

**SUBJECT NO.05**

**Sub: Engg- VUDA– Erosion of Sea – Partial collapse of compound wall on Southern and Eastern sides of Kursura Submarine Museum and caving in of footpath at R.K. Beach – Public concern and apprehension – Visit to CWPRS, Pune by team of officers from VPT, VUDA, GVMC and AU for the development of scheme towards short term and long term measures to be taken up – Board subject placed before VUDA Board for perusal and ratification - Reg.**

- Ref:
1. Collapse of compound wall on 04-01-2014 due to erosion of beach.
  2. Beach Erosion on 30-01-2014.
  3. T/O. Lr. Rc.No.72/2013-2014/EE-II, VUDA, Dt.03-02-2014 addressed to Director, CWPRS, Pune.
  4. Rc.No.72/2013-2014/EE-II/VUDA, Dt.01-03-2014.

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**Agenda Note:**

It is to submit that VUDA and NAVY are jointly maintaining the Kursura Submarine Museum at R.K. Beach since its installation during the year 2002. A compound wall was constructed around the museum to safeguard the museum compound. Previously, erosion had occurred owing to surge of the sea and thereby a threat was posed for damage of compound wall on sea side during the year 2005. At that time, care has been taken to protect the wall and as per the suggestion given by the experts in the field, large size boulders were placed along the sea side compound wall to prevent erosion.

Now, after span of 10 years, might be due to change in the water currents, recent cyclones and climatic changes, erosion of beach has taken place at the side of Kursura Submarine Museum and along R.K. Beach recently. Because of the above, the compound wall on southern and eastern sides collapsed partly on 04-01-2014 and posed threat of further damage to Kursura Submarine Museum premises. News item was also published in daily newspapers.

- Immediately instructions were issued to take up necessary protective measures on war-foot basis to protect the compound wall and submarine museum compound from further damage.

- In compliance, Engineers of VUDA have taken up dumping of large size boulders (having volume 0.50 to 1.00 CuM size stones) on southern and eastern sides adjacent to compound wall and completed the necessary protection work to prevent further damage temporarily.
- The material used for the above work was brought from Madhurawada where rock cutting is in progress under improvement of gradient for formation of 100' wide Master Plan Road via Law College.

Subsequently, on 30-01-2014, again beach erosion took place beside Kursura Submarine Museum causing damage to retaining walls at R.K. Beach posing threat to caving in of existing foot path and road opposite Rajiv Smruthi Bhavan. Thereupon, District Collector, Visakhapatnam, Commissioner, GVMC, Vice-Chairman, VUDA officials of GVMC and VUDA have rushed to the spot and Professors of Andhra University and experts from NIO and other Institutions were called for and examined the erosion.

- After witnessing the site condition, it is opined that immediately, large size boulders or stones are to be dumped along the foot path side to prevent further damage.
- The permanent protective measures and to find a solution to prevent the erosion, Expert opinion has to be obtained from the Competent Authority and technical experts in the field on thorough investigation and studies required in this regard as it involves time and huge financial commitment.
- Accordingly, GVMC and VUDA have taken up the work - dumping of boulders and huge stone matrix from 31-01-2014 to prevent further damage as part of the footpath was collapsed within two days.
- Necessary precautions were taken at the site to restrict the entry of public by way of barricading and placing caution boards and hurdles with the help of Police Department.
- The daily newspapers have published the above phenomenon widely for three days continuously.

Later, the Hon'ble Minister for Infrastructure & Investments and Ports Sri Ganta Srinivasa Rao visited the site on 02-02-2014 and Commissioner,

GVMC and Vice-Chairman, VUDA and other officials of GVMC and VUDA were present. There on instructions were issued to complete the preventive measures on top priority and to take up the permanent remedial measures after making detailed and exhaustive study on the issue and obtaining expert opinion from the competent authority to protect the R.K. Beach.

