Appendix I

Country Paper: Philippines

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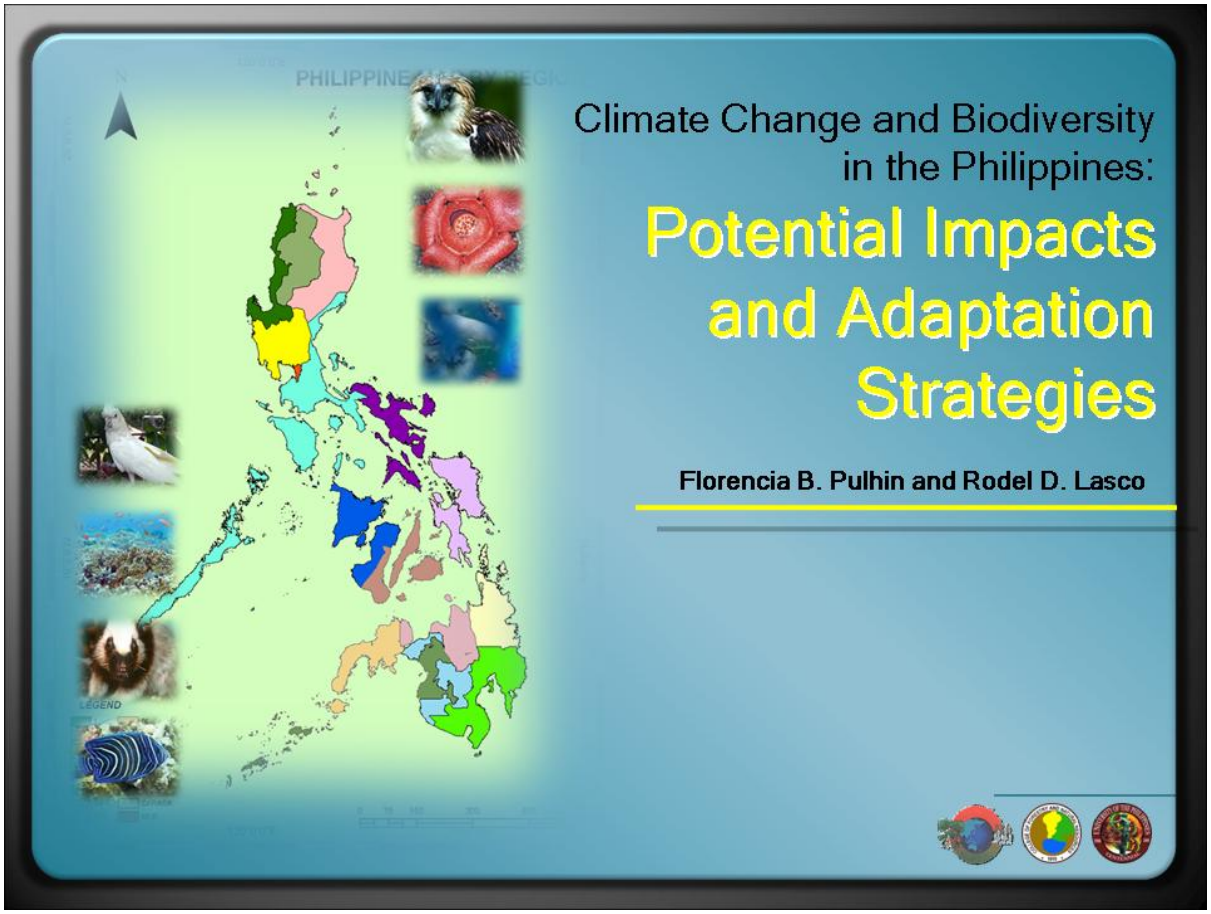
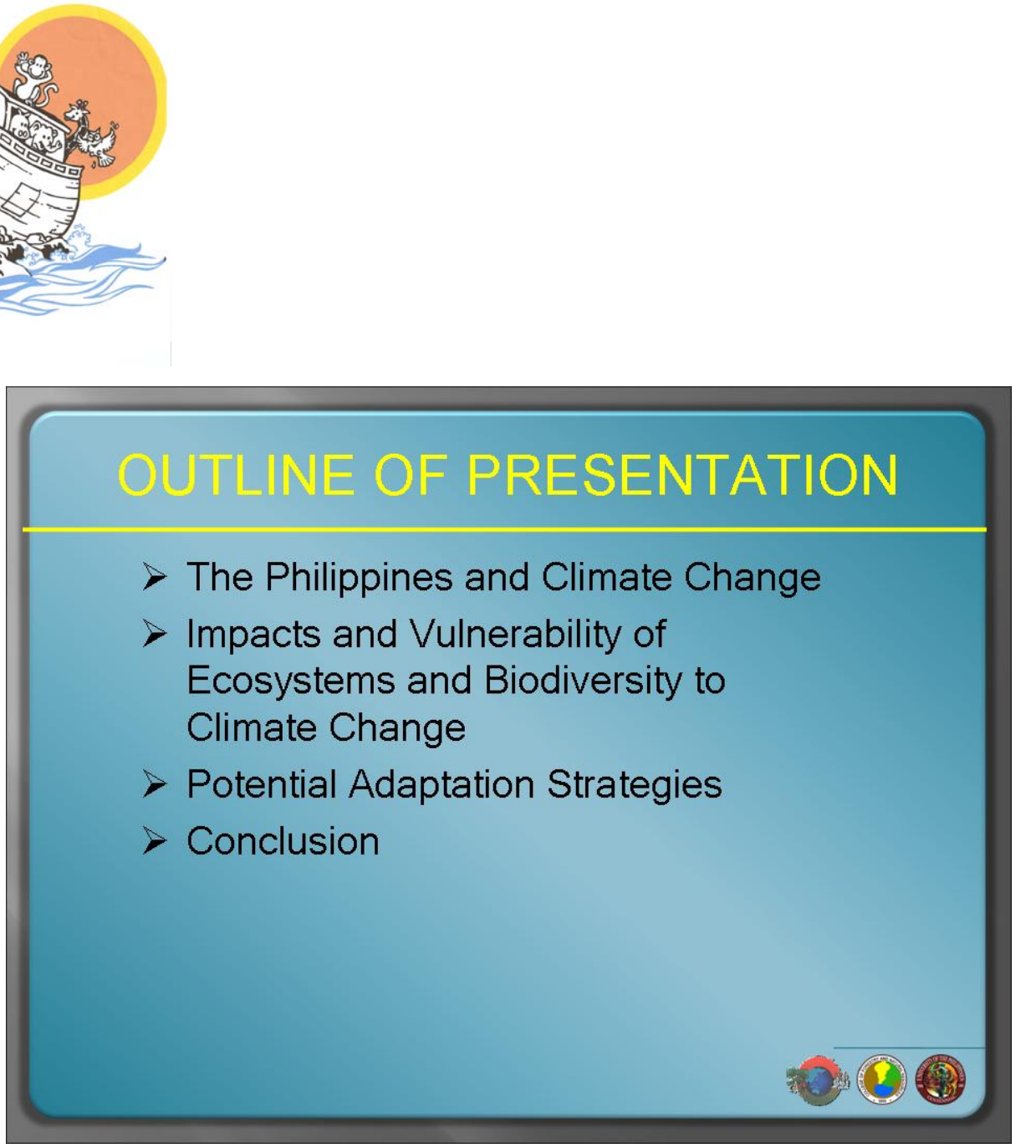
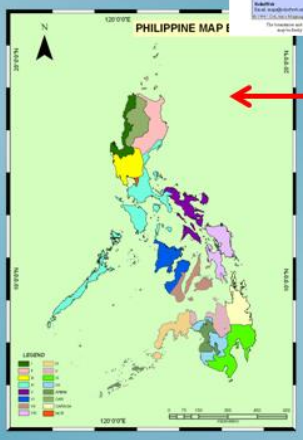


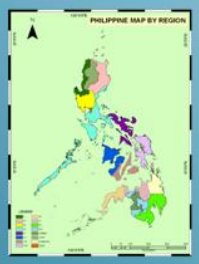

OUTLINE OF PRESENTATION
The Philippines and Climate Change
Impacts and Vulnerability of Ecosystems and Biodiversity to Climate Change
Potential Adaptation Strategies
Conclusion

THE PHILIPPINES

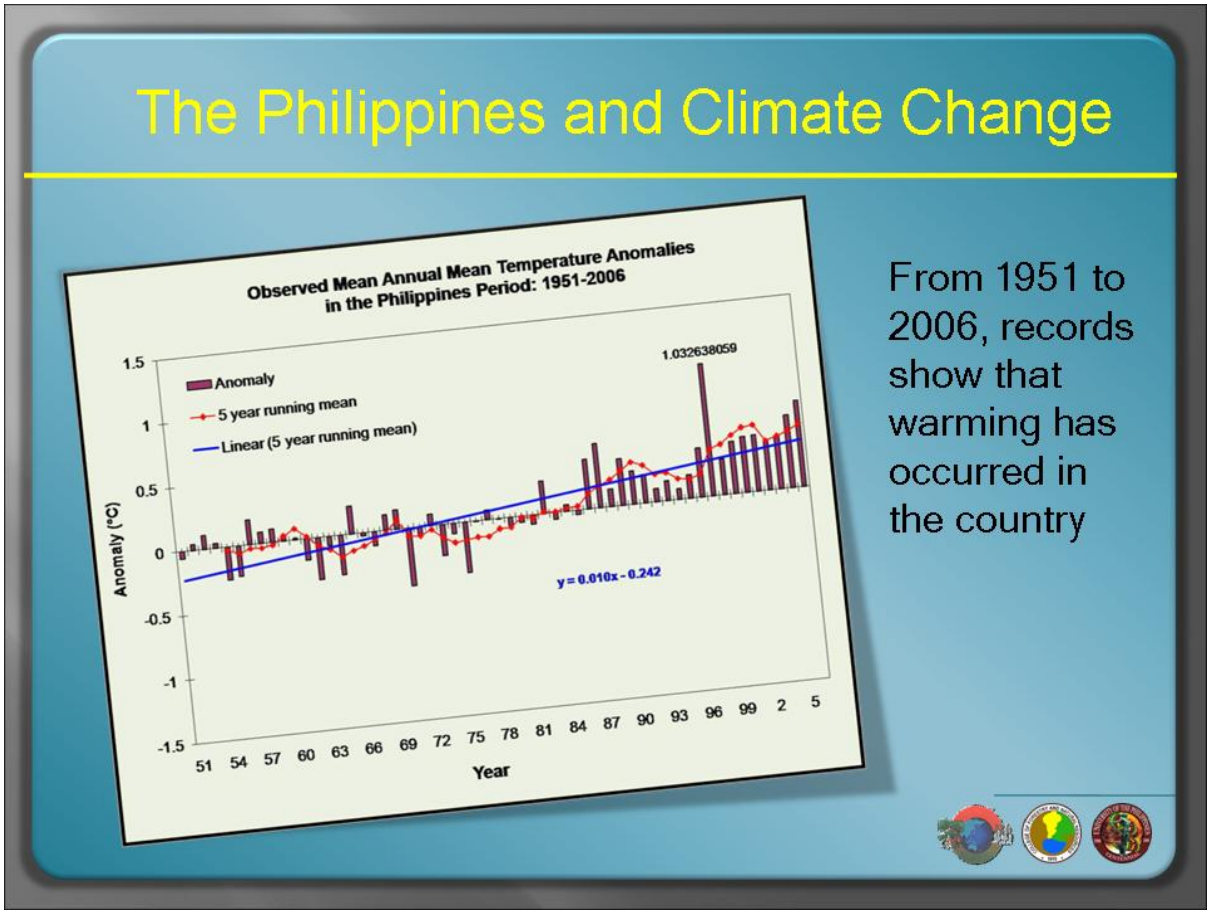
- An archipelagic country composed of 7107 islands
- Bounded on the southwest by Borneo, on the north by Taiwan, on the south by Moluccas and Sulawesi and on the east by Palau
- Covers 30 M ha, almost equally divided between forest land and A & D

