JOURNAL OF CRITICAL REVIEWS

ISSN- 2394-5125 VOL 07, ISSUE 08, 2020

AN INTEGRATED LAND USE AND LAND COVER SCENARIO ON WASTELAND OF UPPER DWARAKESWAR BASIN IN PURULIA DISTRICT, WEST BENGAL

Dr. Raja Ghosh,
Assistant Professor & Head, Department of Geography, Khudiram Bose Central College, Kolkata
Email: rajageo.ghosh1@gmail.com

Abstract: Today no nation can sit in comfort and afford to neglect the gravity of environmental problems which threaten the very survival of life on earth. India is no exception to the global phenomenon of environmental degradation. It shares, with the poorer seventy percent of the world, the painful results of the deterioration of its natural resources and the dilemmas in trying to halt this deterioration. It may be mentioned that the wasteland management of the drought striken Purulia district of West Bengal in India is not an easy task which requires high degree of technical input. The degradation of land and soil erosion causing vegetation loss have brought about such a stage, from where regeneration will take sufficient time. In some places, physiography plays obstruction for managing wasteland up to a mark. Communication system is not well developed throughout the district, so in the remote areas, wasteland management is difficult because of poor communication. Sankamarayan (1988) suggested agroforestry as means of reclaiming wastelands, which would further protect the land from degradation. Wastelands in terms of animal husbandry may provide sustenance to many animals by fodder cultivation. This condition holds true in Rajasthan, where a meagre unfit land may be sufficient to feed domestic livestock Singh S.N. (1969). The success of wasteland reclamation is based on micro-level planning with a clear understanding of topography, soil type, erosion, rainfall distribution and socio-economic conditions of local community (Hegde, 1993). Bhavani et al., (1996) concluded that the nutrient value of land and socio-economic aspects of farmer were the two major problems of wastelands in Tamil Nadu. This stressed the importance of economic conditions of farmers as an important input in the wasteland analysis. An inter-relationship among agriculture, forest and wasteland was explained by Shah (1995) and few of wasteland reclamation activities by growing salt-tolerant species were suggested by Rai (1999). Sen A.K. (1972), stressed on the importance of water and watershed management to wasteland development activities. They stated the utility of considering rainfall distribution, water level variations, soil condition and socio-economic condition of local community as factors in wasteland developmental activities. Nagarathinam (1997) explained the usefulness of remote sensing and GIS based approach to assess land potential for wasteland development at village level in a study conducted around Kalluthu village, Usilampatti Block of Tamil Nadu, India. Vijay and Pradeep Kumar (2001) integrated various thematic layers such as lithology, landforms, soil, groundwater level, rainfall and slope to understand their influences on wastelands and also explained the utility of remote sensing and GIS techniques for reclaiming them. The review helped to understand the utility of remote sensing in delineating various parameters such as landforms, lithology, soil and land use. It also emphasized the significance of integrating remote sensing and GIS in natural resources and could be well utilized in the study of wasteland. Such an integrated approach may help to understand and to identify problems pertaining to wastelands and ways for reclaiming them in the study area. For this purpose, a description on the terrain condition, landform, climate, land use and socio-economic condition of the local community are given in the following chapter.

Keywords: Land Use/Land Cover, Remote Sensing and GIS Techniques, Wasteland Reclamation, degradation of land and soil erosion

