DROUGHT ASSESSMENT AND MONITORING USING REMOTE SENSING DATA IN MAN RIVER BASIN, MAHARASHTRA

SUMMARY OF THE STUDY

UGC MINOR RESEARCH PROJECT

File No. 23-769/13 (WRO)

SUBMITTED TO

UNIVERSITY GRANTS COMMISSION

WESTERN REGIONAL OFFICE, PUNE

PRINCIPAL INVESTIGATOR

DR. R. S. SHIKALGAR

M.A., B. Ed., Ph.D., SET

ASSISTANT PROFESSOR,

DEPARTMENT OF GEOGRAPHY

RAJARAM COLLEGE, KOLHAPUR

MAHARASHTRA

MARCH, 2017

"DROUGHT ASSESSMENT AND MONITORING USING REMOTE SENSING DATA IN MAN RIVER BASIN, MAHARASHTRA"

INTRODUCTION:

Water is a basic resource on earth for all living organisms comprising mankind and for development and existence of plant life. Evidence of significance of water is found in the form of human settlements near water from ancient times. Availability of water motivates development, whereas deficiency of water leads to devastation. Former Vice President of the World Bank Ismail Seregaldein had predicted that the wars would be waged not for oil but for water in the coming century.

The natural disasters like earthquake, tsunami, landslide, cyclone, drought, flood and environmental degradation cause devastating influences on various activities of the planet earth. Water is directly associated to the floods and droughts (result of shortage or surplus water); it is known as hydrologic extremes.

Droughts are most deadly natural hazards in some ways. First, it arises in a regular, creeping way, making its onset and end difficult to determine. The effects of drought accumulate slowly over an extended time span and sometimes longer for years after the drought has ended. Second, this adds to the confusion about whether or not a drought is actually occurring and, if it is, its severity. Third, drought seldom produces structural damages, so its social and economic effects are less obvious than damages from other natural disasters.

Definitions reflect different approaches to measuring drought: meteorological, agricultural and hydrological. Meteorological drought deals with the degree of dryness based on the departure of precipitation from normal values and the duration of the dry period. Agricultural drought is usually linked to a deficit of soil moisture. A plant's need for water depends on prevailing weather conditions, biological characteristics of the particular plants, its stage of growth, and various soil properties. Hydrological drought refers to deficiencies in surface and subsurface water supplies. It is measured as streamflow and as lake, reservoir, and groundwater levels. There is a time lag between the onset of dry conditions and a drop in streamflow, or lowering of lakes, reservoirs, or groundwater levels. So, hydrological measurements are not the earliest indicators of drought.

STATEMENT OF THE PROBLEM:

Droughts are defined based on several aspects and their effective management depends mostly on the accurate assessment. A number of indicators related to weather, soil and crops are currently available for assessing the agricultural drought situation. Conventional approaches have been focused rely on precipitation data which have insufficient in the region, often inexact and tough to obtain in near-real time and non-productive outcomes with no impact on drought mitigation planning and ultimately to the people. Therefore, it is an essential to use a scientific drought assessment technique for sensing the arrival of drought, its extent and magnitude and helps the planners to take required action in precise manner.

SIGNIFICANCE OF THE PRESENT STUDY:

Drought is a regular natural calamity that occurs in some part or the other. Some areas are clearly recognized as a drought prone area. The drought prone areas are demarcated on the basis of a combination of actual annual rainfall and the percentage of irrigated area to the net cropped area. The revenue department assesses yield loss through conventional method. The drought assessments might not have been carried out using scientific methods for demarcation of drought prone area and so the resources utilized to tackle might not have reached the real affected regions and people. Historic analysis of droughts using a systematic scientific methodology will support in recognizing the drought proneness of a region and helps the planners to take necessary action in precise manner. At present we do not have complete and practically related approach to define or analyse droughts. Therefore, there is a requirement to utilize scientific methodology to deal with droughts holistically taking into account of all phases of drought assessment and monitoring.

