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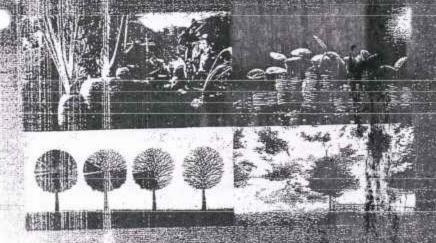
Climate Change and It's Impact on Agriculture Development in India

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Water Resources of Indian A Review

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Abstract:

Water resources of a country constitute one of its vital assets. India receives annual precipitation of about 4000 km. The rainfall India shows very high spatial and temporal variability and paradox of the situation is that Mousinarm near Cherrapunji, which receives the highest rainfall in the world, also suffers from a shortage of water during the non-rainy season, almost every year. The total average annual flow per year for the Indian rivers is estimated as 1953 km. The total annual replenish able groundwater resources are assessed as 432 km. The annual utilizable surface water and groundwater resources of India are estimated as 690 km. and 396 km per year, respectively. With rapid growing population and improving living standards the pressure on our water resources is increasing and per capita availability of water resources is reducing day. Due to spatial and temporal variability in precipitation the country faces the problem of flood and draught syndrome. Overexploitation of groundwater is leading to reduction of low flows in the rivers, and salt water intrusion in aquifers of the coastal areas. Over canal-irrigation in some of the command areas has resulted in water logging and salinity. The quality of surface and groundwater resources is also deteriorating because of increasing pollutant loads from point and non-point sources. The climate change is expected to affect and water availability. The paper presents availability and demands of water resources in India as well as describe the various issues and strategies for developing a holistic approach for sustainable development and nanagement of the water resources of the country, keywords: Water resources, drought, surface water,

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recipitation, population, sustainable development, etc.

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bitat. It is used for drinking, cleaning, agriculture, transportation, industry, creation, and animal husbandry, producing electricity for domestic, industry, dominercial use. Due to its multiple benefits and the problemscreated by its accesses, shortages and quality deterioration, water as a resource requires secial attention. Table I gives land and water resources of India. On a global aic, total quantity of water available is about 1600 million cubic km. The Adrologic cycle moves enormous quantity of water around the global owever, much of the worlds water has little potential for human use because 7.5% of all water on earth is saline water. Out of the remaining 2.5% eshwater, most of which lies deep and frozen in Antarctica and Greenland, high are readily for mankind.

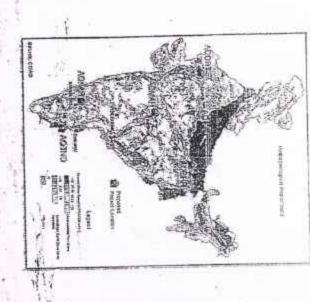
TABLE- 1: LAND AND WATER RESOURCES OF INDIA

PARTICULARS	QUANTITY
Geographical Area	329 million ha.
Flood Prone Area	40 million ha.
Ultimate irrigation Potential	140 million ha.
Total Cultivable Land Area	⊃184-million km
Net Irrigated Area	50 million ha
Natural Runoff (Surface water and Ground water)	1869 Cubic km.
Estimated Utilizable Surface Water Potential	690 Cubic km.
Groundwater Resources	432 Cubic km.
Available Groundwater resource for irrigation	361 Cubic km.
Net Utilizable Groundwater source for irrigation	325 Cubic km.

(Water Resources of India, National Institute of Hydrology.)

ater Resources

Water resources are sources of water that are useful or potentially useful humans. Uses of water include agricultural, Industrial, household, restional and environmental activities.



.... Water Surface

Surface water is water in a river; lake or fresh water wetland. Surface water is naturally replenished by precipitation and naturally lost through discharge to the oceans, evaporation, and sub-surface.

India's average annual surface run-off generated by rainfail and showmelt is estimated to be about 1869 birlion cubic meter (BCM). However, It is estimated that only about 690 BCM or 37 per cent of the surface water resources an actually be mobilized. This is because (i) over 90 per cent of the annual flow Himalayas riversoccur over a four month period and (ii) potential to capture such resources is complicated by limited suitable storage reservoir sites.

Rainfall

The average annual rainfal in India is about 1170 mm. This is considerable variation in rain both temporarily and spatially. Most rain falls in the monsoon season (June-September), necessitating the creation of large storages for maximum utilization of the surface run-off. Within any given year, it is possible to have both situations of drought and of floods in the same region. Regional varieties are also extreme, ranging from a low value of 100 mm in Western Rajasthan to over 11,000 mm in Meghalicys in North-Eastern India.

ailability could affect India's water resources imate change and other predicted or observed long-term trends on water issfole of inges in rainfall patterns in the coming decade, global warming and

ace of soil and rocks. It is also water that is flowing within aquifers below the ter that is closely aquifer (Sometimes called "fossil water") iter table. Sometimes it is useful to make a distinction between sub-surface Sub-surface water, or groundwater, is fresh water located in the

is have already exploited almost all of their dynamic recharge Haryana and jub have exploited about 94 per cent or their groundwater resources. Areas h depleting groundwater tables are found in Rajasthan, Gujarat, most of aund 431 BMC in aggregate terms. On an all India basis it is estimated that itern Utter Pradesh and in all of the Deccan states nestic use. out 30 per cent of the groundwater potential has been tapped for irrigation and India's rechargeable annual groundwater potential has been assessed at The regional situation is very much different and large parts of

slopment options ittle more than a generation to a situation of water scarcity and limited zed and where considerable development potential existed, has transformed indivater resources, a situation where resources were substantially under estment to capture additional surface run-off will became increasingly more um is commonly threshold for water indicating scarcity (UNDP). cult and expensive in the future. Over time, both by surface and Occurrence of water availability at about 1000 cubic meters per capita per

strial activities water demands share of wayer resources. Summing up the arily for irrigated agriculture, but with the growth of Indian economy and urces are stressed and depieting while various sect oral demands are sussect oral projection reveals a total annual demand for water increasing 552 billion cubic meter (BMC) in 1997 to 1050 BMC by 2025 India face an increasingly urgent situation: its finite and fragile water Historically relatively plentiful water resources have been

much diversified hydro geological settings. Further the main source of the Resourcessre important part of development of the country. The country

> management of water resource of the country in the backdrop of a diminishing approach towards surface water and ground water is required for the proper countries water resources (apart from Himalayan Rivers) is minfall, which has holistic approach in evolving suitable management strategies. very vocationalcharacteristic as well as is very erratic in nature. The amount of A sustainable

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