



## CITY – UMLAND RELATIONSHIP OF CLASS I AND II TOWNS RAYALASEEMA

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### ABSTRACT

*In this paper the interrelationships among the thirty selected variables of City-umlands of class I and II towns of Rayalaseema are analysed with the aid of multiple correlation. The relationship between the towns and their respective umlands that exist in different city regions is highlighted. In this study it is clear that no single and simple generalized relationship is found for all the city regions. Therefore, all possible generalizations are drawn with the help of correlation coefficients. The study of city – umland relationship is of interest to planners, administrators, architects, geographers and others. It is essential to understand the infrastructure of the whole urban system; for preparing developmental plans. To identify characteristics of urban centres and to prepare plans for economic development, it is necessary to study existing city-umland relationship.*

**KEY WORDS:** City-Umlands, Rayalaseema and correlation coefficients.

### INTRODUCTION

Each urban centre which makes the core of its region, serves, influences and often dominates the region. The influence of the city or town spreads over the surrounding region and finally it is integrated with the city in such a way that both became inter-dependent of each other (A.K.Dutt1963). Such an area of influence together with the city or town is known as 'city region' or 'umland'. The area of influence of an urban centre can be determined and demarcated on the basis of distance decay curves of selected variables. The influence of the city is gradational in nature. As the distance from the city centre increases, its dominance wanes and also the influence of some other urban centre becomes greater (K. Markandy, 1986)

A scientific explanation of rural – urban relationship was given by Colby (1933) with the concept of centrifugal and centripetal forces. According to him, the centripetal forces attract people and their functions towards the city, whereas the centrifugal forces spread various urban functions into the periphery.

The relationship that exists between the city and its umland is due to several specified functions and it is reciprocal and symbiotic. Every city acts as a centre of gravity for its respective umland and in turn the umland depends upon the city for business, employment, commerce, industry and services. The urban areas through their varied and distinctive functions serve the umlands and articulate the economy of the umlands. This process is known as the tricking down of development of a city into its umland. "The complicated and contradictory nature of urbanization express itself in the interdependence of the centripetal trends, responsible for the concentration in large cities of the society's best brains and bulk of its productive forces and the centrifugal trends, tending to diffuse the social, economic, technical and cultural results of this concentration to the areas adjoining big cities, to make the periphery, particularly rural areas catch up with the cities (Kanstasobovskaya, 1976)."

Each urban centre acts as a focal point at which finance, health, administration, entertainment etc., are concentrated. Because of the locational advantages and centrality almost all the functions gravitate into the core area of the city. The entire transport network of the umland converges at the core of the city and facilitates the movement of people and things from the umland to the city. "A city grows through complex combination of making and marketing of goods and services for a variety of inter dependent and overlapping trade area" (Conzen, 1977). Thus mutual interactions and interconnections between settlements are essential for their sustenance and growth especially in case of city umlands.

The study of city – umland relationship is of interest to Planners, Administrators, Architects, Geographers and others. It is essential to understand the infrastructure of the whole urban system for preparing developmental plans.

### DATA AND METHODOLOGY

The present study relies on different sources of data such as District Census Handbooks, Municipal Administrative reports and local authorities. The mandal maps with village boundaries are also collected from District Census Handbooks. According to 1981 census, Rayalaseema had 6 class I and 10 Class II towns and, as per 1991 and 10 class I and 7 class II Towns. In 2001 and 2011 census it has 12 and 13 class I and, 7 and 16 class II Towns. This study is confined to 13 class I and 3 Class II Towns of 2011 census namely: Anantapur, Kurnool, Tirupati, Kadapa, Proddatur, Adoni, Nandyal, Chittoor, Guntakal, Hindupur, Madanapalli, Tadipatri, Kadiri, Srikalahasthi, Dharmavaram and Yemmiganur.

In the present study an attempt is made to analyse the degree of association among the following thirty selected variables by using the multiple correlation analysis, for the above said sixteen city umlands. Based on the number of highly significant correlation coefficients strong, medium and weak city regions are classified.

