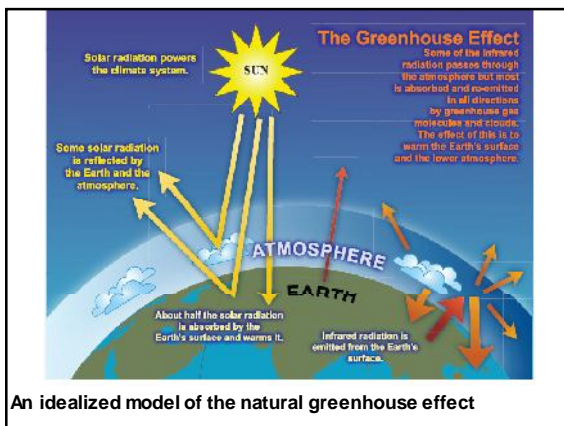
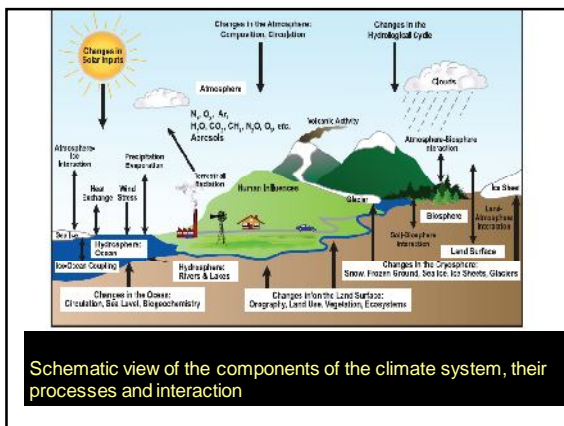


**Observed Changes
 due to Climate Changes
 and action plan programme
 in Sri Lanka**

**E. Sunil Silva
 Director of Meteorology**

CONTENTS

- ^ What is CC
- ^ Studies on CC
- ^ Observed changes
- ^ Plan of Actions for DRR



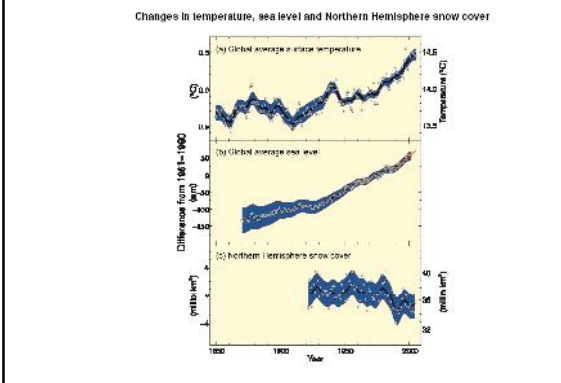
Major Greenhouse gases

GHG	Lifetime	GWP	Major Source
CO2	50-100	1	Fossil fuel Deforestation
CH4	12	21	Agriculture Waste
N2O	120	310	Fertilizer manufacturing
CFCs	50	6200 - 7100	Chemical industries
HFC	1.5-264	1300	Industries

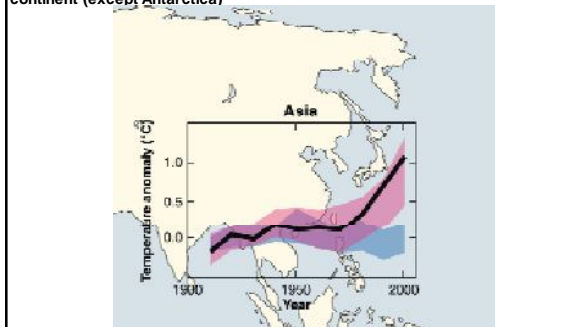
**Per capita emissions in South Asian
 countries in comparison to USA**

Country	Per Capita emissions (carbon tons)	
	1990	1996
USA	5.18	5.37
Bangladesh	0.04	0.05
Bhutan	0.02	0.04
India	0.22	0.29
Maldives	0.19	0.31
Nepal	0.01	0.02
Pakistan	0.16	0.18
Sri Lanka	0.06	0.11

Observed changes in climate and their effects



Most of the observed increase in globally-averaged temperatures since the mid-20th century is *very likely* due to the observed increase in anthropogenic GHG concentrations. It is *likely* there has been significant anthropogenic warming over the past 50 years averaged over each continent (except Antarctica)

