



# GEOENGINEERING

## CLEANING OR ENDING THE EARTH

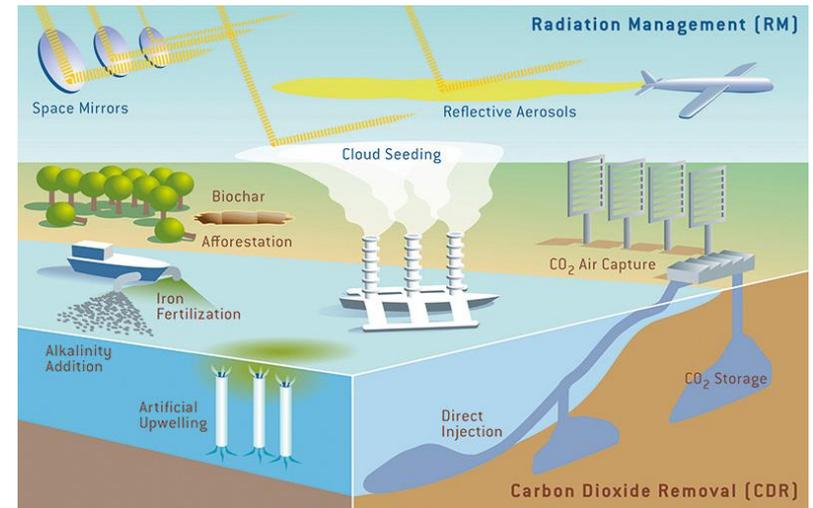
**Major General ANM Muniruzzaman (Retd.)**  
**President**  
**Bangladesh Institute of Peace and Security Studies (BIPSS)**

**&**

**Chairman**  
**Global Military Advisory Council on Climate Change**  
**(GMACCC)**

# INTRODUCTION

- ❖ Geoengineering is being considered as an alternative option to address the adverse impacts of climate change.
- ❖ It involves large scale artificial intervention on the Earth's climate system
- ❖ Concerns revolve around the associated effects of geoengineering
- ❖ A special kind of governance is required at global level to develop and monitor geo-engineering.

