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The aquatic epidemic: Water scarcity in Uttarakhand

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Abstract
Sustainable Development Goal (SDG) 6 propagates the provision of universal access to clean water by 2030. While the objective is indeed ambitious, but it is at the same time intertwined with blazing pragmatic challenges. Focusing on India's water resilience, it can be stated that majority part of India is facing unprecedented drought conditions which is marked with acutely low per capita water availability. What is further astonishing is that when one part of India is facing severe water stress, other part may be undergoing flood conditions. To understand the focus of water scarcity problem in India, it is required to obtain deep insights on the ground level situation. This study focuses upon unravelling the mystery behind the presence of water scarcity in the land of glaciers i.e. the State of Uttarakhand.

Keywords: Water scarcity, aquatic epidemic, Uttarakhand

1. Introduction
The Indian subcontinent is blessed with some of the biggest river basins however they are unable to support the growing human requirements (Chakrabarty, 2016) [4]. While India constitutes 17% of the world's population, it is supported by just 4% of worlds water runoff (Singh, 2016) [19]. The per capita water availability in India has been persistently falling. Further aggrandizing the situation is the fact that drought conditions have been pestering the places which are themselves situated along side perennial water sources (Aggarwal, 2019) [2]. For instance, the State of Uttarakhand faces acute water shortage which becomes severe, especially during the summers (Oki & Kanae, 2006) [16]. Amongst the 15,000 villages, around 2% villages do not have access to a designated water source at all (Nand *et al*., 2017) [15]. While the residents of some of the districts such as Garhwal have to walk 8 – 10 km to fetch water (Agarwal *et al*., 2012) [1]. Such conditions have brought havoc in the economic prosperity, social stability and mental peace. Water has a direct nexus with health (Gleick, 1993) [8] and therefore this study examines the situation in the State of Uttarakhand.

2. Research objectives
To understand the level of water stress in the State of Uttarakhand, its causes and the possible remedies.

3. Research Methodology
The research was conducted in a step wise manner. The first step involved estimating significance, relevance and feasibility of the proposed study. It involved exhaustive brainstorming about the proposed objectives and it was found that they are of crucial necessity and require a careful consideration to provide meaningful results. The later part of this stage involved identifying the tools and equipment needed to execute the research. It was decided that the research will be in the nature of a discovery that will involve determining the aspects of water scarcity. The next step involved data collection and identification of the published research papers articles books conference proceedings that will provide meaningful information about the proposed objectives. It was decided to pursue high-quality research papers and manuscripts available at leading indexes and databases. A total of 49 study material was selected from Scopus, Web of Science, Geographical records, Geological evidence and past published studies. The research phase was divided amongst different sub phases, the first one being segregating the data sources obtained. This step involved collecting similar data and eliminating the redundancies.

Thereafter the study material was carefully considered and relevant information was obtained and noted. Thereafter the relevant observations were drawn. The last step entailed report making and concluding steps.

4. Literature Review

Water scarcity is real and it is very much affecting not only our daily life but also our future on this planet (Central Ground Water Board, 2016 – 2017) [3]. While climate change and natural reasons have always been a factor of altering ecology, their impact has been aggrandized due to anthropogenically induced reasons (Chakrabarty, 2016) [4]. It is important to perform detailed ground zero study to understand the gravity of the situation (Gleick, 1993) [8]. It has been found that the Himalayan state of Uttarakhand has been suffering with fast melting of glaciers, erratic rain patterns, unscientific establishment of industries and agricultural practices and over usage of natural resources such as timber etc. (Nand *et al*., 2017) [15]. The alpine regions are becoming a potent source of forest fires due to widespread presence of natural turpentine in pine trees which can affect the overall climate stability of the country (Singh, 2016) [20]. Innovative water conservation strategies needs to be developed to achieve ecological stability and the attainment of sustainable development goals (Wilfredo, 2004) [22]. However such objective is achievable only if multiple studies are made covering different dimensions (Nagaraj *et al*., 2003) [14]. While quality literature exists about water scarcity and its impact on foreign jurisdictions, the water scarcity of Uttarakhand has not been explored much.

5. Research Analysis

This study has considered the water scarcity in the Uttarakhand from both the macro level and the micro level. Thereafter a careful synthesis has been provided herein. The results are as follows:

Uttarakhand has very vast water resources and is a lifeline for millions of people living in downstream areas (Vörösmarty *et al*., 2000) [21]. However, many areas in the state are facing a water shortage. Land of snow clad peaks and glaciers which are origins to many rivers, Uttarakhand, reservoir for the Northern India Plains, quenches the thirst of 100s of millions of Indian. Uttarakhand is amongst the States where 50% of the population had access to adequate quantity of safer drinking water (Wilfredo, 2004) [22]. Besides, lacking water facilities, the State is also facing intense over exploitation of ground water, land use change, deforestation and drying up of water resources like spring & ponds.

