Tsunami WS abstract

Takashi Kume

The tsunami of 26 December 2004 struck the Nagapattinam District, Tamil Nadu, India. Sea water inundation from the tsunami caused salinization problems for soil and groundwater in coastal areas of the district, and also induced salt injuries in crops. To document the recovery of the agricultural environment from the tsunami, we conducted observations of the soil, groundwater, and vegetation. Soil electrical conductivity increased sharply after the tsunami, but returned to pre-tsunami levels the following year. Groundwater salinity returned to pre-tsunami levels by 2006. These rapid rates of recovery were due to the monsoon rainfall leaching salt from the highly permeable soils in the area. MODIS NDVI values measured before and after the tsunami showed that vegetation damaged by the tsunami recovered to its pre-tsunami state by the next rice cropping season, called samba, which starts from August to February. From these results, we conclude that the agricultural environment of the district has now fully recovered from the tsunami. Based on the results, we have also identified important management implications for soil, groundwater, and vegetation as follows: 1) due to the heavy monsoon rainfall and the high permeability of soils in this region, anthropogenic inputs like fertilizers should be applied carefully to minimize pollution, and the use of green manure is recommended; 2) areas that were contaminated by sea water extended up to 1000 m from the sea shore and over pumping of groundwater should be carefully avoided to prevent inducing sea water intrusion; and 3) data from a moderate resolution sensor of 250 m, such as MODIS, can be applied to impact assessment in widespread paddy field areas like the Nagapattinam District.

B.R. Neupane

It has been over five years since a gigantic tsunami hit the eastern coastline of India, leading to massive destruction of human life, affecting the flora and the fauna of the effected regions in large scale. Large amount of funds flew to the countries that were most struck by this catastrophe, and many organizations and campaigns were initiated for purpose of restoring the displaced and building back the environment post this devastation. Five years on from the tsunami, the majority of programmes have now been completed. Recovery programmes ended in India in 2007, with remaining work handed over to national authorities or integrated into existing programmes of the Governemnt of India.

The tsunami caused extensive damage to the coastal areas of Tamil Nadu and Pondicherry, and posed a serious threat to the groundwater resources of the effected regions. The seawater intruded over the land due to tsunami and fills wells, ponds, stores at low depression areas, percolated down through the subsurface and invades the porous rocks/formations, which in turn caused adverse

consequences when the intruded brackish water penetrated the aquifer and reached the groundwater.

In March 2005, UNESCO implemented a detailed assessment of the impact of the December 26, 2004 tsunami on the groundwater resources for Chennai (capital of Tamilnadu State), Karaikal (town in the Pondicherry Union Territory), Nagappattinam, Mahabalipuram, Velanganni and Cuddalore (towns in the Tamilnadu State). The study revealed a large variation in the groundwater level prior and after tsunami, ranging in between 0.5-5.5 m, and significant intrusion of the tsunami flood in the tune of 2 km from the coastline at many places. It had also revealed the extent of changes in the chemical composition and groundwater quality. A set of lessons were drawn for remediation.

In March 2009, another assessment was undertaken in the same areas to understand the extent to which the remedial measures were implemented and to ascertain effectiveness there of. The study provided a few key lessons and ensued the need for furthering a more systematic investigated on groundwater resources of the area. While the recovery and reconstruction work had been integrated in the on-going governmental programs, a more systematic risk reduction approach appeared lacking. This paper presents the lessons of the two assessments and proposes the salient features of a new project pegged on groundwater resources in the area.

Veera Muangsin

The tsunami on 26 December 2004 was the first time that Thailand had experienced this kind of disaster. It addressed urgent needs for the country to be prepared should it ever occur again. This paper presents an on-going effort to strengthen tsunami preparedness of Thailand with a tsunami warning system based on computer simulation and information technology. Our work has involved three projects. Firstly, we developed a tsunami warning system based on tsunami simulation database for the National Disaster Warning Center (NDWC). Secondly, we are developing a real-time tsunami simulation program using a parallel computing technique. Another on-going project is to develop a tsunami warning system based on real-time water level data and an inversion technique for the Asian Disaster Preparedness Center (ADPC). The project is now under Regional Integrated Multi-Hazard Early Warning System (RIMES). These works are owing to collaboration with Thai National Grid Center and the Global Scientific Information and Computing Center (GSIC) of Tokyo Institute of Technology for providing supercomputing facilities.