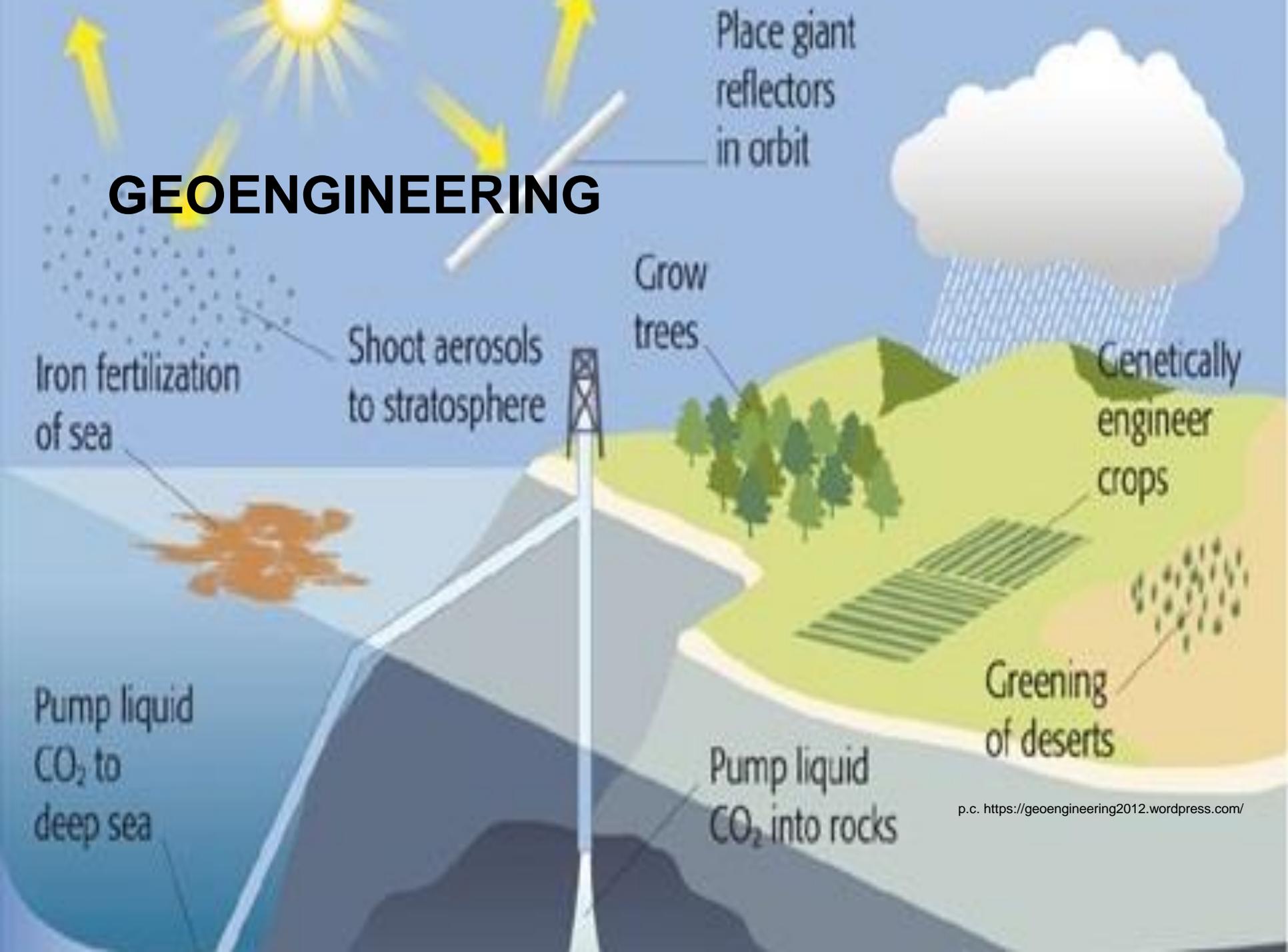


p.c.: <http://blog.castac.org>

# WHAT IS GEOENGINEERING

- ❑ **Geo-engineering denotes large scale direct human intervention on the Earth's natural system to counter the adverse impacts of climate change.**
- ❑ **Considered as the last option to save the Earth from the worst effects of climate change**
- ❑ **Can bring immediate results**

# GEOENGINEERING



# METHODS OF GEOENGINEERING

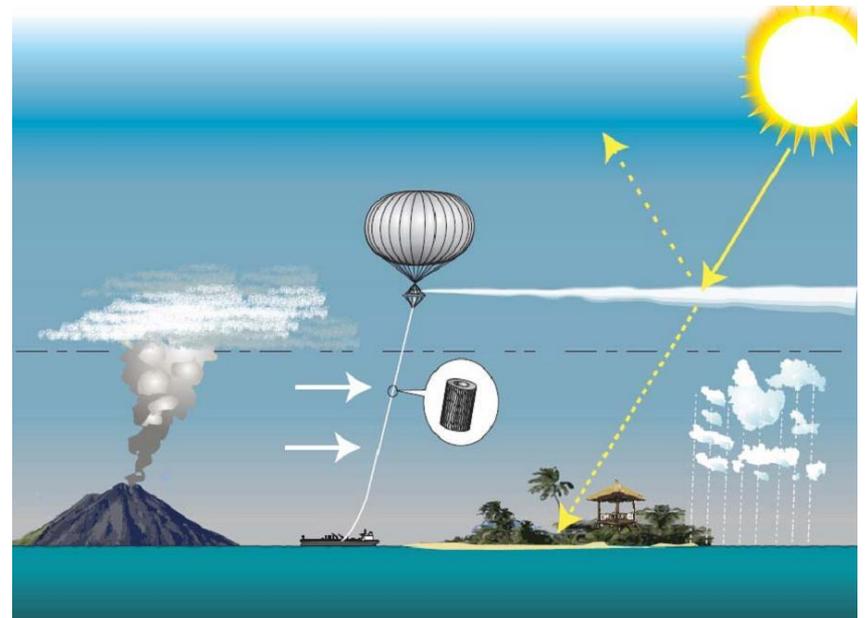
Solar Radiation Management (SRM)