1. Introduction:

The study area consists of 3 CD blocks covering the Dwarakeswar river basin i.e., Para, Hura and Kashipur with 66 small and large villages of Purulia district. For the purpose of three villages namely Bagalia from Para, Dholkata from Hura and Saharbera from Kashipur CD blocks have been chosen. On the map of 1930's wasteland can be seen in most of the area.The right side of the river Futuari had large wasteland from Chuna to Dholkata. Towards Bagalia, both sides of the river were covered with stony wastes. The area was about 46.3 km^2 in 1930 which was reduced to 19.1 km^2 in 1970's. Extreme southern part of the basin was also covered with wastelands. On both sides of Saharbera is now covered with a major share of wastelands around it. With the change in the river course, there is also the change in the coverage of wastelands. Many streams in the 1930's had dried up in 1970's and many new streams developed later. Although the changes are insignificant, still it has some effect on the distribution of wastelands in the Dwarakeshwar basin area. The areas close to the river have less coverage than the areas away from rivers. So, significant impacts of rivers on wastelands have been found. There are very insignificant change of wastelands shares in Bagalia, which has impact in economic development. But in the areas like Dholkata and Sahabera there is significant drop in wasteland percentage. The right side of Futuari has less area under wasteland cover and that of Darbhanga has great reduction in the percentage from 1930's onwards. So, Sahabera has developed economically more than other two villages because now it is quite far from the wastelands and so there is a scope for sustainable management of watersheds. The left side of the Dwarkeshwar like Gamarkuri and Dhanara villages are without wasteland. In Dholkata now there is less area of wasteland than in Bagalia, as it is situated along the Futuari stream. It is because they get water supply from Futuari dam. Satellite image (2005) showing lesser area of wasteland since 1976. Bagalia is also showing significant reduction now compare to 1976. Although in the extreme north-western part there are still some large patches of wastelands. However, river water has reduced the share of wastelands. So, the future of reservoir is supplying huge water to its surrounding area including Dholkata. This dam has the water area of about 255 hectares. Its supplies water to nearly 70 to 80 villages for irrigation and domestic use. This dam has started working from 2001, 7th March. The wasteland close to Darbuanga river has further reduced in the south and extreme south east of the basin. So, Saharbera village is now developed further, as it is getting supply of water from Futuari dam. From Dholkata the wasteland has shifted to the mouth mainly because of sufficient amount of water available for agriculture. So, river water and drainage system of the upper Dwarkeshwar river basin has a great impact on the change of land use pattern. As revised since the year 2005, wasteland cover area largely found in the extreme north- western part near Bagalia and in some area on north of the Dwarkeshwar, on right side of Futuari in the south-central part, and also in scattered patches in the whole basin area.

2. Definition of Wasteland:

Stamp (1948) stated that the land which has been used previously but which has been abandoned and for which no further use has been found may be defined as a wasteland. Wasteland Survey and Reclamation Committee (1961) defined wastelands as those lands, which are either not available or left out of cultivation as fallows and cultivable waste as wastelands. According to National Wasteland Development Board (NWDB, 1986) wastelands are defined as that land which is degraded and is presently lying unutilized except

ISSN- 2394-5125 VOL 07, ISSUE 08, 2020

as current fallow due to different constraints. Wastelands may also be defined as lands with ecological constraints and economic potentials. Based on ecological constraints, wastelands are those which are ecologically unstable and whose topsoil has been nearly or completely lost and which have developed toxicity in the root zone for the growth of most plants. On the basis of economic potential and actual returns, the lands that give less than 20% of this economic potential are “Wastelands”. From all the above descriptions, wasteland may be defined as those lands which are presently unused or which are not being used to their optimum potential due to some constraints (Sinha and Dubey, 1986). Wastelands include barren lands degraded to varying degrees through wind and water erosion, through deforestation, overgrazing, etc. Such lands may also be waterlogged, saline and alkaline, rocky outcrops, stony and pebbly hill slopes, sandy wastes. Wastelands also include those lands available of land for cultivation but not taken up for cultivation. These lands may be abandoned after a few years owing to some reason or the other. Such lands may be fallow for more than five years and may be covered with shrubs and grass lands which are reserved for pasture and not included in culturable waste. In short, the wastelands are those lands that lie uncultivated for the present but could have been used previously. Such awareness on wasteland based on land capability and productivity was there from historical period in India. The Wasteland Survey and Reclamation Committee (1961) classify wasteland as follows:
a) Land not available for cultivation - barren and uncultivated land.
b) Other uncultivated lands excluding fallows - culturable waste, permanent pasture and grazing lands, and land under miscellaneous tree crops and groves.
c) Fallows - current as well as other types.
The National Commission on Agriculture, Government of India, in 1976, for the first time brought out an estimate on the extent of degraded lands, which range from 38.40 m.ha. to 187 m.ha. from the reports by many individual government sectors. Estimation of wastelands by various agencies are compiled and given in the Table 1.2. The areal estimation of wastelands differ agency to agency, this because of their own wasteland classification system.

