UNFCCC Technical Workshop under the Nairobi Work Programme on Impacts, Vulnerability and Adaptation to Climate Change

Advancing the integration of approaches to adaptation planning

The Caribbean Experience

12-14 October 2009
Bangkok, Thailand

Caribbean Perspective

- Climate change has now emerged as a major environmental hazard globally.
- Strong scientific evidence for climate change and attribution to anthropogenic causes.
- Also evidence that climate change will exacerbate existing impacts of climate variability.

Caribbean Perspective

- Caribbean region already vulnerable to risks arising from climate hazard :
  - Weather extremes leading to e.g. floods, drought, landslides
  - Hurricanes
- These events can be attributed to present day climate variability
- Adapting to present risks posed by climate variability is first step towards the longer term goal of adaptation to climate change.

CARICOM INITIATIVES

- Caribbean Governments have initiated regional action to address issue which was accorded top priority in BPOA:

  - CPACC (1997 – 2001)
  - ACCC (2001- 2004)
  - MACC (2004 – 2008)
  - CCCCC establishment (2004)
  - SPACC (2007 – 2010)

INITIATIVES IN PROGRESS

- **Suite of activities to determine:**
  - **extent of risk arising from climate change to which region will be exposed in future.**
  - **vulnerability of the region's natural and socioeconomic systems to climate change.**
  - **impacts of CC on the natural and socioeconomic systems of the region.**
  - **regional response to mitigate those impacts and costs for implementing.**
  - **implementation of mitigative actions (ADAPTATION)**
  - **building regional capacity to carry out the above actions**

Defining the risk

- Expected to answer the following:
  - What is expected change in-
    - Temperature
    - Sea level
    - Frequency of weather extremes – El Nino, La Nina
    - Frequency and intensity of hurricanes
    - Frequency in return periods of extreme events – floods , droughts
    - Patterns and intensity of precipitation