Carbon Dioxide Removal (CDR)

# SOLAR RADIATION MANAGEMENT (SRM)

## What is SRM:

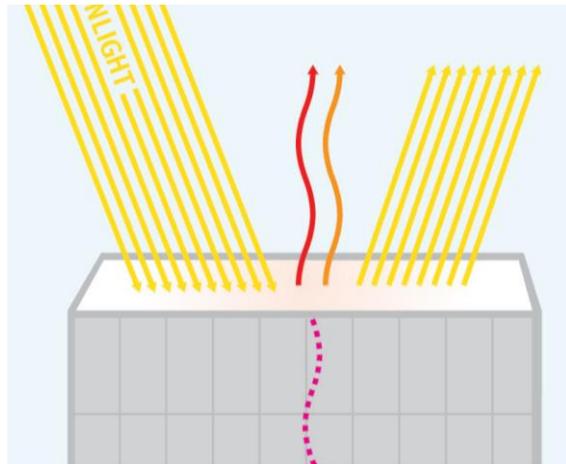
Develop artificial barriers so that solar radiation can be reflected back to the space and reach the Earth surface at a controlled level



By Hughhunt

# ALBEDO ENHANCEMENT

Increase land reflectivity



<https://historicalbanyfoundation.wordpress.com>

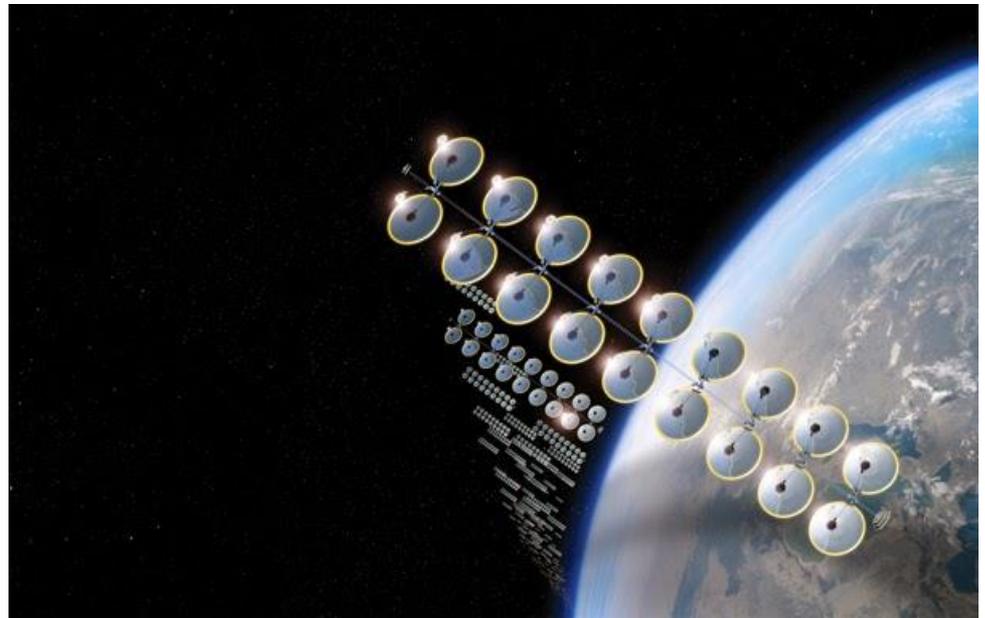
Brighten marine cloud



<http://www.climatecentral.org>

# SPACE REFLECTORS

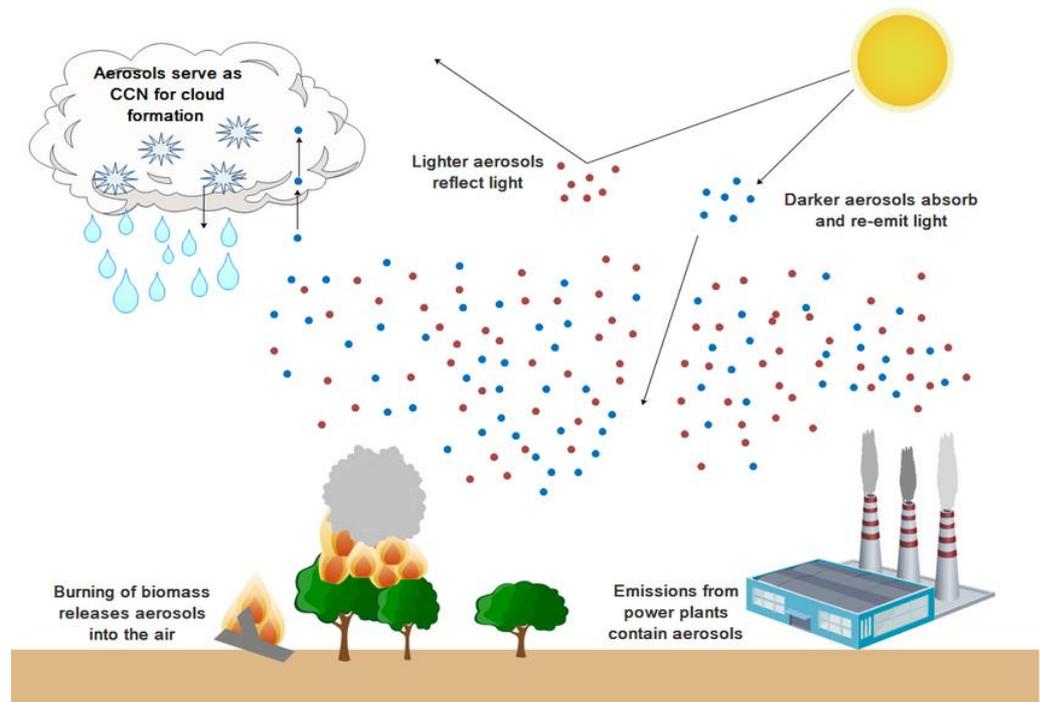
- Float small mirrors in the space
- Block a small proportion of sunlight before it reaches the Earth



p.c.:  
<http://eminaribo.blogspot.com>

# STRATOSPHERIC AEROSOLS

Introducing small, reflective particles into the upper atmosphere to reflect some sunlight before it reaches the surface of the Earth



# CASE STUDY: ERUPTION FROM MOUNT PINATUBO VOLCANO

- Erupted in 1991 in Philippines
- Ejected more than 20 million tons of sulfur dioxide spreading particles in the stratosphere
- These particles scattered and obstructed light to reach Earth Surface.
- Following two years, global temperatures declined by 0.5° Celsius.

