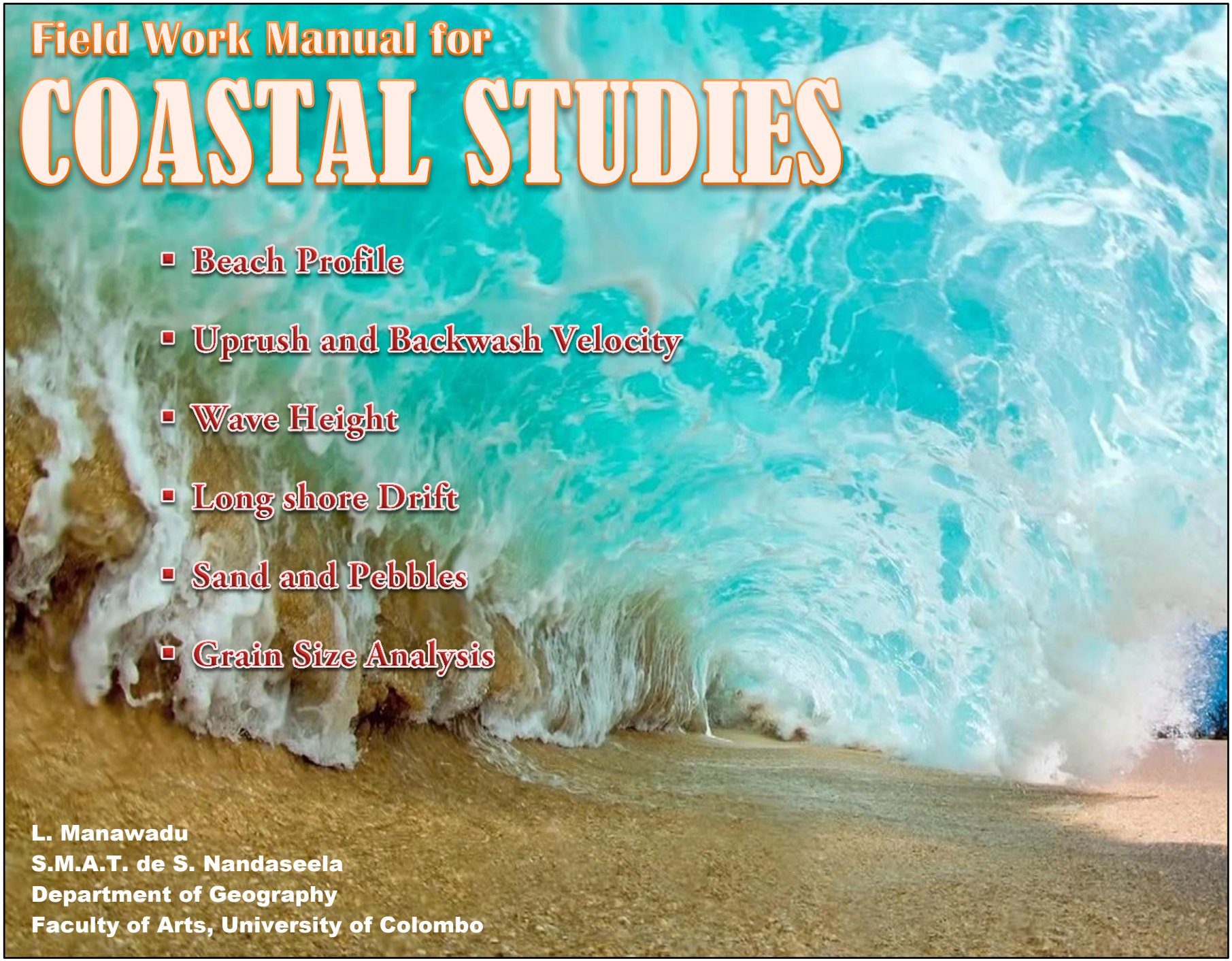
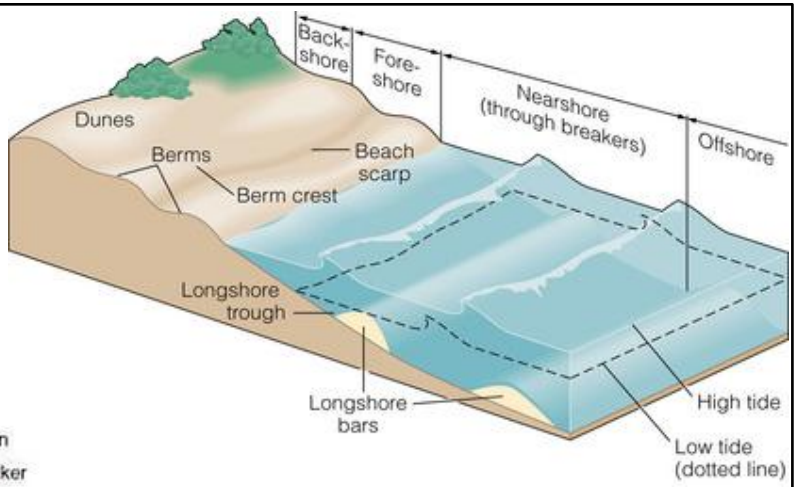
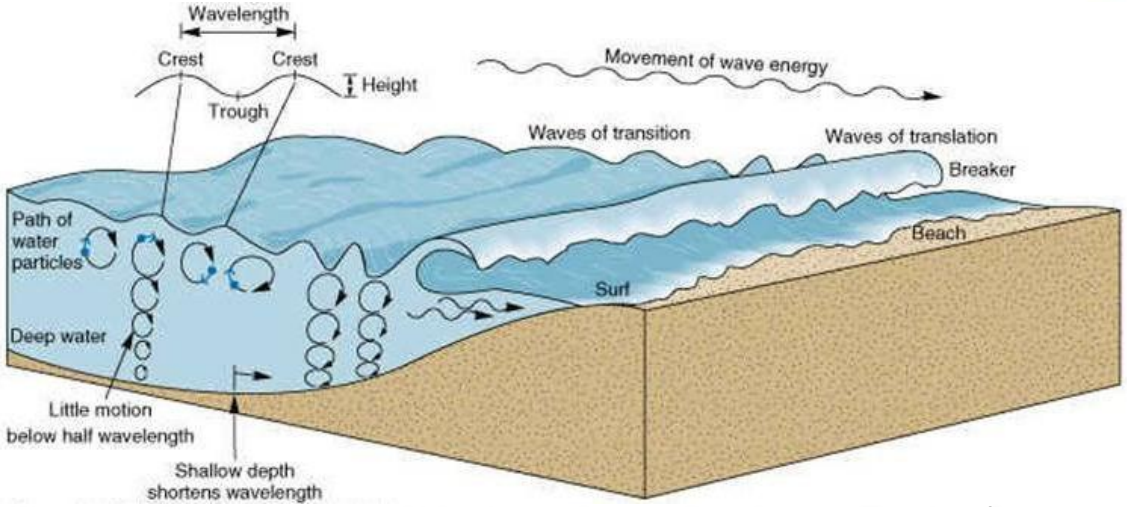


