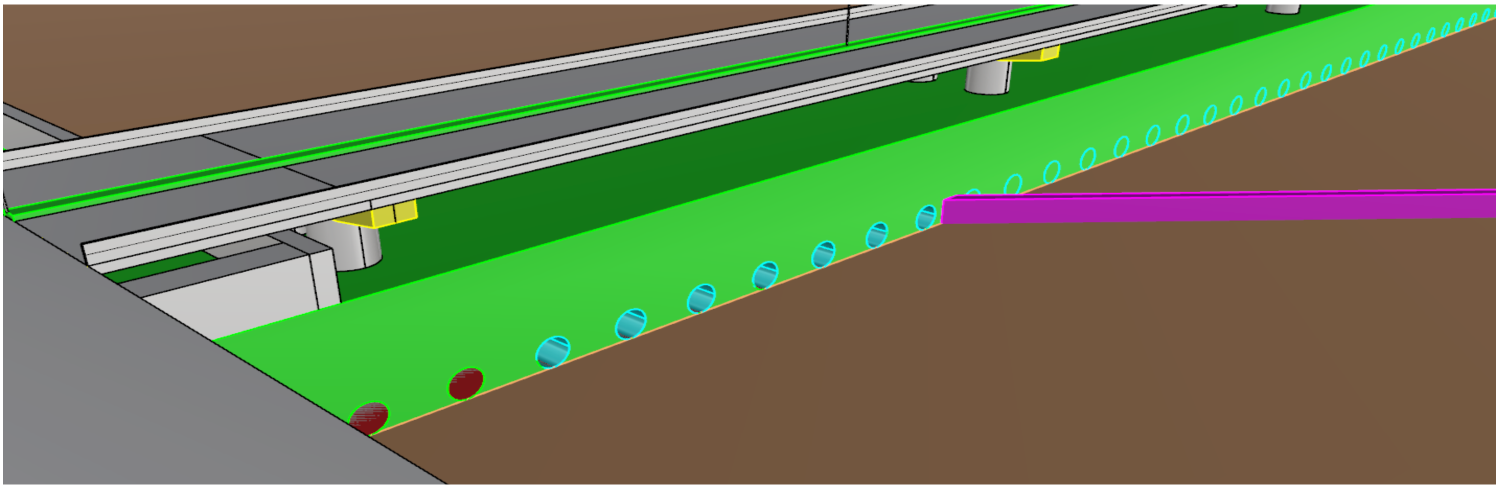
A BLUEPRINT FOR WATER RESOURCES MANAGEMENT

Downstream



Upstream

Water Resources Management

A comprehensive water resources management is a must for stabilising, enticing, and revitalising the agriculture sector. It is a permanent solution to all agriculture sector problems.

The main objectives of water resources management are–

1. To supply water for 35 crore acres of agriculture land through canals throughout the year. To remove interstate water disputes permanently;
2. To minimise floods and consequent crop losses worth thousands of crore rupees annually;
3. To ward off famines due to lack of sufficient rains and depleting groundwater level;
4 To arrest water pollution both on the ground and underground;
5. To protect all rivers, ponds, lakes and reservoirs from industrial and urban pollution;
6. To provide safe and clean drinking water to 30 crore households in India;
7. To protect environment by growing thick forests with high canopy trees;
8. To make all seasonal rivers as perennial rivers;
9. To make short waterways;
10. To make organic farming without chemical fertilizers and pesticides;
11. To save 50,000 crores worth of electricity annually that is being used to power agriculture pump sets to draw water from deep bore wells. Every acre of land can be irrigated through canals with water resources management. Pump sets on canals and ponds will use only 30% of the power with respect to pump sets that draw water from deep bore wells;
12. To arrest soil erosion, forest degradation, forest fires, and silt accumulation in reservoirs, lakes and other water bodies;
13 To conserve wildlife, mountains, forests, national parks, and wildlife sanctuaries;
14 To make India ever greener and cleaner;
15 To promote tourism near reservoirs, rivers and lakes by making them always full of water; and
16. To stop using groundwater reserves;

Water resources management is the main key to check water scarcity and water feuds between states. Water resources management for a vast country with a huge population and large agricultural land resembling India, requires heavy investment, proper planning, and timely execution of water management projects without delays. India is naturally blessed with super topographical advantages, convenient for water harvesting during monsoon period, when India receives over 70% of its rainfall. This article suggests how India's geographical characteristics can be used to its full advantage to conserve and store water efficiently, and to provide sufficient water supply throughout the year to the entire agricultural land and industries, and to provide safe drinking water to 30 crore households without depending upon groundwater by digging bore wells.

