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Cahiers de géographie du Québec

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Volume 20, Number 49, 1976

URI: https://id.erudit.org/iderudit/021311ar
DOI: https://doi.org/10.7202/021311ar

See table of contents

Publisher(s)

Département de géographie de l'Université Laval

ISSN

0007-9766 (print)
1708-8968 (digital)

Explore this journal

Cite this article

Morisset, J. (1976). Urban interrelation and regional patterning in the department of Puno, Southern Peru. *Cahiers de géographie du Québec*, *20*(49), 93–126. https://doi.org/10.7202/021311ar

Article abstract

The department of Puno surrounds lake Titicaca (3 800 m above sea-levet) and extends over a vast stretch of land (the altiplano) and the Andean ridges (the puna) spilling northward into the Amazonian basin (the selva).

Through fied work information and the use of census returns (1940 and 1961), this paper attempts to assess the evolution and the interdependance of Puno's main populated centres on the one hand, and to develop a general scheme of regionalization based on geo-spatial structures and administrative lay-outs on the other. In addition, the nature of settlements is briefly outlined and a more detailed quantitative analysis (30 variables, 85 districts) shedding some light on the internal departmental patterning is attempted.

In conclusion, it is suggested that the planning process should result in a successful compromise between two sets of characteristics : spatio-economical elements (planificación tecnocrática) and social-cultural elements (planificación de base).

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CAHIERS DE GÉOGRAPHIE DE QUÉBEC,
Vol. 20, No 49, avril 1976, 93-126

URBAN INTERRELATIONS AND REGIONAL PATTERNING IN THE DEPARTMENT OF PUNO, SOUTHERN PERU *

by

Jean MORISSET

INTRODUCTION

Migratory movements in the last three decades or so have produced a sudden and rapid growth of the capital cities as well as of the main secondary centres of all South American countries. Many scholars have studied this phenomenon from the point of view of receiving centres, and focussed on problems of marginality. In Peru, one sixth of the 650 000 inhabitants of Puno (see figure 1) lived outside their department of origin when the 1961 census was taken. This process has continued according to the 1972 census which enumerated 780 000 inhabitants in Puno. As inadequate predictions were made to cover out-migration, this total fell short of pre-census extrapolations by almost 50 000 people.

The economic difficulties encountered by these rural migrants and the problems of their integration to an alien world, have been amply studied and documented [1]. Yet similar geographical changes occurring at a more reduced scale — that of small rural settlements — have been comparatively ignored. True, it has been suggested that many small towns serve as adaptation centres prior to more important moves ; a 'campesino' would go first to the provincial, then to the department capital, and so on.

As a consequence of all this, there has been a profound alteration of settlement networks since the colonial and republican periods ; namely the development of alternative marketing and commercial centres to complement a settlement hierarchy hitherto based primarily on administrative factors.

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* Note : This paper is a revised version of a chapter that appeared originally in a doctoral dissertation entitled : *Puno : Geographical Perspectives on Integration in Southern Peru.* The University of Liverpool, 1975 (XI – 403p.)

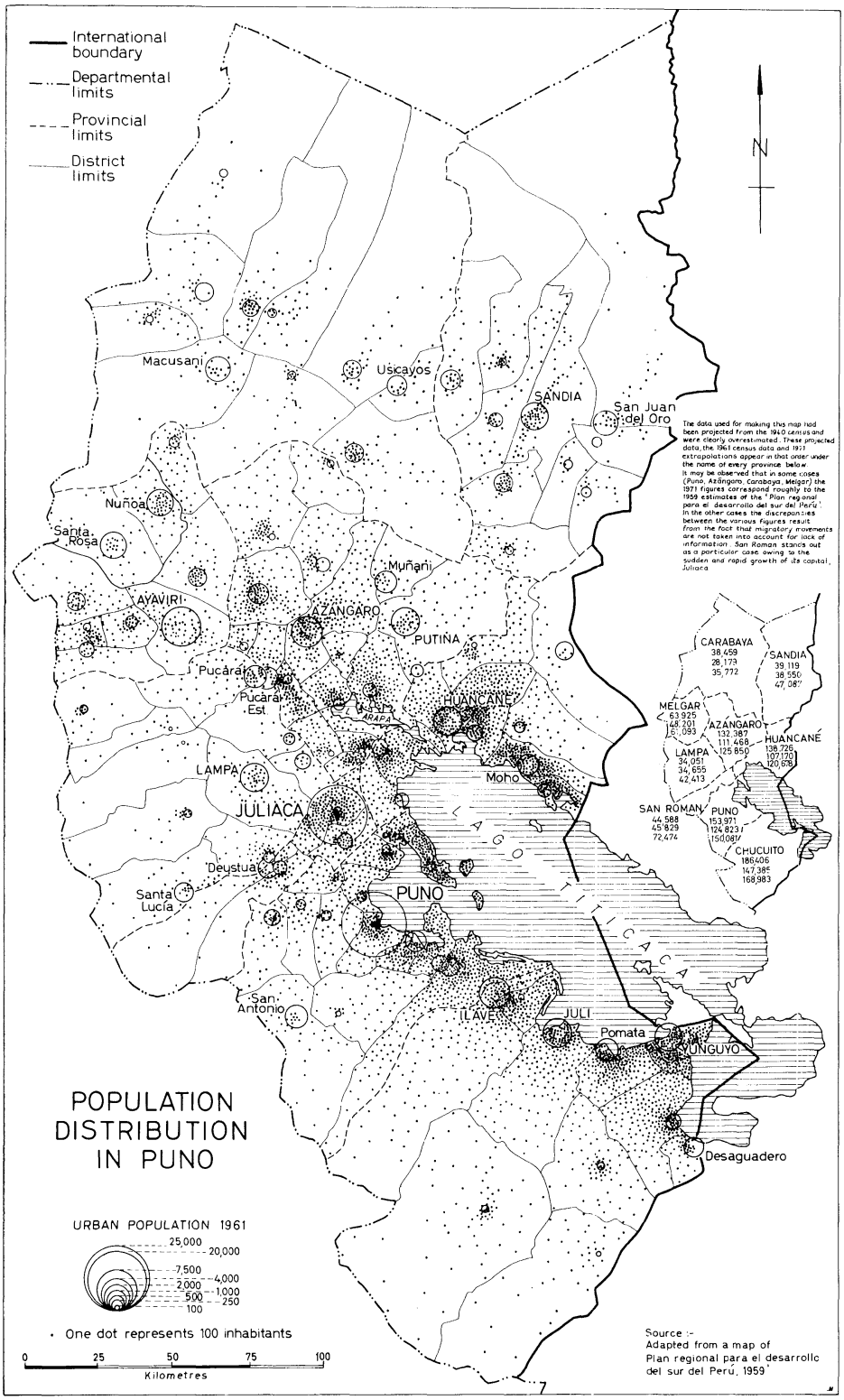
Field research was carried out with the help of the Canada Council.

Figure 1 has been drawn by Joan Treasure, the Department of Geography, the University of Liverpool and figure 5 by Marie-Michelle M.-Béland. All other maps and graphs were drafted at the "laboratoire de cartographie, université Laval", by Isabelle Diaz. Permanent address of the author : Allée des Érables, Saint-Michel, Comté de Bellechasse, Province de Québec, Canada G0R 3S0.

[1] See for instance the article of WEISSLITZ, Jacqueline (1971) "Migration Rurale et Intégration Urbaine au Pérou." in "Impérialisme et Urbanisation en Amérique Latine", a special issue of *Espaces et Sociétés*, No 3 : 45-63.

There is a profusion of studies dealing with such subjects. See BRUNN, Stanley D. (1971) *Urbanization in Developing Countries. An International Bibliography.* East Lansing, Michigan State University, 693 p.

Figure 1


International boundary
Departmental limits
Provincial limits
District limits
N
Macusani
Uscayos
SANDIA
San Juan del Oro
Nuñoa
Santa Rosa
Muñani
AYAVIRI
AZANGARO
PUTINA
Pucará
Pucará Est.
HUANCANE
LAMPA
JULIACA
Moho
Deustua
Santa Lucía
PUNO
San Antonio
ILAVE
JULI
Pomata
YUNGUYO
Desaguadero
The data used for making this map had been projected from the 1940 census and were clearly overestimated. These projected data, the 1961 census data and 1971 extrapolations appear in that order under the name of every province below.
It may be observed that in some cases (Puno, Azángaro, Carabaya, Melgar) the 1971 figures correspond roughly to the 1959 estimates of the 'Plan regional para el desarrollo del sur del Perú'. In the other cases the discrepancies between the various figures result from the fact that migratory movements are not taken into account for lack of information. San Roman stands out as a particular case owing to the sudden and rapid growth of its capital, Juliaca.
CARABAYA 38,459 28,173 35,772
SANDIA 39,119 38,550 47,087
MELGAR 63,925 48,201 55,093
AZANGARO 132,387 111,468 125,850
HUANCANE 138,726 107,170 120,678
LAMPA 34,051 34,655 42,413
SAN ROMAN 44,588 45,829 72,474
PUNO 153,971 124,823 150,081
CHUCUITO 186,406 147,385 168,983
POPULATION DISTRIBUTION IN PUNO
URBAN POPULATION 1961
25,000
20,000
7,500
4,000
2,000
1,000
500
250
100
• One dot represents 100 inhabitants
0 25 50 75 100
Kilometres
Source :-
Adapted from a map of
Plan regional para el desarrollo
del sur del Perú, 1959

This paper will concentrate firstly on settlement network and settlement interrelations.

The positions and functions of the main populated centres delineate the regional (or sub-regional) character of the department whereas the pattern of interrelations emphasizes the impossibility of dissociating the geographical from the social. The regional patterning of Puno will then be

Table 1

Puno : ranking of the seventeen main populated centres on seven variables

Centres \ Variables	I	II	III	IV	V	VI	VII	Total
1 Juliaca	2	3	2	4	2	1	1	15
2 Puno	1	10	1	9	1	2	16	40
3 Ilave	5	5	5	3	8	5	11	43
4 Huancané	6	9	4	1	4	13	10	47
5 Azángaro	4	8	6	7	5	15	3	48
6 Putina	8	4	7	5	13	8	5	50
7 Ayaviri	3	13	3	15	3	11	4	52
8 S.J. del Oro	14	1	14	2	12	5	9	57
9 Yunguyo	11	12	10	8	10	4	6	61
10 Juli	7	11	8	14	6	11	6	63
11 Pacará Estac.	17	2	15	6	16	2	12	70
12 Macusani	15	6	16	12	11	16	2	78
13 Sandia	10	7	11	17	9	14	13	80
14 Lampa	9	16	9	11	7	17	17	86
15 Santa Rosa	13	17	13	10	14	5	15	87
16 Nuñoa	12	14	12	13	17	8	13	89
17 Pomata	16	15	17	16	15	10	8	97

Variable I : 1961 population.
II : popultion growth 1940-1961.
III : 1970 population. Computed from the registration of births and deaths for the 1961-70 period. These data that do not take into account migratory movements, were collected in the municipal buildings of every centre.
IV : population growth 1961-1970.
V : questionnaire (1.1a). Respondants were asked to rank the centres of Puno by order of importance.
VI : questionnaire (3.4). Rank derived from the number of times each centre was mentioned according to its presenting the least promising future.
VII : questionnaire (1.4). Centres ranked according to their level of independance from other centres.

considered in a second section, and a general scheme of regionalization will be suggested ; in the meantime the attitudes and 'modus operandi' of development agencies will have been briefly outlined.

1. EVOLUTION AND INTERDEPENDENCE OF MAIN 'PUEBLOS'

Seventeen of Puno's populated centres exceeded 1 500 inhabitants in 1961, as opposed to ten in 1940. Of these ten centres, only two (or 20%) were not provincial capitals in 1940, whereas in 1961 eight out of seventeen (or nearly 50%) were in that position. The respective ranks of these seventeen centres according to seven variables as well as their ranking average have been computed (see table 1). The preponderance of Juliaca which forms a central area slightly apart from lake Titicaca is coupled to the comparatively weak demographic growth of most traditional centres, namely the long-established provincial towns. Three general trends are noticeable : demographic stability and decrease, shifting population and unstability, rapid development and change, and these trends are all present in every geographical area.

The term Puno Lago has traditionally been used to distinguish from the rest of the department the predominantly Aymara-speaking, highly populated, and highly subdivided lands surrounding the Titicaca. Other expressions used with the same geographical connotations are 'las orillas del lago', 'el área colidante al lago', and at times 'Puno ribereño'. They all aim at identifying the regional context within which the lake adds something to economic activities as well as the inland area that is affected by the ameliorating influence of this large body of water — 8 000 km^2, with an average temperature of 13°C [2].

Indeed, one can speak of a lowland belt circling the lake between 3 812 and 3 900 metres above sea level. Depending on surface features, it does not extend more than 10-15 kilometres from the shore — just enough to border on Juliaca and cut through the humid alpine meadow. This we call in very broad terms Puno Lago. Of course, the term has only an heuristic value and does not conform entirely with morphoclimatic variables. [3] To summarize, Puno Lago comprises about half of the total population within more or less a twentieth of the department territory. As the bulk of commercial exchanges is concentrated along the lake shore, the most important settlement also delineate Puno Lago. Being the commercial centre of the entire department, Juliaca occupies a key-position between the lake and Puno Alto.

