

# BIODIVERSITY

## DEFINITION, PRINCIPLES AND THREATS

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*Look deep into nature, and then  
you will understand everything  
better....*

*- Albert Einstein*



# ETYMOLOGY OF BIODIVERSITY...

- The term “BIODIVERSITY” was first coined by the Entomologist E.O. Wilson in 1986. According to him, it refers to the variety of life on the planet or Biodiversity may be defined as the totality of different organisms.



# Biodiversity

What does “Bio” means ?

**Bio** = **LIFE**

# Biodiversity

What does “diversity” means ?

Diversity = Variety

# DEFINATIONS....

# According to Oxford English Dictionary –

The variety of plant and animal life in the world or in a particular habitat, a high level of which is usually considered to be important and desirable.

According to the United Nations Environment Programm (UNEP) -

Biodiversity typically measures variation at the genetic, species, and ecosystem level.

# According to IUCN in 1988 -

“The variety and variability of species of their populations, the Variety of species of their life forms, the diversity of the complex association with species with their interaction and their ecological process which influence perform”.

# MEGA BIODIVERSE COUNTRIES..

- #.The term **mega diverse country** refers to **any one of a group of nations that harbor the majority of Earth's species and high numbers of living organisms.**
- #. Mega diversity means exhibiting great diversity.

# LIST OF TOP 5 MEGADIVERSE COUNTRIES

- Brazil
- Columbia
- Indonesia
- Mexico
- China. ...