The average rainfall in India is 120 centimetres and India's long-term average precipitation in volume is roughly 3,237 billion cubic metres. The land area of India is 32, 87,263 square kilometres. One square kilometre constitutes 250 acres of land area and one acre is equal to 4046.86 square metres.That means 32, 00,000 x 250 x 4046.86 = 3,23,748,80,000,00 cubic metres of water = 3,237 billion cubic metres of water in volume.3,23,748,80,00,000 cubic metres of water = 1, 14,331 Tmc ft of water in volume.One Tmc ft means one thousand million cubic feet, which is equal to 2, 83,16,800 cubic metres.

Water requirement for 30 crore households per annum is 4,000 Tmc; for industries it is 6,000 Tmc, and for agriculture sector the requirement is 35,000 Tmc. It is believed that, 50 % of total precipitation flows to the rivers, and it is estimated to be 1600 billion cubic metres; which is equal to 57,165 Tmc. If we harvest and conserve this available surface water through proper water controlling projects, the water will be sufficient to meet the entire demands of the irrigation sector, industry sector, forestry sector, domestic and other sectors by 2050. If domestic water demand increases to 200 litres per capita per day by 2050, then the domestic sector requires 150,00,00,000 x 200 x 365 = 1,09,50,000,00,00,000 litres per annum. That equals to 3,910 Tmc of water.

According to some agriculture experts, the rough estimation is that one Tmc is required each year to irrigate 10000 acres.That means for the irrigation sector the water requirement at the maximum level for 35 crores of land is 35, 00, 000, 00/10000 = 35,000 Tmc.

Water requirements for other uses are estimated to be around 2,000 Tmc.
India's 12 major rivers, 46 medium rivers and countless number of minor rivers flow eastward, except Narmada, Tapti, and some Himalayan rivers draining into Bay of Bengal. Rainfall is not uniform throughout India. That is why we need a national water grid system that preserves and stores water in heavy rainfall regions and distributes it to water-starved regions through canals and pipelines.

Total provisional cost to execute a nationwide water grid system with a series of barrages on all major, medium and minor rivers and link canals to connect with lakes, tanks, ponds and reservoirs, is estimated to be 30 lakh crores to be spent over 10 years of implementation stage. Once completed, this project will make the agriculture sector strong enough to produce nearly 100 crore tonnes of foodgrains, which is three times of present production. The target of 100 crore tonnes of foodgrains can be achieved easily with the ensured water supply through canal network system without depending on ground reserve water. After completion of this project, groundwater usage is completely avoided. Subsequently, saturation of groundwater levels is achieved; additional precipitation water to the tune of 400 billion cubic metres will be available to surface water. Currently, groundwater reserves are being used for 40% of irrigation needs and 60% of domestic consumption. This comprehensive irrigation system will save 50,000 mw of power that is being used to draw water from bore wells and also produce 10, 00,000 mw of hydroelectric power by harnessing the potential energy of water stored at higher altitudes.

Three steps to make perfect water resources management are:

1. One year short term plan
2. Five year mid-term plan
3. Ten year long term plan

1. One-year short-term plan - Water conservation at village level and by the farmers' participation to conserve rain water and increase ground water. The Central and all state governments should follow the following steps to conserve water on war footing:

(a) All existing ponds, lakes and other water bodies should be desilted. They have lost water storage capacity over the years with sediment. They need to be desilted and deepened to 4 meters depth.

