Clearing the fog on water conservation

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Posted Date : Wed, 2017-07-05 14:29

Fog water collection from low hanging clouds can bring respite to residents in the water-stressed regions around the world.

Fog harvesting structures.

Water scarcity has been the most pressing challenge to socio-economic and human development since ages. Globally, almost 800 million people do not have access to potable water. Reports from the United Nations state that one in every three people in the world is facing the water crisis. India is no exception to this.

With the current rate of population growth, combined with the growing pressure on available water resources, India will be having the largest number of water-deprived persons in the world in the next 25 years. This acute shortage of water points to a grim situation and necessitates the exploration of alternate sources of water. A mixture of traditional wisdom and new techniques must be found to overcome the inadequacy of water as well as arrest groundwater decline.

Better ways to harvest water

Water capturing holds great promise in augmenting current water supplies. Estimates show that rain captured from one to two percent of India's land can provide 100 litres per person per day for a population of 950 million (Agarwal, 1998). Various forms of water harvesting have been used traditionally throughout the centuries as a sustainable solution to water scarcity.

Rainwater harvesting has been the most common technology adopted in water conservation but is limited to areas experiencing ample rainfall. Desalination as an augmented source for potable water turns out to be a costly procedure. Options such as capturing water from the air and fog are often overlooked but hold great promise where no other source of clean water is available. Such methods should be considered wherever water is scarce, as it makes sense to capture any available freshwater for later use.

Fog collection or fog harvesting is an upcoming technology in harnessing water. This technology allows drawing water directly from moisture in the air even in the driest locations where fog and wind are common. The technology is based on the principle that wherever mist or fog touches a metallic or net surface it condenses to form dew or droplets of precious water. The technology is innovative, environmentally appropriate, socially beneficial and cost effective. It epitomises the "green technology' to obtain clean, fresh water almost anywhere from the earth.

How is fog harvested?

Fog harvesting technology is very simple. The process involves organised collection of dew or condensation through natural or assisted practice. The atmosphere contains enormous untapped freshwater resources in the form of moisture. Through the process of condensation, atmospheric water vapour from air naturally condenses on cold surfaces into droplets of liquid water known as dew.

Water can be harnessed from anywhere where fog density is high, especially in coastal and hilly areas where fog moves inland driven by the wind. Fog harvesting technology involves identification of suitable sites based on a range of geographical and meteorological information, erection of vertical canvas structures known as “fog collectors” and storage of the collected water.

Water gets collected from a fog harvesting structure.

To harvest water, large pieces of vertical canvas consisting of single or double layer mesh net are erected in the direction of the wind. Depending on the location, a number of nylon, polyethylene or polypropylene panels of varying densities are installed that can capture different quantities of water from fog passing through it. As fog passes through the nets, the water vapour in it gets collected on the net. When this volume of water droplets grows, water starts dripping. Dripping water is collected in plastic channels attached at the bottom of the nets using the gravity flow principle. A series of collectors can be arranged in a row, in fog prone regions to collect a considerable amount of water. The water production range from 200 to 1000 litres per day and is subjected to seasonal variations.

As per the United Nations Environment Programme or UNEP estimates, the capital investment and other costs for this technology is generally found to be low in comparison with other conventional sources of water supply. Though costs of the system can vary with the size and the quality of fog catchers and the labour and location of the site, a small system can be installed in about Rs 5000 to Rs 12,000 each. While a moderate system can be installed for about Rs 25000 and large collectors of 40 m2 size can cost nearly Rs 1,000,00 that lasts for about 10 years. A very large village level project that can produce about 2000 litres per day would cost nearly Rs 6,000,00 (FogQuest, 2011). However, the exact cost of the infrastructure will depend on local topography, the demand for water, and availability of financial resources and materials.

The technology is advantageous as it provides clean water and in many cases, it meets the WHO standards for irrigation without any harmful environmental impact. The storage of large quantities of harvested water for dry season use may pose problems. Captured water can then be used for agricultural irrigation and domestic use and it can even be made potable after proper disinfection. Additionally, the technology also provides an opportunity to restore natural vegetation and support agricultural practices through the sourcing of clear water for crops and livestock. Community participation will help to reduce the labour cost of building the fog-harvesting system. It also helps to ensure a sense of ownership by the community and commitment to maintenance. A government subsidised community-managed system would ensure long-term sustainability of the technology.

What about the technology outreach?

Fog harvesting has been around for more than 30 years and is used in countries like Chile, Peru and Ecuador, Atlantic coast of southern Africa (Angola, Namibia), South Africa, Cape Verde, China, East Yemen, Oman, Mexico, Kenya and Sri Lanka. The earliest experiment at fog harvesting was initiated by IDRC (International Development Research Agency) in the early 90s. This technology is yielding good results in neighbouring countries such as Nepal.

It is estimated that in India, 12.5 billion litres of water can be effectively collected through fog capturing in net screens (Singh, 2004). Fog harvesting technology has already been used in some part of India such as Gujarat and Uttarakhand. A pilot study was carried out in the Western Ghats which somehow could not gain much attention as people were not swayed by such innovative technology.

Fog harvesting can be beneficial in rural areas with limited water requirements and lesser population. Potential areas for the implementation of this technology are the coastal and hilly terrains where dense fog is common, especially in winter. The capital city of Delhi and its suburbs witness persistent fog every winter. Places like Gwalior, Kanpur and Allahabad show prominent and prolonged fog. South of Himalayas and the entire Indo-Gangetic plain is the maximum fog affected area in India in winter. In a few regions of the northeast, especially Manipur, Arunachal Pradesh, Mizoram, Assam and Nagaland, this technology is ideal for water augmentation during water scarce season. Fog is common in south-western Ghats too, especially Coorg, Kodai and the Nilgiri hills, Wagamon and Munnar, Attappadi and Pathanamthitta where water is still scarce. The technology is feasible in all areas where weather conditions are favourable for fog harvesting.

In India, fog harvesting technologies are still in their nascent stage. It is high time India emulates other countries with similar geographical and economic conditions rather than imitate the ruinous, technocentric and unsustainable models of the developed world. Fog harvesting is one such solution. With a little encouragement and guidance from local authorities, people in the remotest corners of India can be empowered to draw water straight from the atmosphere. Given the water-scarce situation in the country, such innovative and low-cost solutions are viable in the coming days.