3. Methods and Objectives of the study area:

This encompasses broadly the identification of the problems, pinpoint the basic constraints for evaluation of wasteland in the specific zones and framing the policy instruments on a cost-effective basis by a comprehensive programme of utilization of local initiative, with sequence to study area. The work here by completed in the following three stages, with appropriate usage of suitable tools and techniques as discussed below. In the present study the land use and land cover maps have been prepared for the years of 1992, 2000 and 2015 using LANDSAT digital images of TM, ETM+ and OLI sensors respectively. Following Supervised classification technique, the overall are has been segregated into 12 classes like agricultural land, agricultural fallow land, stony waste, bare land, wet river channel, settlement, degraded forest, dense forest, lateritic exposer, water body. From the temporal study it has been seen that the waste land area is decreasing in nature and the agricultural area has been increased.

Because of cost and time constraints a mini-watershed has been selected for micro level analysis, which is representative of the entire study area. In addition, two smaller hydrological units i.e., micro-watersheds are selected to address the wasteland problems at cadastral level and subsequent reclamation activities. Transferring of certain details such as potential zone and prioritization zone from 1:50,000 scale to 1:12,500 scale involved complex steps like reference to local land records, transfer of control points and geo-references. Similar to the above, transfer of wasteland units from 1:12,500 (as obtained from satellite image) to 1:5000 scale posed certain limitations and involved complex procedures. Cost /Benefit analysis would have been useful additional indicator in suggesting reclamation process, but this was not carried out as it would lead to deviation in core theme of the present research work.

5. Review of Literatures:

The problem of wasteland has a long history starting from the 4 century B.C, where historical rulers demarcated the wasteland as the land, which was not serving any purpose. Emperor Ashoka has also used the wasteland for proper evaluation of land. Ambassador Megasthenes described wastelands as neglected lands. In the Moghul period, Babar also used the term wasteland in different ways, as the neglected land, for purposes of fixing the land value and revenue collection. Under the colonial rule, the Britishers also continued the same practice and they did not charge any kind of land revenue for the land which failed to yield a positive return to the farmers (Yadav, 1986). There has been growing awareness regarding wasteland development and a number of studies have been conducted on examining the problems and reclamation of wastelands. It has been especially true in the Indian conflict. Previously, the recommendations to reclaim wastelands were on the basis of local experience and with limited local field observations. At this juncture, utilizing Remote Sensing (RS) and Geographic Information System (GIS) technology were well appreciated since they could be used to approach the problem from regional to local level. They also aid in analysing various terrain conditions to plan scientific reclamation and management practices. A few of such studies are discussed here. Singh (1969), Mukherji (1971), and Jasbir Singh (1993) have studied the spatio-temporal patterns of wastelands using conventional surveys and existing collateral data. Singh (1971) suggested micro-level studies to understand the extent and problems pertaining to wastelands. Later, the use of remotely sensed data played an important role in mapping the wasteland units. Sen (1972) used aerial photographs combining with intense field verifications depicted the advantage of using remote sensing data. Montapa (1972) were able to recognize and classify wasteland units using aerial photographs. Further, Gautam et al., (1986) demonstrated the use of satellite data in conjunction with collateral data for wasteland development programmes and evolving management strategies. The data derived from satellite were useful in gathering information on wastelands, which helped in generating a wasteland database by Government Agencies (Oberai and Singh, 1986). It also provided information on wastelands at micro-level for various planning and reclamation activities Verma (1986) have discussed various aspects of wastelands development. They stressed the importance of water management and impact of irrigation in wastelands reclamation activities. Identification of wasteland by means of soil survey was explained by *Chandna, R.C. et al.* (1983): by analysing soil condition and location specific land characteristics before it attains the final stage of land degradation. In another study carried out by Gadgil M, 1991: the application of RS in inventorying degraded lands is emphasised by visually delineating various land units such as agriculture, forest, open scrub, erosional surfaces, kankars and saline areas using IRS- 1A LISS-II data. Mishra T, (2002) explained the applicability of GIS by spatially integrating various themes for resources planning. The feasibility of using GIS for assessing land's potential for wasteland development at Block level on 1:50,000 scale has been demonstrated by Adeniyi P.O and Omojola A. (1999) in a pilot study. Pook M.J. (1986), related the natural resources planning and management especially for wasteland reclamation purpose. SKOLE, D.L. (1994) explained the utility of an integrated approach using RS and GIS in analysing and reclaiming water-logged and salt-affected areas in Periyar-Vaigai command area of Tamil Nadu. Trewartha, G.T. (1969): carried out a similar study by integrating remote sensing and GIS for eco-development planning for degraded Aravalli forests around Gurgaon and Alwar. The forest cover and land use patterns had been derived from IRS- LISS-II satellite data and integrated with socioeconomic details to analyse the extent of degradation. From the study it was explained