## EARTH'S MOST BIODIVERSE COUNTRIES

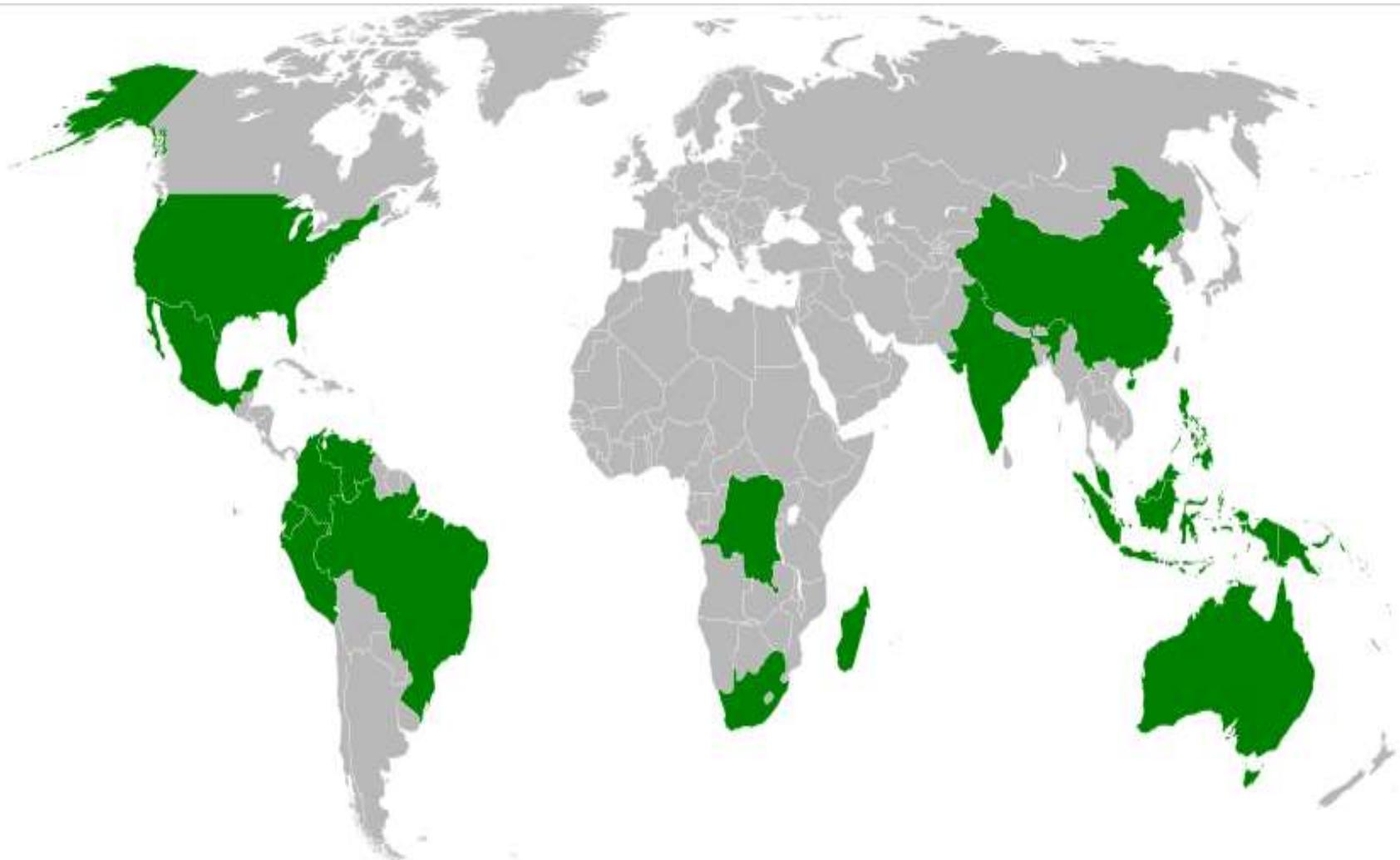
COUNTRY	Birds	Amphib	Mammals	Reptiles	Fish	Vascular plants	BioD Index	Rank	BioD index/ Land area	Rank
Brazil	17.6%	13.6%	11.8%	7.9%	13.7%	20.8%	<b>0.65</b>	<b>1</b>	0.10	
Colombia	18.3%	10.2%	8.1%	5.9%	6.2%	19.0%	<b>0.68</b>	<b>2</b>	0.57	
Indonesia	16.2%	4.6%	12.2%	7.1%	14.1%	10.9%	<b>0.65</b>	<b>3</b>	0.34	
China	12.5%	5.5%	10.0%	4.7%	10.1%	11.9%	<b>0.55</b>	<b>4</b>	0.06	
Mexico	10.9%	5.0%	9.5%	8.9%	7.9%	9.7%	<b>0.52</b>	<b>5</b>	0.26	
Peru	18.1%	7.6%	8.5%	4.7%	4.7%	6.3%	<b>0.50</b>	<b>6</b>	0.41	
Australia	7.1%	3.2%	6.4%	10.1%	14.7%	5.8%	<b>0.47</b>	<b>7</b>	0.06	
India	11.9%	5.2%	7.5%	6.7%	7.4%	6.9%	<b>0.46</b>	<b>8</b>	0.14	
Ecuador	16.0%	7.2%	6.8%	4.3%	3.3%	7.2%	<b>0.45</b>	<b>9</b>	1.59	21
Venezuela	13.7%	4.8%	6.6%	3.9%	5.2%	7.8%	<b>0.42</b>	<b>10</b>	0.45	
United States	8.5%	4.0%	8.0%	5.2%	9.3%	7.2%	<b>0.42</b>	<b>11</b>	0.04	
Bolivia	14.3%	3.2%	6.6%	3.0%	1.2%	6.4%	<b>0.35</b>	<b>12</b>	0.31	
South Africa	7.6%	1.7%	5.4%	4.4%	6.2%	8.7%	<b>0.34</b>	<b>13</b>	0.27	
DR Congo	10.9%	3.2%	7.8%	2.9%	4.5%	4.1%	<b>0.33</b>	<b>14</b>	0.14	
Malaysia	7.1%	3.5%	6.1%	4.7%	5.8%	5.7%	<b>0.33</b>	<b>15</b>	0.97	32
Viet Nam	<b>8.3%</b>	<b>3.0%</b>	<b>5.2%</b>	<b>4.5%</b>	<b>7.3%</b>	<b>3.9%</b>	<b>0.32</b>	<b>16</b>	0.97	33
Papua New Guinea	7.2%	4.9%	4.9%	2.7%	8.5%	4.3%	<b>0.32</b>	<b>17</b>	0.69	
Thailand	9.3%	1.9%	5.7%	4.2%	6.4%	4.3%	<b>0.32</b>	<b>18</b>	0.60	
Tanzania	10.6%	2.7%	6.5%	3.5%	5.3%	3.7%	<b>0.32</b>	<b>19</b>	0.34	
Argentina	10.0%	2.3%	6.8%	4.3%	3.0%	3.5%	<b>0.30</b>	<b>20</b>	0.10	
Cameroon	8.8%	2.9%	6.1%	2.8%	3.1%	3.1%	<b>0.27</b>	<b>21</b>	0.55	
Kenya	10.4%	1.5%	6.9%	2.7%	3.2%	2.4%	<b>0.27</b>	<b>22</b>	0.47	
Panama	8.8%	2.8%	4.5%	2.6%	4.2%	3.7%	<b>0.27</b>	<b>23</b>	3.45	9
Philippines	5.7%	1.5%	3.5%	2.0%	9.9%	3.3%	<b>0.26</b>	<b>24</b>	0.87	
