



**Under the Patronage of
His Royal Highness
Prince El-Hassan bin Talal
*Founding Patron of the Islamic World
Academy of Sciences (IAS)***

Conference on Biodiversity

Organized by:

**Islamic World Academy of Sciences (IAS) and
Organization of Islamic Cooperation (OIC) Ministerial
Standing Committee on Scientific and Technological
Cooperation (COMSTECH)**

1 April 2021

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ORGANIZERS



Islamic World Academy of Sciences (IAS)
Amman - Jordan
www.iasworld.org

Scientific institutions have always played a major role in promoting science and technology and in influencing the general state of development of any society.

In response to the need for an international organisation that can undertake such a task, the Islamic World Academy of Sciences (IAS) came into being as an independent, non-political, non-governmental and non-profit making organisation of distinguished scientists and technologists dedicated to the promotion of all aspects of science and technology in the Islamic world.

The establishment of the Islamic World Academy of Sciences (IAS) was proposed, by the Organisation of Islamic Cooperation; OIC Standing Committee on Scientific and Technological Co-operation (COMSTECH), and approved by the Fourth Islamic Summit held at Casablanca, in 1984. Upon the invitation of Jordan, the Founding Conference of the Academy was held in Amman (Jordan) in October 1986.

The main objectives of the Academy are:

- To serve as a consultative organisation of the Islamic *Ummah* and institutions in the field of science and technology;
- To initiate science and technology programmes and formulate standards of scientific performance;
- To promote research on major problems facing Islamic countries; and to identify future technologies of relevance for possible adoption and utilization; and
- To formulate standards of scientific performance and attainment, and to award prizes and honours for outstanding scientific achievements in science and technology disciplines.

The IAS is a sovereign body that is governed by a General Assembly, in which all the Fellows are member. It is managed by an 11-member Council which is elected by the General Assembly for a 4-year term of office.



**OIC Standing Ministerial Committee on Scientific and
Technological Co-operation (COMSTECH)
Islamabad - Pakistan
www.comstech.org.pk**

COMSTECH the Ministerial Standing Committee on Scientific and Technological Cooperation of the OIC (Organization of Islamic Cooperation) was established by the Third Islamic Summit of OIC held at Makkah, Saudi Arabia in January 1981. The President of Pakistan is Chairman of COMSTECH. The core mandate of COMSTECH is to strengthen cooperation among OIC Member States in science and technology (S&T), and enhance their capabilities through training in emerging areas, undertake follow-up actions and implementation of the resolutions of the OIC, and to draw up programs and submit proposals designed to increase the capability of the Muslim countries in science and technology (S&T). The ultimate aim is to build and nourish a scientific culture in addition to using S&T as a major contributor to socio-economic development and rapid industrialization.

The objectives of COMSTECH include:

1. Assessment of human and material resources of Member States and identification of scientific and technological needs and requirements of the Ummah,
2. Building indigenous capabilities of Member States in the fields of science and technology through cooperation and mutual assistance,
3. Enhancement of cooperation and coordination in scientific and technological fields amongst the OIC member states with a view to achieving collective competence in science and technology for solution of the problems of the OIC member states,
4. Creation of an effective institutional structure for planning, research, development and monitoring of scientific and technological activities at national, regional, and international levels.

INTRODUCTION

Many of the Islamic countries are parties of Convention on Biological Diversity (CBD). However, not all of them are part of Nagoya Protocol on Access and Benefit-sharing of genetic material. The upcoming UN Conference on Biological Diversity (COP-15) will review achievement of these frameworks.

This conference will address different aspects of Biodiversity for the purpose of sharing information in preparation for the fifteenth meeting of the Parties to the Convention on Biological Diversity (COP-15) which will be held in May 2021, in Kunming, China.

OBJECTIVES

The goal of this conference is to raise awareness of Islamic countries of the global international frameworks and protocols governing access to genetic material and to enable active participation in further discussion of its articles. This is important in further formulating or modifying articles in the CBD convention which may have a bearing on the Intellectual Property Rights (IPR) regarding indigenous germplasm and knowledge from developing countries.

The purpose of sharing information is in preparation for the fifteenth meeting of the Parties to the Convention on Biological Diversity (COP-15) which will be held in May 2021, in Kunming, China.

CONFERENCE PROGRAM

Thursday 1 April 2021

10:30-10:35	Welcome note by Prof. Abdullah Al-Musa , President, National Center for Research and Development (NCRD). Director General, Islamic World Academy of Sciences (IAS), Jordan.
10:35-10:45	Welcome note by Prof. Muhammad Iqbal Choudhary , <i>Coordinator General COMSTECH. Director ICCBS/ Distinguished National Professor</i> . International Center for Chemical and Biological Sciences, University of Karachi, Pakistan.
10:45-11:30	Address of HRH Prince El-Hassan bin Talal , Founding Patron of the Islamic World Academy of Sciences (IAS), Jordan.
11:30-11:40	<i>Break</i>
11:40-12:10	What are Farmers' Rights under the International Treaty on Plant Genetic Resources for Food and Agriculture <i>Mary Jane Ramos de la Cruz</i> , Technical Officer, International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), Food and Agriculture Organization of the United Nations (FAO), Italy.
12:10-12:40	Biodiversity under Changing Climate <i>Syed Mahmood Nasir</i> , Former Inspector General of Forests and Focal Point CBD/Nagoya Protocol/ Cartagena Protocol, Pakistan.
12:40-13:10	Sustainable Food Systems, Agricultural Heritage and Biodiversity Nexus <i>Parviz Koohafkan</i> , President World Agricultural Heritage Foundation, Italy.
13:10-13:40	Threats and Challenges of Biodiversity Conservation in West Asia Region <i>Hany Al-Shaer</i> , Regional Director, IUCN (International Union for Conservation of Nature) Regional Office for West Asia (ROWA), Egypt.
13:40-14:10	Biodiversity Loss, Emerging Infectious Diseases Frontier Technologies and Impact <i>Zabta Shinwari</i> FIAS, Professor Emeritus, Quaid-i-Azam University, Islamabad, Pakistan.
14:10-14:40	Biodiversity and Intellectual Property Rights <i>Bushra Mirza</i> , Vice Chancellor, Lahore College for Women University, Lahore, Pakistan.
14:40-15:10	Impact of Climate Change and Human Activities on the Biodiversity of Some Atlantic Coastal Ecosystems in Morocco <i>Omar Assobhei</i> , Resident Member at the Hassan II Academy of Science and Technology, Morocco.

Schedule is in Amman, Jordan Time Zone (GMT+3).

SPEAKERS & ABSTRACTS



WHAT ARE FARMERS' RIGHTS UNDER THE INTERNATIONAL TREATY ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

Mary Jane Ramos de la Cruz
Technical Officer

International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA)
Food and Agriculture Organization of the United Nations (FAO)
Rome-Italy



Dr. Mary Jane Ramos de la Cruz is a Technical Officer on conservation and sustainable use of PGRFA and Farmers' Rights. She obtained her PhD in Agricultural Sciences at Tokyo University of Agriculture and Technology in Japan. She has over 25 years of experience on natural resources management, implementation of development programs and projects on dynamic conservation and management of biodiversity for food and agriculture, sustainable agriculture and rural development.

ABSTRACT

The International Treaty on Plant Genetic Resources for Food and Agriculture (International Treaty)¹ was negotiated by FAO and adopted in 2001 to create a global system that provides farmers, plant breeders and scientists with access to plant genetic materials. The International Treaty aims at:

- recognizing the enormous contribution of farmers to the diversity of crops that feed the world;
- establishing a global system to provide farmers, plant breeders and scientists with access to plant genetic materials;
- ensuring that recipients share benefits they derive from the use of these genetic materials with the countries where they have been originated.

The Treaty recognizes the enormous contribution farmers have made to the ongoing development of the world's wealth of plant genetic resources. It calls for protecting the traditional knowledge of these farmers, increasing their participation in national decision-making processes and ensuring that they share in the benefits from the use of these resources

The International Treaty is the only legally binding international agreement that recognizes the enormous contribution that farmers of all regions of the world have made, and will continue to make, for the conservation and development of plant genetic resources as the basis of food and agricultural production. Article 9 of the International Treaty lists some measures that recognize and promote Farmers' Rights - the rights of farmers to crop genetic resources for food and agriculture. These rights are critical to ensuring the conservation and sustainable use of plant genetic resources for food and agriculture (PGRFA) and, consequently, for food security – today and in the future.

¹ The International Treaty on Plant Genetic Resources for Food and Agriculture was adopted by the Thirty-First Session of the Conference of the Food and Agriculture Organization of the United Nations on 3 November 2001. More information is available at: <http://www.fao.org/plant-treaty/en/>

As farmers are custodians and developers of plant genetic resources, recognizing and rewarding them for their indispensable contribution to the global gene pool and associated knowledge is crucial, in order that they can maintain this role for local and global food security. Thus, Farmers' Rights constitute a cornerstone of the International Treaty. Their realization is a precondition for achieving its three objectives of conservation, sustainable use, and fair and equitable benefit sharing.

This paper aims to highlight the important role of farmers and indigenous local communities in conserving and sustainably using crop genetic diversity, for food security and nutrition and in adapting to climate change, as recognized in the International Treaty. The different ways and means, national measures, best practices, experiences and lessons learned in promoting the realization of Farmers' Rights, shall be discussed.



Food and Agriculture
Organization of the
United Nations



The International Treaty
ON PLANT GENETIC RESOURCES
FOR FOOD AND AGRICULTURE



What are Farmers' Rights under the International Treaty on Plant Genetic Resources for Food and Agriculture

Conference on Biodiversity organized by

Islamic World Academy of Sciences (IAS) and Organization of Islamic
Cooperation (OIC) Ministerial Standing Committee on Scientific and
Technological Cooperation (COMSTECH)

Mary Jane Ramos Dela Cruz, Technical Officer, ITPGRFA

Plant Genetic Resources for food and Agriculture (PGRFA)

- PGRFA are the important foundation of agriculture, agricultural research and plant breeding depend on access to a broad range of **plant genetic diversity**.
- **Critical to food security**, the basic building blocks for providing crops with resistance to diseases, pests and environmental stresses brought by climate change, and to improving yields and nutritional quality.

"life insurance for our food production"

Kent Nnadozie, Secretary, ITPGRFA

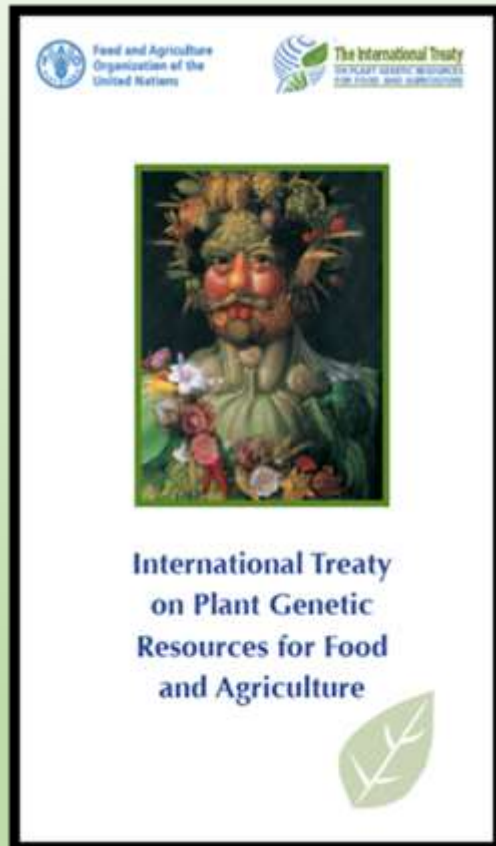


The roots of Farmers' Rights in FAO

- **1983: International Undertaking on Plant Genetic Resources**
- **In 1987, first mention of Farmers' Rights in a Working Group, formed the foundation for all further negotiations on Farmers' Rights:**
 - **Recognition of farmers' contribution**
 - **The need to reward farmers for their contribution**
 - The rights holders were not to be single farmers or communities, but entire peoples
 - Farmers' and plant breeders' rights to be developed simultaneously, seeking a balance
- **1992: The Convention on Biological Diversity Adopted**
- **Together with it a resolution urging the FAO to commence negotiations for a legally binding international instrument on the management of plant genetic resources for food and agriculture, and include the question on Farmers' Rights**



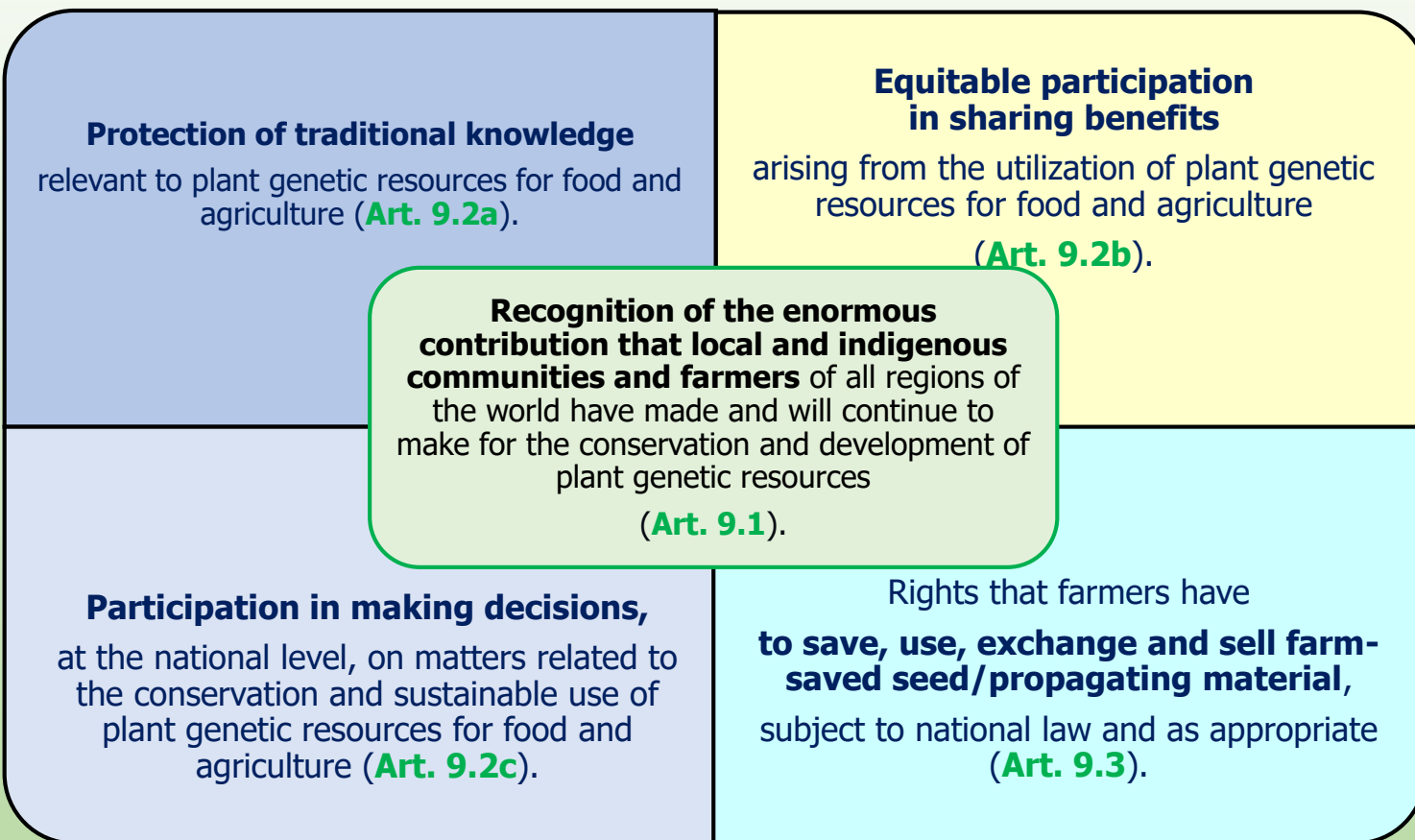
Adopted in 2001; entered into force in 2004



- **International instrument for the management and conservation of crop genetic resources**
- **Objectives:**
 - Conservation
 - Sustainable Use
 - Fair and equitable benefit-sharing

Farmers' Rights – the cornerstone of the implementation of the International Treaty

Farmers' Rights under the International Treaty



The International Treaty on Plant Genetic Resources for Food and Agriculture

- **The only legally binding international agreement...**
- **The International Treaty gives national governments responsibility for implementing Farmers' Rights through provisions.**



Farmers' Rights

- **Recognition of the enormous contribution that local and indigenous communities and farmers** of all regions of the world have made and will continue to make for the conservation and development of plant genetic resources (Art. 9.1)



Farmers' Rights

- **Protection of Traditional Knowledge**
(Art. 9.2a)

Traditional knowledge as it relates to PGRFA , of local communities of farmers whose knowledge, innovations and practices play an important role in nurturing and making available plant genetic resources which are the basis of modern plant breeding.



Farmers' Rights

- **Equitable participation in sharing benefits** arising from the utilization of plant genetic resources for food and agriculture (Art.9.2b)



Farmers' Rights

- **Participation in making decisions** at the national level, on matters related to the conservation and sustainable use of plant genetic resources for food and agriculture (Art. 9.2c).



Farmers' Rights

- Respect of existing rights under national law to save, use, exchange and sell farm-saved seed (Art. 9.3).



Supportive provisions

Preamble: addressing the importance of FR and the importance of promoting it at national and international levels

Article 5: Conservation

- Providing for Contracting Parties to promote/support farmers and local communities' efforts to manage and conserve on-farm their crop genetics

Article 6: Sustainable use

- Providing for Contracting Parties to enhance sustainable use, promote participatory plant breeding, the use of local varieties, on-farm diversity; and to review and adjust regulations on variety release and seed distribution



Realizing Farmers' Rights means...

- **Promote on-farm and in-situ conservation**
- A **significant amount of local crop diversity** is only maintained in farmer's fields
- **On-farm management** facilitates the continuous **local adaptation of farmers' varieties and landraces** over time
- PGRFA managed sustainably on-farm serve as a **live repository/reservoirs and natural backup for *ex situ* collections** worldwide
- **Promoting and sustaining the role of farmers** as custodians of biodiversity
- **Promoting food sovereignty, cultural identity and diversity**
- And many more...



What are the opportunities?

- **The increasing attention to recognition on the role of indigenous local communities and farmers**
- **Formal and local seed systems are complementary: there is a need to ensure legal space for each to contribute to the conservation and sustainable use of PGRFA**
- **Many programmes and initiatives support awareness raising and capacity development in areas of biodiversity for food and agriculture**
- **Increasing level of participation of farmers**
- **During this pandemic – farmers are frontliners of food security, they are doing everything to produce food, to prevent the coronavirus crisis becoming a hunger crisis.**



Farmers' Rights in practice, some examples...

- Awards and recognition of custodian/guardian farmers;
- Approaches to encourage income-generating activities to support farmers' conservation and sustainable use of PGRFA;
- Catalogues, registries and other forms of documentation of PGRFA and protection of traditional knowledge;
- In-situ/on-farm conservation and management of PGRFA, such as social and cultural measures, community biodiversity management and conservation sites;
- Facilitation of farmers' access to a diversity of PGRFA e.g. community seed banks, seed networks and other measures improving farmers' choices of a wider diversity of PGRFA;
- Participatory approaches to research on PGRFA, participatory plant breeding and variety selection;
- Provision of training, capacity development and support to farmers
- Etc.



The Ad Hoc Technical Expert Group on Farmers' Rights (AHTEG-FR)*



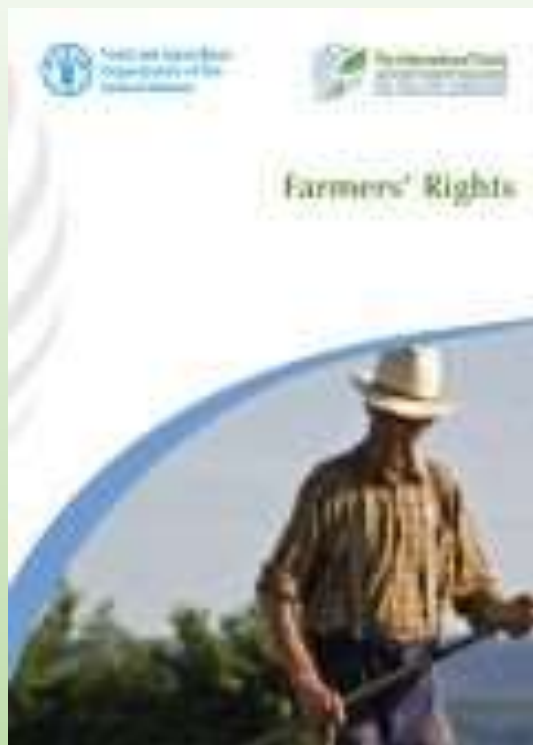
- i. Produce an **inventory** of national measures that may be adopted, best practices and lessons learned from the realization of Farmers' Rights, as set out in Article 9 of the International Treaty; and
- ii. Based on the inventory, develop **OPTIONS** for encouraging, guiding and promoting the realization of Farmers' Rights as set out in Article 9 of the International Treaty

*established by the GB in 2017

Brief Summary

- The International Treaty does not offer a definition of Farmers' Rights but simply describes the measures that need to be undertaken.
- The realization of Farmers' Rights falls under the responsibility of national governments, and the adoption of measures for the promotion of Farmers' Rights remains at the discretion of national authorities.
- Although there is no binding agreement for the implementation of Farmers' Rights, it is clear that farmers need to be supported, so that they may continue their role as stewards of plant genetic diversity in agriculture.
- A list on national measures, best practices and lessons learned from the realization on Farmers' Rights, are available at the ITPGRFA website, submitted by the Contracting Parties and stakeholders
- The work of the Expert Group on developing OPTIONS to guide, promote and encourage the implementation is on going...

Self-pace training materials



Educational module on Farmers' Rights, available at: <http://www.fao.org/3/I7820EN/i7820en.pdf>

An **interactive course** version of this module is also available at the InforMEA Portal (<https://e-learning.informea.org/course/index.php?categoryid=8>).

Other Modules:

<http://www.fao.org/plant-treaty/tools/training/educational-modules/en/>



An invitation to submit examples of measures and best practices and lessons learned from the realization of Farmers' Rights

For further information:

ITPGRFA website: <http://www.fao.org/plant-treaty/en/>

Or write to us:

PGRFA-Treaty@fao.org

MaryJane.Ramosdelacruz@fao.org

BIODIVERSITY UNDER CHANGING CLIMATE

Syed Mahmood Nasir
Former Inspector General of Forests and Focal Point CBD
Nagoya Protocol/ Cartagena Protocol
Pakistan



Dr. Nasir is an experienced former Inspector General with a demonstrated history of working as a true multi-disciplinarian in forests, biodiversity, climate change, species conservation and international trade on wild fauna and flora, CEO of nonprofit companies and as an anthropologist his work with nomadism in particular pastoral people for whom the West is making efforts to bring them back while their critical role in ecosystems is largely ignored in the OIC countries. He has the unique gift of unifying all these diverse fields and yet keeps focus on objectives whether working with communities, parliamentarians or scientists. A professional with as diverse education as his job history.

He holds a bachelor degree in natural sciences and psychology, a master in forestry, a PGD in GIS from ITC Enschede Netherlands. And a PhD in anthropology (2021) from the Quaid i Azam University Islamabad; with an interesting dissertation on what makes the forest dwelling nomads settle, a true blend of physical, natural and social sciences. REDD+, bringing attention to wildlife trafficking of ignored species like pangolins and turtles are some of his 'firsts'. He has been CEO of two companies, is a fellow of LEAD Pakistan and has served as Board member of WWF P and Islamabad Wildlife Management Board. He has been able to link local knowledge of the forest dwelling communities with markets that buy natural products collected from the forests and has opened new avenues for all stakeholders. He strongly believes in linking practitioners with academia, and quality in education for both teachers and students He believes that a breed of real business persons should be involved in nature conservation to get better results. Currently he is CEO of The Nature Clicks Institute Islamabad and Executive Director of an upcoming first of its kind university for the handicapped "Al Mudassar Special Education Trust University" at Kharian district Gujrat Pakistan.

ABSTRACT

OIC member states occupy all Life Zones of the earth as classified under the globally accepted Holdridge Life Zone Classification System. This system is sensitive to capture the changes in climatic patterns before their impact is felt in the local biological diversity. Knowing the expected changes and predict the future trends provides an opportunity to the governments to plan effectively so as to meet the objectives of the CBD. This presentation by Syed Mahmood Nasir a multi-disciplinarian with diverse experiences as a practitioner, researcher, policy maker and inter-governmental negotiator encompasses the population trends, NDCs and projected climate change in OIC member states and analyzes the state of studies on the globally accepted HLZ classification. This presentation provides a valuable roadmap to the top decision makers and planners to ensure that adequate steps are taken to conserve their respective diversity of life before it is too late in a fast changing world.

SUSTAINABLE FOOD SYSTEMS, AGRICULTURAL HERITAGE AND BIODIVERSITY NEXUS

Parviz Koohafkan
President, World Agricultural Heritage Foundation
Italy



Dr. Parviz Koohafkan, is the Founder and President of **World Agricultural Heritage Foundation** who conceptualized and spearheaded the concept of Globally Important Agricultural Heritage Systems (GIAHS) during his services as the Director in the **Food and Agricultural Organization, FAO** and the Task Manager of the Agenda 21 on Sustainable Agriculture and Rural Development. He established, coordinated and implemented the UN Partnership Initiative on “Conservation and Adaptive Management of Globally Important Agricultural Heritage Systems (GIAHS)” in many countries around the world.

He started his work in FAO in 1985 in Haiti and Ecuador and then held several senior positions in FAO headquarter in Rome from 1991 to 2012 including the positions of Director of Land and Water Division, Director of the Climate Change and Bio-energy Division, and the Director of Rural Development Division in Sustainable Development Department of FAO.

He was born in 11 March 1951 in Iran, obtained an engineering degree in Natural Resources Management from University of Teheran, Iran and obtained his Master degree and Ph.D. in Applied Ecology from the University of Sciences and Techniques of Montpellier, France.

Dr. Koohafkan is Professor in Nanjing Agricultural University of China, Senior Research Fellow at Research Institute for Humanity and Nature, Kyoto, Japan, Professor in Beheshti University of Tehran, Iran. His fields of specializations are: Sustainable Agriculture and Rural Development, Integrated Natural Resources Management; Biodiversity and Genetic Resources Conservation; Sustainable Livelihood and Climate Change Management; Land Use Planning and Environmental Impact Assessment. He is fluent in English, Spanish, French and Italian and is the author of several books and publications on sustainable agriculture and rural development, biodiversity, agroecology, natural resources management and climate change. Google Reference: Parviz Koohafkan.

ABSTRACT

Increasing and evolving patterns of human development and food consumption, together with high rates of urbanization, unsustainable use of natural resources, spread of invasive species, erosion of agrobiodiversity and of local varieties, environmental degradation and climate change added by new pandemic of COVID-19 disease, are all threats to the world's food and health security biodiversity and nutrition security, and thus, sustainable food systems and healthy diets. Despite the increased public policies and scientific interest in conserving food diversities and plant genetic resources, many countries tend to overlook the nutritious and quality food production in their quest for increased agricultural production to feed the growing population.

The United Nations has adopted the Sustainable Development Goals (SDGs, 2015) where all Nations have committed for a world free of poverty and hunger by 2030, and in which all life can thrive. This will require countries to develop sustainable food systems and new ways of managing natural resources, including biodiversity and genetic resources for food and agriculture, in order to build a viable future for humankind.

The new models of food systems that humanity will need to include in SDGs are the food systems that have its roots in people's culture and the forms of farming that are more ecological, biodiverse, local, sustainable, and socially just. This means that they should be rooted in the ecological rationale of traditional agricultural heritage systems, representing long established examples of successful community-based local agriculture. There should be closer connections between producers and consumers, therefore local production and consumption and increased link between rural and urban areas.