**Convening of the meeting for further action:**

Further, the District Collector, Visakhapatnam convened a meeting with all the experts in this particular field i.e., Oceanography, Ocean / Coastal Engineering, Andhra University, Civil Engineering Department, Visakhapatnam Port Trust, GVMC and VUDA on 03-02-2014 at 10.00 A.M in Collector's camp office to discuss on the possible ways and solutions for prevention of erosion of beach both short term and long term so as to take a decision to proceed further on the above with the following officers.

|                                |   |   |
|--------------------------------|---|---|
| Sri M.V. Satyanarayana, I.A.S  | - | Commissioner, GVMC  |
| Dr. N. Yuvaraj, I.A.S          | - | Vice-Chairman, VUDA   |
| Sri V.S.N. Murthy,             | - | Scientist, NIO  |
| Sri Ramachandra Rao            | - | Chief Engineer, VPT   |
| Dr. P.M. Raju,                 | - | Superintending Engineer, VPT  |
| Prof. D.S.R. Murthy            | - | Head of the Dept., Civil Engg. AUCE   |
| Prof. CNNV Satyanarayana Reddy | - | Dept., of Civil Engg. AUCE  |
| Prof. M.G. Muni Reddy          | - | Dept., of Civil Engg. AUCE  |
| Sri B. Jayarami Reddy          | - | Chief Engineer, GVMC  |
| Sri I. Viswanadha Rao          | - | Chief Engineer, VUDA  |
| Sri T. Madhusudan              | - | Former Engineer in Dredging Corporation of India (Citizen of Visakhapatnam) |

During the meeting, the officers present have expressed their views and experiences in similar instances occurred in the past in respect of other Beaches and shore areas within the country and abroad.

- The Chief Engineer, VPT has informed that, when similar instance occurred at Submarine Museum during the year 2006, one Executive Engineer from VUDA and one Executive Engineer from VPT was sent to CWPRS, Pune to get their inputs and suggestions for protection of

beach front in view of urgency. Thereon, CWPRS suggested a scheme for immediate protection and to prevent sea erosion and the same was implemented then.

- Prof. M.G. Muni Reddy, Ocean Engineering, Dept., of Civil Engineering AUCE has stated that the solution should be site specific and any protective measure should not be adopted in general as it will not work out and proves to be unfruitful in the long run.
- Prof. CNNV Satyanarayana Reddy, Soil Mechanics and Foundation Engineering, Dept., of Civil Engineering, AUCE has suggested that the preventive measure taken now will be sufficient provided the slopes are to be protected with geo-synthetics to a geometric shape and by way of constructing geo tubes along the shore by filling with sand for dissipation of energy of waves so that beach fill can be developed by filling with sand.

During the discussions as an additional input Sri P.M. Raju, Superintending Engineer, Visakhapatnam Port Trust has contacted Prof. Sundar, Specialist in Ocean Engineering in IIT, Madras and requested to visit R.K. Beach, Visakhapatnam to examine the present situation and to offer his suggestion in this regard as per the instructions of District Collector, Visakhapatnam.

Finally, it is opined that the following could be the possible causes for the present damage.

1. The development and functioning of Gangavaram Port on the North of Visakhapatnam Port Trust for the past three to four years and the activities taken up by Gangavaram Port are to be studied and whether the sand dredged is being by-passed for beach fill or not has to be examined.
2. Short-fall in the quantity of deposit of sand in the existing sand trap in Visakhapatnam Port Trust Area.
3. Effect of series of cyclones(3 Nos.) occurred at a stretch during this North-East Monsoon period.

4. Insufficient beach nourishment in the shore area in the recent periods by Visakhapatnam Port Trust.
5. Heavy tidal affect and variation in wave propagation.

Further, it is agreed by all the officers present that the SoS method adopted i.e., dumping of large size boulders along the compound wall of Submarine museum and beach side at R.K. Beach for immediate arrest of the sea erosion is the only method readily available to prevent further damage being the recommended practice by the experts in case of emergency. The only precaution has to be taken is to fill the beach with sand using suitable methods and constructing a barrier along the sea shore with sand bags or geo-synthetic tubes or bags to avoid rock surface along the beach in the long run.