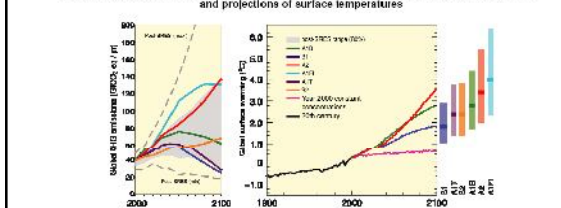


Projected climate change and its impacts

There is *high agreement* and *much evidence* that with current climate change mitigation policies and related sustainable development practices, global GHG emissions will continue to grow over the next few decades

Continued GHG emissions at or above current rates would cause further warming and induce many changes in the global climate system during the 21st century that would *very likely* be larger than those observed during the 20th century

Scenarios for GHG emissions from 2000 to 2100 (in the absence of additional climate policies) and projections of surface temperatures

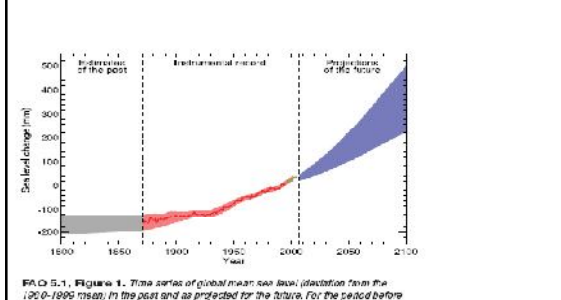


Left Panel: Global GHG emissions (in CO₂-eq) in the absence of climate policies; six illustrative SRES marker scenarios (coloured lines) and the 80th percentile range of recent scenarios published since SRES (post-SRES) (gray shaded area). Dashed lines show the full range of post-SRES scenarios. The emissions cover CO₂, CH₄, N₂O, and F-gases. Right Panel: Solid lines are multi-model global averages of surface warming for scenarios A2, A1B and B1, shown as continuations of the 20th-century simulations. These projections also take into account emissions of short-lived GHGs and aerosols. The pink line is not a scenario, but is for Atmosphere-Ocean General Circulation Model (AOGCM) simulations where atmospheric concentrations are held constant at year 2000 values. The bars at the right of the figure indicate the best estimate (solid line within each bar) and the *likely* range assessed for the six SRES marker scenarios at 2090-2099. All temperatures are relative to the period 1980-1999.

Projected global averaged surface warming and sea level rise at the end of the 21st century

Case	Temperature change (°C at 2090-2099 relative to 1980-1999) A ^b		Sea level rise (m at 2090-2099 relative to 1980-1999)
	Best estimate	Likely range	Model based range, excluding future land dynamical changes in ice flow
Constant year 2000 concentrations case	0.6	0.5-0.9	Not available
B1 scenario	1.8	1.1-2.5	0.75-0.99
A1T scenario	2.4	1.4-3.6	0.20-0.45
B2 scenario	2.4	1.9-3.5	0.20-0.44
A1B scenario	2.6	1.7-4.4	0.21-0.43
A2 scenario	3.4	2.0-5.4	0.23-0.51
A1FI scenario	4.0	2.4-6.4	0.23-0.59

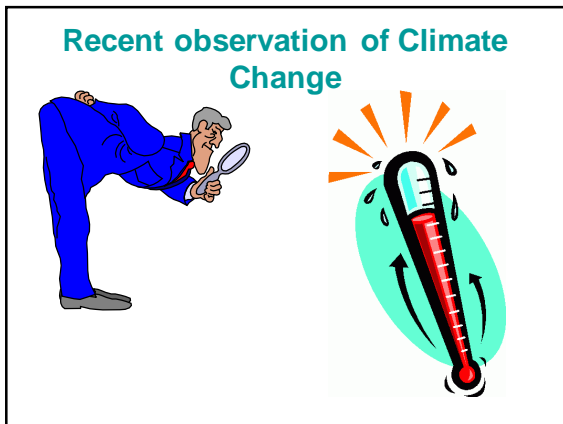
Time series of global mean sea level (deviation from the 1980-1999 mean) in the past and as projected for the future. For the period before 1870, global measurements of sea level are not available. The grey shading shows the uncertainty in the estimated long-term rate of sea level change. The blue shading represents the range of model projections for the SRES A1B scenario for the 21st century, relative to the 1980 to 1999 mean



FAO 5-1, Figure 1. Time series of global mean sea level (deviation from the 1980-1999 mean) in the past and as projected for the future. For the period before 1870, global measurements of sea level are not available. The grey shading shows the uncertainty in the estimated long-term rate of sea level change. The blue shading represents the range of model projections for the SRES A1B scenario for the 21st century, relative to the 1980 to 1999 mean

Climate Change:

Climate Change is defined as statistically significant variation in either mean state of the climate or in its variability, persisting for an extended period (typically decades or longer). Climate change may be due to natural internal processes or external forcing or to persistent anthropogenic changes in the composition of the atmosphere or in land use (IPCC, 2001).