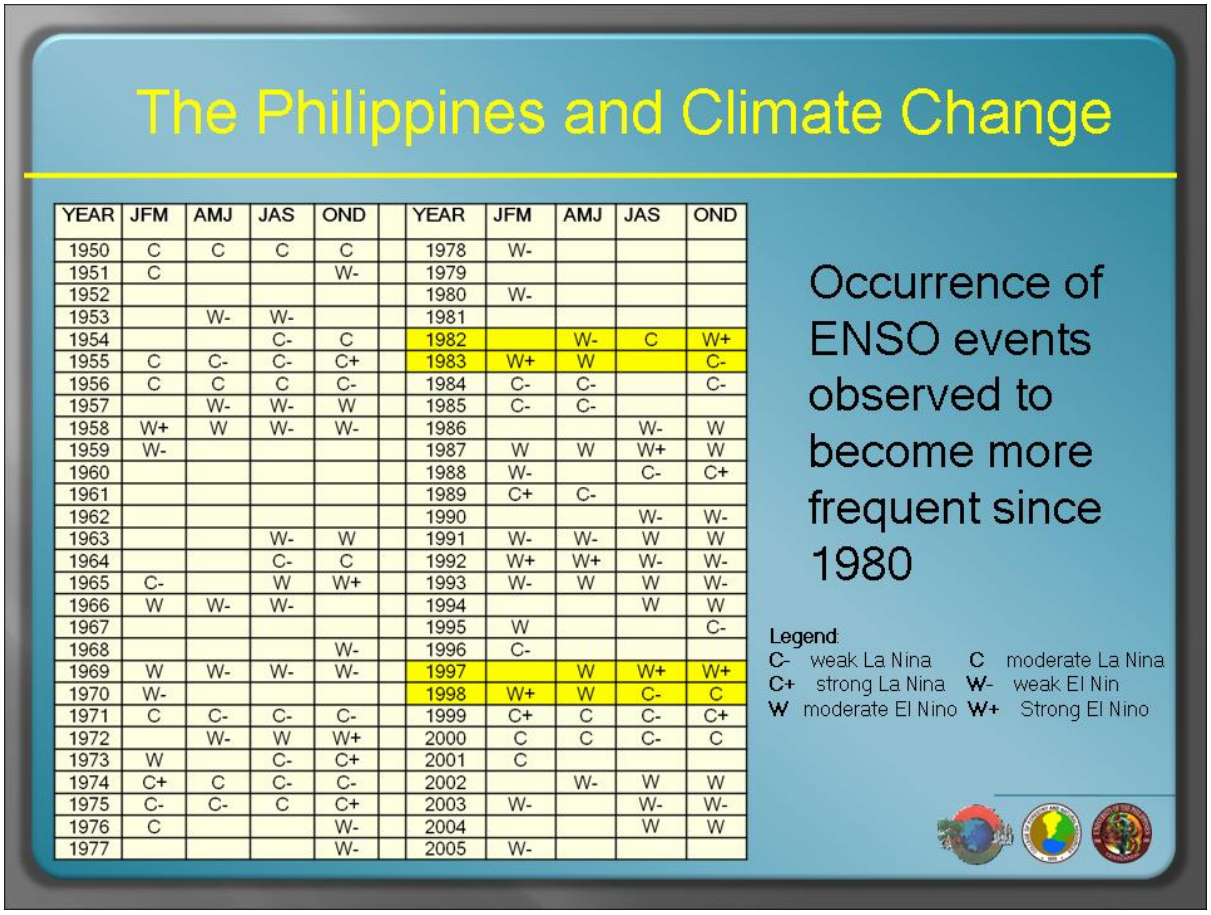


THE PHILIPPINES

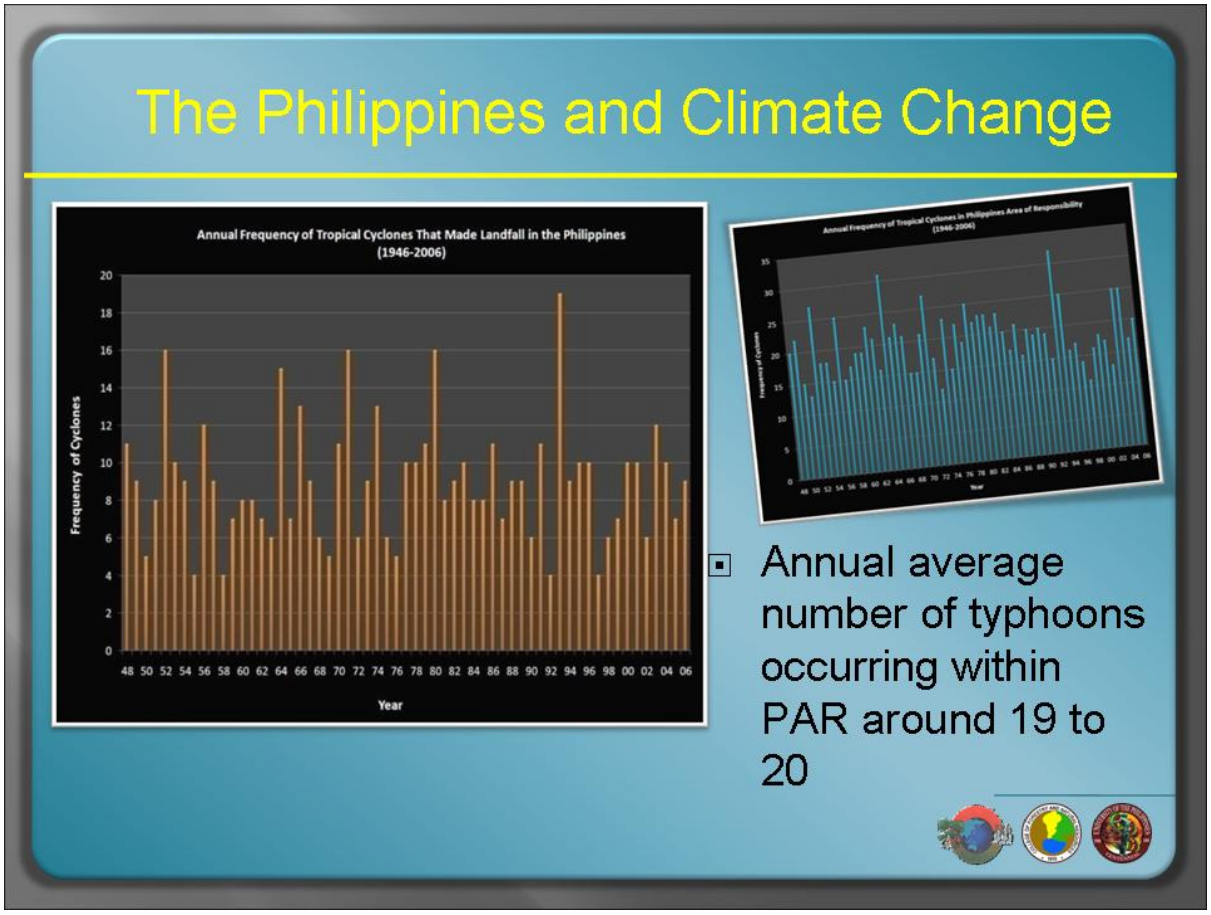


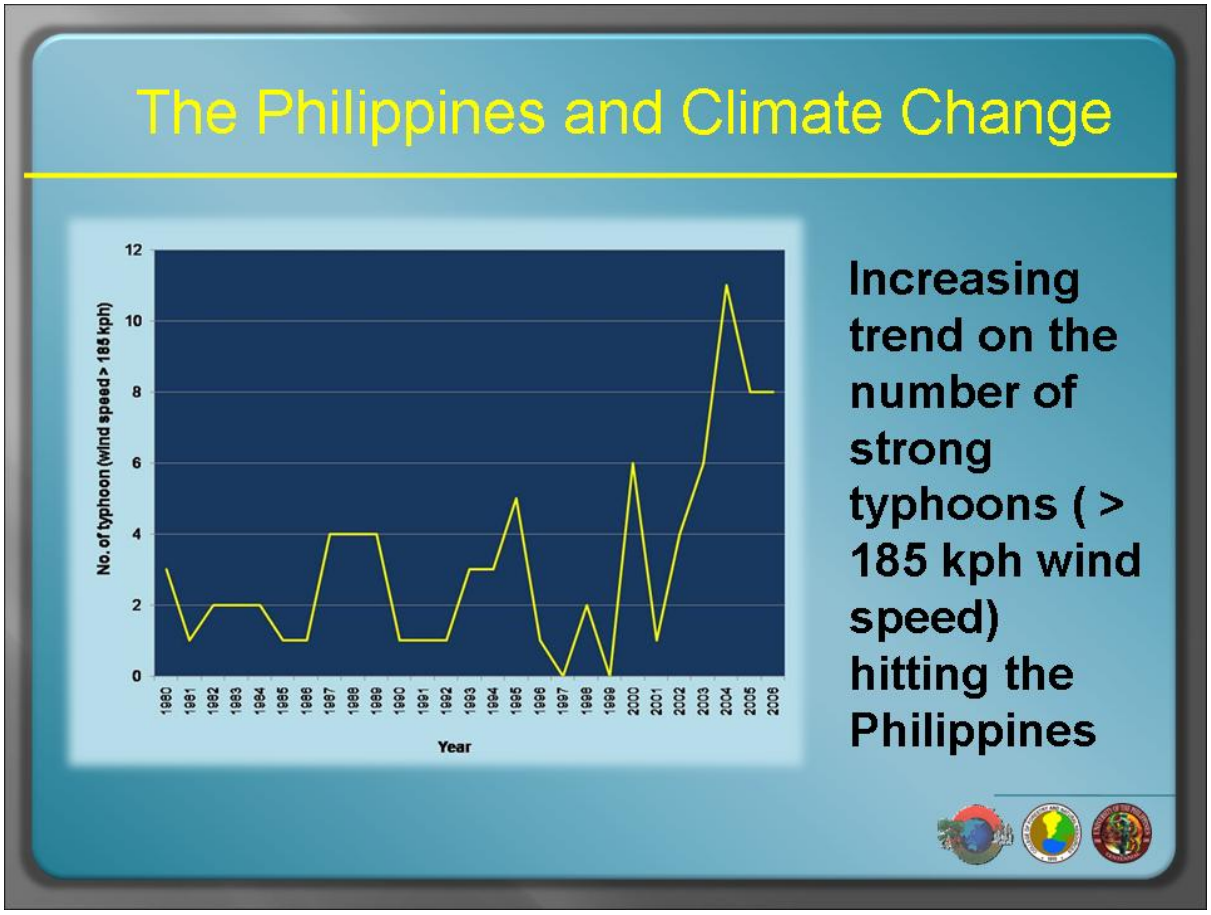
- Has four climatic types
- Average annual temperature 26.6 0C, mean max temperature 28 0C and mean min temperature 25.80C
- Mean annual rainfall range from 965 mm to 4064 mm
- Relative humidity as much as 85% during the month of September.
- As of 2000 census, total population 76.5 M
- Population density 255/km2

