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BET4733 Introduction to Coastal Infrastructures

Coastal Sediment Transport

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Chapter Description

- **Expected Outcomes**

  Analyze the principles of wave mechanics, tides, littoral processes and coastal sediment transport in methods of shore protection and coastal infrastructures.

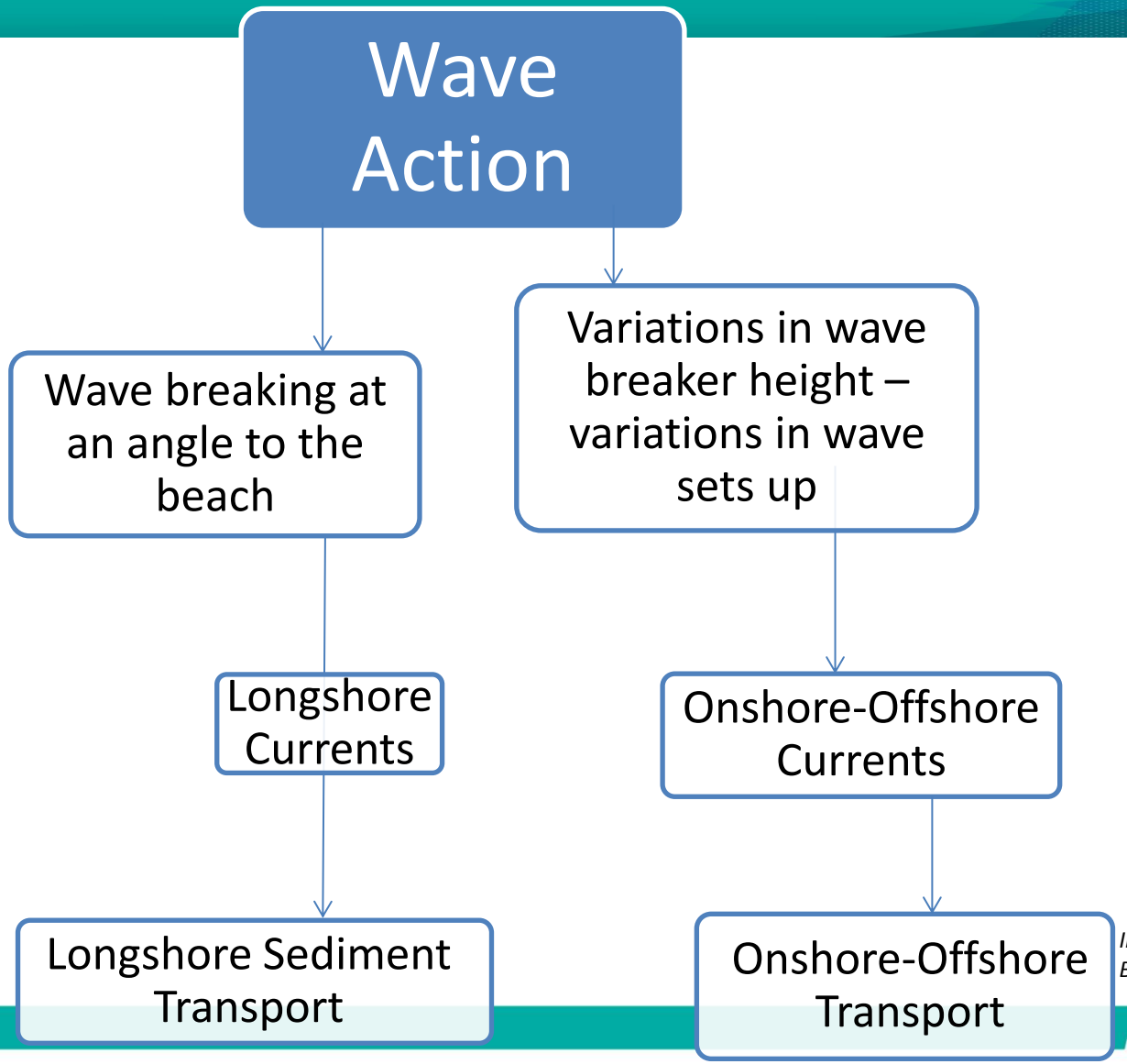
- **References**

1) Kamphuis, J. William, Introduction to Coastal Engineering and Management, Advanced Series on Ocean Engineering-Volume 30, World Scientific, 2010.
2) Reeve D., Chadwick A. and Fleming C. Coastal Engineering-Processes, Theory and Design Practice, CRC Press, 2015.
3) Kim Y.C., Design of Coastal Structures and Sea Defences, World Scientific, 2015.
4) US Army Corps of Engineers, Coastal Engineering Manual, Washington, 1998-now.
5) Sorensen, R.M., Basic Coastal Engineering, Chapman & Hall, New York, 1997.