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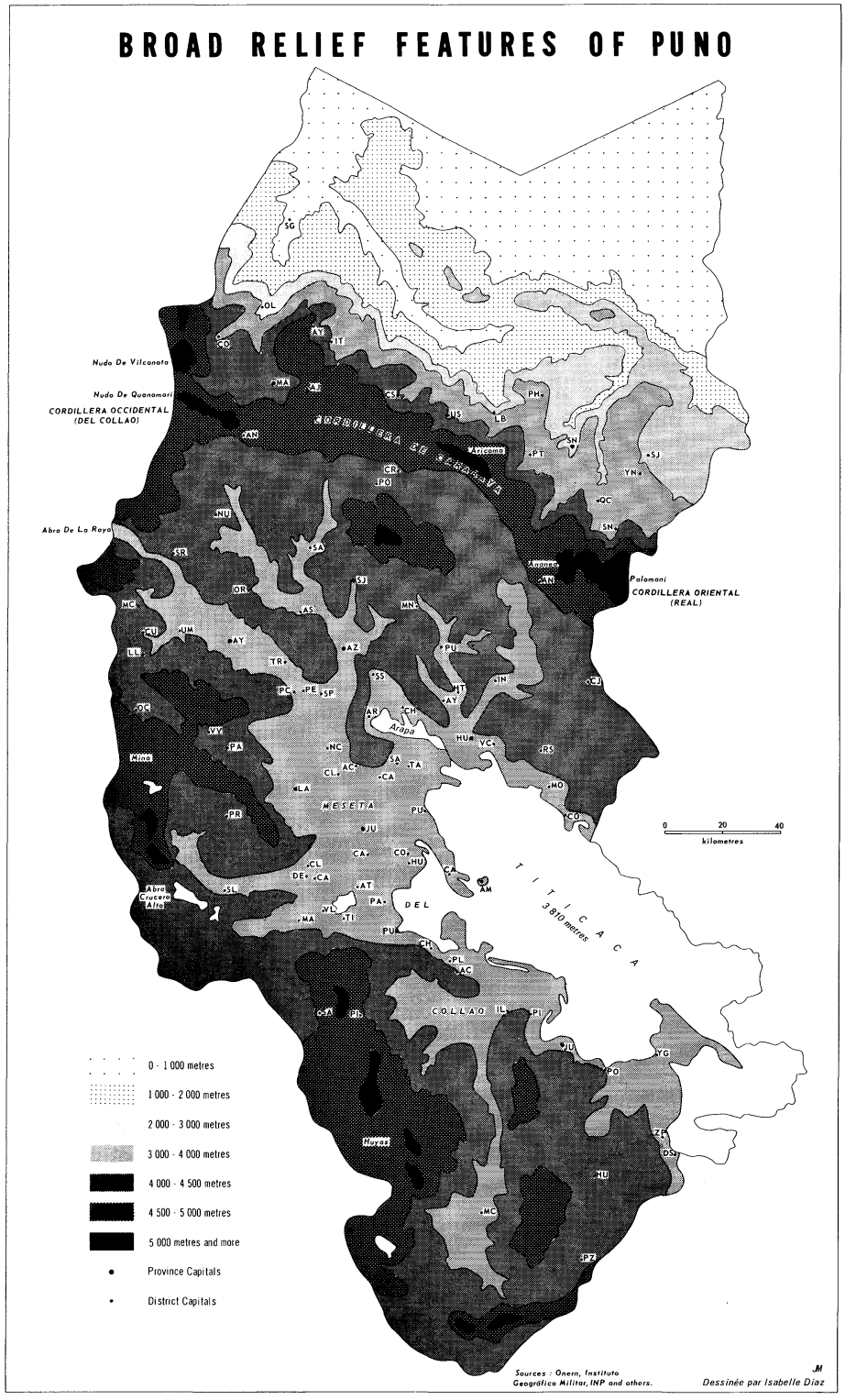
[2] MONHEIM, Félix (1956) *Contribución a la Climatologia e Hidrologia de la Cuenca del Titicaca.* Puno, Universidad Técnica del Altiplano, 1963, 232 p.

[3] In fact, three sub-climatic types are found within Puno Lago. See ONERN — CORPUNO (1965) *Programa de Inventario y Evaluación de los Recursos Naturales del Departamento de Puno — Sector de Prioridad I.* Vol. 5, *Climatología.* Lima, Imprenta de la República, 5 volumes.

Figure 2


BROAD RELIEF FEATURES OF PUNO
Nudo De Vilcanota
Nudo De Quenamari
CORDILLERA OCCIDENTAL (DEL COLLAO)
Abra De La Raya
CORDILLERA ORIENTAL (REAL)
Palomani
Vilcanota
Arapa
MESETA
DEL
TITICACA
3 810 metres
COLLAO
Abra Crucero Alto
Moyas
0 20 40
kilometres
0 - 1 000 metres
1 000 - 2 000 metres
2 000 - 3 000 metres
3 000 - 4 000 metres
4 000 - 4 500 metres
4 500 - 5 000 metres
5 000 metres and more
Province Capitals
District Capitals
Sources : Onern, Instituto Geográfico Militar, INP and others.
Dessinée par Isabelle Diaz

The area encompassed under Puno Alto is still more elusive. With reference to figure 2, it includes most of the 'altiplano' from Juliaca — 'laguna' Arapa going northwest, the 'puna' and 'las alturas' [4] and extends northwards over the 'Cordillera de Carabaya' until one begins to go downwards. It is the real domain of wool production based on sheep, llama and then alpaca as the altitude increases. With the exception of well-sheltered areas in the Province of Azángaro and a few other similar locations, agriculture is absent from Puno Alto. Small mining operations are however present here and there, but it is the 'hacienda' settlement ('poblado de hacienda') which characterizes Puno Alto. Again the designation should be understood in relative terms. For the inhabitant of a lower interandine valley, say in Cuzco or Apurimac, it is the entire Department of Puno that conveys the idea of 'puna', whereas in Puno, it is restricted to outlying grazing and mining areas.

Geographical setting

Indeed, the ecological and economic units which form the basis for Puno's geography may be confined to three interrelated regions : Puno Lago, Puno Alto and Puno Selvatico. This convenient trilogy is in agreement with the broad delimitations outlined below.

In comparison, Puno Selvatico does not present problems of identification. As elsewhere in the Andes, it is quite clear that the upper 'selva' or 'montaña' [5] begins with the Amazonian Basin. Altitudinal levels succeed one another rapidly and abruptly, and thus the differentiation is manifest by the simple presence of woodland vegetation. Where topography allows for plateaux and/or upland valleys on the eastern side of the Andean system (due north in Puno), one might be justified in using ecotypes such as subtropical and tropical Puno. The 'ceja' or 'cabeza de montaña' is a transitional zone mid-way between subarctic conditions and a low fully tropical environment. This ecological variety (see figure 3) has not so far produced a similar variety in economic activities and population patterns. Timber, coffee and fruits are added to production, but the settled areas follow river valleys rather than ecological zones. On the other hand, Puno is of course an entirely tropical department by situation and to avoid any confusion it seems more simple to refer to this last region as Puno Selvatico.

Settlement growth

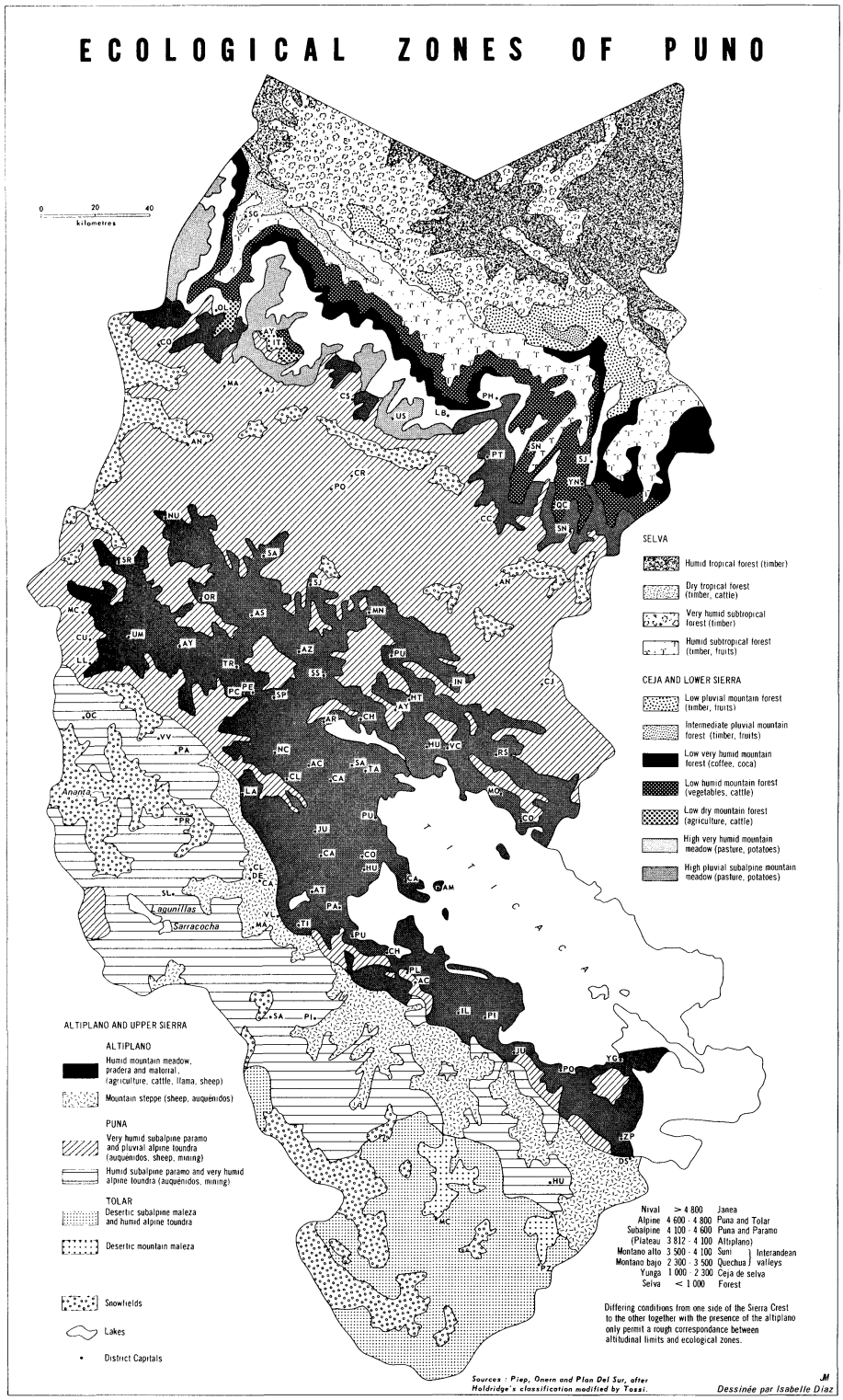
The number of 'pueblos' that exceeded 1 500 inhabitants amounted to 17 in 1961 (see table 2). Puno, the capital of the department is the most

---

[4] Literally the highlands, this is another current expression used to indicate elevation and remoteness from the lake and including all cordilleran lands.

[5] The traditional and sketchy way of dividing Peru into 'costa', 'sierra' and 'selva' (or 'montaña') is of course a view from the coast. A local geography textbook for primary school stated that Puno was divided into 'costa', 'sierra' and 'montaña'. But then the author hastily added : « being an inland department, there is to 'costa' as such in Puno ; nevertheless there fortunately is a lake — the Titicaca — and consequently a lakeshore to play the role of the 'costa'.

Figure 3


ECOLOGICAL ZONES OF PUNO
0 20 40
kilometres
SELVA
Humid tropical forest (timber)
Dry tropical forest (timber, cattle)
Very humid subtropical forest (timber)
Humid subtropical forest (timber, fruits)
CEJA AND LOWER SIERRA
Low pluvial mountain forest (timber, fruits)
Intermediate pluvial mountain forest (timber, fruits)
Low very humid mountain forest (coffee, coca)
Low humid mountain forest (vegetables, cattle)
Low dry mountain forest (agriculture, cattle)
High very humid mountain meadow (pasture, potatoes)
High pluvial subalpine mountain meadow (pasture, potatoes)
ALTIPLANO AND UPPER SIERRA
ALTIPLANO
Humid mountain meadow, pradera and matorral, (agriculture, cattle, llama, sheep)
Mountain steppe (sheep, auquénidos)
PUNA
Very humid subalpine paramo and pluvial alpine tundra (auquénidos, sheep, mining)
Humid subalpine paramo and very humid alpine tundra (auquénidos, mining)
TOLAR
Desertic subalpine maleza and humid alpine tundra
Desertic mountain maleza
Snowfields
Lakes
District Capitals
Laguillas
Sarracocha
Nival > 4 800 Janea
Alpine 4 600 - 4 800 Puna and Tolar
Subalpine 4 100 - 4 600 Puna and Paramo
(Plateau 3 812 - 4 100 Altiplano)
Montano alto 3 500 - 4 100 Suni } Interandean
Montano bajo 2 300 - 3 500 Quechua } valleys
Yunga 1 000 - 2 300 Ceja de selva
Selva < 1 000 Forest
Differing conditions from one side of the Sierra Crest to the other together with the presence of the altiplano only permit a rough correspondance between altitudinal limits and ecological zones.
Sources : Pisp, Onern and Plan Del Sur, after Holdridge's classification modified by Tosi.
Dessinée par Isabelle Diaz

populated centre followed by Juliaca, the 'industrial' market town and then Ayaviri and other provincial administrative settlements. If one tries to assess these figures in relation with other variables a different picture comes forward.

Table 2 reveals that Juliaca comes before Puno, Ilave before Juli, Yunguyo before Pomata and San Juan del Oro before Sandia, on the one hand, whereas Azángaro and Putina are on a comparable ranking, on the other hand. Huancané stands by itself and so does Ayaviri, with the difference in the latter case that three neighbouring centres, Santa Rosa, Nuñoa and Pucará Estación divide up functions that would otherwise produce a situation comparable to that of Ilave with respect to Juli. Lampa is dragged in the wake of Juliaca ; Macusani is relatively more lively that Sandia because Ollachea has not yet developed as much as San Juan del Oro.