Costa Rica	<b>8.6%</b>	<b>2.7%</b>	<b>4.1%</b>	<b>2.6%</b>	<b>3.3%</b>	<b>4.5%</b>	<b>0.26</b>	<b>25</b>	4.89	6
Myanmar	10.2%	1.2%	5.4%	3.0%	3.1%	2.6%	<b>0.25</b>	<b>26</b>	0.37	
Japan	4.4%	1.0%	2.6%	1.0%	12.1%	2.1%	<b>0.23</b>	<b>27</b>	0.62	
Angola	<b>9.1%</b>	<b>1.3%</b>	<b>5.2%</b>	<b>2.4%</b>	<b>2.7%</b>	<b>1.9%</b>	<b>0.23</b>	<b>28</b>	0.18	
Madagascar	2.5%	4.1%	4.2%	4.0%	3.5%	3.5%	<b>0.22</b>	<b>29</b>	0.36	
Mozambique	6.7%	1.2%	4.3%	2.2%	5.3%	2.1%	<b>0.22</b>	<b>30</b>	0.26	
Guatemala	7.1%	2.2%	4.0%	2.6%	2.7%	3.2%	<b>0.22</b>	<b>31</b>	1.93	18
Guyana	7.9%	1.8%	4.3%	1.8%	3.0%	2.4%	<b>0.21</b>	<b>32</b>	0.98	31
Uganda	9.9%	0.8%	5.8%	1.7%	0.8%	2.4%	<b>0.21</b>	<b>33</b>	0.87	
Guinea	<b>6.3%</b>	<b>1.0%</b>	<b>4.1%</b>	<b>5.8%</b>	<b>3.0%</b>	<b>1.1%</b>	<b>0.21</b>	<b>35</b>	0.86	
Nigeria	8.6%	1.5%	5.2%	1.9%	2.3%	1.7%	<b>0.21</b>	<b>34</b>	0.24	
Honduras	7.0%	1.6%	3.9%	2.6%	3.1%	2.1%	<b>0.20</b>	<b>36</b>	1.78	20
Nicaragua	6.8%	0.9%	3.7%	1.9%	3.2%	2.8%	<b>0.19</b>	<b>37</b>	1.46	22
Laos	6.9%	1.3%	3.9%	1.7%	1.7%	3.1%	<b>0.19</b>	<b>38</b>	0.76	
Congo	6.1%	1.0%	3.6%	3.3%	2.3%	2.2%	<b>0.19</b>	<b>39</b>	0.53	
Ethiopia	8.1%	0.9%	4.9%	2.3%	0.5%	2.4%	<b>0.19</b>	<b>40</b>	0.17	
Sudan	9.2%	0.2%	5.1%	1.8%	1.4%	1.2%	<b>0.19</b>	<b>41</b>	0.10	
French Guiana	7.1%	1.4%	3.8%	1.6%	2.9%	2.1%	<b>0.19</b>	<b>42</b>	2.26	15
Ghana	<b>6.8%</b>	<b>1.1%</b>	<b>4.7%</b>	<b>1.8%</b>	<b>2.1%</b>	<b>1.4%</b>	<b>0.18</b>	<b>43</b>	0.75	
Suriname	7.0%	1.5%	3.8%	0.6%	3.1%	1.9%	<b>0.18</b>	<b>44</b>	1.09	28
Gabon	6.1%	1.3%	3.3%	1.3%	2.3%	2.5%	<b>0.17</b>	<b>45</b>	0.64	
Ivory Coast	6.7%	1.1%	4.6%	1.5%	2.0%	1.4%	<b>0.17</b>	<b>46</b>	0.53	
Zambia	7.3%	1.2%	4.3%	1.8%	1.2%	1.8%	<b>0.17</b>	<b>47</b>	0.23	
Iran	4.7%	0.3%	3.4%	3.2%	1.9%	3.0%	<b>0.17</b>	<b>48</b>	0.10	
Nepal	8.1%	0.6%	3.3%	1.4%	0.9%	2.6%	<b>0.17</b>	<b>49</b>	1.16	27
Paraguay	6.9%	1.0%	3.0%	1.8%	0.8%	2.9%	<b>0.16</b>	<b>50</b>	0.39	