Small-scale, family farming and the more traditional forms of agriculture continue to supply most basic food commodities at local, national and global levels (FAO, 2014) and offer an array of environmental, economic, social and cultural services, and remain a source of employment, nutritious food, cultural values and quality of life (Koochafkan, P. & De la Cruz, M. J. 2011; Koochafkan, P. & Altieri, M. 2017).

Numerous agricultural heritage systems around the world have proven their robustness and resiliency and have passed the test of time. They offer solutions for present and future generations and environmental sustainability. They contain a wealth of biological resources, knowledge systems and management practices that can help to ensure food security and quality of life for humanity and to cope with challenges of today and tomorrow. Building on generations of accumulated knowledge and experience, these ingenious Agri-“Cultural” systems reflect the evolution of humanity and its profound harmony with nature. They have resulted not only in outstanding aesthetic beauty, maintenance of globally significant agricultural biodiversity, resilient ecosystems and valuable cultural inheritance but, above all, in the sustained provision of multiple goods and services, food and livelihood security and quality of life for the most poor and remote communities. These systems have been managed with time-tested resilience, ingenious combinations of techniques and practices that have typically led to sustained resources, incomes and food sovereignty, and the conservation of Biodiversity natural resources.

Indeed, the myriad of our agricultural heritage systems and particularly, the Globally Important Agricultural Heritage Systems (GIAHS) that was recognized by FAO as the heritage of the mankind (FAO, 2014) represent unique sub-sets of traditional agricultural systems, family farming and indigenous farming practices that exemplify customary use of globally significant agricultural biodiversity and genetic resources for food and agriculture (Article 8J of the Convention on Biological diversity).



Sustainable Food Systems, Agricultural Heritage and Biodiversity Nexus

PARVIZ KOOHAFKAN

**Former Director in FAO,
President**

World Agricultural Heritage Foundation



FEW WORDS ABOUT WAHF

An International NGO, to Support countries in the promotion of their Globally and Nationally Important Agricultural Heritage Systems (GIAHS and NIAHS) through:

- **Technical Assistance and capacity building**
- **Education & Training of young generation**
- **Empowerment and capacity development of GIAHS and NIAHS communities**
- **Advocacy and Fund Raising for Ag. Heritage Systems**

Our Current Food Systems

- Over 7 billion people more than half of them in the cities
- Near 1 billion have too little to eat
- 1.6 billion eat too much
- Wasting > 30% of food



In the past 50 years...

Increments in the past 50 years

World's
cultivated land

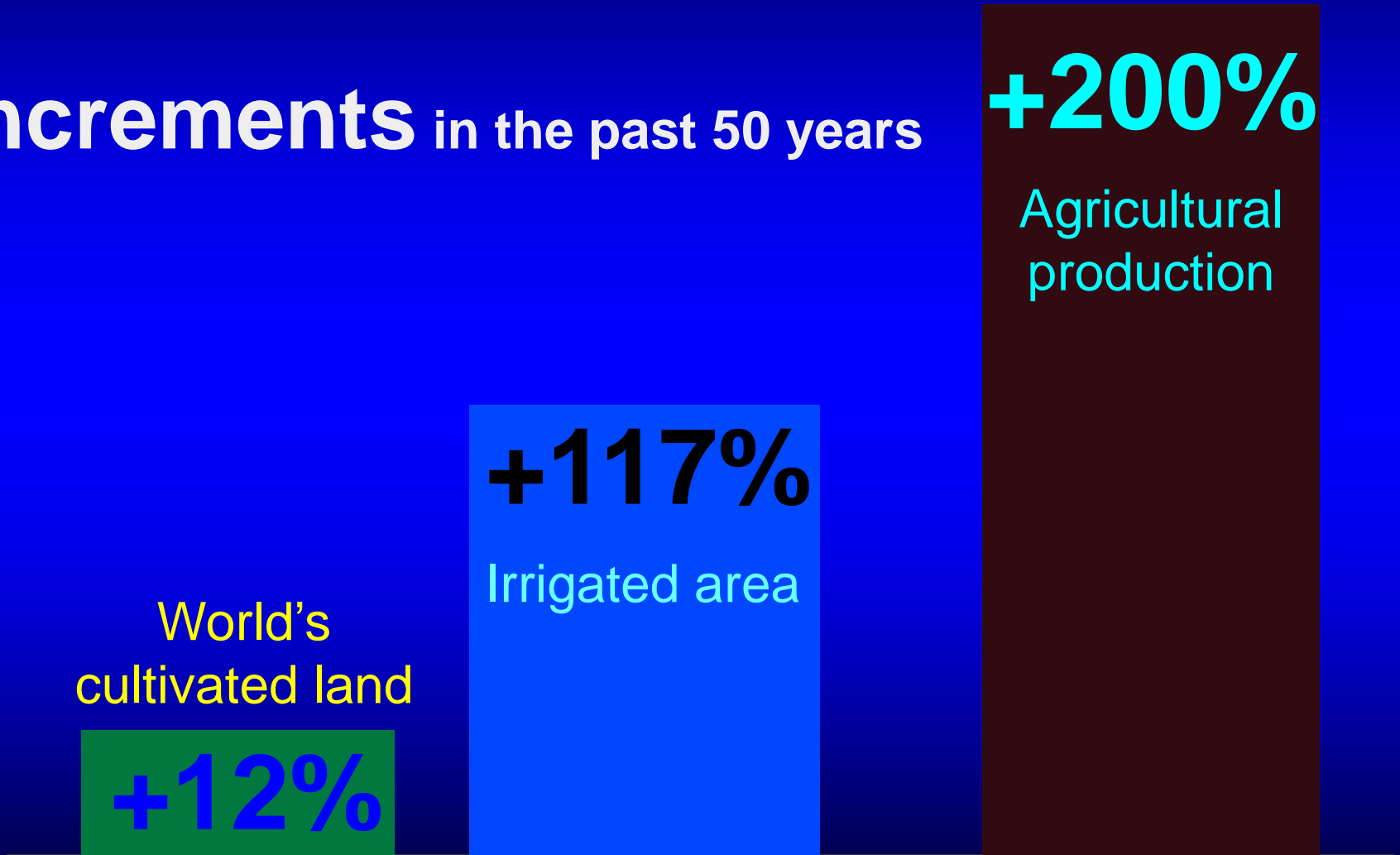
+12%

+117%

Irrigated area

+200%

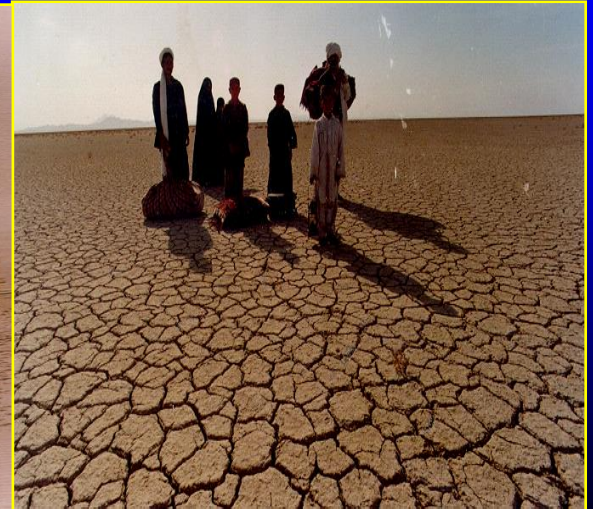
Agricultural
production



Deforestation,, Land Degradation, Climate Change Salinization, Desertification, Poverty and Migration

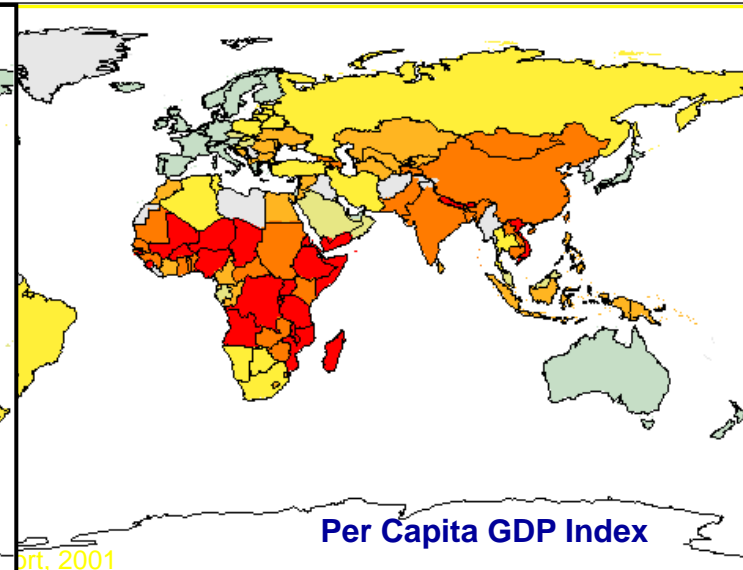
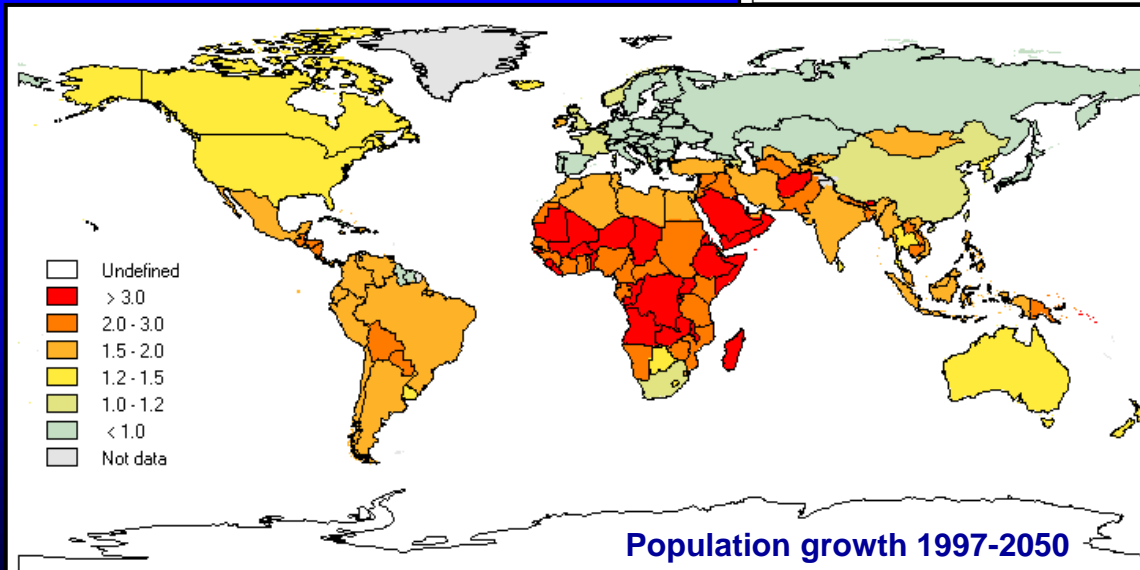
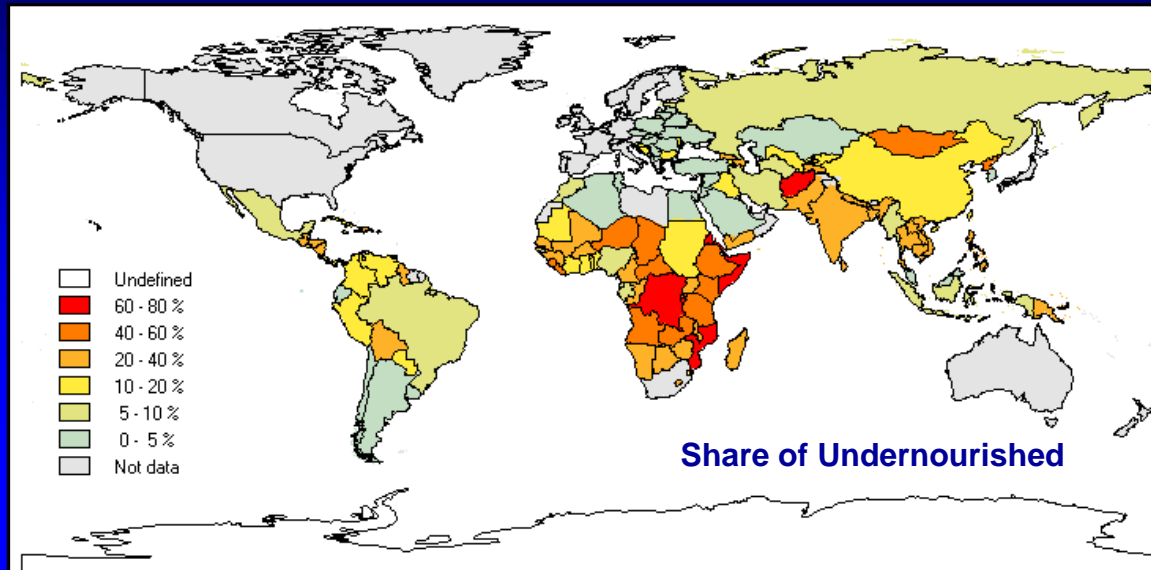


1. Salt-affected soils



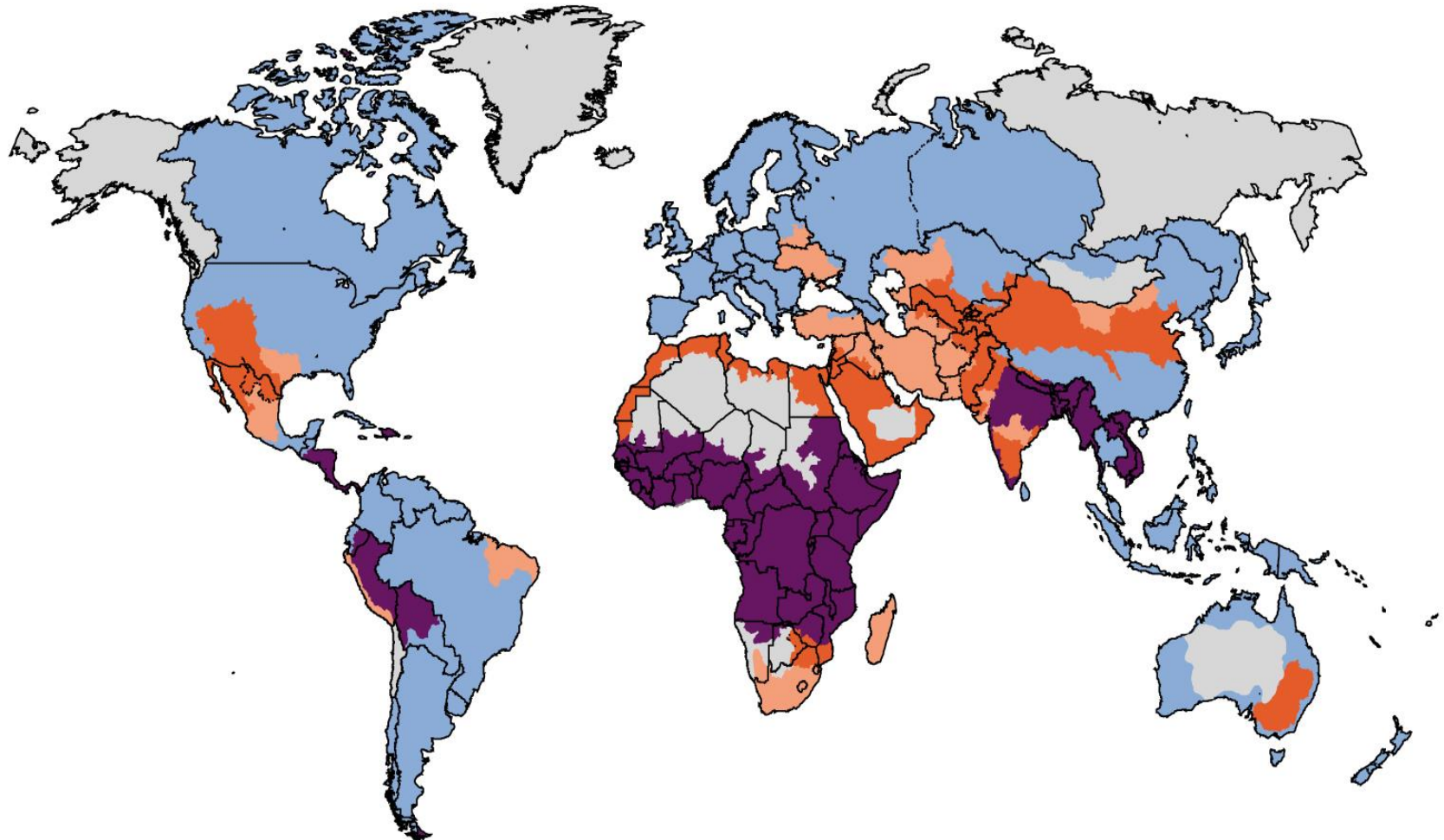
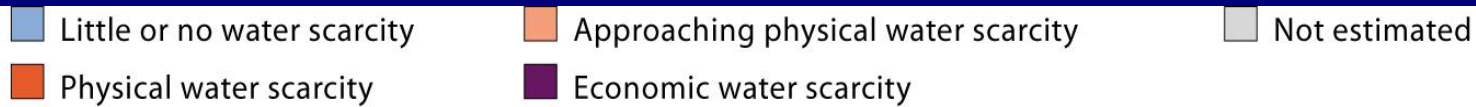
Food Security in an Era of Climate Change

Those with least resources have least capacity to adapt and are most vulnerable



ort, 2001

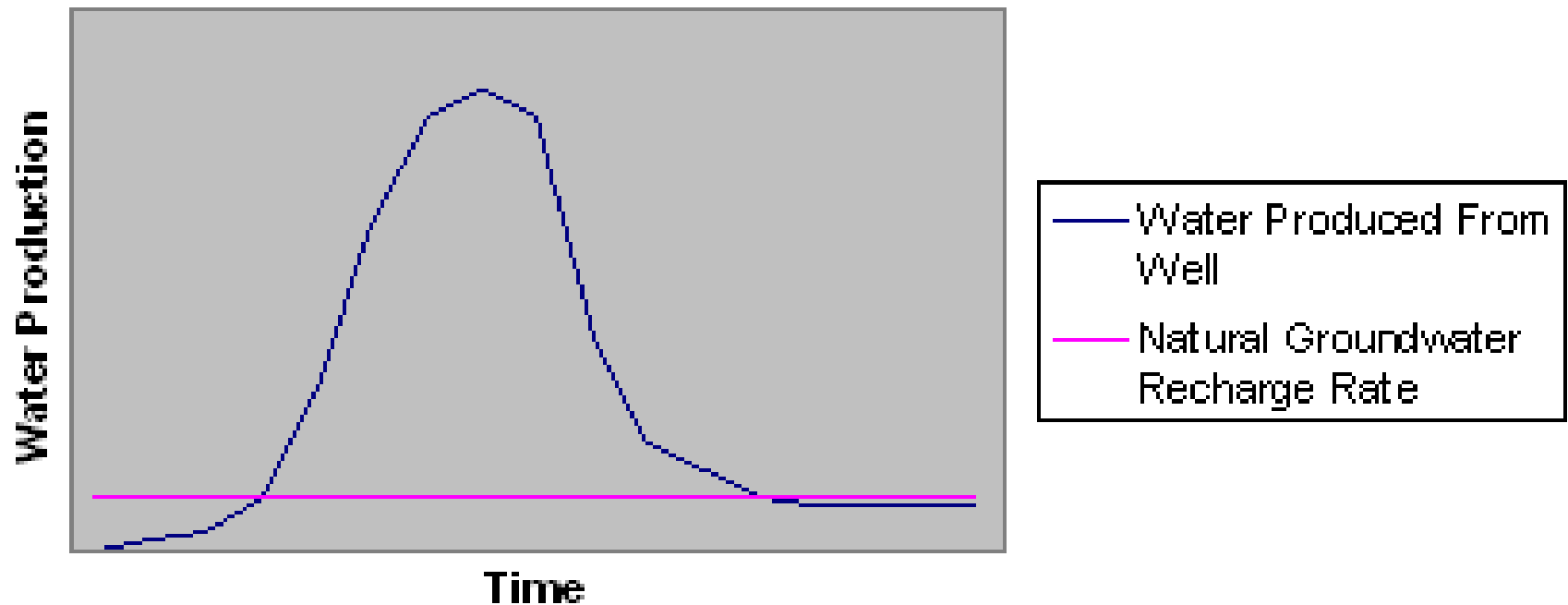
Water Scarcity



1/3 of the world's population live under water scarcity

Aquifer Systems that produce 40% of our food

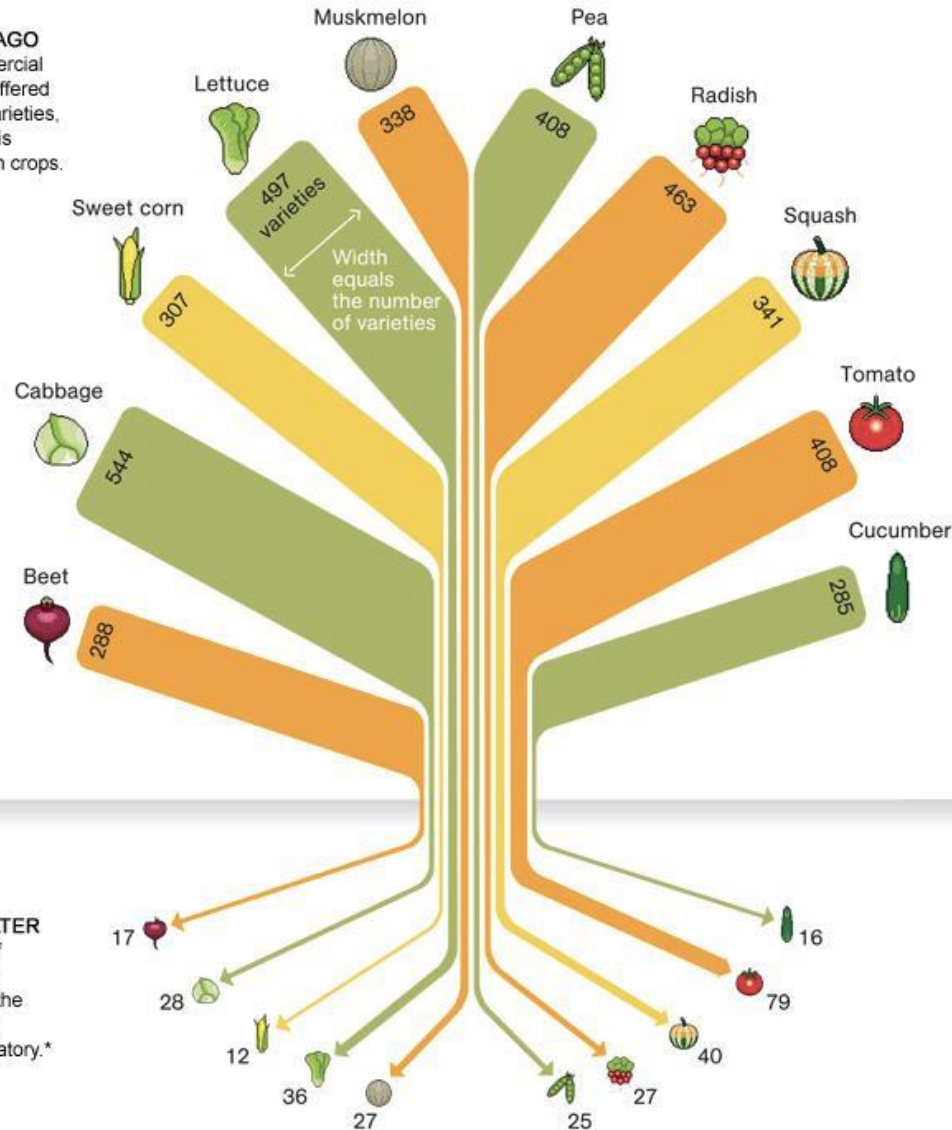
Peak Water Curve for Aquifer



Loss of Agrobiodiversity

A CENTURY AGO

In 1903 commercial seed houses offered hundreds of varieties, as shown in this sampling of ten crops.



80 YEARS LATER

By 1983 few of those varieties were found in the National Seed Storage Laboratory.*

* CHANGED ITS NAME IN 2001 TO THE NATIONAL CENTER FOR GENETIC RESOURCES PRESERVATION

JOHN TOMANIO, NGM STAFF. FOOD ICONS: QUICKHONEY
SOURCE: RURAL ADVANCEMENT FOUNDATION INTERNATIONAL

(Sustainability Lexicon)

(RAFI 2009)

Rice: diversity



Example of India: Loss of over 95% of local rice varieties and landraces

Potato Diversity



Example of Peru: loss of potato diversity is over 50% (Potato Park)

Loss of Functional Biodiversity (Pollinators)

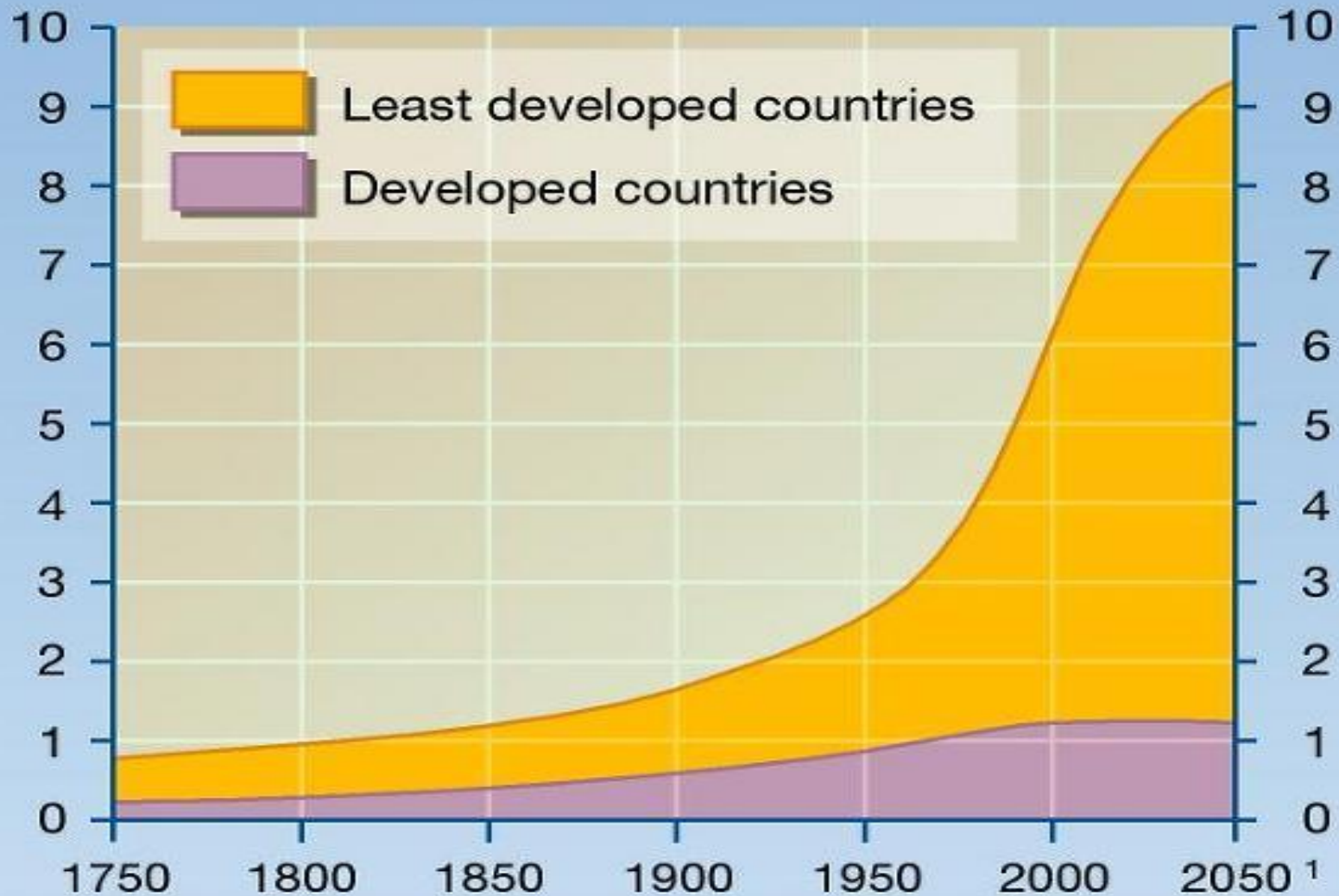


TOWARDS 2050.....

