CS-95 RELATION BETWEEN SOCIAL AND ENVIRONMENTAL CONDITIONS IN COLOMBO, SRI LANKA AND THE URBAN INDEX ESTIMATED BY SATELLITE REMOTE SENSING DATA

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1. INTRODUCTION

In most developing nations authentic and continually updated information concerning the rapidly expanding urban areas does not exist. Therefore the planning of urban infrastructure for the needs of effective development has become difficult, because there is no adequate understanding of the existing urban system. This study shows how digital data from satellite images could replace costly and time consuming traditional data collection efforts and provide a relatively inexpensive and fast method of updating urban information and assessing conditions in urban areas. For this purpose the authors propose the Urban Index UI, using Landsat TM bands 7 and 4. As a case study the Colombo Metropolitan Region in Sri Lanka is selected and it is shown how UI is strongly related to socio-economic and environmental data of this region.

Colombo City is the commercial and industrial center of Sri Lanka. Out of a total population of 17.7 million people living on the Island of Sri Lanka an estimated 2 million people live in the Colombo Urban Area which extends over 58 Sq.km. The population in the most built-up areas of Colombo are in the region of 160 persons to the hectare.

2. REMOTE SENSING DATA USED.

Digital data from a Landsat TM scene aquired on the 12th of February 1993 was used in the study.

2.1 The Proposed Index UI

The proposed index UI was computed as shown in equation 1, using Landsat TM band 7 (B7) and band 4 (B4) exploiting an observed inverse relationship between the brightness of urban areas in the near infra-red $(0.76\ m$ - $0.90\ m$) and mid infra-red (2.08 $\,m$ - 2.35 $\,m$) portions of the spectrum.

$$UI = \left(\frac{B7 - B4}{B7 + B4} + 1.0\right) \times 100.0$$
 (1)

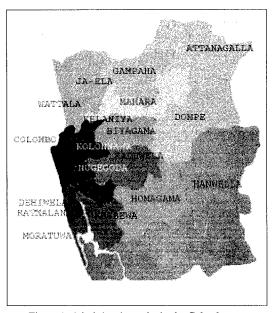


Figure 1. Adminitrative units in the Colombo Metropolitan Region

3. SOCIO-ECONOMIC AND ENVIRONMENTAL DATA USED.

Data of population, housing, labour force, water supply consumption, electrical energy consumption, land values and environmental related diseases relating to the administrative geographical units in the Colombo Metropolitan Region was used. The data relate to the period 1991 to1994. The administrative areas considered in the Colombo Metropolitan Region (CMR) are shown in figure 1. They cover a land area of 1386 Sq.km and has a total population of approximately 3 million.

The environmental related diseases that have been considered are Dysentry, Entric Fever, Viral Hepatitis, Malaria, Diarrhoea, Leotos Pirosis and Wooping Cough.

4. RELATION BETWEEN UI AND SOCIO-ECONOMIC AND ENVIRONMENTAL

The average UI value for each administrative area was calculated by registering a UI image with images of digitised maps showing the boundaries of these geographical units in

in the CMR.

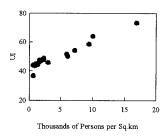


Figure 2 UI - Population Density

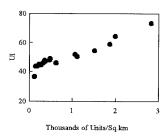


Figure 3 UI - Housing Density

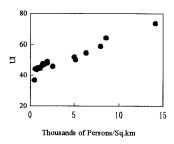


Figure 4. UI - Labour Force Density

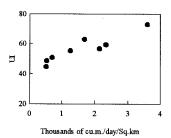


Figure 5. UI - Water Supply Consumption

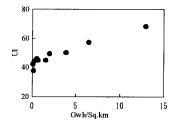


Figure 6. UI - Electrical Energy Consumption

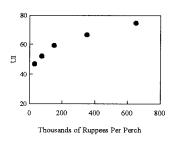


Figure 7. UI - Land Values

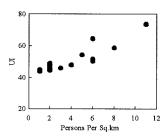


Figure 8. UI - Environmental Related Disease Intensity

5. CONCLUSION

From this study it could be seen that Landsat TM data could be used to update information and assess the conditions in urban areas. Hence satellite images could be used for effective urban and regional planning and could be particularly useful in rapidly changing urban areas.