**DATA SOURCE**  
**1. AUTHOR - RHETT A. BUTLER**  
**2.ON 21 MAY 2016**  
**3. Website -**  
<https://news.mongabay.com/2016/05/top-10-biodiverse-countries/>



# Geographical Locations Of Mega Diverse Countries.....

K



# Levels of the Biodiversity...

Biological diversity is usually analyzed at three different levels, each of which has its own significance. These are :

1. Ecosystem Diversity
2. Species Diversity
3. Genetic Diversity

# 1. Ecosystem Diversity..

#.Depending largely upon the availability of the of abiotic resources and conditions of the environment an ecosystem develop its own characteristic community of living.

#.For ex.- A small pond constitute an ecosystem and possesses a set of flora and fauna different from a river which is another type of ecosystem.

#. Different type of forests, grass lands, lakes, rivers, wet-land etc. represent diverse ecosystem each with a different biotic component.

# Grass land ecosystem...



# River Ecosystem..



# Forests Ecosystem...



# Pond Ecosystem..



# Species Diversity..

- #. The biotic component in an ecosystem may be composed of few species only or a large number of species of plant, animals and microbes, which react and inter – act with each other and with abiotic factor of the environment.
- #. The richness of species in an ecosystem is usually referred to as Species Diversity.

# Species Diversity...



# Genetic Diversity...

- #. Within a species there are often found a number of varieties or races or strains which slightly differ from each other in one, two or a number of characters such as shape, size, quality of their product, resistance to insects, pests and diseases, ability to withstand adverse conditions of environment etc.
- #. These differences are due to slight variations in their genetic set up.

# Genetic Diversity...



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# Major Principles of the Biodiversity...

The following ecological principles describe the assumptions needed to plan actions for conserving biodiversity:

**Principle 1: The objectives of management of land, water and living resources are a matter of societal choices.**

**Principle 2: Management should be decentralized at the lowest appropriate level.**

**Principle 3: Ecosystem must be managed within the limits of their functioning.**

**Principle 4: The ecosystem approach should involve all relevant sectors of society and scientific disciplines.**

# Major Principles of the Biodiversity...

**Principle 5: Deepen people's understanding of biodiversity.**

**Principle 6:Act in such a way as to conserve biodiversity.**

**Principle 7: Use our business operations to help conserve biodiversity**

# Principle 1: The objectives of management of land, water and living resources are a matter of societal choices...

- #. Different sectors of society view ecosystems in terms of their own economic, cultural and society needs.
- #. Both cultural and biological diversity are central components of the ecosystem approach, and management should take this into account. Societal choices should be expressed as clearly as possible. Ecosystems should be managed for their intrinsic values.

## Principle 2: Management should be decentralized to the lowest appropriate level...

- #.Decentralized systems may lead to greater efficiency, effectiveness and equity.
- #.The closer management is to the ecosystem, the greater the responsibility, ownership, accountability, participation, and use of local knowledge.

## Principle 3: Ecosystem must be managed within the limits of their functioning...

- #. In considering the likelihood or ease of attaining the management objectives, **attention should be given to the environmental conditions that limit natural productivity, ecosystem structure, functioning and diversity.**
- #. The **limits to ecosystem functioning may be affected** to different degrees by temporary, unpredictable or artificially maintained conditions and, accordingly, **management should be appropriately cautious.**

## Principle 4: The ecosystem approach should involve all relevant sectors of society and scientific disciplines...

#. Most problems of biological-diversity management are complex, with many interactions, side-effects and implications, and therefore should involve the necessary expertise and stakeholders at the local, national, regional and international level, as appropriate.