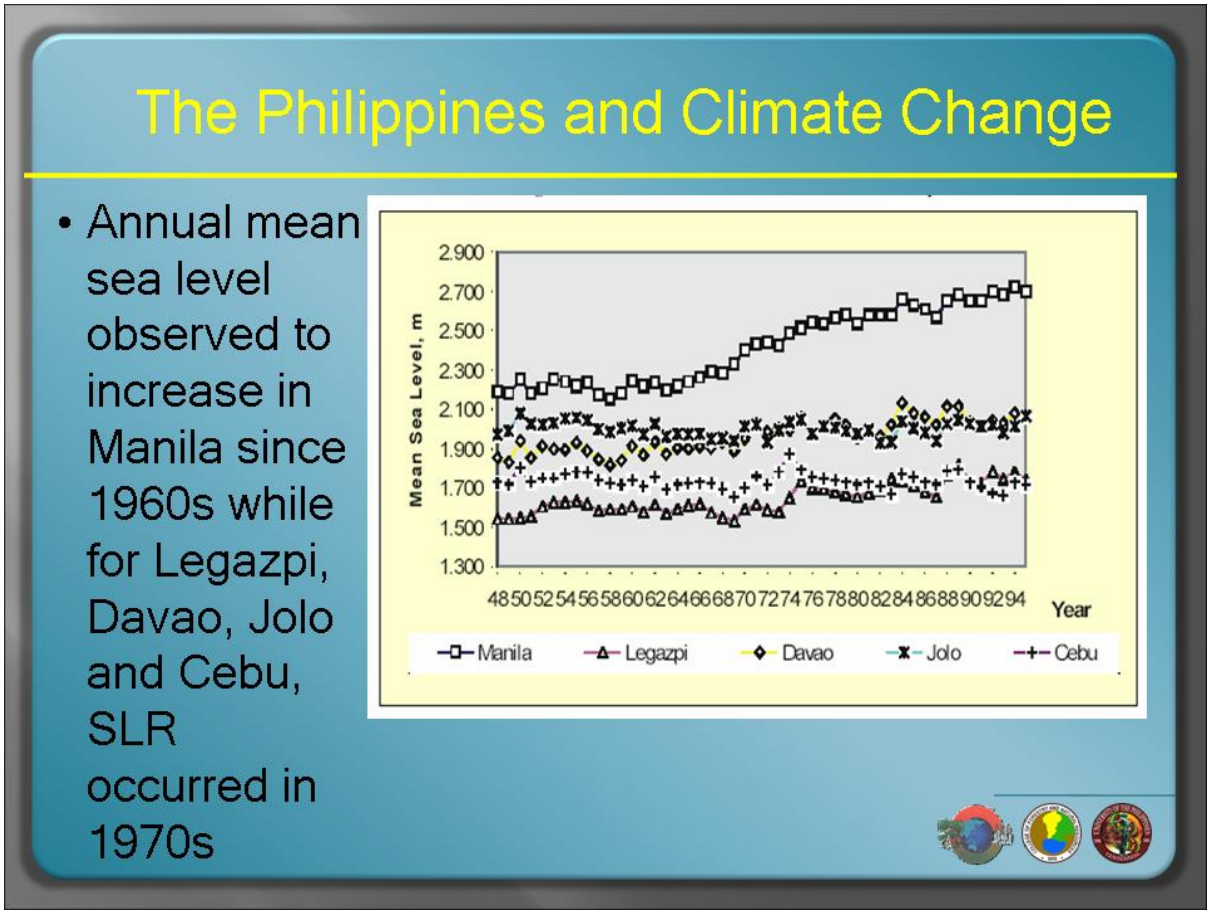

The Philippines and Climate Change
Observed Mean Annual Mean Temperature Anomalies in the Philippines Period: 1951-2006
Anomaly
5 year running mean
Linear (5 year running mean)
1.032638059
y = 0.010x - 0.242
Anomaly (°C)
1.5
1
0.5
0
-0.5
-1
-1.5
51 54 57 60 63 66 69 72 75 78 81 84 87 90 93 96 99 2 5
Year
From 1951 to 2006, records show that warming has occurred in the country



YEAR	JFM	AMJ	JAS	OND		YEAR	JFM	AMJ	JAS	OND
1950	C	C	C	C		1978	W-			
1951	C			W-		1979				
1952						1980	W-			
1953		W-	W-			1981				
1954			C-	C		1982		W-	C	W+
1955	C	C-	C-	C+		1983	W+	W		C-
1956	C	C	C	C-		1984	C-	C-		C-
1957		W-	W-	W		1985	C-	C-		
1958	W+	W	W-	W-		1986			W-	W
1959	W-					1987	W	W	W+	W
1960						1988	W-		C-	C+
1961						1989	C+	C-		
1962						1990			W-	W-
1963			W-	W		1991	W-	W-	W	W
1964			C-	C		1992	W+	W+	W-	W-
1965	C-		W	W+		1993	W-	W	W	W-
1966	W	W-	W-			1994			W	W
1967						1995	W			C-
1968				W-		1996	C-			
1969	W	W-	W-	W-		1997		W	W+	W+
1970	W-					1998	W+	W	C-	C
1971	C	C-	C-	C-		1999	C+	C	C-	C+
1972		W-	W	W+		2000	C	C	C-	C
1973	W		C-	C+		2001	C			
1974	C+	C	C-	C-		2002		W-	W	W
1975	C-	C-	C	C+		2003	W-		W-	W-
1976	C			W-		2004			W	W
1977				W-		2005	W-			

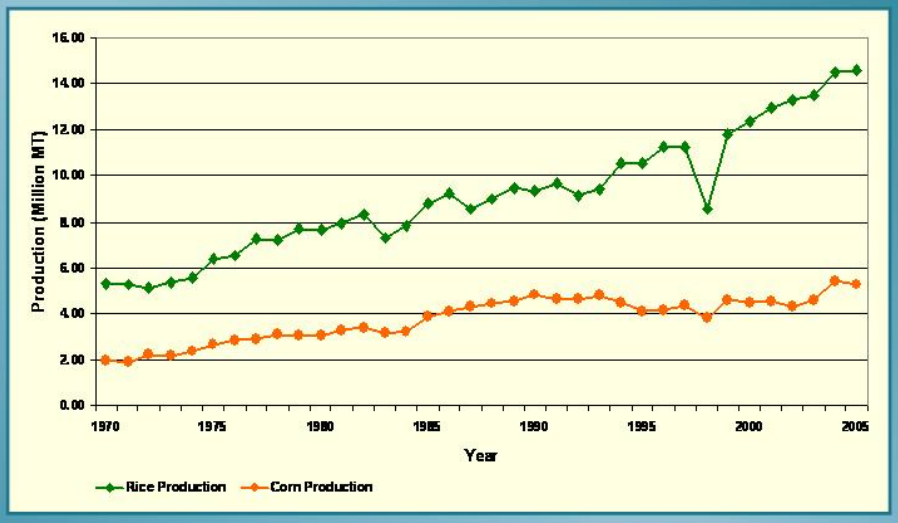

The Philippines and Climate Change
Annual Frequency of Tropical Cyclones That Made Landfall in the Philippines
(1946-2006)
Frequency of Cyclones
Year
Annual Frequency of Tropical Cyclones in Philippines Area of Responsibility
(1946-2006)
Annual average number of typhoons occurring within PAR around 19 to 20


The Philippines and Climate Change
No. of typhoon (wind speed > 185 kph)
0
2
4
6
8
10
12
1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006
Year
Increasing trend on the number of strong typhoons (> 185 kph wind speed) hitting the Philippines

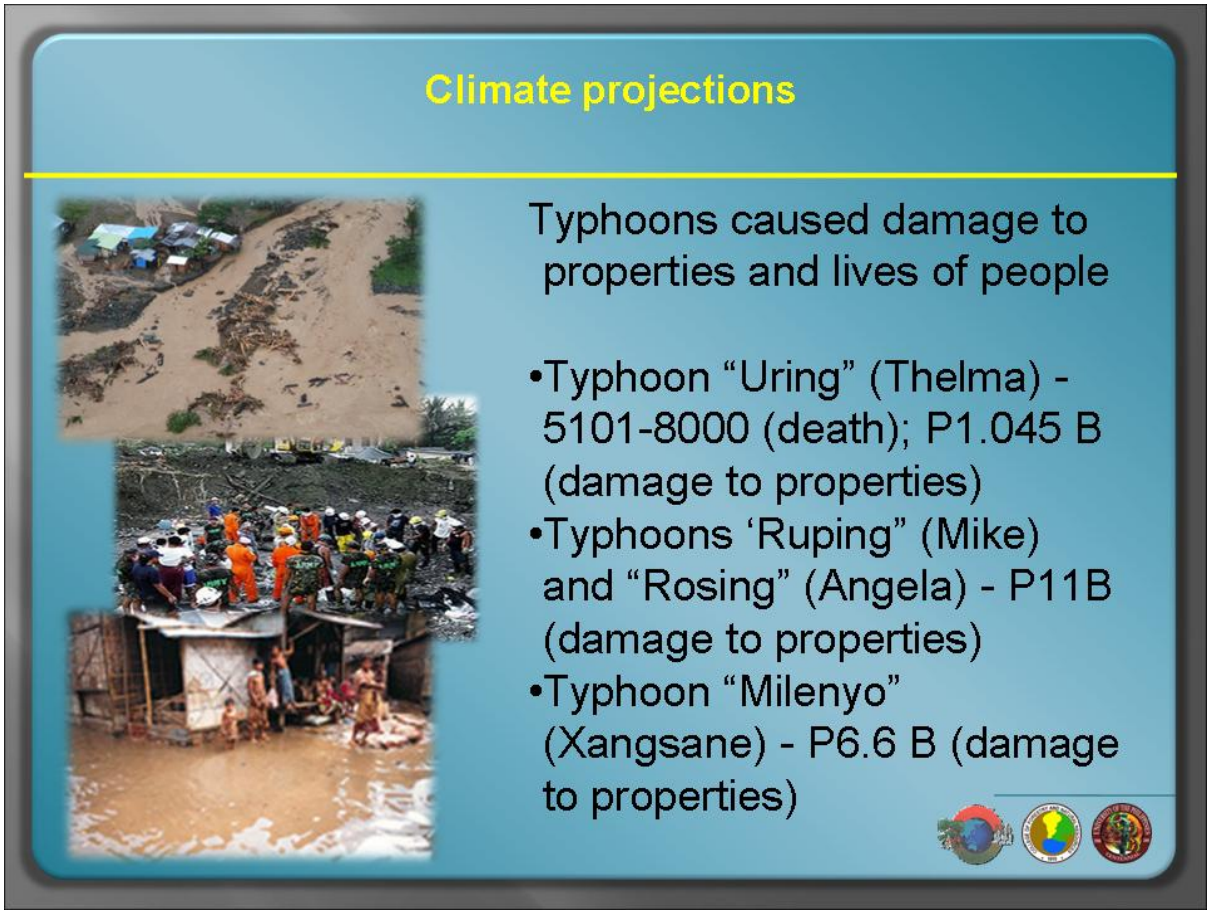

The Philippines and Climate Change
• Annual mean sea level observed to increase in Manila since 1960s while for Legazpi, Davao, Jolo and Cebu, SLR occurred in 1970s
Mean Sea Level, m
2.900
2.700
2.500
2.300
2.100
1.900
1.700
1.500
1.300
48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78 80 82 84 86 88 90 92 94
Year
Manila
Legazpi
Davao
Jolo
Cebu