L. Manawadu
S.M.A.T. de S. Nandaseela
Department of Geography
Faculty of Arts, University of Colombo

Coast; or seashore can be defined as the area where land meets the sea or ocean, or a line that forms the boundary between the land and the ocean or a lake. **Beach:** is a low, sloping interface consisting of loose particles (sand, pebbles, or both) that lies between any water body and land. Study of coastline changes and dynamic characteristics of the beaches are common today since climate change has triggered many adverse impacts on coastal environment.

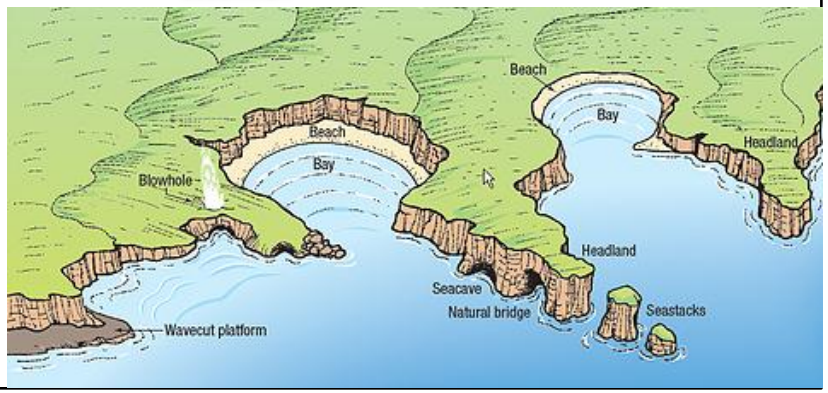




Waves are the main process which triggers the coastline changes. The size of a wave depends on its fetch. The fetch is the distance a wave travels. The greater the fetch, the larger the wave. Wind also has a significant effect on the size of waves. The stronger the wind the larger the wave. As a wave approaches a beach it slows. This is the result of friction between the water and the beach. This causes a wave to break.