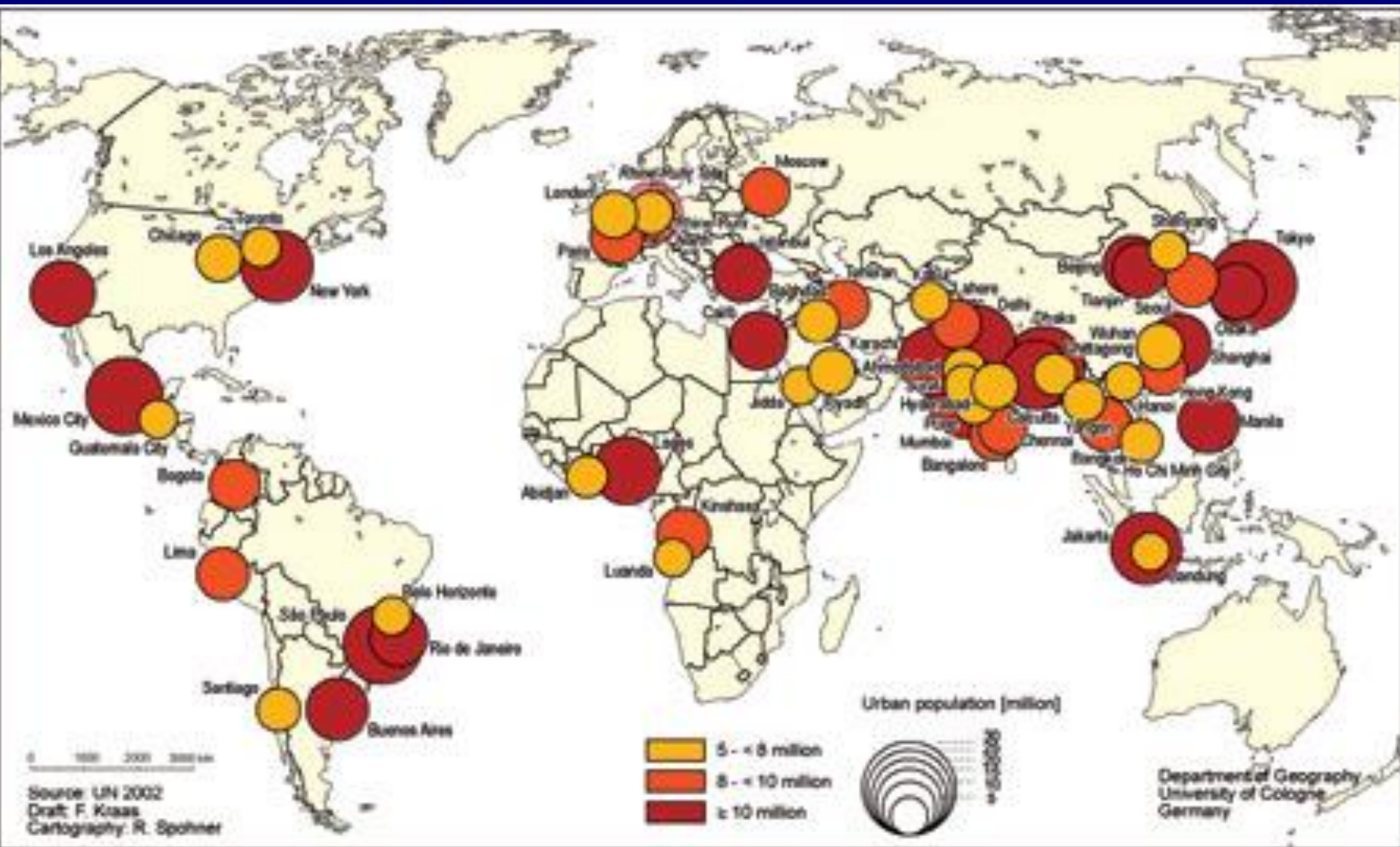
**THE CHALLENGE
AHEAD**

Projected Population Increase

Billion human beings

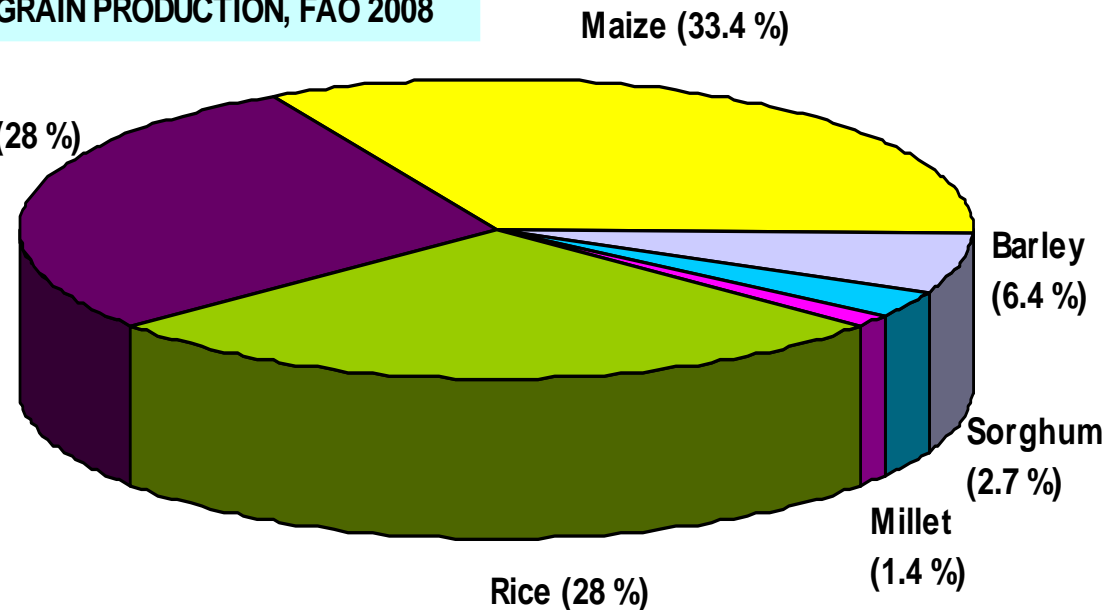


Feeding Megacities



Change in diet and reduction in Food Diversity

GLOBAL GRAIN PRODUCTION, FAO 2008



**Global Grain
Production**

**Rice + Wheat +
Maize = 90.1 %**

Impacts of Reduced Biodiversity on Health and Nutrition

- **Hidden hunger: missing micronutrients**
 - More than 2 billion people worldwide
 - Mostly women and children
- **Double burden: diseases of “affluence”**
 - Type 2 diabetes, obesity, heart disease, etc.

Public Health

non-communicable diseases

China

more meat, oil in diet
overweight 25.4%
obesity in some cities: 20.0%

Philippines

Overweight: 21%
higher in Women

USA

overweight: 70.8
obesity: 33.0

Japan

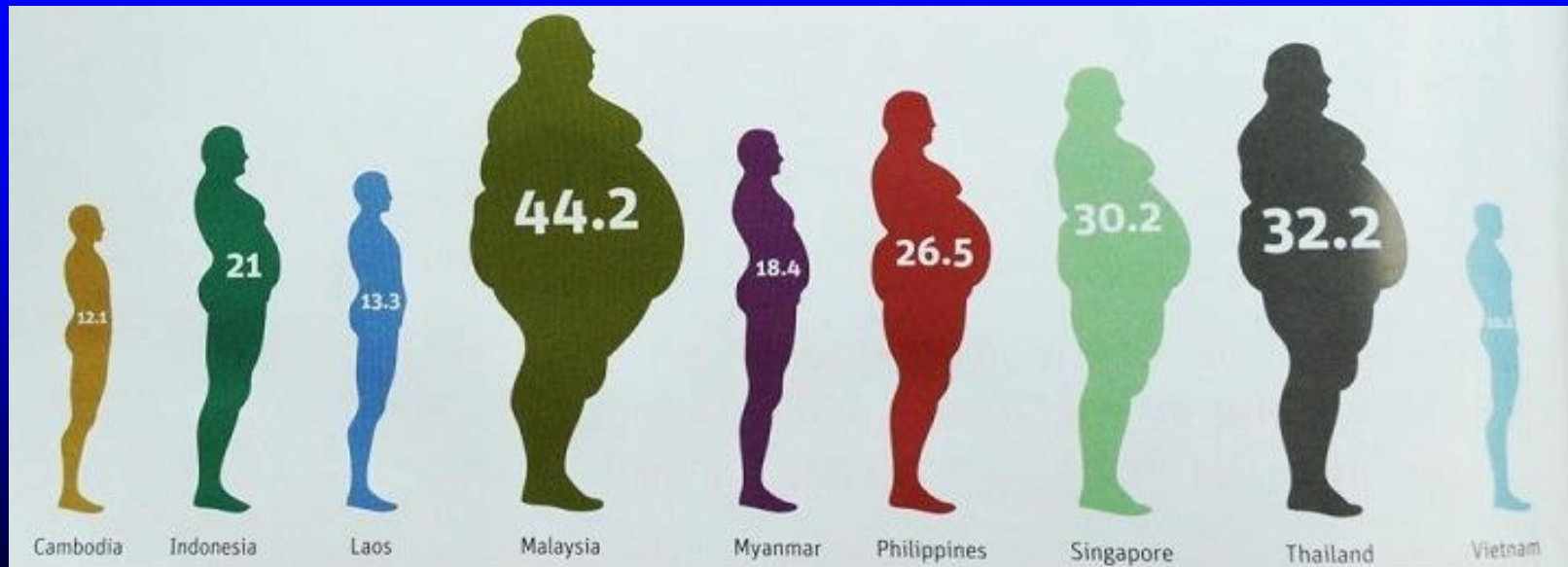
obesity: 20%*
3x increase (1962-2002)

Thailand

overweight: 32.3%
obesity: 8.8%

UK

overweight: 64.2
obesity: 26.9

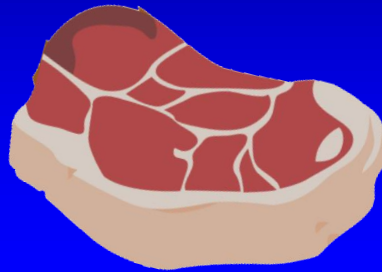


Water and changing diets

Product

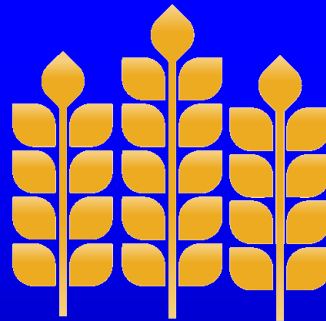
liter/kg

beef



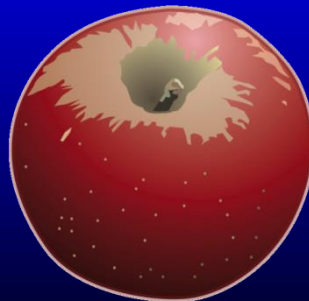
15 000

cereal



1 500

fruit



1 000

We Need: Sustainable Food System

- **Be centred on people and based on rights**
- **Adopt an integrated, territorial approach**
- **Build capacities to manage changes**
- **Redress power disparities through good governance**
- **Involve a long term policy commitment**
- **Be adequately supported and resourced**

CHALLENGES OF SUSTAINABLE AGRICULTURE AND FOOD SYSTEMS

Unsustainable consumption and production patterns are causing loss of local food security, biodiversity and cultural diversity:

- **How can we make production and consumption patterns consistent and supportive of food diversity, biological diversity and cultural diversity?**

Globalization threatens cultural diversity and traditional knowledge

- **Which measures should be taken to protect traditional knowledge of indigenous and local communities in the face of globalization?**
- **How can small holders and indigenous communities benefit from the global markets without sacrificing their traditional eco-friendly sustainable lifestyles and value systems?**

**Brings
together**

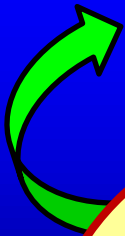
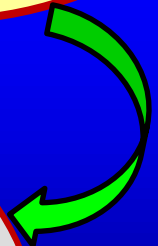
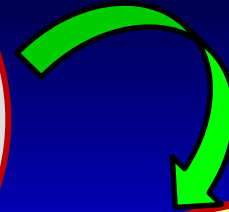
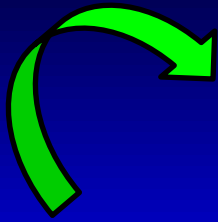
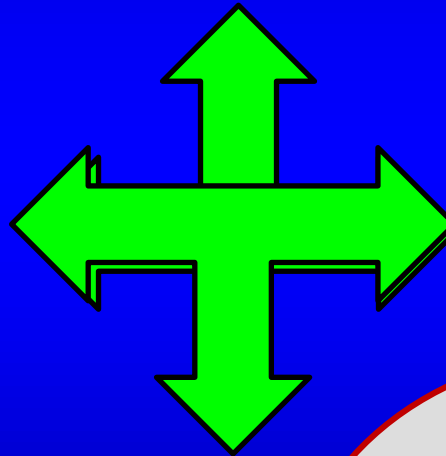
**Food
Security**

Biodiversity

**Human
Health**

**Economics &
Employment**

**Environmental
Health**



Bringing together

- **Ecosystem Diversity**
- **Socio-economic Diversity**
- **Cultural Diversity**
- **Culinary Diversity**
- **Curative Diversity**

Bringing Culture in Agri-Culture

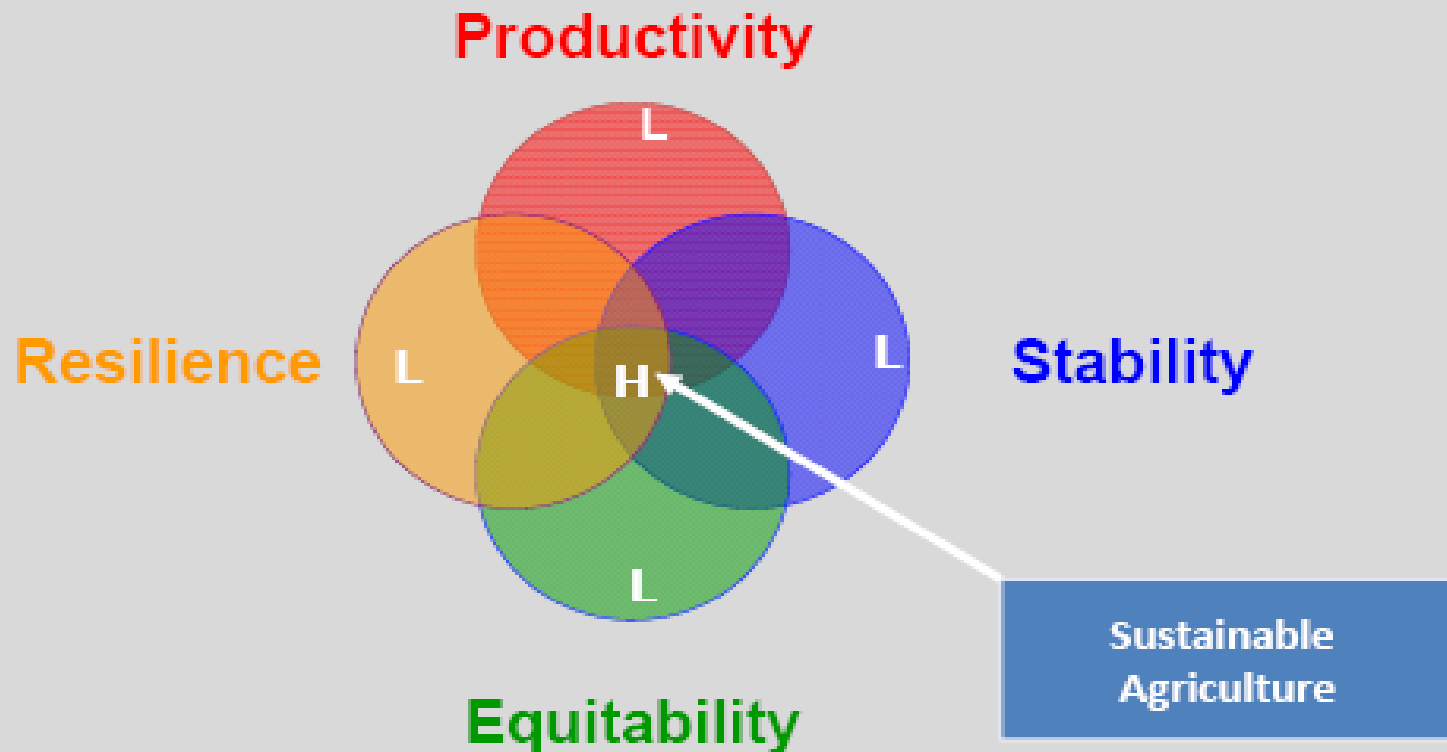
**Culture is:
Standing on
the shoulders
of ancestors**



Empowering women and Working with local communities



Minimising the trade-offs



Source: G Conway, 2009

Intensification without Simplification



Turning challenges to opportunities:

The Small holders and family farmers

- They are more than 1.4 billion
- They are the poorest of the world's poor
- They are the victims of globalisation, climate change and expansion of industrial agriculture
- They are living often in marginal lands and environments that are prone to floods, drought, storms and other environmental disasters
- They produce more than 70% of the global food
- They are the largest number of stewards of the environment and its ecosystem services including biodiversity,

Therefore: Higher and sustainable productivity increase at their level will have a major impact on poverty reduction, economic growth and climate change mitigation and adaptation, Win-Win

Dynamic Conservation of

**GLOBALLY
IMPORTANT
AGRICULTURAL
HERITAGE
SYSTEMS**

GIAHS



What are GIAHS?

Globally Important Agricultural Heritage Systems (GIAHS) are remarkable land use systems and landscapes that are rich in globally significant biological diversity evolving from the co-adaptation of a community with its environment and its needs and aspirations for sustainable development.



- Integrated Agricultural, Forestry, Livestock and Fishery systems
- Result of co-adaptation and co-evolution of plants, animals, humans and landscape under specific environmental circumstances
- Managed through highly adapted social and cultural practices and institutions
- Important at local, national and global levels
- They are under threat

NUMEROUS EXAMPLES OF GIAHS EXISTS ACROSS THE WORLD



Morocco Oasis



Chiloé Agro-sylvo-pastoral



Philippines Ifugao Rice Terraces



Iran, Saffron

➤ At Global level

by identification, selection and recognition of GIAHS

➤ At National level

by capacity building in policy, regulatory and incentive mechanisms to safeguard these outstanding systems and use them as sustainability bench mark systems

➤ At Local Level

by empowerment of local communities and technical assistance for sustainable resource management, promoting traditional knowledge and enhancing viability of these systems through economic incentives



Morocco Oases System



Philippines Rice Terraces



China Rice Fish System



Chiloé Agriculture



Waru Waru, Peru



Soave, Italy



Saffron, Iran and India



Satoyama, Japan

Local benefits of GIAHS

Preservation
of TEK,
traditions
and cultural
identity

Food
security

Income
generation

Soil quality
and fertility

Long- term
yields

Natural
resource and
Biodiversity
conservation

Sustainable Livelihood



Global Benefits of GIAHS

Conservation of
biodiversity
of Global
Significance

Ecosystem
diversity

Social Stability

Cultural
Diversity

Arrested
deforestation,
land
degradation/
desertification

**Environmental Protection
Ecosystem Services**



Recognition of GIAHS is the recognition of Farmers for their important contributin to sustainable agriculture

Conditions fo Success

- Integrated across sectors
- Promotes diversification
- Enhances positive externalities and reduces negative externalities
- Knowledge-based and nature-based
- Builds on renewable assets
- Participatory and bottom-up
- Food Sovereignty included
- Use Mixture of instruments: economic, advisory, regulatory



GIAHS as a model of Recognition of Farmers Right

- **GIAHS is about diversity: cultural, culinary, curative, ecosystems**
- **There are plenty of TEK (knowledge systems, wisdom, religion, belief, customs, etc.) which ensure the co-existence of human and nature;**
- **Indigenous crops, traditional varieties are better valued - ABGS**
- **Give back the identity, pride and honor to our local peoples, farmers and indigenous groups to attain the sustainable development goals - The Future We Want.**
- **GIAHS approach is seen complementing the national and local plans and programmes.**

Biodiversity is “The life insurance policy for life itself” (Koffi Annan)



Thank You

THREATS AND CHALLENGES OF BIODIVERSITY CONSERVATION IN WEST ASIA REGION

Hany El Shaer

*Regional Director, International Union for Conservation of Nature West Asia Region
IUCN ROWA*



Hany El Shaer, the Regional Director for IUCN West Asia Region. Dr. El Shaer has joined the IUCN ROWA team in 2009, and has more than 20 years of experience in protected areas management, biodiversity conservation, environmental impact assessments, environmental monitoring, geographical information system, remote sensing and nature resources valuation.

He holds a PhD in Environmental Studies from the University of Alexandria in Egypt, an MSc in Environment and sustainable development from Oxford Brookes University in England, postgraduate diploma in marine environment, postgraduate diploma in environmental management, and a BA in geographical information system from Alexandria University.

He has wide experience in projects management, sustainable development, developing biodiversity strategies, specifically marine protected areas, management plans and economic services valuation for natural resources.

ABSTRACT

The presentation will highlight some figures and analysis about biodiversity in west Asia region. Also, the presentation will discuss the threats and challenges the region is facing. The presentation will mainly focus on:

- The biodiversity and ecosystem service information for the region is limited, which has made the reporting task challenging, and in many cases, data are too poor and fragmentary to allow robust conclusions.
- The major drivers of biodiversity decline have seen a rapid increase, including urban expansion, the spread of intensive agricultural systems and cultivation of marginal land resulting from considerable population growth. Such changes necessitate reliance on resources imported from elsewhere in the world, meaning that West Asia's ecological footprint is growing sharply and now exceeds the global average.
- The volatile political situation in parts of the region means conservation work has been unable to proceed in the countries or areas experiencing significant internal and international conflicts and political instability in recent years.
- Protected areas networks in West Asia are limited in both coverage and management effectiveness.
- Wildlife crime linked to hunting is a continuing problem with ineffective enforcement of regulations and legislation.
- The region is likely to be one of the hardest hits by the direct and indirect impacts of climate change such as sea level rise, sea temperature rise, increasing water scarcity and ground water salinity, and desertification.



Conference on Biodiversity

Islamic World Academy of Sciences (IAS) and
Organization of Islamic Cooperation (OIC) Ministerial Standing Committee on Scientific
and Technological Cooperation (COMSTECH)

1 April 2021

Threats and Challenges of Biodiversity Conservation in West Asia Region

Hany El Shaer, Ph.D
IUCN ROWA Regional Director





Contents

- Introduction about IUCN
- West Asia threats and challenges.
- West Asia biodiversity situation analysis
- Recommendation





The world's largest environmental network

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- Government and civil society Member organisations
 - Currently, 1300+ Members from more than 160 countries
 - Union created in 1948
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 - Science, law and policy
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Helping achieve global targets



PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

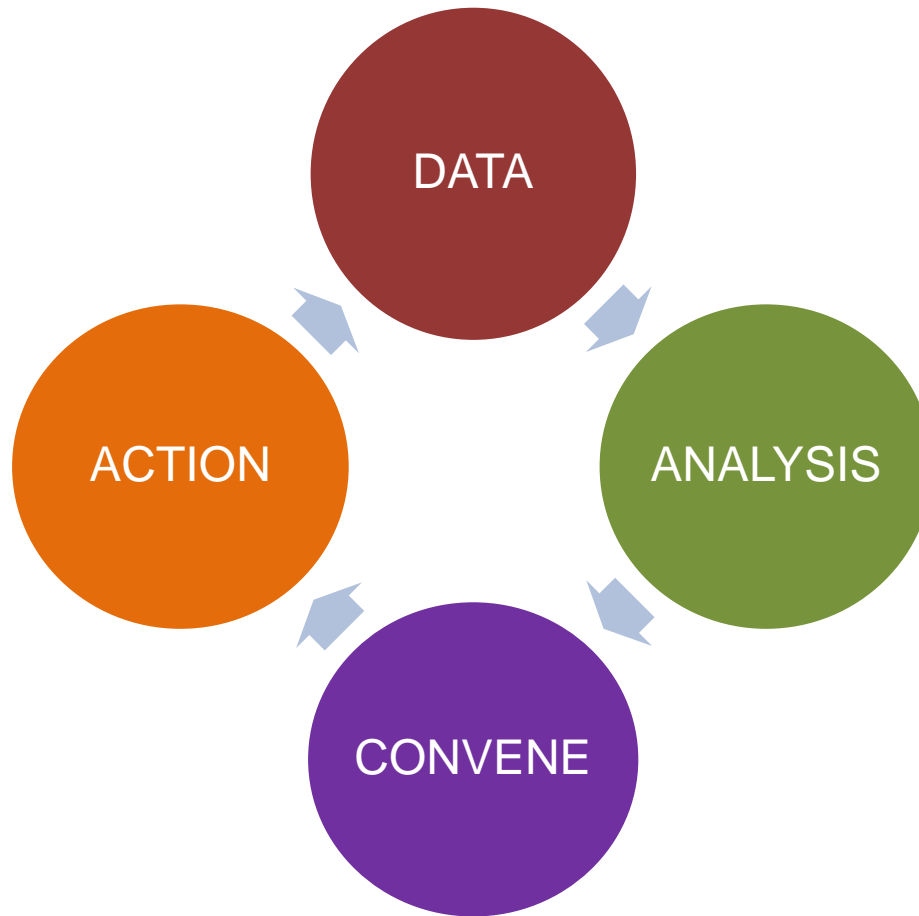


2020 Aichi
Biodiversity Targets





How we contribute

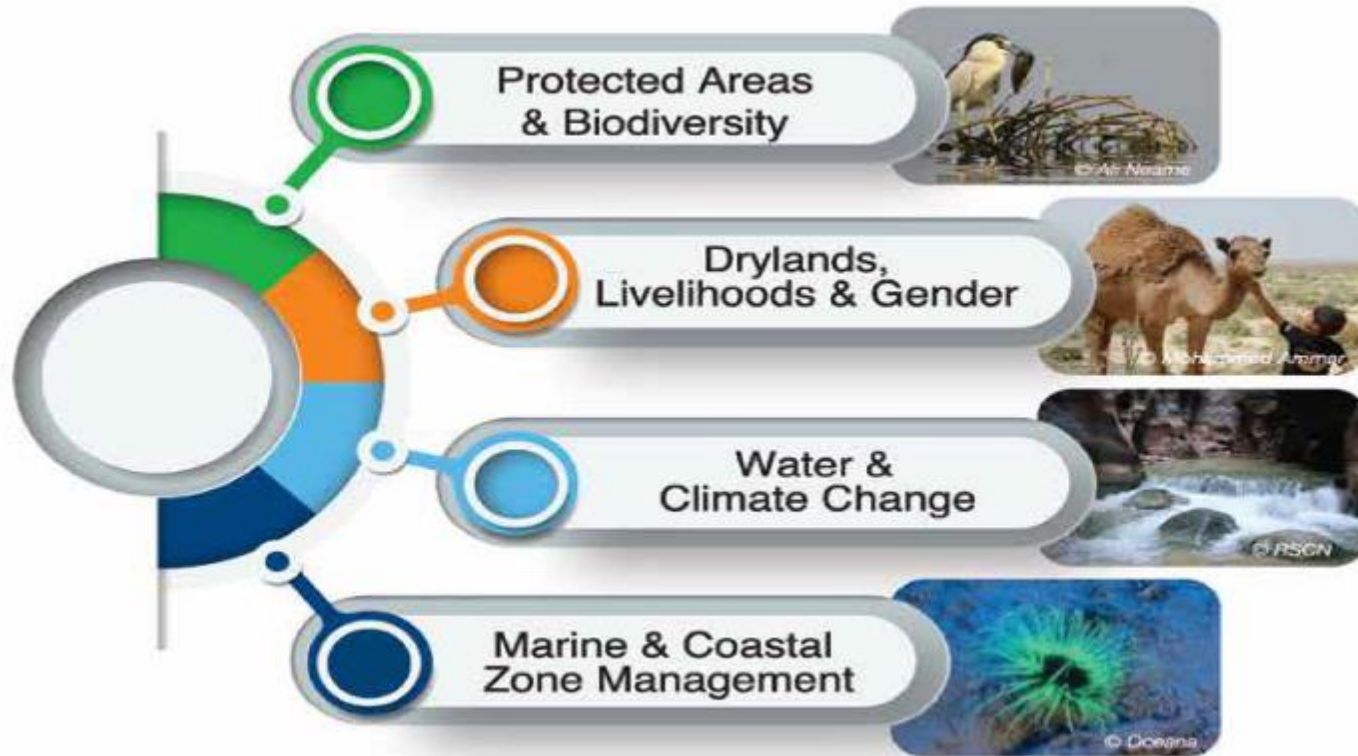


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IUCN ROWA Programmes



www.iucn.org.

