REVIEWING PAST CHANGES AND BUILDING FUTURE SCENARIOS

1. REVIEW OF THE FIELD TRIP

FIELD TRIP OBJECTIVES

- Learning about the beach site as it is now and how it has changed in the past
- Understanding how the beach will likely change in the future as a result of climate change and climate variability

Advance preparation and activities done at the beach

- 1. Location and research into the beach
- 2. Observing and recording everything about the beach and making a sketch map
- 3. Setting up sites where changes in beach size can be measured (erosion and accretion) and making the baseline beach width measurements
- 4. Conducting a survey about residents' and beach users observations of how the beach has changed over time

On return from the beach

- Prepare a sketch map showing key features of the beach, the beach width measurements & where the beach will likely be in 20/40/60 years' time
- Review past changes: the results from the observations, measurements and questionnaire; and prepare 2 key statements about past changes in the beach and the level of confidence in your statements
- Review projections for climate change for this location and prepare 1 key statement about how this beach will be in 20 years time and the level of confidence in your statement
- Prepare 1 key statement on what can be done to make the beach more healthy

2. CLIMATE CHANGE PROJECTIONS AND HOW THESE WILL AFFECT BEACHES

Climate change projections

Parameter	Change	Confidence level relating to direction of the change
Temperature	Increasing temperature 1.5 - 4.0°C	High
Sea level rise	Rise of 0.26 – 0.98 cm	High
Ocean acidification	Decrease 0.14-0.35 pH units resulting in more acidic oceans	High
Extremes	More heat waves and extreme rainfall events	High
Tropical cyclones	Less frequent, but more extreme cyclones (Cat 4-5) possible by 2100 (projections vary according to ocean basin)	Low - moderate
Precipitation	Varies regionally, some areas to get wetter, some drier	Low-moderate

Beach changes

Beaches have changed in the past as a result of:

- Wave energy: storm waves, ocean swells, cyclones
- Man's activities: Mining sand and aggregate from beaches, building houses and other structures in the active beach zone, poorly planned sea defence structures (e.g. jetties, sea walls), damaging (dynamiting) the reef, and others.

Climate change now and in the future will result in:

- 1. more sea level rise
- 2. more acidic oceans
- 3. stormier weather
- 4. rising temperatures
- 5. changing precipitation

1. Sea level rise

- Generally as sea level rises it is expected there will be more beach erosion, but this will vary from beach to beach and place to place depending on past changes, man's activities, the presence or absence of healthy coral reefs and many other factors.

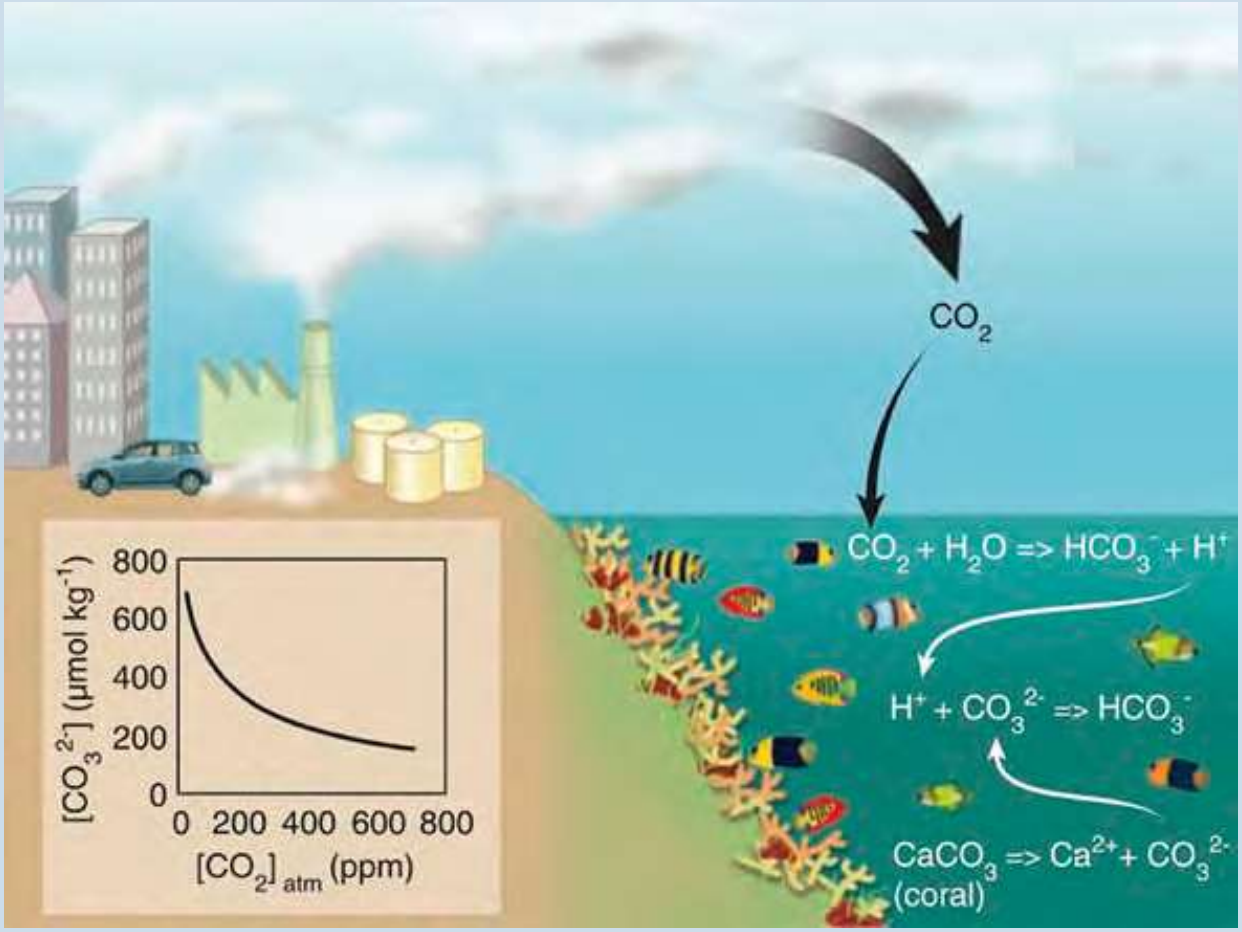
Sea level rise (continued)

