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# **Establishment of Strategies Responding to Climate Change on Island and Coastal Biosphere Reserves**

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# **I. Introduction to the Research**

1. Research Questions and Objectives
2. Research Sites/Research Team
3. Research Contents/Research Framework

## 1. Research Questions and Objectives

- o Various strategies against climate change are being implemented at a global, national and local level.
- o But, IPA- or BR-specific strategies are quite few, even though they are more vulnerable to climate change
- o Having emphasized the necessity for BR
  - 1995: Seville Strategy on BRs
  - 2008: Madrid Action Plan
  - 2011: Dresden Declaration
- o Some researches on the conservation of biodiversity in relation to climate change in a specific BR site

- o Indirect examples (at a macro level)
  - Convention on Biological Diversity
  - WWF: Manual for Building Resistance to Climate Change in Natural Systems
  - 2010: Aichi Biodiversity Targets
  - EU Biodiversity Strategy for 2020
- o Objectives
  - Establishment of the strategies responding to climate change on island and coastal BRs
  - For conserving original ecological and geological quality through launching BR-specific strategy
- o Research period: May 2015 - September 2017

## **2. Research Sites/Research Team**

### **(1) Research Sites**

- o Jeju Island BR in South China Sea
- o Menorca BR in the Mediterranean
- o Macchabee-Bel Ombre BR in Indian Ocean
- o Príncipe Island BR in the Gulf of Guinea
- o St. Mary's BR in Caribbean

## **(2) Research Team**

- o Dai-Yeun Jeong (Principal investigator)
  - Director, Asia Climate Change Education Center
  - Emeritus Professor of Environmental Sociology at Jeju National University, South Korea
- o Ragen Parmananda (Co-researcher)
  - Scientific Officer (Conservation) in the National Parks and Conservation Service
  - Invasive Alien Species Coordinator of Protected Area Network Project funded by UNDP/GEF
- o Juan Rita (Co-researcher)
  - Professor of Botany, Department of Biology, Balearic Island University, Spain
- o António Abreu (Co-researcher)
  - Biologist (Environmental Expert)
  - Vice Chair of the European Environmental Advisory Council
  - Prof. of Environment and Tourism, ISAL, Maderia Autonomous Region, Portugal