OBJECTIVES:

1. To study the geographical set up of Man river basin.
2. To assess meteorological drought severity and monitoring using Standardized Precipitation Index (SPI) in the Man river basin
3. To assess spatio-temporal agricultural drought intensity using Vegetation Condition Index (VCI) in the Man river basin
4. To predict drought resistant crops site suitability using Eco Crop model in Man river basin

DATA SOURCES AND METHODOLOGY:

The data used for this study includes of both spatial and non-spatial data. The data collected from several departments and websites such as Census Directorate, Mumbai, Survey of India, Pune, Indian Meteorological Department, Pune, Indian Institute of Population Studies, Mumbai, Maharashtra Remote Sensing Application Centre, Pune, Bhuvan and USGS Earth Explorer website and Diva GIS website.

The Vegetation Conditional Index (VCI) method is used for agricultural drought assessment and monitoring with the help of Erdas Imagine software. Standardized Precipitation Index (SPI) is used for meteorological drought assessment and monitoring with the help of SPI_SL_6 program. Drought resistant crops site suitability maps is prepared using Eco-Crop model of Diva GIS putting the optimum temperature, rainfall and growing season of drought resistant crops.

CHAPTER WISE SCHEME:

Present research work has been divided in to following chapters.

- Chapter first includes a brief description of the problem, objectives, data sources and methodology, review of literature, scope and significance of the study.
- Chapter second comprises the geographical set up of the study region.
- Chapter third focuses on meteorological drought assessment and monitoring using standardized precipitation index,
- Chapter fourth highlights on spatio temporal analysis of agricultural drought assessment and monitoring.
- Chapter fifth describes drought resistant crop site suitability in the study region
- Chapter six provides the summary, conclusion and suggestion of research work.

CONCLUSION:

Drought has been defined and analysed in many ways. This study assessment and monitoring meteorological and agricultural drought intensity and also suggest the highest possibility of success of growing a specific crop in Man river basin. The specific conclusions made out of this study are:

i. In this study, an attempt was made meteorological drought severity at rainy, winter and 12 month timescales using Standardized Precipitation Index (SPI) in the Man river basin. It is observed that extreme and severe drought occure in the west, north east and and central part of study region. Hence, the whole study region is labled as drought prone area, which needs the irrigation requirement is essential in rainfall deficits region. This study provide useful information to regional water resource management and support to the future water distribution.

ii. Vegetation condition index (VCI) used in this study for agricultural drought assessment and monitoring, identifying drought prone area, delineated from MODIS satellite datasets based on the NDVI response. The results are presented in the form of a drought severity map in GIS environment. It is observed that agricultural drought severity is higher in kharif season than rabbi season. Therefore, kharif season is agriculturally more important and rainfall dependent.

iii. Fortnightly continuous data stream, availability of large source of spatial data, multi-temporal coverage of large areas at regular intervals are the major capabilities of MODIS satellite datasets help in near real time agricultural drought monitoring and assessment. Therefore, Geospatial technologies are suitable for identifying drought prone area to help providing monitory relief and development of long term strategies of drought management in Man river basin.

iv. Drought resistant crops site suitability analysis in the study area using Eco-Crop model of Diva GIS shows that Man river origin area, east and south – east region of Man river basin are excellent suitable for drought resistant crop in the Man river basin. Hence, Eco crop model is point out the area that will have the highest possibility of success of growing a drought resistant crop in Man river basin.

SUGGESTIONS:

Present research work is mainly emphasis on the study of meteorological and agricultural drought assessment and monitoring in Man River Basin of Maharashtra. Considering the main objectives and analysing the facts researcher have been made some suggestions.

i. Timely forecasting of variability of changing weather and computer based adequate information about climatic and meteorological parameters should be provided to farmers. The forecasting will support to select crop carefully that are of less water demanding crops.

ii. Farmers should be cultivated drought resistant crops like Sorghum, Pearl millet, Chick pea, Maize, Barley, Groundnut, Cow pea and Pigeon pea or native crops according to the variation of climate and soil condition instead of more water demanding crops and high yielding varieties crops. Government should give minimum support price for drought resistant crops.

iii. Government should take initiative to develop modern irrigation technology on the large scale in the Man river basin. Especially, the drip irrigation system should be developed. Drip irrigation system supports the farmers to cultivate commercial crops such as floriculture, pomegranate, grapes, papaya, sugarcane, medicinal plants and other cash crops by utilizing minimum water. Otherwise, scare water resources are diverted to commercial crops creating absolute scarcity of water for their staple crops. Therefore, measures should be taken to stop such preferential diversion and unequal distribution of limited water.