

Address at the NAWAD Council Meeting, Madurai

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- By Dr.A.P.J.ABDULKALAM

Integrated water mission

I am delighted to participate and address the NAWAD Council Members at Madurai. My greetings to the organizers, NAWAD Council members, advisors, engineers, Networking of rivers association members, Industrialists, Lawyers, Farmers, students and the people from various cross section of the society. I used to interact and discuss with Mr. A.C. Kamaraj and his team number of times regarding the Interlinking of Rivers and Smart Waterways. We have jointly proposed the Smart Waterways programme to Tamilnadu, Kerala, Andrapradesh and Bihar. Out of which – Kerala Waterways programme has taken shape and it is progressing well. Hence I would congratulate Mr. A.C. Kamaraj and his team for the unstinted endeavor towards the interlinking of rivers with the [alternate](#) proposal to create waterways across the country.

The topic selected for this conference is "Water for all with special reference to Interlinking of Rivers in India" organized by NAWAD Council. I was thinking what I can share with the delegates of the conference who have come to discuss the very important issue of water management particularly conservation, development and management of water resources, and also our concern for providing water for irrigation and good quality potable water for all citizens of the country. There are also other concerns such as ecology, questions of displacement of human habitats etc. Therefore, My address will be on 'Integrated Water Mission'.



Dr. A.P. J. Abdulkalam, Former President of India

There are some who have great expectations about linking of rivers. There are also some others who have a question whether this programme will be a blessing for the country?

I would like to discuss four aspects with you.

1. What is the total requirement of water for our nation for drinking purposes, sanitation, irrigation and other industrial uses and what the nation gets through seasonal inputs (rain and melting of snow)?

2. One third of our population is affected by flood or drought every year.
3. Per capita availability of water varies from 10 kilo litre to 50 kilo litre for different seasons and regions.
4. What are the optimal ways of meeting the minimum needs of water for the entire population, assuming a particular population growth rate for the country. We should remember that by 2020 we have to produce approx 400 million tons of grain and the water requirement will also go up due to population increase.

Water Balance

India gets approximately 4000 Billion cubic meters (BCM) of water every year from all natural sources. Out of this 700 BCM are lost in evaporation and another 700 are lost during the flow on ground. Also, the large part of water namely 1500 BCM flows into the sea due to floods. Thus, the remaining available water is only 1100 BCM. Out of this ground water recharge accounts for 430 BCM per year and the present utilized surface water is 370 BCM. The balance unutilized water which can be harnessed is 300 BCM.

Flood and Drought Situation

I was studying the frequent occurrence of flood and drought. Flood normally affects, 8 major river valleys spread over 40 million hectares of area in the entire country affecting nearly 260 million people. Similarly the drought affects 86 million people who are spread in 14 States covering a total of 116 districts. Wherefrom this flood comes? It comes from the 1500 BCM of water every year flowing during the monsoon season. If we have to prevent the damage due to the flood and reduce the severity of drought, we have to harness this 1500 BCM of water and distribute it to the drought affected areas. We can also partly store it in proper storage system so that it can be available during non-monsoon months. If we succeed in doing all these, we will not only save the loss arising out of the damage caused to the crops, properties and people by the flood to the extent of Rs. 2400 crores on an average per year, we will also save the recurring expenditure of Rs. 1200 crores incurred by the government as short term relief measure. The questions which arise are how to harness the flood water? And how to regulate the out flow of flood water so that it does not go into sea and it is converted as useful water for the mankind.

Harnessing the Water

Hence our aim should be to channelise the 1500 BCM of flood water, so that it can be made use of for providing water to drought affected areas and make sufficient water available to the whole country during non-monsoon months

through proper linking, storage and distribution. Our plans must consider that presently the sanitation facilities are not available in more than 50% of the dwelling units in the country. Planners must take into account this aspect while selecting schemes for harnessing and distributing the water for our growing population. We may have to align our interlinking of rivers project for meeting the growing water demands of the nation by having a hybrid scheme which can harness the additional 300 BCM per year and also the floodwater of 1500 BCM.