# Principle 5. Deepen people's understanding of biodiversity...

- #. In order to conserve biodiversity, people need to understand the impact their work or daily lives has on local ecosystems and habitats.
- #. We therefore need to ensure that our employees and their families, as well as our suppliers, have a thorough understanding of biodiversity.

# Principle 6. Act in such a way as to conserve biodiversity...

- 
- #. By forming links with local communities, schools, and non-profit organizations, we can broaden the scope of our environmental and social contribution activities to include a wider range of programs for conserving biodiversity.
  - #. If we consider the impact our business activities and daily lives has on local ecosystems and habitats, we can more readily take action to conserve biodiversity.

# Principle 7. Use our business operations to help conserve biodiversity...

#. We can use our IT and network technologies to provide solutions that help people understand, conserve, and increase biodiversity.



# THREATS TO BIODIVERSITY



# WHAT CAUSE THREATS TO IT...

#.Biodiversity is under serious threat as a result of human activities.

#.The main dangers worldwide are population growth and resource consumption, climate change and global warming, habitat conversion and urbanization, invasive alien species, over-exploitation of natural resources and environmental degradation

# MAJOR THREATS ...

- HABITATE LOSS
- GLOBAL CLIMATE CHANGE
- OVER EXPLOITATION
- ALIEN SPACIES INVASION
- OVER HUMAN POPULATION

# 1. HABITAT LOSS

- It can be described, when an organism loses its home.
- Reasons of habitat loss by human :

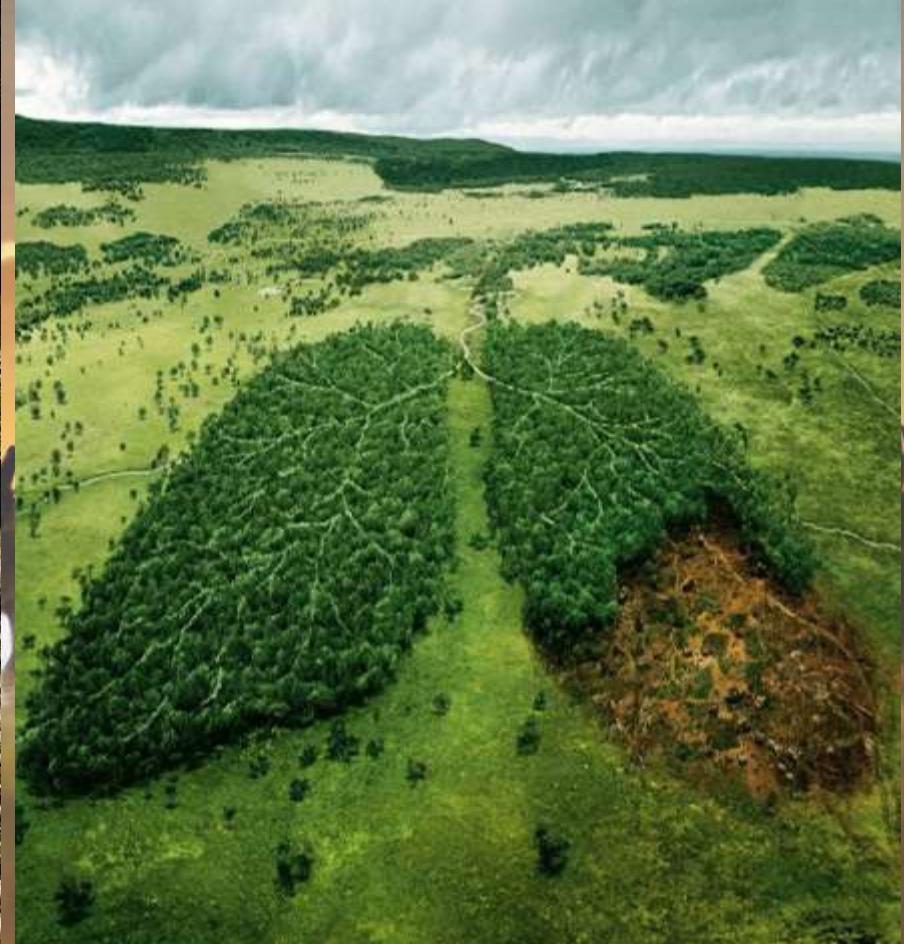
#. Agriculture, Farming

#. Harvesting natural resources for personal use

#. For industrialization and urbanization development

**Habitat loss has been currently ranked as primary cause of species extinction world wide .....**

# Habitat loss....



# Natural disasters too...

Earthquakes, landslides, volcanic eruptions and natural bush fires all affect the many different ecosystems on our planet. Initially, these disasters negatively affect the biodiversity of wetlands, forests and coastal systems by causing the spread of invasive species, mass species mortality and loss of habitat.