Impacts of observed changes in climate trends, variability and extremes

Extreme drought associated with El Nino puts the agricultural sector at risk



Source of Data: BAS, 2006


Climate projections
Typhoons caused damage to properties and lives of people
•Typhoon "Uring" (Thelma) - 5101-8000 (death); P1.045 B (damage to properties)
•Typhoons 'Ruping" (Mike) and "Rosing" (Angela) - P11B (damage to properties)
•Typhoon "Milenyo" (Xangsane) - P6.6 B (damage to properties)

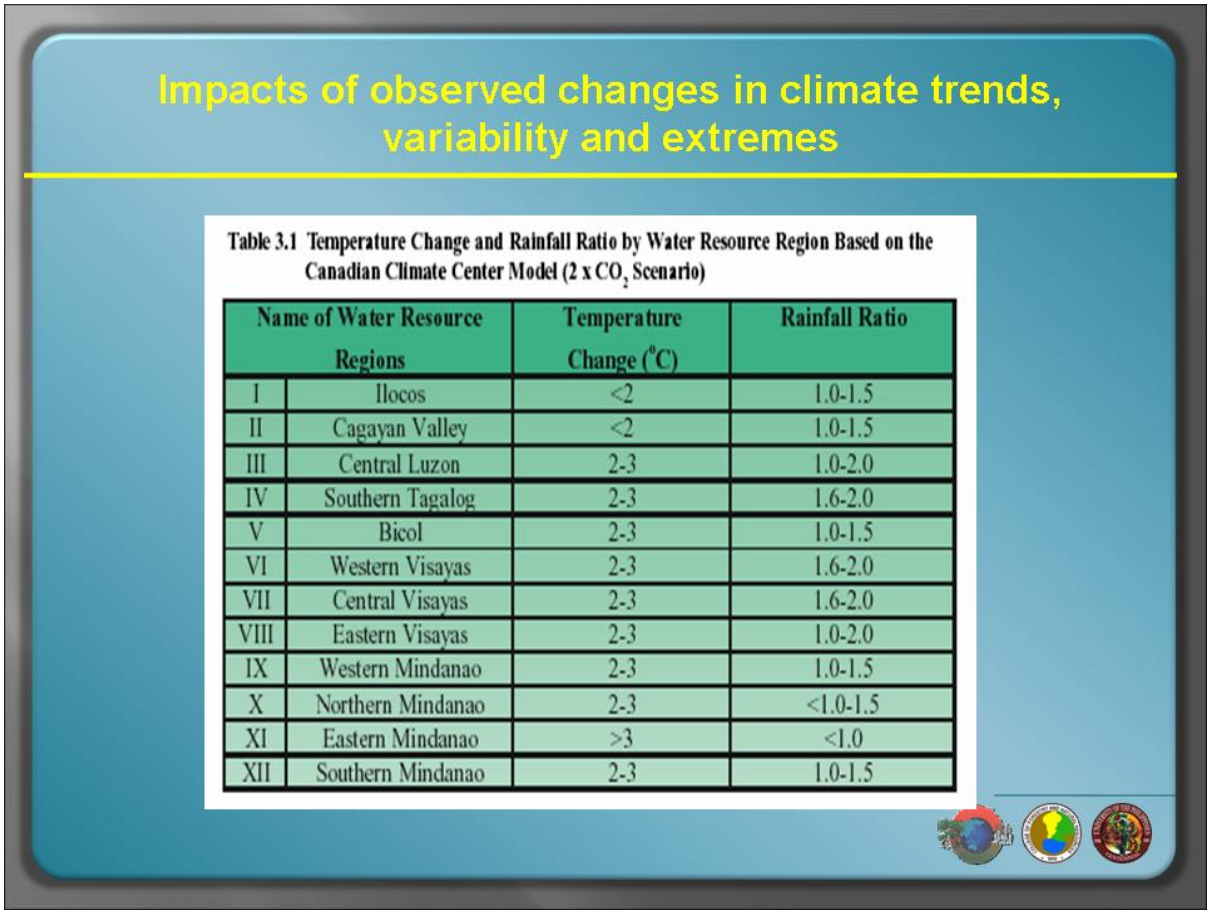
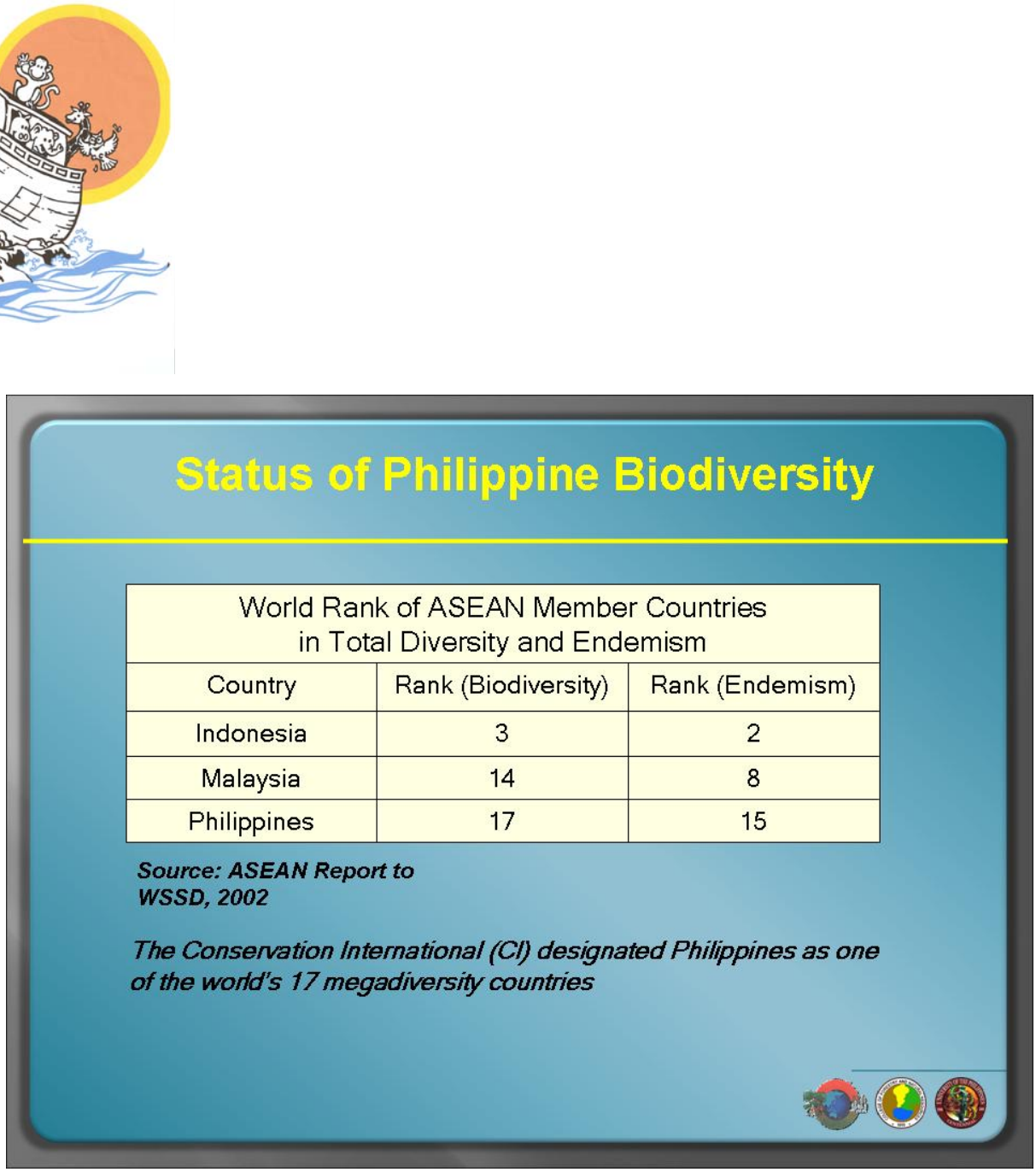
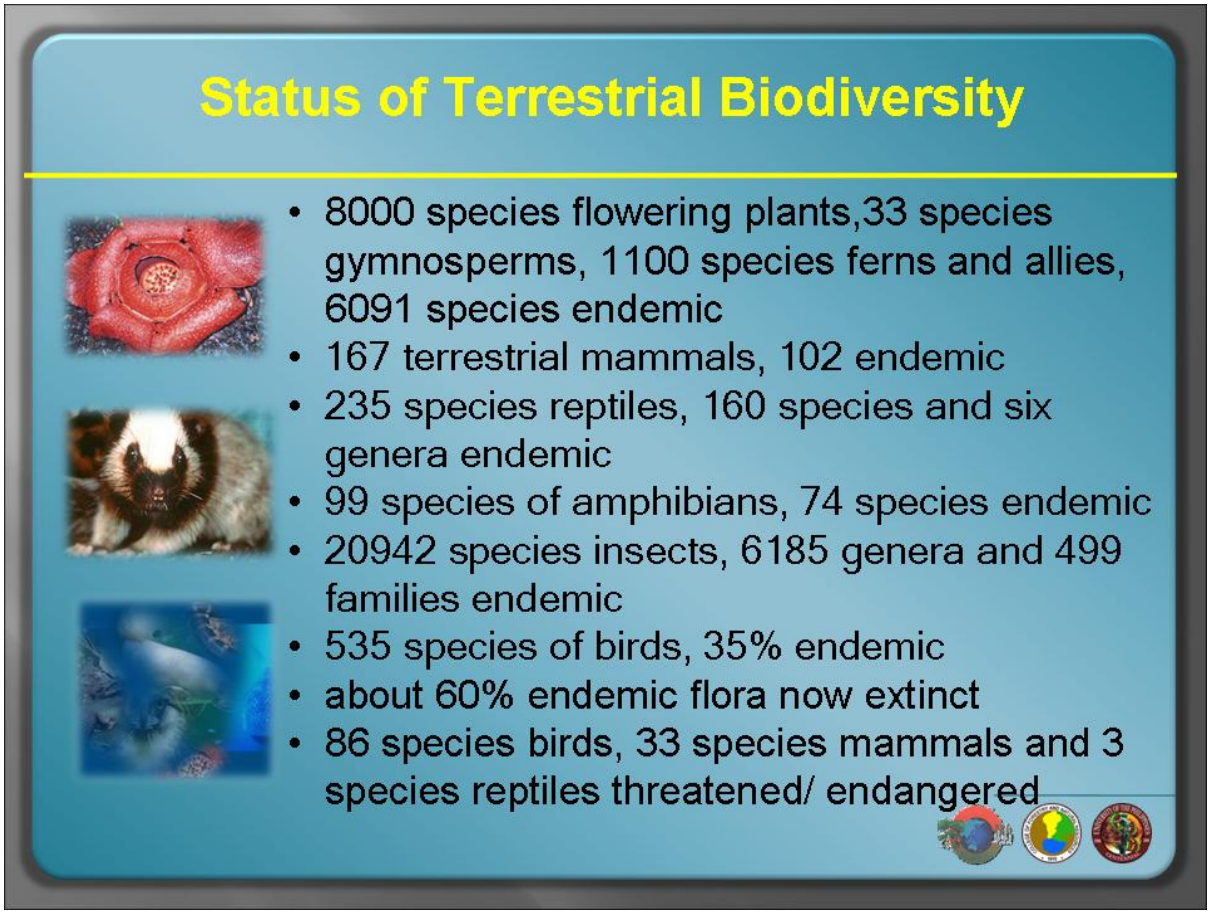
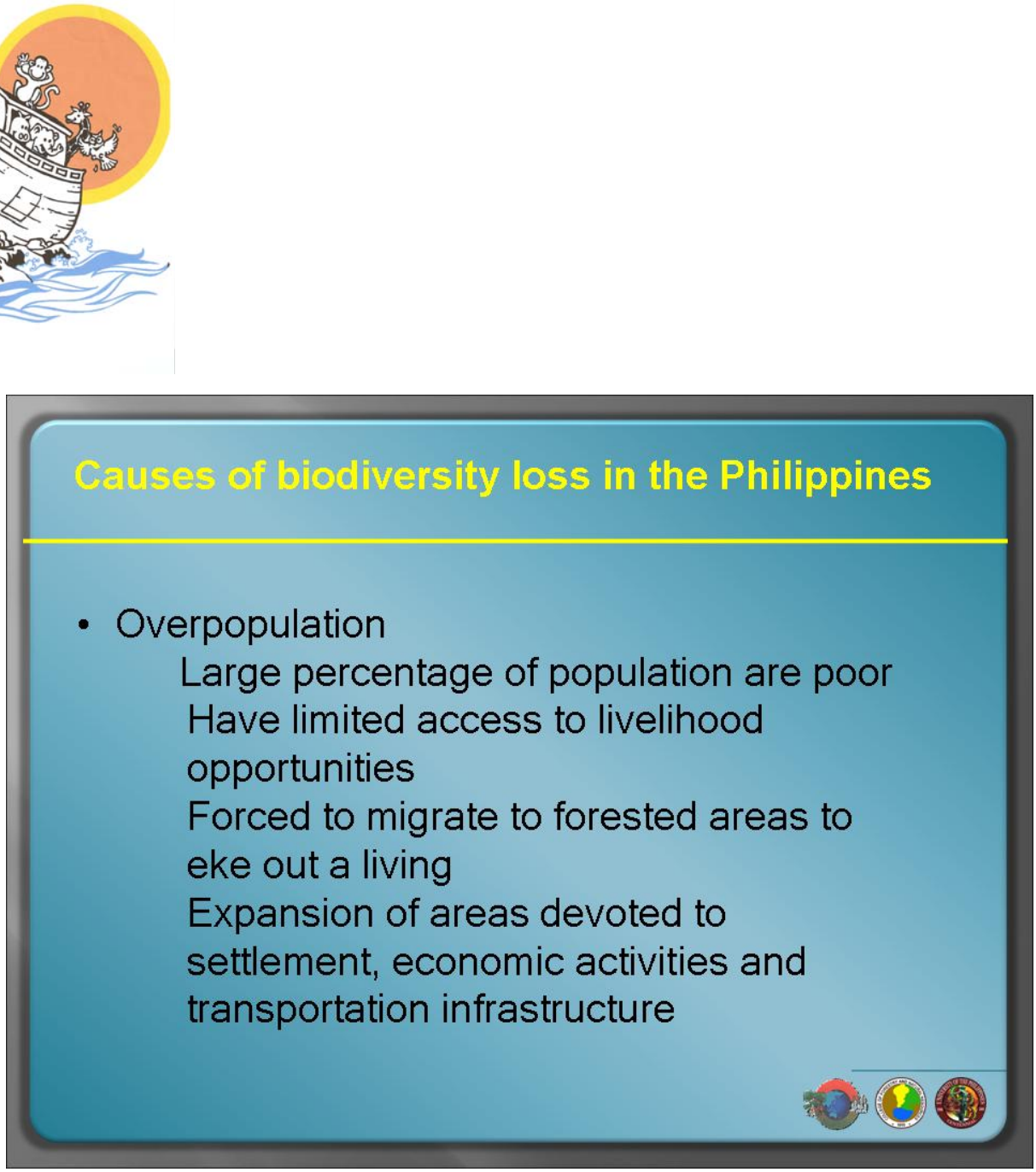