(B) Bring all these ponds, lakes and reservoirs out of the mining Act and allow people and contractors to dredge the clay and gravel freely, to fill house sites, land upgradation, for brick manufacturing, for laying roads and railway tracks, etc.
(C) Allow the farmers to freely transport the sediments in village ponds for the enrichment of soil fertility in their lands. The dependency on fertilizers can be reduced with the usage of alluvium deposited in the village ponds over the years.
(D) Give rights to those individuals or societies to catch fish for 10 years if they come forward to deepen these ponds and lakes to 4 metres depth.
(E) Give 50% subsidy to farmers who want to convert 10% of their land into a water pond 4 meters deep.
(F) Involve non-government organisations, NRIs and individuals in the desilting and deepening process. Allow individuals who want to be involved in this process, to name these ponds and lakes in memory of their parents or as per their other choice/preferences.

2. Five year mid-term plan for constructing barrages coupled with hydro turbines and road bridges across the rivers

1. Interlinking of 12 major rivers, 46 major rivers and hundreds of minor rivers;
2. Connecting all water bodies, ponds, lakes, tanks, reservoirs with gravitational canals, water-pumped canals, and pipelines; and
3. To make rivers into reservoirs, by strengthening river banks and dredging river beds.

Building barrages is a better option than constructing huge dams that consume huge resources in the form of money and lands, displace thousands of families from their habitats, and destroy natural forests. The purpose of constructing barrages is to store water at minimal levels without submerging large tracts of land, to divert water through gravitational canals, and to pump water to high lands through canals and pipelines to fill all water bodies. The main aim is to store water in different places instead of storing it at one place. To substantiate: the ongoing Polavaram project construction has been taken as a case study.

The ongoing Polavaram project on the river Godavari at a huge cost of over 55 thousand crores is a classic example of how the government indulges in bad water resources management.

1. Polavaram project submerges 625 square KMs of land that is equal to 1,50,000 acres, including precious forest area that is worth thirty thousand crores at present market value.
2. This dam displaces over one lakh people and requires Rs 35,000 crores for rehabilitation, which is 60% of the project cost.
3. If we add the land value to the construction cost and rehabilitation cost, the net cost of the project goes to a whopping 85,000 crore rupees.

Huge benefits of barrage construction over dam construction
The height of present Polavaram dam is 45 metres that includes 25 metre crest level and 20 meters height gates with spillway length of 1200 meters and 2.5 KM ECRF dam.

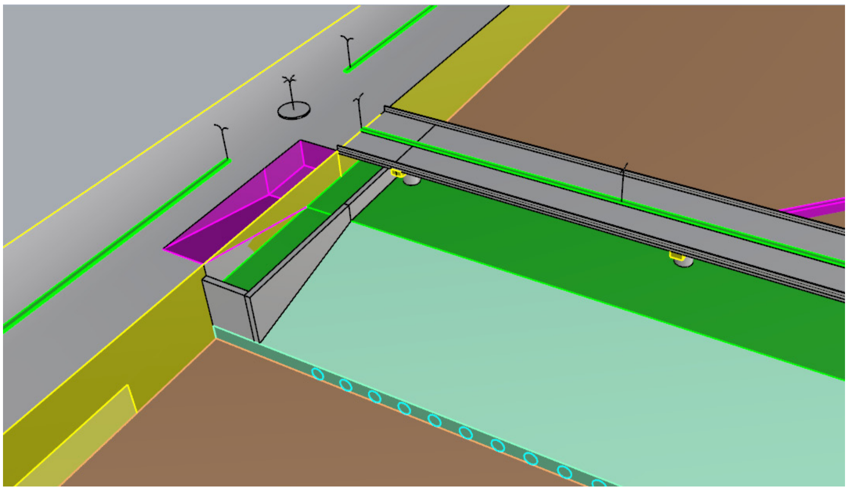
Result – It submerges 1, 50,000 acres. It requires 35,000 crores for rehabilitation
If a barrage was designed with sluice gates and with a total length of 3.7KMs, it could have cost just Rs 5,000 crores saving 50,000 crore rupees and 1, 50,000 acres of land.

