

Address to the Scientists/Staff and Students of National Institute of Ocean Technology

Chennai, May 19 2010

Oceans as resources for development

"Technology will lead to non-linear growth"

I am indeed delighted to address and interact with the scientists, experts, students and other distinguished guests present here at the National Institute of Ocean Technology Chennai. My greetings to all of you. While I am here with all of you I would like to talk on the topic **"Oceans as resources for the development"**.

Focal areas for discussions

Friends, today since I am in the midst of experts of oceans and ocean technologies I would like specifically discussion on the potential of harnessing our ocean resources for achieving a developed nation by 2020. I would like to discuss on the areas of mining, energy and disaster management in the context of the oceans. Finally, we will discuss how all these initiatives combined with a spirit of enterprise can lead to the integrated development of the nation.

Deep Sea Mining

One of the emerging areas in the mining industry is that of deep sea based mining. Many resources including silver, gold, copper, manganese, cobalt, platinum, molybdenum and zinc are found in higher concentrations on the sea floor than on land. According to experts, sea floor mining avoids many of the problems associated with terrestrial mining. There's no acid mine drainage, since the acids are neutralized by the alkaline sea water. The sulphide deposits are on the sea floor, so there would be no excavation and the resulting waste rock piles, and no permanent structures would be left behind.

I was studying various reports on deep sea mining in India. India has a status of Pioneer Investor and has been allotted a site in the Central Indian Ocean Basin (CIOB) by the International Sea Bed Authority (ISA) for exploration and technology development for polymetallic nodule mining. India has about 2 million km² of Exclusive Economic Zone (EEZ), which is nearly two-thirds of its total land area. The mineral potential of the EEZ includes well-known monazite-ilmenite-rutile placers on the east and west coasts, calcareous aggregates and sands in the shallow waters (especially in the Lakshadweep island group off the southwest coast), and phosphate mud and sediments (along the west coast, and possibly in the Andaman Sea). There is also potential for cobalt-rich crusts in several locations, and for hydrothermal sulfide mineralization in the Andaman Sea. In addition, seawater components and hydrocarbon deposits in the offshore areas are already attracting expanded activity. To be able to exploit the mineral potential of the EEZ on a long-term sustainable basis, it is necessary to investigate the nature of each type of deposit and to make an associated oceanographic-environmental evaluation. As the premier institute of Ocean Technology, NIOT will be playing a pioneering role in this area. I was happy to know that NIOT has been conducting in many projects related to deep sea technology which includes development of crawler based mining machine for extracting manganese nodules at a depth of 6000 meters in Indian ocean. I have also come across the fact that deep sea technology group from NIOT is doing research of light weight materials, corrosion studies, imaging and sub sea drive. These are indeed important area of research and development as advanced methods need to be evolved for scout for the resource, and extract them in a cost effective manner. At the same time, NIOT scientific community must also research on the environmental impact of deep sea mining and what could be the mitigation techniques for them. Let me now discuss about the energy which can be harnessed from the oceans. When I met your Director in Delhi, told me that you have also developed an

underwater platform and commissioned, this will be an important research tool for faster acquisition of knowledge in the sea bed.

Ocean Based Energy

According to the 2008 BP Statistical Energy Survey, India has proved natural gas reserves of 1.05 trillion cubic metres, 0.59% of the world total. The bulk of India's natural gas production comes from the western offshore regions, especially the Mumbai High complex. The onshore fields in Assam, Andhra Pradesh, and Gujarat states are also major producers of natural gas. India has natural gas production of 30.17 billion cubic meters. There have been several large natural gas finds in India over the last five years, predominantly in the offshore Bay of Bengal.

Oceans also provide for a variety of energy sources which could be harnessed. I am happy that NIOT has created a special group for exploring the potential of generating fuel through gas hydrates. As you may know the energy potential in the gas hydrates amount to twice as much as all fossil fuels combined. Gas hydrate estimated to contribute a very large amount of methane, a potential clear hydrocarbon fuel resource. I learnt that in India occurrence of gas hydrates was proven during JOIDES drilling program of NGHP under Ministry of Petroleum during 2006. This provides a tremendous potential which may emerge a prominent energy resource for the nation in the future.