In general, the main settlements have experienced a similar evolution. They group themselves pairwise, the rise of one centre producing the stability or the decline of the second. Often a third centre will come in to play interlinking rôle between both 'pôles' of the 'conurbation', though it will more readily cluster with the more important of the two centres. 'Stricto sensu', the term 'conurbation' is out of context here, otherwise it could well express the

Table 2

Puno : main populated centres, 1961 and 1970.

Centres	Population	1961	1970
1	Puno *	24 459	34 587
2	Juliaca	20 351	32 930
3	Ayaviri	7 553	9 783
4	Huancané	4 053	7 659
5	Ilave	4 278	6 949
6	Azángaro	4 772	6 907
7	Putina	3 512	5 674
8	Juli	3 874	5 235
9	Lampa	3 125	4 340
10	Yunguyo	2 506	3 612
11	Sandiá	3 026	3 572
12	Nuña	2 137	2 929
13	Santa Rosa	2 054	2 884
14	San Juan del Oro	1 767	2 772
15	Pucará Estación	1 522	2 362
16	Macusani	1 601	2 210
17	Pomata	1 583	2 004

Sources : 1961 census and municipal registration of births and deaths, 1962-70.
* Order of centres established from the 1970 populations.

situation between Puno-Juliaca, Juli-Ilave, Pomata-Yunguyo, Taraco-Huancané, Azángaro-Putina, Ayaviri-Pucará Estación, Lampa-Deustua and finally Sandia-San Juan del Oro. In every case a once bountiful administrative or colonial centre is more or less marking time whereas static 'villorios' of yester-year have suddenly emerged as leading market and commercial towns —Juliaca, Ilave, Deustua and Yunguyo [6] —, cross-roads centres — Pucará Estación and Putina —, and pioneer settlements — San Juan del Oro and San Gabán —. The intercensal growth of the District of San Gabán (941%) should not be envisaged in absolute terms. It barely existed in 1940 and so far the 'pueblo' of Lanlacuni Bajo — currently designated by the district name of San Gabán — is awaiting completion of the road to take on a regional importance comparable to that of San Juan del Oro. Ollachea, the in-between settlement connecting San Gabán to Macusani, awaits the realization of its potential. The percentage growth of Macusani and Ollachea in the 1940-1961 period was respectively, 123 and 12.

The 'ciudad' of Lampa for its part has completely declined to eke out an existence within the influence of Juliaca. And in the north-western corner of Puno Alto, Macusani has grown out of its isolation to rely more and more upon Juliaca, the difference with Lampa being that distance at Macusani plays a beneficial rôle in distributing functions that Juliaca can totally assume in the case of Lampa. On the other hand, Macusani is a compulsory staging post for the Carabayan 'selva' and almost all its districts, whereas Lampa — twice by-passed by the railway — is finding itself completely excentric to developments occurring within its own provincial territory, hence the eclipsing of Lampa to the profit of Deustua. Dragging along the two neighbouring 'pueblos' — Cabanilla and Cabana, a mere two kilometres away in opposite directions —, Deustua has indeed experienced a 108% intercensal growth, yet Lampa could not even reach 20%.

On the north-eastern side of the Titicaca, the situation is rather advantageous to Huancané, which stands mid-way between Juliaca and Conima. The provincial chief town may thus capitalize on its geographical location. Indeed, among Puno's seventeen main centres, Huancané is the settlement which has achieved the highest natural growth rate (89%) for the period 1961-1970.

Settlement network

To help visualize the basic settlement geography, a general network of interconnections between all district capitals of Puno has been outlined in figure 4. Two other settlements — Quiscopunco and Rosarío — have also been indicated because they are important road junctions, though they are deprived of any administrative function.

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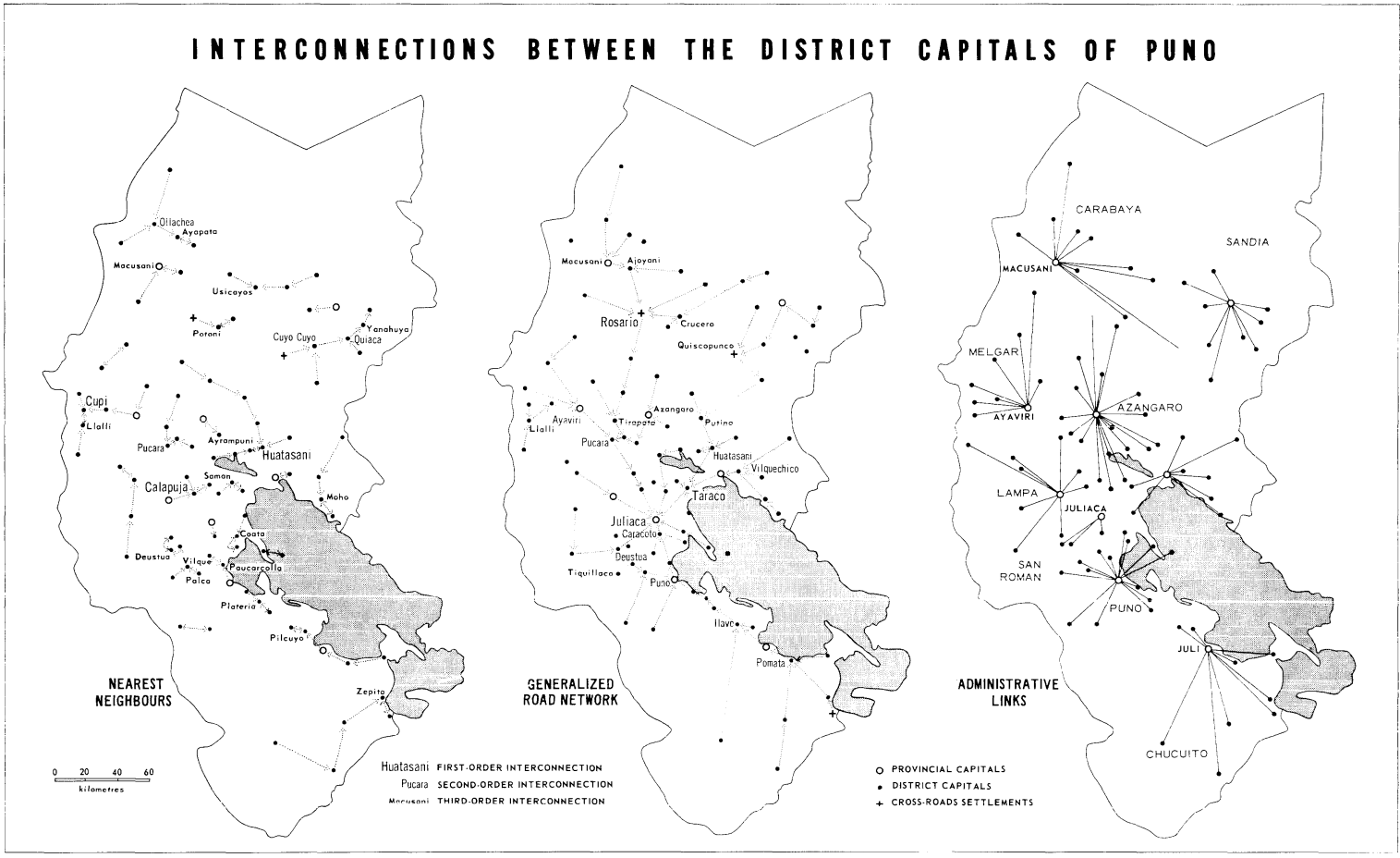
[6] The border location of Yunguyo has been greatly beneficial in comparison with Pomata, but it also has an agriculture hinterland that Pomata lacks.

Figure 4


INTERCONNECTIONS BETWEEN THE DISTRICT CAPITALS OF PUNO
NEAREST NEIGHBOURS
GENERALIZED ROAD NETWORK
ADMINISTRATIVE LINKS
Ollachea
Ayapata
Macusani
Usicayos
Poroni
Cuyo Cuyo
Yanahuya
Quiaca
Cupi
Llalli
Pucara
Ayrampuni
Huatasani
Saman
Calapuja
Moho
Coata
Deustua
Vilque
Paucarcolla
Palca
Plateria
Pilcuyo
Zepita
Ajoyani
Rosario
Crucero
Quiscopunco
Ayaviri
Azangaro
Tirapata
Putino
Vilquechico
Taraco
Juliaca
Caracoto
Tiquillaco
Puno
Ilave
Pomata
CARABAYA
SANDIA
MACUSANI
MELGAR
AYAVIRI
AZANGARO
LAMPA
JULIACA
SAN ROMAN
PUNO
JULI
CHUCUITO
0 20 40 60
kilometres
Huatasani FIRST-ORDER INTERCONNECTION
Pucara SECOND-ORDER INTERCONNECTION
Macusani THIRD-ORDER INTERCONNECTION
PROVINCIAL CAPITALS
DISTRICT CAPITALS
CROSS-ROADS SETTLEMENTS

The nearest neighbour linkage provides an idea of proximity, irrespective of physical barriers which the road network will often reflect. It is, however, interesting to note on the nearest neighbour diagram, that there are only five cases where interconnections associate no more than two centres. Juliaca is one of these as well as two other provincial capitals : Huancané and Sandia. As a general rule, relative isolation and relative concentration are exceptional ; in other words, the set of district capitals is well spread out throughout the department.

The diagram showing the generalized road network is markedly different from the previous one. Indeed, there are only five centres that occur on both networks : Pucará and Huatasani on the first and second-order interconnection ; Macusani, Deustua and Llalli on the second and third-order interconnection. All these centres are communication foci, even Llalli, though at a very reduced scale. Four provincial capitals do not appear as commanding communication centres : Sandia, Huancané, Lampa and Juli.

Lastly, if one considers the behaviour of all centres from one map to the other, it follows that they either interassociate (for instance Potoni with Crucero on nearest neighbour ; Pilcuyo with Ilave, Ollachea with Macusani Ayrampuni with Huatasani on generalized road network) or cluster with more commanding settlements (Vilquechico with Huancané, Vilque with Puno, Cupi-Llalli with Ayaviri, etc.). To focus on a single case, Vilquechico is too close to Huancané to become autonomous vis-à-vis the provincial chief town even if it has a more productive hinterland.

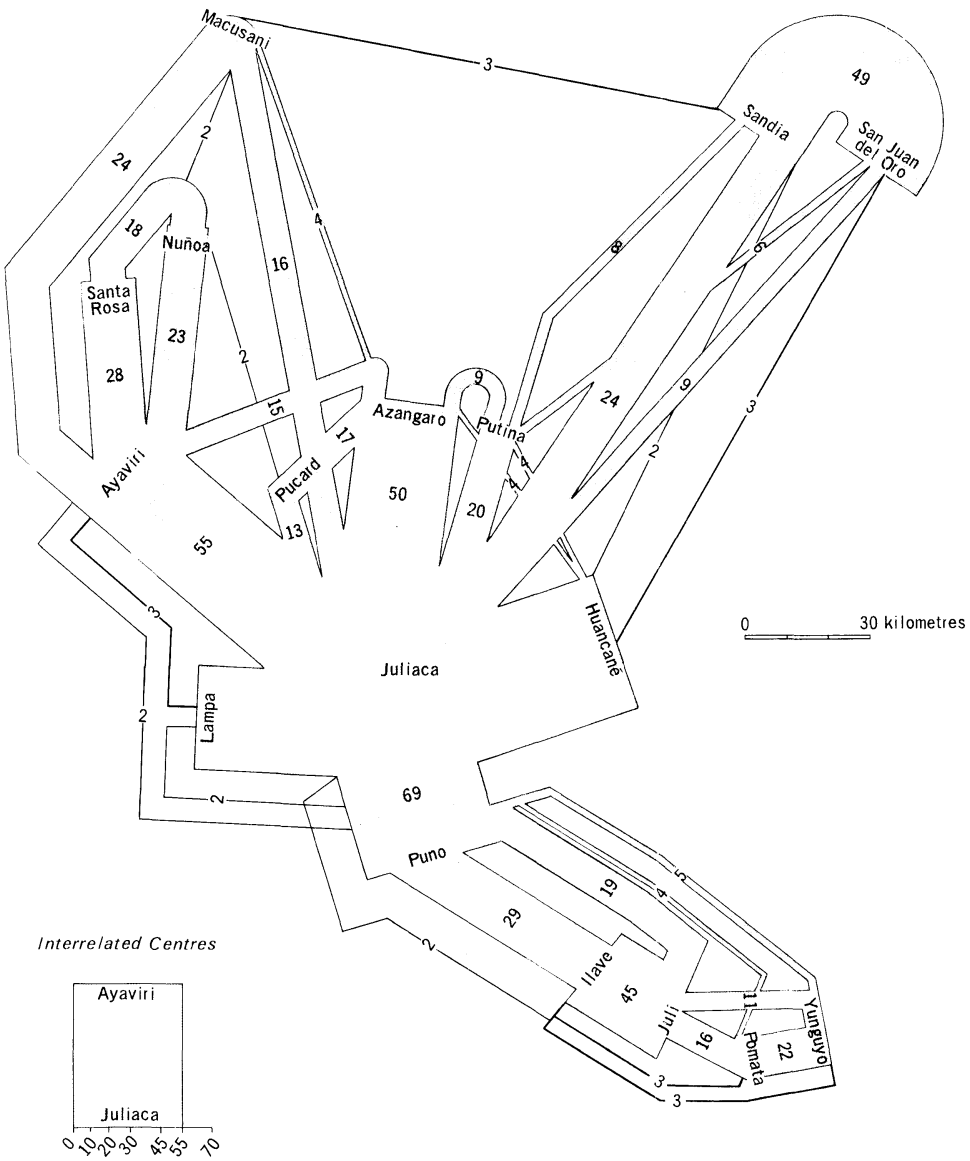
To provide some reference background, a map showing administrative links has been inserted in figure 4. It bears little resemblance to the present hierarchical pattern. If in every province but Melgar, nearest neighbours and road pattern set off parallel networks of interconnections, the administrative linkage reveals that Azángaro, Lampa and Juliaca show the greatest inconsistencies. Clearly Azángaro and Lampa are the two provincial chief towns that least exert areal control over the entire network of their district capitals. Conversely, Pucará and Putina exert some disproportionate control in relation to their administrative status. But it is really the impact of Juliaca that goes most beyond the limits of its province. In many ways, it is the growth of Juliaca that has reverberated on the entire network ; thus settlements that have kept on developing have a central position between areas of production and the commercial centre of the department.