### LIST OF SELECTED VARIABLES IN CITY REGIONS

1. Density of population
2. Distribution of population
3. Literacy rate
4. Male Literacy rate
5. Female Literacy rate
6. Growth rate
7. Educational facilities
8. Medical facilities
9. Electricity facilities
10. Transport facilities
11. Communication facilities
12. Composite Index score of facilities
13. Distribution of settlements
14. Density of settlements / 100 Sq.Km
15. Density of houses
16. Sex ratio/ 100 males
17. Participation rate
18. Male participation rate
19. Female participation rate
20. Sex ration of workers/1000 males
21. Percentages of cultivators
22. Percentage of Agrl. Labours
23. Percentage of workers in Primary activity

24. Ratio of Agricultural activity to non – agri activity
25. Percentage of workers in Secondary activity.
26. Percentage of workers in Tertiary activity
27. Percentage of workers in non – agril.activity
28. Percentage of male workers in non – agri activity
29. Percentage of marginal workers to total population
30. Ratio of Non – primary to primary workers

Five out of the above 30 selected variables, Viz., density of population, literacy rate, social amenities, percentage of workers in primary activity and percentage of male workers in non – agricultural activity are used to delimit the umlands of these urban settlements. An area of 25 kms from the city centre has been selected for all the above said 16 urban settlements and further divided into 10 concentric zones of 2.5 kms radius. The radii of all 16 city regions of Rayalaseema were demarcated with the help of distance decay curves (Fig1). The degree of association of 30 selected variables is analysed with the help of correlation coefficients calculated for the purpose. Distance is an important parameter to obtain the relationship between urban centres and their respective umlands. Therefore all the variables are calculated with distance from city centre. Hence each variable is a function of distance. All the pair wise correlation coefficients are calculated for 30 selected variables in each city region. 't' test is used at 5% level of probability to know the significance of each correlation coefficient. Students 't' test is used at 5% level of probability to know the significance of each correlation coefficient. Based on the number of highly significant correlation coefficients strong, medium and weak city regions are classified. While calculating t test the degrees of freedom are slightly different, since the number of observations varies from one city region to others due to the different zones of city regions. Accordingly the critical values of Correlation coefficients are also slightly different from one city region to other (Table 1). The critical values of correlation coefficients at 5 per cent and higher levels of significance are considered for the present study. Those which are lower than the critical value of 'r' at 5 per cent level of significance are ignored. This indicates that the association between the two variables is not significantly close enough. The degree of association among the variables is the indication of development of a city region. When all the relationships are very close between any town and its umland, then the number of significant correlation coefficients are more with more number of highly significant correlation coefficients. If the 'r' value is equal to +1 then the relationship is said to be perfectly positive or negative. On the basis of level of significance all the correlation coefficients have been divided into highly significant ( $P < 0.001$ ), moderately significant ( $0.01 < P < 0.001$ ), less significant ( $0.05 < r < 0.01$ ) and insignificant ( $r < 0.05$ ).

Note: A correlation coefficient (r) measures the degree of association between any two or more sets of variables or variates. It is a pure number and the covariance ratio between each set of two variables  $X_1$  and  $X_2$  to the product of their respective standard deviations.

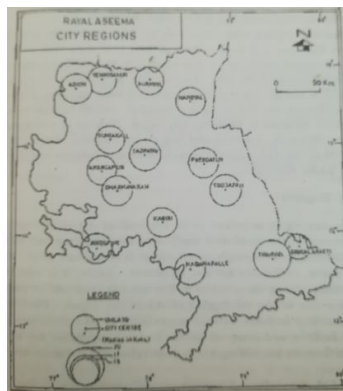


Figure1: Rayalaseema City-umlands

**Table1:Critical Values of Correlation Coefficients in City Regions**

S.No.	City Region	No. of Observations	Degrees of Freedom	Critical Values of the Correlation coefficients at the level of significance				
				10%	5%	2%	1%	0.1%
1.	Kurnool	7	5	0.670	0.754	0.833	0.875	0.951
2.	Anantapur	7	5	0.670	0.754	0.833	0.875	0.951
3.	Tirupati	8	6	0.622	0.707	0.789	0.734	0.925
4.	Adoni	8	6	0.622	0.707	0.789	0.734	0.925
5.	Proddatur	7	5	0.670	0.754	0.833	0.875	0.951
6.	Kadapa	8	6	0.622	0.707	0.789	0.834	0.925
7.	Nandyal	7	5	0.670	0.754	0.833	0.875	0.951
8.	Chittoor	7	5	0.670	0.754	0.833	0.875	0.951
9.	Guntakal	7	5	0.670	0.754	0.833	0.875	0.951
10.	Hindupur	7	5	0.670	0.754	0.833	0.875	0.951
11.	Madanapalli	7	5	0.670	0.754	0.833	0.875	0.951
12.	Tadpatri	8	6	0.622	0.707	0.789	0.834	0.925
13.	Kadiri	7	5	0.670	0.754	0.833	0.875	0.951
14.	Dharmavaram	7	5	0.670	0.754	0.833	0.875	0.951
15.	SriKalahasthi	6	4	0.729	0.811	0.882	0.917	0.974
16.	Yemmiganur	7	5	0.670	0.754	0.833	0.875	0.951