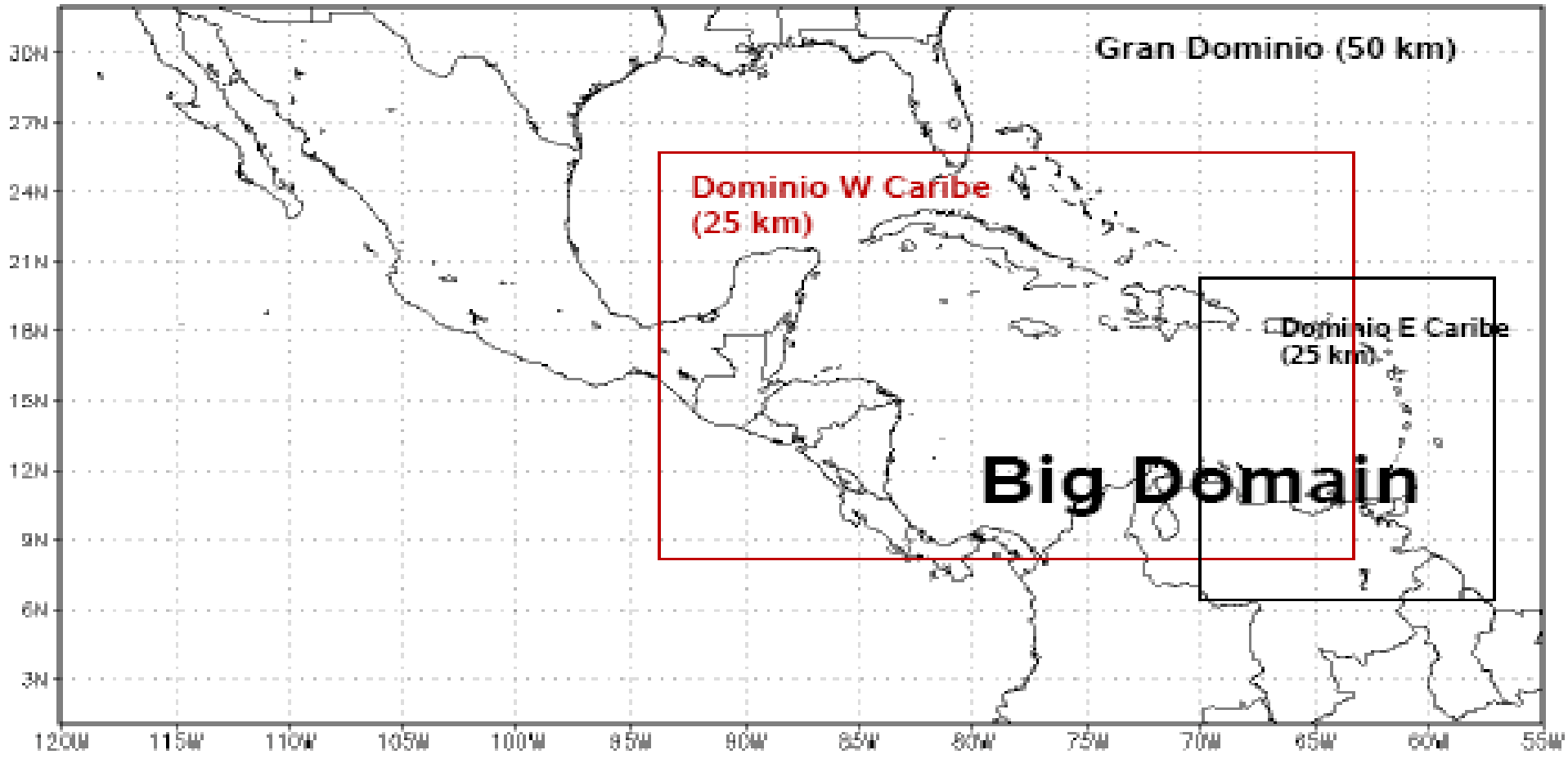
Risk Definition

- Actions to define climate risk include:
  - Sea level monitoring – installation and operation of regional sea level monitoring network.
  - Rescue and analysis of meteorological data.
  - Climate modeling.
  - Trend analysis and interpretation of outputs from climate modeling.

Mainstreaming Adaptation to CC

- (a) downscaling
- (b) regional climate change projections
- (c) regional climate change scenarios
- (d) (c) + impact models (crop, hydrology models)
- (e) impacts of extreme events under different climate scenarios
- (f) Climate impact scenarios
- (g) Adaptation options

Domains


Gran Dominio (50 km)
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Big Domain
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Modeling results to date

- PRECIS-CARIBE (Actual data)
- HadCM3 50km
- 2x30 Years Baseline Ensembles (Control Experiments) 1960-1990 (S)
- 3xA2 30 Years of future scenarios 2070-2100 (S)
- B2 30 Years of future scenarios 2070-2100 (S)

Modeling results to date

- ECHAM4 50km
- Control 1960-1990 31yrs
- A2 1990-2100 114 yrs
- B2 1990-2100 114 yrs
-
- ECHAM4 25Km (Western & Eastern Caribbean)
- Control 1960-1990 31yrs
- A2 1990-2100 114 yrs
- B2 1990-2100 114 yrs

Modeling results to date

- ERA with sulphur cycle 50km
- 20 Years Reanalysis ERA40 (1969-1989)
- 15 Years Reanalysis ERA15 (1979-1993)
-
- SRES Control hourly with sulphur cycle 50km
- 1960-1969 10 yrs

Risk Definition

- Vulnerability assessments :
  - Coasts – natural ecosystems, infrastructure, human settlement
  - Water
  - Agriculture
  - Health
  - Tourism
- Tools – VA methodology, storm surge models, wave models , climate models, sectoral models, community participation.

Institutional Arrangements

- National Focal points
- National Implementation Coordinating Units.
- UWI St Augustine , CIMH (monitoring)
- UWI Mona, Cave Hill (modeling – dynamic & statistical downscaling)
- UWI Cave Hill (M Sc programme)
- CCCCC

Indicative impacts

- Impact studies on vulnerable elements – some indications :
  - Less precipitation - less available water;
  - Changing weather patterns – agriculture adversely affected.
  - Sea level rise – coastal inundation, storm surge exaggeration (tourism, aquifers, agriculture, infrastructure, human settlement)
  - Increased intensity of hurricanes (human settlements, tourism, infrastructure, livelihoods.
  - Increased temperature (agriculture, health, coral reefs)

Steps to Adaptation

- Use of regional climate models and interpretation of outputs.
- Trend analysis, statistical downscaling
- Development of regional climate change scenarios
- Vulnerability studies (sectoral &community vulnerability studies)
- Climate Impact Studies – water, agriculture, health, tourism, coastal zone.
  - Application of storm surge and wave models (SWAN) to coastal vulnerability studies.
  - Identification and use of appropiate sectoral models for impact studies.
- Cost benefit analysis of adaptation options – cost of inaction
- Mainstream adaptation into national development planning

Agriculture – The Guyana Case Study

- **Background**
  - Guyana's coast accommodates 90% of the country's population.
  - The coast represents approximately 8% of the country's landmass of 214,000 Km2
  - The coastal plain is 6 feet below the mean high tide mark
  - It is currently protected by a series of man-made (seawall and groynes) and natural (mangroves, sea grasses, etc) sea defences.