The network illustrated in figure 5 provides some guide to the basic pattern of interdependence in Puno. Juliaca unquestionably appears as the departmental centre of gravity. Puno may well be the departmental capital, but this fact has been practically ignored by the respondants ; [7] excepting

[7] This analysis is based on a questionnaire that was distributed throughout the seventeen most populated centres of the department. Incidently, a fair amount of the information contained in this paper is derived from the answers to many a question that dealt precisely with respondents opinions and perceptions. Regarding the questionnaire itself, all details will be found in the author's dissertation.

Figure 5

INTERDEPENDANCE NETWORK
BETWEEN THE SEVENTEEN MAIN POPULATED CENTRES OF PUNO



Source : From a questionnaire completed by 121 persons. The interdependance network has been derived from the number of interrelations made by the respondants between any set of two centres. Interrelations mentioned less than twice have not been considered.

Juli, all provincial capitals are interrelated with Juliaca (Lampa, Huancané, Ayaviri, Azángaro, Macusani and Sandia). Less apparent is the position of secondary centres. Puno and Huancané fall at par on the number of their interrelations with Juliaca, but Puno has more links that are of greater importance with third-order centres. In that respect Ayaviri comes before Azángaro and both supersede Lampa, as does Ilave with respect to Juli.

Southern centres are all interrelated between each other and in both northern and southern directions. The cut-off point is Puno ; only one respondant has put a weak link beyond Puno (between Ilave and Juliaca). The absence of lake communication sets Chucuito and Huancané completely apart ; no one has interrelated these two Aymara areas. But if everything is directed toward the departmental capital, Ilave stands out as the centre of southern Puno.

The north central settlements are not very strongly interrelated. As a matter of fact, they are linked through Juliaca. Lampa is not sufficiently autonomous to have any settlement linked to it by more than three interrelations. So is Huancané, but to a lesser extent, and it has contact with both Puno Alto and Puno Selvatico. It is not at all clear whether Ayaviri or Azángaro prevails over the other. In comparison to Azángaro, Ayaviri is more heavily interrelated with fewer settlements. And besides, Azángaro is endowed with a central position that has hardly been developed up to now ; indeed from Juliaca, the roads to either Macusani or Sandia bypass Azángaro by thirty kilometres in each direction. Located along these two access roads, the 'pueblos' of Pucará and Putina have experienced a rapid and sustained growth during the last years which would have otherwise profited Ayaviri and Azángaro.

These changing functions of traditional centres are still in flux. But sooner or later the evolutionary tendencies described above are bound to affect the traditional spatial structure of the department. It looks as if the entire settlement organization — the district capital network — could not adequately meet the requirements of an opeping up and developing Puno, by one or two alterations alone.

Urbanization trends

A genuine urbanization is actually taking place without any planning policy. Far from contributing to the reinforcement of the well-established 'ciudades', 'deruralization' (87% of the Puno population was classified as rural in 1940, against 82% in 1961 and 75% in the early seventies) accompanies the emergence of alternative centres. Economic and geographical factors account for the formation of a new urban hierarchy, but other less straightforward explanations also come to mind, for social aspects are concurrently at play.

The 'ciudades' of Puno have always been the residential headquarters of a local plutocracy composed of 'hacendados', administrators, churchmen

and tradesmen. In some instances a single person could cumulate three of these functions, if not all. The plague of absenteism should not be too exaggerated. True, many Puno landlords lived in Lima or Arequipa, the southern regional centre that owes much of its fortune to Puno. But Puno and the other nucleated centres had their provincial life :

> « Il y a encore une trentaine d'années . . . ces petits centres étaient de petites capitales locales . . . Ils étaient fréquentés par les hacendados des environs qui y possédaient une demeure . . . quelques maisons . . . servaient de résidence à cette 'gentry'. Autour d'elles gravitait une clientèle formée du curé, du sous-préfet ou du gouverneur, éventuellement du médecin ou du juge . . . *Maintenant la gentry est absente des bourgades.* Quand les propriétaires vont sur leur hacienda, ils traversent le bourg sans s'y arrêter ; ils font leurs achats à Juliaca, Arequipa ou Lima . . . Les bourgades se sont gonflées de ruraux qui s'efforcent de trouver des petits emplois autour du marché, et qui se livrent à des cultures maraîchères dans des potagers. *Bien que leur population augmente, ces petites villes deviennent de gros villages* . . . Ils ne sont plus que des relais d'un niveau assez élémentaire, des 'gares' d'autocars et de camions tout en conservant, peut-être accrue, leur fonction de marché campagnard. » [8]

The author emphasizes the progressive ruralization of Puno rather than its urbanization. The enquiries of the Plan del Sur arrived at a similar conclusion [9] as the 'pueblos jovenes' and small towns are more and more invaded by migrant 'campesinos'. In this context, is it not paradoxical to speak of an emerging urban network in 'Puno Rural'? But the same could be said of Lima and Arequipa with the growth of 'pueblos jovenes'. [10] The description of Dollfus is valuable, but he does not attempt to explain why migrations have benefited the secondary centres. Indeed, a second look at the situation discloses a quite revealing trend, urban growth is producing in Puno two contrasting settlement types.

Dating from colonial and republican times, provincial capitals have kept growing through the impetus of their administrative functions. But in a parallel direction to that, and only dating from two decade or so, a second network of commercial centres is quite definitely evolving. Juliaca, the wool-marketing centre, is competing with Puno, the administrative capital, to become the leading departmental 'ciudad' ; and the same rivalry exists between Ilave, the fair centre of southern Puno, and the traditional 'city' of Juli. If we add to these criteria the development of communications, other settlements could be opposed : Yunguyo and Pomata, Putina and

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[8] DOLLFUS, Olivier (1968) *Le Pérou : Introduction Géographique à l'Étude du Développement.* Paris, Institut des Hautes Études de l'Amérique Latine, 355 p. Quotations on pages 50 and 51. Our underlining.

[9] SCHAEDEL, Richard P. et *al.* (1959) *Los Recursos Humanos del Departamento de Puno.* Lima, Plan Nacional para el Desarrollo del Sur del Perú, V. 5, No. 9, 179 p.

[10] Euphemism that stands for 'barriadas' or slum areas in the official governmental jargon. Many case studies dealing with that problem have been edited by MANGIN, William (1970) in *Peasant in Cities : Readings on the Anthropology of Urbanization.* Boston, Houghton Mifflin Co., 207 p.

Azángaro, Pucará and Ayaviri, San Juan del Oro and Sandia (see figure 6). It looks as if some of the traditional administrative centres were not that well prepared to accommodate the 'campo' within the city, so that alternative rural-like settlements have spontaneously developed.

It seems that the old provincial capitals (Juli, Lampa, Ayaviri, Azángaro) were slightly mislocated with respect to both population concentrations and commercial exchanges on the one hand, and recent socio-geographical changes on the other hand. These traditional centres were towns made by and for a social class that lived from the land but not with the land. Thus one can observe a spatial segregation between peasant concentrations and the general pattern of administrative and commercial centres. The position and growth of Ilave in relation to Juli and Yunguyo vis-à-vis Pomata are good illustrations of migratory preferences for better market locations within actual areas of production.

Moreover, the former centres had the infrastructural equipment and housing facilities that rural migrants could do without. If not, why have Platería, Pucará and Ilave been preferred to Chucuito, Ayaviri and Juli ? Why has Juliaca attracted more migrants than Puno ? It has been suggested that Juliaca has a more open employment structure which allows for more opportunities. But again why is this so ? It is our contention that socially and geographically Juliaca, Ilave, Yunguyo, Pucará, Deustua became towns of rural-dwellers because the latter needed to make fewer adjustments,

Figure 6

PUNO : SIMPLIFIED MODEL OF SETTLEMENT NETWORK SOCIO-GEOGRAPHICAL CHARACTERISTICS

	"CHOLO" AND "MISTI" SETTLEMENTS	"INDIO" SETTLEMENTS	"MISTI" AND "CHOLO" SETTLEMENTS
AYMARA SETTLEMENTS (PUNO SELVATICO)	*San Juan del Oro 797*	*Yanahuaya 302*	*Sandia 104*
QUECHUA SETTLEMENTS (PUNO LAGO, ALTO &SELVATICO)	*San Gabán 941* *Putina 191* *Pucará Estación 385* *Huancane 81* *Deustua-Santa Lucía 108-250* *Juliaca 237*	*Macusani 123* *Munani 130* *Munoa-S.Rosa 31-16* *Moho-Conima 72-57* *Cabana 49* *Urban Puno 72*	*Ayapata-Ollachea 82-12* *Azángaro 82* *Ayaviri 33* *Taraco 23* *Lampa-Cabanilla 19-<17* *Puno 77*
AYMARA SETTLEMENTS (PUNO LAGO & ALTO)	*Platería 263* *Ilave 132* *Zepita-Desag. 165-191*	*Acora <15* *Pilcuyo 91* *Yunguyo 71*	*Chucuito 16* *Juli 71* *Pomata 30*
	DEVELOPING CENTRES	*INTERMEDIATE CENTRES*	*TRADITIONAL CENTRES*

Numbers refer to 1940-1961 population growth in percentage

fewer adaptive clashes with a pre-existing structure. In contrast, Puno, Juli, Pomata, Ayaviri, Lampa with their colonial 'plazas', churches and grand houses — relatively speaking — produced 'ipso facto' a socio-spatial cleavage between new-arrival and the established population. In Puno, in Juli, one finds readily contrasting suburbs which do not exist in Juliaca and Ilave where migrants created their own social structure. The differences between Puno and Juliaca and the similarities between Puno and Juli — same importance of the juridical function, same juxtaposition of the urban and the rural, same division of the population into Mistis, Cholos and Indios, writes Bourricaud [11] — bring together Ilave and Juliaca. If one refers to the former cities in terms of progressive ruralization, the latter surely connotes the idea of progressive deruralization.

To speak of mislocation as we have done is tantamount to speak of misadaptation to spontaneous tendencies and changing functions. Of course, new centres have only recently developed in 'campesinos' areas. This could not very well have happened before land pressure obliged the population to migrate and look for alternative livelihoods — namely through a mixed economy of subsistence agropastoral activities and subsistence petty-marketing. Fairs came to be held close to areas of production that never quite coincided with the location of colonial towns (with the exception of Huancané and Azángaro). The general result is that Puno has not experienced unidirectional rural-urban movements. Population has moved to the towns and conversely towns have moved toward the population. If the land was divided between 'lalifundismo' and 'minifundismo' ; so would be the towns, this time between administration and commerce.

The conclusion that can be derived from these brief considerations on the evolution of 'Puno Urbano' is that spontaneous geographical adjustments have genuinely occurred to counterweight a traditional network that was based too exclusively on administrative and macro-mercantile interrelations. The current settlement network represents a certain balance of power between unconstrained developments versus change-promoting policies which paradoxically, try to maintain a permanent pattern.

The geographical forces at play as well as their resulting social implications have been tentatively illustrated in figure 6. In the traditional centres, the growing Cholo class appears as a buffer between the Indio and the Misti. [12] In the developing centres, the Cholo takes the place of the

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[11] BOURRICAUD, François (1962) *Changements à Puno. Étude de Sociologie Andine.* Paris, Institut des Hautes Études de l'Amérique Latine, 239 p. Reference on page 64.

[12] Whereas the Mistis make out the socio-ethnic group resulting from the european settlers, the Cholos are in fact the Mestizo class in Peru. It should be noted however that such distinctions are never quite clear-cut and, henceforth, socio-ethnic differenciations are better understood in terms of ambivalence. One of the best synthetic treatment on that intricate subject has come about from Gonzalo Aquirre BELTRAN, in *Regiones de Refugio. El Desarrollo de la Comunidad y el Proceso Dominical en Mestizo America.* México, Instituto Indígenista Interamericano, 1967 (XVIII – 366 p.), see note 19, pp. 301-311.

Misti which then becomes an obsolete element which is no longer necessary to the functioning of the socio-geographical machine. In other words, 'cholificación' of the Indian rear-guard in centres such as Juliaca, Ilave, San Juan del Oro or Platería no longer needs a Misti advanced-guard. Cholos are taking over roles and functions once assumed by Mistis which gradually fade away.

The ongoing geographical decay of Lampa, Ayaviri, Sandia or Chucuito illustrates the fact that integration is taking place by levelling-off the old bipolar social structure. This is even done 'in situ', as exemplified by the changing roles of Huancané and the ambivalent functions of Azángaro. All these forces are rapidly outdating an administrative network (the provinces and the districts) which was established to serve functional regions that exist no more, and it is therefore urgent to provide an alternative intra-regional organization.

2. GEOGRAPHICAL LINKAGES AND REGIONALIZATION

The take-over of Puno by development agencies has kept increasing since the 1950's and this has been outlined in an earlier article. [13] The activities and the aims of the twenty-four agencies operating in Puno in 1967 have been reviewed in detail by Connelly [14] and there is no need to duplicate his work except to point out that all agencies — governmental and para-governmental institutions alike — base their regional activities on the provincial administrative divisions of the department (see again figure 1).

For lack of better criteria or due to a certain 'vis inertiae', not only are pre-established administrative patterns rigorously followed, but the Province of Puno is implicitely given an absolute preponderance. Since Puno is the departmental capital this is to be expected, but the fact is that provincial territories (and 'a fortiori' district areas) are unconsciously classified according to their distance from Puno. Furthermore, the 'vía panamericana' hugs the lake shore from Puno to Yunguyo and consequently institutional services are more evenly distributed in the Province of Chucuito than anywhere else in the department. As the socio-geographical centre of the department lies rather in Juliaca, the situation produces a spatial cleavage which is detrimental to the department as a whole.

