Abstract of Thesis

Sanka river basin is an inter-state basin in India which comprises area of West Bengal and Jharkhand states of India. The basin area consists of 75 villages and one census town namely Balarampur (C.T). Sanka River is the main lifeline of the basin area. Through this study the researcher want to highlight physical settings, lithological setup of the basin and detailed description about the characteristics of complete drainage network and have also been focused on social aspects of the basin as well as spatial variation. Drainage network of the basin has been executed from various sources i.e. topographical map, Google earth images and field survey. Geomorphological scenario of the basin area has been developed through SOI topographical maps, contours, Google Earth 3D terrain model, GSI maps. From geological point of view, the basin has covered with approximately twelve types of rocks. Majority of the basin area is covered with Granite- gneiss of Chhotanagpur Gneissic Complex. The basin area has quite good potential for construction material and building stones. The basin area is also rich with different minerals i.e. kaynite, mica, and apatite in the northern part and kainite, copper ore, china clay, gold and glass sand in the southern part of the basin. Lithological settings of the basin are suitable for the development of drainage network. There are many tributaries of Sanka River. Major tributaries are *Srigi Nala*, *Erka Nala* and *Dudhi jhor*. The Sanka River is a non-perennial river, but lower reach is a perennial. The average rainfall within the basin area always below the normal rainfall but in some months the total rainfall exceeds the normal rainfall of the month and due to high slope occurrence of flash flood and heavy damages of life and habitat. The basin area is categorised into four broad physiographic divisions. Over the landscape 12 major landforms have been identified out of which most of the surface covers with Pediplain. From demographic point of view, population concentration is high in the villages which are located within foothill areas and the other 37 villages located in the high altitude areas are with maximum concentration of forest area were population is less. Majority villages have shown the male and female population compositions are nearly similar. Few villages have more male population than female population. The study area comes mostly under the habitation of economically backward classes.

Chapter three is describing the geomorphological and terrain characteristics of Sanka Basin. The main objective here is to analyze linear, areal and relief attributes in a sub- basin wise manner and grid wise manner through the delineation of the drainage network and related

ordering of streams associated with laws of drainage composition, morphometric analysis and finally classification of terrain. In this regard SOI topographical maps have been used. The demarcation of basin boundary and the sub basins has helped to understand the composition of drainage basin characteristics. The ordering of streams shows that the Sanka River is 6^{th} order river. The Sanka River consists of a total of 450 1^{st} order, 117 2^{nd} order, 30 3^{rd} order, 9 4^{th} order and 02 5^{th} order rivers. A detailed morphometric table receiving the varied formulae to evaluate the basin character has been carried out with areal, linear and relief aspects which have computed to reach to the ultimate solution of geometric and morphological aspects of the drainage unit. The basin morphometric properties have analyzed using descriptive statistics to study the basin relief ration and coefficient of relative massiveness and other morphometric parameters. The grid-wise analysis of diverse morphometric parameters helped to fulfill the preparation of morphometric regions of ten classes using factor analysis. Channel morphometry, longitudinal profile of Sanka River, topographic profiles and hypsometric analysis of the basin have been the serious concern as methodological approach for terrain classification. As a whole Sanka basin is having H.I value of 0.37. To understand minutely the hypsometric analysis of the major sub-basins of fifth order and fourth order basins has been executed and higher values for the fifth order basins were found as they were located mainly within hilly areas. GIS based assessments have been prosecuted thereon to reach to the conclusive terrain units following overlay analysis of morphometric regions and surface lithology.

In chapter four the author dealt with the status of surface soil in the Sanka River basin. Identification of major soil orders and local soil series and their detailed documentation, physical and chemical properties of soil collected from different sample sites, soil textural analysis and ultimately the estimation of soil erosion within the basin are the main themes in this section. With the help of maps collected from NBSS&LUP and NATMO the existing soil classes have been elaborated associated with laboratorial assessment of collected soil samples, sieving of soil aggregates to understand grain size analysis using Folk & Ward method, delineation of basin prioritization and their leading parameters have been tested and calculated for the execution of the selected works. From the results it is inferred that the soil character of the river basin is of inferior quality mainly from agricultural point of view. The scarcity of water and rugged terrain characters have worsen the agronomic condition within the basin.

The patterns of Land Use Land Cover thoroughly within the basin and their temporal changes have been identified in chapter five. As to fulfil the main theme of this chapter the land use land cover map has prepared from the SOI topographical maps and to showcase the temporal variation Satellite images of Landsat 5 and Landsat 8 have used and to understand the changing pattern of land use and land cover according to each terrain class under GIS environment. The processing and classification of images have executed following unsupervised and supervised classification and final corrections have also done using recoding method. The assessment of accuracy of prepared LULC classes have done using field investigation using hand held GPS for 2018 image and Google earth for Landsat 5 image of 1992. To understand the LULC at micro level field investigations with photographic evidences and consultation with local people has consulted with seasonal variation and. The village wise land use land cover map has also prepared using census data of Land use which also helped to understand LULC more minutely. As to fulfil main theme of the thesis finally ten terrain class-wise Land use Land Cover had studied which helps to understand the effect of terrain on LULC in the successive chapter seven.

Water is important natural resource for living organisms for their survival and issues related to water cannot be considered in separation. Water is very important resource for agriculture, dinking, industrial purpose and other day to day life. The status of water of the basin has elaborated in chapter VI. The aquifers are mainly confined within fractured zones of rock. The status of ground water and their methods of extraction and storage has documented from secondary sources of Central Ground Water Board data with suitable diagrams. The data which were collected from above mentioned departments are broadly or widely distributed within and surrounding the basin. The minute description of the depth of ground water from ground and its fluctuation has executed by selecting twenty (20) wells within the basin area and monitoring according to seasonal variability. The level of water from ground has taken during post monsoon (November, 2017) and pre monsoon (March, 2018) from the selected wells within the basin which provides the idea about the amount of availability of ground water resources during dry season. The present scenario and its future prospect has analysed and documented and the ground water scenario for last 20 years has represented through graphical construction with the data collected from Central Ground Water Board (CGWB). The depth of ground water from ground and its fluctuation according to seasonal variability has documented and its status for twenty years also has elaborated. The documentation on surface water storage methods from field investigation explains about some traditional

methods of surface water storage like *Dova, Happar, Goria,* and *Bund* within River bed and *choaa* process; and other methods like check dams and dams. There are mainly two dams constructed over Sanka River namely Pardih Dam and Purudih dam apart from the Chandil Dam and other two dams there are many, near about 125 check dams been constructed on the different parts of Sanka River. The village-wise distribution of tanks and wells were identified to show the relationship between number of surface water storage area and the geographical area of the village. The potential water storage areas have been identified throughout the basin considering terrain and LULC properties of the basin using binary logistic regression model for future prospect of development in LULC.

Finally the effect of terrain characteristics on Land Use Land Cover of Sanka basin has been quantified and explained. The calculated and defined terrain parameters of the ten (10) terrain classes were executed viz. soil characteristics, potential water storage areas and LULC share which exhibited the effect of LULC through suitable statistical analysis like Pearson product moment correlation coefficient and multinomial logistic regression. The proposed remedial measures have enlisted for future scope of development.

Date: 02/09/2021

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