EFFICACY OF MONITORING OF URBAN DEVELOPMENT WITH THE USE OF REMOTE SENSING TECHNIQUES

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INTRODUCTION:

Industrialisation and recent technological developments have hastened the urbanisation all over the world especially in developing countries. Knowledge about landuse and landcover has become increasingly important as the nation plans to overcome the problem of haphazard uncontrolled development and deteriorating environmental quality. In the dynamic siutation, meaningful current and correct data on landuse are essential. Aerial photointerpretation which is in vogue for nearly four decades has admirably helped planners in monitoring landcover, landuse and urbanisation. Repeated, aerial surveys, updating the fast changing developments by maps etc. require large financial investment and infrastructural facilities. For the last one and half decades, with the emerging technology of satellites a new thrust has been given to the remote sensing. Potentialities and uses of satellite remote sensing are many and varied. With judicious use of the technology such as satellite remote sensing along with existing methodologies, efforts can be put in to monitor the urban development and its control on global basis. The present paper discusses some aspects concerned with the satellite remote sensing and urban development and its changes.

RECENT DEVELOPMENTS IN SATELLITE REMOTE SENSING:

In July 1972, U.S.A. launched, the first satellite for earth observation and was subsequently named as Landsat 1. This experimental satellite revolutionalised the remote sensing techniques. Paylaod consists of multispectral scanners (MSS) and return beam videcon(RBV). The resolution of M.S.S. was 79 metres. The data was available in four spectral bands in wave lengths varying from 0.4 to 1.1 μm. With repeated coverage and temporal data, dynamic changes in natural resources such as floods, forest fires, crop diseases, pollution etc. could be identified and remedial measures could be implemented. After the success of Landsat 1, in Jan 1975, Landsat 2 was launched with payload similar to that of Landsat 1. With the launching of Landsat 2, the repetitive data was made available every 9 days. Digital analysis and image processing techniques enhanced the overall interpretation and utility of the satellite data. In 1978, Landsat 3 was launched which supplied the data upto 1983. Meanwhile Landsat 4 was launched in July 1982 with better resolution and thematic mapper data. To back up the Landsat 4, Landsat 5 was launched in March 1984 which continues to give thematic

mapper data in addition to MSS data. In February 1986, "SPOT" was launched by France which has capabilities of better resolution and gives stereopairs for terrain features. Of course many more satellites have been slated during the remaining period of this decade and the next decade. With such an array of facilities, a new dimension has been added to monitor the urban development almost on real time basis.

CLASSIFICATION METHODS:

A landuse and landocver classification system with remote sensing data is very important when the data is received continuously and repetitively on global basis. To a great extent the efficacy of the satellite data is assured only when there is a common classification system with respect to landcover and landuse which includes urban development. The classification system which can effectively employ orbital and high altitude remote sensor data should meet the following criteria (Anderson 1971).

i) The minimum level of interpretation accuracy from remote sensor data should be atleast 85%

ii) The accuracy of interpretation for the several categories should be about equal

iii) Repeatable or repetitive results should be obtainable from one interpreter to another and from one time of sensing to another

iv) The classification system should be applicable over extensive areas

v) The categarisation should permit vegetation and other types of landcover to be used as surrogates for activity.

vi) The classification system should be suitable for use with remote sensor data obtained at different times of the year.

vii) Effective use of subcategories that can be obtained from ground surveys or from the use of larger scale or enhanced remote sensor data should be possible

viii) Aggregation of categories must be possible.

ix) Comparison with future Landuse data should be possible

x) Multiple use of land should be recognised when possible.

The kind and amount of landuse and landcover information with regard to urban development may be obtained from different sensors depend upon the altitude and the resolution of each sensor. Therefore multilevel landuse and landcover classification system has to be developed on global basis for world wide application so that efficacy of operationalisation would be standardiseed for monitoring urban development.