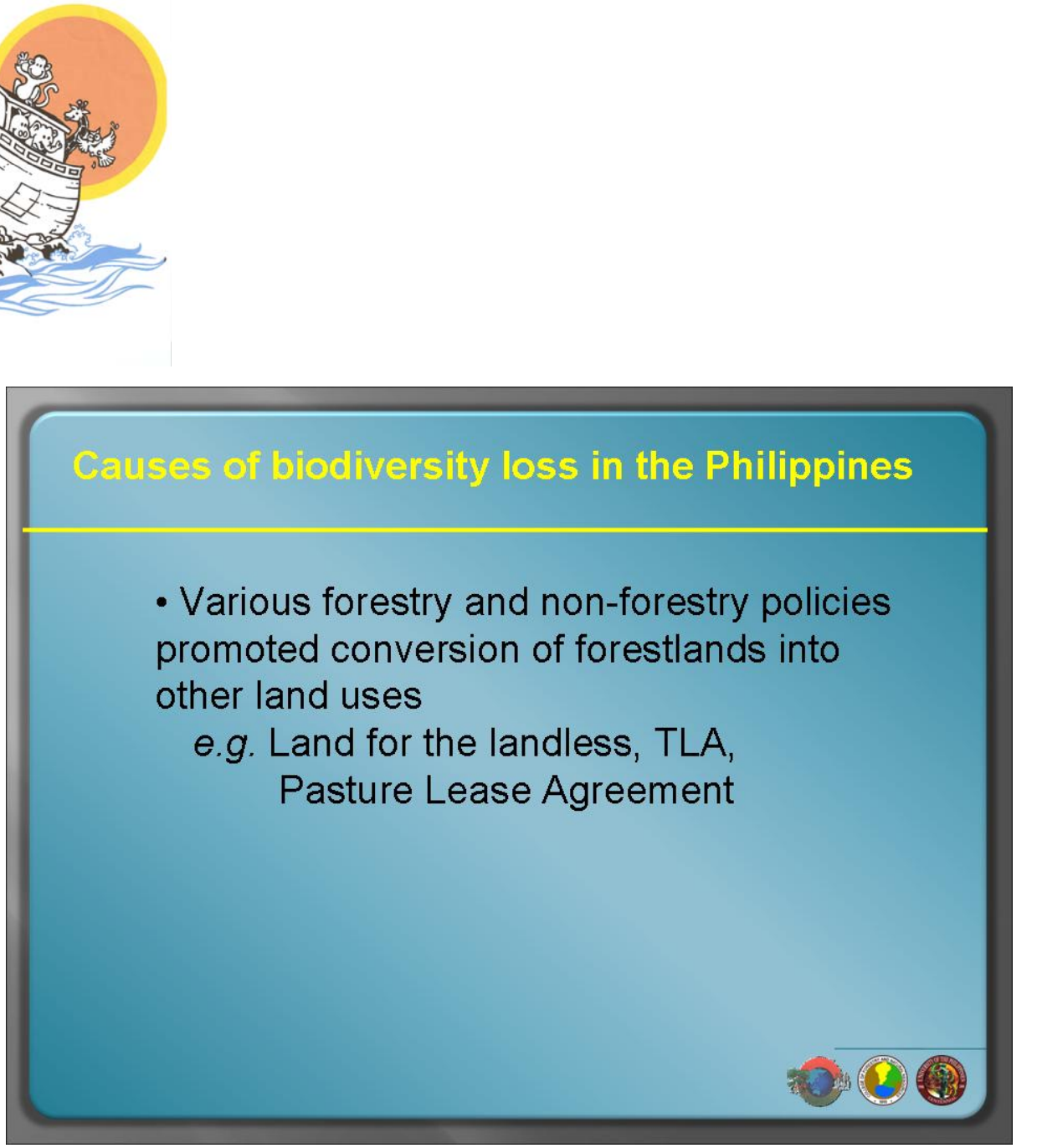
Table 3.1 Temperature Change and Rainfall Ratio by Water Resource Region Based on the Canadian Climate Center Model (2 x CO_2 Scenario)

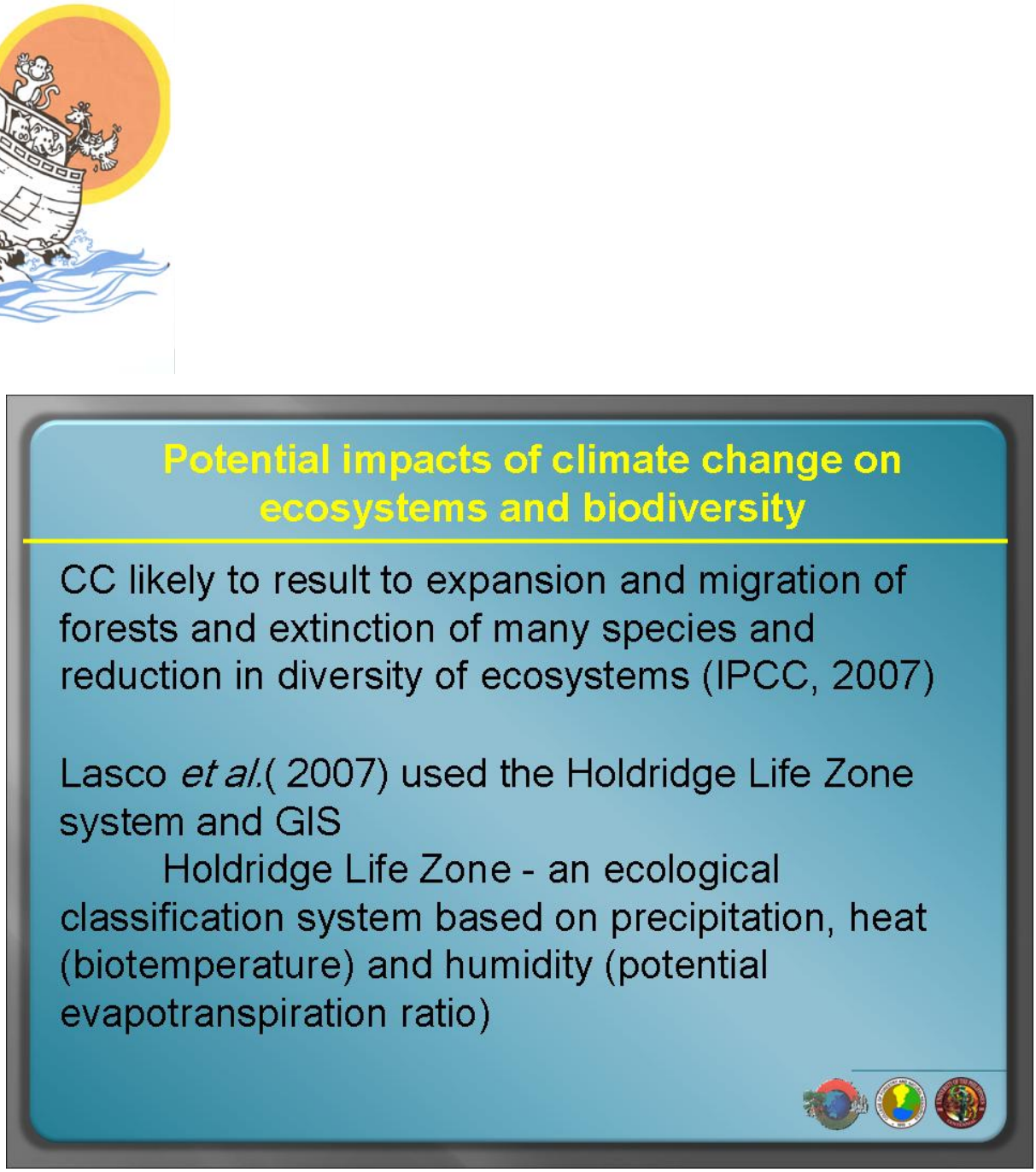
Name of Water Resource Regions		Temperature Change (^{0}C)	Rainfall Ratio
I	Ilocos	<2	1.0-1.5
II	Cagayan Valley	<2	1.0-1.5
III	Central Luzon	2-3	1.0-2.0
IV	Southern Tagalog	2-3	1.6-2.0
V	Bicol	2-3	1.0-1.5
VI	Western Visayas	2-3	1.6-2.0
VII	Central Visayas	2-3	1.6-2.0
VIII	Eastern Visayas	2-3	1.0-2.0
IX	Western Mindanao	2-3	1.0-1.5
X	Northern Mindanao	2-3	<1.0-1.5
XI	Eastern Mindanao	>3	<1.0
XII	Southern Mindanao	2-3	1.0-1.5

