

## Facts, Fables and Political Opportunism with regards to coastal erosion and climate change

Henk Jan Verhagen, Delft University of Technology (Netherlands), H.J.Verhagen@tudelft.nl

### Introduction

Climate change is often blamed for increasing the problems with coastal erosion. However, analysis shows that often political opportunism is a much more driving factor for (apparent) coastal erosion. To analyse this it is good to distinguish two types erosion:

- Chronic erosion: erosion caused by a gradient in longshore transport or by sea level rise
- Acute erosion: erosion cause by attack during storms

### Chronic erosion.

A gradient in longshore transport has nothing to do with climate change. But human works may also create such a gradient (like groyne construction). Local decision makers prefer in such cases not to blame the groyne construction, but the climate change. Then they assume responsibility is elsewhere.

The effect of sea level rise can be determined quite accurately with the Bruun rule. This rule assumes that the shape of the coastal profile is not changing due to sea level rise, and that there is no supply or depletion of sand from elsewhere (so no gradient effect). For a typical non tidal beach it is shown that 1 m sea level rise will result in approx. 20 m of coastal retreat of the waterline and 30 m retreat of the dune line (example from Shkorpilovtsi, Bulgaria). At that specific location this does not cause any problems.

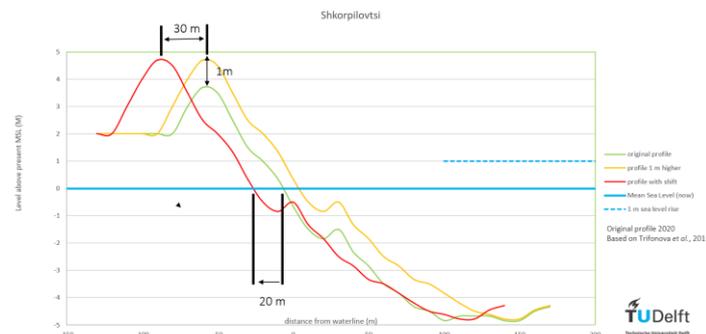


Figure 1: Coastal erosion due to 1 m of sea level rise at Shkorpilovtsi using the Bruun rule

When projecting the same erosion on a very developed beach (e.g. Golden Sands, Bulgaria) it is shown that the useable beach area decreases considerably. It seems that only one third of the beach remains. However, other beach developments have already taken a large part of that beach, in the order of tree times the expected erosion in the next 100 years.

**HERMES - A HarmonizEd fRamework to Mitigate coastal EroSion promoting ICZM protocol implementation**

Project co-funded by the European Union and national funds of the participating countries

Practically there are two solutions for this location: removing the existing development on the beach or execute beach nourishment. Probably beach nourishment is most economic, it will cost in the order of € 100,000 per year for this 2.5 km of beach with a high economic value.

#### **Acute erosion.**

During storms the waterlevel will rise by wind set-up. The combination of a higher water level and the big waves will result in an adaptation of the coastal profile to a typical storm profile. Basically this means that sand is transported from the higher beach and dune front to deeper water (in the breaker zone). When there is no gradient in longshore transport on the long run (mainly during calm weather) this sand dumped in deeper water will come back to the higher beach and dune front. However, for developments on the beach or on the seaward side of the dune it means that they are destroyed.

Preventing problems due to acute erosion is technically simple, one should determine a set-back line and building seaward of this line no constructions should be allowed. However worldwide maintaining such set-back lines is a political problems. The value of seafront property is very high, so politicians are easily convinced to allow sea front development in hazardous zones because the (rich) owners of the property are extremely influential.

#### **Example.**

As an example the construction of a dance club along the coast near Varna (Bulgaria) is considered. This is a steep cliff coast with a generic shortage of sand and a small longshore transport. Supply of sand is limited, the main source of beach sand is the eroding cliff itself. But due to cliff-foot protection the supply of sand has become virtually zero. To avoid disappearance of the beach a number of T-groynes have been constructed. The beach of the city centre itself remains in position because of the big harbour breakwater at the south side of this beach.

The beach is at this moment relatively stable, although there are minor fluctuations, depending of the wave conditions of de subsequent years. During storms some sand will erode to deeper water, this will come back in the following summer season(s). At the northern end of te beach on a narrow section of the beach the discotheque Xtravanganza has been constructed. The owners complain that the beach in front of the property disappears. However, comparing maps before and after construction show that the waterline was not changed at all. The beach has disappeared because it was completely used by the club building.

After some years the building was seriously damaged by a storm. The beach was partly washed away, but recovered quite fast. And the owners decided to rebuild it (in a more expensive way) on exactly the same place.

#### **Conclusions.**

Climate change may cause extra coastal erosion, but for a sandy coastline the effect is limited. A change in wind direction might have a substantial effect. Increase of storminess is a problem, but can easily be accommodated for. However because of the high economical value of coastal property there is a unhealthy pressure to compromise set-back lines. The effect of lousy coastal zone management is more severe than the effect of climate change. But politically it is very handy to blame climate change.

*HERMES - A HarmonizEd fRamework to Mitigate coastal EroSion promoting ICZM protocol implementation*

Project co-funded by the European Union and national funds of the participating countries