones.

The investment plan that resulted from this process indicates the funds required during each year of the period 1983-1987, the project packages to be funded, and the areas in which these are to be located. The plan was not intended to be a one-time final statement, but rather a reflection of current thinking, to be revised and updated periodically as conditions change and new opportunities present themselves. It is being treated as a framework for preparing annual operating plans, and for soliciting financial support for particular components from national and international agencies.

#### (9) *Implementation, monitoring and evaluation*

Spatially integrated development necessarily implies the collaborative participation at the planning and implementation stages of numerous public agencies at the regional level. In most countries, however, the division of responsibilities among the arms of government is structured along functional or sectoral lines, rather than on the basis of areal or regional units. Channels of communication, command and control, are designed primarily to link central and regional offices of the same line agency, and are ill-suited for horizontal connections between offices of different agencies in the same region. Thus, effective implementation of a policy of integrated development depends crucially upon the setting up of an appropriate coordinating organization with sufficient powers to harness and steer the collective energies and resources of the principal public agencies responsible for social and economic development of the region. Particular attention needs to be paid to alternative

administrative, financial and contractual mechanisms that might be adopted to ensure that participating agencies are better able to fulfill their commitments.

In Potosi, a Departmental advisory council has been set up under the direction of the President of the development corporation, composed of representatives from each of the main public agencies in the Department, for the purpose of bringing about a common approach to development problems in the region, and coordinating plans and programmes. In addition, it was proposed that branch advisory councils be established for each of the sub-regions of the Department identified in the spatial analysis, in order to provide knowledgeable expertise on local conditions and to secure agency collaboration in the field for the implementation and monitoring of project packages in specific areas.

Over the longer term, some process of ex-post evaluation will also be required to measure the impact of development activities in terms of the original objectives of raising incomes and standards of living. The preceding analysis provided considerable information as a baseline against which to measure future changes in the local economy and spatial structure. Nevertheless, for more fine-grained impact analysis in specific localities, it would be necessary at the outset to carry out sample surveys of the target population to collect data on levels of income, education, health and nutrition.

#### (10) *Creation of a continuing planning process*

The implementation of the programmes and projects identified earlier will require several years, and even under the most favourable circumstances development goals will be reached only very slowly. As was implied earlier, the UFRD methodology was not intended to conclude with the preparation of an investment plan, but rather to establish an ongoing planning process to provide pertinent information to those responsible for the future of the region at both local and national levels. To accomplish this aim, deliberate measures need to be taken. Personnel have to be assigned and funds budgeted to carry out the research and planning tasks on a continuing basis. Staff have to be trained in concepts of integrated regional development and techniques of analysis; community groups and officials from other local agencies and organizations should be included in field studies and briefed periodically with progress reports. Internal administrative and

budgetary procedures may have to be modified to incorporate a spatial perspective alongside the conventional sectoral view.

## 5. CONCLUSIONS

The integrated regional development planning now going on in the Department of Potosi is aimed at overcoming many of the spatial problems inhibiting equitable economic and social development. The methodology seeks to provide, quickly and easily, the macro-regional information needed to make micro-investment policies and decisions. It does not, and cannot, provide all of the detailed information needed for regional investment planning, but it provides a sufficiently detailed profile of regional needs and opportunities to allow an investment programme to be established while more detailed and time-consuming studies are made of specific

functions and settlements and more detailed plans are formulated. The methodology can, over time, be adapted and supplemented as more data become available, as regional planners are trained and their skills improved, and as investment programming becomes more complex. Where it has been applied in other countries, the methodology has provided substantial new information on spatial structure, created new perspectives on development policy, aided the identification of projects, and given regional planners new tools and techniques for influencing investment and budgetary decisions. Moreover, the Urban Functions in Rural Development methodology can provide local and regional planners with the means for making a useful contribution to national planning and investment decision-making, so that articulated and integrated regional economies can be linked to each other to strengthen the national economy.

## NOTES

1. See the studies of Latin American cities in W. Cornelius and R. V. Kemper (eds.), *Metropolitan Latin America* (Beverly Hills: Sage Publications, 1978); and the analyses by Gino Germani, 'Urbanization, social change and the great transformation', in Germani (ed.), *Modernization, Urbanization and the Urban Crisis* (Boston: Little, Brown, 1973), pp. 3-58; and Jorge E. Hardoy, 'Urbanization policies and urban reform in Latin America', in F. Rabinovitz and F. Trueblood (eds.), *Latin American Urban Research*, Vol. 2 (Beverly Hills: Sage Publications, 1972), pp. 19-44.

2. The argument is outlined in Dennis A. Rondinelli and Kenneth Ruddle, *Urbanization and Rural Development: A Spatial Policy for Equitable Growth* (New York: Praeger, 1978); and in Dennis A. Rondinelli, *Secondary Cities in Developing Countries: Policies for Diffusing Urbanization* (Beverly Hills: Sage Publications, 1983).

3. See E. A. J. Johnson, *The Organization of Space in Developing Countries* (Cambridge, Mass.: Harvard University Press, 1970); Salah El-Shaks and Robert Obudho (eds.), *Urbanization, National Development and Regional Planning in Africa*, (New York: Praeger, 1974); and John Friedmann, *Urbanization, Planning and National Development* (Beverly Hills: Sage Publications, 1973).