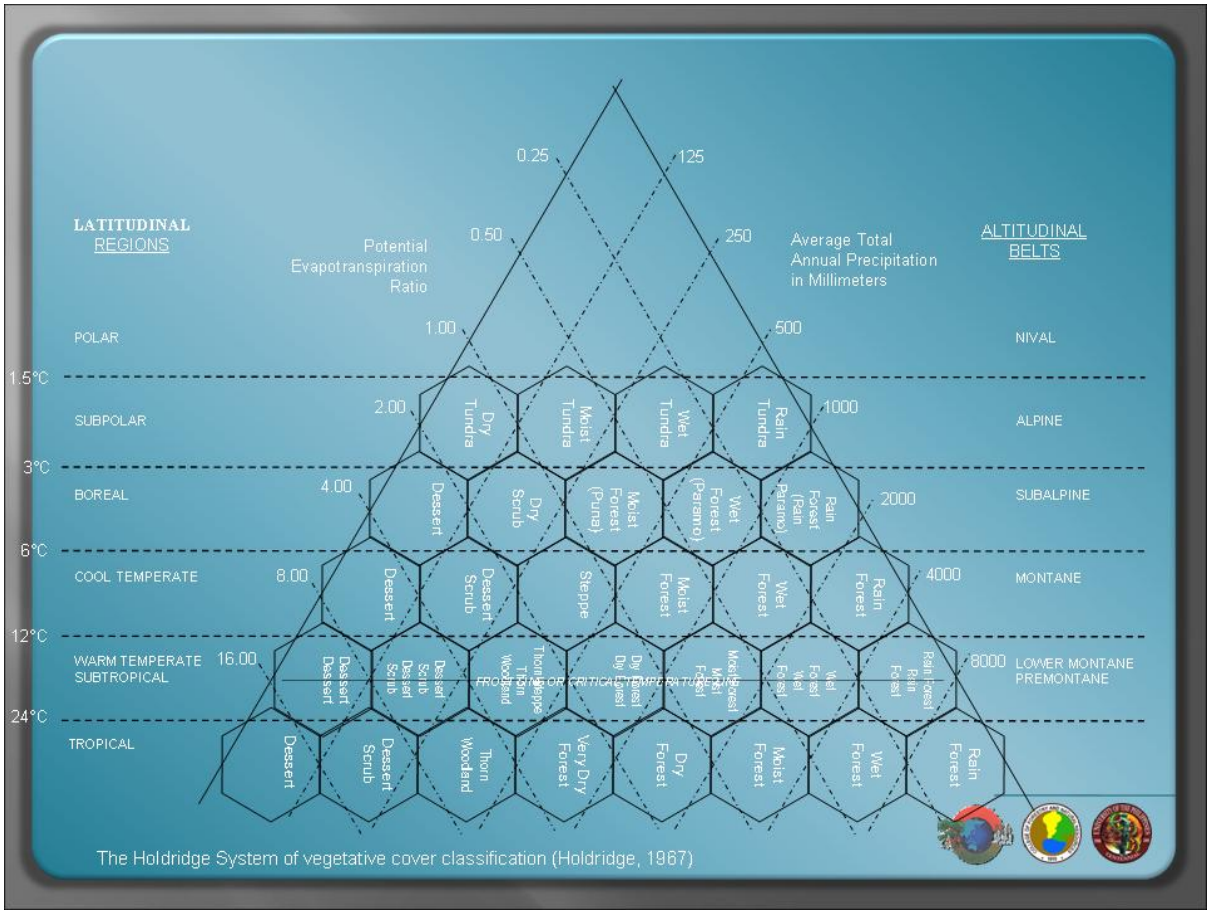

Status of Philippine Biodiversity
World Rank of ASEAN Member Countries in Total Diversity and Endemism
Country | Rank (Biodiversity) | Rank (Endemism)
Indonesia | 3 | 2
Malaysia | 14 | 8
Philippines | 17 | 15
Source: ASEAN Report to WSSD, 2002
The Conservation International (CI) designated Philippines as one of the world's 17 megadiversity countries

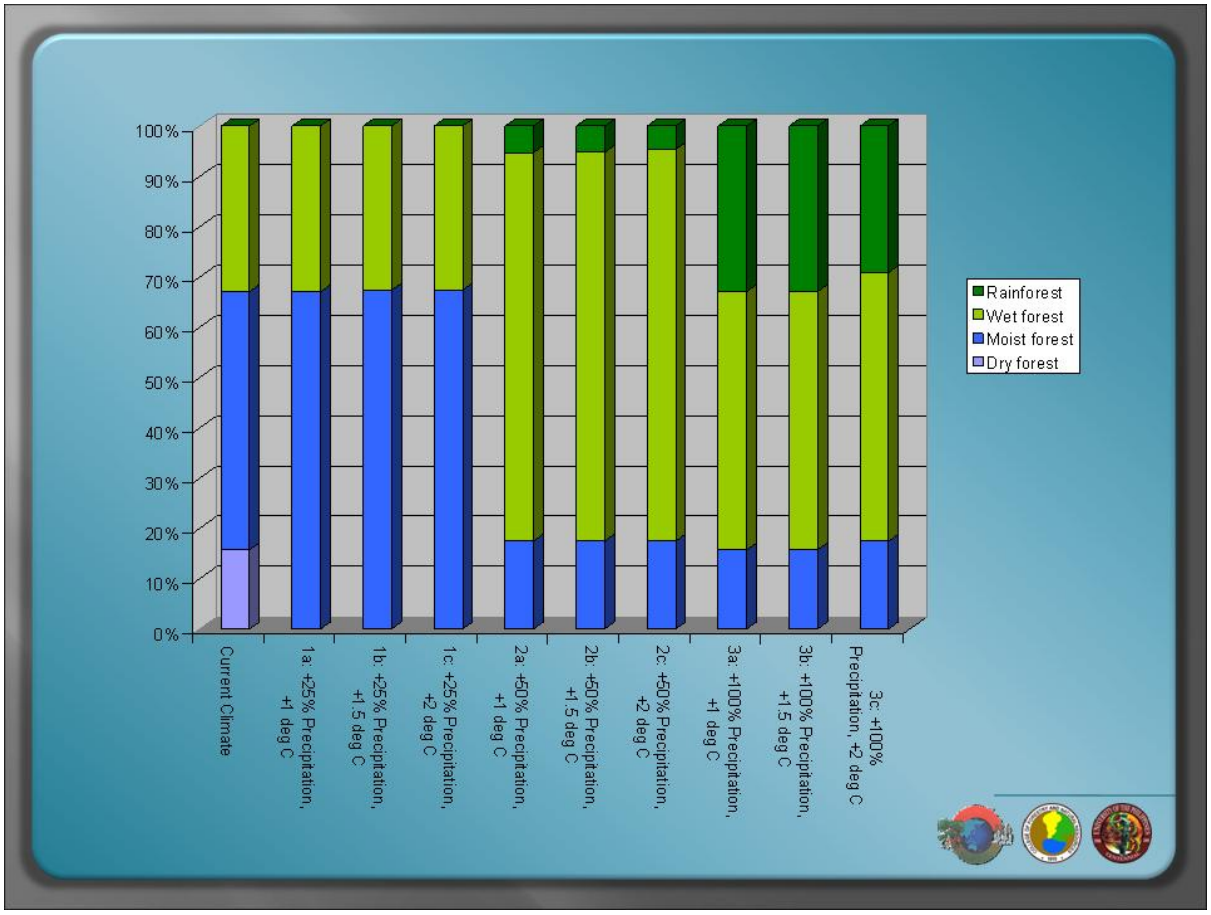

Status of Terrestrial Biodiversity
• 8000 species flowering plants,33 species gymnosperms, 1100 species ferns and allies, 6091 species endemic
• 167 terrestrial mammals, 102 endemic
• 235 species reptiles, 160 species and six genera endemic
• 99 species of amphibians, 74 species endemic
• 20942 species insects, 6185 genera and 499 families endemic
• 535 species of birds, 35% endemic
• about 60% endemic flora now extinct
• 86 species birds, 33 species mammals and 3 species reptiles threatened/ endangered