**LEVEL OF SIGNIFICANCE OF CORRELATION COEFFICIENTS IN CITY REGIONS**

In the present study, above 50 per cent of the correlation coefficients are significant at 5 per cent level in all city regions except in the case of Adoni (42.3%), Kadapa (35.4%) Madanapalle(41%) and Srikalahasti (43.5%). All the 16 city regions have correlation coefficients of more than 20 per cent which are highly significant except in the case of Madanapalle (15.86%), Srikalahasti (12.6%) and yemmiganur (9.43%). Moderately significant correlation coefficients are less than 10 percent exist in the city regions of Adoni (1.15%), Kadapa (2.76)and Madanapalle (7.82), and the remaining city regions have more than 10 percent. Above 15 per cent of the correlation coefficients which are less significant are found in all the city regions except in the case of Kurnool (13.8%), Tirupati (11.03), Adoni (3.22%), Kadapa (50.52%) and Hindupur (7.6%).

**CATEGORIZATION OF CITY REGION**

After thorough examination of the analysis of the correlation coefficients (Table2), the categorization of umlands of the present study can be done into strong, medium and weak based on the percentages of highly significant, moderately significant and less significant correlation coefficients.

**Table : 2 Analysis of Correlation Coefficients**

City Region	No. of corr.coeff. Significant at				Insignificant corr. Coeff. (below 5%)
	$Y > c0.05$	$0.05 < Y < c0.01$	$0.01 < Y < c0.001$	$0.001 < Y < 1$	
1.Kurnool	230 (52.87)	60 (13.79)	46 (10.57)	124 28.50	205 (47.13)
2.Anantapur	268 (61.61)	103 (23.68)	51 (11.72)	114 (26.21)	167 (37.93)
3.Tirupati	231 (53.10)	48 (11.03)	57 (13.10)	126 (28.97)	204 (46.90)

4. Adoni	184 (42.30)	14 (30.22)	5 (1.15)	165 (37.93)	251 (57.70)
5. Proddatur	251 (57.70)	189 (20.46)	46 (10.57)	116 (26.67)	184 (42.30)
6. Kadapa	154 (35.40)	24 (50.52)	12 (2.76)	118 27.13	281 (64.60)
7. Nandyal	285 (65.52)	104 (23.91)	89 (20.46)	92 (21.15)	150 (34.48)
8. Chittoor	261 (60.00)	66 (15.17)	92 (21.15)	103 (23.68)	174 (40.00)
9. Guntakal	299 (68.74)	98 (22.53)	111 (25.52)	90 (20.69)	136 (31.26)
10. Hindupur	233 (51.26)	33 (7059)	84 (19.31)	106 (24.37)	212 (48.74)
11. Madanapalli	178 (46.92)	75 (17.24)	34 (7.82)	69 (15.86)	257 (59.08)
12. Tadpatri	299 (68.74)	108 (24.83)	78 (17.93)	113 (25.98)	136 (45.06)
13. Kadiri	239 (54.94)	68 (15.63)	60 (13.79)	111 (25.52)	196 (45.06)
14. SriKalahasthi	189 (43.45)	71 (16.32)	63 (14.48)	55 (12.60)	246 (56.55)
15. Dharmavaram	299 (68.74)	108 (24.83)	79 (18.16)	112 (25.75)	136 (31.26)
16. Yemmiganur	218 (50.11)	92 (21.15)	85 (19.54)	41 (9.43)	217 (49.89)

**Note:** the Percentage of correlation coefficients are given in parenthesis

Among those city regions which have more than 50 per cent of significant correlation coefficients. More than 28 per cent of highly significant correlation coefficients are categorized as strong city regions. Again, among those city regions which have 50 or less than 50 per cent of significant correlation coefficients with less than 20 percent of highly significant ones are categorized as weak city regions. The remaining city regions are considered as medium city regions.