Poh Poh Wong

The Indian Ocean tsunami of 26th December 2004 wrought a heavy toll to human life, property and economic activities. It brought substantial damage to coastal tourism which is important in Thailand, Sri Lanka and the Maldives. The environmental resilience of Thai tourist coasts at Phuket Island, Khao Lak and Phi Phi Island is examined through field data and secondary

sources. The focus is on the tsunami impacts on the tourist coasts, the recovery of the beaches and infrastructures and the lessons learnt from the recovery and reconstruction process. Emphasis was given to the recovery of Phuket Island, particularly to Patong Beach which recovered within a year. Phi Phi Island had previous land use problems and less progress was made. Khao Lak was most affected by the tsunami and has not fully recovered. One particular beach, Bang Niang, illustrates measures taken by the developers who have almost protected the entire beach with seawalls with consequences for dramatic beach changes between the monsoons. While beaches recovered through natural processes in the post-tsunami period, the resilience of beaches had also improved by measures such as raising the backshore, the filling-in of depressions behind sand dunes and the replanting of coastal biobelts. The resilience has not been further improved by the reconstruction of hotels and tourism infrastructure as setbacks have not been implemented or enforced, with buildings still close to the coast, and few new tourist structures are tsunami-proof. Overall, the tourist coasts have tsunami warning towers, supplemented by evacuation routes and signs and, more recently, the construction of tsunami shelters at Khao Lak.

B.Shanmugasundaram

An Expost facto study was conducted among 120 Tsunami affected rice farmers belonging to 16 villages of Nagapattinam and Cuddalore districts of Tamil Nadu and Karaikal region of Union Territory of Puducherry. The study was taken up to propose a strategy for Tsunami affected Rice farmers. The Nature and Extent of damage to the affected rice fields, socio economic condition of farmers, Interventions made by different agencies and level of mitigation, Extent of adoption and Causes for non adoption of recommended post tsunami practices were studied. The damage function revealed that the damage due to tsunami in the rice fields in the increasing order was soil damage followed by water damage, crop damage and livestock damage. Socio economic changes with respect to Area, Yield, Income, Farm changes, Home changes, Material changes, Social changes, Economic changes, Health Education and Spiritual changes were assessed. About 28 Interventions made by 23 agencies were documented. Activities such as Gypsum distribution, Daincha seed distribution, Group formation, Providing cash relief to farmers,Demonstration in farmers field, Providing crop loan, Canal desilting and animal health care were performed by agencies which benefited more than 50.00 per cent of the farmers. The study shows that only 17.50 per cent of farmers in the first season after Tsunami have expressed that their lands have been completely mitigated due to the post tsunami interventions. Overall Knowledge, Awareness and Adoption of post tsunami rice cultivation practices shows that the respondents fall in the Medium and High categories. Technological, Psychological, Social, Environmental and Personal causes were the reasons for non–adoption of post tsunami rice cultivation practices. Strategies for Government system, Research System, Extension System and Client System were also formulated.

R.C. Srivastava

The Andaman and Nicobar Islands popularly known as the bay islands are situated 1200 km away from Indian mainland and are well known for their wide range of biodiversity. The dreaded tsunami hit the island on 26th December 2004 leading to devastation of livelihood, biodiversity, water and land resources. In post tsunami scenario, the life of the people was devastated due to loss of natural resources and they were surviving on the doles given by the government/NGO as relief measures and on their earlier savings with their self confidence levels at lowest level. The government/NGO initiated work for cash programme for providing livelihood to them through cash for work programme. Although, this provided them immediate relief and their income were around Rs 1500 to 2000 p.m, but they were reduced from honourable farmers to daily wage labourers and this had hit their self esteem badly. Survey on farmer's behavioral changes using open end questionnaire method on all the adopted villages after tsunami suggested that nearly 80% of them had decided to abandon agriculture and were expecting the government to announce relief packages for their livelihood and alternate employment opportunities. They felt that agriculture based on the damaged/degraded natural resources cannot provide them sustainable livelihood. The challenge was to see whether their livelihood through agriculture could be restored through suitable technological interventions aimed towards restoring natural resources and their self esteem and confidence as an honourable farmer brought back.

