



Climate Engineering

Background Information:

Scientists around the world are developing tools to try to prevent global warming from getting worse and have been looking at new ideas to change the Earth's climate. This climate engineering is considered dangerous by some as it is interfering with the world's delicate ecosystems, however some scientists believe it could prevent catastrophic global warming

Prof. Steven Salter (University of Edinburgh) and Prof. John Latham (National Centre for Atmospheric Research) are working on a project to change our climate.

Their idea is to build a fleet of nearly 2000 specially designed wind-powered ships that would spray sea water particles into the atmosphere. When the water in the sea spray evaporates it will leave particles of salt in the atmosphere. The salt particles act as a core around which the water droplets can condense and form white clouds.

The white clouds formed will reflect sunlight back into space (see Prof. Salter's Explanation on Cloud Reflectivity in the references and resources below). As less sunlight will be able to heat the ocean this may cancel out the effects of global warming.

However, this idea does not solve global warming as it would only be effective as long as the ships were in constant use. At present the technology for this is still being developed and it is not yet known whether it will help cool inland areas.



Figure 1. Wind-driven spray vessels for enhancing cloud albedo to reduce global warming. Left: an artist's impression of such a vessel. Right: Cloudia, an existing vessel working on the same principle. Both pictures taken from [4], copyright J MacNeill and Discovery Channel, respectively.

Experiences and Outcomes:

Having selected scientific themes of topical interest, I can critically analyse the issues, and use relevant information to develop an informed argument.

SCN 4-20b

I can identify the possible consequences of an environmental issue and make informed suggestions about ways to manage the impact.

SOC 3-08a

Transferable Skills:

Researching - using the Internet
Researching - using a library
Debating

Communicating
Data analysis
Working in a team

Materials:

Poster paper
Coloured pens
Video camera

Camera
Debate Starter Sheet
Highlighters/coloured pencils

Suggested activities:

Group Presentation

Split the class up into groups and ask them to research Cloud reflectivity and climate engineering. Pupils may find it helpful to use the WebPages listed in the references and resources below or the school library.

Ask the pupils to work as a group to construct a presentation about their research. This presentation could be a poster, a short talk, a news report or a letter to a Politician outlining the principles of the project and stating the pros and cons of the idea. Pupils should include their own opinion in their work and support this with evidence they have found while researching the project.

Great Debate

To finish the unit of work the pupils could take part in a debate - younger children may find this difficult to start so they might like to use the Climate Engineering debate Worksheet.

Extension Ideas:

Investigate other ideas that have been suggested to engineer our climate. There have been a lot of articles in the media recently with ideas such as placing giant mirrors in space to covering Greenland in blankets suggested by scientists.

Alternatively ask pupils to use their new knowledge of meteorology to come up with their own climate engineering project. Give the pupils an opportunity to report their idea back to the class and discuss the pros and cons of each idea.

References/Resources:

Increasing Cloud Reflectivity: (21st Century Challenges)

<http://www.21stcenturychallenges.org/60-seconds/increasing-cloud-reflectivity/>

BBC News clip of Salter and Latham explaining Cloud reflectivity: (You Tube)

<http://www.youtube.com/watch?v=fg7J8P-uXqM>

Customising cloud to stop global warming: (The Telegraph)

<http://www.telegraph.co.uk/earth/environment/climatechange/4699641/Customising-clouds-to-stop-global-warming.html>

Can Geo-engineering rebuild the planet? (The Telegraph)

<http://www.telegraph.co.uk/earth/4641586/Can-geo-engineering-rebuild-the-planet.html>

Cloud ships on course to beat climate change, says Copenhagen study: (The Times)

<http://www.timesonline.co.uk/tol/news/environment/article6742023.ece>

Crazy Ideas to fight Global Warming: (The Telegraph)

<http://www.telegraph.co.uk/earth/environment/climatechange/4611654/Crazy-ideas--to-fight-global-warming-revealed-by-scientists.html>

Geo-engineering: The radical Ideas to combat global warming: (The Guardian)

<http://www.guardian.co.uk/environment/2008/sep/01/climatechange.endangeredhabitats>

Climate Engineering Debate Worksheet:

Cut out the following statements and divide them into two sets:

1. FOR (agree with climate engineering)
2. AGAINST (disagree with climate engineering)

Use the blank speech bubbles to write down some thoughts from your group:

“World governments are going to be far too slow to agree to reduce greenhouse gas emissions. Schemes like this could help to buy time for the world and help prevent catastrophic climate change.”

“we don’t know what the local effects of schemes like this might be – they might cause drought in some countries, or only reduce air temperatures over the oceans”

“there will be less sunlight reaching the Earth’s surface. This might have an effect on how well some plants produce their own food”

“ the amount of carbon dioxide in the climate system will carry on rising. This means other problems, like the oceans becoming more acidic, and some plants growing better than others, won’t be solved”

“it was tampering with nature that got us into this mess in the first place, we should stop emitting too many greenhouse gases rather than try solutions that may cause even more problems”

“by making clouds about 10% more reflective, we can reflect the Sun’s rays back into space. A large fleet of ships spraying droplets of seawater into the atmosphere could compensate for the increased amount of greenhouse gases.”