Coastal zone can easily be segmented in to four as back shore, foreshore, near shore and off shore. The backshore area of a beach extends from the limit of high water foam lines to dunes or extreme inland limit of the beach. It is only affected by waves during exceptional high tides or severe storms. Most of the wave transformation and processes can be seen in near shore where waves started to break. But many anthropogenic activities are agglomerated in the back shore and far beyond. Having many dynamic properties these activities are highly threaten where coastal conservation is highly essential.

Constructive waves build beaches. Each wave is low. As the wave breaks it carries material up the beach in its swash. Destructive waves destroy beaches. The waves are usually very high and very frequent. The back wash has less time to soak into the sand. Tides often determine the range over which sediment is deposited or eroded. The tidal range is influenced by the size and shape of the coastline. Waves erode coastline as they break on shore releasing their energy; the larger the wave the more energy it releases and the more sediment it moves. However based on the wave types there can coastal landforms due to both erosion and deposition.



Beach Profile; is a simple cross section of a beach and it is used for coastal monitoring and management in identifying the coastline changes over the time. Beach profiling is a simple surveying technique used to measure changes in the contour of the monitored beach.

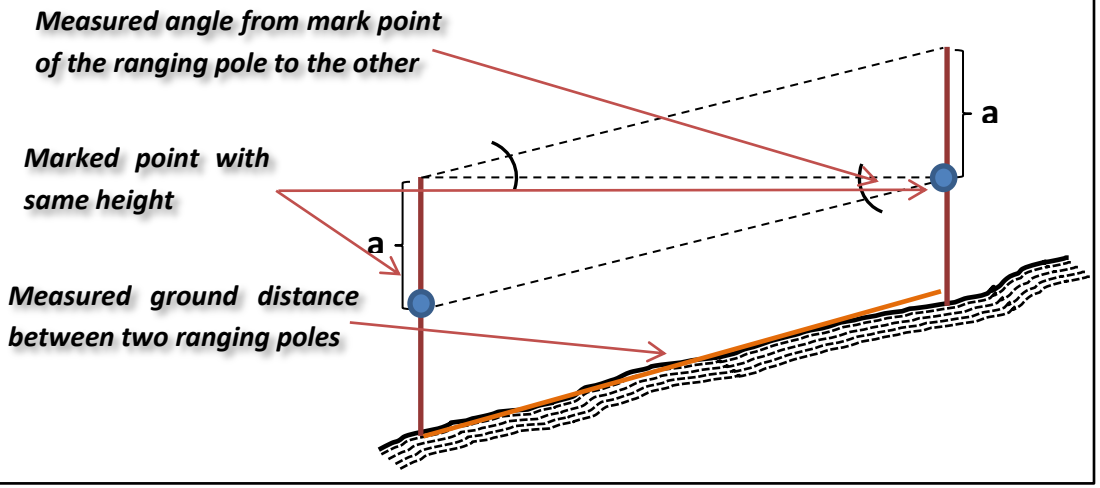
Step 01; segmentation of the beach. Sometimes the clear segmentation can be identified by looking at the slope gradient. It is easy to then identify the gradient of the slope accordingly. If there is a normal or single gradient equal distance can be used for profiling.

Step 02; Identification of the reference point. It is always advised to start measurements from a permanent reference point which does not change along with the time. And measure the height from the ground.

Step 03; Mark the same height on the ranging pole and place it in at the end of the first section. Measure the angle from the reference point to the mark on the pole. (Reference point height is normally the height of the surveyor to his eye level)

Step 04; Measure the angle from the reference point to the mark point on the ranging pole and repeat the same for all segments. ***Abney level*** is most commonly used when measuring angle.

Step 05; using a measuring tape, measure the distance between each ranging pole.



Step 06; based on Trigonometry with the measures of angle of each segment and the distance the exact slope gradient can be calculated. It can also be displayed as a slope gradient diagram.

