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IMPACT OF DROUGHT ON SHIVAJI UNIVERSITY CAMPUS

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ABSTRACT

Today's Indian facing various dangerous problems concern to sustainable and inclusive development due to increase manmade as well as natural hazardous like climate change, storms, tsunami, land sliding, snow avalanches and drought. But today, our most of countries part covered by natural calamity of drought; Drought is a feature of climate that is defined as a period of below-average rainfall sufficiently long and intense to result in serious environmental and socioeconomic stresses, such as crop failures and water shortages, in the affected area. Droughts can occur in any climatic region, but their characteristics vary considerably among regions. What droughts in all climatic regions have in common is their gradual onset, which—in contrast to other natural hazards—makes their beginning and end difficult to identify. Defined primarily as natural phenomena, droughts have not received much attention in the social sciences. Only since the 1990 with the increasing appreciation of the linkages between the environment and society, have droughts begun to be viewed as an issue of interest also for the social sciences. Concluding, I have tried to explain and find out impact of drought on Shivaji University campus through using some important various variables, besides how to minimize worst conditions through using my suggestions.

KEY WORDS: Drought, Climate Change, Rainfall, Water and Shivaji University, Kolhapur

1. INTRODUCTION

India is second populous country in the world whose main occupation is agriculture. Nearly 65% of Indian population depends directly on agriculture and it accounts for around 13.7% of GDP. Agriculture has a special importance from the fact that it has vital supply and demand links with the manufacturing sector. Also agricultural development is essential to substantially increasing agricultural output and feeding the world's growing population without damaging the environment, especially as threats to

food security intensifies under climate change, land degradation, and water scarcity. One famous proverb applies to Indian agriculture, "Agriculture is gamble of rainfall". Because, rainfall has not regular due to natural changes in atmosphere; resulting preparing the drought condition in command area. Drought is one of the most dangerous natural calamity found in Indian subcontinent. Therefore found the results of drought are immediate fall in crop production, Farmers are faced with harvests that are too small to both feed their families and fulfill their other

commitments. Livestock sales act as a buffer in times of hardship, farmers disinvesting in these assets to buy food. The first animals to be sold are usually those which make the least contribution to farm production, such as sheep and goats. However, as the period of drought-induced food deficit lengthens, farmers will have to start selling transport and draft animals, such as oxen and donkeys, as well as breeding stock, which constitute the basis of the household's wealth.

Drought in India has resulted in tens of millions of deaths over the course of the 18th, 19th, and 20th centuries. Indian agriculture is heavily dependent on the climate of India: a favorable southwest summer monsoon is critical in securing water for irrigating Indian crops. In some parts of India, the failure of the monsoons result in water shortages, resulting in below-average crop yields. This is particularly true of major drought-prone regions such as southern and eastern Maharashtra, northern Karnataka, Andhra Pradesh, Odisha, Gujarat, and Telangana Rajasthan's. but my research study has concern to, do the study of impact of drought on Shivaji University campus, those are the one of the micro point of eastern Maharashtra.

2. STATEMENT OF RESEARCH PROBLEM

Shivaji University is well-known eco-friendly and biological area of Kolhapur city, because we can see the ecological, botanical and biological diversity in Shivaji University campus due to sufficient availability of surface water and rainfall. But, some of the current years, we have been looking the worst condition of Shivaji University campus due to insufficient availability of surface water and rainfall. Therefore; creating essential scope for present study to find out influences of drought on Shivaji University campus.