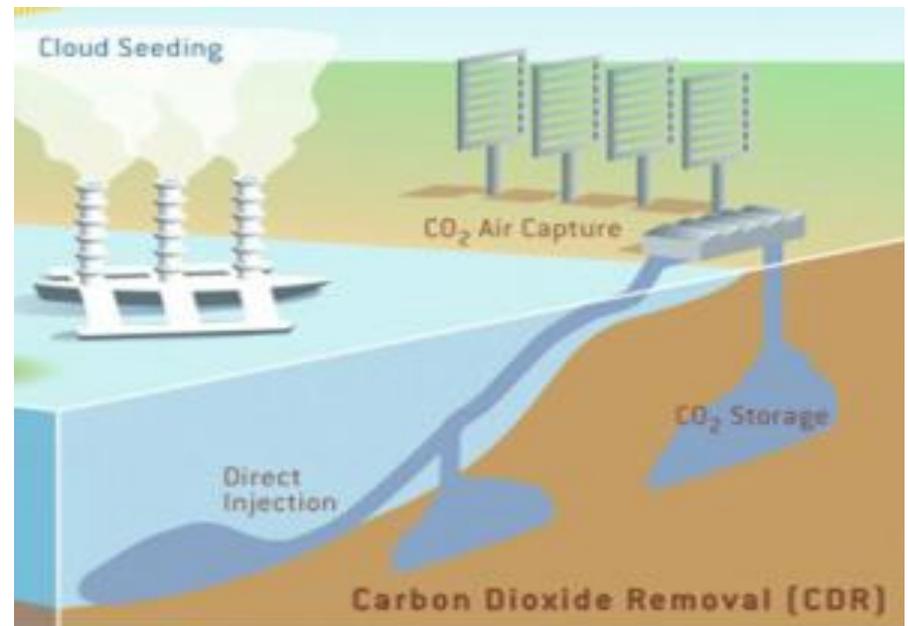


<https://pubs.usgs.gov>

# CARBON DIOXIDE REMOVAL (CDR)

## What is CDR?

The elimination of carbon dioxide from the Earth environment directly countering the increased greenhouse effect and ocean acidification



# AFFORESTATION

- ✓ **Global-scale tree plantation effort**
- ✓ **Slow but more effective to counter the adverse impacts of climate change**
- ✓ **No side effect**

# AMBIENT AIR CAPTURE

Set-up sophisticate machines that can eliminate carbon dioxide directly from our surrounding air and store it elsewhere



Synthetic trees

<http://www.earth.columbia.edu>

# BIOCHAR

Bury large amounts of charcoal into soil so that its carbon is locked up and cannot enter the carbon cycle

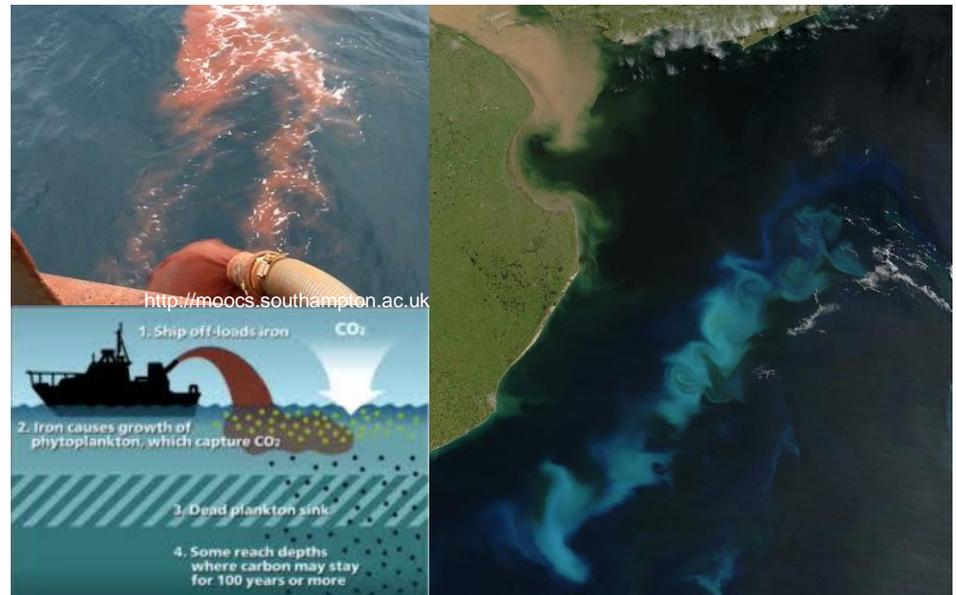


<https://inhabitat.com>

# OCEAN FERTILISATION

## Process

- Add nutrients such as iron, urea, etc. to the top layers of the ocean
- Lead to increased phytoplankton growth
- Draw down carbon dioxide from the atmosphere
- Phytoplankton sink from the surface to the deep ocean as dead cells.



