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Good morning, ladies, and gentlemen.

I am delighted and honored to have been asked by the organizers to deliver a short inaugural address. For that I must really thank Dr. Shobha Shukla who has put her faith in a fossilized specimen like me! I did some work on developing innovative water technologies in my previous avatar as a water researcher during the 70s and 80s - about which I will talk in my Institute lecture today in the afternoon.

Nowadays I spend most of my time in Understanding the Nature of Human Mind, because I believe if we develop a powerful mind then it will give us wisdom to use our natural resources wisely and can help us live a sustainable life. Water usage and its conservation are an important part of this strategy. This also follows my pet theme that spirituality + technology = sustainability and happiness; about which I have written for the last 20 years.

But we have gathered here to discuss water technologies and here are some of my thoughts on this important subject.

1. Total projected water demand in India for 2025 ~ 810 BCM (billion cubic meters). This is GOI data.
2. Average rainfall over Indian landmass ~ 3880 BCM.
3. Our water requirement ~ 20% of total rainfall.

4. However rainfall is uneven and quite a times does not fall where we need it. Thus there is a need to develop innovative water vapor management technologies.
5. Rainwater harvesting (which is a part of water vapor management) should be done locally and its judicious use is the only solution to India's water crisis.

Water vapor management has three components. Rainwater harvesting, cloud management and dew condensation. I will briefly talk about them.

Rainwater harvesting strategy

Construction of small rainwater harvesting ponds, which are inter-connected, could provide a possible solution in rural areas. These small water storage bodies will act similar to invertor-battery backup for electric supply. I will talk about this strategy in my lecture later.

Soil excavated during the construction of these ponds can be used for making bricks and in other aspects of construction and agriculture industry. Naturally the issue of ownership of these water bodies and the energy requirements will have to be evaluated thoroughly. There is a need for setting up few experimental systems to validate this concept.

In urban areas, rainwater harvesting in every building will help the process. It should be made mandatory and incorporated as a part of building code. The rainwater can be filtered and purified for various uses. Technologies exist for doing so.

In our Institute we have developed a rainwater harvesting system with solar purification to provide clean drinking water for rural households. We are now extending it to provide clean drinking water for rural schools. I will also talk about it in detail in my lecture.

Cloud management

Since rain comes from the clouds, there is a need for cloud management strategy. Solar energy has already evaporated water to form a cloud and hence there is a need to manage it for water production wherever it is needed. This is far better than desalination which requires huge amount of energy to evaporate water.

Cloud management presently is done in limited manner via cloud seeding but it is a dicey process since one is not sure where it will rain. I had a great honor of knowing and interacting, during 1970s, with Vincent Schaefer, the father of cloud seeding. He had told me that the whole science of cloud seeding is very dicey and unfortunately till today the situation has not improved.

We therefore dreamt of a scheme in early 1980s about using specially designed kites to suck clouds and transport them to the ground through a hollow pipe which would also act as kite "string". The water vapor would be condensed by suitable means for water production. The scheme has remained a dream, but I guess with better materials and drone technology it should be possible to make a small prototype and test the idea. Some bright engineers present here may take up this challenge.

Clouds consist of charged water droplets. With varying magnetic field of the earth the cloud movement also changes, resulting in rains falling at unpredictable places. Detailed understanding of cloud physics will help us predict climate changes and manage it for our benefit.

I am sure there can be many more creative schemes for cloud management and should be a challenge for young researchers and water technologists present here.

Dew condensation

Before the evaporated water goes very high to form a cloud it remains near the earth's surface as dew. Most of it is near the coast but is also exists in various proportions all over the land mass and is a function of atmospheric water vapor conditions. India's mainland is endowed with a long coastline of ~ 5500 kms. All the areas situated near this coastline can get clean drinking water through dew condensation.

We pioneered dew collection in early 1980s where we firstly developed the thermodynamic data for dew condensation and then developed a scheme of large-scale dew collection for drinking water purposes for coastal areas. I will talk in detail about this technology in my afternoon lecture.

Our work and calculations show that the Indian coastline has the potential of producing ~ 40% of India's total *drinking water demand!* Dew water is pure water and hence can be used directly for drinking. However there is a need to develop economical and innovative dew harvest technologies.

Thus I feel the strategy for developing water technologies should be based on the following water vapor management systems :

(1) Decentralized rainwater harvesting and its usage for various purposes.
(2) Development of innovative technologies for cloud management.
(3) Dew collection in coastal areas for drinking water production.

All these strategies combined can substantially alleviate the water crisis for India. I hope there will be some opportunities to discuss them during this seminar. Thank you very much.

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