Azángaro, the third province in total population, San Román, the fastest growing province, or Huancané, the poorest province do not obtain their fair share of 'development'. Prior to the agrarian reform, Lampa was hardly visited by institutional agencies. This 'état de fait' has prompted one of our

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13 In « The Department of Puno as a Territory-to-be-developed in Southern Peru. » *Revista Geográfica*, No. 79 (Diciembre 1973) : 11-40.

14 In CONNELLY, Mark Q. (1967) *Programas de Desarrollo Socio-Económico en el Departamento de Puno.* Puno, 81p., mimeo.

informants to advocate an administrative reorganization in the following terms :

> « Se debe preconisar una decentralización de la capital (Puno) originando un desarrollo administrative macrocefálico en perjuicio de las provincias que pueden ser más importantes. »

Administrative zoning

The administrative zoning of Puno has been tentatively synthesized in figure 7. Only ten development bodies or institutions have been chosen because many an agency operates without any regional framework. CORPUNO is the most notorious example, its geographical policy being to irradiate throughout the department from the city of Puno. In fact only Promoción Comunal had chosen to be located in San Román (Juliaca), a better located 'centro de operación' with respect to rural Puno.

In figure 7, provinces have been listed from left to right according to their average zoning position. If Puno usually comes in first place, followed by either San Román, Lampa or Chucuito, the general impression is that of inconsistency and complete anarchy with regard to the division of Puno for administrative purposes. Of course, the requirements of these several institutions may vary according to their functions, but everyone concerned did express a need for uniformity. [15]

The question of administrative reorganization is indeed an unavoidable theme with which geography recurrently finds itself. In the Bolivian 'altiplano', certain low-level geographico-administrative changes have taken place following the 1952 'revolution'. [16] In Puno, the problem of administrative reorganization has never been tackled but it has nonetheless been recognized time and again. In the late 1920's, Emilio Romero approached this subject by writing :

> « Pues hoy, nuevos elementos de civilización como el automóvil ... precisan una demarcación provincial completamente distinta a las necesidades coloniales.
>
> La nueva demarcación territorial de las provincias no tendrá nada que ver con la costumbre ni la tradición, tomando solamente en cuenta el kilometraje de los caminos carreteros, los ríos y la proximidad de unos pueblos a otros por los más rápidos medios de comunicación.
>
> La transformación completa de la noción de espacio, gracias al motor, exige una demarcación que se acomode a las necesidades actuales. » [17]

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[15] This refers to a work done on that subject during our field research. See MORISSET, Jean et *al.* (Oscar Carreón ed.) (1971) *Zonificación Provisional de la Sub-Región Puno (Zonas y Sub-Zonas).* Puno, Oficina Nacional de Desarrollo Comunal, 44 p. mimeo.

[16] On that matter see the interesting goegraphical study of the anthropologist Hans C. BUECHLER (1968) The Reorganization of Counties in the Bolivian Highlands : An Analysis of Rural-Urban Networks and Hierarchies. In Elizabeth M. Eddy, ed. *Urban Anthropology.* Athens, Southern Anthropological Society Proceedings, No. 2 : 48-58.

[17] ROMERO, Emilio (1928) *Monografia del Departamento de Puno.* Lima, Imprenta Torres Aguirre, V – 541 p. — IX. Quotation on pages 275 and 276.

Figure 7

ADMINISTRATIVE ZONING IN PUNO, 1971.

Provinces / Agencies	PUNO	SAN ROMAN	LAMPA	CHUCUITO	AZANGARO	MELGAR	HUANCANE	CARABAYA	SANDIA
Desarrollo Comunal Areas de Planificación	Area I		Area I & Area IV	Area II	Area I & Area IV	Area IV	Area III	Area IV	Area III
Banco de la Nación Zonas Administrativas	Zona I	Zona II		Zona I	Zona III		Zona II	Zona III	Zona II
Agricultura Sectores de Acción	Sector I	Sector II		Sector III	Sector IV			Sector V	Sector IV
Zona de Salud Areas Hospitalarias	Area I	Area II		Area I	Area III		Area II	Area III	
Educación Zonas Administrativas	Zona I				Zona II	Zona I	Zona II		
Promoción Comunal Areas de Influencia	Area III	Area I		Area II	Area IV		Area V	Area IV	Area V
Jurisdicciones Religiosas Sectores Administrativos	Sector I			Sector III	Sector I	Sector II	Sector III	Sector II	
Ejército Areas Geopolíticas	Area III			Area I	Area III		Area II	Area III	Area II
Turismo Zonas de Interés	Zona I				Zona II				
Population *	2	6	8	1	3	5	4	9	7
Questionnaire **	1	2	7	3	5	6	4	9	8

* *Order of the Provinces according to 1961 population.*

** *Order of the Provinces according to the importance given to each Province in question*

Source : Field Research

In the early 1950's, Guevara Velasco concluded his statistical survey of the department by saying :

> « Se hace indispensable una nueva demarcación territorial de Puno, tomando como base los accidentes naturales. » [18]

[18] GUEVARA VELASCO, Agustin (1954) *Apuntes sobre mi Patria.* Volumen del Departamento de Puno. Cuzco, Editorial H.G. Rozas S.A., 3 Vol., 1456 p. Quotation on page 950.

Finally, in the early 1970's, the meeting that was called in Puno to face up the same problem, was inaugurated with these words :

> « . . . los límites políticos y administrativos (provinciales y distritales) del departamento, son cada vez más anacrónicos en relación con la realidad actual de Puno, con las necesidades de su desarrollo y los imperativos de una racional administración. » [19]

Of course, by 'accidentes naturales', Guevara Velasco meant that 'planning' areas should be overwhelmingly dependent upon physical variables. But thirty years before, Romero had foreseen, in what he calls 'la civilización del coche', that spatial networks would become gradually human in bias. In other words, geographical dynamics would grow more and more into a compromise between nature and man-made networks — if it had ever been otherwise.

Developmental axis

The question of the geographical (re-)organization of Puno really came to be posed in operational terms with the publication of the 'Documento Regional del Sur' (also called the 'Segundo Plan del Sur') by the Southern Bureau of the National Institute of Planning in Arequipa. ORDESUR was the first government institution to be given the precise and exclusive rôle of coordinating the work of these various agencies which hitherto functioned in a rather monolithic fashion. But development and coordinating strategies could not be put forward without the help of a spatial framework. The geographical hierarchy thus proposed (figure 8) readily differed from previous more circumscribed attempts — namely the ONDC and CO-POOP [20] — in two fundamental aspects. Firstly, it suggested the creation of an 'interior developmental axis' parallel to, rather than perpendicular to, the coast. This was done to break up the spatial relations of 'dominación-dependencia / sierra-costa', to which we shall come later on.[21] Secondly, it suggested the formation and fostering of so-called 'centros de apoyo'. Without necessarily altering the gross urban network of Southern Peru, these supporting centres were defined in the following terms :

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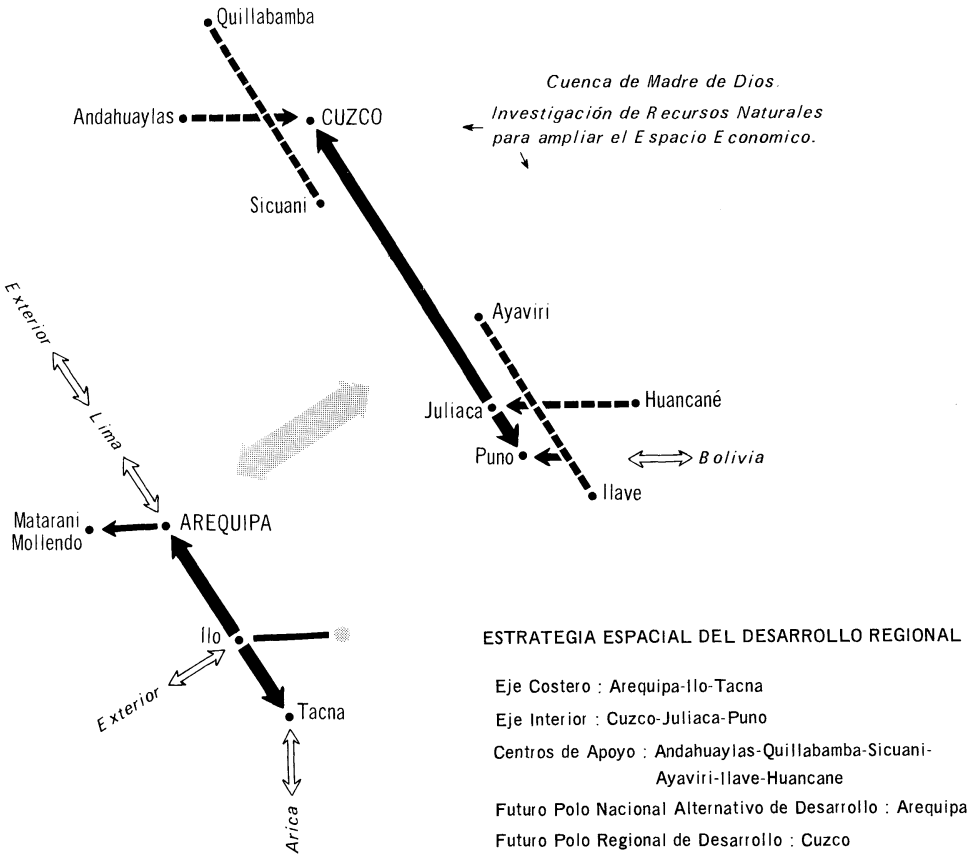
[19] In *Zonificación Provisional de la Sub-Región Puno.* 1971, *op. cit.,* Quotation on page 31.

[20] Presidencia de la República (1970) *Evaluación de la ONDC,* Lima, Imprenta de la República, 2 Vol., 72 p. & 38 p. Central Mayor Puno-Juliaca. CO-POOP (1969) *La Microplanificación a Nivel de la ZAC Puno-Lago.* Juliaca, 42 p. Another proposal (which falls short of its aim) will be found in Luis Edmundo Olazabal Monteagudo (1965). *Planeamiento Regional del Departmento de Puno.* Lima, Universidad Nacional de Ingeniería.

[21] These oppositions are really the application to the 'regional structure' of the ideas developed by Julio COTLER (1970). La Mecánica de la Dominación Interna y del Cambio Social en el Perú. In *El Perú Actual : Sociedad y Política.* México, Instituto de Investigaciones Sociales, pp. 47-89.

Figure 8

STRUCTURE OF REGIONAL DEVELOPMENT IN SOUTHERN PERU



Source : Ordesur, "Documento Regional del Sur", Arequipa, 1970.

« Se ha determinado dentro de la estrategia espacial y social de desarrollo de la región, la necesidad de identificar, estudiar e implementar ... determinados centros de naturaleza urbana que en las áreas de alta saturación poblacional rural, cumplan con el doble objetivo de desarrollo local para ampliar la cobertura urbana del área y al mismo tiempo pueda concentrar a los agentes y dinamismos capaces de promover el cambio y desarrollo en cada espacio de influencia, habitando por cien mil personas en cada caso, como promedio general. Estos 'focos' o 'núcleos' han sido denominados ... como Centros de Apoyo. » [22]

[22] ORDESUR (1970) *Los Centros de Apoyo en la Estrategia de Desarrollo del Sur.* Arequipa. 9 p. mimeo. Quotation on page 4.

In the Department of Puno, Ilave, Ayaviri and Huancané, were chosen immediately as 'centros de apoyo' to Puno and Juliaca. As a consequence, four areas were established according to specific criteria :

a – Area Central.
Comprende las provincias de Puno y San Román y parte de las de Lampa y Azángaro, con una población aproximada de 250 000 habitantes. Se le denomina área central, por contener los centros administrativos y económicos del departamento : Puno y Juliaca, respectivamente.

b – Area Ayaviri.
Comprende la provincia de Melgar y parte de la provincia de Azángaro, con una población aproximada de 75 000 habitantes. Su centro es la ciudad de Ayaviri.

c – Area Huancané-Sandia.
Comprende las provincias de Huancané y Sandia, con una población aproximada de 120 000 habitantes.
Es un área con predominio de raíz cultural Aymara y con variada actividad agropecuaria. La población está claramente concentrada a orillas del Lago Titicaca, alrededor del centro Huancané.

d – Area Chucuito.
Comprende la parte de la provincia de Chucuito vecina al Lago Titicaca y fronteriza con Bolivia. Tiene una población aproximada de 140 000 habitantes.
Es el área más densamente poblada y dinámica de las áreas rurales de la Región. Posee varios núcleos importantes entre los que destacan los Centros de Ilave en lo económico y Juli en lo administrativo. » [23]

Spatial relationships

In order to assess the validity of this choice and to also proceed further down in this regional hierarchy, an 85 × 35 matrix of information has been built (35 characteristics for 85 districts). From there a matrix of correlations could be obtained (figure 9), thus offering the most general pattern of spatial relationships structuring the Department of Puno.

Variables 1 to 3 refer to physical characteristics ; 4 to 9 to population ; 10 to 13 to settlement types ; 14 to 16 to socio-economic attributes ; 17 to 25 to agriculture ; 26 to 34 to stock-raising ; and finally variable 35 gives the deviation from the median district as provided by 30 variables. The last column gives the weight or the inter-correlation importance of every variable upon all other variables. For instance, the first variable (area) with a total of 6.35 comes in 27th rank, whereas district population (fourth variable) comes in first place and variable 19th (oca-olluco-mashua) in last place. [24]

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[23] ORDESUR (1971). *Comité Regional de Desarrollo de Puno.* Arequipa, Instituto Nacional de Planificación, 15 p. Quotation on page 9.