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Knowledge Outputs

IUCN produces analytical work and knowledge to inform decision makers

Some examples:



<https://www.iucn.org/regions/west-asia/resources/resources>

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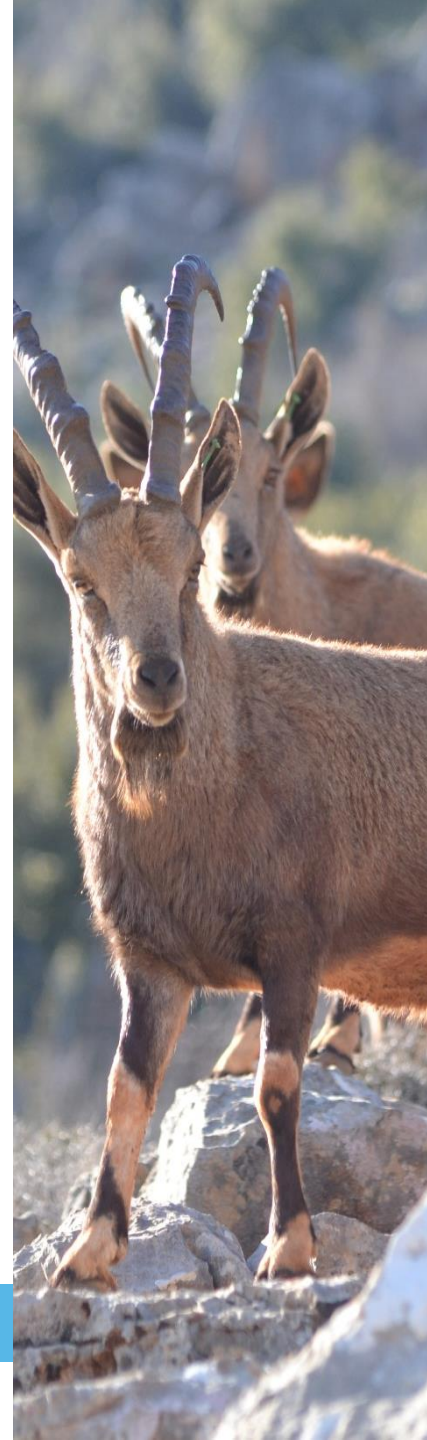


West Asia region and biodiversity

The spectacular terrain and various climatic conditions that prevail in west Asia region, along with the diverse **biogeographic origins** of the species, contribute to the **diversity of flora and fauna** at the species level, particularly to the **endemism** of these taxa.

The number of plant species varies among the sub-regions of the Arab region, reaching up to **4,000 species in some countries**.

A large number of endemic taxa also occur in the region; the total number of known endemic flora is about **3,397**



Reptiles

- Persian leaf-toed gecko (*Hemidactylus persicus*)
- Green turtle (*Chelonia mydas*)
- Common sandfish (*Scincus scincus*)
- Hawksbill turtle (*Eretmochelys imbricata*)
- Arabian horned viper (*Cerastes gasperettii*)
- Annulated sea snake (*Hydrophis cyanocinctus*)





Fish

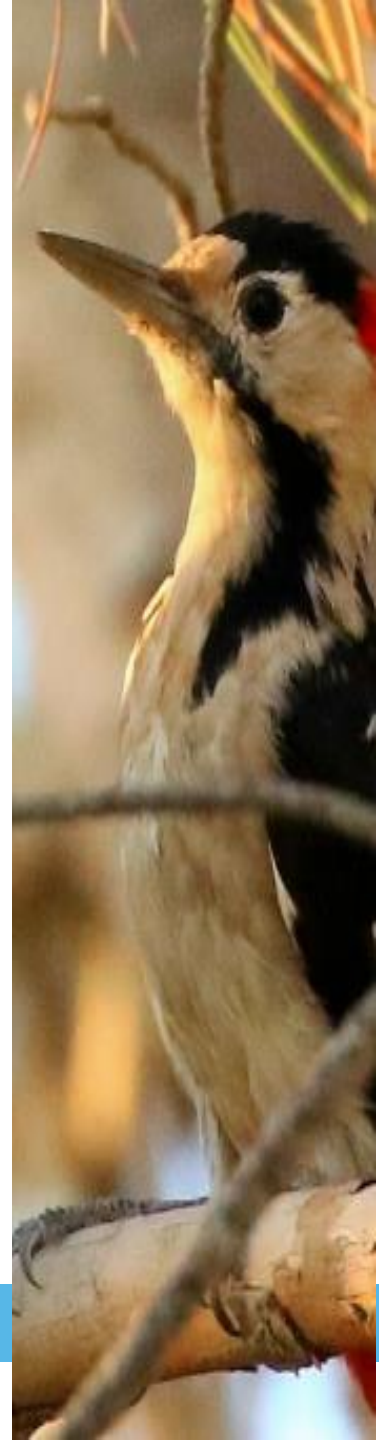
- Oceanic whitetip shark (*Carcharhinus longimanus*).
- Mediterranean bluefin tuna (*Thunnus thynnus*).
- Dusky Grouper (*Epinephelus marginatus*).
- Manta rays (*Manta birostris*) / giant devil ray (*Mobula mobular*).
- scalloped hammerhead (*Sphyrna lewini*).





Birds

- Egyptian vulture (*Neophron percnopterus*)
- Red-tailed hawk (*Buteo jamaicensis*)
- Common sandfish (*Scincus scincus*)
- Syrian Serin (*Serinus syriacus*)
- Arabian horned viper (*Cerastes gasperettii*)
- Annulated sea snake (*Hydrophis cyanocinctus*)





Threats in Region

Natural resources are under pressure from :

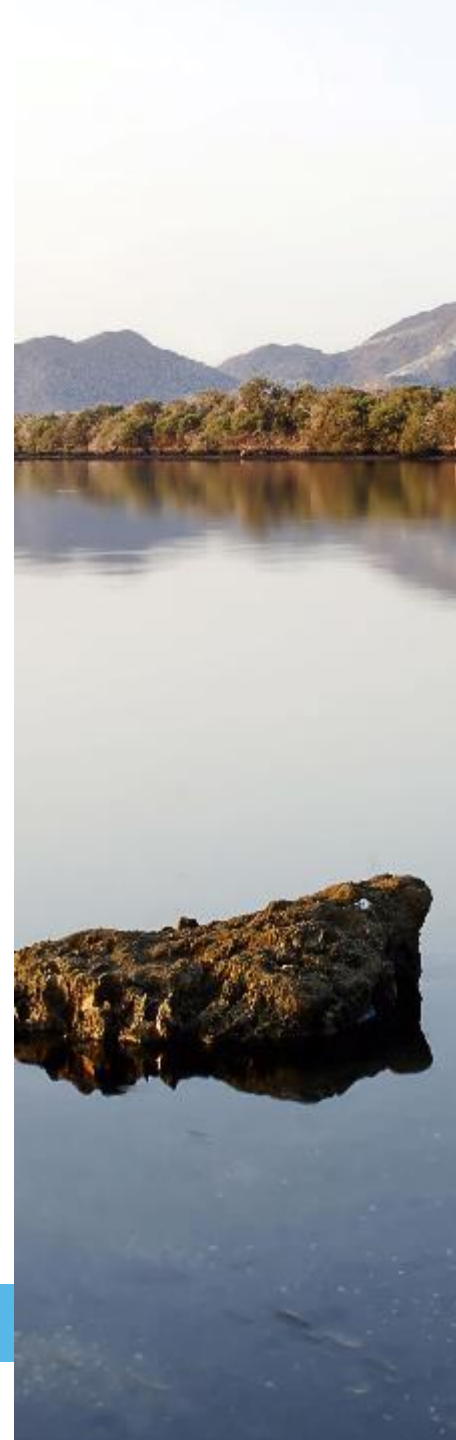
- **Population growth** and unbalanced economic growth.
- **Weak environmental institutions.**
- **Illegal, Unreported and Unregulated fishing and hunting.**
- **Wildlife crimes**
- **Invasive Alien Species.**
- **Loss of coastal lagoons** due to ever growing coastal development.
- **Wars and political instability.**
- **Ever growing fossil fuel extractions.**





Biodiversity & Ecosystem priority issues in West Asia:

- **Water scarcity.**
- **Wetlands loss .**
- **Marine ecosystem degradation.**
- **Land degradation .**
- **Desertification .**
- **Biodiversity loss.**
- **Dust Storms .**





Challenges and a dilemma

- **External challenges:** Society is increasingly acknowledging the threat posed by **climate change** and working towards solutions to address it. The same applies **to health** (although less so the links between biodiversity and health). These two challenges are interlinked with that of biodiversity loss as recently highlighted by the UN Secretary General in “**The State of the Planet**”, December 2020 and reinforced at the One Planet Summit on 11 January 2021. However, **society is not yet addressing the biodiversity crisis** at a level commensurate with the threat it represents.



Challenges and a dilemma

- **Internal challenges** : The reaction to the suboptimal influence and reach of the Convention on Biological Diversity internally can be a tendency to conclude that engaging with its negotiations is a less than effective way of reaching what is needed. However, the eventual power and reach of the Framework may be far greater than can be foreseen today.
- **The dilemma**: These challenges bring about a “chicken and egg” situation.



Situation Analysis West Asia

A. BIODIVERSITY

1,700 mammals

- **39** (or 3 percent) are endemic
- **30** species of birds are endemic to the region
- **132** species of reptiles and eight amphibians
- more than **30 percent** of the biota is endemic

Red List

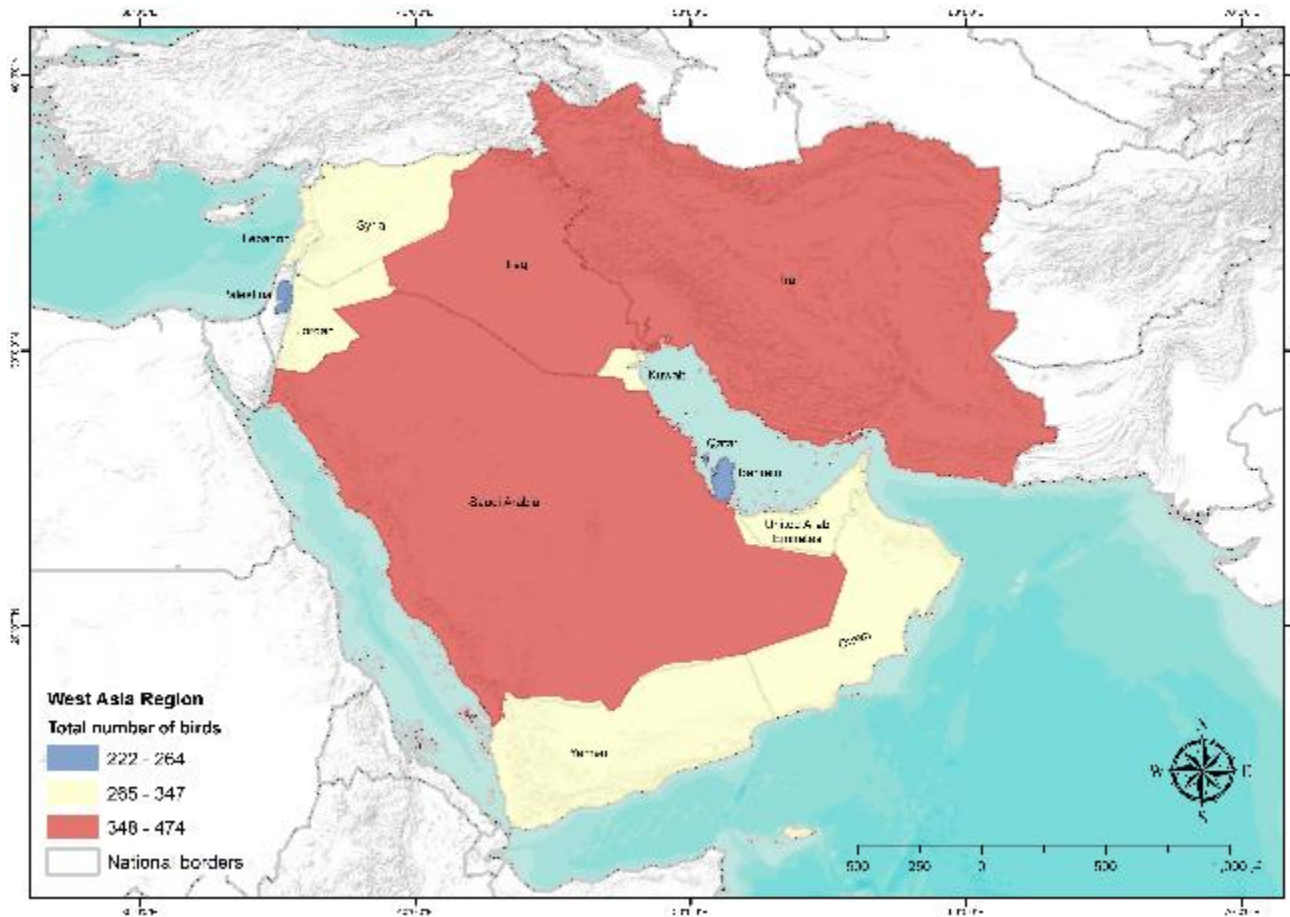
there are 775 bird species in West Asia which they are categorized in IUCN redlist to be 7 CR, 1 DD, 13 EN, 676 LC, 51 NT, and 27 as VU

Source: <https://www.iucnredlist.org>





Total number of birds in West Asia

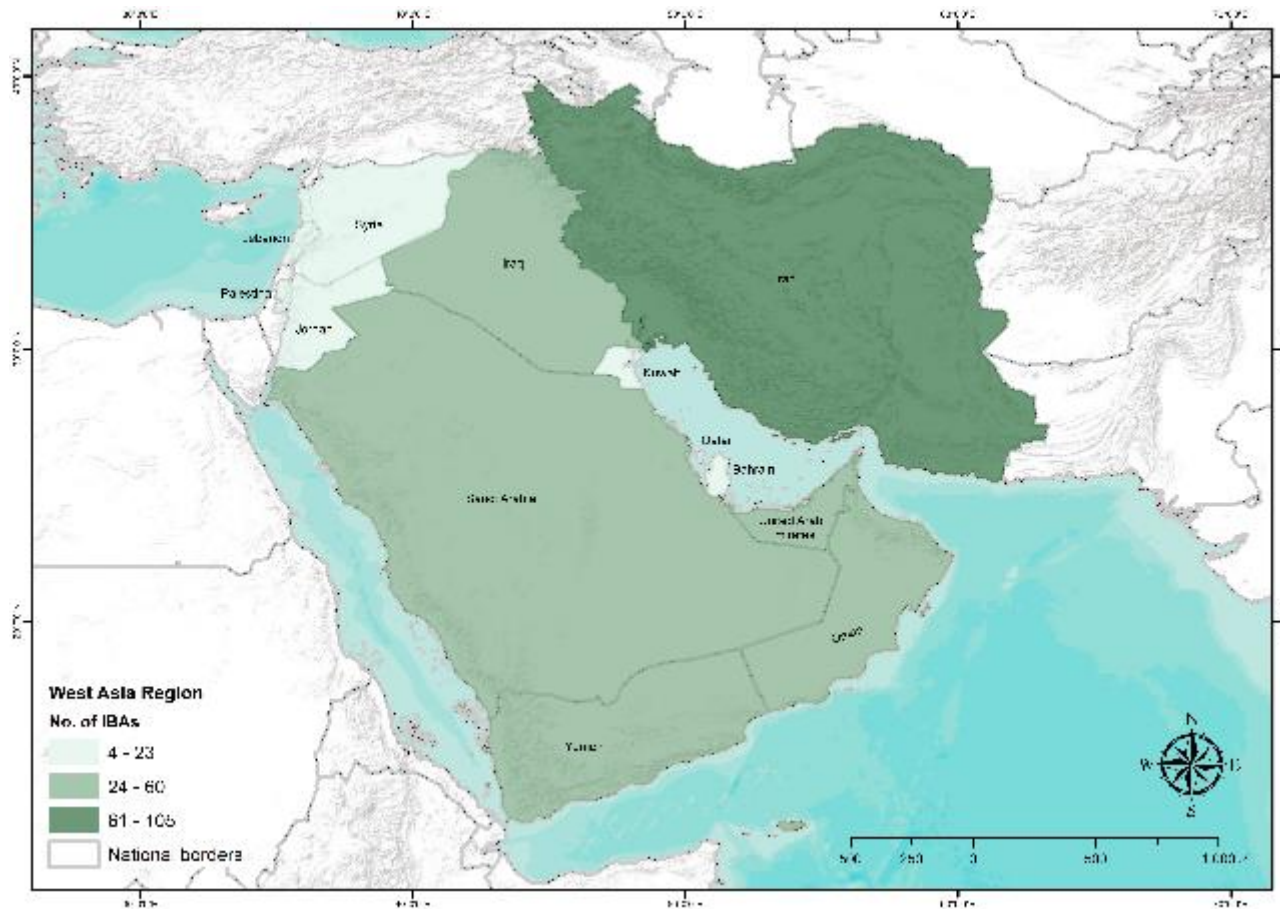


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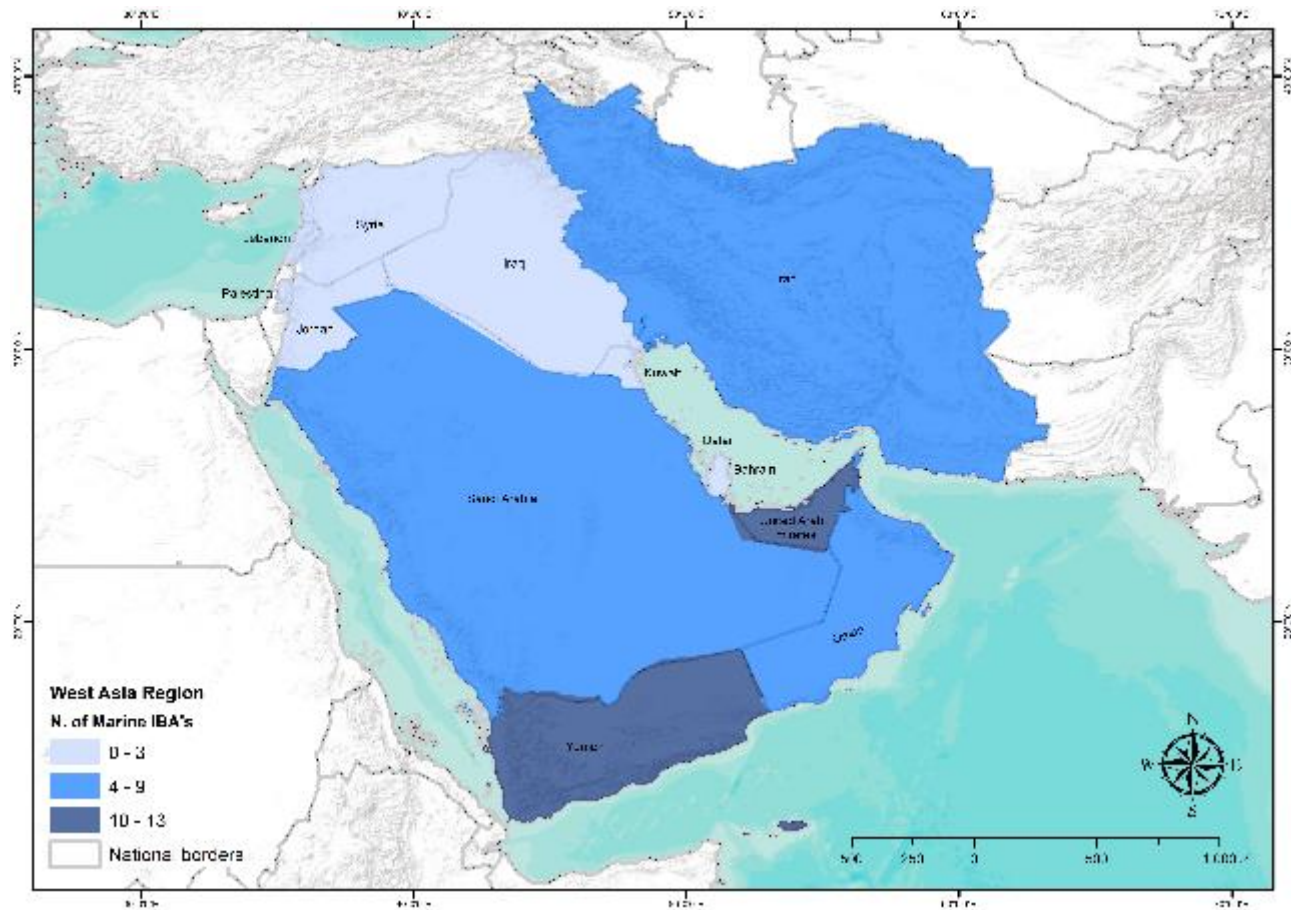


Number of Important Bird Areas (IBAs) in West Asia





Number of Marine Important Bird Areas (MIBAs) in West Asia

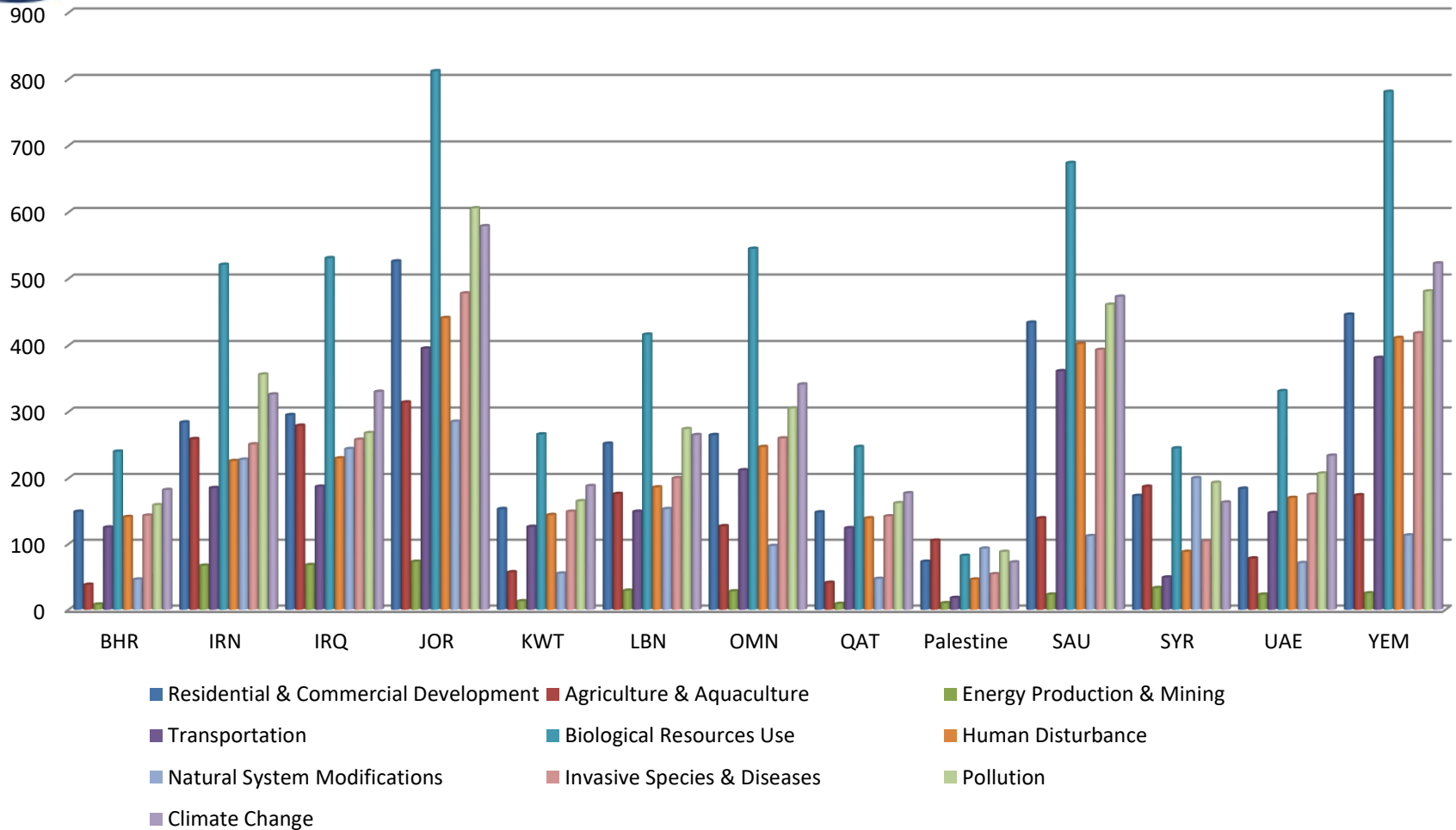


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Situation Analysis of Biodiversity in West Asia: Species