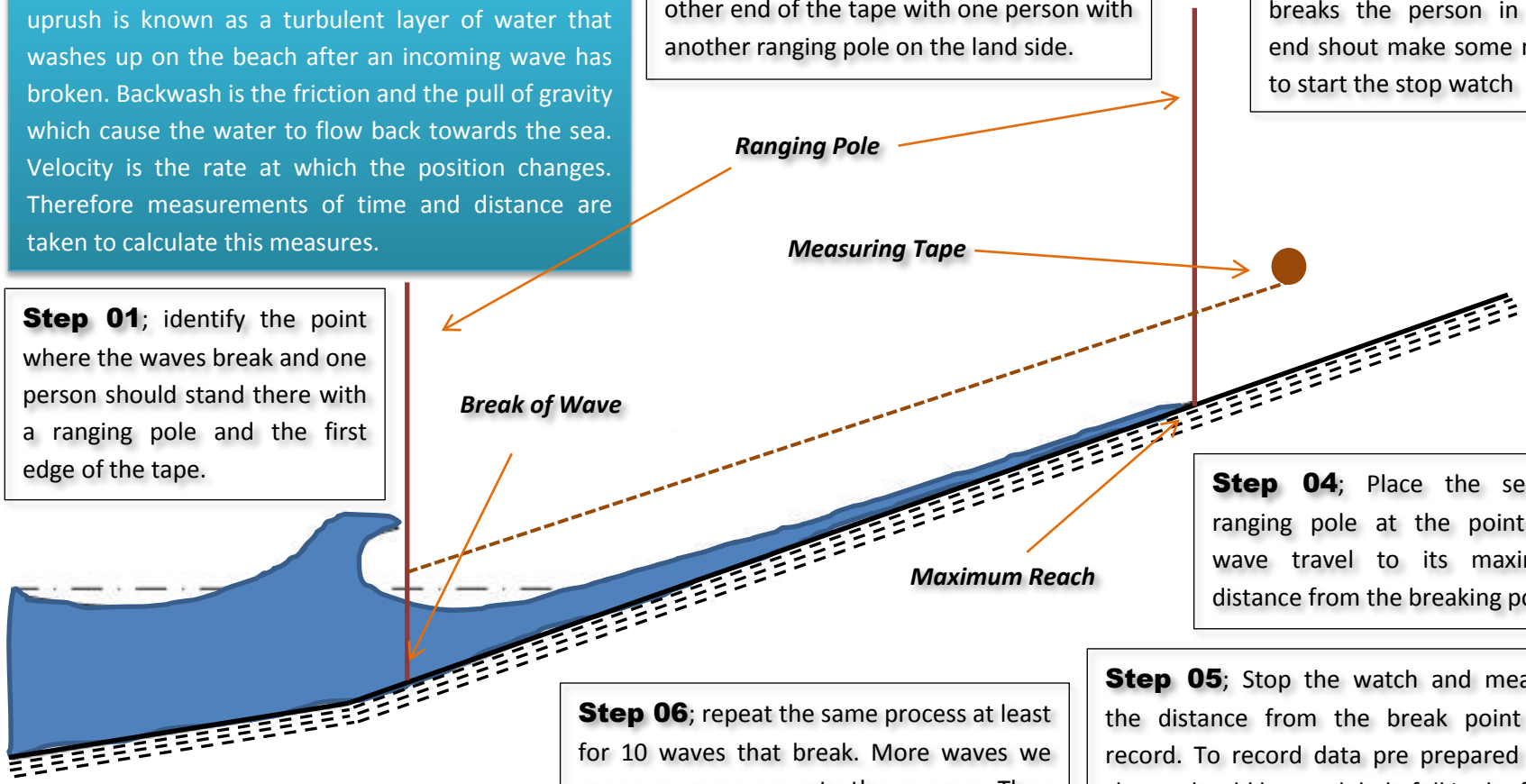
Uprush and Backwash Velocity;

uprush is known as a turbulent layer of water that washes up on the beach after an incoming wave has broken. Backwash is the friction and the pull of gravity which cause the water to flow back towards the sea. Velocity is the rate at which the position changes. Therefore measurements of time and distance are taken to calculate this measures.

Step 01; identify the point where the waves break and one person should stand there with a ranging pole and the first edge of the tape.

Step 02; ready the stop watch and the other end of the tape with one person with another ranging pole on the land side.

Step 03; As soon as wave breaks the person in that end shout make some noise to start the stop watch



Step 04; Place the second ranging pole at the point the wave travel to its maximum distance from the breaking point.

Step 05; Stop the watch and measure the distance from the break point and record. To record data pre prepared data sheets should be much help full in the field.

Step 06; repeat the same process at least for 10 waves that break. More waves we measure more accurate the average. Then calculate the velocity of the each wave.

$$velocity = \frac{displacement}{time}$$

Finally the average velocity can be calculated as a value of meter/seconds.

Note; Characteristics of the waves are changing along the time periods with in a day due to the low and high tide differences. Also it can be change along with the changes of the wind currents and sometimes seasonal changes can be identified. Therefore to have a proper idea on a particular shore line long term measurements of sea currents are highly needed.

Wave No	*Time (s)*	*Length (m)*
	example	

Wave Height; the wave height of a surface wave is the difference between the elevations of crest and a neighboring trough. Height of the wave also differs even in one location due to many reasons. Simple Measurement of the wave height can be done with a theodolite and a measuring pole. Very good observation is highly needed.