The saved 50,000 crore rupee could have been used to construct 12,000 Mwh capacity solar power plants. 12,000 Mwh of solar power is equal to 3,000 Mwh of thermal plants. The water carrying capacity of the left canal and the right canal is 1 TMC per day. Power required to lift 1 TMC of water each into these canals is 250 Mwh. The remaining power could have been used in lift irrigation schemes that already existed on both left side and right side of downstream and upstream of river Godavari. By using 1500 Mwh of power, 10 TMCs of flood waters can be lifted daily by installing lift pumps at different locations from both upside and downside of this barrage during 5 months of rainy season to dry lands at high altitudes of entire AP to fill all existing lakes, ponds, tanks and reservoirs. Thus, 1200 TMCs of flood water can be pumped to supply water to all existing water bodies and link Godavari with Krishna, Penna and Cauvery rivers. The remaining 1500 Mwh can be used to meet the demand of 20% of agriculture pumps in AP. During the summer season, the entire 12,000 Mwh solar power can be used for 25 lakh agriculture pump sets from morning 9am to evening 5pm in the entire state of AP, saving 4,000 crores per year. This saving of 4000 crores per year can be used for deepen

ing of all ponds, lakes, reservoirs, and river beds to store more than the 200 TMCs of water that is equal to the storage capacity of Polavaram project.
Furthermore, 3% of the storage capacity of any dam is lost every year due to alluvium brought by flood waters.
Storage of water in deepened tanks, ponds, river beds, and reservoirs located at different places will increase groundwater levels uniformly throughout the state.
All medium and minor rivers between two major rivers shall be linked by a series of link canals supported by barrages. Barrages act like lungs to supply water to every acre of land.

Barrages are a better option compared to dams
Dam constructions have long gestation periods. The ongoing Polavaram project has been under construction for the last 20 years, still not yet completed. Barrage can be completed within a short period of time.
Under this water resources project, a series of barrages are to be constructed on all major, medium and minor rivers at a distance of 30 km apart on major rivers, 15 km apart on medium rivers and from 5 to 8 kms on minor rivers, starting from estuaries towards upstream up to the source of the river. 80 % of India's landscape slopes from west and north towards east abutting Bay of Bengal. India's average rainfall is 120 cms and it receives 3000 billion cubic metres of water annually. It is estimated that 1600 billion cubic metres of rain water flows from high-altitude areas of north, east, and central India towards east, draining into the Bay of Bengal. The average height of Indian land altitude is 600 metres. For conservative calculation if we take the average height of the total volume of rain water that flows in rivers as 300 meters to be on the safer side for rough estimation, and the total volume of water that can have potential energy at this height is 800 billion cubic metres.

Downstream side



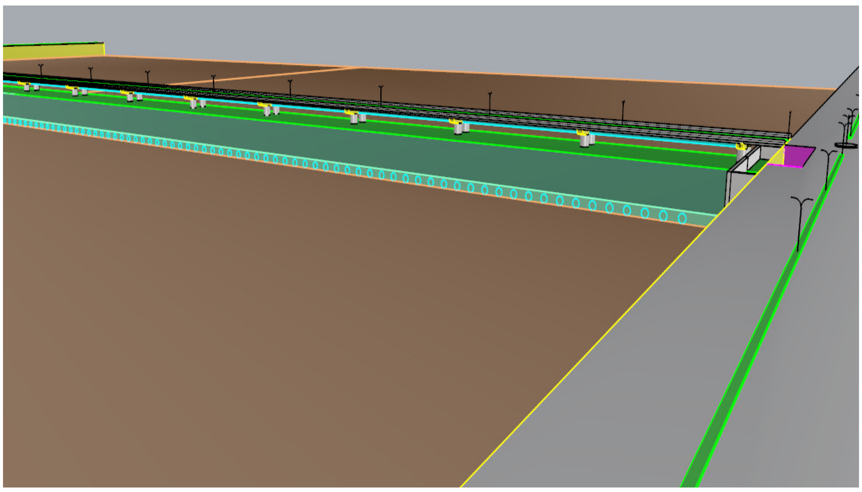
Upstream side

Now we can estimate the hydropower that can be harnessed by constructing a series of barrages coupled with hydro turbines, from 800 billion cubic metres of water that flows from the heights of average of 300 metres to 10 metres MSL. At two metres of minimum gross head, 2 cubic metres of water per second that flows from the turbine for an hour generates 25 KWs of hydroelectricity. That means by losing 2 metres of height, 2x60x60 = 7200 cubic metres of water will generate 25 KWs of power = 25 units.