Flood control

There is an urgent need to find long-term solution to control flood, store and utilize the surplus water during drought. Also the scheme chosen must be such that there is continuous availability of additional water for the growing population and the related needs of the nation by regulating the outflow into the sea. Now I would like to discuss about the possible issues arising out of this mission. The main issues which concern certain number of people are rehabilitation and environmental upgradation.

Rehabilitation

While working on such large schemes, certain amount of displacement of people is bound to happen. We should aim at minimizing dislocations. We also have to consider the overall impact and benefits of the scheme which in this case is going to benefit nearly 340 million people who are affected constantly by floods or droughts. Rehabilitation Plan should include working out area required for providing housing for the affected families which have to be relocated, space required for the livelihood agricultural, artisanal or industrial. Adequate funds required should become the component of the mission of "Connecting Water Resources". Also, by learning from the problems of the past, necessary new mechanisms have to be put in place to provide facilities to those who are likely to be displaced well in advance. Governance issues connected in these projects are equally important as technologies, project management, finances etc. The project report should consist of all these components before seeking sanction.



Viewers

Environmental upgradation:

There are certain apprehensions by environmentalists that the large-scale diversion of water and disturbance to the terrain may endanger or affect geological and ecological balance. It is therefore essential to find solution to their concern and build it as a part of the mission of interlinking of rivers. For example, the aforestation area could be increased 10 to 15 percent from the present forest area and also designing the river flow management. Therefore the comprehensive mission planned by the government will have to take in to account pooled allocations from the various departments and closely monitored, as it will have impact in every field of development programmes of many ministries of state and central governments.

Mapping the Water resources and the route planning:

Science and Technology can surely help in executing such missions. India has its own remote sensing satellites and their applications will help in large-scale survey from the source and river flow pattern at various seasons. Optimum water routes and mapping of the environmental profile can be evolved using virtual reality through satellite and aerial imageries. Most important means is to use CARTOSAT-I for getting stereo type pictures on water resources and drought. This should become part of the Water Mission.

State wise linking local river basins:

Interlinking of Tamilnadu Rivers: Let me now focus on the interlinking of rivers in Tamilnadu. Every time, Mettur Dam gets filled up most of the water goes to sea. For instance, in 2005, 3 times Mettur Dam overflowed and more than 400 TMC (Thousand Million Cubic meters) water went into sea. In 2007, now it is overflowing and possibly around 100 TMC may go to sea. This has become a repetitive phenomenon in the changed environment conditions.

In this context, let us discuss how we can harness the flood water during flood, so that the surplus water can be saved and made available to the other drought prone regions of Tamilnadu and to the same region when they are in drought.

It is our experience that when flood devastates one river basin, the other basin experiences drought. During the October 2005 rains, when Cauvery was in overflowing conditions, vaigai basin experienced less rain and Vaigai dam level stood at 49ft, just 1/3 of its full capacity. When there was heavy downpour in Chennai, the drinking water sources around did not receive enough water. When Cauvery overflowing 3 times, all other dams and tanks in Tamilnadu were far below the capacity, even less than 40%. Kollidam proved very effective, discharging 3.23 lakhs cusecs during the 2005 flood. Since the width is 1km and runs for 160 km. It acted as reservoir. The lesson from Kollidam is "The flood

carrier should be capable of absorbing heavy floods". This gives the message that by making the river as a flood absorber, we get maximum benefit for preserving the water. Now I would like to discuss about the Tamilnadu Waterways connecting the Tamilnadu river basins.