[24] Regarding the few statistical manipulations involved in the presentation of the above data, ample information will be found in COLE, J.P. and C.A.M. KING (1968). *Quantitative Geography.* London, John Wiley & Sons Ltd., 672 p. See pp. 150-152 and 287-294.

Figure 9

PUNO; MATRIX OF

PEARSON PRODUCT-MOMENT CORRELATIONS

FOR THIRTY-FIVE VARIABLES

	Area	Deviation Titicaca	Distance Puno-Juliaca	District Population	% Increase District Population	Population Density	Settlement Population	% Increase Settlement Population	% of Urban Population	Hacienda Population	Estancia Population	Parcialidad-Caserío Population	Comunidad-Ayllu Population	Indian Population	Literate Population	Primary School Enrolment	Potatoes: Total Production	Potatoes: Subsistence Production	Oca-Olluco-Mashua	Quinua-Cañahua	Fodder-Barley-Wheat	Horticulture	Selviculture	Agriculture: Total Monetary Value	Subsistence Production: Total Monetary Value	Cattle Population	Sheep Population	Llama Population	Alpaca Population	Horse Population	Swine Population	Sheep-Equivalent Unit Population	Guinea Pig Population	Poultry Population	Deviation Median District	Variables	Total on Rectangular Matrix	Rank
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35				
Area 1	100	54	48		36	-34		59															70	56	24			35	24						23	1	6.35	27
Deviation Titicaca 2		100	59	-26	54	-32		65	23	-23				-33	-27	-24				-26	-32		46	23		-33	-31					-21			37	2	8.39	20
Distance Puno-Juliaca 3			100	-36		-45	-23	27		-27	-26	-21		-31	-31	-35			26	-30	-44		28			-32	-33		21	-23					3	8.19	21
District Population 4				100		70	61			40	76	31	36	85	81	97	80	79		79	76	54		53	77	72	22			46	61	22	31	80	45	4	15.74	1
% Increase District Population 5					100			61	21					-28					-25				25									-31		38	5	5.38	32
Population Density 6						100	55			23	45	34	30	54	58	71	50	50		42	58	50		25	47	31		-23	-29	24	59		25	60	33	6	11.89	14
Settlement Population 7							100		66	58			46	21	59	75					33	26												53		7	7.98	22
% Increase of Settlement Population 8								100	21													22	52	38											30	8	5.59	30
% of Urban Population 9									100	43	-23		26		24	27																				9	4.66	34
Hacienda Population 10										100				29	42	44					28					28	33					32				10	6.44	25
Estancia Population 11											100			85	58	64	81	76		83	69	35		46	77	76	21			46	63	27	33	58	39	11	13.00	12
Parcialidad-Caserío Population 12												100	23	24		28	23	27				63			21				-26							12	5.44	31
Comunidad-Ayllu Population 13													100		48	43	24	24			24	48		25	24					32	23		32	48	26	13	7.07	23
Indian Population 14														100	78	74	86	83		83	80	47		46	78	79	28			54	59	28	44	63	37	14	15.32	2
Literate Population 15														100	80	66	65			62	71	51		36	62	59	24			41	44	23	36	68	33	15	14.02	9
Primary School Enrolment 16															100	70	69			67	71	51		46	68	62				41	53		29	80	41	16	14.97	5
Potatoes: Total Production 17																100	97			87	78	61		65	92	74			-21	60	76		47	68	48	17	15.28	3
Potatoes: Subsistence Production 18																	100			80	74	60		72	96	70			-25	59	69		45	71	46	18	15.20	4
Oca-Olluco-Mashua 19																		100											-22			-21	48			19	3.54	35
Quinua-Cañahua 20																			100	80	44		48	75	79	25				54	68	31	29	59	40	20	13.87	10
Fodder-Barley-Wheat 21																				100	40		41	68	68	28				53	59	27	33	67	32	21	14.29	8
Horticulture 22																					100	30	57	60	31				-23	33	63		35	55	42	22	11.29	16
Selviculture 23																						100	79	34										35	26	23	6.07	28
Agriculture: Total Monetary Value 24																							100	84	38				37	49		30	70	50	24	12.10	13
Subsistence Production: Total Monetary Value 25																								100	67				-26	55	67		46	77	52	25	14.94	6
Cattle Population 26																									100	41				58	56	46	30	53		26	13.04	11
Sheep Population 27																										100				32		74				27	5.88	29
Llama Population 28																											100	63				57	-21			28	4.92	33
Alpaca Population 29																												100				71	-26	-23		29	6.44	26
Horse Population 30																													100	46	41	25	50	22	30	10.27	17
Swine Population 31																														100		38	51	41	31	11.85	15
Sheep-Equivalent Unit Population 32																															100				32	7.00	24
Guinea Pig Population 33																																100	43	23	33	8.58	19
Poultry Population 34																																	100	48	34	14.41	7
Deviation Median District 35																																		100	35	9.70	18

Coefficients have been rounded and multiplied by 100

Indices inferior to ± 21 have been omitted

It has been impossible to compile information for the same year of reference (say 1970) and to use contrasting information particularly in the area of socio-economic factors. However, it is quite revealing to find so much accessible information in one of the most under-developed areas of the world. Questions regarding the value and the reliability of the data do arise, and there are no good answers. One could argue that such a matrix may be taken as a contestable estimate of innumerable estimates, to the extent that the reality is left far behind these appraisals, particularly if the percentage of error is not constant from one variable to the other. But in all practical terms, people do operate with the information they are provided with, and do have to make decisions or put forward policies from their knowledge of the reality. In the last instance, isn't knowledge as important, if not more important, than the reality it describes ?

A quick look at figure 9 reveals that correlation indices are generally positive. In fact, only variables 2 (deviation from the Titicaca), 3 (distance from Puno-Juliaca) and 29 (distribution of alpaca population) prevalently obtain negative values, and they all represent remoteness from central Puno. if one considers the column of the matrix entitled 'total on rectangular matrix', one finds out that there are four variables above 15,00 : a) district population, b) Indian population, c) potatoes : total production and d) potatoes : subsistence production. Thirteen variables obtain a score ranging from 15,00 to 10,00 ; fifteen from 10,00 to 5,00 and that leaves only three variables below this last number. In other words, many variables are additive, or experience comparable geographical variations within the department. This means that Puno, beyond the basic spatial differentiations previously pointed out, is altogether an integrated geographical unit.

An appraisal of the most significant spatial interrelationships disclosed by the correlation matrix has been outlined in figure 10.[25] Only the most significant positive bonds have been considered, since negative correlations may be easily assessed by reading the matrix.

The compact clustering of most variables around 'district population' and 'primary school' on the one hand, on 'Indian' and 'potatoes' on the other hand, in the area defined as Puno Lago, unequivocally points out the absolute importance of the Titicaca as the demographic and economic axis of the department. It can be suggested that in a society where functions are always heavily mixed for lack of absolute divisions between activities, geographical attributes, in a like manner, are in turn spatially integrated.

It is henceforth geographically logical to find on the one hand 'literate population' and 'poultry population' associated with 'district population' as well as with 'primary school enrolment', and on the other hand 'cattle' and 'fodder' with 'Indian' and the latter with 'potatoes'. In fact the variables

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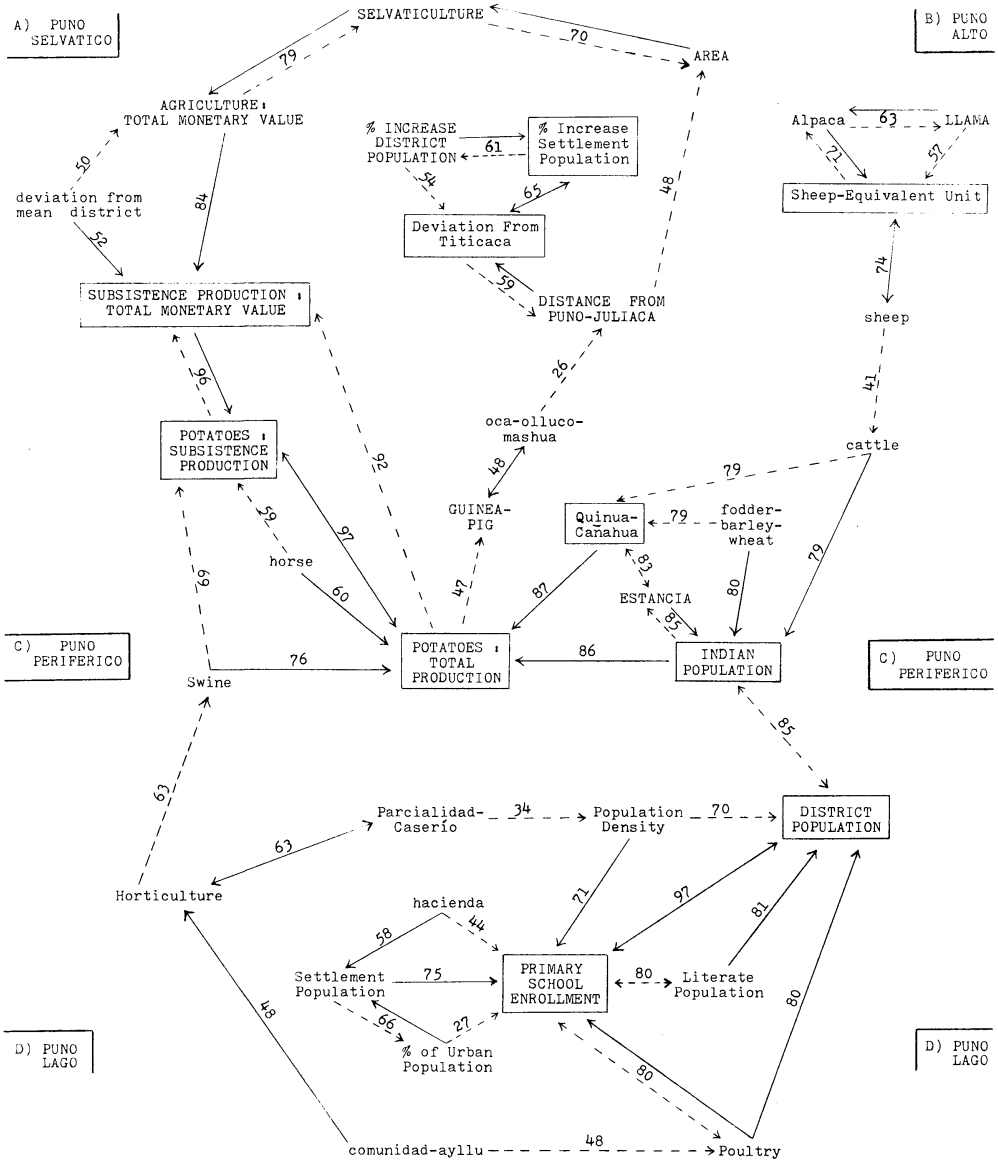
25 For a discussion on the techniques involved, see MCQUITTY, L.L. (1967). Elementary Linkage Analysis for Isolating Orthogonal and Oblique Types and Typal Relevancies.*Educ. Psycho. Measur.*, No. 17.

Figure 10

PUNO : SPATIAL LINKAGE BETWEEN THIRTY-FIVE VARIABLES



Straight Line : Highest Correlation

Dotted Line : Second Highest Correlation

Only positive correlations have been indicated above; indices have been rounded and multiplied by 100 .

'district population', 'total production of potatoes', 'subsistence production of potatoes' and 'primary school enrolment' hold respectively the first five highest scores on the rectangular matrix. From there the numerous bonds they set up with other variables : settlement types ('parcialidad-caserío' and 'comunidad-ayllu') interlink with 'horticulture' and the latter with 'swine' which in turn is directed towards 'potatoes' ; 'hacienda' and the 'percentage of urban population' with settlement population and the latter with 'primary school enrolment'.

Wool production (alpaca-llama-sheep) stands slightly apart to identify Puno Alto, whereas a combination of nine variables dealing with size, area, population growth and the value of agricultural production identifies Puno Selvatico. 'Grosso modo', variables tend to amalgamate pairwise to then join up with a third variable : criss-crossing bondages outnumber those few spatial linearities that none the less mark out the tripartite regional system of Puno.

