

VULNERABILITY OF BIODIVERSITY

CLIMATE CHANGE AND ECOSYSTEM–BASED ADAPTATION

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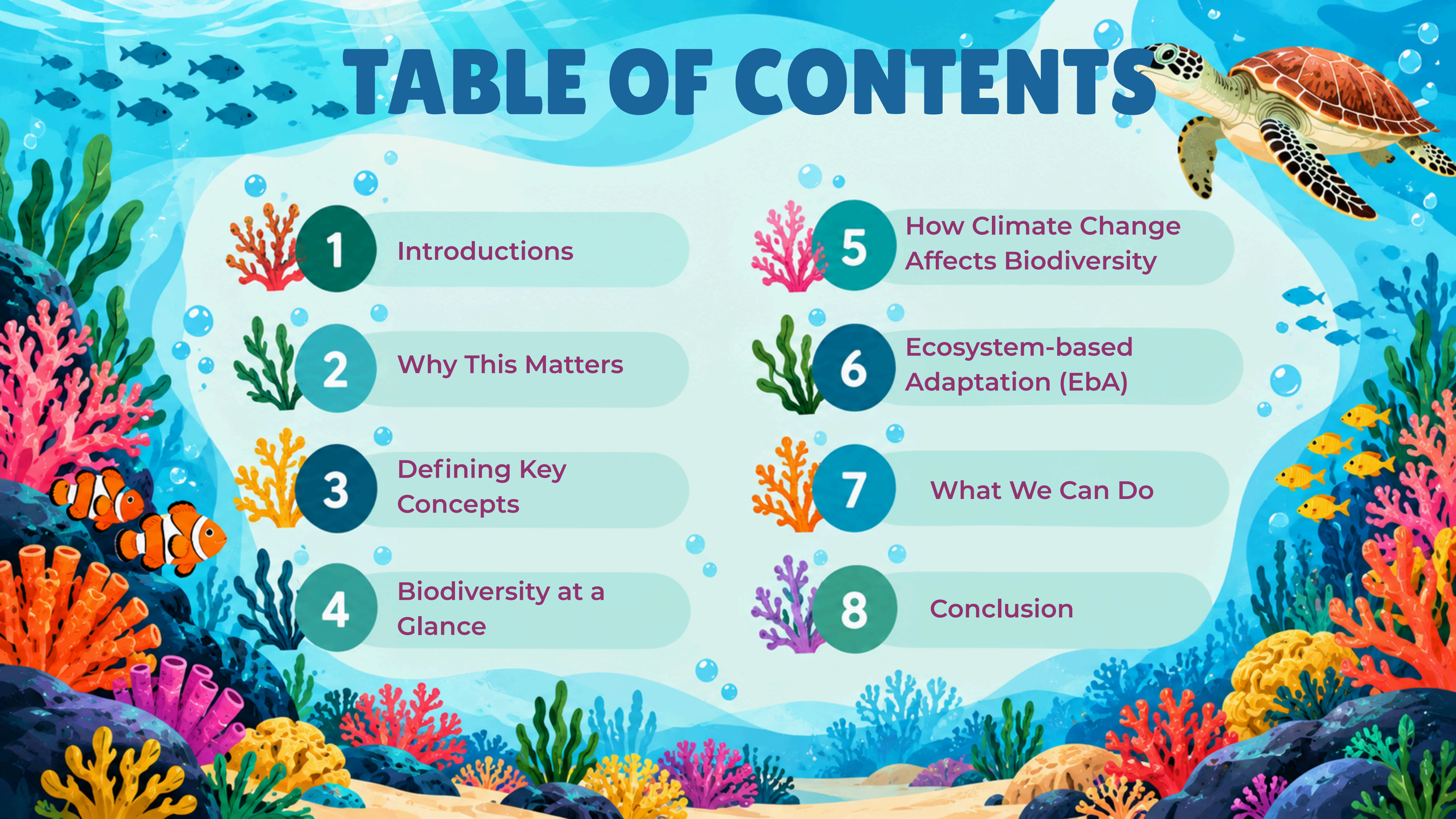

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A GROWING CRISIS

According to the Intergovernmental Panel on Climate Change (IPCC) Report on Climate Change 2022: Impacts, Adaptation, and Vulnerability, climate change is already causing severe disruptions to ecosystems in every region of the world. Rising temperatures, unpredictable rainfall, and an increase in extreme weather events are altering natural habitats and threatening countless species. The report extinction will grow dramatically, as many plants and animals will not be able to adapt fast enough to new environmental conditions.



WHY THIS MATTERS

Biodiversity keeps Earth’s systems balanced. Forests, oceans, and wetlands regulate the climate, purify air and water, and support life. When species disappear, ecosystems weaken, making natural disasters, droughts, and climate change worse. Protecting biodiversity safeguards the planet’s stability and ensures that nature can continue sustaining all forms of life.





WHY THIS MATTERS

Human life depends entirely on biodiversity. Nature provides food, medicine, and raw materials, while stable ecosystems support economies and cultures. Losing species means weaker agriculture, higher disease risks, and fewer natural resources. Indigenous peoples especially suffer as traditions and livelihoods vanish. Protecting biodiversity ensures human survival, health, and global well-being.



BIODIVERSITY AT A GLANCE





At the landscape scale, biodiversity vulnerability reflects how entire ecosystems respond to climate change. Rising temperatures, changing rainfall, and habitat fragmentation are reshaping species distributions and ecosystems functions.