Step 01; identify a location in the shore before the break of waves where through and the crest can be identified clearly. Then one person should go in to the sea with the measuring staff and locate.

Step 02; place the theodolite on the tripod and adjust is where the measuring staff can be visible clearly from the lens.

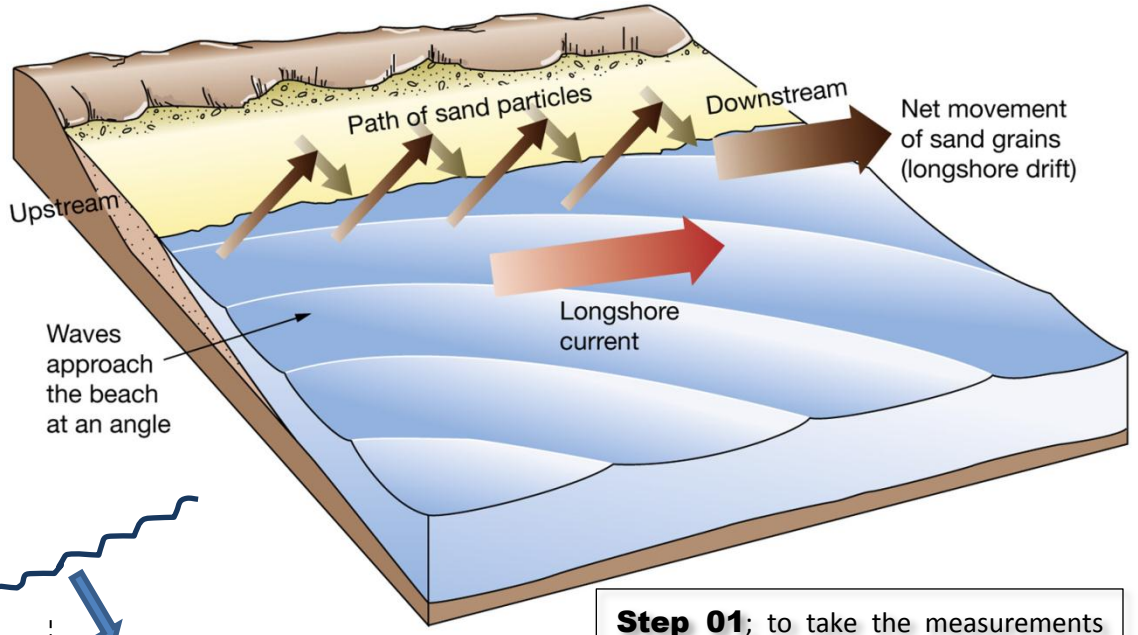
Step 03; looking through the theodolite record the heights of the crest and the through of the waves.

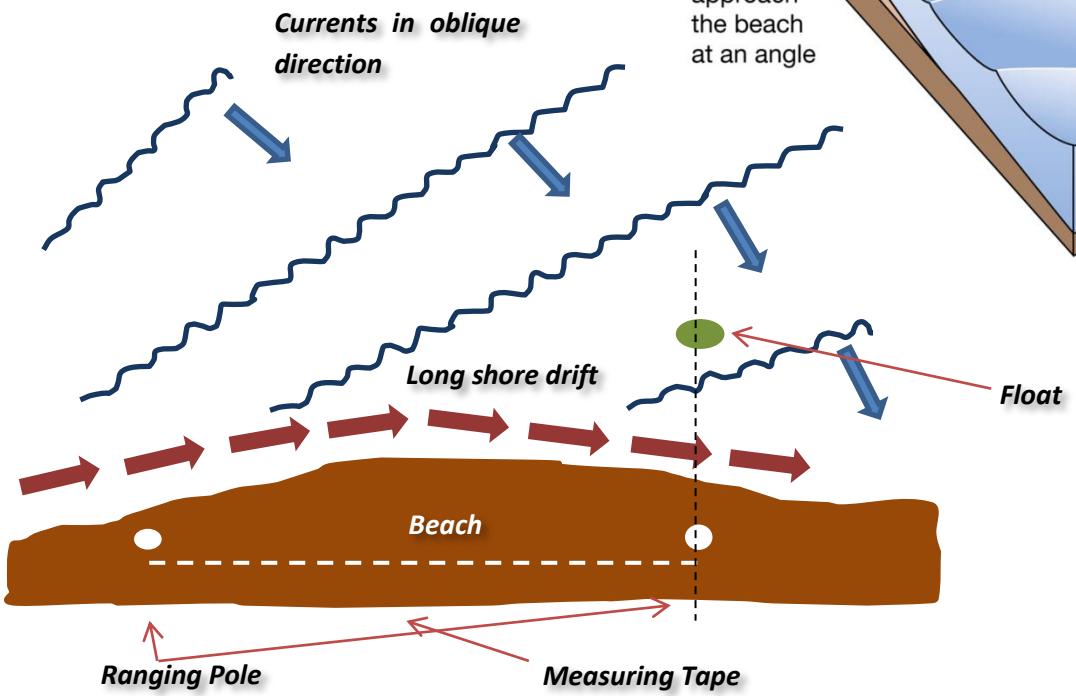
Step 04; record the values at least for 10 waves. More waves we record more accurate will be the final conclusion based on average.