Clustering areas

However, a closer look at figure 10 reveals the likelihood of some meaningful intermediary clusterings in the periphery of Puno lago. To enquire further into this trend the original matrix of information has been inverted (from 85 × 35 to 35 × 85) and the position of the 85 districts upon 30 variables [26] has now been analysed. As the districts took the place of the variables, they were then re-ranked (from 1 to 30) according to their value upon every variable. On this basis, a new matrix could then be produced showing the rank-order correlation of every district with respect to all remaining 84 districts.[27] In fact, the resulting matrix really shows the similarity or dissimilarity of all districts with respect to each other : most highly positively correlated districts are the most similar and vice versa.[28]

A cluster analysis built up on the above sets of data has been carried out subsequently by inter-associating all districts on their coefficients of highest similarity. The result is illustrated by two linkage trees. The first one grouping the districts of Puno without contiguity (figure 11) and the second with contiguity (figure 12). The difference between both figures stems from the fact that by adding a contiguity constraint the scale of similarity (or of correlations) has to be extended downwards. In orther words complete generalization entails a greater loss of detail in the case of contiguity. The eighty-five districts of Puno on the left of both figures

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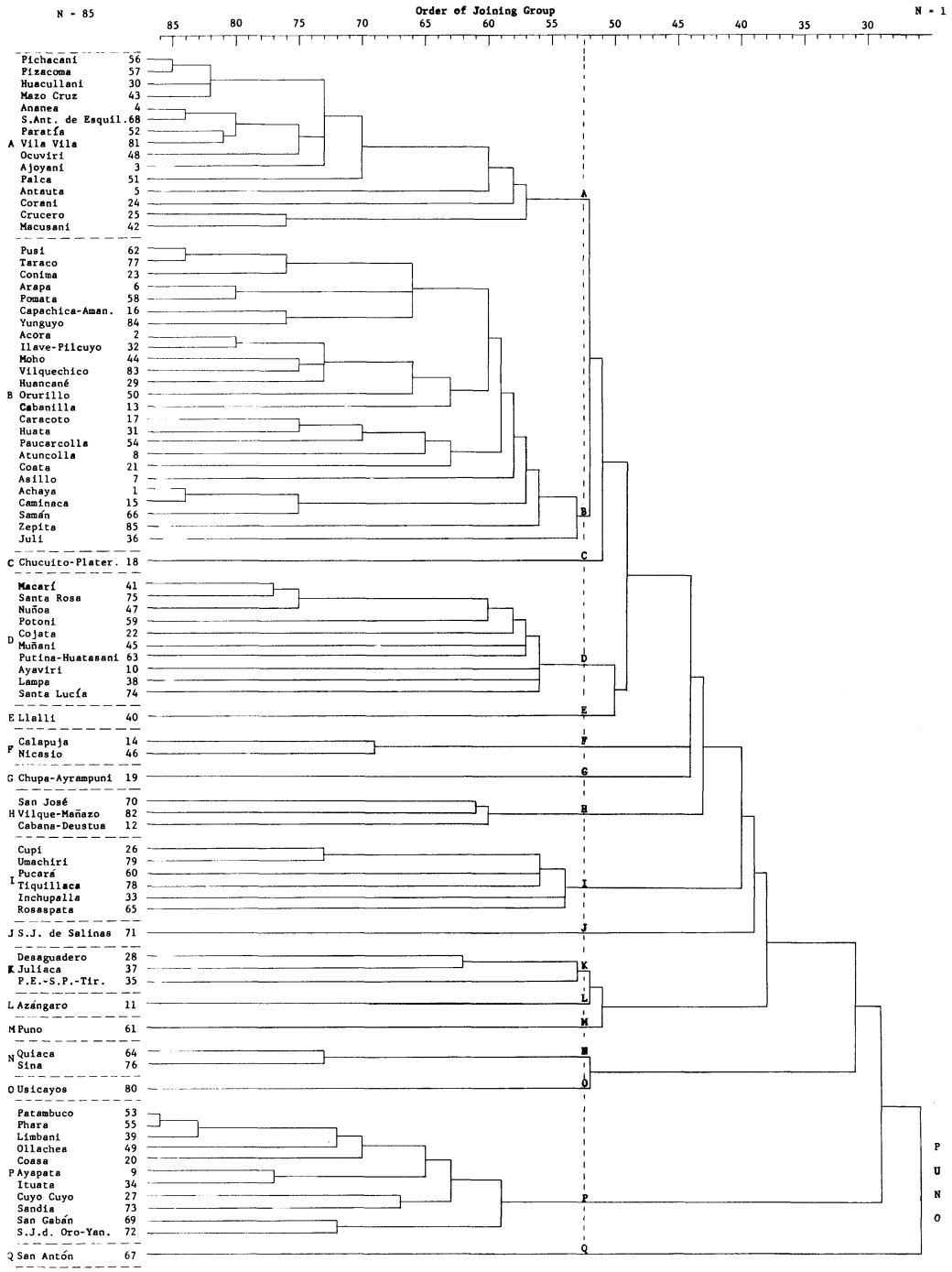
[26] Four variables were dropped because they were a product of, or were included in other variables — 'population density' (6), 'UAO' (22), 'deviation from median district' (35) and 'subsistence agriculture' (25). A last variable was also dropped 'kilometric distance' (3), so that proximity could not add unduly to similarity.

[27] This matrix is too large to be reproduced here as it includes 7 225 correlation indices (85 × 85).

[28] The method that has been used is explained at length in COLE, J.P. (1968). *Quantitative Geography, op. cit :* pp. 279-286

Figure 11



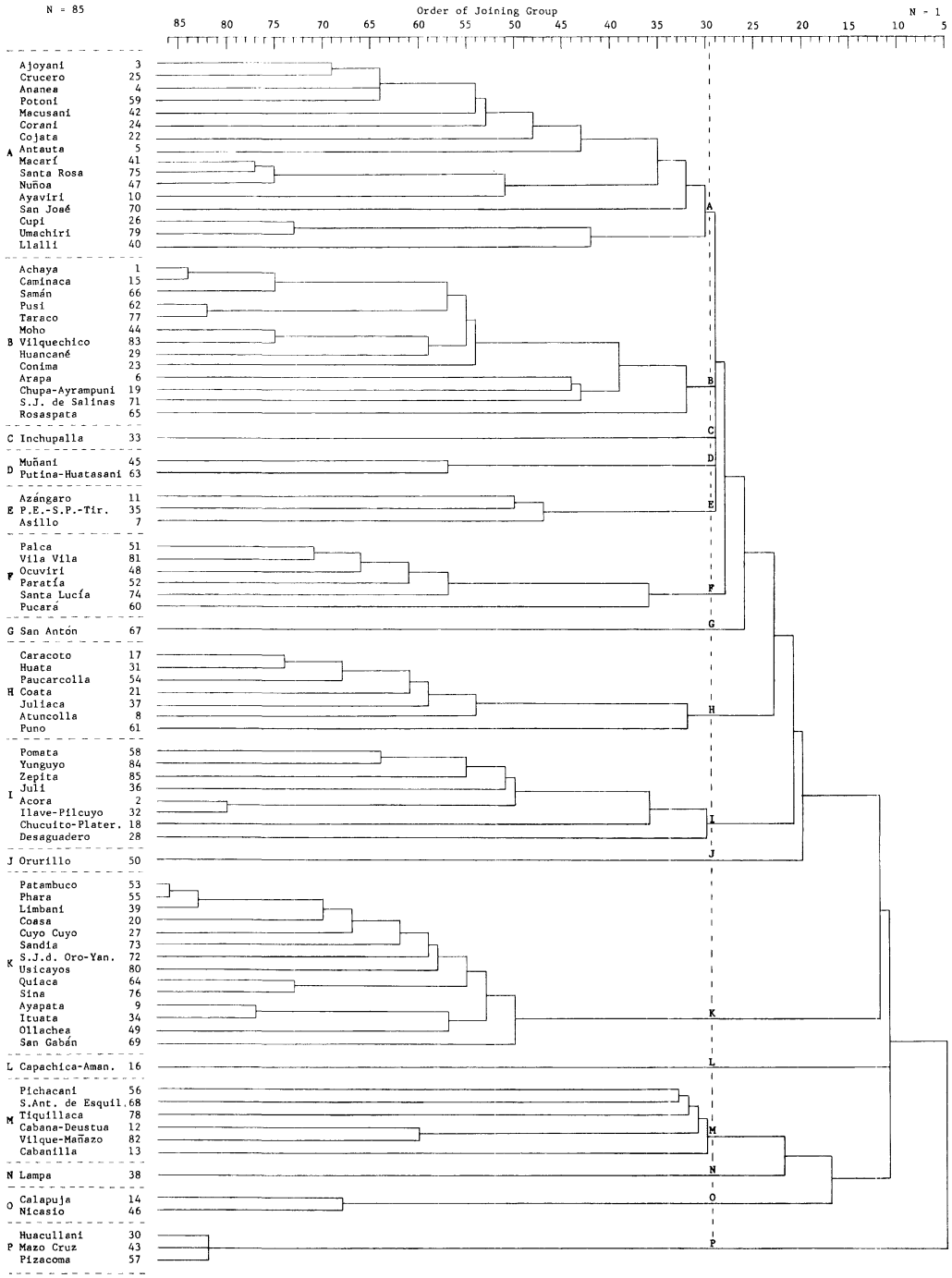
Districts are grouped on the basis of their rank-order correlation coefficient of similarity with respect to each one of the other Districts, according to their ranking differences upon 30 variables.

Horizontal Axis: grouping steps along the scale of correlations. The scale goes from 86 to 26, that is from the highest to the lowest positive correlation (x by 100).

Vertical Axis: the 85 Districts with their reference number and their reduction into 17 regions (A to Q) at correlation 52.5.

LINKAGE TREE GROUPING THE DISTRICTS OF PUNO WITHOUT CONTIGUITY.

Figure 12



Districts are grouped on the basis of their rank-order correlation coefficient of similarity with respect to each one of the other Districts, according to their ranking differences upon 30 variables.

Horizontal Axis: grouping steps along the scale of correlations. The scale goes from 86 to 5, that is from the highest to the lowest positive correlation (x by 100).

Vertical Axis: the 85 Districts with their reference number and their reduction into 16 regions (A to P) at correlation 29.5.

LINKAGE TREE GROUPING THE DISTRICTS OF PUNO WITH CONTIGUITY.

imply complete detail whereas the word Puno (that is the department) stands for complete generalization.[29]

Such linkage clusterings are really taxonomic devices facilitating the identification and the extent of uniform regions. Seventeen and sixteen such regions have been marked respectively in figure 11 and figure 12. But the usefulness of such models lies in their openness as any number of regions or of district clusterings may be established by scanning an imaginary line (a dotted line appears in both figures) along the horizontal axis.

The taxonomic information contained in the linkage trees brings forth some crucial geographical patterns that can be summarised in three points (see Figure 13–C). Firstly, the continuous area hitherto referred to as Puno Lago is broken up into two zones : a) the southern lake shore districts from Chucuito-Platería to Yunguyo-Desaguadero and b) the northern lake shore districts from Pusi-Taraco to Moho-Conima with those districts encircling 'laguna' Arapa. These zones are interconnected by Puno-Juliaca and their near-by districts. Secondly, the fifteen districts extending northwards from the 'cordillera de Carabaya' cluster all in one block to make up Puno Selvatico. Thirdly and of decisive importance, the area of Puno Alto does not stand out as a single uniform region. Indeed, intermediary zones are finally established between Puno Alto and Puno Lago : these zones are primarily based on Putina-Azángaro and secondarily on Orurillo-San Antón and Lampa-Nicasio. The Province of Chucuito cannot really conform to this regional pattern : its upper districts are fairly large, thus masking such differentiations. At first glance, the Province of Puno does not conform either to this intermediary zoning. However, the linkage tree grouping the districts without contiguity shows that Tiquillaca (in Puno) clusters with Pucará (in Lampa) to then be adjoined to Inchupalla and Rosaspata (in Huancané). In figure 13–C, Lampa (N) has been integrated with Calapuja-Nicasio (O) and San Antón (G) with Orurillo (J) thus reducing the number of taxonomic regions from sixteen to fourteen.

The inferences that can be drawn from the above facts are twofold. There definitely exist some transitional areas based on mixed activities (agriculture and stock-raising) or specifically set apart by their participating in both Puno Lago and Puno Alto. Moreover, there is a complete lack of concordance between the administrative, provincial, set up and the real geographical patterning : this is warranted by a visual comparison between figure 13–A and figure 13–C.

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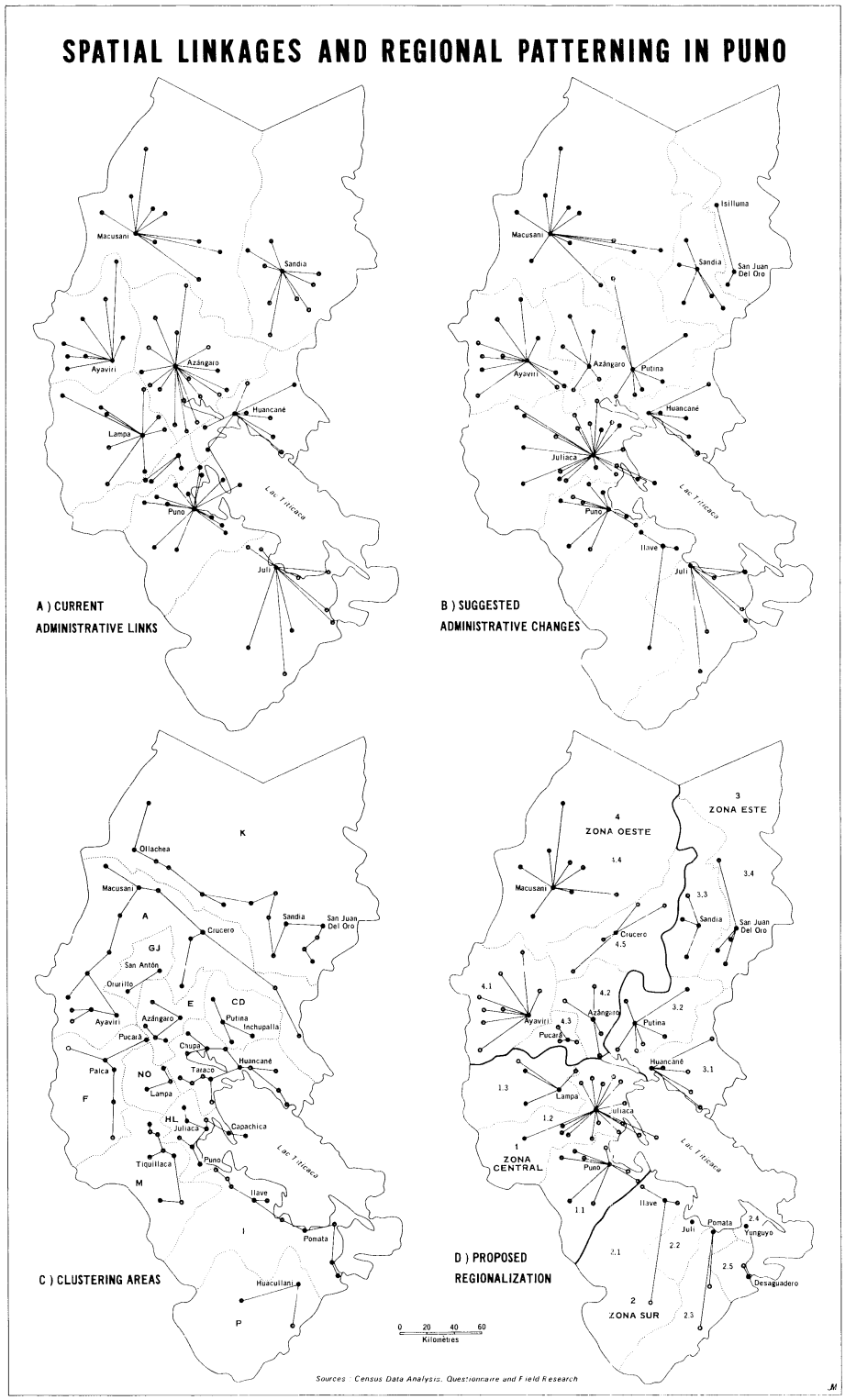
[29] The number adjoined to each district is just an index of identification. For the techniques involved in the preparation and manipulation of the data, see SPENCE, N.A. (1968). A Multifactor Uniform Regionalization of British. Counties on the Basis of Employment Data for 1961. *Regional Studies*, 2 (1): 87–104. And ABLER, R.J., John S. ADAMS & Peter GOULD (1971) *Spatial Organization*. Englewood Cliffs, Prentice-Hall Inc. XIX – 587 p. pp. 182-190.