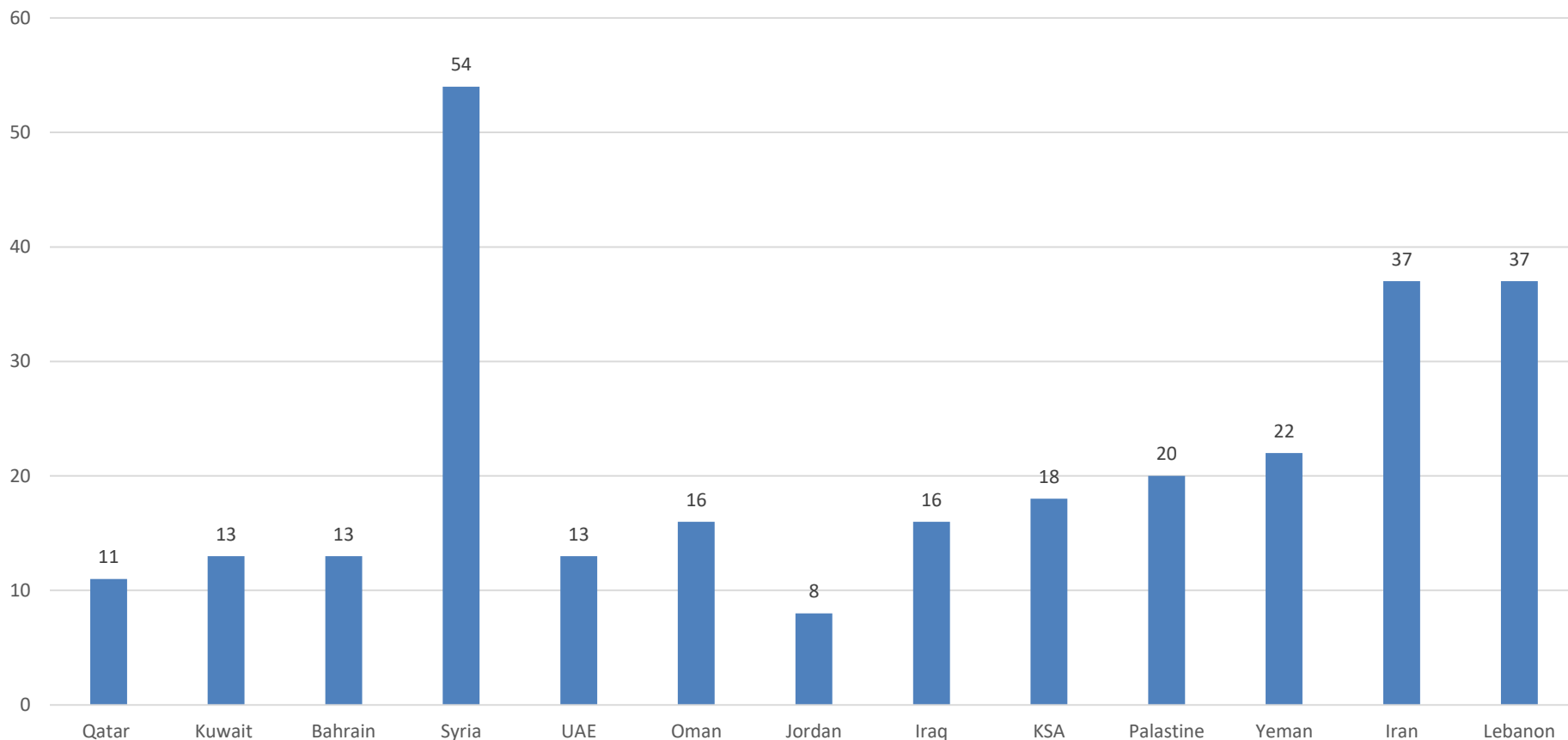
Total number of species affected by threats within West Asia





Total number of Critically Endangered according to IUCN Red List 2020

Total number of Critically Endangered according to IUCN Red List 2020



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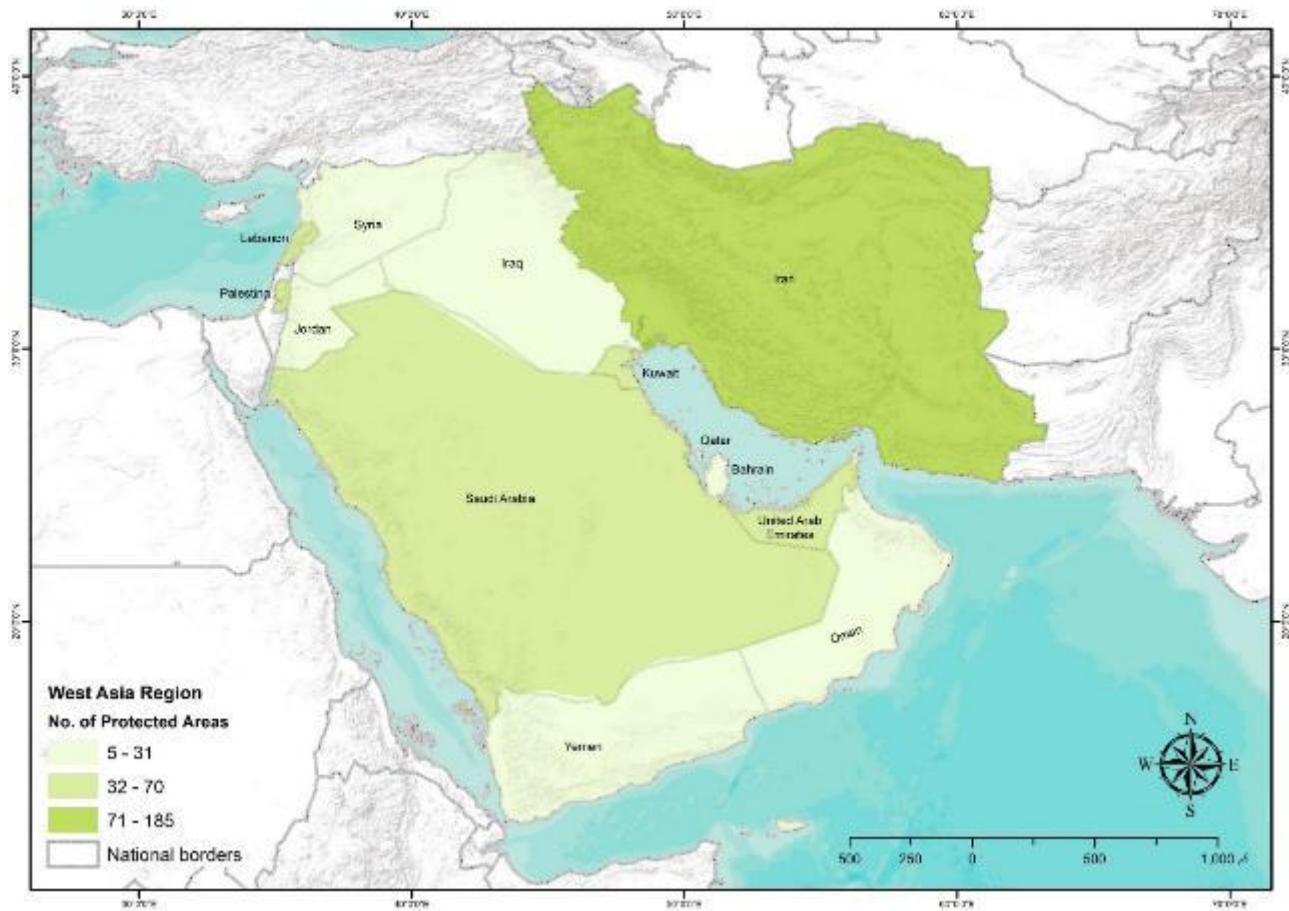
B. PROTECTED AREAS

- A total of **534** protected areas have been designated in West Asia
- over **150** protected terrestrial areas
- **24** biosphere reserves





Number of Terrestrial Protected Areas within West Asia

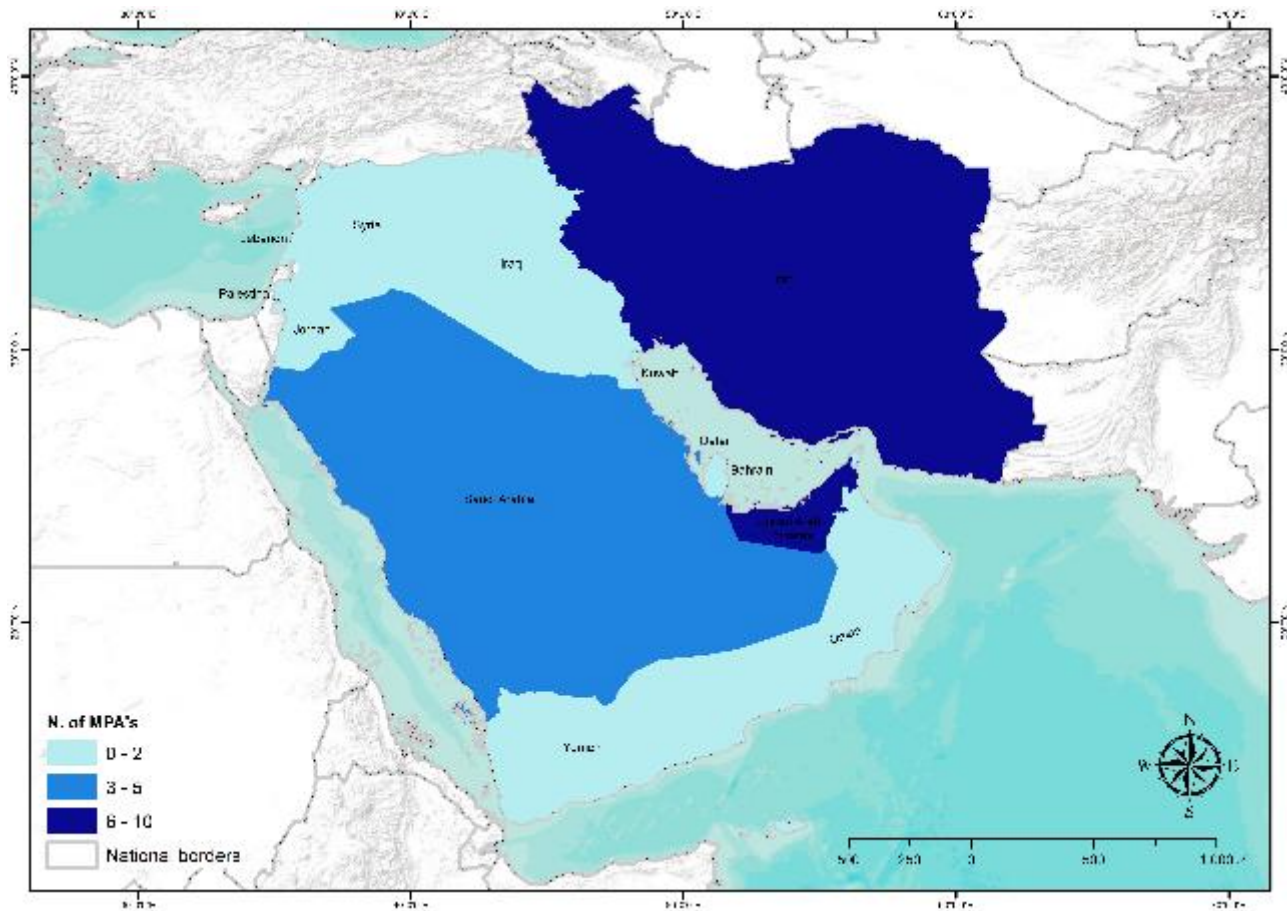


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Number of Marine Protected Areas within West Asia

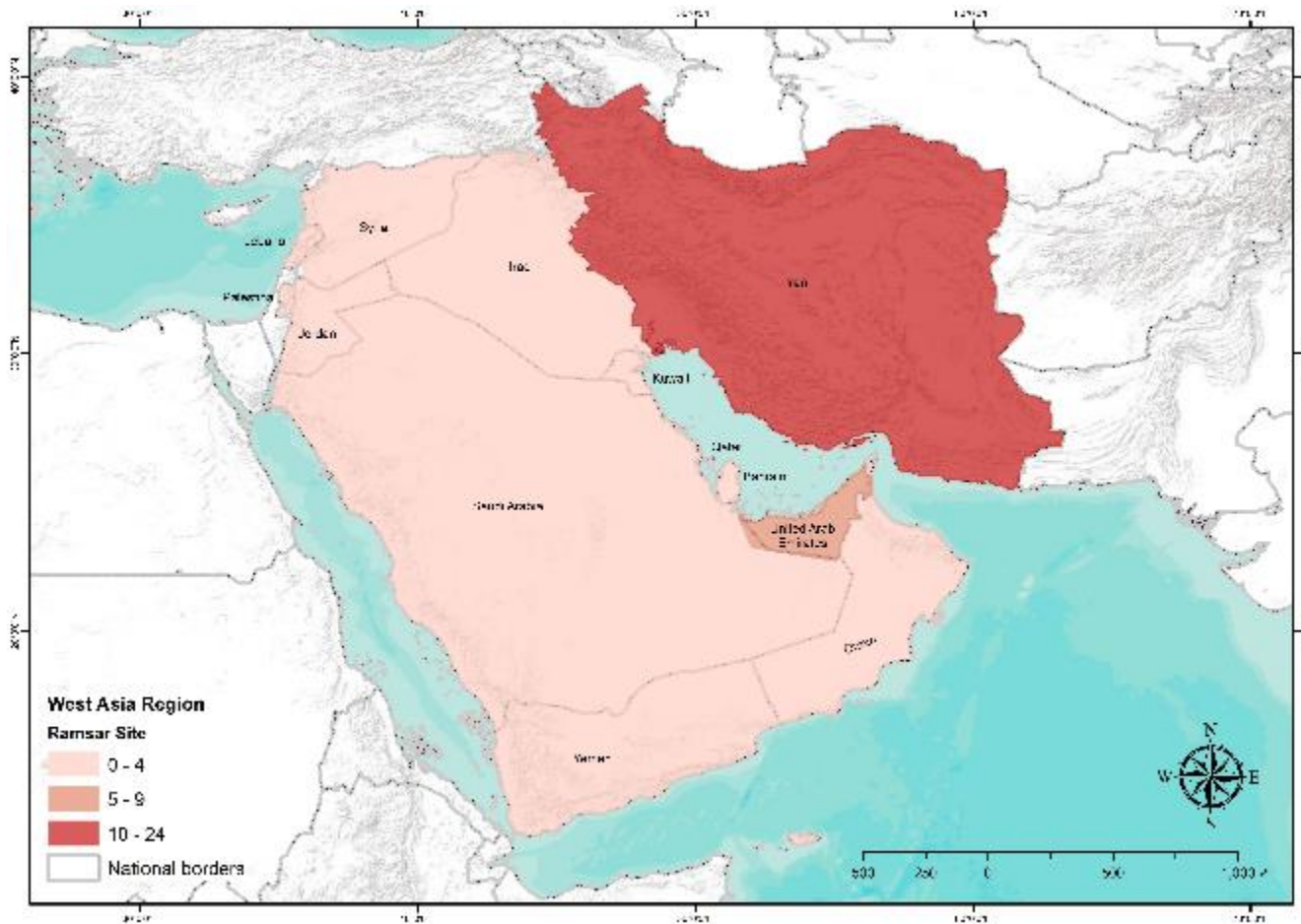


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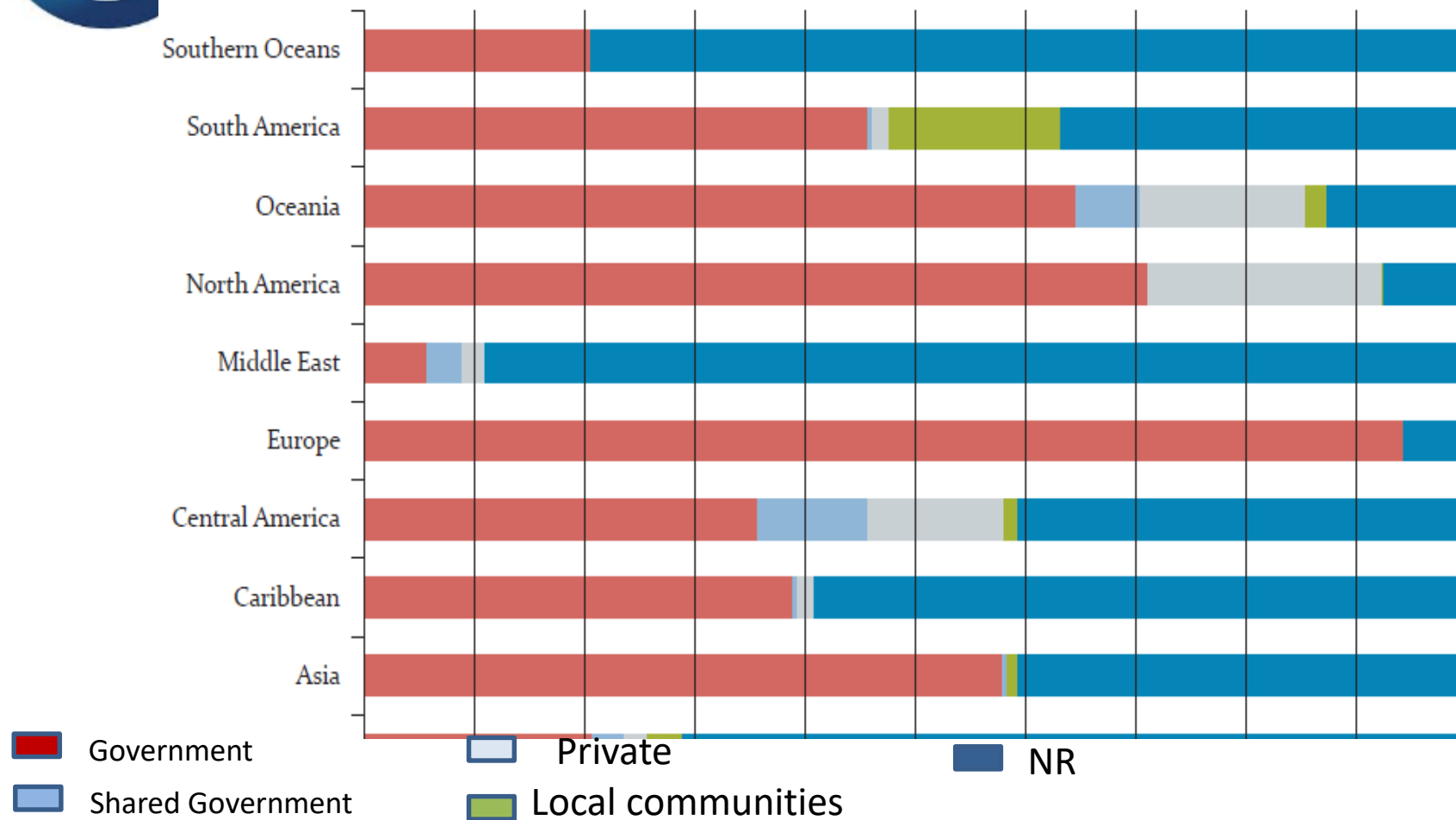
Ramsar sites within West Asia



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Global Protected Areas Governance (No. & areas)



Comparison of protected areas' governance type distribution within regions

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Status of West Asia countries regarding International Environmental Agreements and its Instruments

Countries (years)	BHR	IRN	IRQ	JOR	KWT	LBN	OMN	QAT	Palestine	SAU	SYR	UAE	YEM
CBD convention	1996	1996	2009	1994	2002	1995	1995	1996	No	2002	1996	2000	1996
Cartagena Protocol	2012	2004	2014	2004	No	2013	2003	2007	No	2007	2004	2014	2006
Nagoya Protocol on Access and Benefit-sharing	No	No	No	2015	No	No	No	No	No	No	2014	2014	No
Nagoya – Kuala Lumpur Protocol	No	No	No	No	No	No	No	No	No	No	No	No	No
Updated NBSAP	No	No	No	2015	No	No	No	No	No	Yes	No	Yes	Yes
Action Plan for Programme of Work on Protected Areas (PoWPA)	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	No
Climate Change Convention	1995	1996	2009	1994	1995	1995	1992	1996	No	1995	1996	1995	1996
Kyoto Protocol	2006	2005	2009	2005	2005	2007	2005	2005	No	2005	2006	2005	2005
Convention to Combat Desertification	1997	1997	No	1997	1997	1996	1996	1999	No	1997	1997	1999	1997
UNESCO	1991	1975	1974	1975	2002	1983	1981	1984	2011	1978	1975	2001	1980
Ramsar Convention	1998	1975	2008	1977	No	1999	2013	No	No	No	1998	2007	2008
Convention on the Conservation of Migratory Species of Wild Animals (CMS)	RS	2008	RS	2001	RS	RS	RS	RS	RS	1991	2003	RS	2006
CMS Instrument (Marine Turtles)	2007	2001	RS	2004	RS	No	2004	RS	No	2005	No	2007	2008
CMS Instrument (Dugong)	2010	RS	RS	No	RS	No	RS	RS	No	2013	No	2007	2010
CMS Instrument (Bird of Prey)	RS	2015	RS	RS	RS	2014	RS	RS	No	RS	2014	2008	2008
CMS Instrument (AWEA)	RS	RS	RS	1999	RS	2002	RS	RS	No	RS	2003	RS	RS
CMS Instrument (Sharks)	RS	RS	RS	2014	RS	RS	RS	RS	No	RS	2014	2014	2014
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	2012	1976	2014	1979	2002	2013	2008	2001	No	1996	2003	1990	1997
CITES (Amendment to Article XI)	2012	1988	No	1987	2002	2013	2008	2001	No	1996	2003	1990	1997
CITES (Amendment to Article XXI)	No	No	2014	No	No	No	No	No	No	No	No	No	No
UN Convention on the Law of the Sea	1985	1998	1985	1995	1986	1995	2008	2002	2015	1996	No	No	1987
Total no. of agreements and instruments signed (out of 21)	12	13	9	16	8	14	11	9	2	13	14	16	16
RS = Range State													
Source: Conventions' websites (last accessed on April 2015)													



Recommendation

- **Urgent policy action is needed to transform economic, social and financial models to stabilise biodiversity loss in the next 10 years** at scale at all levels from all sectors and across all realms (land, freshwater and ocean) to secure the planet's life-supporting 'safety net'.
- Such action should include **ramping up nature conservation for solving the climate emergency**. The framework needs to fully align and contribute to the 2030 Sustainable Development Goals and targets. SDG targets with a timeline of 2020 (reflecting current Aichi targets) need to be updated and harmonised with the post-2020 framework.
- The framework must aim to **“bend the curve”** – i.e. halt the (net) loss of biodiversity by 2030, and achieve recovery and restoration by 2050. A clear Mission for 2030 should reflect this ambition.

Vision and Mission:

- **“Living in harmony with nature”** needs to be underpinned by science - based Goals (on all three components of biodiversity: ecosystems, species and genes) and accompanied by 2030 Milestones to track progress to 2050.

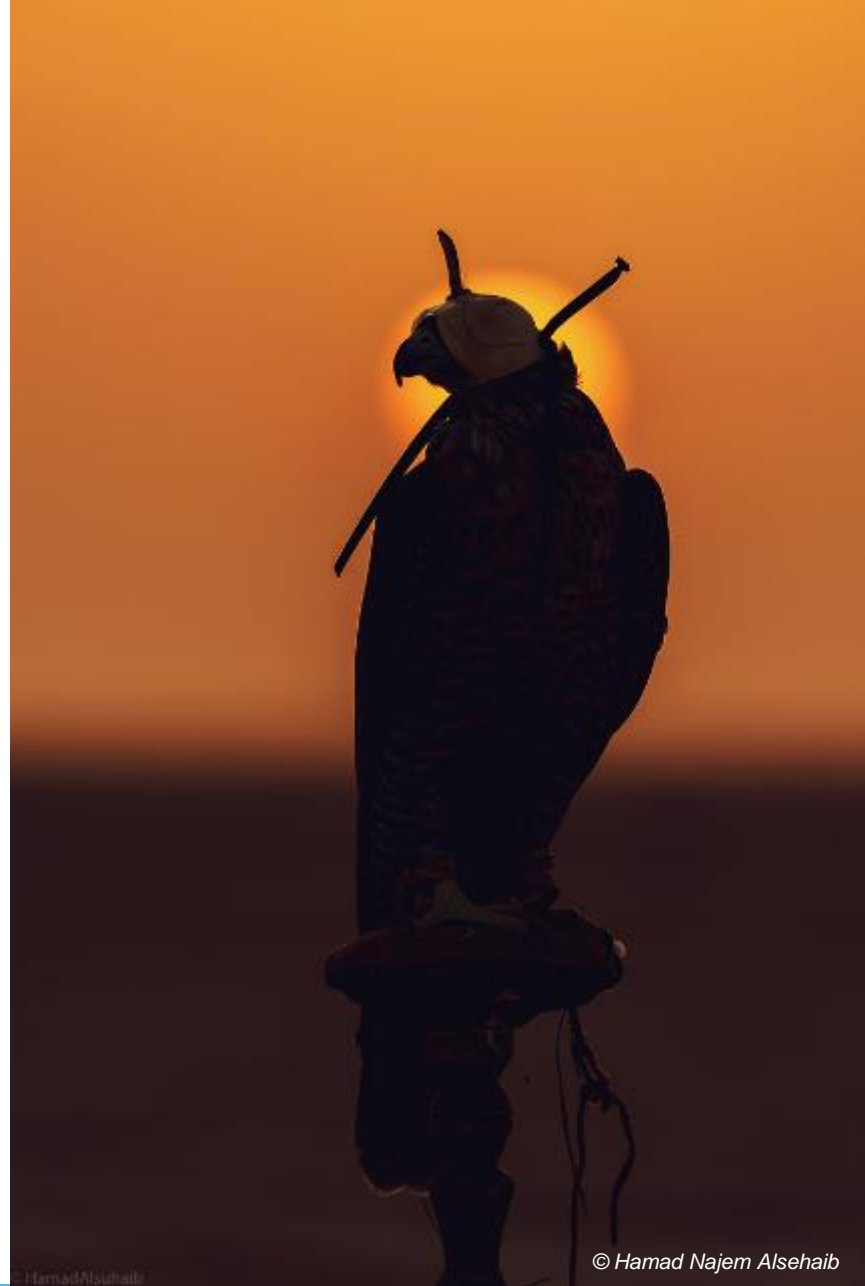


شكراً

Thank you!

<https://www.iucn.org/regions/west-asia>

https://www.iucn.org/sites/dev/files/content/documents/iucn_rowa_situation_analysis.pdf



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BIODIVERSITY LOSS, EMERGING INFECTIOUS DISEASES FRONTIER TECHNOLOGIES AND IMPACT

Zabta K. Shinwari

*Vice Chairman, UNESCO-World Commission on the Ethics of Scientific Knowledge & Technology
(COMEST)*

*Professor Emeritus Plant Sciences Department Quaid-i-Azam University
Islamabad-Pakistan*



Hailing from Kohat (Tribal Area Pakistan) –Dr. Zabta Khan Shinwari got Ph.D. from Kyoto University (Japan) followed by several Post Doc. Fellowships in Japan. He served Pakistan Museum of Natural History, National Agricultural Research Centre, WWF-Pakistan, COMSTECH before his appointment as Vice Chancellor of Kohat University of Science & Technology. One of his major achievements is to extend higher education facilities to the neglected communities of Pakistan especially to female. He also established University of Science & Technology, Bannu. He is the founder of KUST Institute of Medical Sciences (KIMS). Dr. Shinwari also served private sector as CEO of Qarshi Research International and Vice Chancellor/PD Qarshi University-Lahore. He was tenured Professor of Biotechnology and Dean of Faculty of

Biological Sciences in Quaid-i-Azam University, Islamabad and President, National Council of Tibb. Also served as Secretary General, Pakistan Academy of Sciences, Islamabad.

Dr. Shinwari interest is Molecular Systematics, Bioethics and Biotechnology. Dr. Zabta Khan Shinwari reported genes for drought, cold, and stress tolerance. His publications: 9 books authored; 8 international proceedings edited; 455 articles in impact factor journals; citation more than 12150; H index 54, i10-index 248; M.Phil & PhD produced: >100; Patents 2.

He is a fellow of the Pakistan academy of sciences and Islamic World academy of Sciences. Government of Pakistan awarded him two civil awards (Tamgha-e-Imtiaz) in 2012 and Sitara-e-Imtiaz in 2018. He also got Best University Teacher Award from Higher Education Commission, Pakistan. While recognizing his efforts in Ethics in Science and Technology UNESCO awarded him (Avicenna Gold Medal in 2015. He is also Vice Chairman of World Commission of Ethics in Scientific knowledge & Technology (COMEST) since 2016. He is Focal Person of Alliance of International Science Organizations (ANSO-HO, China), 2016-2022; Distinguished Scientists Award by Chinese Academy of Sciences, 2019-2020; Research Presented/Invited Lectures Delivered (301 including national and International).

Member, National/International Scientific Bodies (65); Grants/Funds Secured (60).

Zabta Shinwari's main interest is in teaching and developing Modules on Dual Use Education. He has been a partner in promoting Biosecurity education in Pakistan, as well as being a key figure in Pakistan in terms of Biosecurity and international engagement on Biosecurity issues. Presented research articles in more than 300 international conferences. Won more than 30 research grants from National and International agencies.