800 billion cubic metres of water at the average gross head of 300 metres can produce approximately 80,000,00 ,00,000/2=40,000,00,00,000/7,200= 5,55,55,555 x 25 x 300 = 41,666,66,66,666Kw/1000 = 41,66,66,666 Mw of electricity. So the total potential energy of Indian surface water that can produce hydroelectricity = 41,666,66,66,666 units of electricity per annum. The value of the total units produced annually is equal to Rs 82,000 crores at the cheap rate of Rs 2 per unit.

This has to be converted into installed capacity 41,66,66,666 Mw/24 = 1,73,61,111 Mw /365 = 47,564 Mwh capacity.
At present, India's total installed power capacity is 4, 00,000 Mwh including thermal (60%), hydro (13%), renewable (25%), and nuclear (2%) as on April 2021.

Downstream side



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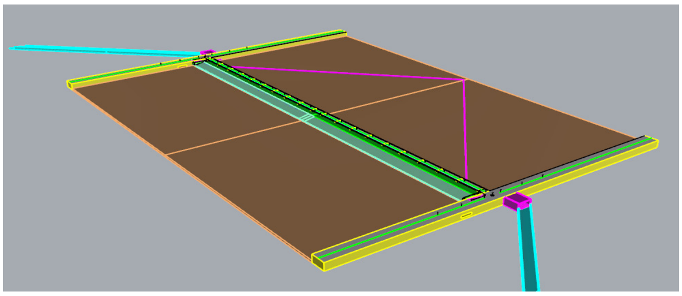
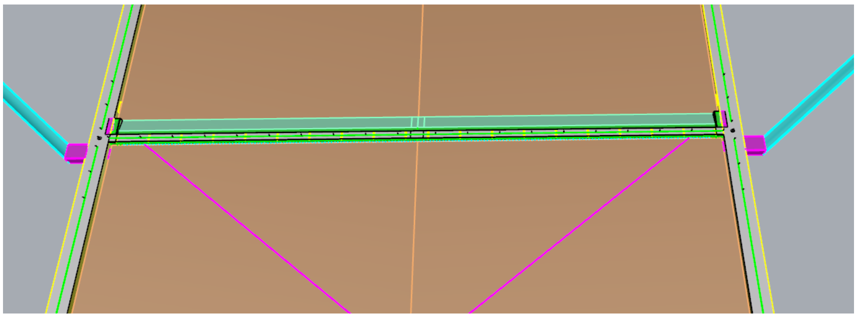


As I suggested earlier in this paper, if solar energy plants are installed with a total capacity of 10,00,000 Mw equalling 3,00,000 Mw of thermal power plants, then total power generation of power from hydro, thermal and solar energy will be 8,00,000 Mw. That will be sufficient for all needs of road and railway transport, industries, irrigation projects, water supply schemes, commercial establishments, mining sector, street lighting apart from 30 crore households.

Solar power units of 10, 00,000 Mw and Hydropower units of 47,000 Mw could complement each other to meet the country's energy demands. The hydro turbines could be used from evening 5pm to next morning 8am to produce power by releasing water downstream. Stopping hydropower generation during day time is a better option when there is no rush of flood waters. The day-time energy needs can be entirely met through solar energy at the peak generation of 10, 000, 00 Mw of power.