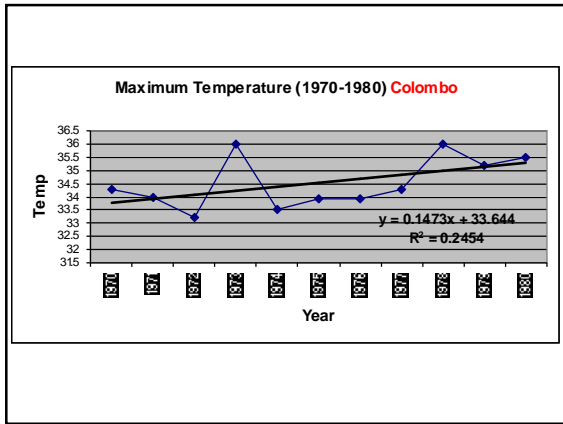
Human influences have:

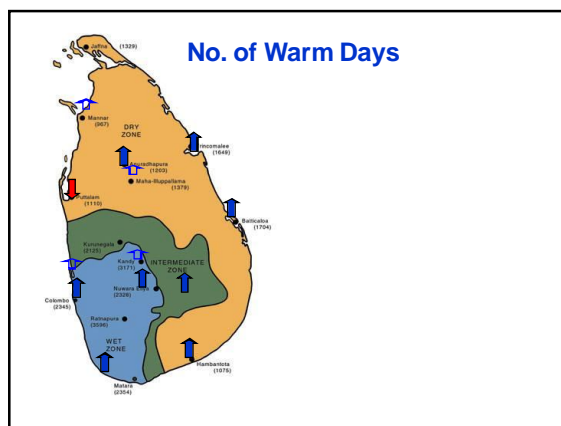
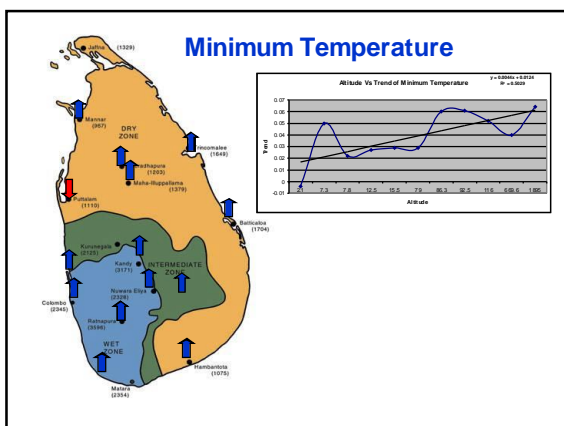
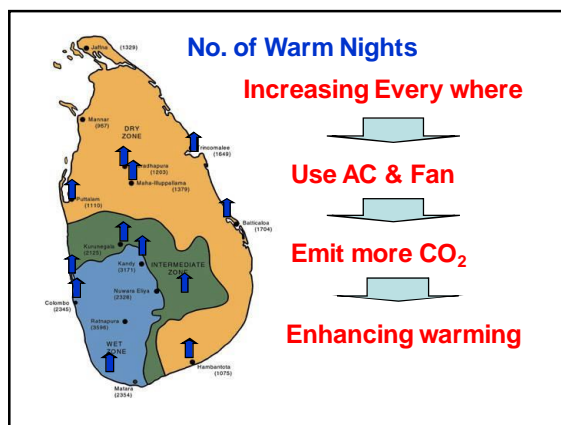
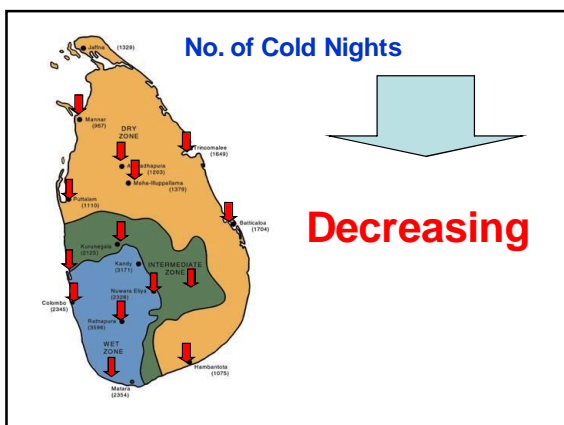
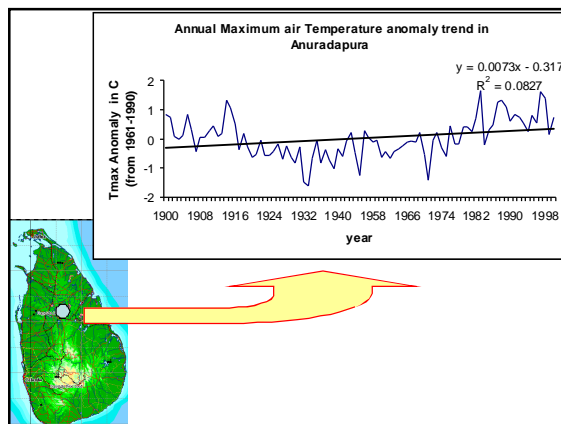
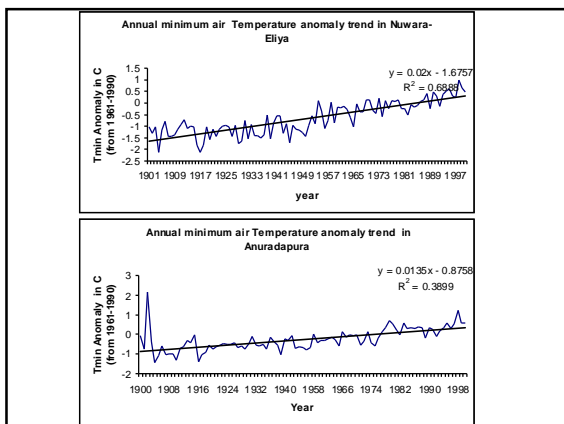
- *very likely* contributed to sea level rise during the latter half of the 20th century
- *likely* contributed to changes in wind patterns, affecting extra-tropical storm tracks and temperature Patterns
- *likely* increased temperatures of extreme hot nights, cold nights and cold days
- *more likely than not* increased risk of heat waves, area affected by drought since the 1970s and frequency of heavy precipitation events.