Prof. Shinwari has developed linkages with various national and international agencies like BEP, USA; LNCV (Italy); UNICRI and Bradford University etc. to promote Biosecurity education in Pakistan. He is exploring opportunities to deliver the materials to a multi-institutional audience, allowing him to promote the idea of a national Pakistani Biosecurity network, through networking at the event.

His principal aim is to promoting Biosecurity from the grassroots upwards, to economic improvement in Pakistan's growing biotechnology industry; informed scientists are better equipped to meet the needs of international ethical & safety standards, improving the country's economic standing.

ABSTRACT

With all this advancement of science, there are still over 500 million people living in "absolute poverty" mainly in Asia and Africa. People die of hunger numbers are doubled to it. Majority of these people belong to the area which is rich in biodiversity. Therefore, the current trends in resource conservations mainly include participation of locals in reserved areas rather than banning their entry.

The sheer richness of biodiversity also has human benefits. Many new medicines are harvested from nature, such as a fungus that grows on the fur of sloths and can fight cancer. Wild varieties of domesticated animals and crops are also crucial as some will have already solved the challenge of, for example, coping with drought or salty soils. Pakistan with a unique biodiversity rich country of Hindu-kush Himalayas has an altitude ranging from 0 to 8611m, therefore, has a variety of climatic zones. It has about 6,000 species of higher plants. More than 4000 plants species grow in mountainous regions of northern region of Pakistan, i.e., Hindukush – Karakorum-Himalayas. It has been reported that 600 to 700 species are used for medicinal purposes. Globally, there is a rising trend to shift resources from allopathic to traditional healthcare systems. Deforestation in the Himalayas is generally attributed to demographic pressure and other related effects: increase in demand for land for cultivation; livestock population; use of the remaining forest to meet growing needs for fodder, fuelwood, and timber.

We had chosen herbal products that are effective in cough, bronchitis and asthma and have looked in its efficacy against these infections. In current pandemics several plant species proved to be effective in treating the patients and boosting immune systems in China, India, Pakistan, Madagascar and other African countries. We also checked the heavy metals in these products and have suggested ways of improvements to the industries. Based on these data certain products are rated high in the trade. People will continue to be heavily reliant on local plants. Poorest people, will remain most dependent on resources of wild plants, hence poorest people stand most to gain if Plants resources are managed in sustainable ways. Scientists prefer only the glamorous aspects of science like Biotechnology or Nanotechnology and they are seldom exposed to the 'reality' of rural areas. The real issue is: how does science cater to the poor?

Ten leading Dawakhana [Herbal manufacturers] of Pakistan annually consume more than 4 million kg of 200 medicinal plants in 1990s while its consumption increased multifold in the last three decades. Some of the uses of medicinal plants in the Unani system for some ailments seem to have origin in the medicine of ancient Greece.

Globally, there is a rising trend to shift resources from allopathic to traditional healthcare systems. The global market (2002) for medicinal and aromatic plants was US\$ 62 billion and estimates suggest that it will reach US\$ 5 trillion by 2050. The income of the poor collectors and the local vendors can be increased, if proper scientific support data is available for the herbal products.

Almost all the medicinal plants in Pakistan are collected from the wild and 90% collectors are women or children. Local collectors are unaware of the best collection procedures. Experiments are suggested to investigate ways of growing plants and to provide a better understanding of the propagation and agronomic requirements, especially of selected species of medicinal plants, concurrent with the reduction in harvest of wild species that will *occur* once sustainable *management* practices are developed and put into place.

The vast majority of plant genetic resources and other forms of biodiversity are found in - or originate from - developing countries. Developing countries need to access biodiversity resources and developing countries seek to ensure that access is regulated so as to ensure that access is regulated, so as to ensure fair and equitable sharing of benefits through transfer of technology and finance.

Frontier technologies or innovative technologies fundamentally improve the way we operate. They constantly collect data and information, enable better decision-making overtime. Frontier technologies can help assess, impact of invasive species and help to mitigate and adapt to climate change which in turn provides an opportunity to accelerate efforts to achieve the Sustainable Development Goals.

Spread of invasive species, rising global temperature, sea-level rise, ocean acidification and other climate change impacts are seriously affecting least developed countries (LDCs) in particular. Survival of many societies, and of the biological support systems of the planet, is at risk. For example, recent flooding in Karachi can be linked to introduction of *Conocarpus* that blocks sewerage system similar to Cape Town.

New technologies OR Frontier Technologies, e.g. synthetic biology has some good aspects e.g. Artemisinin with potent antimalarial properties, produced by the plant *Artemisia annua*. However, the supply of plant-derived artemisinin is unstable, resulting in shortages and price fluctuations, complicating production planning by ACT manufacturers. Synthetic biology to develop strains of *Saccharomyces cerevisiae* (baker's yeast) for high-yielding biological production of artemisinic acid, a precursor of artemisinin. But there are worries that products of synthetic biology may interrupt ecosystem services and may cause irreparable loss to biodiversity.

Frontier technologies offer a multitude of opportunities a) innovation in production processes has the potential to enhance productivity. b) technologies have the potential to lift the sustainable development curve c) innovative policy action to utilize technologies in the delivery of public services is gaining ground d) frontier technologies can help anticipate and respond to the effects of climate hazards and air pollution through the adoption of state-of-the-art technologies to address environmental impacts

But, there are challenges too. I) There are uncertainties about the future of work. II) Despite the rapid penetration of the internet the world over, several billion have been left behind. III) Frontier technologies pose trust and ethical questions.

To conclude, [Biodiversity](#) is the most complex feature of our planet and it is the most vital. "Without biodiversity, there is no future for humanity". Loss of biodiversity is like humanity is currently "[burning the library of life](#)".

IRREVERSIBLE LOSS COUPLED WITH FRONTIER TECHNOLOGIES : THREATS TO HUMAN HEALTH & FOOD SECURITY

Zabta K. Shinwari
Prof. Emeritus, Quaid-i-Azam University;
V. Chair, UNESCO-COMEST

Top Global Risks (Modified from WEF survey of global risk perception 2021)

- ➡ **Infectious disease (killed 2m; loss of 28 trillion \$)**
- ➡ **Livelihood crises (poverty) 14% lost job, widespread youth disillusionment**
- ➡ **Extreme weather events (Hurricanes, flood, fire; biodiversity loss, natural resource crises)**
- ➡ **Cyber security**
- ➡ **Digital inequality**

Mass Poverty and Inequality

Phenomenal Growth per capita in 300 years

Yet, every second 4 people die because of starvation or related diseases

1% of world population has 50% of world wealth

Richest 26 persons of world has more wealth than the bottom 50% of world population

Climate change: Change in average weather pattern. Resulting from global warming, will *affect every aspect of life*, characterized by extreme & unpredictable weather conditions, changes in precipitation pattern and environmental degradation

This Is How Human Extinction Could Play Out

- above the Arctic Circle, in Siberia, a heat wave thawed a **reindeer carcass that had been trapped in the permafrost**. The exposed body released anthrax into nearby water and soil, infecting two thousand reindeer grazing nearby, and they in turn infected some humans; a twelve-year-old boy died. As it turns out, permafrost is a “**very good preserver of microbes and viruses, because it is cold, there is no oxygen, and it is dark**” — scientists have managed to revive an eight-million-year-old bacterium they found beneath the surface of a glacier.
- Researchers believe there are fragments of the Spanish flu virus, smallpox, and bubonic plague buried in Siberia and Alaska.

Global Warming Evidences

- **Rise in recorded T** over land and oceans: 0.8-1.0°C in 130 yr. Last 34 hotter than 100 yr average; 2014-16 hottest recorded
- **Warming of Oceans:** Top layer warming at 0.2°F /decade
- **Melting of Glaciers, Polar Ice Caps Recession & Thawing Permafrost:** Alps, Cascades, Rockies, S Andes undergoing continuous recession; 2024 HKK glaciers <2% in 2000-2010). 35% shrinking in Sept ice cover
- **Rise in Sea Level:** 20 cm over the previous century
- **Increase in Extreme Events:** Hurricanes, cyclones, floods?
- **Ocean Acidification**, endangering marine life (partly hydrothermal)
- **Damage to coral reefs** and iconic African **Baobab trees**. Half of Great Barrier Reef colourful algae bleached to death! *(NatGeog Aug 18)*

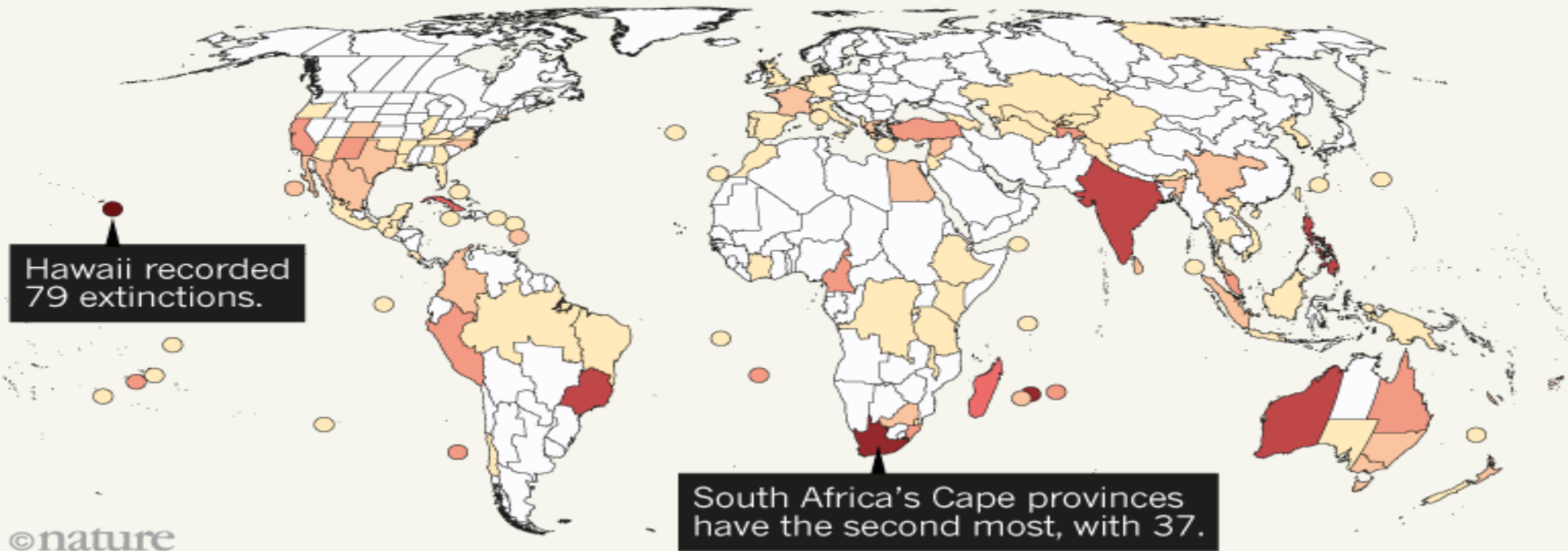
What is Biodiversity?

- Biodiversity refers to every living thing, including plants, bacteria, animals, and humans. Can be considered at the three level; genetic diversity (variability within species), species diversity within an ecosystem and the variety of habitats on the planet
 - **c.1.75 million living species (presently known)**
 - **C.300000 fossil species (described until now).**
 - **On an average 300 species are described every day.**
 - **Current estimates of the total living species range 10-50 million (May, 1988, Wilson 1992, Gaston & Spicer, 2004)**

EXTINCTION PATTERN

The number and locations of seed-bearing plant species that have disappeared since 1900.

0 1-2 3-5 6-10 11-20 21-30 31-40 41-79



Humphreys, A. M. *et al. Nature Ecol. Evol.*
<https://doi.org/10.1038/s41559-019-0906-2> (2019).

The researchers found that about 1,234 species had been reported extinct since the publication of Carl Linnaeus's compendium of plant species, *Species Plantarum*, in 1753. But more than half of those species were either rediscovered or reclassified as another living species, meaning 571 are still presumed extinct.

Destruction of world's forests increased sharply in 2020

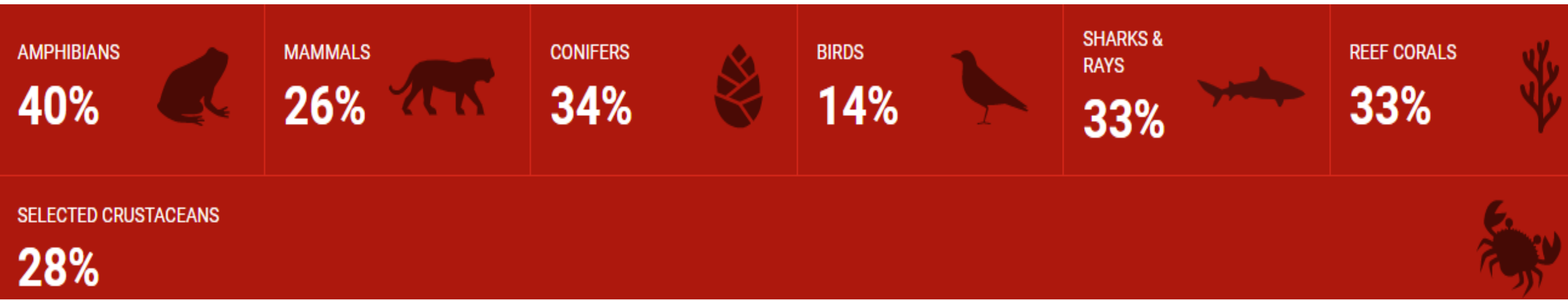


- Global Forest Watch, the loss was well above the average for the last 20 years, the third worst year for forest destruction since 2002 when comparable monitoring began.
- Altogether, 12.2m hectares of tree cover were lost in the tropics in 2020, an increase of 12% on 2019.
- Brazil's forested areas fared the worst, with 1.7m hectares destroyed, an increase of about a quarter on the previous year.
- The Covid-19 pandemic and lockdowns around the world did not have a clear impact on forest loss patterns
- Tree loss in Indonesia in 2020 fell for the fourth year in a row, down from a peak in 2016 after devastating forest and peat fires led the government to place a moratorium on the cutting down of primary forest and converting peatland to agriculture while restricting licensing for palm oil plantations.
- Malaysia, which has lost about a third of its primary forest since the 1970s, has also recently succeeded in reducing deforestation, with tougher laws on illegal logging.

128,918 species have been assessed for The IUCN Red List.

More than 35,500 species are threatened with extinction

That is still 28% of all assessed species.



March 29, 2021

It is estimated that one-fourth of endemic species in the Indian Himalaya alone could be lost by 2100 at current rates of ecosystem degradation and species loss.

(Photo: Jitendra Raj Bajracharya/ICIMOD 2021)

- The most important lesson from the COVID-19 pandemic is that human health is dependent on the health and integrity of our natural world.
- The Hindu Kush Himalaya (HKH) is home to 240 million people and more than 70% of them are directly dependent on nature for food, fodder, fuel, medicine, and other means of livelihoods. The HKH is also the source of water, food, and energy for people living in the river basins downstream and beyond. Nearly 1.65 billion people living in the 10 river basins downstream benefit directly and indirectly from its resources and more than 3 billion people benefit from the food produced in its river basins.
- Five major drivers of **Biodiversity loss: climate change, resource overexploitation, land use change, pollution, and invasive alien species.**

Species multiply as Earth heats up

- **Biodiversity increases with gentle warming.**
- Rather than kicking off the expected cycles of extinction, periods of warming in Earth's history were accompanied by increased biodiversity. But this does not mean that the mass extinctions that are taking place today, with Earth warming at an unprecedented rate, will be reversed in future.

According to Mayhew, et al. 2012 (Proc. Natl Acad. Sci.) in 540 million years of Earth's history¹. They found that when temperatures were high, so was biodiversity. When temperatures fell, biodiversity also declined.



[Richard Lovett](#), *Nature*:03 September 2012

Warming produces both extinctions and originations, and in the past the originations of new species have outstripped the loss of old ones, says Mayhew. But this does not mean that today's climate change will be beneficial.

Invasive Alien Species (IAS)

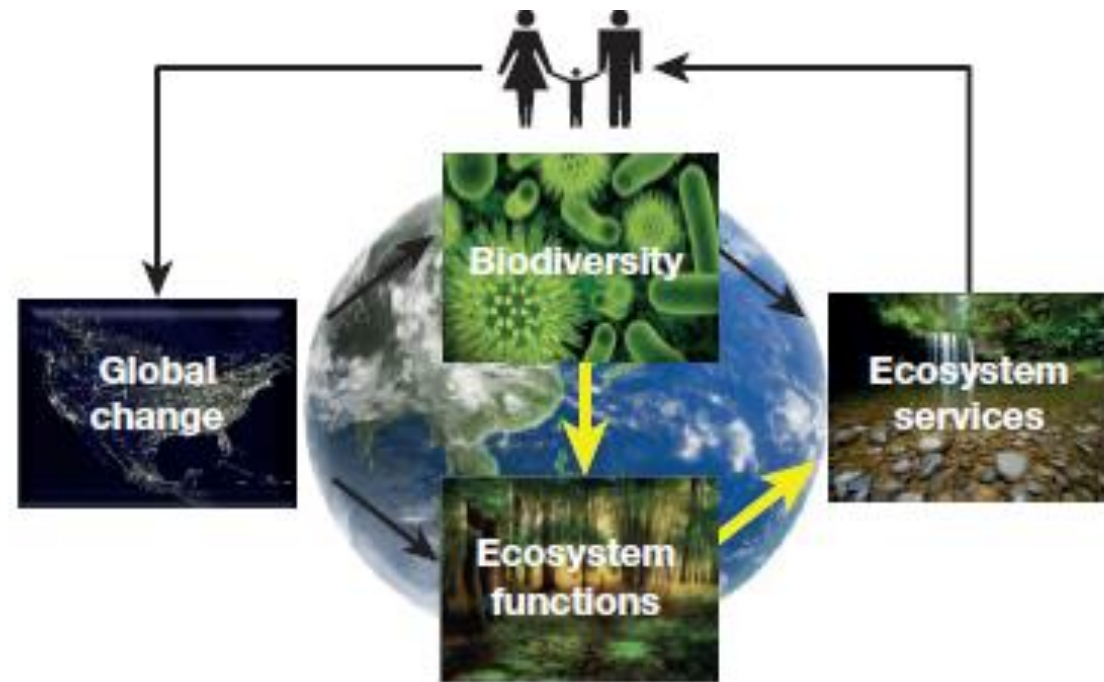
- Global Invasive Species Programme (GISP) defines “Plants and other organisms that are non native to an ecosystem, and which may cause economic or environmental harm or adversely affect human health as Alien”.
- UNEP 2009 estimates that since seventeenth century almost 40% of all animals extinctions have been due to IAS
- UNEP estimates the annual environmental losses to US, UK, Australia, South Africa, India and Brazil caused by pests to be over 100 billion US\$.
- **S. Africs forest-munching wasps, and trees attractive to mosquitoes**, cost the country (US\$450 million) a year and are responsible for about a quarter of its biodiversity loss.
- Alien plants, which often use more water than do indigenous ones, **consumed more than 100 million litres of water a day** — about a fifth of the city's daily usage.

- Biodiversity loss influences ecosystem functions, and its impacts on the goods and services ecosystems provide

A forest store more carbon if it has a greater variety of tree species?

A stream clean up more pollution if it has a greater variety of microbial genotypes?

Natural enemies better control agricultural pests if they are composed of a variety of predators, parasites and pathogens?



Link of reduce Biodiversity with invasiveness of species

- Plants with weedy traits become more abundant when plant diversity declines. Consequently, the very species that have traits permitting persistence in degraded and species-poor ecosystems are also more likely to carry high pathogen and vector burdens.
- The density of small mammals (marsupials, rodents, sloths etc.) as **main reservoirs of leishmania increases with increasing forest fragmentation due to the loss of larger predators and consequently the disease itself spreads rapidly**

Pilgrim, et al., Biol. Conserv. 120, 161–170 (2004).

An aerial photograph showing a stark contrast between a lush, green forest on the left and a cleared, brown, and debris-covered area on the right. The cleared area is covered with a dense layer of dry sticks and branches, suggesting recent logging or land clearing. The forest in the background is dense and vibrant green, with some small white structures visible in the distance.

Can the Earth Be Saved?
The answer is 'yes,' with some big
'if's. Here are 3 things we must do.

[The Nature Conservancy](#) Verified account [@nature_org](#) May 26
2019

Fix
Agriculture



Stop
Overfishing



Ramp Up
Clean Energy



- **1. Produce More Food on Less Land**
- Large-scale agriculture is the biggest source of land conversion, drives deforestation that worsens climate change, uses 70 percent of the world's freshwater supply and relies on fertilizer practices that pollute our waters. A billion more people increased, agricultural expansion will devastate habitats.
- **How to fix it:**
Produce food where it's most likely to thrive, which will use less water and less land.



- 2. Eliminate Overfishing
- **TARGETED FISHING** Use technology to catch only the right species.
- **Problem:**

Overfishing and poor fisheries management is not only devastating to the fish species being pushed to the brink of collapse. It threatens billions of people who rely on seafood. Without serious changes, 84 percent of the world's fish stocks will be in peril in our lifetime.
- **How to fix it:**

Refine our fishing methods to only take what the fish populations can tolerate now, so our oceans can be more abundant and healthier in the future.



- 3. Increase Clean Energy
- **TARGETED ENERGY SITING** Use already degraded land for energy development.
- **Problem:**

Climate change is the single most serious threat facing our planet. We must reduce carbon emissions to, or below, levels agreed to in the Paris Climate Agreement to prevent catastrophic harm. And with global energy demand expected to increase 56 percent over the next couple decades, it will be impossible to meet those emissions targets if we stick primarily with traditional fossil fuels.
- **How to fix it:**

Shift 85 percent of the world's energy supply to non-fossil fuel sources and invest in strategies like reforestation that capture carbon dioxide.

Geoengineering debate shifts to UN environment assembly

- *Countries will discuss whether to commission a study of technologies to blunt the effects of climate change.*
- (UNEP) to prepare a comprehensive assessment of geoengineering, including methods [to pull CO₂ out of the atmosphere](#) or [inject aerosols into the stratosphere to block sunlight](#). Due by August 2020, the report would examine the underlying science and technology, and how to govern research and wide-scale use.
- In 2010, the 196 member countries of the Convention on Biological Diversity [called for a moratorium on geoengineering technologies](#), citing gaps in scientific knowledge and potential environmental, social and economic risks; the non-binding decision includes exceptions for research. And in a series of decisions over the last decade, parties to the London Convention on ocean pollution have [banned the commercial use of ocean fertilization](#) — in which iron is released into the ocean to spur the growth of CO₂-absorbing algae
- A fleet of high-flying aircraft could pump enough sulfur into the stratosphere to offset around 1.5 °C of warming for as little as US\$1 billion–\$10 billion annually, according to the Intergovernmental Panel on Climate Change.— while laying out criteria for research.

One type of geoengineering seeks to cool Earth by injecting sulfur particles into the stratosphere to reflect sunlight into space.

This Is How Human Extinction Could Play Out

Food-system collapse, sea-level rise, disease.

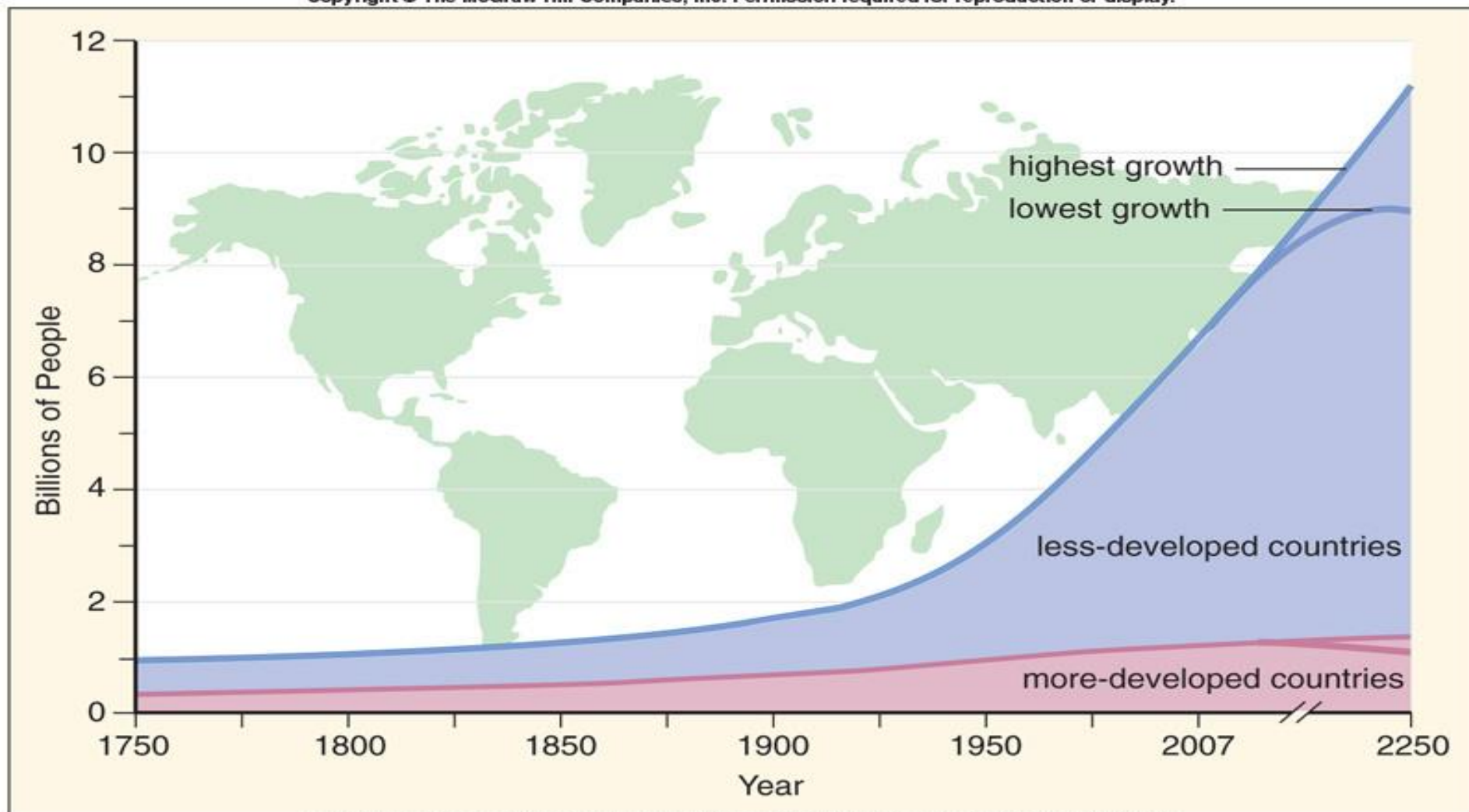
- as ice sheets melt, they take weight off land, and that can trigger earthquakes — seismic activity is already increasing in Greenland and Alaska.
- After tripling between 1900 and 1990, wheat yields had stagnated
- Even if we hit the UN target of limiting temperature rise to two degrees Celsius, pests should cut wheat yields by 46 percent, corn by 31 percent, and rice by 19 percent.
“[Warmer temperatures accelerate the metabolism of insect pests like aphids and corn borers at a predictable rate](#),”. Sorghum, for instance, which is a staple for half a billion humans (yield drop 17%).
- the median [estimate](#), from the International Organization for Migration, is that we may see two hundred million climate refugees by 2050. (The high estimate is a billion.)
- Brazil accounts for 17 percent of the world’s grain exports, but heavy rainfall in 2017 stranded three thousand trucks.