Step 05; calculate difference to get the exact height from the trough to the crest of the wave and calculate the average value.

Note; Wave heights can be different based on the changes of high and low tide, seasonal changes and changes of the wing process. Therefore for accurate measures long time observations are needed.

Long shore Drift; Long shore drift is a process that consists of the transportation of sediments (clay, silt, sand and shingle) along a coast parallel to the shoreline, which is dependent on oblique incoming wind direction. This current and sediment movement occurs within the surf zone.





Step 01; to take the measurements two ranging poles, a tape, a float (any small object) and a stopwatch is needed. First of all through the float as far as you can and when it hits the water start the watch and place the first ranging pole directly on the beach.

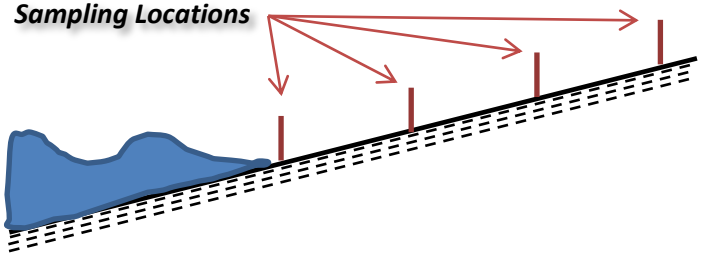
Step 02; Measure the time may be for one minute of period and while doing that follow the direction of the float along the shore line. Take the stop watch and the other ranging pole

Step 03; As soon as one minute finishes place the second ranging pole directly to the float location on the beach. Then measure the distance between two ranging poles.

Note; this will provide a rate between time and distance. How far has the float travel from the point of origin with in one minute? The direction can also be observed if the compass is available or knowledge that we have. Long shore current can also be varying with surrounding characteristics like morphology and environmental features like climate and seasons. Therefore continuous assessment on long shore current will provide us with better understanding on a particular coast that we study.

Sands and Pebbles; Sands and pebbles are much common sediment types which can be seen in many parts of the world. Sand is a naturally occurring granular material composed of finely divided rock and mineral particles. Pebbles are clast of rock generally considered larger than granules (2 to 4 millimeters diameter) and smaller than cobbles (64 to 256 millimeters diameter). To understand the characteristics grain size analysis bases on sand sampling and pebble size measurements can be used.

Sampling Locations



Step 01; determine the interval from the shore towards up the beach. Pebbles can be selected using a 10m tape measure laid out parallel to the water, and using a random number chart to choose points along this tape to collect pebbles from.

Step 02; repeat the same accordingly with the interval distance that has been determined early.

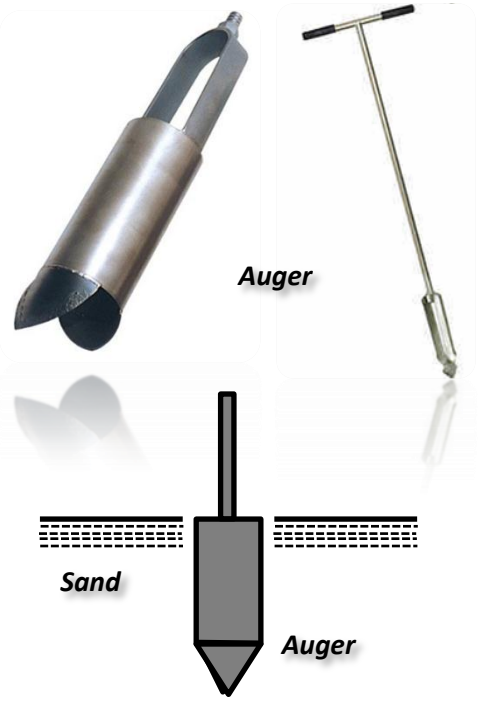
Step 03; collected pebbles can be analyzed based on pebble size measurements and also by the roundness.