Finally, the Chief Engineer, Visakhapatnam Port Trust, Scientist, NIO and Sri M.G. Muni Reddy, Professor of Dept., of Civil Engg. AUCE have suggested that it is desirable to contact CWPRS (Central Water and Power Research Station), Pune being the only competent authority in the country for suggesting protective measures both soft and hard solutions to protect the R.K. Beach in the long run.

#### **Decision arrived in the meeting**

Accordingly, District Collector, Visakhapatnam, Commissioner, GVMC and Vice-Chairman, VUDA have decided to send a team of officers from VPT, VUDA, GVMC and AU to CWPRS to study about the possible causes for the incident happened and to obtain suitable solution for the erosion of sea along the coastal line of Visakhapatnam City and to protect the Submarine Museum and R.K. Beach duly explaining the site conditions and series of events that occurred during the last two months.

There upon the following officers are nominated to visit CWPRS, Pune to study the sea erosion problem occurred at R.K. Beach.

|                       |   |   |
|-----------------------|---|---|
| Sri I. Viswanadha Rao | - | Chief Engineer, VUDA                    |
| Sri Rajanikanth       | - | Superintending Engineer, VPT.           |
| Prof. MG. Muni Reddy  | - | Andhra University, Dept, of Civil Engg. |
| Sri M. Vinay Kumar    | - | Executive Engineer, GVMC                |

In pursuance of the decision taken above, Vice-Chairman, VUDA addressed Mr. S. Govindan, Director and Mr. Kudale Joint Director, CWPRS, Pune vide reference 3<sup>rd</sup> cited above informing the recent happenings occurred at Submarine Museum and R.K. Beach and requested to indicate the date when the team from Visakhapatnam can visit CWPRS with the data available towards the objective of preparation of site specific scheme. In response, it was informed that the team may visit between 10<sup>th</sup> -12<sup>th</sup> of February, 2014 through e-Mail. As per the above, Vice-Chairman, VUDA have issued instructions to all the nominated officers to proceed to CWPRS, Pune on the said dates to get the scheme.

### **Visit to CWPRS, Pune**

Accordingly, all the four officers nominated were proceeded to Pune on 09-02-2014 and attended to CWPRS office from 10<sup>th</sup> to 12<sup>th</sup> February, 2014 for appraisal of the incidents occurred and discussions on the subject. During the visit, the CWPRS officials have shown the physical model of Visakhapatnam Port Trust and other ports in the country including wave propagation, design of breakwaters and other important harbour and irrigation structure models and explained the technical features comparing with the actual ground position.

After examining the present incident occurred along with the data available and considering the similar instances happened in the past along the coast of Visakhapatnam and development activities that are being taken up from time to time by Visakhapatnam Port Trust and their impact, the Joint Director, Scientist and Research Officers concerned of CWPRS have discussed in detail and explained about the littoral drift phenomenon, the behaviour of the coastline at Visakhapatnam, technical significance of the beach nourishment, disposal, location and period of disposal. Summing up the discussions, some of the reasons for the erosion and damage to the coast line could be stated and short term measures and to evolve long term management plan, the activities that are required are listed out and recorded in the Minutes of the Meeting communicated.

Finally, the Chief Engineer, VUDA requested that the CWPRS officials may immediately visit the eroding beach site at Visakhapatnam so that the decision for immediate protection works can be finalized.

As per the Minutes of the Meeting (copy enclosed), the short terms measures suggested are:

- Regarding the damage occurred to the protection wall of the Kurusura Submarine Museum, it is necessary to repair the same by providing a similar pitching work of the stones as was done in the past in consultation with CWPRS.
- The 200 m long portion of the beach south of the Kursura museum has suffered erosion for about 200 m length of the beach with damage to the footpath and caving of the earth fill.
  - This was a result of undermining of the footpath along the road due to wave action.
- In order to prevent further receding of the land, immediate measures like providing a protection in the form of sand filled geo-textile containers can be adopted before restoring the footpath.
  - However, this protection will only provide very temporary solution for the further receding of the land and it may not help in restoring the beach.
  - The necessary sectional details for the temporary protection will be furnished by CWPRS.
- The present scenario of the erosion has occurred during the north-east monsoon due to depletion of the sand supply to the beach. In this season, some littoral movement is expected towards south.
  - However, due to depletion of the sand bypassing quantities not much accumulation has occurred on the north side of the Catamaran Harbour.
  - In the pre-monsoon period it is expected that some onshore movement of sediments may occur with positive effect on the beach. However, with the onset of the south west monsoon in May, the long shore drift will be towards north.