3. RESEARCH METHODOLOGY AND DATA COLLECTION

The present analytical research study wholly depends on secondary data. Secondary data collected from various research papers, articles and E-Journal. Shivaji University Campus selected based on purposive sampling method as per the purpose my Study objectives

4. WHAT IS DROUGHT?

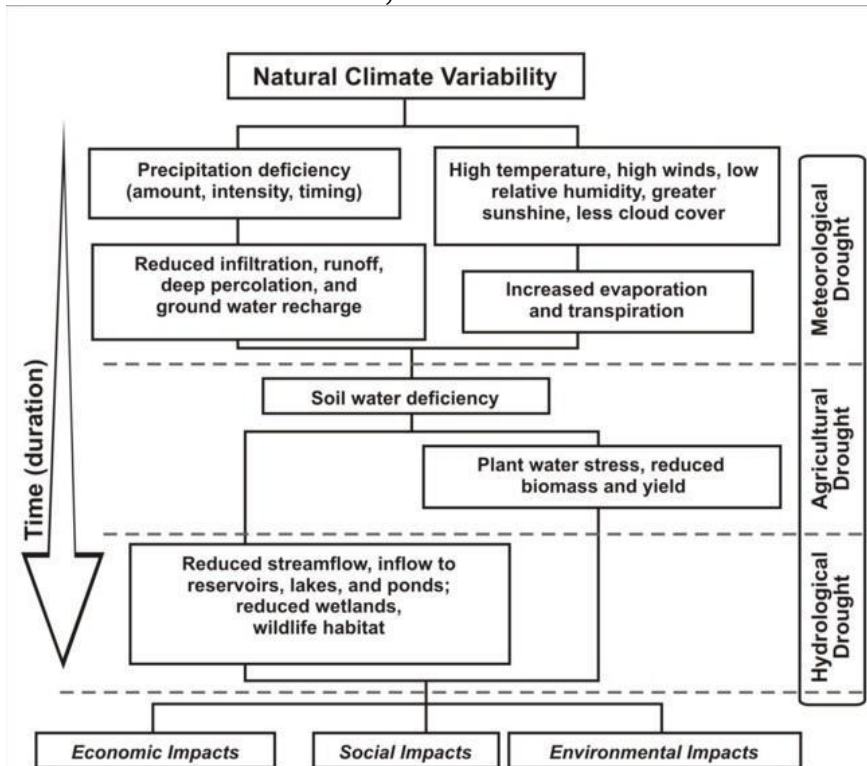
The effects of drought on environment, economy, and society are manifold. In order of the increasing severity and scope of their impacts, four types of drought are commonly distinguished: A meteorological drought manifests itself in a shortfall of precipitation or changes in precipitation

intensity and timing, possibly aggravated by other climatic factors, such as high temperatures and winds. Risks associated with this type of drought include wildfire hazard and reduced water infiltration into the soil. If the drought persists long enough to result in significant soil water deficits and plant water stress, it crosses the threshold into an agricultural drought. Lower crop yields and quality, as well as increased soil erosion and dust emission, are possible impacts expected from this type of drought.

Because various crops differ in their water demand, a farmer's choice of crop type can either buffer or exacerbate the effects of an agricultural drought. A drought is classified as a hydrological drought once the precipitation shortfall affects surface and subsurface water supplies. Hydrological droughts usually lag behind the occurrence of meteorological droughts because of the time needed for precipitation deficits to reach the surface and groundwater levels of the water cycle. Their impacts, which consequently are also out of phase with those of a meteorological and agricultural drought, include reduced stream flow, below-normal reservoir and lake levels, loss of wetlands, and declining water quality. Although climate is the primary factor of a hydrological drought, humans contribute to its effects by changes in land and water use, such as urbanization and the construction of dams. Finally, a socioeconomic drought occurs when the supply of economic goods and services, including water, forage, and food, and hydroelectric power, can no longer be met for drought-related causes. Farmers and ranchers, who depend on agricultural and pasture productivity, are the first to suffer losses. Then follow industries depending on agricultural production. As a result, consumers may have to pay more for their food and other weather-sensitive products and services.