Note 01; ***Sand*** sampling can be done along with the beach profile. Sampling locations can be decided based on equal distance or even by representing each segmented unit of the profile

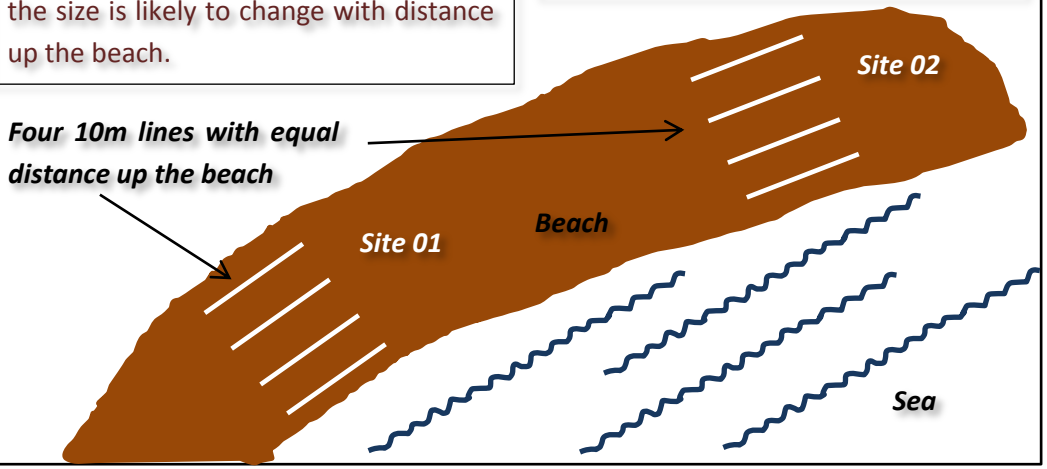
Step 01; decide the sampling location from break of wave to the end of the beach perpendicular to the shore. This is to understand the sorting of sand from shore to inland.

Step 02; using the bucket auger, collect the sand from selected sites. Depending on the requirement it can be go until deep sand sampling for 1m or surface sample may be enough.

Note 02; for ***pebbles*** the method is different from this. To collect pebbles systematic method can be applied since the size is likely to change with distance up the beach.



Step 03; collected samples then can be used for grain size analysis in a laboratory along with other characteristics.



Grain Size Analysis; this test is performed to determine the percentage of different grain sizes contained within a soil. Sand sorting in beaches are more common and studying this characteristics is highly important in understanding the beach. The mechanical or sieve analysis is performed to determine the distribution of the coarser, larger-sized particles, and the hydrometer method is used to determine the distribution of the finer particles.

Step 01; Preparation of the soil or sand sample. If the sample is wet, it should be dried to a moist condition. Drying may be accomplished by the use of air, oven, electric hot plate, stove, or infrared dryer. If the sample is a recycled material, or if it contains any bituminous material (asphalt, etc.), drying may only be accomplished by use of air drying or in an oven not exceeding 140° F (60° C). Make sure that particles will not be altered and no loss of material.

Note; in coastal sand analysis the organic materials should not be removed from the sand since it also a part of the composition. Material like sea shells, pieces of corals and etc.

Sieve Shaker

Step 02; take measured amount from the prepared sample (100g, 200g etc.) and record the weight.

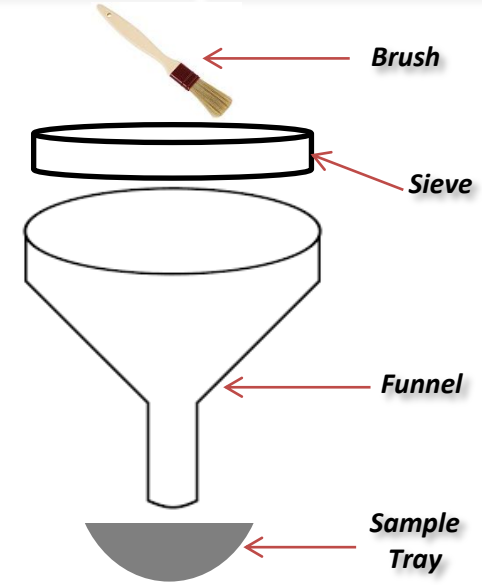
Step 03; Prepare the sieves in order from largest on the top and the smallest in the bottom and placed it on the sieve shaker. Then add the soil specimen to it.

