An overview of Drought evaluation and monitoring using remote sensing and GIS

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ABSTRACT

Drought is one of the most threatened natural vulnerabilities that are initiated by reason of scarcity of rain in a specific region. By comparing with all other natural hazards, it is very tough to discover since it develops slowly and have massive effect on the society and environment. Hence, in many countries satellite based drought indications have been recommended for early identification. Weather-related and satellite based directories are used to identify variety of drought, comprising climatological, farming and hydrological drought. On account of the growth in water request and impending climate change, latest years have perceived much concentration on worldwide drought circumstances. The numerous atmospheric variables such as rainfall, temperature, wetness and vapor transpiration are essential to determine drought rigorousness level. In this proposed system, likened the model of agricultural drought and its association with further types of droughts and revised the development of research on agricultural drought monitoring directories on the source of station data and remote sensing. The cultivation part is susceptible to the drought. Currently satellite imagery has been used in the estimation of agriculture drought. The national management activities and local based community department can produce drought alleviation plan based on drought watching model. It also conferred the use of remotely sensed data for agriculture drought valuation. Completely the whole drought-prone countries would improve national drought strategies and readiness tactics that habitat importance on threat management instead of resulting the traditional method of disaster management, wherever the importance is on sensitive, crisis reaction processes. Disaster management reduces self-reliance and raises requirement on management and contributors. Developments in the remote sensing technology and the Geographic Information Systems assist in factual period checking, initial threatening indication and rapid destruction valuation of both drought disasters. In this proposal, the use of remote sensing and GIS for the drought and disaster management is discourse with the help of GIS and remote sensing.

Keywords: *Drought, GIS and remote sensing, disaster management.*

1. INTRODUCTION

Droughts is the scarcity of water related natural calamities that distress a comprehensive range of ecological issues and accomplishments associated to cultivation, vegetation, human and wild life survival matters. Famine is a short period of time usually of the command of month of the year in interval concluded which the definite humidity supply at a given place rather constantly fall short of the climatically expected. It is the distinct principal metrological natural disaster often intensified by the activities of the human; meanwhile it distresses very large areas for a very long period and it have a major impact on local food manufacture, life prospect for whole populations and commercial performance of huge provinces or numerous nations. Drought occurs due to insufficient moisture level of crop production so that crop production highly affected due to the drought. Drought has a high impact on economy of the country, because it is very hard to balance between food demand and food supply. This issue has attracted the attention of scientific community, government planner and society. In the recent years large-scale intensive droughts have been observed in all continents leading to huge economic losses, destruction of ecological resources, food shortages

and starvation of millions people. Floods are among the most devastating natural hazards in the world, claiming more lives and causing more property damage than any other natural phenomena. Drought is a natural disaster which is hard to predict, and it is complex to study. Scanty or irregular rainfall reduces soil moisture level. Various meteorological parameters like temperature, moisture, humidity, evaporation of water, rainfall are helpful for defining drought.

Remote sensing techniques sort it promising consideration to acquire and allocate information promptly over large extents through sensors functioning in a number of spectral bands, attached on flying machine or satellites. The major work done by the satellite is to orbit the earth and also reveal the entire surface in a short period and also repeat the same process of the same area at affixed intervals, whereas an aircraft can stretch a more comprehensive exploration of a smaller area, if an exact need is essential. The enormous growth of the technology in the aerospace field, the Geographical Information Systems benefit to progression Remote Sensing interpretations from satellites. In a spatial format of maps - both separately and along with tabular data and moment of truth organized to afford a new awareness - the spatial conception of information of natural resources. The integration of information derived from RS techniques with other datasets - both in spatial and non-spatial formats provides tremendous potential for identification, monitoring and assessment of droughts and floods.

2. CLASSIFICATION OF DROUGHT

The environmental impact of drought for a certain area provides a greater consideration of its features and the possibility of reappearance at numerous levels of rigorousness. Information of this kind is useful in the preparation of alleviation approaches. The drought can be categorized into four types. They are scheduled below as:

- **METEOROLOGICAL DROUGHT**

Meteorological drought is well-defined on the origin of the grade of dryness, in contrast to a usual or typical amount, and the interval of the dry period. Descriptions of meteorological drought must be region-specific; meanwhile the atmospheric situations that effect in shortages of rainfall are extremely region-specific. It is recognizing based on rainfall data. If precipitation under the threshold, it causes to climatological deficiency. The field specialist creates difference amongst complete and limited drought. Data sets vital to evaluate meteorological drought are regular precipitation information, temperature, moisture, wind velocity and pressure, and evaporation.