On high islands, and continental coasts, especially where beaches are already experiencing erosion, the average position of high water mark will likely move inland.

Sea level rise (continued)

- On atolls and islands protected by coral reefs, the picture is less clear and will likely depend on other factors such as the health of the coral reef

2. Ocean acidification



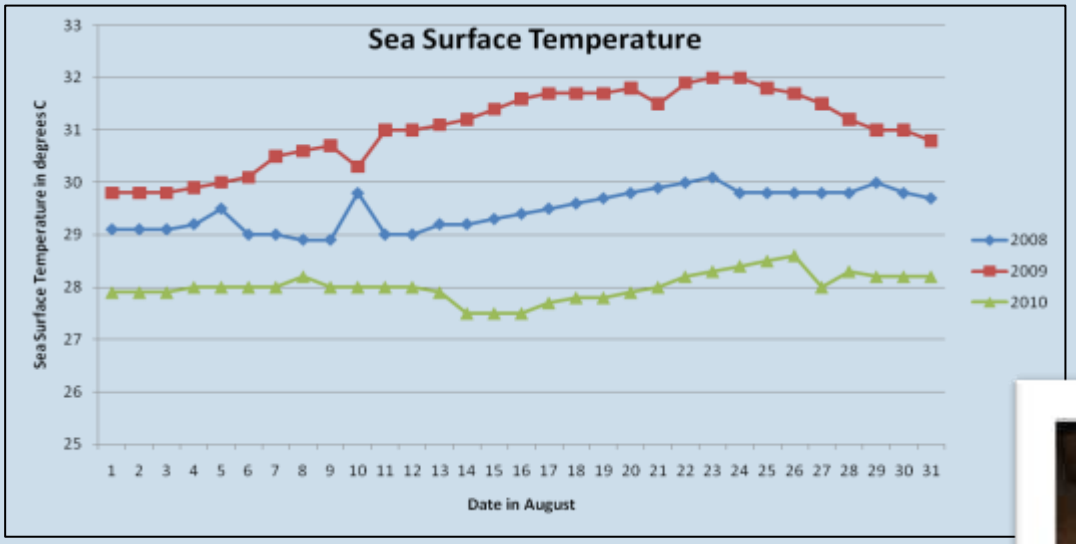
Source: Hoegh- Guldberg et al. 2007

Much of the CO_2 gets absorbed by the ocean resulting in more acidic conditions which impacts all animals with $CaCO_3$ in their shells or skeletons.

3. Stormier weather

- During storms high waves and swells are generated which result in beach erosion, coastal flooding & inundation of freshwater lenses, and damage to coastal infrastructure.
- More of these types of events will likely result in increased beach erosion.

4. Rising sea surface temperatures



Rising sea surface temperatures lead to more coral bleaching

Rising sand temperatures affect the gender of sea turtle hatchlings

5. Changing precipitation

- Changing precipitation may influence the amount of sediment reaching the coast and the beach

BUILDING CLIMATE RESILIENCE

A beach in trouble

A healthy beach