

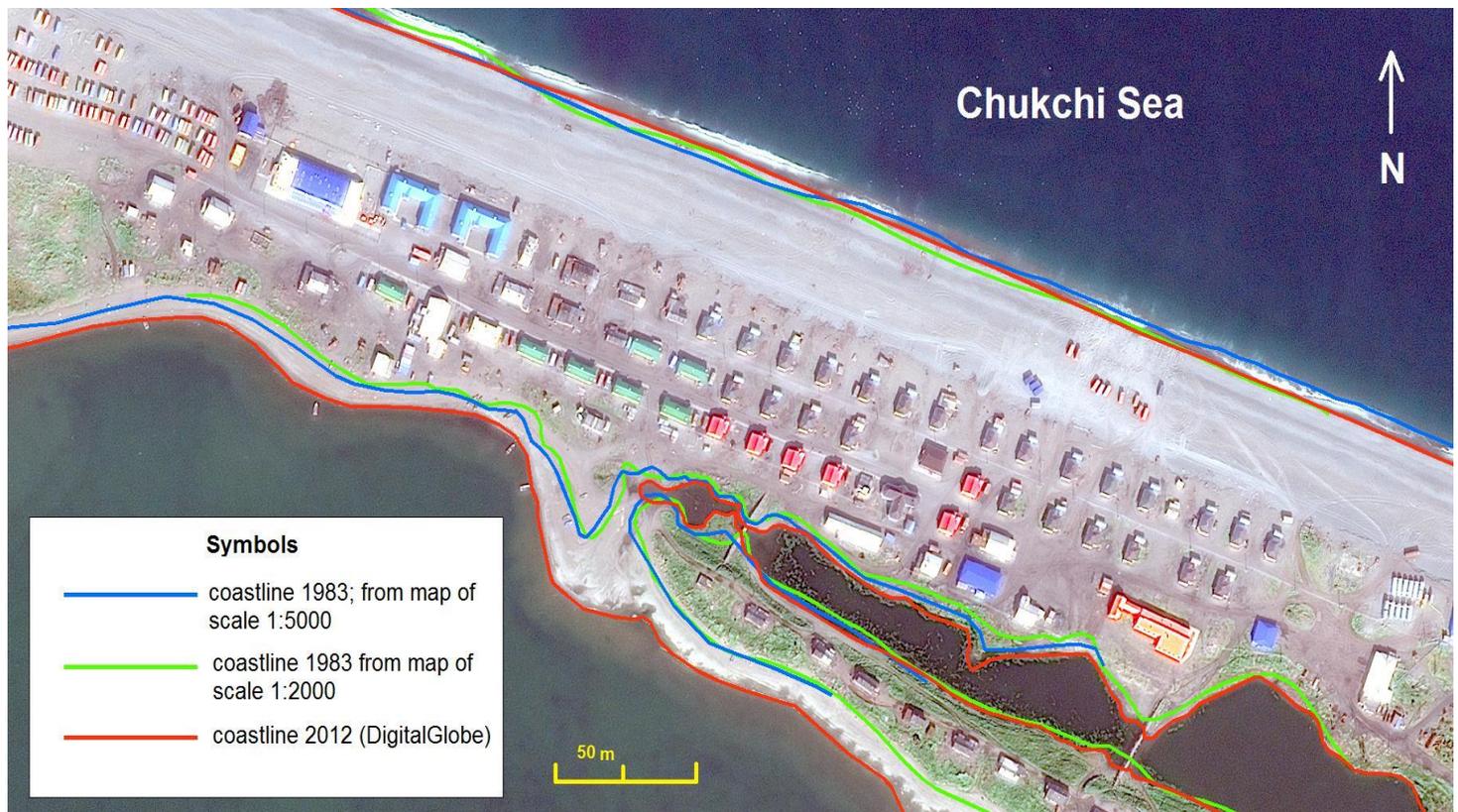
Coastal Dynamics Studies Prevent Costly Consequences of Coastal Erosion

Satellite imagery used to examine coastal retreat and thermal erosion over the Chuckhi Peninsula in Russia

Coastal dynamics reveal that climate change and its direct effect on permafrost temperature and open water period expansion have accelerated the rate of thermal erosion and Arctic coastal retreat. The average shoreline retreat rate in the Arctic is 0.57 meters per year. Depending on coastal morphology, sediments, and permafrost features, as well as the location in respect to prevailing winds and sea ice duration, the registered coastal rate can reach 3- 15 meters per year.

Only 5% of the Arctic shoreline is covered by regular instrumental or remote studies, and even less data exists on coastal dynamics for the Chukchi and Bering Sea coasts, which have always been the place of population concentration. The plight of several communities in Alaska and the Russian Arctic has been widely documented. Besides the threat to buildings, many landfills, sewage lagoons and water sources are situated in locations where they can be damaged by erosion, which could lead to negative environmental impacts. In 2010 coastal dynamics studies were initiated for several communities on the shores of Chukchi and the Bering Seas. The coastal erosion rates were studied with the help of archival topographic maps and plans, high-resolution satellite imagery, and modern geodetic studies – together allowing for the reconstruction of these rates for several decades.

Anastasia Radosteva, a student at Moscow State University, used high-resolution satellite imagery of the Chukchi Peninsula provided by the DigitalGlobe Foundation to examine the coastal fluctuations of Incheon. The studies have shown varied dynamics of the seaward coastline and accumulation of the lagoon coastline. These variations were caused by sediment balance on marine slopes and tidal fluctuations, with permafrost factors playing a secondary part in these processes. Nevertheless, the expansion of the ice-free period in this area causes longer wave impact on sea shores and higher storm frequency. These studies demonstrate the need for suitable shore protections measures, which will help to avoid costly restorations as a consequence of coastal erosion.



Above: DigitalGlobe satellite image of Incheon settlement, used for revealing coastal fluctuation for the period of 1983 – 2012.