Forest, coral reefs, and wetlands are among the most threatened. As climate zones shift, species must migrate or adapt, but many cannot move fast enough or find suitable habitats. Large-scale monitoring shows that biodivesity loss is accelerating, especially in tropical and costal regions, where climate and human pressures overlap most intensely,

DEFINING KEY CONCEPTS



BIODIVERSITY



Biodiversity refers to the immense variety of life on Earth, encompassing the diversity of genes, species, and ecosystems. It underpins the stability and functioning of the planet's natural system, maintaining food chains, regulating the climate, purifying water, and supporting pollination. High biodiversity increases resilience, allowing ecosystems to recover from disturbances such as disease, drought, or habitat loss. Ultimately, it is the living foundation that sustains all human and ecological well-being

1. Ecompasses genetic, species, and ecosystem diversity
2. Ensures natural balance and resilience to change
3. Vital for ecosystem service and human survival

CLIMATE CHANGE

Long-term alterations in global temperatures and weather patterns, primarly driven by human activities such as burning fossil fuels, deforestation, and industrial emissions. These activities increase greenhouse gases in the atmosphere, trapping heat and disrupting natural cycles. It threatens biodiversity, human health, food security, and economic stability, making it one of the most urgent challanges facing the planet today.





HOW CLIMATE CHANGE AFFECTS BIODIVERSITY



Climate change is reshaping some of the most biologically rich and unique areas on Earth. Rising temperatures, shifting rainfall patterns, ocean acidification, and increased frequency of fires and droughts are disrupting habitats and ecological interactions. Species in biodiversity hotspots, such as the Amazon rainforest, coral triangle, and African savannas, are highly sensitive to even small environmental changes.

EXAMPLE: CORAL REEFS

Coral reefs are among the most climate-sensitive ecosystems on Earth. When waters become too warm, corals expel their symbiotic algae, turning white and often dying if heat persists. These bleaching events are increasing in frequency and intensity, devastating marine biodiversity and threatening the livelihoods of millions who depend on reefs for food, tourism, and coastal protection.





EXAMPLE: POLAR REGIONS

The polar regions are warming at more than twice the global average, dramatically altering biodiversity and ecosystem dynamics. As ice-dependent species like polar bears and seals lose their habitats, invasive species move northward, reshaping fragile ecosystems. The melting of permafrost also releases greenhouse gases, creating feedback loops that accelerate global warming and biodiversity loss far beyond the poles.

EXAMPLE: FOREST ECOSYSTEMS

Forests, often described as the planet’s lungs, are under growing threat from climate change. Tree species are at risk from rising temperatures, droughts, pests, and wildfires. These stressors weaken trees, reduce forest productivity, and make ecosystems more vulnerable to collapse. When forests decline, biodiversity suffers, species lose habitats, carbon storage decreases, and local climates become less stable.







ECOSYSTEM SERVICE

Ecosystem services are the essential benefits nature provides to humanity, such as clean water, fertile soil, pollination, climate regulation, and recreation. They form the foundation of economies and well-being.

When ecosystems degrade, these services decline, leading to food insecurity, health risks, and economic instability. Protecting nature safeguards these vital life-support systems.

ECOSYSTEM–BASED ADAPTATION (EbA)

Ecosystem-Based Adaptation (EbA) is a nature-centered approach that uses healthy ecosystems to help people adapt to the impacts of climate change. Instead of relying solely on engineered solutions, EbA restores and protects natural systems, such as forests, mangroves, wetlands, and coral reefs, to provide resilience and reduce vulnerability. For example, mangroves buffer coastlines from storms, forests regulate water cycles, and wetlands absorb floods.



HOW EbA WORKS

EbA works by integrating natural systems into climate adaptation planning. Instead of relying only on infrastructure like dams or seawalls, EbA supports the management, restoration, and conservation of ecosystems to naturally buffer against climate impacts. For instance, reforesting watersheds helps prevent floods and erosion, while restoring mangroves protects coasts from storm surges. By combining ecological restoration with social participation, EbA creates adaptive systems that benefit both people and nature over the long term.



BENEFITS OF EbA

EbA provides multiple benefits that extend far beyond climate resilience. It helps protect biodiversity, improves food and water security, supports livelihoods, and enhances human well-being. For example, restoring wetlands in Uganda has reduced flood damage while improving fish stocks, and replanting mangroves in Vietnam has saved millions in coastal defense costs. EbA also contributes to climate mitigation by storing carbon in forests and soils.



BENEFITS OF EbA

Addressing biodiversity loss and climate change requires active engagement at all levels. Communities, governments, and individuals can work together to protect and restore ecosystems, reduce greenhouse gas emissions, and adopt sustainable practices in agriculture, fisheries, and urban planning. Actions include reforestation, wetland restoration, sustainable resource management, and supporting policies that conserve biodiversity. Education and awareness-raising are also crucial, helping people understand how everyday choices affect ecosystems.

CONCLUSION



The challenges posed by climate change and biodiversity loss are interconnected and global, affecting every region and every aspect of life on Earth. Healthy ecosystems are the foundation of human survival, providing essential services such as food, water, clean air, and climate regulation. Protecting and restoring nature is therefore not only an environmental priority but a social, economic, and ethical one. By integrating conservation, sustainable development, and nature-based solutions into policies and daily practices, societies can build resilience, reduce risks, and secure a healthier planet for current and future generations.