

## Rising Sea Levels.

The rise in global temperature causes sea levels to rise. This rise comes about for 2 reasons:-

1. The temperature of the oceans rises and causes the water to expand. It must also cause the temperature of the land to rise but this is mainly confined to the top few metres and on balance the water expands more than the land.

The scale of this rise is comparatively small, and has been predicted to be about 50 cms by the end of the century.

2. The potentially much more significant rise is caused by the melting of ice that rests on the land. That is the ice covering mountains and the ice lying as ice-sheets on land in the polar regions, when this ice melts and runs into the sea the sea-level rises.

NB. The melting of ice floating on the sea has no effect on the sea level - ice floats because it expands when it melts it returns to the same volume as the water it displaces.

There are large amounts of ice covering the country of Greenland and covering the Antarctic continent. The Greenland ice-sheet is about  $2\frac{3}{4}$  million kilometres<sup>2</sup> and its thickness is up to about 3 kilometres. That is a lot of ice! If the Greenland ice-sheet melts completely sea levels will rise about 7 metres (or 25 feet).

In Antarctica there is an ice-sheet covering the West Antarctic peninsula this is fairly peripheral to the main Antarctic continent. It is estimated that if this melts it will raise the sea-level by about 5 metres. If all the ice on the Antarctic continent were to melt this would raise the sea level by about 60 metres. These various ice-sheets have melted in the past and sea-levels have been higher by these amounts.

Currently scientists working on the Greenland ice sheet have concluded that the ice sheet will melt. So the major question is no longer "if", but "how long will it take". It used to be believed that such melting would be likely to take 1000 years. However more recent research has suggested that melting may be very much quicker.

Scientists had been monitoring the Larsen B ice-sheet - a floating sea ice-sheet about the size of South Wales and about 220 metres thick. They had detected signs that it was melting but were predicting that it would take about 100 years to break up and melt. In 2002 they were more than a little surprised when it broke up in 35 days! And was gone within 9 months. Subsequently they have developed theories to explain this extremely rapid disintegration. The Greenland (also the West Antarctic) ice-sheet shows some signs similar to those which preceded the break up of the Larsen B. Recent research has revealed that the rate of melting is accelerating and newer theories concerning the melting suggest that the melting is likely to be much more rapid. A matter of centuries rather than 1,000s of years.

Some recent research has suggested that both the West and East Antarctic Ice-sheets are also showing signs of melting.

Currently the official predictions from the IPCC in the AR4 do not include any allowance for extensive melting of the polar ice-sheets.

In TGWS we believe that this is unduly optimistic. We believe that if the temperature rise is allowed to become greater than 2 °C, it is likely that the sea-level rise will be greater, than the 80cms predicted by the IPCC. But how much greater is a very open question. The President of the American Academy for the Advancement of Science says that there is a significant chance of the sea-level rise being 4 metres by the end of the century. This would produce enormous problems for every country with borders on the sea.