Regional-scale changes :

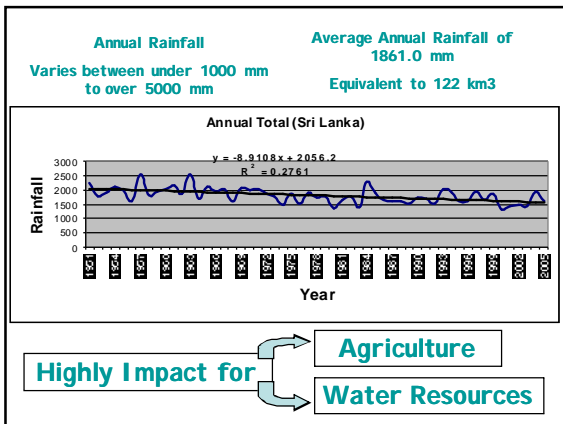
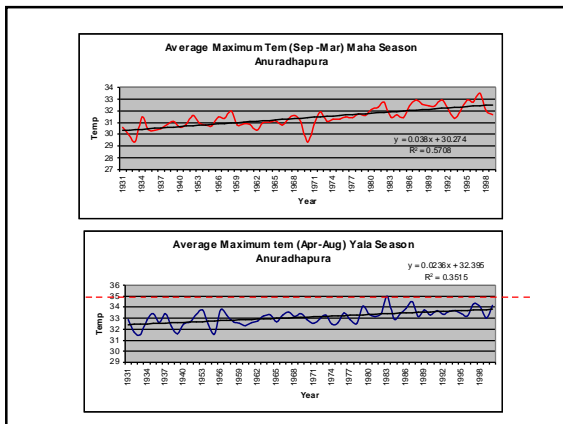
- warming greatest over land and at most high northern latitudes and least over Southern Ocean and parts of the North Atlantic Ocean, continuing recent observed trends
- contraction of snow cover area, increases in thaw depth over most permafrost regions, and decrease in sea ice extent; in some projections using SRES scenarios, Arctic late-summer sea ice disappears almost entirely by the latter part of the 21st century
- *very likely* increase in frequency of hot extremes, heat waves, and heavy precipitation
- *likely* increase in tropical cyclone intensity; less confidence in global decrease of tropical cyclone numbers
- poleward shift of extra-tropical storm tracks with consequent changes in wind, precipitation, and temperature patterns
- *very likely* precipitation increases in high latitudes and *likely* decreases in most subtropical land regions, continuing observed recent trends.