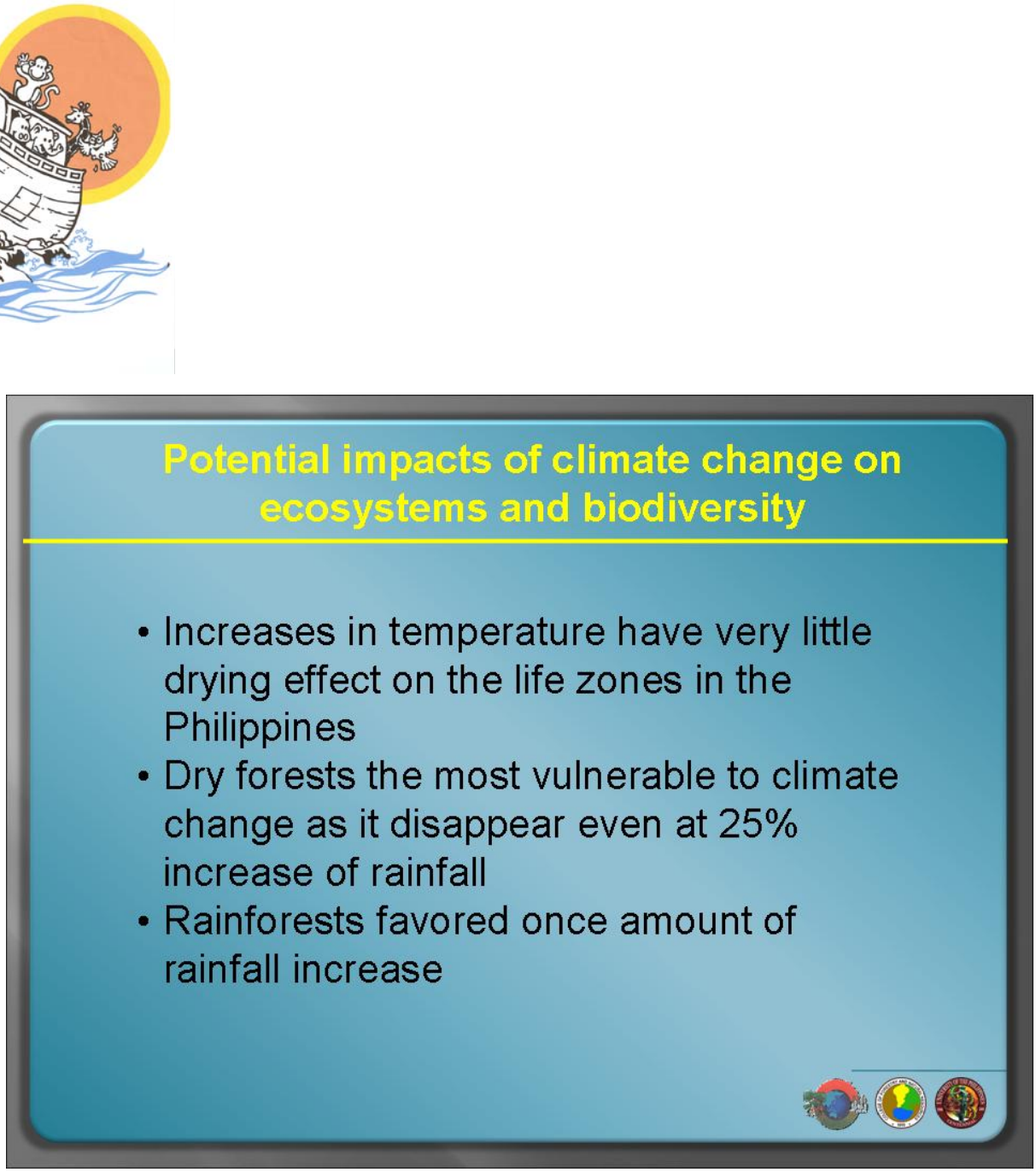

Causes of biodiversity loss in the Philippines
• Overpopulation
Large percentage of population are poor
Have limited access to livelihood opportunities
Forced to migrate to forested areas to eke out a living
Expansion of areas devoted to settlement, economic activities and transportation infrastructure

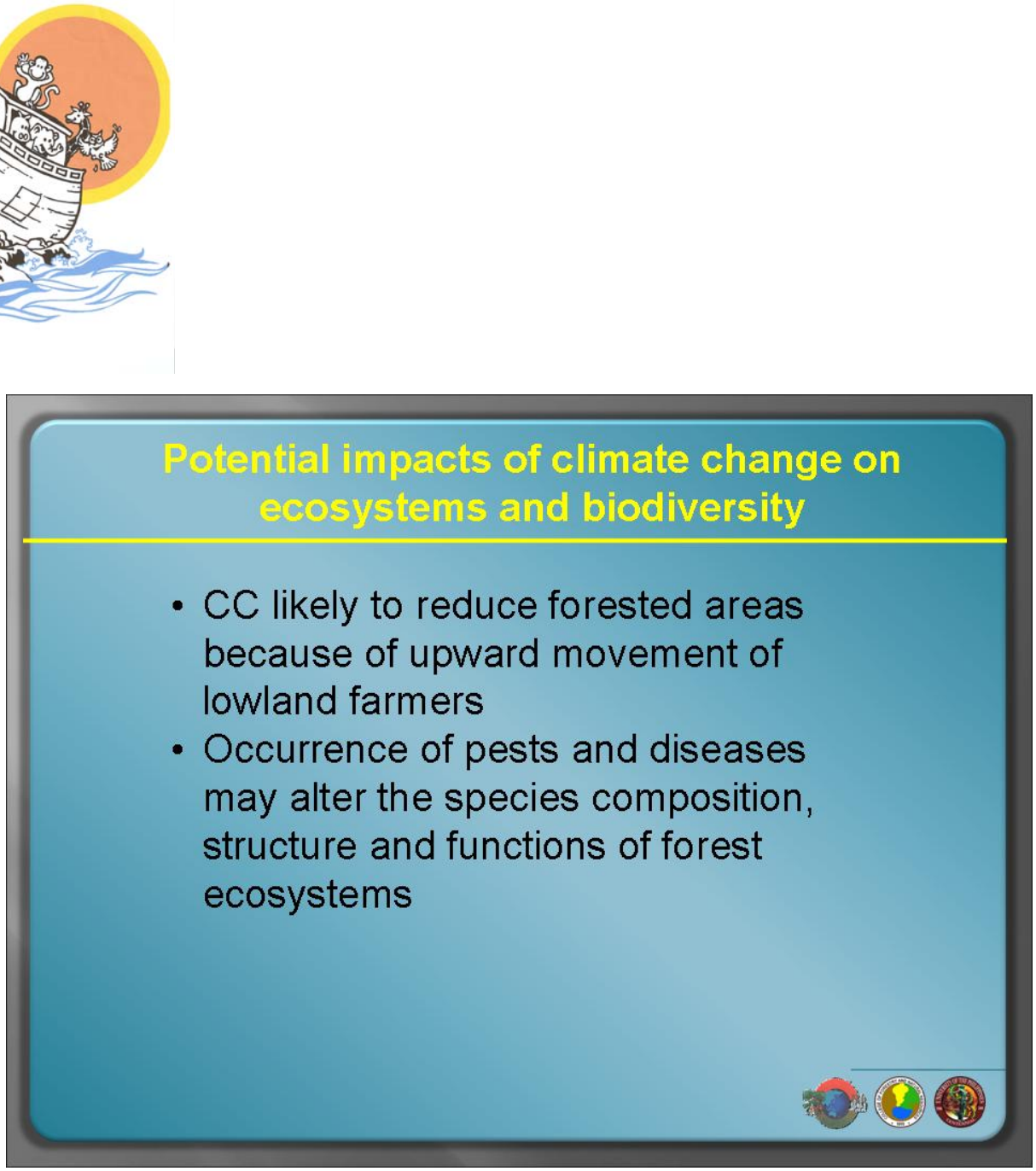

Causes of biodiversity loss in the Philippines
• Various forestry and non-forestry policies promoted conversion of forestlands into other land uses
e.g. Land for the landless, TLA,
Pasture Lease Agreement

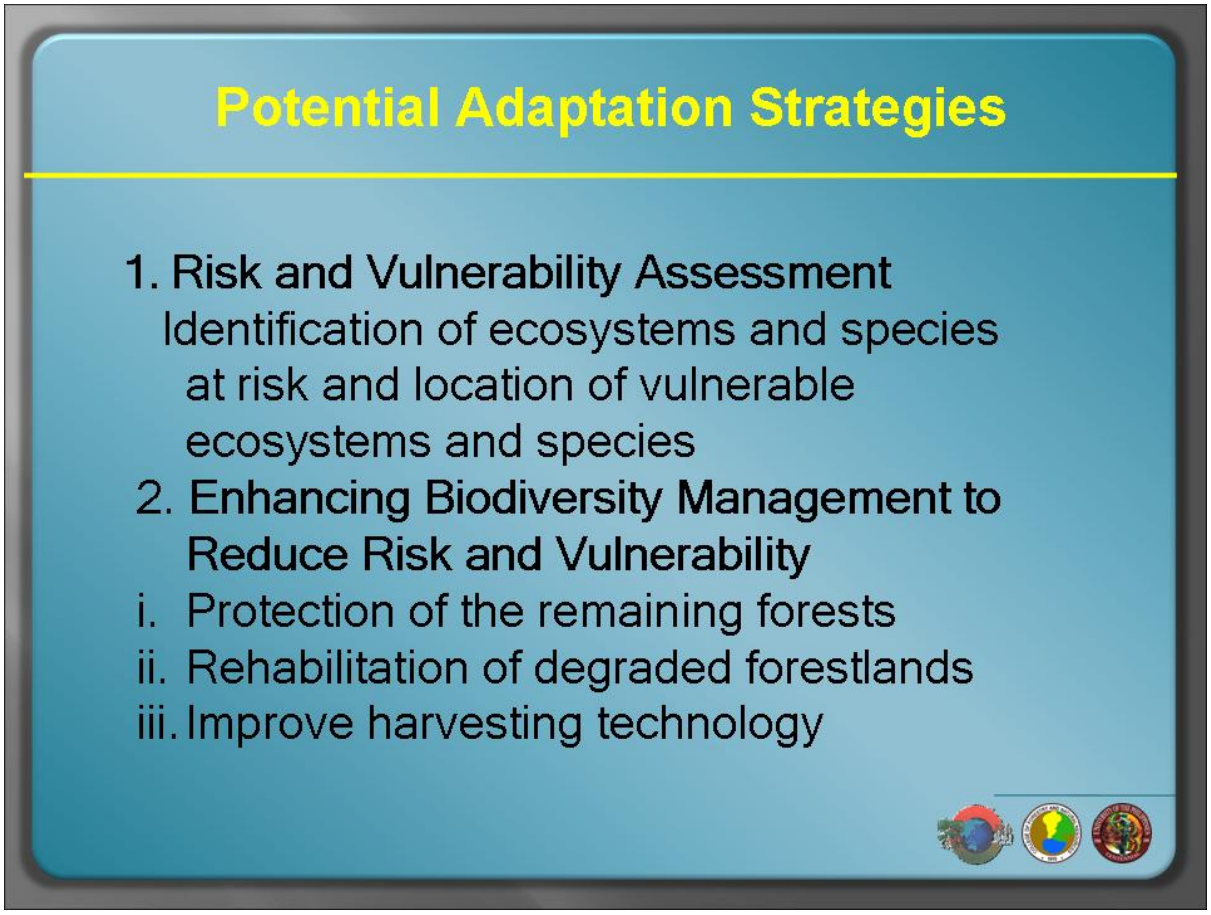

Potential impacts of climate change on ecosystems and biodiversity
CC likely to result to expansion and migration of forests and extinction of many species and reduction in diversity of ecosystems (IPCC, 2007)
Lasco *et al.*(2007) used the Holdridge Life Zone system and GIS
Holdridge Life Zone - an ecological classification system based on precipitation, heat (biotemperature) and humidity (potential evapotranspiration ratio)


LATITUDINAL REGIONS
Potential Evapotranspiration Ratio
Average Total Annual Precipitation in Millimeters
ALTITUDINAL BELTS
POLAR
SUBPOLAR
BOREAL
COOL TEMPERATE
WARM TEMPERATE SUBTROPICAL
TROPICAL
1.5°C
3°C
6°C
12°C
24°C
0.25
0.50
1.00
2.00
4.00
8.00
16.00
125
250
500
1000
2000
4000
8000
NIVAL
ALPINE
SUBALPINE
MONTANE
LOWER MONTANE
PREMONTANE
Dry Tundra
Moist Tundra
Wet Tundra
Rain Tundra
Desert
Dry Scrub
Moist Forest (Puna)
Wet Forest (Paramo)
Rain Forest (Rain Paramo)
Desert Scrub
Steppe
Moist Forest
Wet Forest
Rain Forest
Thorn Woodland
Very Dry Forest
Dry Forest
Moist Forest
Wet Forest
Rain Forest
FROST OR CRITICAL TEMPERATURE LINE
The Holdridge System of vegetative cover classification (Holdridge, 1967)