Tamilnadu Waterways Project:

An expert team headed by Mr. A.C. Kamaraj, has prepared a project report called "Tamilnadu waterways Project". We had a detailed discussion, which I would like to summarise. Incidentally, I have presented this proposal to both the Chief Ministers of Tamilnadu during their regimes. They are also concerned about this problem and are taking certain steps towards to implement the project. We need to accelerate this programme in the interest of the



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state. It has to become a mission mode project. A smart waterway will have the characteristics such as: sufficient navigable depth and width; conditions will permit navigation throughout the year; have smooth bends and minimum siltation; be able to navigate at least 18 hours per day; cater for efficient loading and unloading points; and the waterway should be adequately lighted and equipped with modern navigational and communication aids. This facility will enable the State to take advantage of the energy efficiency of transportation through waterways which is double of railways and eight times the road transportation system for a given load. This will also reduce the congestion on the road, and improve the environmental conditions and afforestation. Hence, there is a need to embark on a mission mode programme to make the total waterways length operational by improving the maintenance, dredging and creating water transport facilities through public - private partnership. This has to be a joint effort between the State and Central Government. Also, wherever the land acquisition and resettlement problems are coming in the way a special dispensation needs to be found for removing the bottlenecks.

I have seen waterways in many countries leading to the progress of the economy and tourist attraction. The Government must undertake to provide policy and legal support for the private operators to function without bottlenecks.

Tamilnadu Waterways Project is an **innovative scheme**, which serves as a storage reservoir and contains flood. It facilitates two-way flow and allows inter-basin transfer without affecting the existing system. It proposes to connect the following dams such as Sathanoor, Mettur, Bhavani Sagar, Vaigai, Manimuthar, Petchiparai, Solaiyar, Papanasam, Servalar and connects the lakes

and tanks such as poondi, cholavaram, redhills, chempampakkam, veeranam, Ramanathapuram.

All the west to east flowing rivers in Tamilnadu are linked with Tamilnadu waterways GRID. This waterways grid may be created at the height of around 300 Meters above Sea Level so that it becomes a single horizontal plane, which connects all the dams and rivers at the same plane facilitating water feed or withdrawal from any part of the GRID. Entire river system is connected to Tamilnadu Waterways Grid.

Based on the preliminary estimates this project can be implemented in 5 phases. In the first phase – we may connect Mettur – Vaigai that is around 350 km stretch. Second phase, 270 km stretch will connect Mettur – Pallar. 150 km stretch of Vaigai to Tamirabarani can be connected in the third phase. In the fourth phase, 130 km stretch of Tamirabarani to Perunjani may be taken up. In the mean time, concurrently government should take up expanding the connectivity to all tanks and subsidiary rivers. The unique feature of this project is, it does not divert the utilizable flow of water from that river basin, but [uses only excess flood water](#) and [does not involve any pumping](#).

Benefits: This project envisages the following benefits to the state: effective flood control, provides irrigation facilities for additional 7.5 million acres, generates 2150 MW of hydro power, reduces the power consumption by 1350 MW due to increase in ground water level, provides 900 km of waterways with smart navigation for transportation of goods, the navigation will be operational around the year and will have a depth of 10 meter and width of 120 meter, Oil saving in waterways is 90% compared to Roadways, provides domestic and industrial water supply for 50 million people. Facilitates additional fish cultivation and promotion of tourism and water sports.

Estimate: The project is a [financially viable](#) proposition. It will cost around Rs. 36,000 crores including the cost of power generation, waterways reservoirs and dams. The returns estimated per year from the Tamilnadu Waterways is around Rs. 4600 crores, including power Rs. 2150 crores, Rs. 1350 crores from navigation, Rs. 1100 crores from other sources such as drinking, fisheries and tourism. In addition, it will enrich the environment leading to creation of additional forestry, upgradation of environment through use of hydropower and more efficient waterways navigation, which uses only 10% of the oil required for equivalent road transportation. Certainly, this project can be implemented World Bank assistance or BOOT (Build, Operate, Own, and Transfer) method.