Study results on
Climate change in SL





Change of Temperature during Yala and Maha Seasons



For Agriculture

↓

Rainfall Variability

Short-term fluctuations around the average weather

Raining, when rain is not expected
Not raining, when rain is expected

Example for the impact of rainfall variability in Sri Lanka during Maha Season in 2007

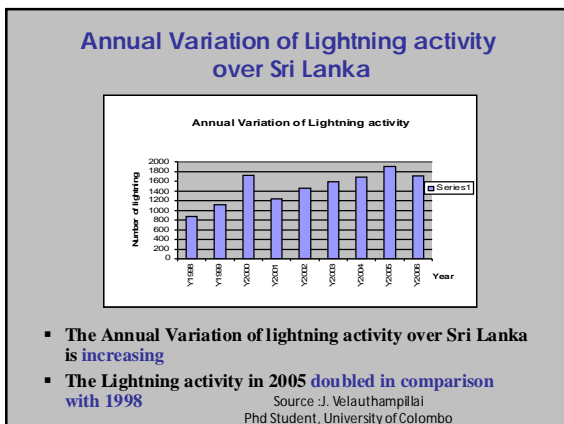
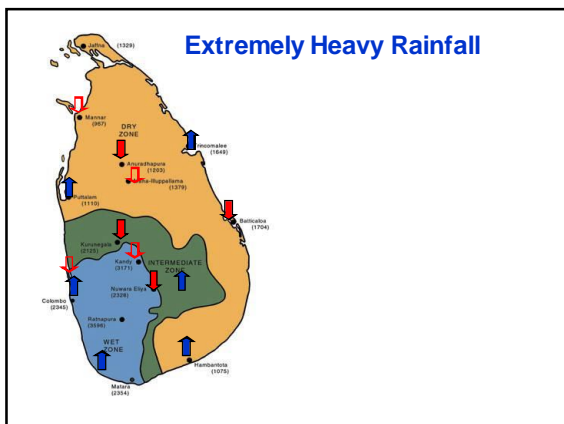
Sri Lanka lost about 40% of paddy yield during 2007 Maha Season due to high rainfall variability during the Second inter monsoon and Northeast monsoon in 2007

- Maha season starts in September
- sowing time is October

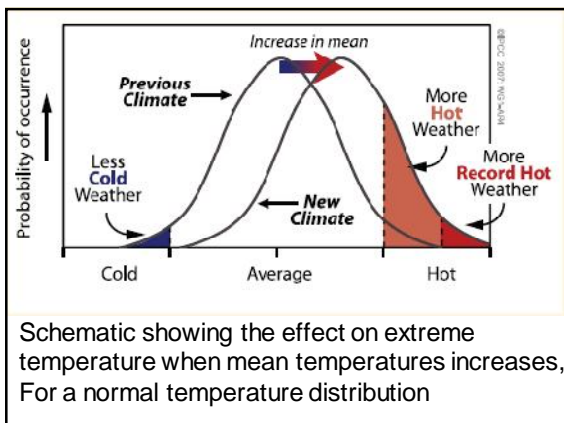
General practice in rice cultivation

- Start sowing in November
- Harvesting month is March
- Generally low rainfall in March

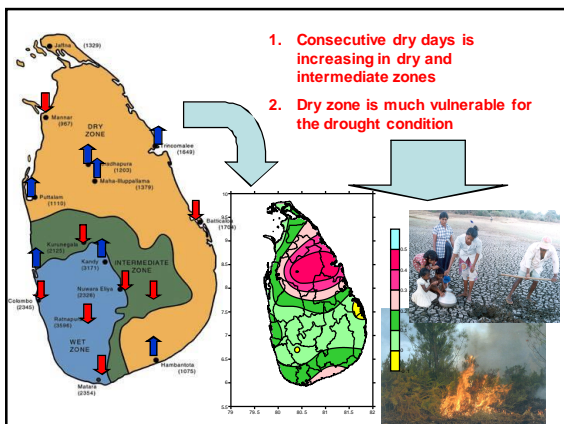
What happened in 2008 March?
rainfall was high