### **3. Research Contents/Research Framework**

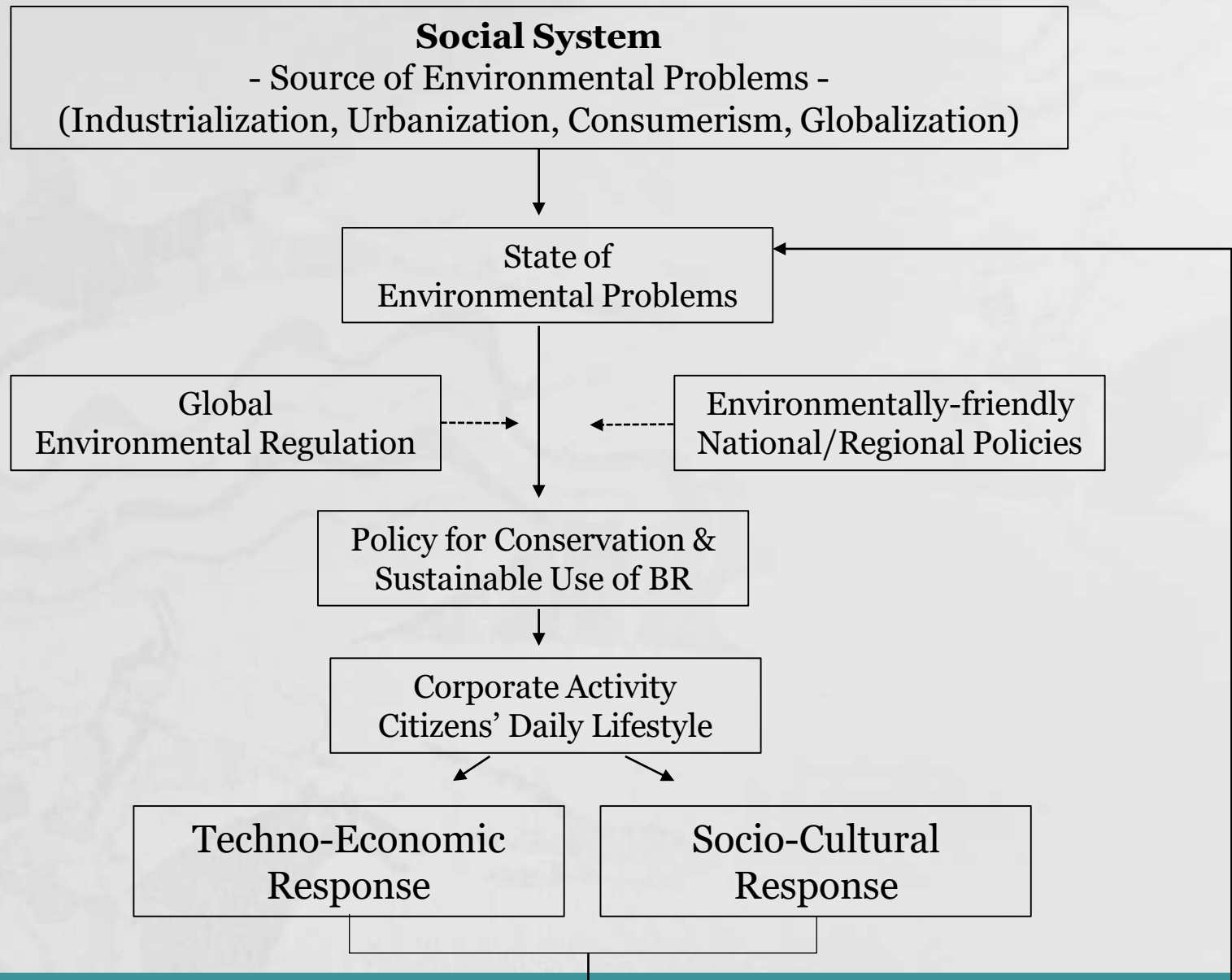
#### **(1) Research Contents**

- o Reviewing the Existing Mitigation and Adaptation Measures against Climate Change
- o Reviewing Protection Strategies for Protected Areas
- o Establishment of Strategy against Climate Change on Island and Coastal BRs
  - Ecological vulnerability
    - Ecosystem
    - Biodiversity
    - Communities of flora and fauna
    - Species



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- Social vulnerability
    - Social vulnerability and climate change
    - How to assess social vulnerability to climate change
    - Biosphere reserves and community resilience through strategies
  - Economic vulnerability
    - Agriculture
    - Tourism
    - Fishery industry

## (2) Research Framework



## II. Existing Protection Strategies for Protected Areas

### o Principles of protecting PAs (IUCN, UNEP, etc.)

- Ecosystem-based approach, nature-based solution
- Maintains the highest possible level of environmental integrity
- Use of indigenous knowledge
- Promote connectivity of protected areas
- Increase the Coverage of protected areas
- etc.

### o Approaches to mitigation

- Energy efficiency (including transportation)
- Increase renewable energy
- Improve waste management
- etc.

- o Approaches to adaptation
  - Reduce non-climatic stressors
  - Prioritize the protection of intact and connected ecosystems
  - Identify and protect climate refuges
  - Conserve ecological features
  - Preserve and enhance connectivity
  - Sustain or restore ecosystem process
  - Improve representation, redundancy and replication
  - Assist colonization
- o Main tools to address the fight against climate change
  - Networking
  - Planning, but manage for change: assessment (vulnerability, disaster, etc.)

# III. Strategies on Ecological Vulnerability

1. Ecosystem
2. Biodiversity
3. Communities of Flora and Fauna
4. Species

## **1. Ecosystem**

- o Maintain well-functioning ecosystems
- o Protect a representative array of ecological systems
- o Remove or minimize existing stressors
- o Manage appropriate connectivity of species, landscapes, seascapes and ecosystem processes
- o Eco-engineering may be needed to assist the transformation of some communities under climate change
- o Increase the extent of Protected Areas

- o Improve representation and replication within Protected-Area Networks
- o Improve management and restoration of existing Protected Areas to facilitate resilience
- o Manage and restore ecosystem functions rather than focusing on specific components (species or assemblages)
- o Evaluate and enhance monitoring programs for wildlife and ecosystems

## **2. Biodiversity**

- o Apply a risk management approach to deal with uncertainties about climate change
- o Minimize threats and seize opportunities
- o Manage invasive alien species
- o Develop dynamic landscape conservation plans
- o Review and modify existing laws, regulations, and policies regarding wildlife and natural resource management
- o Education and communication to bring the public along with change



### **3. Communities of Flora and Fauna**

- o Develop dynamic landscape conservation plans
- o Deal with uncertainties: ecological resilience and transformation
- o Bridge ecological knowledge gaps and research
- o Ensure wildlife and biodiversity needs

## 4. Species

- o Design new natural areas and restoration sites to maximize resilience
- o Protect movement corridors, stepping stones, and refugia
- o Improve the matrix by increasing landscape permeability to species movement
- o Focus conservation resources on species that might become extinct
- o Translocate species at risk of extinction
- o Establish captive populations of species that would otherwise go extinct
- o Reduce pressures on species from sources other than climate change
- o Incorporate predicted climate-change impacts into species and land-management plans, programs and activities
- o Genetic preservation must be considered in some cases

## **IV. Strategies on Social Vulnerability**

1. Social Vulnerability and Climate Change
2. How to Assess Social Vulnerability to Climate Change
3. Biosphere Reserves and Community Resilience through Strategies