This project is multi-disciplinary and will provide challenge to all the disciplines of engineering such as civil engineers, hydraulic experts, mechanical engineers, IT and electronic engineers, Geological experts, Cartographers and remote sensing technologists and business management teams. Availability of the state waterways will enable easy connectivity to the national waterways as an when it becomes operational. The following are the other waterways projects,

which I have proposed to the State Assemblies in consultation with Mr. AC Kamaraj and his team.

Andrapradesh Smart Waterways:

During my address to the Andhra Pradesh assembly, it was suggested that the Godavari water which flows into the sea to the extent of 2500 tmc during floods and 750 tmc during normal conditions may be diverted into the basin area for irrigation purposes through step dams, irrigation canals and water storage lakes and ponds. This will increase the irrigated area of the Godavari basin by over 30%. Andhra Pradesh government has agreed to implement this scheme.

Kerala Smart Waterways:

The inland water transport system of Kerala has navigable rivers, backwaters and man made cross canals. What Kerala needs, as visualized, is a major water way extending from Thiruvananthapuram to Kasargod. This will connect the whole state with all other cross canals. Development of smart waterways to the length of 650 kms will require detailed planning taking into account of additional irrigation potential, drinking water to population, flood control, additional power generation, tourist traffic potential and employment potential. The detailed project report has to be prepared and Govt. has to entrust the task to professional bodies. I have requested the Kerala legislative assembly to consider generating a policy of Smart waterways for power generation, tourist transportation, and material transportation round the year. Recently, the Minister for Water Resources from Kerala informed me that the Kerala waterways project work is in progress and nearing completion. I am sure technological upgradation of Kerala Waterways with progressive policy will lead to prosperity of the state through employment generation.

Bihar Waterways Project:

I have observed certain unique features in the river system of Bihar though Ganga. This main river is flowing from West to East, there are two types of flows coming into the Ganga. The northern rivers emanating from the Himalayas and another from the southern rivers coming from the Chhotanagpur plateau and Hazaribagh plateau. The major rivers coming from North-South are Ghaghara, Gandak, Bagmati, Karcha and Kosi. The rivers coming from the South are Son, Punpun, Phalgu, Dhadhar and Badua. Because of the flow from both the directions no water is saved and everything goes to the Sea. Also, the main flood bearing river the Kosi when it comes into Bihar is already in the plains and we have to find innovative flood management techniques with intensive international co-operation. We have seen the recent Koshi river flood which have deviated from the normal path due to the sudden flood and inflicted enormous amount of damage to the people of Bihar and their belongings and also damaged the land and properties.

Layered Wells: In the Gangetic region, I have recommended construction of layered wells in the entry points of Kosi river in. Normally the flood water has certain dynamic flow conditions. The layered wells assist gradual reduction in dynamic flow velocity after filling each storage well. The water thus stored will be useful during shortage period. Similar solution can be found for the north-eastern region. I have recommended this scheme can be included in the Interlinking of rivers programme.

However, I have suggested to Bihar Assembly to mitigate Bihar from the fury of the floods it will be essential to undertake the following short term measures.

(a) Recover the all the water bodies from encroachments using satellite maps.

(b) All the village ponds be immediately de-silted along with clearance of inlet and outlet and revived in the Gangetic basin.

(c) Carry out the dredging of the rivers from the center so that the riverbed is below the adjoining land area.

(d) Raise the protection wall for the wells slightly above the normal flood water level so that the debris does not fill the wells during floods and drinking water is available immediately after the floods.

(e) Create check dams so that water can be retained in the drought prone southern Bihar.

(f) To protect the cities create channelization, embankment and diversion channels up-streams.

(g) Encourage fishing in the ponds so that it can generate revenue for the farmers.

This activity can be linked to a mission of Bihar of doubling fish production through introduction of modern production technologies, developing innovative strategies and approaches and taking effective conservation measures.