Agriculture – Background (continue)

- Agriculture is one of the main economic sectors in the country, but is done mainly on the coast
- Agriculture represents:
  - 35% of GDP
  - 30% of export earnings
  - 30-35% of the national labour force directly and indirectly

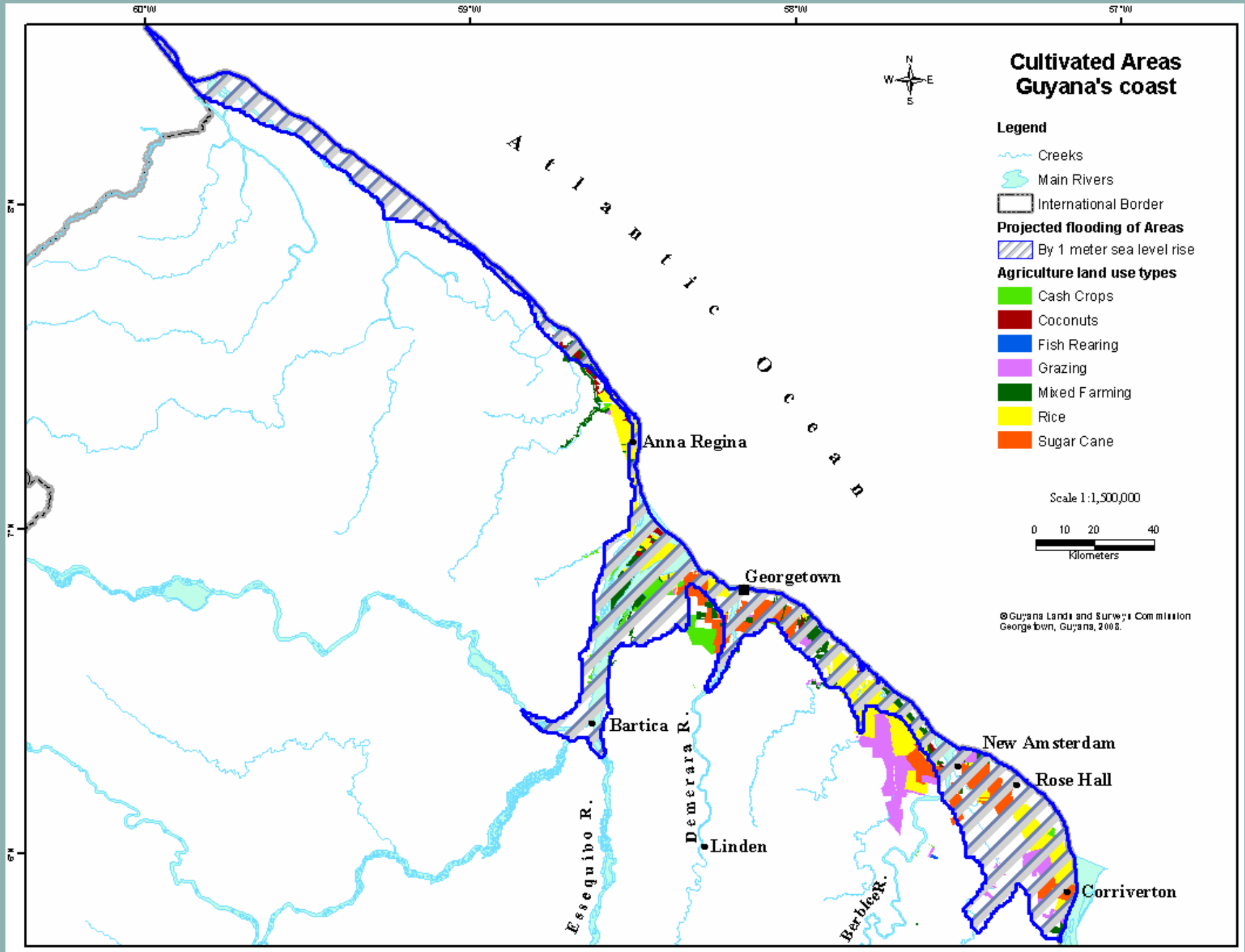
Methodology Applied

- Collection and study of secondary data, inclusive of:
  - Vulnerability and Capacity Assessment: Impacts of Climate Change on Guyana's Agriculture Sector (2007)
  - Guyana's First National Communication (INC 2002)
  - Guyana's Climate Change Adaptation Policy and Implementation Strategy for Coastal and Low- lying areas (2002)
- Stakeholder consultations/survey analysis

Methodology (continued)

- Sector Assessments
- Modeling analysis, using PRECIS data for Guyana, and the A2 and B2 scenarios
- Various GIS analyses of sea level rise and the effect on the Guyanese economy
- Various quantitative models, inclusive of regression analysis.
- Adaptation options
- Stakeholder Workshop

Impacts of 1m rise in sea level



Climate Predictions for Guyana

- Data and models predict-
  - an increase in temperature
  - a slight decrease in total rainfall
  - a decrease in the length of the rainy period.
- Result: more intense rainfall during the rainy season
- Rising CO_2 levels and high RH