Step 04; Switch on the sieve shaker for 10 minutes and let the sand to be sort and sieved. (Time and motion speed can be set accordingly)

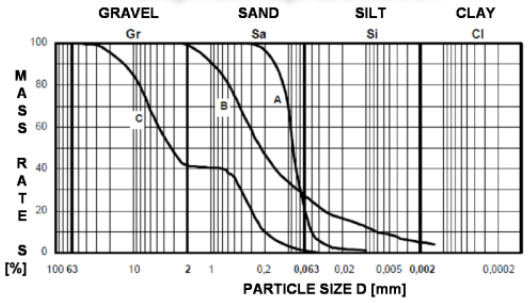
Step 05; take one large funnel and place it on a stand and keep a sampling tray under it. (Take the weight of the sampling tray and label it before)

Step 06; carefully take one sieve from the set and place it upside down inside the funnel and remove the sand very carefully by using a brush.

Step 07; repeat the process for all and measure the weights. The results can be graphically represented.



Graphical Representation



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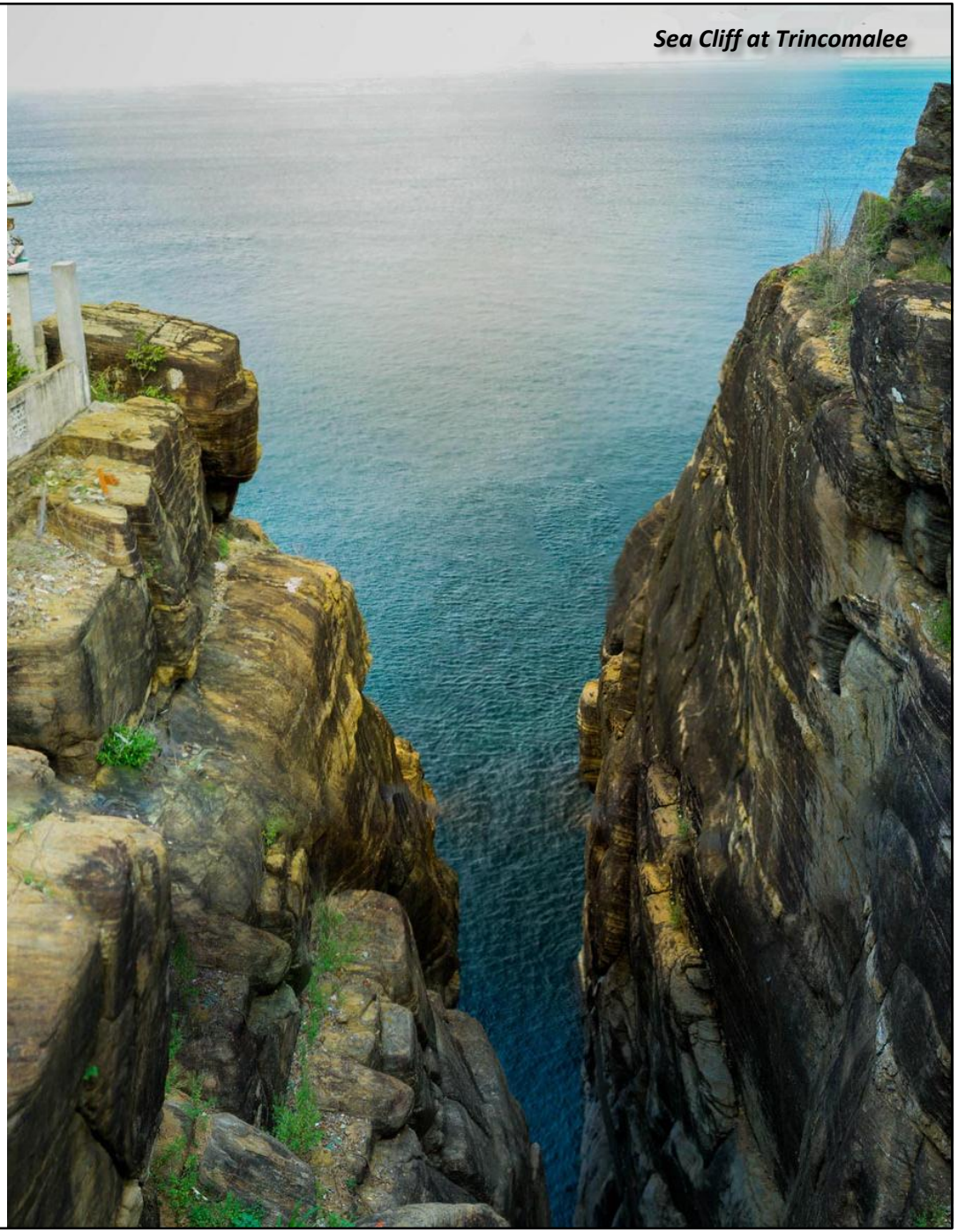

Sea Cliff at Trincomalee