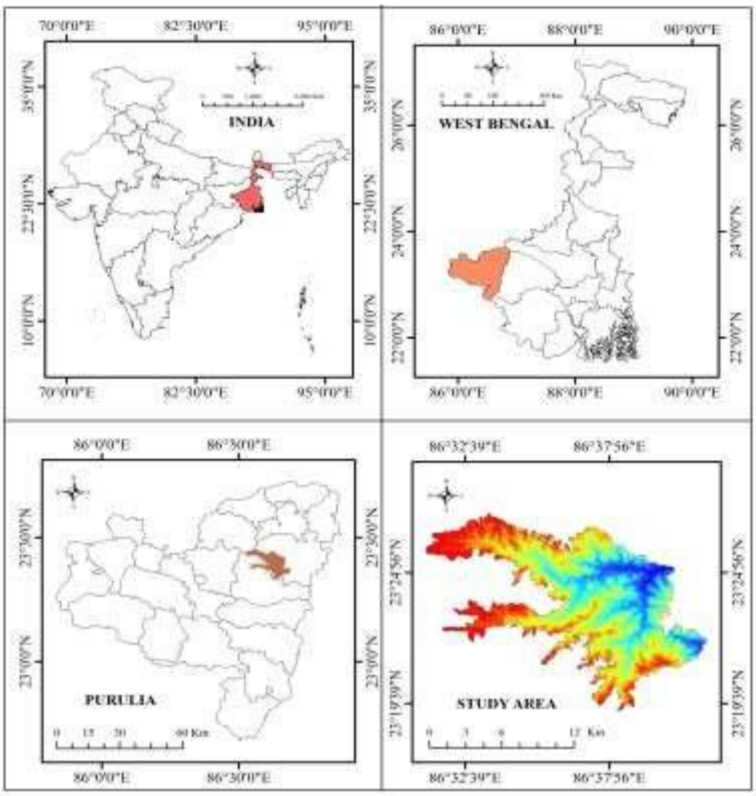
ISSN- 2394-5125 VOL 07, ISSUE 08, 2020

that the degradation had been due to socio-economic aspects of the area. A farm level development planning, with the aid of GIS techniques, was explained by Sivasamy et al., (1997). The study was conducted in a small village (Vadakkur village) in Tamil Nadu, India emphasized the utility of GIS in micro-level analysis, planning and land management.