- In the absence of sufficient sand nourishment to the coast, the beach would be adversely affected with similar erosion recurring in the beach front near Gokul park.
- As such, it is very much essential to create advance buffer of sand through other means of beach fill. The concerned authority may explore possibilities of identifying suitable sources of sand for beach fill in consultation with VPT.
- This bypassing has been done by VPT, however there is no sand supply in the sand trap of the Visakhapatnam Port.
- A proposal for identifying borrowpits in the offshore area can also be explored.
- The involvement of the Gangavaram Port Authorities would be essential to bypass the sand from updrift to downdrift side of the port by adopting a similar sand bypassing system as is being practiced by Visakhapatnam Port.
  - This activity needs to be taken up before the onset of the coming South West Monsoon season.
  - As an immediate measure, a Sand Trap can be created along the south breakwater of Gangavaram Port and the material from the capital dredging quantity can be immediately disposed directly on the coastline at Visakhapatnam.
- The nourishment of beach by VPT using floating pipeline should ensure that the pipeline is taken closer to the surf zone say up to (-) 1.0 m contour.
  - It is also suggested that the entire quantity dredged from the sand trap should be bypassed by VPT for beach nourishment instead of dispersing in the offshore dumping ground.



## **Long Term Coastline Management Plan (LT-CLMP)**

In addition, it is opined that the model studies will identify the effect of storm surge and wave attack and their impact at the vulnerable beach for monitoring and advance actions. In this context, a long term coastline management plan will be evolved and the following activities are proposed:

1. A detailed field data collection programme has to be taken up for collecting data on beach profiles adequately covering surf zone, littoral currents, sediment properties like sediment concentrations, bed sediment characteristics, tides, wave approach conditions, bathymetry survey and identification of borrow pits etc. The field data has to be arranged by VUDA/GVMC/CWPRS will provide guidance in this regard for identifying suitable agencies etc.
2. Desk studies and mathematical model studies can be taken up for storm surge estimation, wave propagation, coastline evolution using remote sensing and shoreline management studies. A detailed proposal in this regard can be submitted by CWPRS on formal request from the sponsoring authority.
3. In due course a detailed monitoring programme has to be taken up by VUDA/GVMC to regularly monitor the beach by taking field measurements. If necessary a new unit may be created for this purpose by VUDA/GVMC. Necessary assistance in the form of training to the officers and guidance regarding monitoring of the beach can be provided by CWPRS / VPT.

It is further to state that as per the oral enquiry made with officials of CWPRS regarding the consulting fee for model studies, it was informed that it costs around Rs.50.00 Lakhs (Approx.) and the necessary data has to be furnished to them including local assistance during their stay.

### **Future course of action proposed**

In the above mentioned circumstances, wherein the long time actions required subject expertise involved expenditure warrant, a permanent

monitoring system, the efforts of all organisations which have raised to the occasion of R.K Beach erosion, have to be converged so that the benefits accrue to the requirement and the Committee thus constituted should have the following broad objectives viz,

- To periodically review and insist the beach nourishment exercises done by various organizations and anti-erosion measures being taken up by the local bodies.
- To get the issues of erosions occurring at different points of time be examined and arriving at the immediate measures required.
- To take the required actions towards long time measures to prevent the erosion of beach - the prestigious one in the country.
- To involve the organizations with similarly objectives and to garner necessary subject expertise and financial help from these organizations for achieving the objectives.
- To achieve the objectives of protection of Beach - duly co-ordinating with all different arms of the Government & Public forums and organizations.