- **AGRICULTURAL DROUGHT**

Agricultural drought associates numerous features of meteorological drought to agricultural influences, concentrating on rainfall scarcities, differences between definite and possible evaporation, natural deficiencies, condensed fresh water or reservoir stages, and so on. It is termed in relations with yield disaster and occurs when sludge moisture is exhausted so that crop yield is condensed significantly. The Agriculturalist perception of drought is when humidity storage unavailable through rainfall or soil is scarce to authorize best crop growth. Plant water demand depends on prevailing weather circumstances, organic features of the particular plant, its phase of development, and the physical and organic possessions of the soil. A worthy description of agricultural drought must describe vulnerability of crops during different stages of crop progress. Incomplete topsoil wetness at implanting may delay germination, principal to low plant inhabitants per hectare and a decrease of yield. Data sets necessary to evaluate agricultural drought are soil consistency, richness and soil humidity, crop kind and area, crop water necessities, pests and climate.

- **HYDROLOGICAL DROUGHT**

Hydrological drought denotes to a determinedly low ejection and capacity of water in tributaries and tanks, enduring months or years. It happened owing to shortage of the apparent water or ground water for ordinary operation in a specific area. To hydrologist, drought is as a consequence of low flow in rivers under a precarious threshold release. It has been

demarcated in several works completed by many scholars and the technical community as important reduction in accessibility of water in all its procedures. This type of drought is a usual sensation, but it may be aggravated by human accomplishments. Hydrological droughts are typically linked to meteorological droughts, and their reappearance intermission differs consequently. Alterations in land use and land deprivation can disturb the dimensions of hydrological droughts. Data sets necessary to evaluate hydrological drought are surface-water area and capacity, surface runoff, stream flow dimensions, penetration, water-table variations, and aquifer limitations.

- **SOCIO-ECONOMIC DROUGHT**

Socioeconomic explanations of drought subordinate the stream and request of some financial good with essentials of meteorological, hydrological, and agricultural drought. It varies from the other types of drought in that its existence rest on the progressions of supply and request. Socioeconomic drought takes place when the request for a financial good surpasses the source as a consequence of a weather-related deficit in water supply. The drought may effect in suggestively abridged hydroelectric power production because power plants were reliant on watercourse flow instead offloading for power generation. The request for economic belongings is growing as an outcome of population evolution and economic growth. The resource may also rise as a consequence of enhanced production productivity, technology, or the construction of reservoirs. Data sets essential to consider socioeconomic drought are human and animal population and growth rate, water and food necessities, cruelty of crop disappointment, and manufacturing category and water supplies.

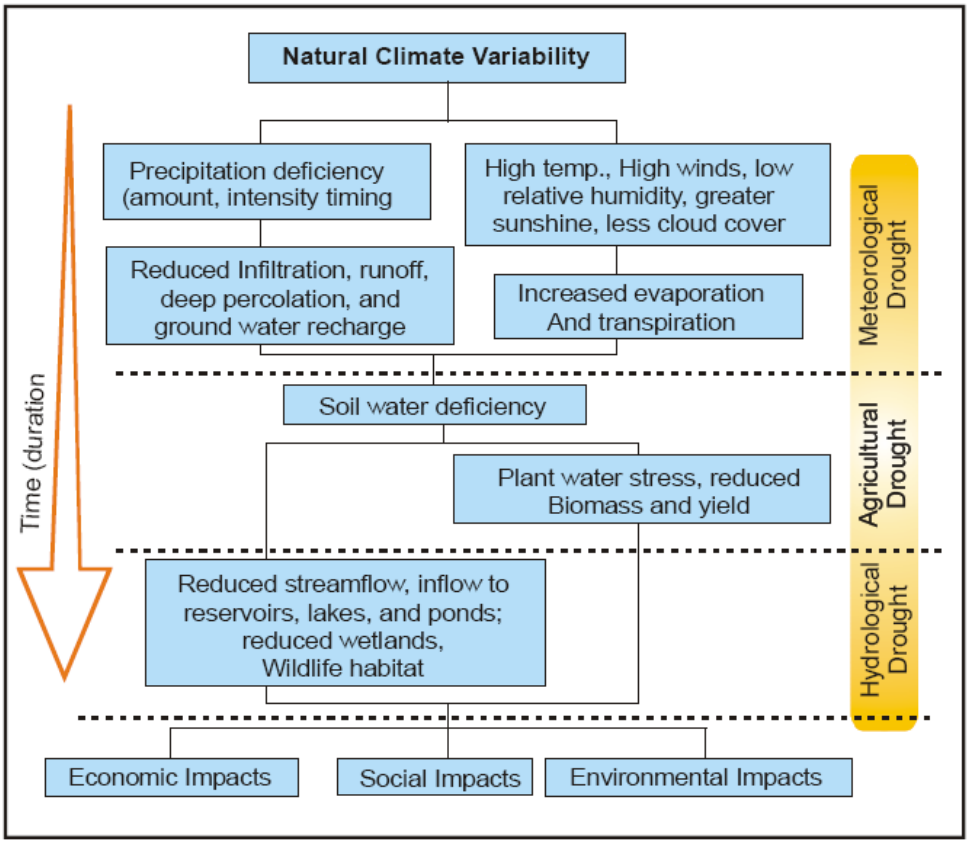

Fig.1: Structure of Drought impacts

3. REMOTE SENSING FOR DROUGHTS

The remote sensing in drought is mainly admired by the data sets that are collected and it