### STRONG CITY REGIONS

Kurnool and Tirupati are considered as strong city regions, though, they have less number of significant correlation coefficients than that of Anantapur, Proddatur, Nandyal, Chittoor, Guntakal, Tadipatri, Kadiri and Dharmavaram city regions since the number of correlation coefficients which are statistically significant at 0.1 per cent level is more (124 and 126). In other words, there is a strong inter-relationship among the 30 variables of Kurnool and Tirupati towns and their umlands.

More than 50 per cent of the correlation coefficients are statistically significant at 5 per cent level of probability and nearly 30 per cent of them are highly significant in Kurnool city region. The variables: distribution of settlements and marginal workers to total population are weak. Educational and medical facilities, density of settlements per 100 Sq.Km and sex ratio are the weaker variables for Kurnool city region. No correlation exists between the weaker and all other variables.

In cases of Tirupati city region, 53 percent of the correlation coefficients are significant and more than half of them are highly significant. Educational facilities and marginal workers to total population are

weak variables. Medical facilities and density of settlements per 100 Sq. Km are in significant variables and hence there is no relationship between Tirupati city and its umland in respect of these variables.

### MEDIUM CITY REGIONS

The variables of Anantapur city region are showing moderate inter-relationship. More than 60 per cent of correlation coefficients are statistically significant, of which only 26 percent are highly significant. The number of correlation coefficients which are less significant is also more (103). The variables namely electricity and educational facilities and marginal workers to total population are weak. The variables medical facilities, density of settlements per 100 Sq.Km and sex ratio are the insignificant ones.

Adoni has larger number of highly significant correlation coefficients (165), but it is treated as medium city region because of more number of (251) insignificant correlation coefficients. The weak variable is density of settlements per 100 Sq.Km. Educational and medical facilities are null factors and not correlated with any one of the selected variables.

Proddatur city region proved to have medium inter-relationship among its variables. It has 58 per cent of significant correlation coefficients, but only 27 per cent of them are highly significant.

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**Note:** The variables which correlated with less than 10 variables studied, is taken as weak variable and the variable showing insignificant correlation with all other variables is referred as weaker variable or null factor.

Transportation facilities, social amenities, distribution of settlements and male participation rate are weak and educational and medical facilities are the weaker variables.

Though Kadapa has only 35 per cent of significant correlation coefficients, it is designated as medium city region, since 27 per cent of them are highly significant at 0.001 level. Density of population, male literacy rate, transportation and communication facilities, social amenities, density of settlements per 100 Sq.km and sex ratio are weak variables.

Nandyal, Chittoor, Guntakal, Hindupur, Tadpatri, Kadiri and Dharmavaram city regions have also proved to be medium, because the percentage of highly significant correlation coefficients are less than 28 per cent and also majority of the correlation coefficients are moderately significant. Hence, the inter-relationship among the variables of these towns and their umlands are moderate.

Chittoor city region has 60 per cent significant correlation coefficients. Out of them above 23 per cent and 20 per cent of the correlation coefficients are highly and moderately significant. Distribution of population, medical density of settlements per 100 Sq. Km and marginal workers are null factors.

Guntakal city region also has 69 per cent of significant correlation coefficients at 5 per cent level, but majority of them are moderately significant. Sex ratio per 1000 males, electricity and medical facilities and density of settlements per 100 Sq.Km are weak variables in Guntakal city region.

The other city regions which have medium inter relationship between the variables are Hindupur and Kadiri. Both of them have more than 50 per cent significant correlation coefficients, out of which only 24 and 26 per cents respectively are significant at 0.001 level. Growth rate, educational, electricity and medical facilities and sex ratio per 1000 males are weak variables. Populations, density of settlements per 100 Sq.Km and marginal workers to total population are insignificant variables in Hindupur city region. Number of settlements and sex ratio per 1000 males are weak and educational facilities, density of settlements per 100 Sq.km and marginal workers to total population are the weaker variables in kadiri city region.

### WEAK CITY REGIONS

Yemmiganur city region is proved to be the weakest out of all city regions. Here, 50 percent of the correlation coefficients are significant and only 9 per cent of them seem to be strongly correlated at 0.14 per

cent level. Majority of the correlation coefficients are less significant. Hence, it is said that the inter-relationship among the variables of Yemmiganur town and its umland are weak. This is due to the overlapping of Adoni city region. Distribution of population, medical facilities, ratio of agricultural to non-agricultural workers, educational facilities of settlements per 100 Sq.Km and sex ratio per 1000 males are the null factors.

