Technology Fact Sheet

Creation of artificial underwater reef[i]

1) **Sector:** Water resources

2) **Subsector:** Sea coastal zone

3) **Technology Name:** Creation of artificial underwater reef

4) **Recommended option of technology:** Creation of artificial underwater reef

5) **Scale:** The replication and spreading of this technology is possible for any type of seashore.

6) **Availability:** The technology is available and, combined with the arrangement of artificial swell and construction of dikes it represents one of the most effective and relatively inexpensive way to mitigate the coastline washing off and to adapt to eustazy.

7) **Background/notes (short description of the technology option)**

Wave-breakers are widely used for coast protection in many countries. One kind of wave-breakers is the artificial reefs, created at the most active part of underwater slope – in the wave-strike zone. Besides the breaking of waves, artificial submarine reefs have another important purpose – the ecological function. In the offered technology the artificial reefs, so called "reef-balls" promote the reproduction of algae, fish and shellfish, that correspondingly can facilitate the development of diving for tourists, playing an important role in the Anaklia free tourist zone. The proposed method is used very successfully in the Ukraine. By the formation of artificial underwater reef the same processes are stimulated, as in case of wave-breakers. However, they have some preferences, as it represents the through construction and does not impede the transfer of sediment along the coast. Therefore reef-balls, combined with coastal swell and dikes are one of effective technologies for adopting the coastal zone to climate change. In Georgia's conditions the construction of submarine reefs could be conducted along the coastline in the wave-strike zone. The artificial underwater reef could be created of concrete construction, produced at the land-disposed concrete manufacturing plant and mounted at the bottom of the sea using special technology. The artificially created submarine reef promotes the breaking of the wave and preserves the beach from washing off.

Advantages of technology:

* The unique character and preference of the method consists of the fact, that it facilitates the preservation of the beach, represents inexpensive technology and keeps the seashore landscape undistorted, as the reef-balls are not visible at the sea surface.

- Artificial underwater reefs contribute to the creation of natural environment for seaweeds, shellfish and fish, and correspondingly they facilitate good conditions for diving in the selected area. Hence, the creation of artificial submarine reefs could be regarded as a valuable technology to provide the solution of both environmental and recreational problems.
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Approximately the same is technology based upon the artificial drowning of ships and the construction of through wave-breakers at underwater slopes.

8) Implementation assumptions (how the technology will be implemented and diffused across the sub-sector)

The proposed technology could be adopted in places endangered by the local degradation of beaches, sea-level rise and the consequent submergence of low-laying neighbouring territories. The technology promotes the effective dissipation of wave energy and the removal of coastal slope profile inland at the rate of sea-level rise 3-5 mm/yr. It could be applied for the provision of safe construction and maintenance of coastal recreation and other types of utilities.

The Black Sea coastal section at the village of Anaklia, located in the northernmost part of the Kolkheti Lowland, represents a technologically damaged area, the natural development of which has been disturbed by the transfer of R. Enguri into the river of Eristskali and by the construction of Enguri HPP giant dam. From 1970-es this anthropogenic interference has stipulated the intensive washing off of beaches in the Anaklia area, being in progress at present. As a result of this process the beach washing off rate from the former mouth of R. Enguri to the outfall of R. Tikori makes about 10m per annum. According to the Georgian government decision at present the free tourism zone is being created here, featured by the construction of multi-storey hotels and other tourism infrastructure. Hence, the adoption of above mentioned technology at the Anaklia seashore would provide the formation of stable natural beaches and, therefore, the preservation of existing there recreational, tourist and other facilities, and natural wetlands as well. At the same time, in case of beach degradation and wiping out, a sufficiently large area of land could be lost in the recreation zone, that is economically impermissible for Georgia with its shortage of land. The proposed technology represents a measure for preventing the development of scenario in this direction.

The artificial underwater reefs are featured with functions of wave-breaking, improving the environmental conditions and promoting the development of diving.

9) Impact statements

- **Social development priorities:** The introduction of offered technology will make a definite share to the promotion of recreation and tourism industry in Georgia.

- **Economic development priorities:** The technology is important for the development of such priority sectors of economy as the tourism and transportation. The adaptation of this technology will facilitate the development of recreation, travelling and transport infrastructure.In particular, the erection of buildings at 4.1 km long coastline

in Anaklia is planned including multi-storey hotels, modern aquapark, bars and restaurants, sporting complexes, the tourist-recreational infrastructure, natural park, sea-water lagoon park, modern motor-highways, rapid communication with the Poti Airport, buildings of hospital and the police headquarters. Stating briefly:
* The creation of a new sea-resort is planned;

  - The construction of a highway along the seashore is planned;
  - The building of a sea-port is planned at the land, which could become an important strategic economic facility.

- **Environmental development priorities:** The offered technology plays an important role in the protection of natural wetlands, as they are being threatened by the eustazy and increasingly intensified storm surges. The presence of natural beaches is recognized as one of effective factors for the preservation of recreation facilities and wetlands. The beaches also represent natural habitat for many species of flora and fauna, hence its rehabilitation technology is valuable from the environmental standpoint as well.

- **Other factors:**
  1. Absence of concrete manufacturing plant near to the coastline;
  2. Problems concerning financial and coastal management.

10) Costs (US$)

- **Capital costs over 10 years:** According to 2007 prices 1m3 of concrete costs 120-150 USD. However, the expenses on the mounting of reef-balls depend on their size, the cost of fuel and concrete, that should be specified after scoping and designing the project.

- **Operational and maintenance costs over 10 years:** The maintenance cost is about 10-30 thousand USD.

- **Other costs over 10 years:** Regular topographical survey and geomorphological examination will cost about 50-100 thousand USD.

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[i] **This fact sheet has been extracted from TNA Report - Adaptation for Georgia. You can access the complete report from the TNA project website http://tech-action.org/**