6. The Study Area:

Purulia district forms a part of the Precambrian metamorphic terrain of the south-eastern Chotanagpur plateau comprising mainly of granite, gneisse, quartizite, etc. rocks with the Gondwana sediments in faulted trough (McDougall & McElhinny 1970). The study area forms the last two steps in the descent from the hills of Central India and Chotanagpur plateau to the Damodar plains of West Bengal.

In the study area which lies (Map 2.1) between 23^0 18’ N to 23^0 30’ N of latitudes to 86^0 30’ 30’’ E to 86^0 41’ E of longitudes different types of wastelands could be noticed. The ratio of wasteland to total geographical area of the study area has inevitably decreased in recent years. Irrigation facilities have helped to bring more and more land under cultivation. The wasteland has undergone many changes since 1930’s. Either most of the area was covered with stony wastes but with the progress of time the share of wastelands has reduced to a great extent.



Map 1. Location map of the study area

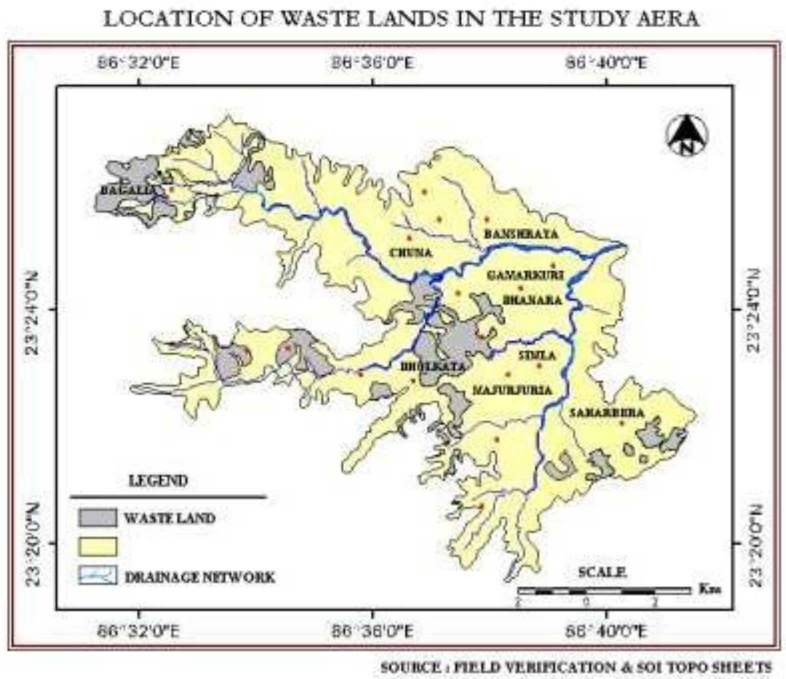
ISSN- 2394-5125 VOL 07, ISSUE 08, 2020

7. Analysis and Discussion:

According to the structure and landform, Purulia is a part of the Ranchi peneplains (Singh, 1978). The contrast of relief texture corresponds to different cycles of erosion and also to differences in lithology. Purulia district forms a part of the Precambrian metamorphic terrain of the south eastern Chotonagpur plateau comprising mainly of granites, gneisses, quartzites etc. rocks with Gondwana sediments in faulted troughs.

7.1 Land Use/Land Cover, Concepts and Development:

Land is the stage on which all human activity is being conducted and the source of the materials needed for this conduct. Human use of land resources gives rise to 49 "land use" which varies with the purposes it serves, whether they are food production, provision of shelter, recreation, extraction and processing of materials, and the bio-physical characteristics of land itself. Hence, land use is being shaped under the influence of two broad sets of forces – human needs and environmental features and processes. The terms land use and land cover are not synonymous and the literature draws attention to their differences so that they are used properly in studies of land use and land cover change. Land cover is the biophysical state of the earth's surface and immediate subsurface.