The socio economic effects of a drought vary not only in proportion to the severity of the climatologically event but also depending on the vulnerability of the affected population. Monetary costs arise for any economy hit by drought, such as to cover for lost crops, crop insurance payouts, and fire damage; but only in the most vulnerable populations of the developing world are drought effects—food insecurity, famine, health problems, and loss of life and livelihoods—often paired with economic, social, and political difficulties. Subsistence farmers and pastoralists in particular suffer from crop and livestock losses, as well as from increased food prices. Droughts force many of them to migrate from rural to urban areas, increasing pressure on resources there

5. DESIGN OF PROCESS OF DROUGHT, THEIR KIND AND IMPACTS



The word “drought” is a relative term, and is defined differently by different regions and sources. Webster’s Dictionary defines drought as “a long period of no rain”, though this is an inadequate definition for the water supply industry. Wikipedia describes drought in stages and effects: “As a drought persists, the conditions surrounding it gradually worsen and its impact on the local population gradually increases.

5.1 Droughts Can be of Three Kinds:-

5.1.1. Meteorological drought:-

This happens when the actual rainfall in an area is significantly less than the climatologically mean of that area. The country as a whole may have a normal monsoon, but different meteorological districts and sub-divisions can have below normal rainfall. The rainfall categories for smaller areas are defined by their deviation from a meteorological area’s normal rainfall- Excess 20 per cent or more above normal- Normal: 19 per cent or more above normal- 19 per cent below normal Deficient: 20 per cent below normal- 59 per cent below normal Scanty: 60 per cent or more below normal.

5.1.2. Hydrological drought: A marked depletion of surface water causing very low stream flow and drying of lakes, rivers and reservoirs

5.1.3. Agricultural drought: Inadequate soil moisture resulting in acute crop stress and fall in agricultural productivity

6. COMMONLY, THERE ARE THREE TYPES OF DROUGHT IMPACTS ARE DESCRIBED BELOW

6.1. Economic Impacts:-

Many economic impacts occur in agriculture and related sectors, because of the reliance of these sectors on surface and groundwater supplies. In addition to losses in yields in crop and livestock production, drought is associated with insect infestations, plant disease, and wind erosion. The incidence of forest and range fires increases substantially during extended periods of droughts, which in turn places both human and wildlife populations at higher levels of risk.

Income loss is another indicator used in assessing the impacts of drought. Reduced income for farmers has a ripple effect. Retailers and others who provide goods and services to farmers face reduced business. This leads to unemployment,

increased credit risk for financial institutions, capital shortfalls, and eventual loss of tax revenue for local, state, and federal governments. Prices for food, energy, and other products increase as supplies are reduced. In some cases, local shortages of certain goods result in importing these goods from outside the drought-stricken region. Reduced water supply impairs the navigability of rivers and results in increased transportation costs because products must be transported by alternative means. Hydropower production may also be significantly affected.

6.2. Social Impacts:-

Social impacts involve public safety, health, conflicts between water users, reduced quality of life, and inequities in the distribution of impacts and disaster relief. Many of the impacts identified as economic and environmental have social components as well. Population migration is a significant problem in many countries, often stimulated by a greater supply of food and water elsewhere. Migration is usually to urban areas within the stressed area, or to regions outside the drought area. Migration may even be to adjacent countries. When the drought has abated, the migrants seldom return home, depriving

rural areas of valuable human resources. The drought migrants place increasing pressure on the social infrastructure of the urban areas, leading to increased poverty and social unrest.

6.3. Environmental Impacts:-

Environmental losses are the result of damages to plant and animal species, wildlife habitat, and air and water quality, forest and range fires, degradation of landscape quality, loss of biodiversity, and soil erosion. Some of these effects are short-term, conditions returning to normal following the end of the drought. Other environmental effects last for some time and may even become permanent. Wildlife habitat, for example, may be degraded through the loss of wetlands, lakes, and vegetation. However, many species eventually recover from this temporary aberration. The degradation of landscape quality, including increased soil erosion, may lead to a more permanent loss of biological productivity.