Downstream side



Upstream side

The outcomes of establishing solar power plants, wind power, and hydro power units-

1. The excessive generation of electricity through solar, wind and hydro power can be used to lift water through canals and pipelines to dry lands at higher altitudes.
2. The entire area of India's agricultural land can be brought under assured water irrigation through gravitational canals and lift irrigation canals.
3. To reduce floods by lifting water through canals and pipes to fill ponds, tanks, reservoirs on dry lands at high altitudes which suffer from acute water shortage due to little rainfall.
4. The farm output can be tripled to record levels of 100 crore tonnes from the present level of 35 crore tonnes. The value of an additional 70 crore tonnes of food grains is equal to 14, 00,000 crores. This huge production of food grains will be sufficient not only to nourish 140 crore people and 60 crore livestock, but also flood international markets with cheap prices.
5. With an assured water supply, three crops can be raised per year on every acre of land. That increases rural employment. The migration from rural areas to urban areas can be stopped.
6. Having met India's energy needs through solar, wind and hydro power, thermal plants can run on half of its capacity. The dependence on coal will be reduced by half. The existing thermal plants could be turned into backup generators that work to full capacity only when monsoon fails. There is no need to construct new thermal plants.
7. All nuclear power plants known for the creation of wastes which are radioactive and hazardous to human life, can be phased out one by one, in due course of time.
8. Groundwater usage can be completely stopped.
9. The heights of all existing dams can be reduced by 5 feet per year so that 20 lakh acres of forest land that was submerged due to these dams can be brought back to life. This reclaimed land can be used for raising thick forest with a high canopy of fruit-bearing and non-fruit bearing trees to support animal life.
10. With cheap electricity available through solar and hydropower plants to industries, commercial establishments and service sector, the goods or services produced would become cheaper and competitive at international markets with decrease in material cost, production cost, transport cost and services cost.
11. The import bill on food grains and crude oil to the tune of Rs 8, 00,000 crores will be saved. The loss of revenue in the form of taxes on petroleum products will be compensated by savings on imported crude oil, cooking oil, fruits, and nuts.

Method of constructing barrages

1. Barrages are to be constructed on all major, medium and minor rivers at a distance of 30 km apart on major rivers, 15 km apart on medium rivers and from 5 to 8 kms on minor rivers starting from estuaries towards upstream up to the source of the river.
2. Barrage height is to be determined so that the stored backwater can reach up to a halfway distance to the upstream barrage. The remaining half length of the river shall be used to take the rain water from streams, rivulets, and canals so that there will be no submergence of lands due to heavy rains.
3. The height of the river banks at the barrage should be raised by 2 metres and run up to halfway distance to the up

stream barrage.
4. The entire length of the river bed between the two barrages shall be deepened by removing sand deposits. This sand can be supplied at minimal prices for constructions. The sand deposits are to be removed every year and supplied for construction of houses or projects. The river portion between the two barrages will become a reservoir. With construction of barrages, sand availability increases.
5. Diaphragm wall is to be constructed to stop water seepage under the barrage. It increases barrage longevity.
6. Piers and pillars are to be constructed for the road bridge above and for installation of crest gates between them to pass the flood waters.
7. A still basin of 200 metres or more width between two banks on the river bed, to be constructed so that 100 meters downside and 100 metres upstream of the barrage. The still basins must be designed to facilitate the deepening of the river between barrages. The still basin is also to be designed to dissipate excess hydraulic energy downstream the barrage.
8. Crest gates shall occupy ¾ of the river width and the remaining 1/4 length of the barrage shall be used for water turbine installations on both sides of the barrage.
9. The still basin/spillway height can be determined so that stored back water cannot reach more than 1/3 of the distance towards upstream barrage.
10. Head regulators or to be installed for two canals, one on each side of the river bank, for water diversion, either through gravitation or by lifting water through pump sets.
11. The power generated by the water turbines shall be used to pump water into canals that carry it to dry lands at higher altitudes above the river water level.
12. The height of the spillway/still basin should be fixed for discharge of maximum flood waters recorded during the last 100 years without overflowing river banks and the road bridge on pillars.
13. The river banks towards upstream should be strengthened with riprap up to the distance where back waters reach.
14. Barrages act as an impediment to the natural flow of sediment transported by the river flow. This sediment gets deposited upstream of the barrage. At every barrage there should be a water injection dredger permanently placed for the regular flushing of sediment. This highly fertile sediment can be supplied free to farmers to enrich the agricultural lands adjacent to the river. This sediment increases the vitality of the soil and decreases the usage of chemical fertilizers.
15. There must be provision separately on the bridge for electrically operated cranes to move on the rails apart from regular movement of traffic. This crane can be used to remove trees, branches, agriculture waste, etc. that come with flash floods. The floating garbage may choke the intakes of turbines and hamper the free flow of water downstream for power generation.