Keeping in view the above objective, the following four classification levels have been suggested (Anderson 1976)

	Classification Level	Typical data characteristics
I.	Level I	Landsat type of data regional planning about 79 metres resolution.
II.	Level II	High altitude data at 40,000 ft. (12400m) (Recent satellites are capable of giving better resolution data. Landsat 4,5 & SPOT)
III.	Level III	Medium altitude data taken between 10,000 and 40,000 ft.(3100 to 12400 m) (Spot stereoscopic data and thematic mapper data can give results for interpretation for this classification level)
IV.	Level IV	Low altitude data taken below 10,000 ft (3100m) (Aerial photogtraphs, topogaphic sheets,land survey methods)

Anderson's method has demonstrated the importance of multilevel classification and the needs to be implemented widely so that the global data usage would be standardised. Of course local authorities can improve the classification levels especially level 3 and 4 so that efficacy in the particular region would be enhanced.

With the digital analysis and the latest image processing techniques, it has become possible to interpret the satellite data so that classification levels 3 and 4 can be attempted with the sufficient confidence.

IMPLEMENTATION:

In order to use the repetitive and temporal data on world wide basis with respect to urban development, the following aspects will have to be looked into.

I. Zones of rapid urban development

a. Industrialization

b. Pollution

c. Population Concentration

d. Social & Economical considerations

Serious thinking has to be given to all the points which have long ranging effects on the human habitat. These problems have assumed serious proportion even in developing countries.

World organisations have to co-ordinate the work to monitor the urban development on regional basis so that there would be optimum development and the quality of human life will not deteriorate because of uncontrolled and haphazard urbanisation. Most of the cities in developing countries such as India, it has become impossible to control the influx of population from the rural sector to the urban sector mainly because of economic considerations causing there by reduction in the quality of life, increase in the poverty, illhealth and unhygenic living conditions. Thus to monitor all round development has become mandatory and with the remote sensing techniques and with properly trained manpower it could be possible to monitor the haphazard urbanisation and necessary checks can be introduced well in advance so as to avoid chaotic situations. For this type of operation of work on the worldwide basis we need trained dedicated personnel and organisational mechanism.

II. Trained Manpower: All local bodies which are directly connected with urbanisation, should see that sufficient number of scientists and engineers are exposed and trained in the emerging area of satellite remote sensing so that the technology can be straightway utilised for their routine day to day work. Slowly and steadily, the present methods of measurement, survey techniques and map making should give way to the use of remote sensing data and use of computer and image processing techniques. Training is of vital importance so that the dynamic technology will be put into usage at various organisational levels. To have proper manpower, new methodologies of inservice training, distance education and audio visual expert lessons can be thought of. In this regard, developed countries will have to take necessary lead in providing training facilitis to the developing countries especially in the Asian Region.

III. Mobilising of Finances: Muncipalities and local bodies can be encouraged in switching on to the latest techologies so that their information system would be uptodate with respect to urban development and its optimum benefits to the local habitat. In order to mobilise funds, the local bodies and industries which are attracting and causing shift in population should contribute towards a fund which will be exclusively used for incorporating emerging technologies such as remote sensing towards better control of urban development.

IV. Geographical Information System: In order to monitor the changes it is essential to maintain an informattion system which will enable to update the data at short notice on a continuous basis. This is very important when the repetitive data is available continuously from the satellite. For this computer based data retrieval system becomes absolute necessity. Thus information retrieval and analysis system for handling landuse and landcover data plays a very essential role in monitoring the urban development.

CONCLUSION

From the disucssion it could be concluded that

i) The efficacy of monitoring urban development can be improved with the use of satellite remote sensing techniques.

ii) Training of scientific and engineering personnel in this emerging area is very important for the operationalisation

iii) World bodies should come forward to utilise the remote sensing techniques with special responsibilities towards developing countries to control haphazard urban development in the overall human welfare and excellance

iv) Computer based geographical information retrieval and analysis systems, have to be encouraged in all local offices, muncipalities at regional and national levels so as to monitor the urban development using remotly sensed data

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