Map 2. Identify of waste Lands of the study area

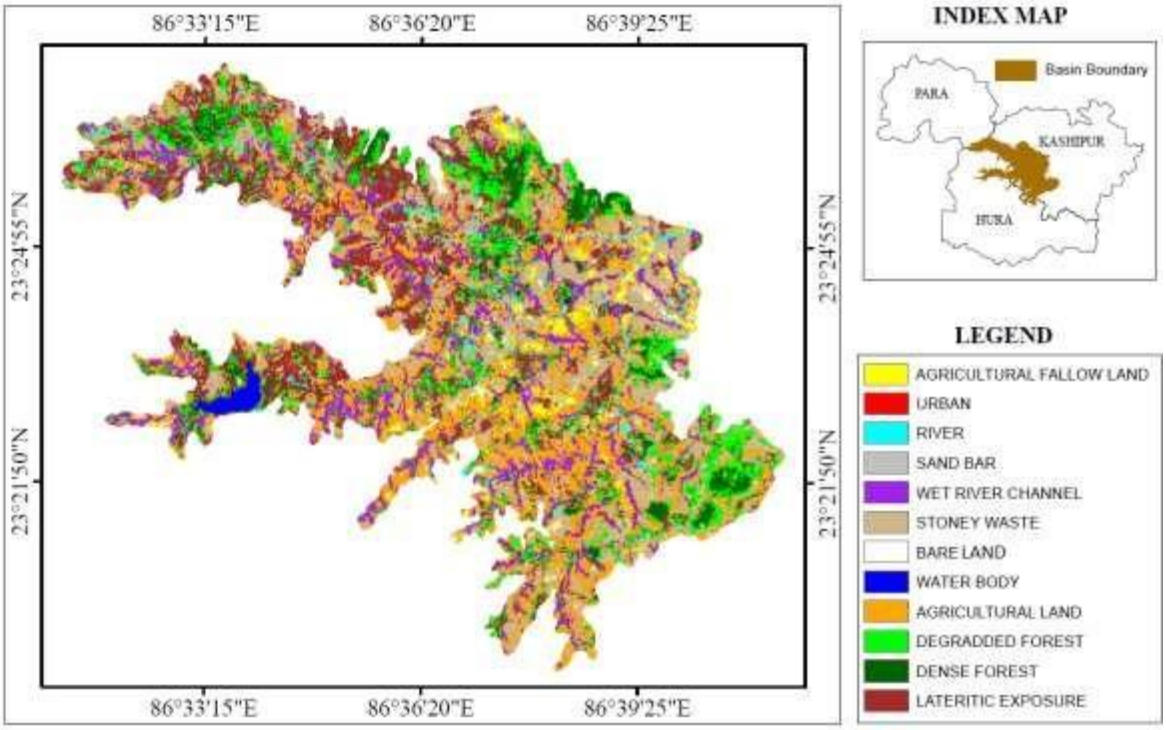
7.2 Impact of Land use/Land Cover Change on Environment:

Man's activities have completely dominated the environmental change and which are now exceeding the limits of variability. Today the changes in the environment are because of the changes brought in land use by the man. Therefore, land use change leads to environmental change and which in turn affects the land use practices. Similarly, a study on land use land cover mapping that the heterogeneous climate and physiographic conditions in these districts has resulted in the development of different land use/land cover in these districts. It was

ISSN- 2394-5125 VOL 07, ISSUE 08, 2020

inferred that land use/land cover pattern in the area are generally controlled by aero-climatic conditions, ground water potential and a host of other physiographic factors.

Besides that, the forest area is also seen to be increased. In the year of 1992 almost 23% of the area was under stony waste where as in the year of 2015 through 2000 this has been decreased to 14% and 8% respectively. Besides this the agricultural land has been increased to from 41% to 53% through 46% in the years of 1992, 2000 and 2015 respectively.



Map 3. Land Use Land Cover Map of Dwarakeswar drainage basin (2015).

