

division are inspected for stability and safety measures recommended. Attempts are made to establish buffer zones around active quarries to reduce complaints from the effect of noise, dust and blasting vibrations which are policed by the Department of Mines under the Mines and Works Inspection Act.

West of the Mount Lofty Ranges depositional conditions during the Quaternary Period have given rise to highly plastic clays which exhibit marked seasonal changes in volume with changes in moisture content. Aeolian calcareous silts have also been deposited along the seaward face of some of the lower fault scarps. Both types of soil cause foundation problems for domestic housing and special footings have been devised to cope with these. Numerous sand and

clay pits occur in this zone and some are being filled to provide home sites. This necessitates close compaction control.

On the coastal zone bordering the St. Vincent and Spencer Gulfs loose organic deposits of the St. Kilda Formation provide highly unsuitable foundations due to their compressibility. Major subdivisions at West Lakes and North Haven have overcome this problem for domestic housing by employing special soil engineering techniques. However, larger structures such as schools require expensive piled foundations.

In country areas minor aquifers associated with Recent coastal dunes are used for domestic water supplies and must be protected from contamination by septic tank effluent disposal.

## ENGINEERING-GEOLOGICAL EVALUATION OF CURRENT GEOLOGICAL PROCESS ON THE CAUCASIAN BLACK SEA SHELF AIMING AT RATIONAL COAST DEVELOPMENT

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Rational development of the sea coast and continental shelf poses a major problem of environmental protection within the zone of the sea basin adjoining the sea coast. Investigations of the Caucasian Black Sea shelf proved the main factors that determine engineering-geological conditions and current geological processes to be: recent geological history and neotectonics; hydrodynamics and lithodynamics; submarine canyons; and man's engineering activity.

Engineering-geological conditions of the Black Sea shelf within the Caucasus are described in three regions: the Great Caucasian southern slope; the Kolkhety depression; and the region of mountain-folded structures of the Minor Caucasus.

The Great Caucasus southern slope region comprises a geological-structural shelf of miogeosyncline zones and is characterized by the occurrence of large structural blocks with differential neotectonic movements.  $C^{14}$  dating of subsiding blocks proved intensive sedimentation on the shelf during the Holocene – about 80 m during 8500 years, the average rate of sedimentation being 10 mm per year – whereas in the uplifted blocks only slight local sedimentation has been observed.

During the whole Quaternary period the Kolkhety depression preserved a zone of intensive sedimentation with steady recent upwarping lasting to the present day at the rate of 6 mm per year.

The region of mountain-folded structures of the Minor Caucasus is a zone of steady, recent uplift with a narrow, tectonically ruptured shelf.

Current lithodynamic processes are largely determined by longshore drift flows. On the Caucasian coast the nature of the wave field indicates three general flow directions: from northwest to southwest (Northwest Caucasus), frontal to the shore (Kolkhety) and from south to north (Adjara coast). Most of the longshore drift flows feed the coast zone and beach, thus assisting coastal stability. The remainder are interrupted by both natural (abraded anticline zone) and artificial (ports, submarine structures) barriers. The sediment drifts into deep water and submarine canyons, resulting in a sediment deficit and the waste of useful littoral territory in some places.

Submarine canyons present a morphogenetic form typical for the Caucasian Black Sea shelf, therefore some researchers attach exaggerated importance to their absorbing the energy of longshore drift. Our investigations indicated that the majority of the submarine canyons are relict pre-Holocene erosion forms and don't influence coast zone stability. On the other hand we have taken pebble samples at a depth of 600 m in some canyons, indicating

both drift displacement along their thalwegs and also their lithodynamic activity. It follows that determining the genetic type of submarine canyons is very important for prediction and evaluation of coast zone stability.

Beach preservation is a primary problem of environmental protection and of coastal zone development. Changes in the natural environment are caused by a wide range of construction of resorts, ports, and coast strengthening structures on the Caucasian Black Sea coast as well as the erection of hydrotechnical complexes on rivers, and the winning of sand and gravel. Realization of these measures without taking into account the engineering-geological conditions of the shelf and littoral zone, and without the scientific prediction of environmental dynamics, can result in the disturbance of coast stability.

Engineering-geological research during the last decade has led to the following principal recommendations aiming at Caucasian Black Sea coast stabilization.

1. Prohibition of construction within zones of intersection of longshore drift flows of great capacity.
2. Where submarine canyons cut the coastal zone, the most effective measure should be the artificial deposition of sandy-pebbly material on beaches and around the apexes of the canyons.
3. On erosional coasts it is possible to accomplish active protection measures with beach preservation.
4. The Pitsunda case shows that in beach development great attention should be paid to zones with a pulsational dynamic regime where construction leads to major deformation.
5. In designing hydrotechnical structures on rivers it is necessary to take into account compensation of the drift deficit in coastal areas, which can be predicted where controlled by river runoff.
6. Measures directed at coast stabilization should be based on preservation of the natural regime of coastal dynamics, beaches and marine shoal accretion which are the main factors in coast protection.
7. Limitation, and sometimes even strict prohibition, of exploitation of sand deposits in the river mouths and on the submarine slope is necessary.

Today these recommendations are being carried out as the engineering-geological part of a general scheme of coast stabilization on the Black Sea coast in Georgia, established by the Soviet government, and they have already had good effects.