Here, I would like to give an example to the Members from the experience which DRDO (Defense Research & Development Organization) had in the Nalanda project. Few years back, a project has been taken up for commissioning of an Ordnance Factory in an area of approximately 3000 acres. While taking over the land we found that lot of water logging used to be there in the whole area during the monsoon season. During the last four years by reviving number of ponds in the area and using the soil in the ponds for increasing height of the adjoining land and planting a number of trees around the ponds, flooding in the area has been completely controlled. Hence, I consider this model can definitely be replicated in the whole of Bihar for preventing devastation and disruption due to floods.

In addition an expert group headed by A.C. Kamaraj has suggested creation of a 500 kms long waterway in South Bihar by connecting the South to North flowing rivers of Bihar, which will act as an additional reservoir for the state. It is essential to build the intermediate dams in the cross section of the rivers and the waterways, which creates the balancing waterways. This will provide irrigation facility to over 5 million acres enable generation of 1000 MWs of power and provide employment for 9 million people. These measures could also reduce the severity of floods by fast disposal of flood water and also ensure storage of surplus water for future use.

Goa waterways:

Also I was informed by the Chief Minister of Goa that the Government of Goa has interlinked Zuari river with Kalay river in Mandovi basin through installation of pumps and gravity flow. This has been done to ensure availability of drinking water in this region. Every State should be asked to inter-connect their own rivers on the lines of Goa. This should form part of the State Planning. Overall planning of interlinking of rivers has to integrate the state water resource connectivity.

Water Management

Simultaneously we have to undertake missions for water harvesting, recycling and environmental upgradation, for long term availability of 800 BCM surface and ground water. Water harvesting and water recycling should become mandatory for all the states. To improve water table we need to build check dams; develop water sheds, desilt ponds and rivers, clear the inlets and outlets to the ponds and water bodies and recharge the wells. If our rural areas are made to have the operational clean water bodies, recharging of the wells will take place. These activities will also generate employment.

Tamil Nadu government has taken the lead and made water harvesting as a mandatory requirement for all house holders in the states including rural areas. Studies indicate that this has resulted in considerable improvement in ground water level in this season. In addition to water harvesting, water recycling is an essential for large consumers such as hotels, public Institutions and industries. The recycled water must be used for all usages including agricultural needs, except for drinking. This will reduce the percapita requirement of water to nearly 25% of the present consumption and enable larger number of population to get adequate potable water and for sanitation.

Conclusion

Our planet will encounter in the next few decades severe shortage of water if we are not careful in conserving and preserving precious water resources. In India, we should have action oriented plans to foresee the problem and work on a

mission mode before the water situation worsens. It is essential that we must have a water management mission that unfurls our vision for next two decades, integrating interlinking of rivers, water harvesting, water re-cycling, and desalination of sea water using solar energy in specific areas.

Hence, I would suggest the following seven action points for this conference to discuss and debate and come out with the possible recommendations:

- a. Recommending schemes which will ensure availability of minimum 25 kilo liters of water per year for each citizen in the country.
- b. The schemes chosen should also ensure that availability of water required for producing four hundred million tones of food grains per year by 2020. Simultaneously, It is suggested that the agricultural scientists need to develop crop varieties, similar to ICRISAT seeds, which will need minimum water.
- c. Scheme chosen should ensure that no state is affected by flood or drought.
- d. Water harvesting must be made mandatory for all buildings. Necessary legal provisions may be made in this regard.
- e. Recommend appropriate legal provisions for making recycling of water mandatory in all buildings particularly large hotels and industries where large amount of water is consumed.
- f. Expenditure required for rehabilitation and environmental up gradation should become part of the mission of "connecting water resources". Also a people oriented governance system should be in place to take care of affected people.
- g. There are many schemes for interlinking of rivers. Ministry of Water Resources has to consolidate all the best aspects and bring out cost effective project report. As a whole, interlinking of rivers has to be a mission mode project.

I wish the NAWAD Council success in your mission of providing water for life to every citizen of the country.

May God bless you.

Dr. APJ Abdul Kalam

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