# Habitat loss by natural disasters ..



# Solutions for this...

- Protecting remaining section of habitat
- Reduce human population and expansion of urbanization and industries
- Educating the public about the importance of natural habitat and bio diversity ..
- Planting more trees.
- Provide better solutions for wildfire..

## 2. GLOBAL CLIMATE CHANGE ...

- Changes to the climate system have been observed at a global scale, in the measurements of temperature at the surface, and the middle atmosphere, increased sea level, increased sea surface temperature, increased ocean heat content, and increased water vapour in the atmosphere.

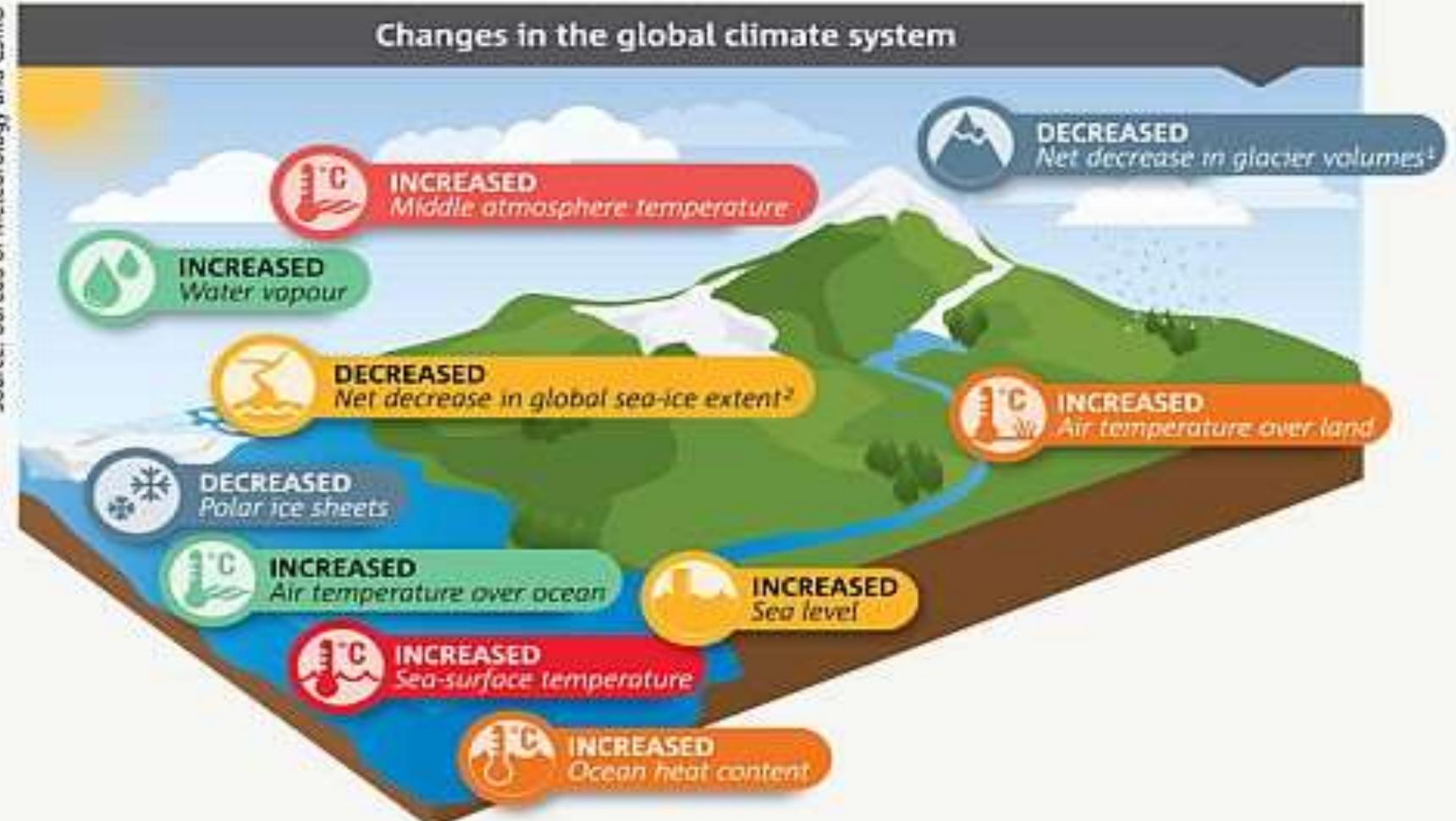
# Climate change is very harmful...