## **1. Social Vulnerability and Climate Change**

- o Is the result of a complex combination and interaction of different factors such as
  - The existing natural, environmental and geographical conditions of each site
  - The socio-economic structure, dynamics and capacity to cope and adapt to natural and human induced impacts
- o Small Islands and Coastal areas are particularly vulnerable to climate change impacts

## **2. How to Access Social Vulnerability to Climate Change**

- o Three main factors to access
  - Exposure      - Sensitivity      - Adaptive capacity
- o The three areas determine the level of vulnerability
- o Therefore, social vulnerability to climate change can be measured by combining
  - Measurements of the three components
  - Considering different scales (individuals and/or communities)
- o Several methods can be used to compile information (qualitative and quantitative)
- o Assess the exposure such as
  - Existing vulnerability assessments
  - Expert opinions
  - Models or observational data
- o Assessing social sensitivity to climate change relates with the degree of dependence on the ecosystem goods and services

### **3. Biosphere Reserves and Community Resilience through Strategies**

- o Four step approaches for building resilience
  - Vulnerability assessment
  - Identification of resilience-building strategies
  - Prioritizing resilience efforts
  - Implementation of resilience-building strategies
- o In relation to these steps BRs need to consider
  - Community-based Adaptation
  - Ecosystem-based Adaptation
- o Thus, facilitating a broader and integrated approach
- o Should consider for enhancing ecosystem conservation the role of both the natural and hard infrastructures

# **V. Strategies on Economic Vulnerability**

1. Agriculture
2. Tourism
3. Fishery industry

# 1. Agriculture

## o Adaptation

- Basic infrastructure investments improving efficiency on water/soil use and management
- Introduce complementary measures that are more resistant to
  - the expected temperature
  - soil composition
  - salinity
  - other physical and chemical conditions



- Depending on the specific conditions (geographical, social, economic, etc.)
  - introducing new varieties/species better adapted to the existing and predicted conditions
  - enhancing water collection and management through climate smart infrastructures and conservation agriculture
  - optimizing timing and/or location of cropping activities
  - ensuring sound and effective pest and disease management
  - diversifying income by integrating agriculture with other activities
- However, adaptation outputs are not a linear positive process

## o Mitigation

- Establishing a strategy to reduce greenhouse gas emission
- Mitigation can result from three types of interventions
  - reducing the emissions intensity along the entire agricultural supply chain
  - including avoided land use change driven by agriculture, sequestering additional carbon in agricultural systems
  - shifting away from high-carbon intensity agricultural products such as meat from ruminants.

## **2. Tourism**

### **o Adaptation**

- Must be combined with land planning in order to minimize impacts
- Moving from bed-based to activity-based tourism
- Requires a global approach on how to manage natural resources
- Should be supported by knowledge and information
- Direct and indirect links that tourism promotes between different socioeconomic sectors

## o Mitigation

- Reducing greenhouse gas emitted in the process of operating own tourism resort
- Ecotourism-based operation for all tourism resources being used
- Developing a manual to reduce greenhouse gas emission
- Establishing the system of energy and resource circulation through
  - saving resources and energy
  - improving the efficiency of resources and energy
  - introducing new and renewable energy
  - reducing emission of pollutant and waste discharge, etc.
- Providing visitors with environmental education program for leading them to environmentally friendly behaviors during their tour in the tourism resort

### 3. Fishery industry

- o The scope of causes impacting on marine BR is much wider than that of the scope of causes on terrestrial BR in terms of
  - The actor contributing to climate change
  - The source boundary where the impact is originated
  - The unclear boundary of the activity of fishes between marine BR and non-marine BR
- o Such special situations imply that
  - The establishment of adaptation/mitigation strategy on fishery industry
    - should be based not on marine BR-specific
    - but on general marine fishery industry
    - and priority should be given to adaptation when the strategy is focused on marine BR-specific one

- o Adaptation can be part of a well designed plan or can be the whole set of individual actions that are undertaken by individuals and communities addressing climate change related events or trends
- o In small island and coastal Biosphere Reserves it is highly improbable to ensure access to capacity and resources
- o Instead, BRs should explore and benefit from integrated approaches promoting sectoral contribution such as the reinforcement of conservation through the core zones as these areas have already local and/or national legal status
- o However, legal and political instruments are also necessary to prevent contradiction/conflicts between the well addressed local actions and the external trading/management frameworks

## VI . Conclusion

- o Adaptation should be more of a BR-specific strategy than mitigation
- o Establishment of mitigation requires, at least three phases
  - 1st Phase: Preparing greenhouse gas inventory by sector
  - 2nd Phase: Setting up the goal of reduction
  - 3rd Phase: Establishing reduction method
- o Establishment of Adaptation
  - By sector in BR
  - Among options, the most efficient, effective, and low-cost measures should be launched
- o How to improve adaptation capacity should be considered

- o Necessary steps for developing the strategy on improvement of adaptation capacity
  - Reviewing and defining its concept (conceptual components)
  - Categorizing its conceptual components (genetic vs. specific)
  - Establishing its strategy (policy and measure)

Thanks a lot for your kind attention