This Is How Human Extinction Could Play Out

- Oceans by 2100 they might become hot enough to “stop oxygen production by phyto-plankton by disrupting the process of photosynthesis.” Given that two-thirds of the Earth’s oxygen comes from phytoplankton, that would “likely result in the mass mortality of animals and humans.”
- Siberia, a heat wave thawed a reindeer carcass that had been trapped in the permafrost. The exposed body released anthrax into nearby water and soil, infecting two thousand reindeer grazing nearby, and they in turn infected some humans.
- Permafrost is a “very good preserver of microbes and viruses, because it is cold, there is no oxygen, and it is dark” — scientists have managed to revive an eight-million-year-old bacterium they found beneath the surface of a glacier. Researchers believe there are fragments of the Spanish flu virus, smallpox, and bubonic plague buried in Siberia and Alaska.

Human population growth

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Population Reference Bureau and United Nations, World Population Projections to 2100 (1998)

Climate Change and Agriculture

Agr-most vulnerable human enterprise (fresh water scarcity, disruption in supply, changes in weather pattern, land degradation & soil erosion, water logging, floods, drought, deforestation, threat to tropical forest cover)

Global warming → Melting of polar icecaps and mountain glaciers

Climate change would cause changes in agro-ecological conditions which would impact crop yield, nutrition value and livestock productivity

With projected **population** growth to **9B by 2050**, **Agr** production must also **increase by 70%** (FAO)

Globally, **Agr** accounts for **13.5% of GHG emissions** and indirectly another **17% due to deforestation & land-use change**

Agriculture is therefore part of the problem and part of the solution to Climate Change

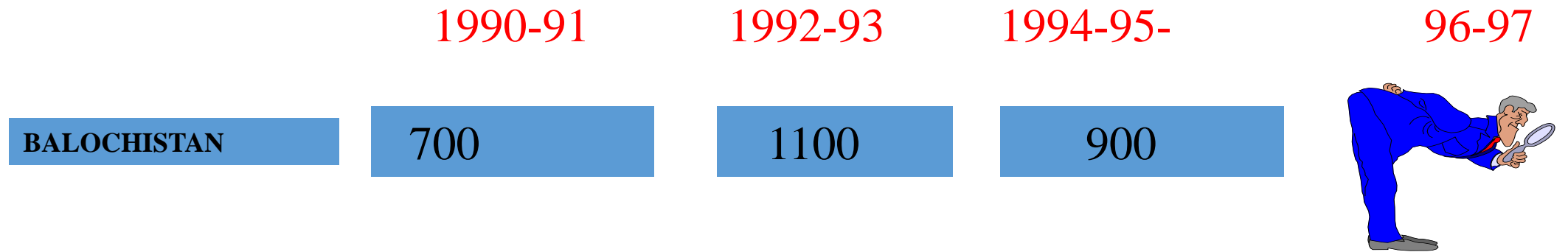
The natural world holds secrets to the development of new kinds of safer and more powerful pain-killers; treatments for a leading cause of blindness – macular degeneration – and possibly ways of re-growing lost tissues and organs by, for example, studying amphibians, salamanders etc.

• *Fagonia cretica*
(Family Zygophyllaceae)
Breast cancer



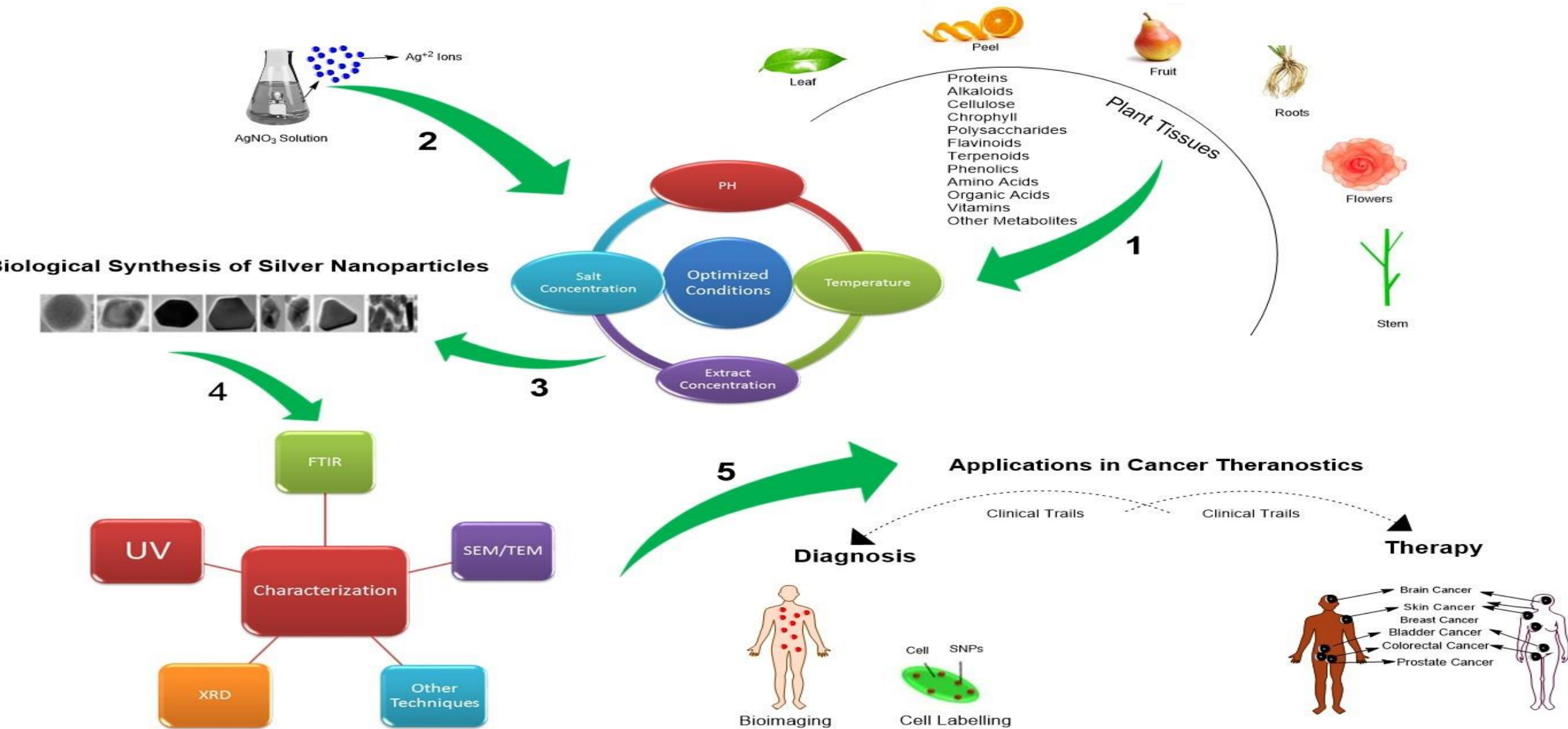
OUT-TURN OF MINOR FOREST PRODUCTS (TONNES)

EPHEDRA



Chinese physicians began prescribing *Ephedra* tea for colds, asthma and hay fever around 3,000 BC, but it may have been used long before that time, since it was also found in a 60,000 year old burial site in Iraq, along with seven other medicinal plants ([Chevallier, 1996](#))

Phytonanotechnology: A novel approach



Ovais M *et al.*, "Green synthesis of silver nanoparticles via plant extracts: beginning a new era in cancer theranostics." *Nanomedicine*, 2016, 12(23): 3157-3177.

Ayurvedic medicine for dengue is likely to launch in market

- medicine is expected to be ready after multilevel trials in the next couple of years. “Trials on the Ayurvedic medicine for dengue are currently on and we will come out with it at the earliest possible,”
- *Indian* ministry has aimed to expand the current size of Ayurveda and AYUSH business of around \$3 billion to \$10 billion by 2022.

05 November 2018

BioSpectrum
the business of Bio & Health Sciences





Biodiversity loss – it will make you sick

**Super Ants could Help
Create Next Generation
of Antibiotics**

A new generation of antibiotics, new treatments for thinning bone disease and kidney failure, and new cancer treatments may all stand to be lost unless the world acts to reverse the present alarming rate of biodiversity loss.

New 'Fairy' Insect Is Mind-Blowingly Small



Tinkerbella nana, a new species of fairyfly from Costa Rica.

Living on the eggs and larvae of other insects. It's a gruesome way to live, but it makes fairyflies useful for farmers, who sometimes import them to control nasty pests.

Many fairyflies are extraordinarily tiny, including *Kikiki huna*, a Hawaiian species that grows to be only 0.005 inches (0.13 millimeters) long — about the diameter of the tip of a fine drawing pen.

Tinkerbella nana is only about 250 nanometers long.

Stephanie Pappas, LiveScience Senior Writer

Date: 24 April 2013

Synthetic Biology: On the Horizon?

- Cloning Extinct Species (SOURCE: CNN 11.18.08)
 - Good biodiversity or bad?
- Fully synthetic bacterial genome (*M. genitalium*)
- Engineered Plagues for Invasive Species (e.g., Stewart Brand, *Conservation*, 2006)
 - Integrated pest management, or plague?
- “Sugar Economy” (SOURCE: ETC Group, 10.9.08)
 - Biosustainability or neo-colonialism?
- Earth Engineering and Carbon Sequestration (SOURCE: *New Scientist* 7.25.09)
 - Saving the climate or messing with Mother Nature?

The Reconstruction of the 'Spanish Flu'

Efforts to reconstruct the 1918 flu virus (also known as 'Spanish flu') started in the mid 1990s, when Dr Jeffrey Taubenberger from the US Armed Forces Institute of Pathology in Washington DC succeeded in recovering and sequencing fragments of the viral RNA from preserved tissues of 1918 victims.

DEATH TOLL GROWING AS INFLUENZA CLAIMS MANY SCORE VICTIMS

Tent Hospitals to Be Erected
if Epidemic Spreads; Sa-
loonmen to Be Prosecuted;
Volunteer Nurses Needed to
Care For the Sick

Public Utilities Suffer Because
of Labor Shortage Due to
Illness; Business Houses
Feel Loss; Traction Com-
panies Shorthanded

Harrisburg Telegraph, October 9, 1918

**Coughs and Sneezes
Spread Diseases**



As Dangerous as Poison Gas Shells

**SPREAD OF SPANISH INFLUENZA
MENACES OUR WAR PRODUCTION**

**U. S. Public Health Service Begins Na-
tion-wide Health Campaign.**

Impacts of biodiversity on the emergence and transmission of infectious diseases

- Current unprecedented declines in biodiversity reduce the ability of ecological communities to provide many fundamental ecosystem services.
- Reduced biodiversity affects the transmission of infectious diseases of humans, other animals and plants.
- Evidence indicates that biodiversity loss frequently increases disease transmission.
- Areas of naturally high biodiversity may serve as a source pool for new pathogens.
- Current evidence indicates that preserving intact ecosystems and their endemic biodiversity should generally reduce the prevalence of infectious diseases.
- Infectious disease include a host and a pathogen; often many more species are involved, including additional hosts, vectors and other organisms with which these species interact.

Emerging infectious diseases (EIDs)

- 335 infectious diseases were emerged in last 64 years, among which 60.3% were borne by zoonotic pathogens i.e., through non-human animal sources
- 18 most prevalent and virulent diseases according to their EID class, pathogens, hosts, geography, impact and factors associated with the emergence
- Zoonotic pathogens, 71.8% were developed in wildlife envisaging spread at lower altitudes; most of them were bacterial or rickettsial infections

Links between diseases and the diversity

- In human bodies, for example, 90% of all cells are microbial. A number of studies have begun to show links between diseases and the diversity of an organism's 'microbiome'. **Changes in the composition of microbiomes are frequently associated with infection and disease.**
- A rich microbial community appears to regulate the abundance of endemic microbial species that can become pathogenic when overly abundant

Pakistan: a blessed country

- *The origin of Pakistan's Physical Diversity*
- *Potential to serve the world in multiple unique ways*
- *Today's presentation will unleash one unexplored perspective*





Produced by:
Centre for Research on Poverty Reduction and Income Distribution

Forest-based communities

- Forest communities involved in relatively new initiatives in local forest management
- Over-arching goals such as enrichment of forests, poverty reduction and sustainable livelihoods.
- However, in Pakistan - forest –based communities getting marginalized in mainstream development with limited options
 - Now exposed to the worst (Extremism vs State actions)

Socio-economic context:

Widespread poverty

Substantial reliance on remittances from migrant household members.

Strong dependence on natural resources e.g. fuelwood, wild foods, medicinal plants, thatching grass, construction timber etc.

Wild plant products formed an important part of household diet.

Solidarity

The poor are most vulnerable to climate change and least able to protect themselves.

We should consider every human being as a trust of the whole.

The goal of wealth creation should be to make everyone wealthy.

Voluntary giving is more meaningful and effective than forced redistribution.

Human Impacts of Climate Change

- Climate change is a threat multiplier:
- An increase in extreme weather events: floods, droughts, cyclones
- Less winter snowfall, melting glaciers, water shortages
- Changing conditions for agriculture and forestry, shifting fish stocks
- Sea level rise, flooding low-lying areas and islands
- Millions of environmental refugees
- High costs of mitigation and adaptation
- Greatest impact on the poor
- Population & Governance

Large pop. Results in lack of basic freedom, basic needs, food, housings, edn, employment; so they are attracted to violence, civil unrest & extremisms.

Poverty & Terrorism: Is there any link?

- There is strong anecdotal evidence but very little analytical work establishing the link between poverty and terrorism
- Concentration of extremists and religious fanatics against the most deprived districts in Pakistan, also rich in biodiversity
- Hunger (Poverty) kills more people than
- HIV (Aids) + TB + Malaria +++



www.images.google.com

We can choose

- Business as usual in a materialistic society ignoring the future
- Retreating to a fortress world of old values
- Making a transition to sustainability with science and religion in harmony

Environmentalism

- We are running an uncontrolled experiment on the only home we have.
- We can no longer expect to enjoy peace & security, economic growth, & human rights, if we continue to ignore key problems of energy-climate Era:
 - Energy supply & demand, climate change, energy-poverty & biodiversity loss

Friedman, 2008

The health and demographic impact of biomass fuel use: A cross country comparison

- Indoor air pollution and rural like
- Dependence on biomass exacts a heavy price on quality of life and health, especially among rural population, women and children



Indoor air pollution from household fuels in Pakistan because more than 50% still rely on wood to cook their meal

- Use of wild food resources by rural households in Limpopo Province, South Africa (Hansen 1998):

- Wild herbs and vegetables – 92%
- Wild fruit – 81%
- Insects – 77%
- Bushmeat – 32%

- Cultivated food crops (Giannecchini 2000);

- Homestead garden plots – 98%
- Large fields outside of village – 89%

- Animal ownership (Twine et al. 2003)

- Cattle – 34%
- Goats – 56%

Edible WildPlants In Asia

Sales Successes

- Japan
 - 500 Tons per year
- Korea
 - 400 Tons per year
 - Domestic China
 - 3,000 Tons per year

Hurdles

- Existing bureaucratic/political procedures
- Top-down communication channels (still the main vehicle of governance)
- Absence of a pro-poor stance amongst the officials
- Only political will can make it happen

Common Lessons Learnt:

Strategic forest management – Institutional forestry rules changed for involving local communities in decision-making/action

Bettering access of the poor to NTFPs – Poor worse off in absence of forests -crucial to increase their access to such resources

Monitoring food-livelihood security – food-livelihood security implies good forestry **Building social capital** – nurturing local social bonding

Respecting indigenous knowledge – Knowledge/Experience of local communities needs to be respected and integrated into local level decision-making

Endophytic Microbes

“Microbes that live within plants without causing them disease”

- Live in a symbiotic relationship with their host
- Provide phytohormones, acquisition of nutrients and inhibit phytopathogens and pests in return for food and shelter
- Both fungi and Bacteria

Cont.

- These microbes are threatened by extinction with the loss of plant diversity (partly due to climate change) and need to be discovered before they are extinct
- Increased incidence of abiotic and biotic stress due to climate change threatens the yield of major crops
- Endophytes have been shown to impart invasive and stress tolerant properties to their hosts
- Endophytes have immense potential in sustainable agriculture since they provide a cheaper, safer and effective alternate to current practices of crop yield enhancement

Applications of Endophytes

Industrial & Medical

- Antibiotics (Cryptocin, Ecomycins, Ambuic acid)
- Antiviral (Cytonic acids A and B)
- Anticancer (Paclitaxel)
- Immunosuppressant (Subglutinin A and B, Cyclosporine)
- Antioxidants (Pestacin, Isopestacin)
- Anti-diabetic agent (L-783,281)
- Biofuels

Bioremediation

- Phenols
- Chloro-phenols
- MTBE
- TCE
- 2,4-D
- TNT
- BTEX

Plant Health & Protection

- Antimicrobial compound production
- Induced Systemic Resistance (ISR)
- Bio-insecticides (Nodulisporic acids)

Plant Yield & Growth promotion

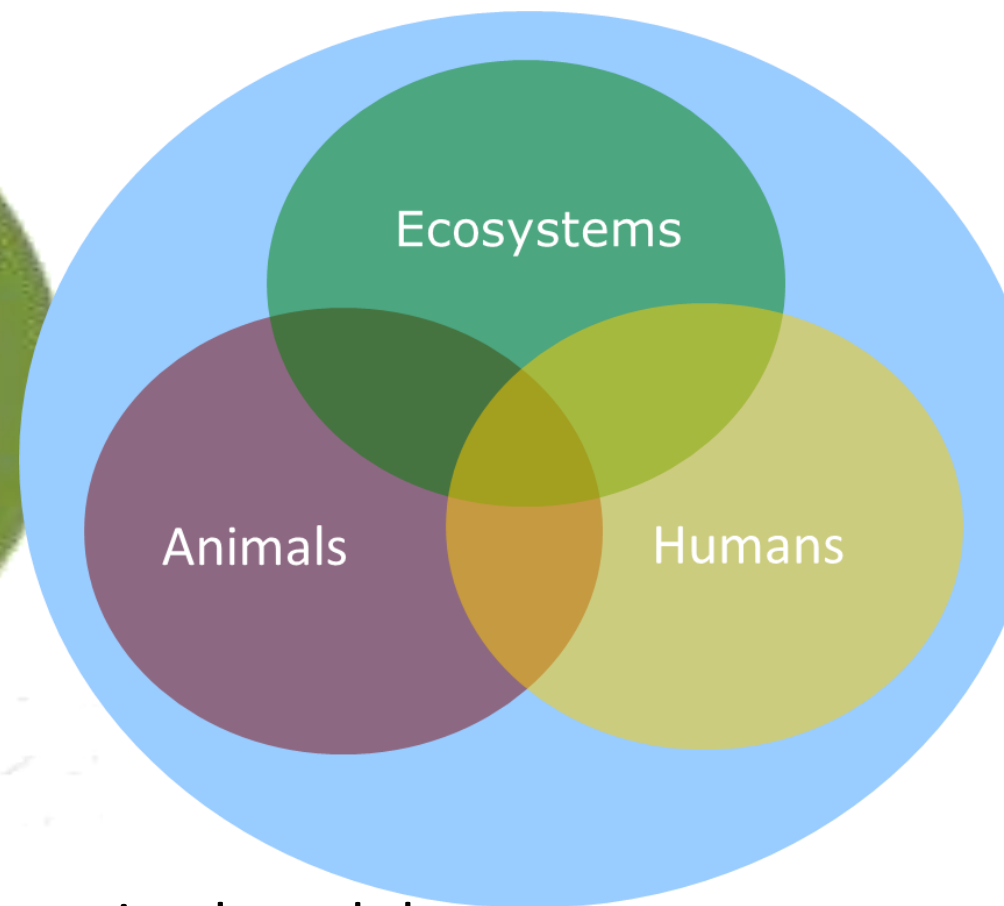
- Growth Hormones (IAA)
- Nitrogen fixation
- P solubilization
- Nutrient availability
- Phyto-stimulation

Mitigating the Climate Change Effects on Food Security – brighter side of the picture

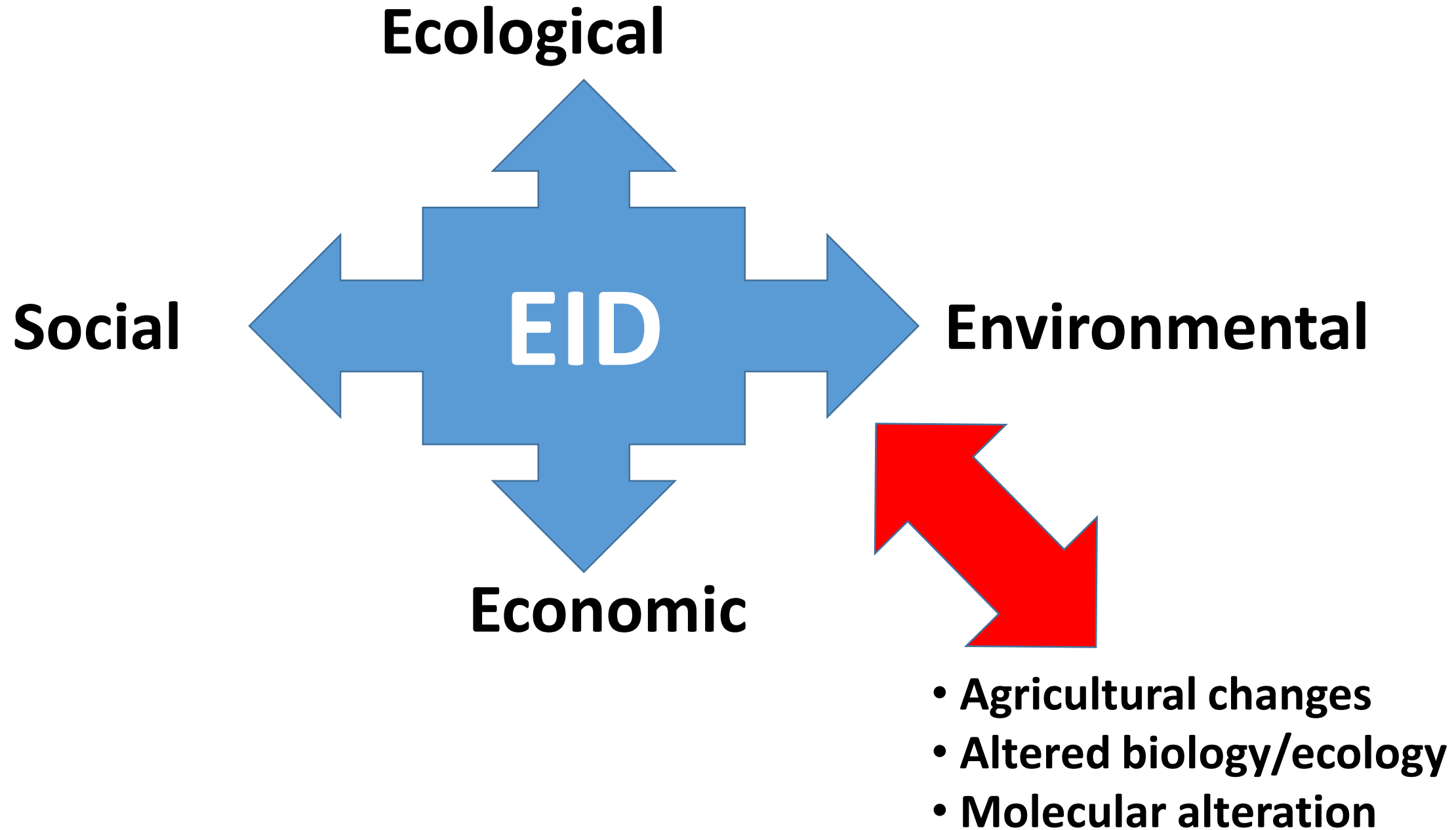
- Green revolution of 1960's , decrease in number of very poor people.
- Unprecedented development of Information Flow (TV, Radio, Internet, Cell Phones etc): Social media activists put pressure on governments for farmer friendly policies.
- **Effective international response:** UN Framework Convention on climate change (UNFCCC), UNDP/Global environment facility, UNEP – **Koyoto protocol (1977), Marakech Accord (2001) – for reducing gas emissions**
- **Climate Smart Agriculture**
 - Increase per unit water, per unit area, per animal head yields under changing environments
- World Bank views a 2nd green revolution in Africa through soil fertility improvement



ONE HEALTH-RATIONALE



One health recognizes that the health of people, animals and the ecosystem of which we are part, are interconnected



A One Health Approach to Preventing the Next Pandemic

- *Instead of waiting for the next deadly microbe to spill over into humans, public health experts and policy-makers must confront the drivers of zoonotic diseases.*
- Some countries has a long tradition of people eating wild animals and using them in traditional medicines—practices that likely [increase the transmission risks](#) of microbes from animals to humans, causing what are called zoonotic diseases.
- A new coronavirus was [posted on December 30, 2019](#), of the first patient with the unexplained pneumonia had reportedly visited a wholesale seafood market in Wuhan, the largest live animal market in central China. The symptoms of these early patients suggested a coronavirus, a family of viruses that cause respiratory tract illnesses, including the common cold.
- Earlier a disease caused by a coronavirus, severe acute respiratory syndrome (SARS), which also originated in a live animal market in China. A chef who regularly cooked with exotic animals was one of the earliest persons to be diagnosed with SARS.
- Genomic studies suggest that *Rhinolophus affinis* (Chinese horseshoe) bats are the reservoir host species for the [SARS](#) and [COVID-19](#) viruses. It appears that these coronaviruses spread to people through intermediate animal hosts. In the case of SARS, civet cats were the intermediate hosts. Pangolins, which are scaly anteaters, may be the intermediate hosts for the new coronavirus, named SARS-CoV-2. Highly coveted for food and traditional medicines, pangolins are the most heavily trafficked mammal in the world.
- [Middle East respiratory syndrome \(MERS\)](#) another example originated through bats, and camels serving as intermediate hosts [endemic to camels](#) a mortality rate [estimated at nearly 35%](#), .

<https://issues.org/one-health-approach-preventing-pandemic/#.Xrf-lvKZ5jp.mailto>

A One Health Approach to Preventing the Next Pandemic

- The [One Health Initiative](#) focuses on these goals.
- Two billion people around the world [eat insects](#). “insects-of-the sea,” [lobsters were once viewed as vermin](#) and fed to prisoners.
- The world’s population of nearly 8 billion people maintains roughly 30 billion food animals. People and their domesticated animals produce an estimated [4 trillion kilograms of fecal matter](#) each year, with animals accounting for about 80% of it. Making matters worse, antibiotic use in intensive animal farming [gives rise to antibiotic-resistant bacteria](#), which also pose a major public health challenge.
- *The problem with banning wildlife trade is that it goes underground as long as demand remains, making surveillance and control of zoonotic pathogens even more difficult.*
- We live in a microbial world. We inhale microbes. We eat microbes. The sooner we figure out how to meet our nutritional needs while preventing deadly zoonotic microbes from infecting us, the better off we’ll be.

Recommendations

International debate: Access and Benefit sharing

Need for a balance

ownership, equity and benefit sharing unresolved issues

The Convention on Biological Diversity (CBD) Article 8(j) assigns ownership of biodiversity to indigenous communities and individuals and asserts their right to protect this knowledge.

- The vast majority of plant genetic resources and other forms of biodiversity are found in - or originate from - developing countries
- Need to find a balance between:
 - **Developed countries' needs to access biodiversity resources**
 - **Developing countries seek to ensure that access is regulated so as to ensure fair and equitable sharing of benefits, including through transfer of technology and finance**

SIX URGENT ACTIONS FOR THE HINDU KUSH HIMALAYA



Vaccinate in biodiversity hotspots to protect people and wildlife from each other

- Rural areas of low-to-middle-income countries host most biodiversity hotspots, where interactions between people and wildlife are frequent.
- Given the broad potential range of hosts for SARS-CoV-2, vaccinating often-neglected populations around protected areas will reduce the risk of people infecting wildlife and creating secondary reservoirs of disease, and thence risking potential reinfection of humans with new variants. **This should be considered after vaccination of priority groups, such as older people and health workers.**
- Vaccinating people who live near felids, non-human primates, bats and other animals protects wildlife and limits ‘reverse spillovers’. Such events have been documented for various human respiratory viruses, for instance in wild great apes in west Africa ([S. Köndgen et al. Curr. Biol. 18, 260–264; 2008](#)).
- Non-standard actors, such as national park authorities or conservation organizations, could help vaccination to reach remote regions. This is called a One Health approach: it protects the health of people, animals and the environment.