8. Findings:

- Though the proportion of wasteland is constantly changing here in the study area (as per the satellite image analysis and temporal field investigations) still there is a high need of improved wasteland management technique to be implemented.
- As a wasteland management technique Sabai grass based economic support can be a good option. So, the author has done an economic evaluation test based on this agriculture. The result is quite satisfactory.

Analysis of the data about profit from *Sabai* grass-based agroforestry production revealed shown that in Bagalia village the percentage profit of agriculture, *Sabai* grass, fuel, and fodder was 63.17%, 34.21%, 1.31% and 1.31% respectively whereas in Dholkata village 72.75%, 24.10%, 1.78% and 1.37% respectively, and in Saharbera village 74.45%, 23.87%, 0.84% and 0.84% respectively.

So, succession is not well distributed over the study area. Facilities are not available equally in each and every village. Thus, government should take initiatives for decentralization of the facilities. More emphasis is needed for the construction of new roads to access facilities, plantation (social forestry) along both sides of roads, clearance of drainage and excavation of old check dams, etc. In future these may overcome the hindrances to developments of this area.

ISSN- 2394-5125 VOL 07, ISSUE 08, 2020

9. Recommendation:

Like other researches, this study has its implication for practitioners and scholars as well. The result of this research may help in decision making on resource through wasteland development in this region. There are useful managerial implications on the basis of the findings of this study. It may be concluded; we can conclude that the first and most important issue in study area is lack of having applications of proper regional planning. A sustainable master plan is required to address the problem of environmental degradation and developmental aspirations of the people. Irrigating and low fertility of land are the major problems in this region. Planners need to have account this issue. Old check dam is needed to be renovated as soon as possible. Small scale handicraft industries can generate employment in this region.

Conclusion:

On the basis of the basis of the discussion made in the previous chapter it may be concluded that the upper dwarakeshwar river basin area has been suffering from resource inadequacy due to the physical condition of land, soil and climate, which is not favourable for intensive agriculture practices. Wastelands are thus dominating the area with low productivity of land. The limited resource base and relative inaccessibility. Lack of proper planning for augmentation of availability of and fertility of soil has accelerated the problems. Thus, the human development of the region in terms of income, education and health are also poor. Hence then is enough scope for development of the region though integrated wetland management for creation of local resources, employment opportunities and other social – economic development. There should be of introduction of modern technological inputs with traditional local wisdom for creation of new resources for better livelihood of the people of the region.

References:

- Adeniyi P.O and Omojola A. (1999) Landuse landcover change evaluation in Sokoto – Rima Basin of North Western Nigeria based on Archival of the Environment (AARSE) on Geoinformation Technology Applications for Resource and Environmental Management in Africa. Pp 143-172.
- Bhavani V, Shankar and Muthukrishnan N. (1996), 'A survey of Wastelands in Tamil Nadu with Reference to Their Nutrient Status', Indian Journal of Environmental Protection, Vol.16, No.l, pp.29 - 35.
- *Chandna, R.C. et al*. (1983): "Changes in the Industrial Structure of India's Male Working Force 1961-81", *Population Geography,* Vol. 5, Nos. 1 & 2, p.47.
  Gadgil M, 1991: Conserving India's biodiversity: the social context. Evol. Trends in plants, 5:3-8. **V**
- Hegde N.G. (1993), 'Development of Wastelands: Role of Micro-Level Planning', Wasteland News, Vol. IX, No. 1, pp.40 - 45.
- McDougall, I., and M. W. McElhinny, 1970, The Rajmahal Traps of India — K-Ar ages and paleomagnetism: *Earth and Planetary Science Letters*, v. 9, p. 371–378, 1970.
- Mishra T, 2002: Forests of Bengal. *Paschimbangya Viggyan Mancha*; Kolkata - 14.
- Mukherji A.B. (1971), 'Geographical Patterns of Changes in Agricultural Wastelands in Uttar Pradesh', Geographical Review of India, Vol.XXXII, No.2, pp. 120-132.
- Nagarathinam V. (1997), 'Geographic Information System (GIS) for Land Evaluation and Planning', in Proceedings of the National Seminar on Geographic Information System (GIS) for Development Planning, The Ranganathan Centre for Information Studies, Chennai, pp.53-63.