4. See Rondinelli and Ruddle, *op. cit.* (1978), Chaps. 1 and 2.

5. See Bertrand Renaud, 'National Urbanization Policies in Developing Countries', *World Bank Staff*

*Working Paper* No. 347 (Washington: World Bank, 1979); Harry W. Richardson, 'City Size and National Spatial Strategies in Developing Countries', *World Bank Staff Working Paper* No. 252 (Washington: World Bank, 1977); United Nations Economic and Social Council, *Interrelationships Between Population, Resources, Environment and Development*, Doc. No. E/1981/65 (New York: United Nations, 1981), esp. pp. 26-28; and Harold Lubell, *Urban Development Policies and Programs*, Working Paper for Discussion, Bureau for Program and Policy Coordination (Washington: US Agency for International Development, 1979).

6. See Kingsley Davis, *World Urbanization 1950-1970*, Vol. 1: 'Basic Data for Cities, Countries and Regions', Population Monograph Series, No. 4 (Berkeley: University of California, 1969), revised edn.

7. See Rondinelli, *op. cit.* (1983), esp. Chaps. 1 and 2.

8. Quoted in Michael McNulty and Michael E. Conroy, 'An evaluation report on potential sites in Bolivia and Paraguay for the Urban Functions in Rural Development Project' (Washington: USAID, 1977), mimeo, p. 10.

9. US Agency for International Development, *Bolivia: Country Development Strategy Statement, FY 82*, (Washington: USAID, 1980), p. 2.

10. *Ibid.*, pp. 32-33 *passim*.

11. *Ibid.*, p. 6.

12. USAID, Office of Urban Development, 'Urban Functions in Rural Development Project Paper' (Washington: USAID, 1976), p. 4.

13. See Dennis A. Rondinelli and Kenneth Ruddle, *Urban Functions in Rural Development: Analysis of Integrated Spatial Development Policy* (Washington: US Agency for International Development, 1976).

14. *Ibid.*

15. For a review of the results see Dennis A. Rondinelli, *Bicol River Basin Urban Functions in Rural Development Project: Summary and Evaluation* (Washington: USAID, 1978); or Dennis A. Rondinelli, 'Applied policy analysis for integrated regional development planning in the Philippines', *Third World Planning Review*, Vol. 1, No. 2 (Autumn 1979), pp. 150-178.

16. A summary of all three projects is presented in Eric Chetwynd, Jr., 'Regional planning projects to strengthen the contribution of urban centers to rural development', unpublished paper, mimeo. (Washington: USAID, 1980).

17. The methodology is given in more detail in Dennis A. Rondinelli, 'Spatial analysis for regional resource development: a case study of the Philippines', *Resource Systems Theory and Methodology Technical Papers*, No. 1 (Tokyo: Natural Resources Programme, United Nations University, 1980); also in Hugh Evans, *Funciones Urbanas en el Desarrollo Rural: Análisis Espacial para Desarrollo Regional Integrado* (La Paz: USAID Bolivia and the Ministerio de Plancamiento y Coordinación, 1981).

18. Chetwynd, *op. cit.* (1980), pp. 5-6.

19. Settlements with a significant number of basic functions are called central places. The number of people required to support a function, or a combination of functions, is called a threshold population level. Each function has a different population threshold. Some provide daily goods and services and require only a relatively small number of people to make their operations profitable and efficient. Large numbers of these functions are found in a region and some are located in nearly every settlement. Others offer goods and services that are rarely needed or that are expensive to produce or deliver. These require large market areas and populations to support them and are located only in larger urban centres.

Generally, the larger the number of basic functions located in a settlement, the greater their diversity and the higher their population threshold, the higher

is the settlement's centrality. A central place consists of a core area in which basic functions are physically located, and each central place has a service area or hinterland from which people come to avail themselves of services and facilities located in the central place. Settlements within a region can be ranked in a hierarchy, based on their levels of centrality. The service areas of central places can be determined and the degree of interaction or trade among them can be estimated. For more detailed discussion of these terms see Brian J. L. Berry and Frank E. Horton, *Geographical Perspectives on Urban Systems* (Englewood Cliffs, New Jersey: Prentice-Hall, 1970).

20. See Johnson, *op. cit.* (1970); and G. W. Skinner, 'Marketing and social structure in rural China', *Journal of Asian Studies*, Part 1 in Vol. 24 (1964), pp. 3-43, and Part 2 in Vol. 24 (1965), pp. 195-228, for a theoretical discussion.

21. During the mid 1600s Potosi was the largest city in the western hemisphere and one of the richest mining centres in South America. For a description of the city at the peak of its power and wealth, see Charles E. Chapman, *Colonial Hispanic America: A History* (New York: Macmillan, 1933), pp. 149-150; and Lewis Hanke, *The Imperial City of Potosi: An Unwritten Chapter in the History of Spanish America* (The Hague: Martinus Nijhoff, 1956).

22. See for example John V. Marshall, *The Location of Service Towns* (Toronto: University of Toronto Press, 1969).

23. See Walter B. Stohr, 'Some hypotheses on the role of secondary growth centers as agents of change for the spatial transmission of development in newly developing countries - the case of Latin America', in F. Helleiner and W. Stohr, (eds.), *Proceedings of the Commission on Regional Aspects of Development of the International Geographical Union*, Vol. II (Ontario: IGU, 1974), pp. 75-111; R. P. Misra and K. V. Sundaram, 'Growth foci as instruments of modernization in India', in A. Kuklinski (ed.), *Regional Policies in Nigeria, India and Brazil* (The Hague: Mouton, 1978), pp. 97-204; and Dennis A. Rondinelli, 'Regional disparities and investment allocation policies in the Philippines: spatial dimensions of poverty in a developing country', *Canadian Journal of Development Studies*, Vol. 1, No. 2 (Autumn 1980), pp. 262-287.

24. The accessibility model is described in more detail in John Dickey and Hugh Evans, 'Estudio de accesibilidad: métodos de análisis', *Documento de Trabajo No. M 4* (Potosi: CORDEPO, 1981).