In case of Madanapalle and Srikalahasti city regions, the number of significant correlation coefficients is 178 and 189 only. Out of which the number of highly significant ones are 69 and 55 respectively. So they are proved to be weak city regions, since majority of their correlation coefficients are insignificant. The relationship between these towns and their respective umlands is weak. Above 55 per cent of the correlations are insignificant in these two city regions. Electricity facilities, marginal workers to total population, distribution of population, educational and medical facilities etc., are weak and growth rate, distribution of settlements and density of settlements per 100 Sq.Km are insignificant variables in Madanapalle city region. These variables do not show definite decrease or increase of values with distance from the city centre. Distribution of population, female literacy rate, growth rate, male participation rate, marginal workers etc., are weak and educational and medical facilities are the weaker variables in Srikalahasti city region. There is no relationship to the variables namely educational and medical facilities with others.

Except Kadapa city region, almost all city regions are poor in educational and medical facilities. Generally, most of the people of umland depend upon the town or city for educational and medical facilities. Though these facilities are available to some extent they are not sufficient.

On the basis of the above study, some important generalizations can be made based on the correlation analysis of all the selected variables of each city-umland of Rayalaseema.

1. Large and developed towns with poor umlands have strong inter-relationship among the variables. This hypothesis is valid in Kurnool and Tirupati city regions and not valid in case of Anantapur, Adoni, Proddatur and Kadapa city regions. Anantapur, Adoni, Proddatur and Kadapa towns are big and developed, but the inter-relationship with their respective umlands is only medium.
2. If both the town and its umland are not developed, then the inter-relationship between them is not strong. This assumption is true in case of Yemmiganur, Srikalahasti and Madanapalle umlands. These are small towns. The urban system within the city and its region is not well established. The backwardness of both town and its umland resulted in weak inter-relationship among the variables. Hindupur, Tadpatri, Kadiri and Dharmavaram city regions show deviation from the above trend. Though these towns and their umlands are also backward, the relationship between the town and its umland is moderately strong.
3. The overlapping of one city region on the other causes shadowing effect and weakens the city-umland relationship. This statement is proved in case of Srikalahasti and Yemmiganur and not proved in case of Anantapur and Dharmavaram city regions. Tirupati city region has overshadowed Srikalahasti city region and Adoni city region overshadowed Yemmiganur city region. Hence they have weak relationship. However though Anantapur and Dharmavaram umlands, are overlapping with each other, they have medium inter-relationship among the selected variables, due to the presence of sericulture unit in Anantapur and labour intensive spinning industries in Dharmavaram umlands.
4. The presence of small town/towns within the umland region may weaken the relationship between the town and its umland. This assumption is accepted in case of Proddatur and Madanapalle umlands, Yerraguntla town is located about 1.3 Kms from the Proddatur town and is the rail station leading in non-metallic and mineral based industry. This is the cause for medium relationship between Proddatur town and its umland. The presence of Vayalpadu town, which is 12 Kms from Madanapalle town appears to be reason for weak relationship of Madanapalle umlands. Both towns are taluk head quarters, serving the same functions.



5. The presences of urban centres adjacent to the umlands also weaken the city-umland relationship. This statement is valid for madanapalle umland and not valid for Guntakal umland. The presence of Punganur town (fort town and taluk head quarter) adjacent to Madanapalle umland weakened its relationship among the selected variables. For Guntakal umland, Gooty and Uravakonda towns are nearer, but the city-umland relationship is not weakened. It is due to the well developed transport network of Guntakal town and its umland.

## CONCLUSIONS

The city – umland relationship is analyzed on the basis of 30 selected variables for all 16 city regions by applying the multiple correlation analysis. All the 16 city regions have correlation coefficients of more than 20 percent which are highly significant except in the case of Madanapalle, Srikalahasti and Yemmiganur, Moderately significant correlation coefficients are less than 10 percent exist in Adoni, Kadapah and Madanapalle city regions and the remaining Hindupur.

It has been observed from the study that the degree of association among the variables is the indication of development of a city region. On the basis of Strength and weakness of the thirty variables the city regions of Rayalaseema are classified into strong, medium and weak city regions. There is strong inter-relationship among the variables for Kurnool and Tirupati and their umlands. Moderate inter-relationship among the variables is observed in the case of Anantapur, Adoni, Proddatur, Kadapa, Nandyal, Chittoor, Guntakal, Hindupur, Tadpatri, Kadiri and Dharmavaram and their umlands where as weak relationship is observed for the variables of Madanapalle, Srikalahasti and Yemmiganur and their umlands.

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