The import cost in 2009 of oil and natural gas was about 150 million tonnes worth more than Rs. 400,000 crores (\$90 billion). Moreover, every time we import petroleum products we indirectly import GHG gases, as each liter of petrol burnt produces about 2.7 kg of CO₂. This situation has to be carefully addressed as a large fraction of our net imports are Petroleum imports only and hence major fluctuations in the international prices of Oil and Gas has the potential to destabilize our balance of payment. This highlights the need to generate the next generation alternative fuels which are economical, fast to produce and safe to use. In the future, India has to take strides towards achieving energy independence which means generation of its energy requirements by a combination of non-conventional sources like wind, solar, nuclear, tidal and geothermal energy. I was glad to know NIOT is working on ocean based renewable energy scheme as part of which it is already commissioned the first wave powered (75 kilo watt) desalination plant at Vizhinjam, India. I was also happy to know that energy and fresh water group of NIOT has been focusing on wave energy conversion using floating wave powered devices called backward Bent Ducted Buoy.

One clean fuel is in the form of bio-diesel from Algae. Recently, I visited Eastern Kentucky University in USA where they have set up a research center for Algae Oil. Algae can be easily grown in low lying shallow areas of the sea and can later be used to extract Algae oil which can act as a supplement to the conventional petroleum derivatives. Algae Oil is far superior in terms of yield per hectare and compared to conventional bio-fuel crops like corn, which generate about 172 liters per hectare, Algae Oil can generate more than a hundred times that yield. The challenge is to develop better technologies which can bring down the cost of generation of Algae oil. NIOT can pioneer the work of marine algae oil research in the nation which can be done in partnership with foreign universities engaged in algae oil research.

Another area of green clean energy is that of wind energy. India has over 7000 km long coastline which presents a huge potential for off-shore wind energy generation. The present potential of wind energy in India has been worked out to be 45,000 MW. NIOT can partner with relevant technological institutions for launching studies to explore potential of off-shore wind farms in India.

Now I would like to talk about the disaster prediction especially against tsunamis and discuss some technological perspectives about it.

Disaster Prediction

When a magnitude 9.1 tremor struck Sumatra, Indonesia, in 2004 and created a 100-foot tsunami that killed more than 200,000 people worldwide, researchers were largely in the dark and there was little warning that the wall of water was racing for the vulnerable shores. This Tsunami was one of the worst disasters India and the world faced. In India, more than 10,000 people lost their lives and about 400,000 ended up as refugees.

I was reading about magnitude 8.8 quake struck Chile on this Feb. 27th when technology provided much needed early warning. A team of scientist was providing detailed and accurate reports in hours about what potentially affected communities should expect. This was possible due to their worldwide network of tsunami-detection devices. In 2008, a team from disaster management agency, National Oceanic and Atmospheric Agency, USA, deployed 39 deep-ocean Assessment and Reporting of Tsunami (DART) detection buoys that make up the U.S. tsunami detection system. These deep ocean buoys have a great advantage over the traditional tide gauges. Tide gauges can be affected by underwater geography near the shore and not give an accurate picture of the strength and direction of tsunamis. DART buoys, on the other hand, are placed in deep water. A sensor is dropped from the buoy to the ocean floor and by measuring water pressure it can detect movement of a tsunami wave only a centimeter in height.

I understand that NIOT is also working in the direction of Tsunami warning systems through its research area of ocean observation system and deployment of data buoy network, and I am sure these technological aspects would be kept in mind while designing such a mission.

PURA as a Sustainable Development tool and PURA Corporation

Friends, this year India will turn 63 years old as the largest democracy in the world and we witness a defining period for the nation and its people. We stand ten years away from the goal of achieving the vision for a developed India by 2020, and there has been significant progress in all directions. Each step we take towards a developed nation also opens a fresh challenge to overcome. The need of the hour is the evolution of sustainable systems which act as “enablers” and bring inclusive growth and integrated development to the nation.

One such sustainable development system is the mission of Provision of Urban Amenities in Rural Areas (PURA). It means that:

1. The villages must be connected with in themselves and with main towns and metros through by good roads and wherever needed by railway lines. They must have other infrastructure like schools, colleges, hospitals and amenities for the local population and the visitors. This is **physical connectivity**.
2. In the emerging knowledge era, the native knowledge has to be preserved and enhanced with latest tools of technology, training and research. The villages have to have access to good education from best teachers wherever they are, must have the benefit of good medical treatment, and must have latest information on their pursuits like agriculture, fishery, horticulture and food processing. That means they have to have **electronic connectivity**.
3. Once the Physical and Electronic connectivity are enabled, the knowledge connectivity is enabled. That can facilitate the ability increase the productivity, the utilization of spare time, awareness of health welfare, ensuring a market for products, increasing quality conscience, interacting with partners, getting the best equipment, increasing transparency and so in general **knowledge connectivity**.
4. Once the three connectivities viz Physical, Electronic and knowledge connectivity are ensured, they facilitate earning capacity leading to economic connectivity. When we Provide Urban Amenities to Rural Areas (PURA), we can lead to upliftment of rural areas, we can attract investors, we can introduce effectively useful systems like Rural BPOs, Micro Finance.