Climatic Extremes



- ### Climate Extremes
- Eg:
- Consecutive Dry Days
 - Consecutive Wet days
 - No of Cold nights
 - No of Warm nights
 - No of Cold days
 - No of warm days
 - One day heavy rainfall events etc.
 - Heavy rainfall
 - Extremely heavy rainfall



Summary

- **Temperatures has increased**
 - **Minimum**
 - **Maximum**
- **Warm night has increased**
- **Warm days has increased**
- **Cold night has decreased**
- **Cold days has decreased**
- **Consecutive dry days has increased (specially in the dry zone)**

Action Plan on Climate Change

Focal point
 Department of Meteorology - Focal point for IPCC
 Ministry of Environment - Focal point for UNFCCC

Responsibilities
 Facilitate implementation of necessary policies and related actions on climate change in collaboration with line agencies and other relevant stakeholders

Actions
 Enhance the national capacities and raise general awareness on climate change and its effect and prioritize climate change issues on the national agenda through strengthened cooperation and increased involvement of all relevant stakeholders.

Conducting Awareness Programs

- Conducted awareness programs in year 1995/96 for school children and teachers through out the island to get the knowledge of climate change
- Conducted seminars in year 2005/ 2007 in institutional levels to aware the present situation and action plans of climate change adaptation.
 - Senior staff and Policy makers
 - Scientists
 - General Public
 - Students

Follow Kyoto Protocol

“Industrialized countries should reduce their combined GHG emission by at least 5% compared to their emission levels in 1990 , during the period 2008-2012”.

•Kyoto targets

• **Target is to reduce CO2 by 5% from the 1990 level**

Country Target

USA	7%
EU countries	8%
Japan	6%
Croatia	5%
Russia	0%

Kyoto Mechanisms

- Clean Development Mechanism**
 Projects in developing countries
 - Sustainable Development Objective
- Joint Implementation**
 Projects between countries with targets
 (Annex 1 countries)
- International Emissions Trading**
 Between countries with targets
 (Annex 1)

Reduce Emissions of GHG

Clean Development Mechanism (CDM)

Implementing projects in developing countries, that reduce emissions of GHG or absorb GHG from the atmosphere and sell the amount avoided or absorbed to developed countries

Potential sectors

Two types of projects:

Emission avoidance projects
GHG Removal or sink projects

Sectors

Energy
Industrial
Agriculture
Waste sector
Forestry

Forest Carbon (CDM)

- Only afforestation and reforestation projects eligible for CDM according to Bonn Agreement

Afforestation

Direct human induce conversion of land that has not been forested for a period of at least 50 years to forested land through planting, seeding and/or the human induced promotion of natural seed sources

Reforestation

Direct human induced conversion of non-forested land to forested land through planting, seeding or human induced promotion of natural seed sources, on land that was forested but that has been converted to non-forested land. For the first commitment period(2008 –2012), reforestation activities will be limited to reforestation occurring on those lands that did not contain forest on 31st December 1989

Eligible forest CDM Projects under Bonn Agreement

- Establishment of woodlots on communal lands.
- Reforestation of marginal areas with native species eg: riverine areas, steep slopes, around and between existing forest fragments (Through planting and natural regeneration)
- New large-scale, industrial plantations.

- Establishment of biomass plantations for energy production and the substitution of fossil fuels.

Eligible forest CDM Projects under Bonn Agreement

- Small-scale plantations by landowners

- Introduction of trees in to existing agricultural systems (agro forestry)

- Rehabilitation of degraded areas through tree planting or assisted natural regeneration

Hazards due to climate change

- Health sector
- Agriculture sector
- Coastal erosion and sea level increase
- Flash floods and landslides
- Droughts

Challenges

- Lack of finance on technology transfer.
- Delays in Funding.
- Lack of knowledge.
- No easy access to new information.
- Fear of adopting new technologies.

YOU CAN HELP TO STOP GLOBAL WARMING/CLIMATE CHANGE



Thank you !!!