regulates the way and type of the drought happens. Observation and estimation of scarcity concluded remote sensing and GIS be governed by the aspects that results drought and the features of drought effect. Remote sensing is particularly beneficial for considering the spatiotemporal land cover variation in relation to the simple physical assets in terms of the surface warmth and emissivity facts. The most important attention for the growth of remote sensing for drought valuation and disaster declination is the prolonged to which operational user can trust on a continued supply of data. Drought is a usual, intermittent feature of climate and follows in all regions, even if its appearances vary considerably from one region to another. Drought creates a composite web of influences that extent many segments of the budget and spread outside the area suffering physical drought. Drought effects are frequently mentioned to as direct or indirect. Condensed crop, rangeland, and forest efficiency; increased fire threat; summarized water levels; enlarged livestock and wildlife transience rates; and injury to environment are the effects of drought.

3.1 DROUGHT PRONE IDENTIFICATION STAGE

The drought susceptible area or danger zone recognition is generally agreed on the basis of notable data investigation of precipitation or rainfall and vaporization and the area of irrigation maintenance. The predictable approaches shortage identification of spatial variation and do not protect human impact such as land use variations like moistened area established and the area exaggerated because of water logging and salinity. The remote-sensing based method for rectification of drought liable zones uses chronological vegetation index data from satellite sequences and delivers spatial information on drought prone area provision alto the inclination in vegetation expansion, frequency of low development and their standard abnormalities.

3.2 DROUGHT PREDICTION STAGE

The practice of remote sensing for drought expectation can advantage from climate changeability forecasts using coupled marine and climatic prototypes, investigation of snow packs, stubborn irregular circulation arrangements in the marine and atmosphere, early territory humidity, integration of remotely sensed data into mathematical forecasting models and amount of water accessible for irrigation. Almost global periodic climate variance predictions are probable due to the prosperous combination of observational networks for operational climatological, oceanographic and hydrological interpretations. Enhanced united models and near-real time assessment of remote sensing data - permits for the first time substantially drought cautions numerous months in spread, rising number of republics previously communicate their strategies in agriculture, fisheries and circulation of goods.

3.3 DROUGHT PREVENTION STAGE

Drought observing system occurs in most of the nations based on earth information on scarcity associated factors are precipitation, climate, crop situation and water accessibility, etc. Global clarifications from satellite are extremely matching to those composed by *the* systems. Satellites are frequently essential for the establishment of synoptic, wide-area analysis and recurrent information necessary for spatial observing of drought situations. The current state of remotely sensed data for drought checking and primary threatening is based on precipitation, surface humidity, hotness and vegetation observing. It comprises the subsequent periods such as Drought Monitoring and Early Warning, Rainfall Monitoring, Surface Temperature Assessment, Soil Moisture Valuation, Vegetation Monitoring.

3.4 REACTION/MITIGATION STAGE

Remote sensing use for drought influence evaluation includes the following subjects such as land use, perseverance of strained situations on a seasonal time scale, demographics and organization about the compressed area, strength and range, agricultural harvest, influence related with infection, pests, and drinkable water accessibility and quality etc. High perseverance satellite sensors from LANDSAT, SPOT, IRS, etc. are being used. Remote sensing use for drought reply review includes

assessment is for water controlling board, crop administration and for alleviation and substitute approaches. In India, for extended period of drought administration, action plan maps are being produced at watershed level for application.

CONCLUSION

The chief objective of this paper is to propose an operative preparation that initiates the mixture of remotely sensed data and GIS for monitoring and considering drought vulnerabilities. By means of the accessibility of global data sets like satellite-based rainfall, NDVI and land surface temperature, the decision-support system revealed the actual application of satellite-derived data and results for inspecting drought conditions generally. A number of weather-related variables such as rainfall, temperature, moisture and evapo transpiration are the main part of the system to recognize drought and its influence on land cover. The scarcity rainfall is in authority for desertification procedure. The long-term chronological data of precipitation is used to estimate SPI index. The combination of geospatial knowledge in drought observing and decision support system can distribute well improved consequence of drought valuation in agricultural part.

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