Agricultural lands highly vulnerable to 1 metre sea level rise

Region No.	Total area highly vulnerable to 1 metre sea level rise	Area used for Agricultural activities	Agricultural lands within the highly vulnerable zone	% of agriculture lands in the highly vulnerable zone
Region 2	28,910	31,667	14,440	46%
Region 3	148,203	65,107	47,365	73%
Region 4	51,489	30,006	28,119	94%
Region 5	52,182	89,285	36,913	41%
Region 6	180,708	74,003	72,719	98%
TOTAL	**461,492**	**290,068**	**199,556**	**69%**

Climate change impacts on the agricultural sector

Climate factor	Direction of change	Consequences and threats to agricultural production and food security
Sea level rise	Increase (0.2m-0.5m).	- Flooding; saltwater intrusion and salinisation of major rivers. - Reduction in aquaculture production. - Susceptibility of mangroves to decline.
Rainfall	Increased intensity, but of a shorter duration.	- Increased run off and possibly greater erosion of soil. - Increased leaching of nutrients and agricultural chemicals into groundwater and surface water. - Greater overtopping of conservancies. - More flooding and water logging - Increase in some pests and diseases. - Wetter conditions at harvest time could increase the potential for decreasing quality of many crops.

Climate change impacts on the agricultural sector (cont'd)

Climate factor	Direction of change	Consequences and threats to agricultural production and food security
Drought	Difficult to predict	We may experience more extremes of weather resulting in: - Crop failure - Yield decrease - Death of livestock - Competition for freshwater - Loss of rural income.
Temperature	Increases (rise of 1.2 ^{0}C in minimum temperature.	- Greater evaporation and transpiration of water. - Greater soil moisture deficits. - Increased pressure on irrigation schemes to supply adequate water to farms. - Shorter cropping season i.e. faster crop maturation. - Shorter life cycle of pests and pathogens. - Faster breakdown of residual chemicals in the soil.

Climate change impacts on the agricultural sector (cont'd)

Climate factor	Direction of change	Consequences and threats to agricultural production and food security
Atmospheric CO_2	Increase (doubling to tripling).	- Faster rate of photosynthesis and increased water use efficiency especially for C_3 plants e.g. rice, beans, and cabbages. However, other factors will influence final yield. - Added weed growth and more expensive weed control practices.
Wind	Higher gusts of wind with greater turbulence especially when accompanied by rainfall.	- Breakage of branches, lodging of crop. - Damage to farms. - Sea swells and tidal surges. - Occasional flooding.

Challenges to the Sub-Sectors

Sub-Sector	Challenges
Livestock systems	• Inconsistent productivity due to variability in pastoral and water resources • Reduction in pastoral land as a result of arable agricultural activities • Loss of cattle • Spread of disease due to changes in the environment • Increasing conflict between cattle rearers and crop (especially rice) farmers
Cropping systems	• Lower productivity due to reductions in rainfall and increased moisture deficits • New pests • Spatial redistribution of pests • Unpredictable rainfall

Challenges to the Sub-Sectors (cont'd)

Sub-Sector	Challenges
Forestry and agro forestry	• Expansion of agricultural activities into forest • Uncontrolled utilization of forest reserves as a means of livelihoods • Risk of extinction of some animal species due to the destruction of their ecological habitat (because of the shift of forest areas to agricultural land)
Land and water management	• Monoculture with negative effects on water harvesting and management • Increasing conflict over use of water resources • Intense rainfall, floods and soil erosion

Challenges to the 'Sub-Sectors' (cont'd)

Sub-Sector	Challenges
Fisheries	• Disturbances in fish fertility cycles; • Increased mortality amongst young fish due to rising water temperatures particularly in lakes and rivers; • Effects of strong salinity in these surroundings exacerbated by the penetration of sea water seriously effects fishery resources and already fragile ecologies; • Frequent fish migration into deep water; • Change of the spawning grounds of fishes & shrimps
Food insecurity	• Low production and productivity leading to increased food prices
Vulnerability	• Low mobilization of knowledge to support strategic interventions • Low response • Information not accessible to the vulnerable • Lack of national and regional models for vulnerability assessment • Lack of data and information for vulnerability assessment

Challenges to the 'Sub-Sectors' (cont'd)

Sub-Sector	Challenges
Institutional	• Insufficient institutional capacity; • Insufficient information at a downscaled level; • Insufficient inter-agency collaboration; and • Insufficient public awareness and dissemination about climate change.
Policy	• Current policies and laws do not address climate change issues directly; and • The ICZM Committee has been inactive for an extended period.

Recommendations

- Capacity Enhancement (both technical and institutional),
- Infrastructure Management, inclusive of drainage and irrigation, and seawall defence construction
- Policy and Legislation,
- Research and Development (i.e., pest resistant varieties), and
- Awareness and communication.


THANK YOU