<https://geoengineering2012.wordpress.com>

By NASA -  
<http://earthobservatory.nasa.gov/>

# OCEAN FERTILISATION

## **Impact**

- Plankton blooms can affect the physical properties of surface waters by absorbing light and heat from the sun
- Changes in phytoplankton species
- Harmful algal blooms and the production of nitrous oxide and methane
- Adverse impact on Marine life
- Unknown consequences on the ecosystem

## GEOENGINEERING EXPERIMENT By RUSS GEORGE

- An American businessman named Russ George made a private geoengineering experiment.
- He dumped around 100 tonnes of iron sulphate into the Pacific Ocean as part of a geoengineering scheme off the west coast of Canada.
- The iron has spawned an artificial plankton bloom as large as 10,000 square kilometres.
- The experiment adversely affected the surrounding ecosystems, producing toxic tides, severing ocean acidification
- Huge outcry by different bodies including Lawyers, environmentalists and civil society groups

# GEOENGINEERING EFFORTS SO FAR

- Large scale interventions on climate change are still in research level.
- However, some field level experiments have taken place.

## **Harvard project**

- The world's biggest solar geoengineering programme to date
- Launch a high-altitude balloon from a location in Tucson, Arizona
- Spray aerosol 20km up into the earth's stratosphere

## SECURITY IMPLICATIONS

- Geoengineering will have unknown and uncertain consequences
- Impacts may go beyond our control leading to fatal consequences on global climate
- Geoengineering technology may be weaponised in the guise of addressing the climate change
- It may be exploited for military and political ambition over other countries
- It might trigger a race for military expansion and geoengineering might be exploited for military purpose

# SECURITY IMPLICATIONS

- ❑ Large military establishments in the duty of implementing geoengineering may be target of militant or military attack.
- ❑ The suspicion and blame-game can give rise to 'weather war'.
- ❑ Once started, geoengineering mechanism must be continued for an extended period of time.
- ❑ If the process is stopped abruptly, we may experience termination shock that will negate the success of geoengineering that has been achieved so far and the temperature will shoot up again in a dramatic rate.

# GOVERNANCE STRUCTURE NEEDED

- Right now, a huge opaque condition exists regarding the research and experimentations of geoengineering.
- There is no accepted oversight body to monitor the issue.
- It is high time we fixed the governance structure to avoid unmanageable circumstances in the future.



<https://www.project-management.pm>

## GOVERNANCE STRUCTURE NEEDED CONTINUED

- Wider information debate on each dimension of geoengineering technology at international level is needed.
- The rules and regulations of the application of geoengineering are needed to set up
- An international body to oversee and regulate the mechanism has to be set up perhaps under the UN umbrella.
- There should be a verification regime to accurately monitor the impacts after deployment.

# “OXFORD PRINCIPLES”

1 *Geoengineering to be regulated as a public good*

2 *Public participation in geoengineering decision-making*

3 *Disclosure of geoengineering research and open publication results*

4 *Independent assessment of impacts*

5 *Governance before deployment*

## WAY FORWARD

- There should be global moratorium to undertake large-scale geoengineering intervention on climate until everything is in place.
- Recent findings regarding geo-engineering must be transparent and open access must be given to all.
- A global research pool has to be formed.
- Contingency planning should be made ready beforehand at global level.



**BIPSS**

Towards a Secure World

# THANK YOU

Bangladesh Institute of Peace and Security  
Studies

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