7. DATA PRESENTATION CONCERN TO IMPACT OF DROUGHT ON SHIVAJI UNIVERSITY CAMPUS

Table No.1:- 25 Years Average Rainfall in University Campus (1990-2015)

Sr.No	Average Annual Rainfall	Rainfall (mm)	Number of Rain Day's
1	January	1.2	0.2
2	February	1.4	0.3
3	March	1.8	0.4
4	April	4.2	0.9
5	May	4.10	1.8
6	June	32.5	9.6
7	July	40.2	12.2
8	August	34.1	9.8
9	September	28.6	8.7
10	October	8.4	3.7
11	November	7.4	1.2
12	December	1.8	0.4
Total		165.7	49.2

Source: <http://mahaagri.gov.in/rainfall/distdailyrain.asp>

Above table no.1 revealed the picture about monthly average rainfall in Shivaji University Campus during 1990 to 2015. Data shows that average maximum rainfall has been in month of June, July, August and September. Rainfall measure in Millimeter Unit, the four-month, average rainfall is gradually was 32.5mm, 40.2mm, 34.1mm and 28.6mm. Month of July, found average higher rainfall (40.2mm) to other months and month of January enrolled average minimum rainfall (1.2mm) in 25 years. Right coloum of data table shows that

number of rainy day of particular month. July and January found extreme point of maximum (12.2 days) and minimum (0.2 day's) average rainy day of 25 years.

Concluding part of this table is after summation of all rainfall during the 25 years, then we found the average annual rainfall, the rate is 165.7mm and average annual days of rainfall is 49.2

Table no.2:-Last Five year Annual Rainfall in Shivaji University Campus

Sr.No	Year	Rainfall (mm)	Number of Rain Day's
1	2010	178.3	54
2	2011	164.8	52
3	2012	159.4	48
4	2013	156.2	47
5	2014	165.1	42
6	2015	146.7	38
Average Annual Rainfall		161.75	46.83
C.G.R		-2.78%	-6.67%
C.V		6.52%	12.84%

Source: <http://mahaagri.gov.in/rainfall/distdailyrain.asp>

Above table no.2 shows annual rainfall and rainy days of Shivaji University Campus in last five years. We clearly see, the annual rainfall from 2010 has continuously declined to 2015 at -2.78 per cent rate. Annual average rainfall during the 5 year was at 161.75 Millimeter and coefficient of variation at 6.52 per cent. Means, fluctuation found is very rate in rainfall of selected five years period. But, when we look last column of above table, they are showing numbers of rainy day in selected five years. Found that 46.83 days is average for rainy season in year.

Similarly, declining the growth rainy day at -6.67 per cent of annual compound growth rate and C.V at 12.84 per cent looks. That means variation in rainfall day, found very high than actual rainfall in Shivaji University Campus.

Concluding, rainfall and rainfall day both of the declining but at different rate of C.G.R. we seen that number of rainy day's inclusively declining (-6.67%) than the rate of rainfall at -2.78 per cent. That mean high rainfalls are see in less day compare to natural rainy season period.

➤ **Economics Impact**

Table no.3:- Income of Mango trees of Vidyarthi Bhavan, Shivaji University, Kolhapur

Sr. No	Year	Annual Mango's Income	Percentage Change
1	2010	46,000.00	00.0%
2	2011	35,000.00	-24.0%
3	2012	29,000.00	-17.0%
4	2013	32,000.00	+10.0%
5	2014	25,000.00	-22.0%
6	2015	10,000.00	-60.0%

Source: Official Record of DAPVB, SUK

Above table display the annual income of Earn & Learn Scheme from mango production and marketing. In 2010, earn and learn scheme has earned Rs.46, 000.00 from mango production and marketing. Gradually this annual income of mango steadily declining to yet, now last year (2015) only Rs.10, 000.00 got from same source. Beside right column of above table shows that percentage change of income of mango. Excepting the year 2013 all year has

showing minus percentage change of mango income to earn and learn scheme of Shivaji University. In 2015, we can see the higher minus (-60.0%) change of annual income of mango's.