It is proposed to have an institutional mechanism to achieve the above objectives by forming a committee with the members from Vizag Port Trust, District Collector, Commissioner, GVMC and other Members like Vice Chairman, VUDA, Vice Chancellor, AU, Director, NIO, Concerned Commander from ENC, Gangavaram Port, Dredging Corporation of India, Superintending Engineer, R&B, CEO, ZP, Executive Engineer, APPCB and other engineering heads of the ULBs and required subject experts from different walks of the society.

It came to the notice that during the visit of Professors from Indian Institute of Technology – IIT, Chennai to the spot where sea erosion occurred and after viewing the presentation on the incidents happened in the recent past in the Chambers of Commissioner, GVMC, it was informed that it requires around Rs. 25.00 lakhs for conducting the study and giving necessary short term and long term solutions so that the same can be implemented.

In the above circumstances, with the objective of maintaining the prestigious beach of the country, VUDA will be participating in the conduct of study as decided by the GVMC in this regard and it is ready to partner for the expenditure to be incurred towards the conduct of the required study. The GVMC being the urban local body can take a decision duly taking all the above facts and VUDA can take further action on hearing from GVMC in this regard. Accordingly, a proposal is sent to GVMC duly marking a copy to the Government vide Rc.No.72/2013-2014/EE-II/ VUDA, Dt.01-03-2014.

Further, an expenditure of Rs.99,000/- was incurred towards performance of the journey by flight for the said tour by all the four nominated officers from 9<sup>th</sup> - 12<sup>th</sup> February,2014 and Vice-Chairman, VUDA accorded sanction for the above amount. Apart from the above, VUDA has spent an amount of Rs.9.28 Lakhs(4.05 + 5.23),towards providing rock boulders at South side of Kursura Submarine Museum compound wall and at the collapsed compound wall including footpath of beach road in R.K. Beach near Submarine Museum to prevent further damage and to protect the footpath as well beach road under SoS measure as per the advice of experts in the field and based on the past experience.

Hence, the matter is placed before VUDA Board for kind perusal and ratification of the action taken towards expenditure incurred for visit to CWPRS, Pune by the team of officers and protective measures taken under SoS condition to protect the Kursura Submarine Museum compound and beach road including foot paths.

| Sl. No. | Subject No. | Subject  | Resolutions   |
|---------|-------------|--|---|
| 4       | 3           | Engg-VUDA-Details of works for which Revised AS accorded & deviations occurred during execution Subject placed before Board for perusal & approval Reg.  | <b>Subject to the Verification and confirmation by VC, VUDA on the genuineness of the additional expenditure, the proposal is agreed.</b> |
| 5       | 4           | Engg - VUDA - Conversion of Visakhapatnam to Bheemli Beach Road into four lanes - Proposal of R & B Department - Meeting the cost of land acquisition and shifting of utilities by VUDA - Providing funds to a tune of Rs.18.90 Crores from VUDA - Draft subject placed before VUDA Board for approval - Reg.  | <b>Reviewed the earlier decision and agreed to provide the funds as instructed by Government.</b>   |
| 6       | 5           | Engg- VUDA- Erosion of Sea - Partial collapse of compound wall on Southern and Eastern sides of Kursura Submarine Museum and caving in of footpath at R.K. Beach - Public concern & apprehension - Visit to CWPRS, Pune by team of officers from VPT, VUDA, GVMC & AU for the development of scheme towards short term & long term measures to be taken up - Board subject placed before Board for perusal and ratification - Reg. | <b>Ratified the expenditure for the visit to CWPRS, Pune; VC is instructed to pursue with GVMC for arriving at permanent measures.</b>    |
| 7       | 6           | Engg. - VUDA - Proposals for setting up of IT Tower - Domain specific Innovation and Incubation Centre on IT/ITES in marine petroleum and power by STPI in Association with VUDA behind VUDA office complex, Siripuram, Visakhapatnam - Draft subject placed before Board for perusal and to take a decision - Reg.  | <b>Progress of project with STPI is very slow and hence, decided to partner with APIIC; work out further modalities.</b>                  |

*Handwritten signature*  
10/11/2014