- Pook M.J. (1986), 'Water Conservation and Water Management for Wasteland development', Dimensions of Wastelands Development, Proceedings of National Seminar on Wastelands Development, New Delhi, pp. 165 - 174.
- Rai P (1999), 'Growing Greener and Increase the Production of Wastelands', Wasteland News, Vol. XIV, No.3, pp. 48-50.
- Sankamarayan K.A. (1988), 'Agroforestry: The Key to Rehabilitation of Wastelands, Wastelands Development and their Utilization', Proceedings of National Seminar held at Central Arid Zone Research Institute (CAZRI), Jodhpur, Scientific Publishers, India, pp. 322 - 342.
- Sen A.K. (1972), 'Land Utilization Mapping to Estimate the Wastelands of Arid Zones in Rajasthan by Photo-Interpretation Technique', Indian National Science Academy Bulletin, No.44, pp.67-71.
- Shah S.A. (1995), 'Involvement of Industry in Development of Degraded Forest Lands', Wasteland News, Vol.X, No.4, pp. 29 - 30.
- Sharpe, C.F.S. (1938): Landslides and related phenomena, Columbia University Press, pp. 137.
- Singh S.N. (1969), 'Distribution and Changing Pattern of Cultivable Wastes in Kerakat Tehsil, Jaunpur District, Uttar Pradesh', National Geographical Journal of India, Vol. XV, Nos.3&4, pp.207-223.
- Singh, Col. Rao Ram (1993): Developing India's Wasteland, *Yojana* vol.
- Singh, R, P. (1969): Geomorphological Evolution of Chotanagpur Highlands, India. National Geographical Society of India, Varanasi, India, pp. 20, 63, 69, 79-82, 91-95, 108-112.
- Sinha B.P and Dubey B.P. (1986), 'Status, Distribution and Development of Wastelands in Bihar', Dimensions of Wastelands Development, Proceedings of National Seminar on Wastelands Development, New Delhi, pp. 23-30.
- SKOLE, D.L. (1994) Data on Global Land-Cover Change: Acquisition, Assessment, and Analysis. In: MEYER, W.B. and TURNER, B.L. II., (eds.) Changes in Land Use and Land Cover: A Global Perspective, Cambridge: Cambridge University Press, pp. 437-471.
- Stamp L.D. (1948), 'The Land of Britain: Its use and Misuse', John Willey and Sons Ltd., London, 433 p.
- Swaminathan M.S. (1997), 'Towards a Hunger - Free India', Wastelands News, Aug.-Oct. 1997, Vol.XIII, No.l, pp. 8-9.
- Trewartha, G.T. (1969): *A Geography of Population: World Patterns,* John Wiley & Sons, New York, p.171
- Verma S.S. (1986), 'Impact of Irrigation on Wasteland: A Case Study of Gandak Command Area (Uttar Pradesh)', Dimensions of Wastelands Development, Proceedings of National Seminar on Wastelands Development, New Delhi', pp. 203 - 212.
- Vijay U and Pradeep Kumar A.V. (2001), 'Micro-Level Wasteland Development on Watershed Basis using GIS and Remote Sensing: A Case Study of Beguruhalla Watershed, Shikaripur, Shimoga District, Karnataka', ICORG 2001, Vol. 2, pp... 152 - 157.
- Yadav S.S. (1986), 'Geographic aspect of wastelands development in India', Dimension of wastelands development, Proceedings of the National seminar on Dimensions of wastelands development, New Delhi, pp.31-34.