Concluding, income from mango marketing has been continuously declining and more fluctuated.

➤ **Social Impacts**

Table No.4:-Fluctuation in Examination Time Schedule of Shivaji University due to climate Change.

Sr.No	Year	Name of the University Exam			
		Social Sciences (Economics)	Percentage Change	P.G Diploma's in Economics	Percentage Change
1	2010	320	-	296	-
2	2011	317	-0.93%	293	-1.01%
3	2012	312	-1.57%	291	-0.68%
4	2013	311	-0.32%	285	-2.06
5	2014	307	-1.28%	290	1.75
6	2015	303	-1.30%	289	-0.34
7	2016	248	-18.15%	234	-19.03%

Source: Primary data collection

Above table appears the number of days during concern academic year Shivaji University. Researcher took the social science examination required academic days for examine social impact of drought on Shivaji University examination. In 2010, ordinal 320 and 296 days required for final examination of economics subject and P.G Diploma examination. But after that, both of examination academic required days has been declining to current year. Excepting the year 2014, percentage change of required days for examination has been declining and fluctuating. Adverse impacts of drought appear in

current year. Because their percentage change are gradually minus 18.15 percentages and minus 19.03 percentage concern to semester –II & IV of social sciences examination and P.G Diploma examination.

Summary of table show that from 2010 to current year, percentage of required academic day for concerned social sciences semester has been continuously declining due to the climate change of Maharashtra State.

➤ **Environmental Impacts**

Table No.5:-Natural and Actual Water Capacity of Shivaji University Lakes

Sr. No	Year	University Lakes			
		Music Department Lake (Capacity:99.50 Million Cubic Feet)	Bhashabhavan Department Lake (Capacity:104.50 Million Cubic Feet)	Rajaram Lake (Capacity:240 .35 Million Cubic Feet)	Total Water Storage
1	2010	2,30,865	98,45,452	12,42,60,845	13,43,37,162
2	2011	2,03,542	90,54,364	11,64,84,556	12,57,42,462
3	2012	1,86,000	81,20,000	8,72,60,540	9,55,66,540
4	2013	1,84,000	70,20,321	8,10,42,234	8,82,46,555
5	2014	2,01,231	65,10,548	9,47,84,987	10,14,96,766
6	2015	1,60,070	55,57,185	7,48,75,874	8,05,93,129
C.G.R		-5.00%	-11.00%	-9.00%	-9.00%
C.V		12	21	21	20

Source: www.pelagiaresearchlibrary.com

Above table depict the data about natural and actual water capacity of Shivaji University lakes. There are three lake available and exist in Shivaji University Campus as music department of lake, bhashabhavan department lake and rajaram lake. The daily water need of the university is 5.5 lakh liters and the university used to purchase water from the Municipal Corporation (Ref. Chande Sonal Goroba & Jadhav Aasawari Suhas, 2011). Also earlier due to rain water harvesting program, the campus was completely self-sufficient in the supply of water. But now, available water is insufficient for daily use of drinking, departmental use and garden use. Therefore, we are looking the worst condition of garden. Moreover, various types of problems always seen in university hostel, concern to cleaning and health.

The university is tapping rain water that gets gathered on the terraces of building in the campus. The water tanks conserve water to the capacity of average 10 crore cubic feet. The university’s program of rain water harvesting includes building of the campus, nala construction, canal contours and resuscitating of water springs in the different wells.

(Ref. Patil Shilpa G & Prakash D. Raut, 2011). Ultimately, Shivaji University total water storage capacity has been declining at minus 9 percent annual compound growth rate and coefficient of variation at 20 percent.

FINDING AND CONCLUSION

Even though, rainfall has been steadily declining in the Maharashtra. But the Shivaji University has appropriate water conservation of rainfall in their premises, and then we can preserve and protect the ecological, botanical and zoological diversity of university campus from adverse impact of drought.

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