CONTENTS

- Coastal Sediment Transport
- Mode of Sediment Transport
- Longshore Sediment Transport

Coastal Sediment Transport



Mode of Sediment Transport

Suspended Sediment Transport

- Sediments (eg. Silt, fine sand or clay) carried above the sea bottom (or into suspension).

Bed Load Sediment Transport

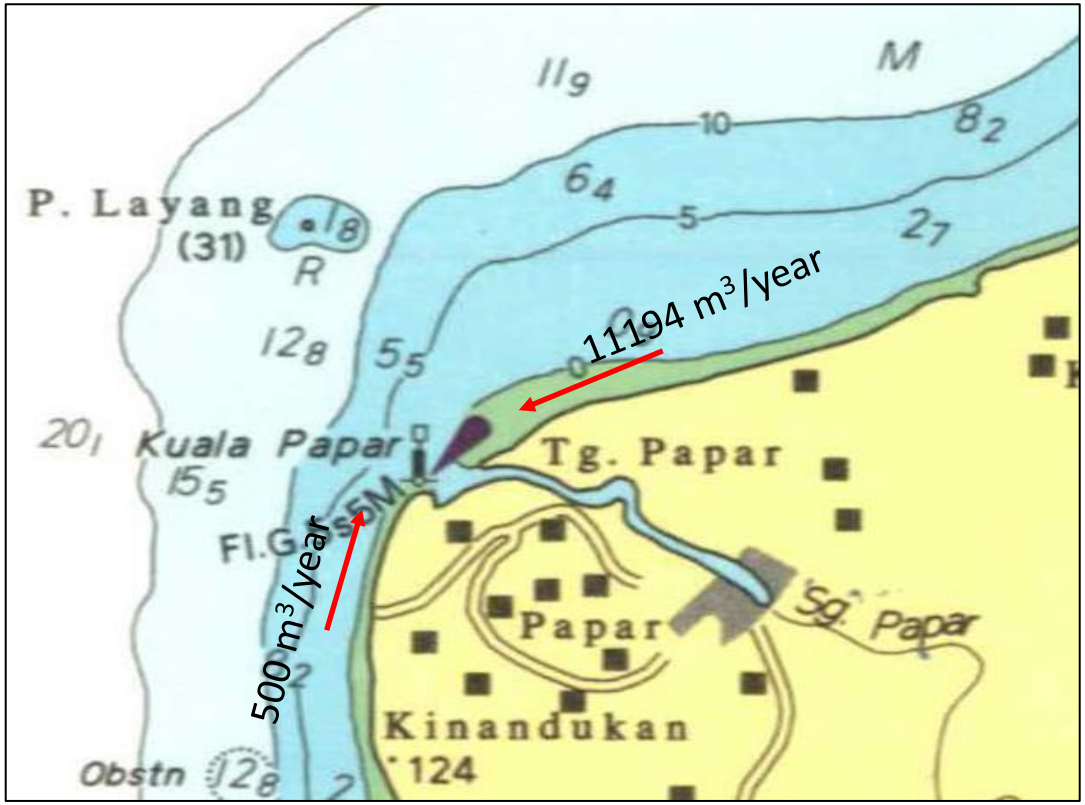
- Grains remain close to the bed and move by rolling and saltating by the currents.

Longshore Sediment Transport

- Controls beach morphology by determining shore accretion, erosion or remain stable.
- Longshore transport rate:

No	Types	Definition
1	Net longshore transport rate	updrift - downdrift littoral transport; or downdrift - updrift littoral transport
2	Gross longshore transport rate	updrift + downdrift littoral transport

Longshore Sediment Transport



Source of image: Bathymetric chart, National Hydrographic Center

Longshore Sediment Transport

- According to Sorensen (1997), longshore transport rates can be estimated by one of the following method:

No	Method	Remarks
1	Adopt transport rate at a nearby location	Must have similar beach characteristic, shoreline orientation, and annual wave climate. Supported with good engineering judgement
2	Available littoral transport data	Beach changes data Littoral transport trap
3	Formula	Wave data for at least a year

Longshore Sediment Transport

- The CERC-formula(Shore Protection Manual, 1984):

The volumetric longshore sediment transport rate Q is given by:

$$Q = \sqrt{\frac{g}{\gamma}} \frac{sin2\alpha_b {H_b}^{5/2}}{16(s-1)a\prime}$$

Where	γ	the ratio of wave height to water depth
	α'	the ratio of solid to total volume for the sediment
	s	sediment specific gravity
	H_b	wave breaker height
	K	coefficient (K = 0.32 for typical beach sands)

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