The number of PURA for the whole country is estimated to be 7000 covering 600,000 villages where 700 million people live. There are number operational PURA in our country initiated by many educational, healthcare institutions, industry and other institutions. Government of India is already moving ahead with the implementation of PURA on the national scale across several Districts of India

I was happy to learn that NIOT with a long term vision of developing energy and fresh water technologies has commissioned a one lakh liter per day capacity desalination plant in Kavaratti Lakshadweep in July 2005 and also commissioned a one million liter per day capacity barge amounted desalination plant near Chennai coast in April 2007. This is indeed a societal mission with far reaching impact.

NIOT Island PURA

National Institute for Ocean Technology with its core-competency in marine technology may like to take the undertake of evolving an Island PURA. I visualize a unique profile of an NIOT Island PURA which can be a way to generate economic activity in all the islands and also deliver welfare in the form of better employment and life to the local people.

As scientists and experts, who are the torchbearers of the knowledge movement, all of you need to find unique opportunities which can be undertaken under PURA. The Island PURA would present three prominent competencies which the region needs to focus on. They are fishing and maritime industry, forest product based industry and tourism. In all these sectors we must find avenues of application of technology to improve the yields coming out.

To achieve better physical connectivity, the NIOT Island PURA should develop small and medium boat landing centres and community sheds for maintenance of fishing equipment. Improving markets and providing them connectivity to the production centre by the means of roads is needed to facilitate better economy gains. The Island PURA should give electronic connectivity in the form of wireless connectivity using HAMSAT and Satellite radio. Knowledge of the best fishing practices and technologies for processing of the product should be implemented into the PURA Complexes.

Data on metrology and sea state should be converted into meaningful information which can benefit the local fishermen. The scientific community need to share a common platform and develop optimal ways to collect data and disseminate them with the help of technological intervention and innovative practices. Bringing in the physical, electronic and knowledge connectivity together these Island PURAs should focus on tapping the entire value chain of the industry. This can come about when the best technology is employed.

The Island PURA must also focus on value adding research exclusive to the Island development of the nation. For this, an Island research zone may be established within the island PURA which can continuously evolve scientific ways to harness the core competencies of the islands. For example, when I visited Iceland, I saw, how they have converted threat from the volcano into an opportunity for providing heating and generation of unpolluted power. They have mapped the areas where hot springs exist at a depth of nearly 2 kms. These springs provide hot water mixed with steam which is separated in a plant. The hot water is taken to the cities on insulated pipeline for providing heating to the houses and the steam is taken to the turbines for generation of electricity. I saw a cluster of plants which had a generating capacity of 90 MWe. They are planning future geothermal electric plants of the size of 120 MWe. This utilization of hot spring water also provides a natural bleeding for the system reducing the possibility of further volcanoes in the same region. NIOT can also study the possibility of converting the volcanic barren island for generating electricity which can be useful for the entire Andaman & Nicobar Islands? NIOT PURA can adopt the mechanized deep water fishing, fish processing, storage and marketing to enhance the yield. Some of the islands in PURA can be made into an integrated tourist destinations with infrastructure built through leasing of certain areas to reputed Build Own and Operate Companies on the lines of Maldives. The combined effect of improving the fishing, production of electricity from geothermal sources and pro-active tourism can definitely generate wealth for the people in the PURA Complex and improve the human development.

Conclusion

Friends, NIOT is the premier institute of ocean technology of the nation and has a vital role to play in welfare of the nation and its people. All of you through your technological competence and acumen will be undertaking many missions which will be having many far reaching implications on how the future of India shapes. Ocean wealth on the sea, under the sea and above the sea will a great wealth generator which will give thrust to the economic development of the nation and have

a dream, in five years NIOT will be known as a successful institution that made a change to the nation.

At this point I would like to recall the saying of Maharishi Patanjali, about 2,500 years ago: "When you are inspired by some great purpose, some extraordinary project, all your thoughts break their bounds. Your mind transcends limitations, your consciousness expands in every direction, and you find yourself in a new, great and wonderful world. Dormant forces, faculties and talents come alive, and you discover yourself to be a greater person by far than you ever dreamt yourself to be." If you dream and work for it, I am sure, you will definitely succeed in your missions.

My best wishes to all of you in all your endeavors.
May God bless you all.

By, Dr. APJ Abdulkalam