# WHAT DOES CLIMATE CHANGES CAUSE..

Source: Bureau of Meteorology and CSIRO

## Changes in the global climate system



# 3.OVER EXPLOITATION

- Overexploitation means harvesting species from the wild at rates faster than natural populations can recover.
- Overfishing and overhunting both are types of overexploitation.
- Currently, about a third of the world's endangered\* vertebrates are threatened by overexploitation.

\*Endangered - seriously at risk of extinction.

# OVERFISHING



# RESULT OF OVERFISHING...

- Removal of essential predators
- Growth of algae
- Financial losses
- Removal of endangered fishes
- Unbalanced food chain

# Alien species Invasion

- Invasive alien species are plants, animals, pathogens and other organisms that are non-native to an ecosystem, and which may cause economic or environmental harm or adversely affect human health.
- *Alien species* – a species that has been intentionally or unintentionally introduced to a location, area, or region where it does not occur naturally..

# AN INVASIVE ALIEN SPECIES

*Parthenium hysterophorus* :-

- #. Parthenium can almost grow anywhere and spreads extremely rapidly, displacing valuable forage species.
- #. It is toxic to livestock and can have detrimental impacts on human health, causing respiratory problems and dermatitis.
- #. If unmanaged, it can reduce crop yields by more than 90%.

# IMPACTS

- Poisonous to cattle
- Release toxins into soil to stunt growth of native plants
- Loss of land
- Reduces native biodiversity
- Negatively impacts livelihoods

# SOLUTIONS TO THIS...

- **Manual control :-**

It is possible to prevent further spread of Parthenium by destroying the plant before it flowers. This is difficult because it cannot be manually removed as it causes irritation to the skin. Equally, the use of machinery to remove the plants can result in increased seed dispersal.

# Continue ...

- **Chemical control :-**

Various herbicides, when applied in high volume, have been found to be effective in managing the plant. However, these methods are both expensive and unsustainable.

# Continue ....

- **Biological control :-**

Biological control has been deemed the **best sustainable solution** to a **Parthenium infestation**. A **beetle\*** has been introduced to some parts of India which has eradicated the weed in some locations.

# HUMAN OVERPOPULATION

- Human overpopulation is among the **most pressing environmental issues**, silently aggravating\* the forces behind global warming, environmental pollution, habitat loss, consumption of finite natural resources, such as fresh water, arable\* land and fossil fuels, at speeds faster than their rate of regeneration. However, ecological issues are just the beginning...

# What Causes Overpopulation?

- An increased birth rate and lower birth mortality rates.
- Decreased overall mortality rates and increased life spans.
- Introduction of foreign species — does not generally apply to humans

# MAJOR EFFECTS OF OVERPOPULATION...

- Plant and Animal Extinction
- Climate Change
- Pollution
- Reducing Forest Area

# SOLUTIONS...

- Social Awareness...
- Importance of family planning...
- Tax Benefits or Concessions...

# REFERENCES...

- <https://www.nec.com/en/global/eco/life/guide/index.html>
- <https://www.cbd.int/ecosystem/principles.shtml>
- <https://unsplash.com>
- Google Scholar
- Wikipedia
- Convention On Biological Diversity (CBD)
- <https://www.invasive-species.org/species/parthenium/>
- <https://news.mongabay.com/2016/05/top-10-biodiverse-countries/>

*“If we start walking at the time, we don’t need to run at the end...”*



A close-up photograph of a fluffy orange hamster with dark eyes and whiskers, looking directly at the camera. The hamster is positioned in the center of the frame against a blurred background.

**THANK YOU...**