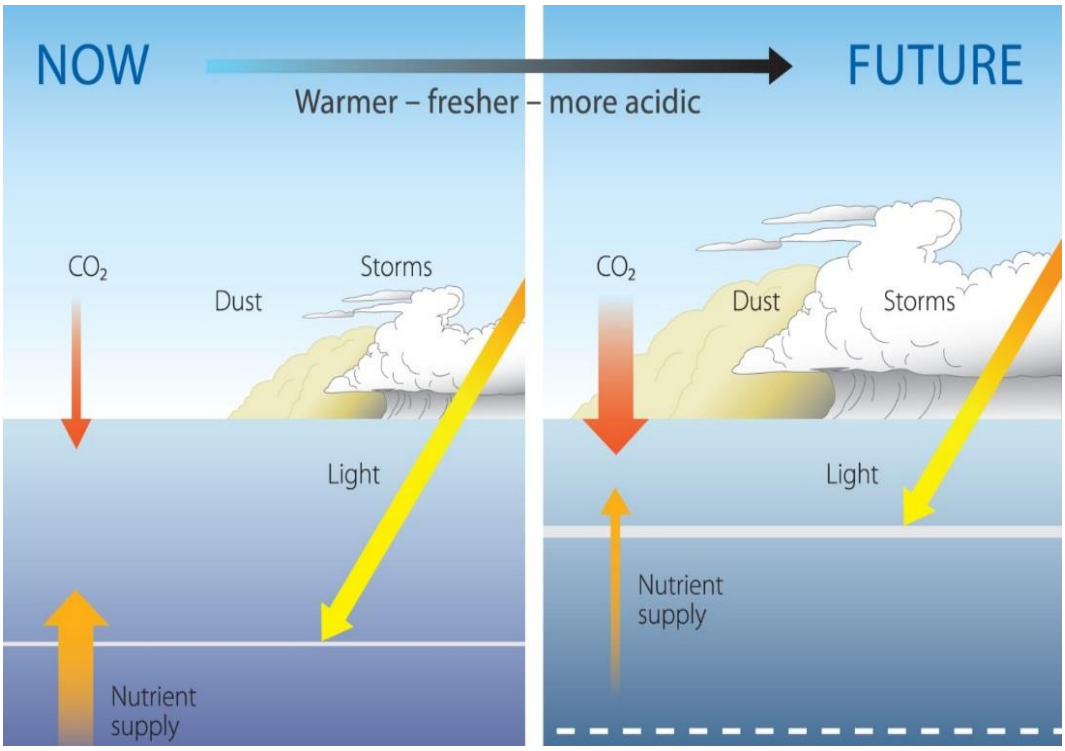
Ocean acidification

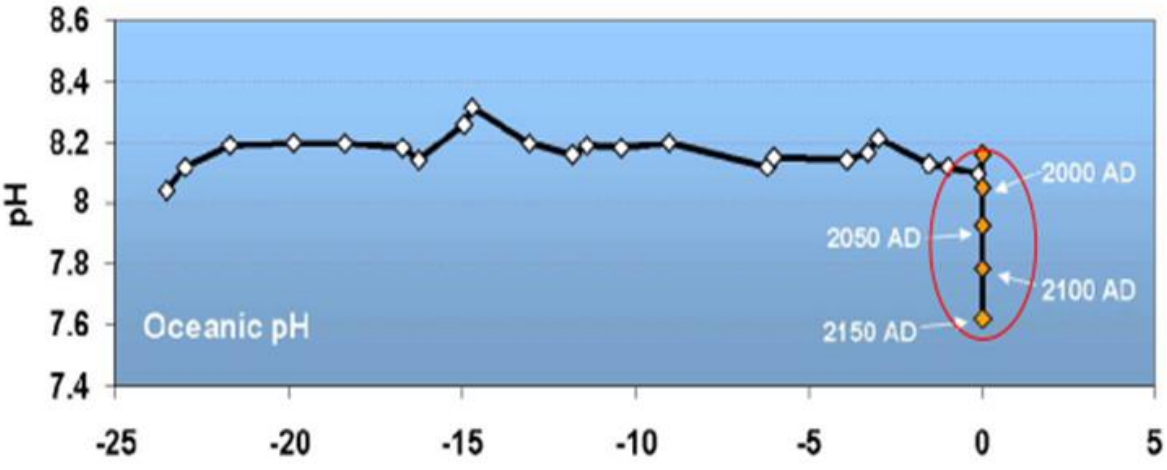
Watch video: https://vimeo.com/314358520

More than a quarter of the CO_2 released to the air by human activities is absorbed by the world's oceans and the upper 2m ocean holds same heat content as the entire atmosphere. This helps buffer global climate change but also causes seawater to acidify. This acidification may threaten the delicate balance of life in our oceans.



The warming of the surface of the ocean will change density and mixing of surface waters and is leading to increased CO_2 entering the ocean and lowering the pH. Phytoplankton (grass of the ocean) in the surface layer will be in a higher light, lower nutrient environment.

The current global decrease in pH is large compared to past changes. pH has already decreased by 0.1 (~30% decrease in H^+ ions) since industrial revolution but projected decline is at a rate 100x of any past events. The speed of change makes it difficult for marine organisms to adapt.



Ocean acidification poses substantial risks to marine ecosystems, especially polar ecosystems and coral reefs. Some may benefit, such as phytoplankton and algae that use CO_2 in photosynthesis. This may have positive benefits, however, organisms that have carbonate shells – shellfish, corals etc are sensitive to the decrease in carbonate availability. These species play an important role in ecosystems and are important environmentally and so their loss/decline will be disruptive.

NIWA and others are working on solutions, for example:

- Monitoring on mussel farms and a national coastal network provides information on variability; where is most vulnerable
- Testing different families of mussels to see which show most resilience which may aid the industry
- Models of what's driving ocean acidification in coastal waters
- Local solutions for mussel farms:
    - Bubbling
    - Waste shell addition to water (increase pH).

There's only one solution at global level – to reduce CO_2 emissions.

Activity: See how CO_2 affects the pH of water

Materials
1 x pH indicator kit
2 empty cups
water (or ideally seawater)
paper straws
pH scale print out

Scientists use something called a pH scale to measure how acidic or basic a liquid is. pH is a number from 0 to 14.

From 0 to 7 are acids, with 0 being the strongest. From 7 to 14 are bases with 14 being the strongest base. If a liquid has a pH of 7, it's neutral. This would be something like distilled water.

The ocean has a pH of around 8.1

1) Think of examples of things that are acidic and that are basic. Have a look at pH scale and see how that compares.
2) Put water in two cups. Fill about half way.
3) Put a few drops of pH indicator in one cup but before you do that have a guess of what colour you expect the water to turn.
4) For the second cup of water choose a volunteer to blow bubbles into the water for at least 30 seconds using a paper straw.
5) After this is complete, have a discussion about what colour you expect the water to turn if pH indicator was added.
6) Add a few drop of the pH indicator and see the results
7) Discuss what this experiment shows. What impacts would this have in our oceans?