100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Rainforest
Wet forest
Moist forest
Dry forest
Current Climate
1a: +25% Precipitation, +1 deg C
1b: +25% Precipitation, +1.5 deg C
1c: +25% Precipitation, +2 deg C
2a: +50% Precipitation, +1 deg C
2b: +50% Precipitation, +1.5 deg C
2c: +50% Precipitation, +2 deg C
3a: +100% Precipitation, +1 deg C
3b: +100% Precipitation, +1.5 deg C
3c: +100% Precipitation, +2 deg C


Potential impacts of climate change on ecosystems and biodiversity
• Increases in temperature have very little drying effect on the life zones in the Philippines
• Dry forests the most vulnerable to climate change as it disappear even at 25% increase of rainfall
• Rainforests favored once amount of rainfall increase


Potential impacts of climate change on ecosystems and biodiversity
• CC likely to reduce forested areas because of upward movement of lowland farmers
• Occurrence of pests and diseases may alter the species composition, structure and functions of forest ecosystems

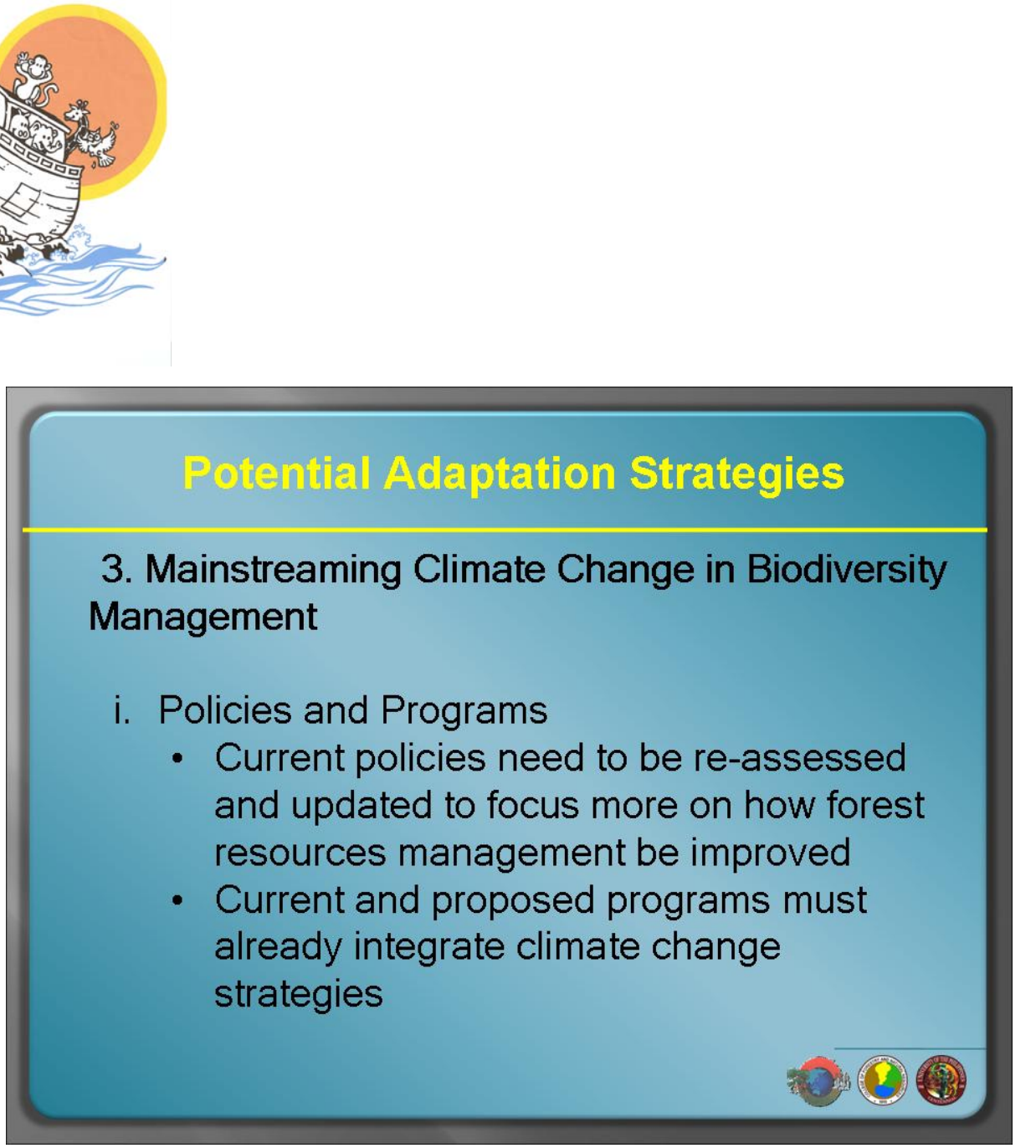

Potential Adaptation Strategies
1. Risk and Vulnerability Assessment
Identification of ecosystems and species at risk and location of vulnerable ecosystems and species
2. Enhancing Biodiversity Management to Reduce Risk and Vulnerability
i. Protection of the remaining forests
ii. Rehabilitation of degraded forestlands
iii. Improve harvesting technology

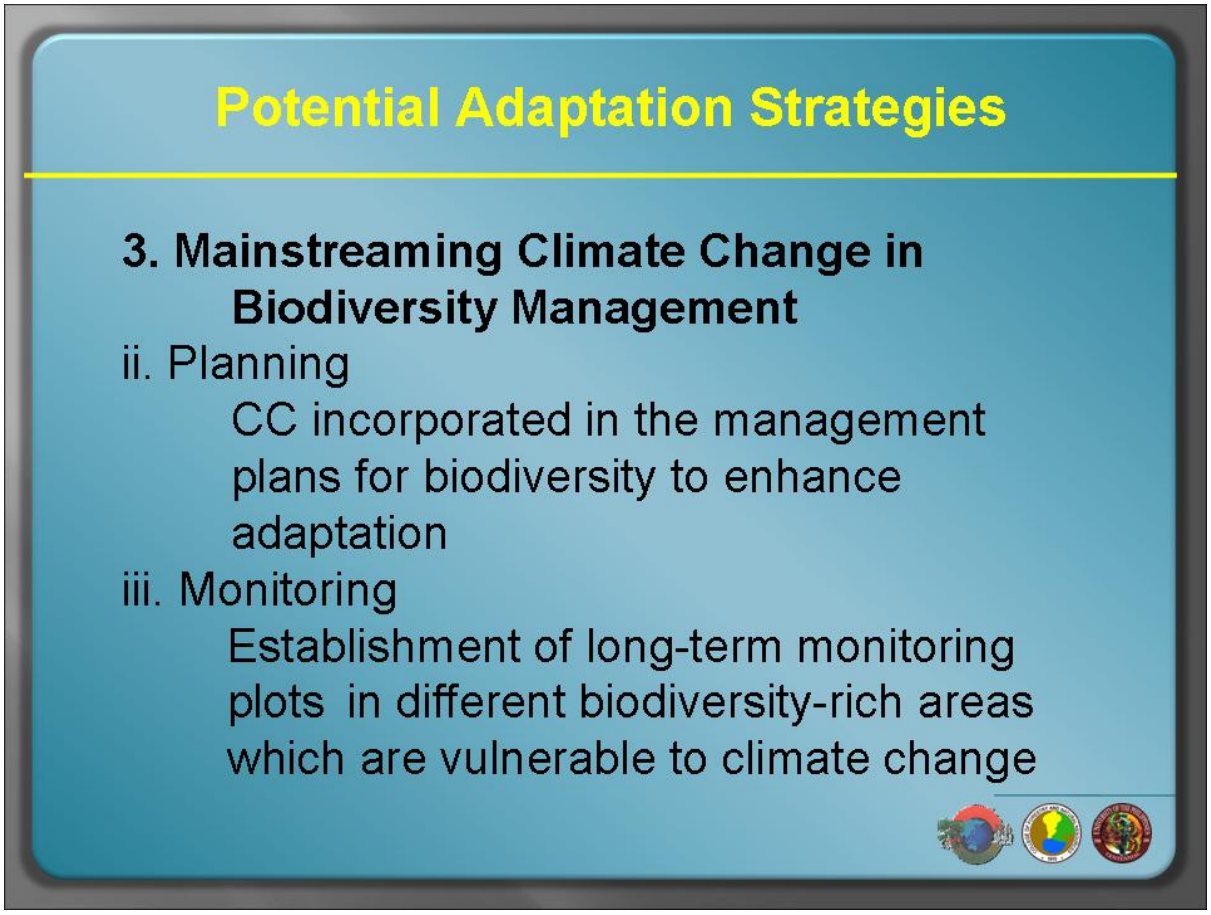
Potential Adaptation Strategies

Adaptation options to climate variability and extremes for forest lands PCW

Land Use	Adaptation Options
Tree plantation	Adjust silvicultural treatment schedules Plant species that can adjust to variable climate situations Proper timing of tree planting projects or activities Implement proper silvicultural practices Construction of fire lines Controlled burning Supplemental watering
Natural forest	Safety net measures for farmers by local and national government Cancellation of logging permits (total logging ban)
Grasslands	Reforestation- adaptation of contour farming in combination to organic farming Promote community based forest management Increase fund for forest protection, regeneration from national government Increase linkage building of LGU-GO-NGO Introduction of drainage measures Controlled burning Introduction of drought resistant species Intensive information dissemination campaign among stakeholders

Source: Lasco et al 2007)


Potential Adaptation Strategies
3. Mainstreaming Climate Change in Biodiversity Management
i. Policies and Programs
• Current policies need to be re-assessed and updated to focus more on how forest resources management be improved
• Current and proposed programs must already integrate climate change strategies


Potential Adaptation Strategies
3. Mainstreaming Climate Change in Biodiversity Management
ii. Planning
CC incorporated in the management plans for biodiversity to enhance adaptation
iii. Monitoring
Establishment of long-term monitoring plots in different biodiversity-rich areas which are vulnerable to climate change


Potential Adaptation Strategies
4. Securing Sustainable Financing Mechanism
• Biodiversity management can be effective and sustainable if long-term financial support is assured
• One of the possible sources to finance biodiversity management is PES

KEY MESSAGES

1. Current state of Philippine biodiversity is alarming
2. Many stressors (i.e. overpopulation, deforestation, unsustainable livelihood, development) greatly contribute to the erosion of biodiversity
3. With climate change, biodiversity expected to be further threatened
4. Aside from climate change, biodiversity will also be affected by the response of the vulnerable sectors to the impacts of climate change

KEY MESSAGES

5. Local communities will exert more pressure on forest resources as income from current livelihood activities will be adversely affected by climate change
6. Adaptation strategies need to be undertaken
   - Assessment of risk and vulnerability
   - Enhance biodiversity management to reduce risk and vulnerability
   - Mainstream climate change to biodiversity management
   - Sustainable financing mechanism


THANK YOU!