Water resource management: 10-year long term plan–
This 10 year long term plan includes three steps:
This is the most important phase of water resources management. The conservation of water at the foot of the mountains, on mountain tops and between mountains makes all major, medium and minor rivers perennial. Water conservation at mountains is easy, time saving and cost-effective when compared to dam constructions. The main objective of water conservation plans in mountains is to protect natural forests, animal life; increase soil absorption and land fertility; decrease flash floods and soil erosion. The benefits of water conservation in mountains are enormous in the long run. Thick forests with high canopy trees can be grown on mountain tops and on its slopes. Thick forests on mountain tops and its slopes absorb the intensity of heavy rainfalls to check soil erosion and decrease the sediment deposits on river beds and dam beds. The longevity of dam storage capacities increases.

Mountains occupy 9, 60,000 square kms of Indian land. Out of which, the Himalayas occupy 5, 00,000 square kms of land area. Vindhya ranges, Satpura ranges, Aravali ranges, Western Ghats and Eastern Ghats, in India's peninsular region, occupy nearly 4,00,000 square KMs of land. That is equal to 10 crore acres and 12% of Indian land area. Vindhya ranges, Satpura ranges, Aravali ranges, and Western Ghats and Eastern Ghats are ideally suited for rain water conservation, as they receive 15% of India's total rainfall that is equal to 35,000 cubic KMs of water. 35,000 cubic KMs of water is equal to 12,360 TMC of water. The average height of these mountain ranges and Ghats is 600 metres. Conservation of rain water at these altitudes gives more potential energy to water by virtue of its position.

Water conservation methods on mountain ranges include three steps:

1. Digging deep trenches at the Foot of the Mountains;
2. Construction of check dams between mountain valleys; and
3. Construction of ponds on flat mountains.

Digging deep trenches at the Foot of the Mountains–

1. The total length of deep trenches that are to be dug around the mountains of Vindhya ranges, Satpura ranges, Aravali ranges, and Western Ghats and Easter Ghats in peninsular India is approximately 5,00,000 KMs.

2. The trenches should be 8 metres deep and 12 metres wide to store rain water from the summit and slopes of the mountains. The dug material should be used as a rock and earth wall with a height of 8 metres on the downside of this trench around the mountains. The rainwater running down from the mountains first fills these trenches before overflowing into streams and rivers. This rampart, formed by the mounds of earth dug by excavators, will act as a fortification around mountains for protection of animal habitat. There must be a provision for a ramp at every 3KMs with a small undug portion. The animals that fell accidentally into these trenches would easily walk to the ground by the ramps. In 10 to 20 years these trenches will be filled with vegetation, dead leaves, pebbles, top soil, etc. There shall be no problem with accumulation of sediments in the trenches. The mixture of these sediments will act as a super sponge to absorb water into the ground. The accumulated mass over the years in the trenches can be supplied to farmers free for enrichment of agricultural lands.

3. *Cost of digging trenches through:* heavy excavators with a capacity of digging 8 metres deep and 12 wide trenches shall be used. The estimated cost of digging 8 metres deep and 12 metres wide trench may be nearly 80 lakhs per one km of length. The total cost of digging 5 lakh KMs length of trenches at the foot of the hills and mountains cost nearly 4 lakh crores. The digging of trenches is necessary to preserve rain water in mountain ranges and Ghats in peninsular India. The embankments adjoining the trenches are useful in safeguarding forest trees from being illegally cut by smugglers and preventing animal poaching and the protection of wildlife.

4. *Formation of ponds on flat mountains:* approximately 40% of peninsular mountains are nearly flat-topped up to 20% corresponding to their base areas. If the top area of the mountains, which constitutes 10% of the total occupied land area of the peninsular mountains for water conservation, 1000 TMC of water can be stored on mountain tops.