Figure 13


SPATIAL LINKAGES AND REGIONAL PATTERNING IN PUNO
A) CURRENT ADMINISTRATIVE LINKS
B) SUGGESTED ADMINISTRATIVE CHANGES
C) CLUSTERING AREAS
D) PROPOSED REGIONALIZATION
Macusani
Sandia
Ayaviri
Azángaro
Lampa
Huancané
Puno
Juli
Lac Titicaca
Isilluma
San Juan Del Oro
Putina
Juliaca
Ilave
Ollachea
Crucero
San Antón
Ourillo
Inchupalla
Pucará
Chupa
Taraco
Palca
Capachica
Tiquillaca
Pomata
Huaculiani
ZONA CENTRAL
ZONA ESTE
ZONA OESTE
ZONA SUR
Yunguyo
Desaguadero
0 20 40 60
Kilometres
Sources : Census Data Analysis, Questionnaire and Field Research

Regionalization scheme

By intermingling the various types of spatial networks previously mentioned (namely ecological areas, road network, land-based economy, settlement growth and urban polarity) with the geographical trends revealed above, it thus becomes possible to draw a general scheme of regionalization for the Department of Puno. But before doing so, it is all the more necessary to know which alterations should be made to the present administrative pattern.

In a questionnaire filled in by 121 informants from the seventeen main populated centres of Puno, a question dealt precisely with those districts that should change their administrative affiliation. From the answers to that question, it follows that San Román (Juliaca) is the most enlarged province as it integrates almost all Lampa and parts of Azángaro, Huancané and Puno. Besides, Azángaro is the most heavily dismantled province and the creation of three new administrative areas is eagerly prompted: a province of Putina, of Ilave and of San Juan del Oro.[30] The overall administrative pattern that would result from these proposed changes appear in figure 13–B. The only inconsistencies in the answers are that Potoní (Melgar) is directed towards Carabaya whereas Crucero (Carabaya) is joined to Putina, Ayrampuni (Azángaro) to Putina and Huatasani (Azángaro) to Huancané. In every case, these are neighbouring 'pueblos' and should belong to a single province, whatever it may be. A last suggestion (coming from Puno) has not been marked on the map ; that of incorporating the District of Juliaca (and what comes along with it) to Puno !

These suggestions together with a consideration of present road network as well as of the arguments put forward in this paper have been synthesized into a general regionalization or a geographical reorganization of the Department of Puno (figure 13–D). A subsequent re-arrangement of sub-regions (or 'zonas')[31] and micro-regions (or 'sub-zonas') with 1961 population figures is included (figure 14). In this last figure, the districts of Quiaca and Sina which actually belong to Sandia have been incorporated to San Juan del Oro — not only for their close proximity to that 'sub-zona', but also because the proposed route Huancané — San Juan del Oro via Sina would necessarily bring the latter 'pueblo' (and Quiaca) within the regional influence of San Juan.

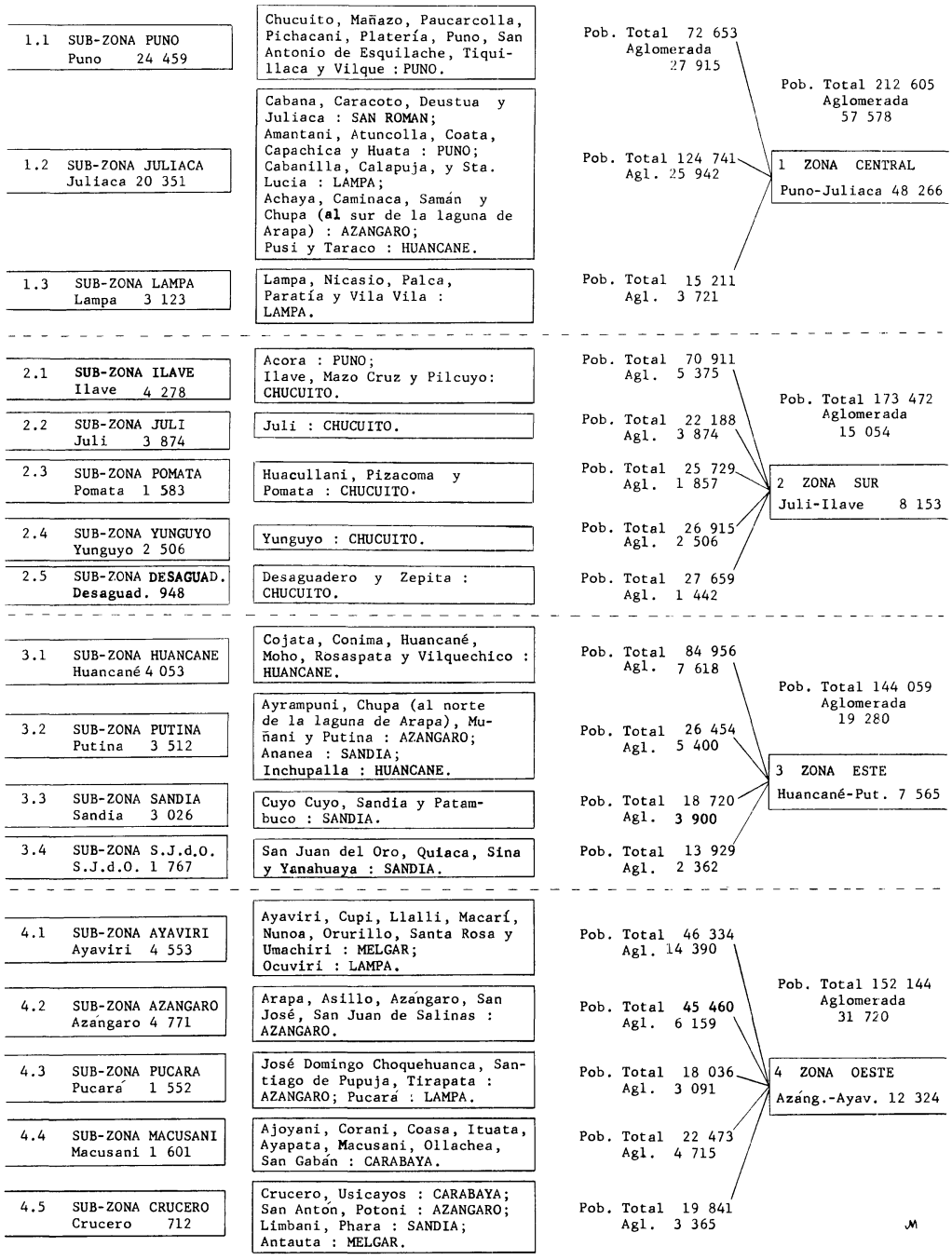
The Department of Puno is thus divided into four planning or regional areas based on two centres — an institutional-administrative 'ciudad' coupled with a commercial-'ferial' 'pueblo' — and subdivided in turn into seventeen sub-regions or 'sub-zonas' (figure 14). Only one last suggestion comes to mind with respect to the 'Zona Sur', that of combining 2.2 with

30 Including the area of the upper Inambari (Yanamayo and Pucaramayo), that is the northern half of the District of Sandia.

31 The word 'zona' is used in preference to 'region' because the entire Department of Puno is considered as a 'sub-region' within the national planning framework.

Figure 14

REGIONALIZATION OF THE DEPARTMENT OF PUNO



2.3 (Juli and Pomata) and 2.4 with 2.5 (Yunguyo and Desaguadero) for a total of fifteen 'sub-zonas'.

CONCLUSION

The consideration of geographical networks at the sub-district or micro-regional level could be a further step of investigation. We can only point out that it is an area where geographical and social components are tightly interrelated. As a matter of fact, below the micro-regional level come the ZAMC ('zonas de acción multi-comunal') and the ZAPE ('zonas de acción pre-extensiva'), to follow up the terminology developed by the former 'Co-operación Popular' (now a component agency of SINAMOS). Many original researches have been carried out at these rather important basic levels and their findings could add an indispensable underpinning to our proposed regionalization. [32]

Viewed from Puno, regionalization might well mean a self-sustaining spatial organization but viewed from Peru, regionalization means an organization of the departmental space to fit outside and external policies. [33] Planning from the bottom — 'planificación de base' — should eventually meet (in the proper and figurative meanings of the word) planning from the top — 'planificación del Instituto Nacional de Planificación' —. The fact is that a regionalization, however heuristic it may be, must finally compromise between both levels as it cannot evolve 'en vase clos'. Sooner or later, the 'internal' regionalization of Puno inescapably impinges on the problem of the integration of the department into the rest of the national territory.

RÉSUMÉ

MORISSET, J. : Interrelations urbaines et structuration régionale Département de Puno, Pérou méridional

Le département de Puno s'inscrit autour du lac Titicaca (3 800 m au-dessus du niveau de la mer) pour occuper un vaste plateau (l'altiplano) ainsi que les hautes chaînes andines (la puna) et déborder au nord vers le bassin amazonien (la selva).

En utilisant à la fois des informations recueillies lors d'enquêtes sur le terrain et des données de recensement (1940 et 1961), cet essai poursuit un double objectif : on a tenté d'analyser d'une part, l'évolution et l'interdépendance des principaux centres du département de Puno pour proposer, d'autre part, une régionalisation à partir des structures géo-spatiales et des organisations administratives. De plus, on a brièvement traité

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[32] There is a rather important information at the community level. See the titles listed under ORTIZ, Pedro (1964). *Bibliografía Básica de Puno.* Lima : PNIPA, Ministerio de Trabajo y Asuntos indígenas, 39 p.
MARTINEZ, Héctor ; Miguel CAMEO C. and Jesús RAMIREZ S. (1969) « Puno » in *Bibliografía Indígena Andina Peruana (1900-1968),* Lima, Centro de Estudios de Población y Desarrollo 82-87 & 119-21.

[33] See MORISSET, Jean (1973) The department of Puno as a Territory-to-be-developed in Southern Peru. *Revista Geográfica,* (79) : 11-40.

de la nature des agglomérations et on a réalisé une analyse quantitative regroupant 30 variables reportées sur les 85 districts du département.

L'auteur conclut en suggérant que toute planification est un processus qui doit aboutir à un compromis entre des composantes spatio-économiques (planificación tecnocrática) et des composantes socio-culturelles (planificación de base).

MOTS-CLÉS : Population, environnement, agglomérations, analyse spatiale, régionalisation
Puno, Lac Titicaca, Pérou Méridional, Amérique du Sud.

ABSTRACT

MORISSET, Jean : Urban interrelations and regional patterning in the department of Puno, Southern Peru

The department of Puno surrounds lake Titicaca (3 800 m above sea-level) and extends over a vast stretch of land (the altiplano) and the Andean ridges (the puna) spilling northward into the Amazonian basin (the selva).

Through fied work information and the use of census returns (1940 and 1961), this paper attempts to assess the evolution and the interdependance of Puno's main populated centres on the one hand, and to develop a general scheme of regionalization based on geo-spatial structures and administrative lay-outs on the other. In addition, the nature of settlements is briefly outlined and a more detailed quantitative analysis (30 variables, 85 districts) shedding some light on the internal departmental patterning is attempted.

In conclusion, it is suggested that the planning process should result in a succesful compromise between two sets of characteristics : spatio-economical elements (planificación tecnocrática) and social-cultural elements (planificación de base).

KEY WORDS : Population, environment, settlements, spatial analysis, regionalization.
Puno, Lake Titicaca, Southern Peru, South America.

RESUMEN

MORISSET, J.: Interrelaciones urbanas y estructuración regional, Departamento de Puno, Perú meridional.

El departamento de Puno se situa alrededor del Lago Titicaca (3800 m sobre el nivel del mar), ocupando una vasta zona del Altiplano y de las altas cadenas andinas (La puna), desbordandose al norte hacia la cuenca del Amazonas (La selva).

Utilizando al mismo triempo las informaciones obtenidas durante las encuestas sobre elterreno y los datos de los sensos (1940 y 1961) ; éste ensayo persigue un doble objetivo : analizar la evolución y la interdependencia de los principalos centros urbanos del departamento de Puno por un lado y, por el otro, proponor una regionalización partiendo de estructuras geo-espaciales y de organizaciones administrativas. Asimismo, se ha estudiado brevemente la naturaleza de las aglomeraciones y se ha efectuado un análisis cuantitativo reagrupando 30 variables refereidas a los 85 distritos del departemento. El autor concluye sugiriendo que toda planificación es un proceso que debe conducir a un compromiso entre los componentes económico-espaciales (planificación tecnocrática) y los componentes socio-culturalos (planificación de base).

PALABRAS-CLAVE : Población, medio-ambiente, aglomeraciones, análisis espacial, regionalización.
Puno, Lago Titicaca, Perú meridional, América de sur.