Technology Fact Sheet

Artificial growing of coastal knolls in width and in height[i]

1) **Sector:** Water resources

2) **Subsector:** Sea coastal zone

3) **Technology Name:** Artificial growing of coastal knolls in width and in height

4) **Recommended option of technology:** Artificial growing of coastal knolls in width and in height

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

6) **Availability:** The technology is available and it represents one of the most effective and relatively inexpensive ways to mitigate and adapt to the sea eustazy, compared with the specially erected dikes or vertical walls.

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

The coastal swells consisting of sand and shingle created naturally as a result of transport by the sea waves of inert material in perpendicular to the coast direction and of sea-level variation. They carry the two-fold function: 1) Swells represent a barrier between sea and land (same to a dike); 2) Swells and the beach are components of a joint system, in which they interact with each other and vary under the impact of wind and waves, climate and sea-level rise. However, when the coast undergoes intensive erosion resulting from the shortage of inert material the underwater slope is being denudated, the coastal swells begin to degrade and are reduced in size, hence they have to be restored artificially.The importance of coastal swells is widely recognized in coast protection activities; therefore their rehabilitation is one of effective technologies aiming the adaptation of coastal zone to climate change.

The rehabilitation of coastal swells or their heightening and widening could be implemented in parallel with the artificial formation of beach or dumping of inert material. This operation could be performed in different ways:
Forming of swell with the abundant inert material delivered by dump-trucks and levelled using bulldozers, graders or excavators;

1. Formation of swell by the “By-passing” method, using sand pipelines, dredgers and hopper-barges;
2. Planting of vegetation at the surface of swell to preserve its stability.

Advantages:
* The rehabilitation and extension in sizes of coastal swells, in contrary to the construction of dikes and concrete vertical walls, does not deteriorate natural landscapes, formed for many years;

- Coastal swells provide the natural habitat for many flora and fauna species, among them for that included in the Red Book (e.g.*Pancratium maritimum),* which require much attention and care. Hence the preservation and extension of coastal swells could

be considered as an important technology to provide the solution of both environmental and recreational problems.

Approximately the same technology is described in:

1. http://techaction.org/Guidebooks/TNAhandbook_CoastalErosionFlooding.pdf
2. http://climatetechwiki.org/content/artificial-sand-dunes-and-dune-rehabilitation
3. http://climatetechwiki.org/content/sea-dikes

However, these sources concern dunes created by the wind, while the proposed technology considers coastal swells formed under the impact of waves and sea-level variation.

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

The offered technology could be adopted in places endangered by the sea-level rise and consequent submergence of low-laying territories. The technology could be applied to provide safe conditions for the construction and maintenance of waterside highways and coastal recreation facilities.

In the northern part of the Kolkheti Lowland at the Black Sea coastal zone near the village of Anaklia natural coastal swells are stretched, representing a barrier dividing coastal beaches from the preserved territories of Kolkhida Wetlands. In case of sea eustazy, degradation of coastal swells or their destruction by waves and subsequent overflow of sea water, the recreation infrastructure could be damaged, the salt water could intrude into the wetlands and flood them, causing ecological catastrophe to the freshwater flora and fauna. At the same time, in case of the described scenario, sufficiently vast territory could be lost in the recreation zone, that is economically impressible for Georgia with its shortage of land. The offered technology is just aimed to prevent such disaster.

9) Impact statements

- **Social development priorities:** The introduction of offered technology will definitely contribute to the promotion of recreation and tourist 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 development of a new sea resort is planned;

    - The construction of motor highway is planned over the rehabilitated coastal swell stripe;
    - Beyond the swell at the inland territory the construction of sea port is planned, 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, causing their flooding and annihilation. Besides, the coastal swells create natural habitat for many species of flora and fauna, hence the swell rehabilitation technology is valuable from the environmental position as well.

- **Other factors:**
  1. Availability of inert material;
  2. Presence of existing capital buildings and private property at the technology adoption place;

10) Costs (US$)

- **Capital costs over 10 years:** Considering that the dumping of 1m3 of inert material at 2007 prices costed about 7-10 USD, the creation of 1km of 1m high coastal swell will cost 2-3 million USD, depending on the distance from a sand-pit and on the mining and transportation technology. This value would be defined more exactly after scoping and designing the project. All in al, the elevation by 1m of a 3 km-long sandy swell could cost 6-9 million USD. The elevation of 15 km-long section (from the mouth of R. Enguri to the outflow of R. Khobistskali) by 2 meters will cost 60-90 million USD.

- **Operational and maintenance costs over 10 years:** The maintenance expenses of 1 km-long rehabilitated and artificially expanded section of swell vary in the range of 30-100 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/**