5. The available top area of the mountains shall be divided into one-hectare portions. A 5 metre width and 3 metre depth around each hectare should be dug and this dug material should be used for pond embankments of the height of 3 metres. The centre of the tank shall be left untouched for raising high canopy trees. Trees are also raised on the embankments of all ponds. The purpose of these tanks on mountain tops is to preserve every drop of rainwater that falls on the mountains and stop it running down the mountains. So the entire mountain tops will be covered with high canopy trees surviving on the water stored in the ponds. This stored water in the rainy season on mountain tops slowly percolates through all its sloping sides to its feet, where deep trenches are dug to catch the running waters from mountain slopes. Heavy forests can survive on mountain slopes in the hot summer season, also by absorbing water that slowly oozes from multiple ponds on mountain tops.

6. The most important step in water conservation is the construction of check dams across streams in mountain valleys. These 3 metre height check dams, at regular distances in valleys, will inhibit the flow of running water streams between mountains and help forming of small brooks and lakes. The countless number of check dams on all peninsular mountain ranges help water conservation at a huge level at low cost, without damaging flora and fauna. These check dams between mountains, and ponds on mountain tops keep forests evergreen and will become highly productive in terms of fruits, honey, lac, herbs, fodder for animals and other forest products. These evergreen, highly productive forests enabled by water conservation projects hugely benefit tribals who primarily depend on forest products for their livelihood. The increased forest cover with availability of water throughout the year will keep forest herbivores thriving in large numbers, leading to plentiful availability of non-vegetarian food for the tribal population.

Thus, the basic thrust of water resources management is to store water everywhere and widespread, from high altitudes to low altitudes: on mountain tops; at the feet of the mountains; in rivers, in lakes and in village ponds, to quench the thirst of every acre of land every day during the entire year. The focus of water storage should be shifted from concentrated storage in large dams that submerge huge lands and displace lakhs of people to decentralised storage of water with minimal environmental damage.

Total investment for revitalising the agriculture sector in India	
Cost of solar power plants with 10 lakh MW capacity [Without land cost]	= 40 lakh crores
Cost of digging 5 lakh KMs of trenches around mountains	= 4 lakh crores
Cost of formation of ponds on mountain tops	= 2 lakh crores
Cost of constructing check dams	= 3 lakh crores
Cost of barrages, turbines, canals, pipelines	=20 lakh crores
Total cost	**= 69 lakh crores**

Benefits per annum	
Value of the solar power generation at 2 Rs per unit	= 5 lakh crores
Value of hydro power generation	= 1 lakh crore
Value of increased foodgrains production	= 14 lakh crores
Value of savings on imported vegetable oils, fruits, nuts, petroleum products, etc.	= 4 lakh crores
Total visible benefits per annum	**= 24 lakh crores**

Invisible benefits

Rural employment is guaranteed with the availability of plentiful water for agriculture throughout the year. The migration from rural areas to urban areas in search of employment will be stopped. With the arrest of water shortages, self-sufficiency in foodgrains could be achieved. There will be sufficient production of fodder for cattle, thereby increasing milk and dairy products. By switching over from fossil fuel vehicles to e-vehicles, transport cost will be halved. According to government reports subject to correction, there are about 22 crore motorcycles, scooters and mopeds; 3 crore cars, taxis and jeeps; and 60 lakh auto rickshaws. If 90% of motorcycles, scooters, mopeds and auto rickshaws, and 50% of cars are transformed into e-vehicles with cheap supply of solar power for recharging, then carbon emissions could be reduced by 100 crore tons from 300 crore tons annually. India's percentage of global emissions will be reduced from 7% to 4%. The cumulative effects of reduced carbon emissions, the evergreen forests with high canopy trees and complete greenery encompassing the entire land area will reduce the average temperatures in India by at least 2 degrees centigrade.

If agriculture reforms and water resources management packed with solar power and wind power generation are not initiated immediately, then severe water shortages could cause India's foodgrains production to decline by 30%. Without proper water utilisation projects, the water wars between states could aggravate further. ■

(Disclaimer – Views expressed are author's personal opinion. The article published is part of author's Digital India project created for Top Tax System).

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