Central Agricultural Research Institute, Portblair undertook a study with the aim of restoring the livelihood of the tsunami affected farmers through various agriculture and allied technological interventions in the tsunami affected cluster of villages namely, Guptapara, Manjery, Manglutan and Indira nagar of South Andaman through participatory mode as well as developing a model for dealing such scenario in future. Post tsunami scenario was characterized in three situations, namely i) low lying coastal area where there was permanent inundation of sea water in the agricultural lands, ii) low lying coastal areas where sea water reaches the agricultural land with every high tide and recedes with low tide and iii) low lying coastal areas where sea water intruded the agricultural fields only during the event of tsunami and later receded permanently. Technological module specific to the each situation was developed and implemented for restoration of livelihood of target group. Livestock based (dairy, goatery, piggery and backyard poultry) interventions were implemented for the first situation, where the affected farmers had lost cultivated land and livelihood through land could not be restored. In the second situation, interventions like sea dyke construction along with sluice gate were made to arrest the ingression of sea water in to the agricultural land during high tide. Interventions were made with technologies like Vegetable cultivation on Raised bed with coconut husk on areas just near the sea shore; Crop diversification through broad bed and furrow (BBF) method of rice and vegetable cultivation in waterlogged lowlands and Brackish water based

integrated farming system affected by cyclinc tidal waters were implemented to raise the income of the affected farmers. In situation III, mat nursery technique, system of rise intensification (SRI), fresh water based integrated farming system, high yielding varieties in cereals, vegetables, spices and plantation crops, saline tolerant crops, composting, azolla cultivation, integrated pest management practices to advocate bio pesticide applications were the need based interventions made to enhance the agricultural productivity more than pre tsunami levels to compensate the loss of production and income from degraded lands. In addition to technological interventions, efforts were made to intensify agriculture through creating water resources by open dug well cum water recharge structures (gabions along the nallah) in the affected village in participatory mode through Water User Association (WUA) formed by the farmers of the affected villages by registering under Societies Act in the island for the first time. This helped in sustainable use of water resources for irrigation and house hold. The socio-economic impact of the interventions were also analyzed and found that there was significant success in restoring the livelihood and nutritional security of the affected farmers and establishing an agrarian model village in the tsunami affected area.

The number of incidence of natural disasters is increasing fast due to climatic change and global warming and man made interference. Each natural disaster leaves a trail of destruction, damaged/degraded natural resources and loss of livelihood of affected population and this requires a scientific approach for rehabilitation of natural resources and livelihood. This study fulfills this objective of developing scientific approach for restoration of livelihood not only relevant to this particular disaster but also to such type of other disasters as evident by the following results of this study.

1. To alleviate salinity caused by one time sea water intrusion in high rainfall area, there is no need of addition of chemicals to reclaim it. Simple field bunding to facilitate storage of rain water and its deep percolation will do the needful. The construction of field bunds will also provide immediate employment to the affected people.
2. Where the agricultural land is totally lost, the livestock based farming system will provide livelihood.
3. Wherever there is cyclic inundation of either freshwater or brackish water, pond based integrated farming system can provide livelihood.
4. Intensification of agriculture through better technologies and water resource development in areas where land resources are least affected, can enhance productivity higher than pre disaster levels and therefore can compensate for loss of production and income due to damage /degradation of natural resources by disaster in other part of farm holding.
5. Technology selection should be compatible to socio-economic conditions and need of farmers.

Thus this study has technological and scientific relevance both at local level as well as

national/global level, because it provides knowledge on restoration of natural resources and livelihood for this particular natural disaster as well as for future natural disasters.