The dynamic ground water resource of India report of the central ground water board showed that 1499 out of 6881 assessed unit in 2017 were in over exploded & critical categories (Central Ground Water Board, 2016-2017) [3]. The report sounds urgent changes in the extraction pattern of ground water and surface water intervene has nearly 22% of underground water resources in the country have either dried up or are in the critical category, at a time. When water crisis is crippling the country, Pani Project and Initiatives which aims at raising awareness about water conservation Dehradun, Uttarakhand.

Uttarakhand which is considered reservoir for Indian subcontinent has faced drought in 10 out of 13 districts for 2 year from 2007-2009 (Gosling & Arnell, 2013) [9], which scent rainfall in winter, the state is likely to go through the situation of severe water crisis and forest fire. A vulnerability risk assessment with regard to water crisis in the states estimates about 226 lakhs springs provide 90% of the drinking water source in Uttarakhand (Kummu *et al*., 2016) [12]. Due to continued deforestation for projects like roads, construction or to meet fuel and fodder demands of the local communities, it was found after collecting information from various sources and communities that discharging of 500 water supply sources including springs, streams, pounds etc. have reportedly reduced more than 50% climate change will further amplify reduction of local water resources. Inherent nature of resource land use changes lack of scientific understanding, and climate variability all makes. Springs further vulnerable to extension Champawat accounts for the maximum number of village 85% along the slopes thereby making it more vulnerable water scarcity, precipitation includes landslides & non-climate hazards such as earthquake, Dehradun & Garhwal districts have biggest water crisis cases due to poor surface water and ground water availability across the year. Water crisis in Pauri Garhwal district is one of the reason for large scale and migration. Severe problems have been reported in most prominent villages of Jaiharikhal, Dwarikhal and Dugadda blocks. In Uaunsar area of district Tehri Garhwal. In villages such as Nagthas, Duena, Vishnoi, Gadal, Jandoh, Chitar, Chidhrad and Gangoa, the water is mostly acidic in nature. The problem in Chitar and Gangoa villages is very severe, where man and women carry water on matkas from 8 to 10 km to the villages. Lack of water and reduced moisture in the forest floor where evidently. One of the main reason for increased number of forest fire. As highlights in the state action plan for climate change about 20% of the 15,165 villages have varied range of problems related to drinking water provision and more than 180 villages do not have designated source.

The Himalayan mountain system in dotted with 12 rivers, out of 18 major rivers of the country hundreds of small rivulets and thousands of stream makes the Himalayas as “water bank of Asia”. This constitutes 42% of the total of the country. It is ironical that these rivers have not been of any use to the local residents, except for the minor utilities form of water mill, Occasional irrigation, not exceeding 2 % of total potential use.

The government scheme of water supply has largely fall to its appropriate nature, poor maintenance and distributions. This is plunged maintain residence to severe water shortage, so much so that women & girl there to walk kilometre for portable water. In Uttaranchal, out of total 16000 villages 8800 villages have been placed as water scarce village,

This has plunged mountain residents to severe water shortage, so much so that women and girls have to walk kilometers for portable water. The districts like Almorah, Pouri, Tehri, Pithora Garh and Chamoli are facing drinking water crisis. 72% women and 14% children have to bear the responsibility of carrying portable water (Nand *et al*., 2017) [15]. Around 60% women have to walk 1/2 km while 10% of them walk 4 km to fetch water. The villagers believe that traditional methods of water harvesting can be important components of resolving this aquatic epidemic:

Project Paani

To resolve the problem of water crisis in Uttarakhand, team of voluntary organizations in carrying out Door-to-Door

awareness drives. The State Govt, is focusing on both short and long term projects to resolve the problem of water scarcity under the short term plan, 700 localities in the hills and planes that might face acute water scarcity in summer would be covered. In that connection, a help desk would also be set up which would later to al 700 localities (Dearing *et al*., 2014) [6]. It is further important to fulfill the 40 litres water per day per capita requirement of individuals in rural areas (Chambers, 1988) [5]. Similarly, in towns those specification come to 135 litre per capita per day (Central Ground Water Board, 2016-2017) [3]. A water policy is also underway to be formulated. It is also planned that taxes would be levied on extraction of ground water so that it be covered and rainwater harvesting could also be made compulsory, Further, mapping of 5000 natural springs is also underway so that the supply of portable water can be increased, The state's host has planned intake the help of Gram Panchayat and other grass root Level Organizations in conservation efforts of water. Ministry of Water Resource, Government of India has launches National Water Missions as one of the eight National Missions, which form the care of the National Action Plan for climate change.

6. Conclusion

Despite of Earth being a Watery Planet, there has arisen an unprecedented water shortage which is expected to only aggravate in the upcoming future (Rockström, 2009) [17]. This research looked at the Water crisis situation in the State of Uttarakhand and tried to understand the ground level situation along with the reasons for the same.

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