Mitigation Measures

**Clean Energy: hydro,
solar, wind, nuclear,
geothermal combined**

**Carbon Capture,
sequestration,
storage**

**Afforestation
Reforestation**

**Energy efficient &
eco-friendly
buildings**

**Improvement in
Waste management**

**Envior friendly
Agr & Efficient
Irrigation**

**Land-use change
and management**

Geo-engineering

Life style changes

Recommendations:

Hope lessons from this crisis only inform decision-makers how to better prepare for the next pandemic—rather than enhancing risk processes, capabilities and culture—the world will be again planning for the last crisis rather than anticipating the next.

- ✓ The policy makers:
 - ✓ (1) formulating analytical frameworks that take a holistic and systems-based view of risk impacts; (2) investing in high-profile “risk champions” to encourage national leadership and international co-operation;
 - ✓ (3) improving risk communications and combating misinformation; and
 - ✓ (4) exploring new forms of public-private partnership on risk preparedness.

António Guterres (March 19, 2021) @antonioguterres

- If you don't feed people, you feed conflict.
- The world is facing multiple conflicts, driven by famine, and worsened by [#COVID19](#) & the climate crisis.
- We have a responsibility to do everything in our power to end violence & alleviate the suffering of millions of people.

BIODIVERSITY AND INTELLECTUAL PROPERTY RIGHTS (IPRs)

Bushra Mirza
Vice Chancellor, Lahore College for Women University
Lahore-Pakistan



Dr. Bushra Mirza obtained both of her M. Sc and M. Phil degrees with distinction from Quaid-i-Azam University. After completing her Ph. D from the University of Cambridge, on Cambridge Commonwealth Scholarship, she did a short post-doc from the University of North Carolina, USA. She remained a regular faculty member of Quaid-i-Azam University since 1999 till 2019 when she joined Lahore College Women University as Vice Chancellor. During this period, she has been working on several research projects. She pioneered the establishment of research laboratory to produce transgenic plants, in Quaid-i-Azam University. Her research interests include evaluation of biodiversity and medicinal activity of various plants and their genetic

transformation for improvement. She has also been involved in analysing medicinal activities of newly synthesized compounds.

Twenty five PhD and 133 M. Phil students have completed their research work successfully under her supervision. She has published more than 200 papers in the refereed journals of international repute with total impact factor and citation more than 300 and 2000 respectively. Apart from lab work, she has been interested in the bioethical aspect of Biotechnology as well and has been working at various levels in this regard. In 2001, she represented Pakistan at Salzberg Seminar “Biotechnology: Legal, ethical and moral issues” held at Salzburg, Austria. As a consequence of that seminar, she contributed to a book entitled “Cross Cultural Biotechnology” published by Rowman & Littlefield Publishers, Inc. Maryland, USA in 2004.

In 2013, she was awarded an honorary position of ICESCO Women Science Chair. In this regard she has organized several events especially for the female scientists working in OIC countries. In 2017 she participated in the joint meeting of presidents of ICESCO Women Science Chairs at ICESCO’s Headquarters, Rabat, to develop a roadmap for promotion of science and technology by focusing on contribution of females in the region. Furthermore, she has been involved in volunteer work as well in different capacities. She has been coordinating at national level for High School Summer Science Research Program aimed to help high school students develop research aptitude. Besides, she is a member of several international forums like UNESCO-IFAP National Committee, Global Biodiversity & Health Big Data Alliance and executive member of the National Chapter of the Organization of Women Scientists of Developing World (OWSD).

As recognition of her research achievements, she was awarded Best Young Research Scholar Award (2006) by Higher Education Commission, Pakistan, gold medal for Biochemistry in the Year 2008 by Pakistan Academy of Sciences and Prof. A. R. Shakoori Gold Medal by the Zoology Society of Pakistan in 2010. Best Research Paper Award, by Higher Education Commission and Presidential Award Tamgha-i-Imtiaz in 2017.

ABSTRACT

Access and Benefit Sharing (ABS) System provisions of the Nagoya Protocol (Articles 5 and 6) and the Convention on Biological Diversity (Articles 15, 16 and 19) is the notion, that states have sovereign rights over their own biological resources. Access to genetic resources by users must therefore be based on *prior informed consent* (PIC) and equitable benefit sharing must occur on *mutually agreed terms* (MAT) and CBD. The over-arching aim of the access and benefit-sharing (ABS) of genetic resources is to enable fair distribution of benefits between the users (such as universities and biotech companies) and providers (such as biodiversity rich countries) so as to both open the doors for innovation and create incentives for biodiversity conservation. Access to genetic resources is crucial for research related to conservation of plant genetic resources as well as R&D for agricultural products and evolved crops that can attain to the new weather conditions climate change brings. Therefore, access to genetic resources in general as well as benefit-sharing from that access is a key element for sustainable development in order to secure research as well as environmental sustainability and resource availability. Pakistan is signatory to both Convention on Biological Diversity and Nagoya Protocol. Therefore, it's necessary to sensitize/train relevant regulators and the Pakistani scientists regarding exchange of such genetic resources with foreign collaborators/institutions to avoid any unpleasant situation.

IMPACT OF CLIMATE CHANGE AND HUMAN ACTIVITIES ON THE BIODIVERSITY OF SOME ATLANTIC COASTAL ECOSYSTEMS IN MOROCCO

Omar Assobhei

*Resident Member of Hassan II Academy of Sciences and Techniques
Morocco*



Dr Omar Assobhei is Professor of Higher Education at Sidi Mohamed Ben Abdellah University of Fez, holds a PhD from the University of Lorraine (Nancy I, France) in 1988 and a “Doctorat d’Etat” from Chouaib Doukkali University (El Jadida, Morocco) in 1995.

Professor Omar Assobhei is a resident member of the Hassan II Academy of Sciences and Techniques of Morocco. He is former President of Sidi Mohamed Ben Abdellah University of Fez (2013-2018). He was a member of the Higher Council for Education, Training and Scientific Research (2014-2018). Prof. Assobhei is co-founder and was national coordinator of the “National Network of Marine Sciences and Techniques” (1996-2014), a program which includes more than 40 laboratories and over 300 researchers from all Morocco. He was co-holder of the UNESCO Chair for Research and Training in Marine Sciences (1995-2008).

In 2010, Professor Assobhei signed in Telde (Gran Canaria) the act of creation of the Atlantic marine observatory Morocco-Canaries. Which is created in the frame of the Project OMARAT funded by European Union through its financial instrument FEDER (program POCTEFEX). Since 2003, he represents Morocco in the AFRIMAR Network for sustainable development of marine resources and was a focal point of IODE/IOC. He has also been involved in many European projects such as MOROCOMP, MEDAWARE, WasteSUM and OMARAT either as head of project or as scientific coordinator.

The research work of Prof. Assobhei focuses on marine pollution and marine biotechnology. Dr. Assobhei has authored more than 140 peer-reviewed research papers and scientific communications, scientific reports, books and is an editorial member of several international scientific journals and publications.

ABSTRACT

Based upon current scientific evidence, emissions of greenhouse gases from human activities are projected to cause significant global climate change during the 21st century. Such climate change will create novel challenges for coastal and marine ecosystems that are already stressed from human development, land-use change, environmental pollution, and over-fishing.

Coastal ecosystems such as wetlands, estuaries, and coral reefs are particularly vulnerable to climate change. Such ecosystems are among the most biologically productive environments in the world. Their existence at the interface between the terrestrial and marine environment exposes them to a wide variety of human and natural stressors. The added burden of climate change may further degrade these valuable ecosystems, threatening their ecological sustainability and the flow of goods and services they provide to human populations.

In Morocco, as everywhere in the world, human population densities are increasing along the coastal areas. This result in a continuous and rapid acceleration of the use of these areas and increased pressure on ecosystems and species they contain. The marine pollution from land-based sources, navigation,

introduction of invasive species, overfishing, degradation, fragmentation and habitat loss are the factors responsible for the erosion of marine biodiversity.

The Atlantic coastal ecosystems in Morocco contain a great diversity of habitats and high biodiversity. Despite this richness, they are a coastal area where conflicts of interests are exacerbated and where human pressures are high mainly because of an industrial coastal development. Through various examples from recent literature, we will examine the main causes affecting marine biodiversity in Atlantic coastal ecosystems in Morocco. The serious dangers posed by the loss of biodiversity for the ecological balance of the marine environment and the well-being of humanity will also be addressed, as well as the need to take biodiversity into account in the conduct of human activities.

Keywords: climate change, biodiversity, marine ecosystem, humane activities.

Impact of climate change and human activities on the biodiversity of some Atlantic coastal ecosystems in Morocco.

Prof. Omar ASSOBEI

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Plan

1. Importance of marine ecosystems

2. Climate Change

1. Global warming
2. Acidification
3. Sea level rise
4. Coastal ecosystems vulnerabilities

3. Moroccan marine ecosystems

1. Moroccan coastal ecosystems
2. Atlantique coast
3. Mediterranean coast
4. Lagoons

4. Coastal ecosystems: lagoons

1. Marchica lagoon
2. Oualidia lagoon

5. Conservation of marine biodiversity in Morocco

1.Importance of marine ecosystems

Benefits of marine ecosystems

- Recreational opportunities
- Key nursery habitats
- Clean water
- Nutrient recycling
- Carbon sink
- Sustainable fisheries
- Rich biodiversity underpinning resilience

1- Marine ecosystems: some meaningful numbers

- Earth is an ocean planet: 70% of it is covered by the sea
- Projected Coastal population by 2025 : 6 billion
- 61% of the world's total economic output comes from areas within 100 kilometers from the coast
- Marine tourism, marine fisheries, and aquaculture are estimated to provide global economic benefits worth \$161 billion, \$80 billion and \$57 billion, respectively
- Marine pollution originating from land based sources: 80%
- The largest reservoir of atmospheric CO₂ emissions
 - Contains 50 times the amount of carbon in the atmosphere and 10 times more carbon than is held by soil and plants
 - **CO₂ uptake has not been without negative consequences**

Threats to the ocean and coastal resources

Climate change impacts

- Ocean warming
- Acidification
- Sea-level rise

Coastal ecosystems will be affected by a number of consequences of climate change

2. Climate Change

Global Warming

- CO₂ level prior to industrial revolution: 280 ppm
- Current day: 387 ppm
 - “Greenhouse” effect
 - caused global surface temperatures to rise approximately 0.5°C in the past 50 years
- By 2100, CO₂ levels to double pre-industrial revolution
 - Loss of environmental biodiversity,
 - Favors invasive species
 - disrupt ecosystem processes,
 - reduce ecological goods and services

Ocean Acidification

- The increase in acidity in the surface waters of the ocean is a consequence of the ocean uptake of anthropogenic CO_2 from the atmosphere.
- Historically: pH of 8.2
- Since early 1900s, pH drop by 0.1 units, estimate a drop in seawater pH by 0.5 units by 2100
- CO_2 reacts with water to form carbonic acid (H_2CO_3)
 - Increases carbonate (HCO_3^-) and H^+ in the ocean surface water (reducing pH), and decreases bicarbonate (CO_3^{2-}).

Sea-Level Rise

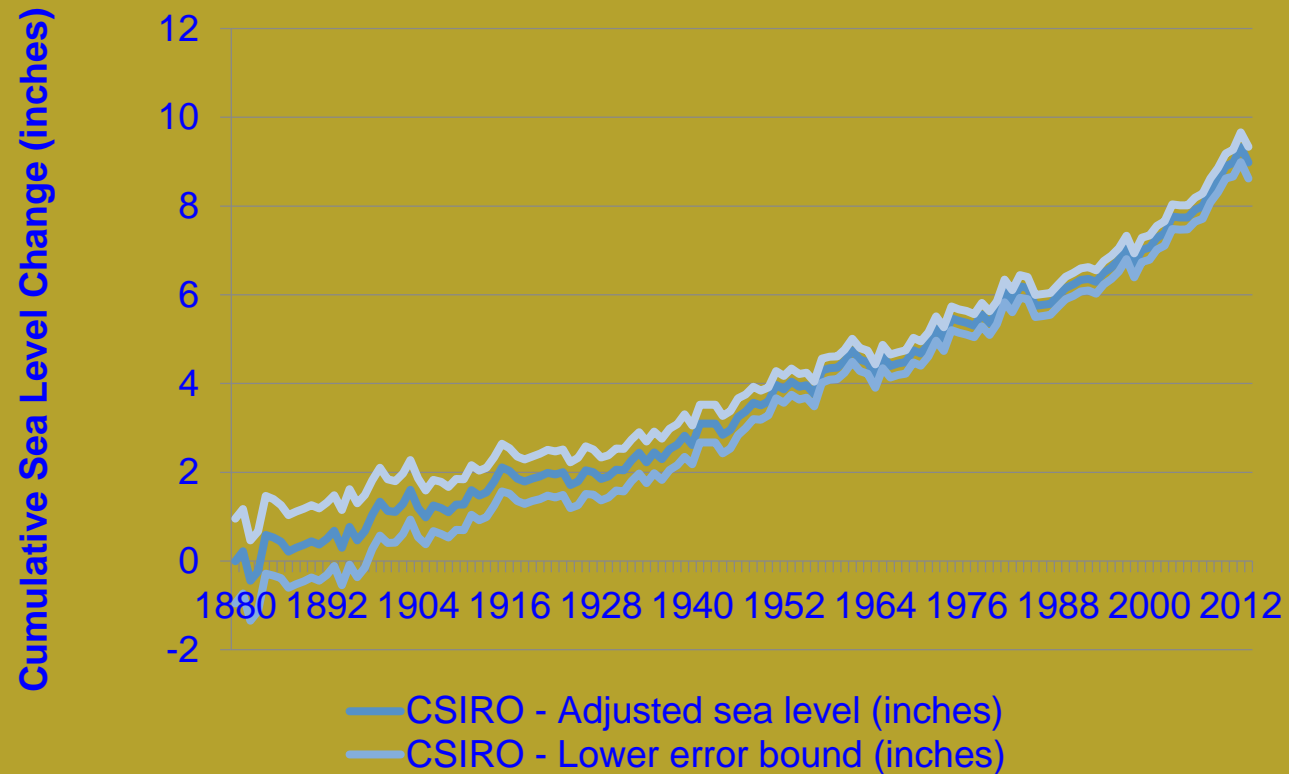


Figure: Sea-Level Rise, 1880–2012

Source: IPCC, 2014a

Projected global average Sea Level Rise at the end of 21st Century

- There is a growing consensus in the science community that SLR at the upper end of the IPCC estimates is plausible by the end of this century, and that a rise of more than **1.0 meter and as high as 1.5 meters** cannot be ruled out.
- SLR will not stabilize by 2100. Regardless of reductions in greenhouse gas emissions, sea level will continue to rise for centuries; an eventual rise of several meters is possible.

Coastal ecosystems vulnerabilities

- Loss of resources and disappearance of cultural values
- Increased sea surface temperatures
- Saline intrusion into freshwater aquifers
- Increased coastal erosion and loss of coastal habitats
- Damage to coastal infrastructure
- Increased risk of loss of life
- Increased loss of land Increased risk of disease
- Increased risk of loss of life
- Loss of resources and disappearance of cultural values

3. Moroccan marine ecosystems

Importance of marine ecosystems in Morocco

- Marine area under Moroccan sovereignty is more than: 1 Million Km²
- 60% of Moroccans live in coastal area;
- Coastline : 3500 Km
- Strait of Gibraltar (transfer of water masses between the Mediterranean Sea and the Atlantic Ocean);
- Coastal upwelling (biological productivity and biodiversity)
- Huge ecosystems under marine influence: lagoons, beaches, estuaries, bays, etc.
 - national heritage of great socio-economic ecological interests. □
 - protection and preservation for future generations.
- Maritime space: 61% of the urban population, 80% of industries, 53% of tourist capacity, 92% of maritime traffic, the densest infrastructure and communication networks, etc..

Biodiversity in Morocco

- Morocco is home to a rich and diverse marine and coastal ecosystems.
- In general, Morocco's marine biodiversity remains subject to the threats of climate change and to great pressure from human activities on the coast and at sea, which currently constitute the main threat to this natural heritage.
- All these activities of natural or anthropogenic origin, have contributed to the extinction of many species and the depletion of many others.
- Morocco's marine fauna numbers around 270 species considered endangered, including corals, fish, molluscs and crustaceans.
- Note that more than half of the wetlands in Morocco have disappeared since the beginning of the 20th century, according to the Moroccan Alliance for Climate and Sustainable Development .

4. Coastal ecosystems: lagoons

Moroccan coastal ecosystems: lagoons

- Coastal Lagoons are among the most productive marine ecosystems; however, they remain fragile and are often exposed to multiple natural and anthropogenic constraints.
- Lagoons are highly productive areas that are located in the transitional areas at the land–ocean boundary.
- These areas have become important because they provide the key to understanding the general dynamics of the seas they are connected with.



The Moroccan coast is home to many lagoons and merjas, the most important of which are:

- Lagoon of Restinga-Smir.
- **Lagoon of Marchica,**
- Moulay Bousselham lagoon,
- Merja de Sidi Boughaba,
- **Oualidia lagoon,**
- Khnifiss lagoon,
- Dakhla bay

Marchica lagoon

- Nador lagoon or Sebkhath Bou Areg
- one of the most important lagoons in the Mediterranean Sea.
- Site of Biological and Ecological Interest (SIBE) and RAMSAR site since 2005.

Oualidia lagoon

- Oualidia –Sidi Moussa Lagoon
- the most important lagoon in Atlantic coast
- The largest coastal wetlands in Morocco.
- Site of Biological and Ecological Interest (SIBE) and RAMSAR site since 2005. .

Marchica lagoon

- Rich in its natural and ecological potential, with an area of 115 km²
- It is separated from the Mediterranean sea by a fragile dune of 25 km long.



Marchica lagoon - Nador lagoon - Sebkhate Bou Areg

Particulars of the Marchica lagoon biodiversity

- The Marchica lagoon is a site of Biological Interest SIBE and a RAMSAR site since 2005. The main characteristics of the site:
- High diversity of habitats for flora and fauna
- The only Moroccan site with some seriously endangered marine species
 - Posidonia: *Posidonia oceanica* is endemic to the Mediterranean
 - Grande nacre *Pinna nobilis* is a bivalve shell from the Mediterranean. It is one of the largest seashells in the world



Grande nacre *Pinna nobilis*



Aquatic plante *Posidonia oceanica*

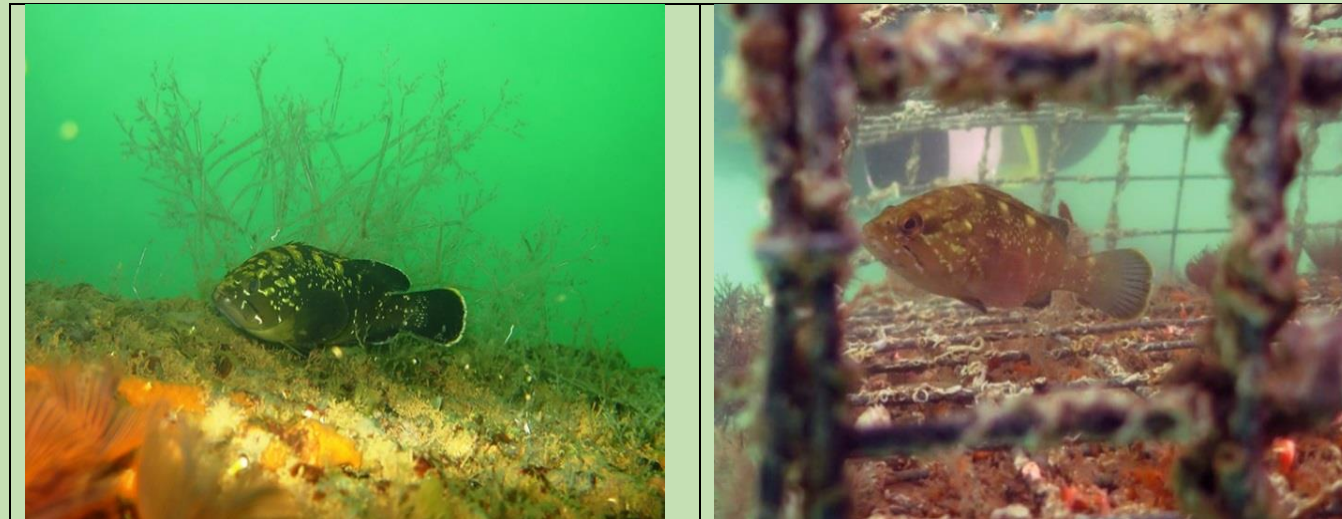
Particulars of the Marchica lagoon biodiversity

- The lagoon contains a large number (24) of **species of socio-economic value**, including three introduced species.



Bursatella leachii specie of **invasive gastropod** in Marchica

- The **rare species** are all Bivalve Molluscs (Flat oyster *Ostrea edulis*, Praires *Venus gallina* and *Venus verrucosa*).

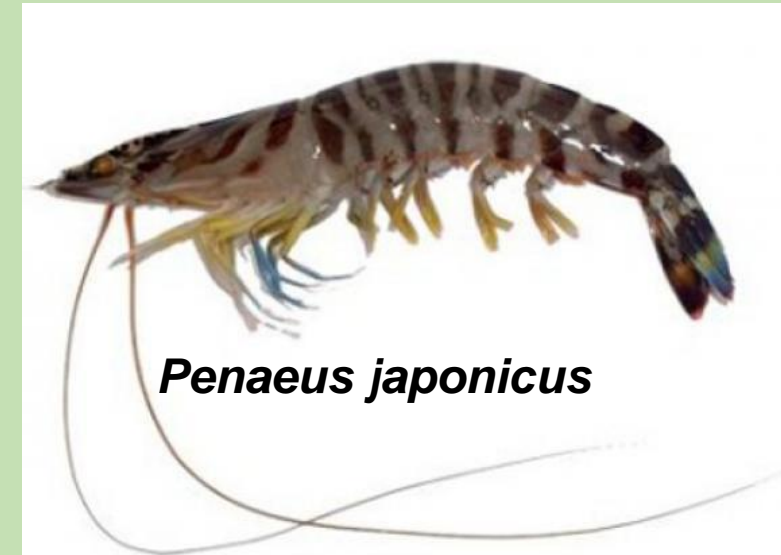


Le Mérrou brun *Epinephelus marginatus*, espèce emblématique de Méditerranée qui a élu domicile dans les biohuts installés dans la lagune de la Marchica

Particulars of the Marchica lagoon biodiversity

Aquatic fauna of socio-economic interest at least:

- 13 Fish (Bars, Sars, Dorades, Pageot, Sole, Marbré, Eel),
- 2 Crustaceans (*Penaeus keraturus* and *Penaeus japonicus*).
- 6 Bivalves (Oyster, Mussel, Lithophaga, Grande nacre, Clam, ***Solen***)
- 9 Molluscs
- 2 Cephalopods (Octopus and Cuttlefish).



Penaeus japonicus

Particulars of the Marchica lagoon biodiversity

The population of Birds is relatively diverse:

- a wide variety of Terns.
- globally **semi-threatened species** (Audouin's Gull) gives this lagoon international importance.
- About sixteen **species of national interest** (rare or threatened across Morocco). They are:
 - 3 nesting species (*Ardeola ralloides*, *Sterna albifrons* and *Recurvirostra avosetta*), the first being considered threatened in the country;
 - 13 wintering and / or migratory species, 6 of which are well represented in the lagoon (*Phoenicopterus ruber*, *Sterna caspia*, *Sterna maxima*, *Sterna bengalensis*, *Gelochelidon nilotica* and *Sterna hirundo*).



Goéland d'Audouin : *Ichthyaetus audouinii*



Les flamands roses lagune de Marchica
(Ph. Marchica Med)

Particulars of the Marchica lagoon biodiversity

- The flora of the site has around thirty species, including **three interesting species**:
 - *Limonium cymuliferum*, **very rare in Morocco** and fairly well represented on the site;
 - *Atriplex semibacata* and *Limoniastrum monopetalum*, **rare in the country** and with very restricted distribution in the site;
 - *Cymodocea nodosa*, **vulnerable in Morocco** and very localized in SIBE.
- The invertebrates and fishes: the site present a remarkable specific richness which already gives this site a great ecological interest.

Particulars of the Marchica lagoon biodiversity

- **Aquatic fauna of socio-economic interest** includes at least:
 - 13 Fish (seabass, Sars, Gilthead, red sea bream, tongue-fish, Sand steenbras, Eel),
 - 9 Molluscs: the **rare species are all Bivalve** (*Ostrea edulis*, *Venus gallina* and *Venus verrucosa*); they are very localized in the lagoon.
 - 6 Bivalves (Oyster, Mussel, Lithophaga, fan shell bivalve, Clam, *Solen*)
 - 2 Cephalopods (Octopus and Cuttlefish).
 - 2 Crustaceans (*Penaeus keraturus* and *Penaeus japonicus*).
- Amphibians, Reptiles and Mammals did not show any rare or remarkable taxa in the wet habitats of the site.

Environmental characteristics of the Marchica lagoon

- The Marchica lagoon is an example of a vulnerable coastal area:
 - **undergoing socio-economic change**
 - **suffering the imperceptible effects of climate change.**
- The strong urbanization experienced by its shore has generated disturbances of various kinds (pollution by urban and industrial wastewaters and solid waste, loss of habitat, etc.)
 - ➔ **negative repercussions on ecological values, functions and services**

Environmental characteristics of the Marchica lagoon

The Marchica lagoon has been classified as a **Mediterranean pollution hotspot** by the Mediterranean Action Plan. The main sources of pollution are related to:

- Malfunctions of the collection and treatment system for wastewaters and solid waste in the watershed;
- Pollution of agricultural origin (herbicides, pesticides, nitrogen and phosphate inputs, significant sedimentation linked to soil degradation, etc.);
- Pollution linked to industrial and port activities (in particular by heavy metals).

Development and enhancement project for the Marchica Lagoon site

- Considerable touristic, urbanistic and ecological project. It will contribute to the promotion of the economic and social development of the region through:
 - the creation of **richness**,
 - the promotion of **employment** and
 - the **protection of the natural resources and biodiversity** of the lagoon.
- The project meets the Kingdom's commitments in terms of sustainable development and respect for the environment. It is a **sustainable spatial planning project** built around seven thematic cities for an amount of approximately \$ 2.6 billion.



Lagune de Marchica : SM le Roi préside la cérémonie de présentation du plan d'aménagement spécial (3 décembre 2012)

Development and enhancement project for the Marchica Lagoon site

Environmental rehabilitation of the lagoon

- Decontamination of the Marchica lagoon.
 - Construction of a Grand Nador **wastewater treatment plant**;
 - Organization of a **solid waste collection**, transport and storage service;
 - **Rehabilitation of the old landfill** and construction of a **new storage center**.
- Planting and landscaping;
- **Bird park**.

Development and enhancement project for the Marchica Lagoon site

Opening a new pass lagoon - sea

- The first phase of the project consisted in the opening of a passage one kilometer long and 300 meters wide.

The opening of a new pass, allowed the resourcing, the regeneration of the marine environment, and thus the gradual restoration of the marine ecosystem.



Development and enhancement project for the Marchica Lagoon site

Nouveau parc ornithologique

- Morocco has staked everything on ecological tourism to upgrade the Nador region. The Marchica site has the largest ornithological park in the southern Mediterranean.
- The ornithological observatory could attract nearly 150,000 visitors per year when migrating birds return to the lagoon.
- On the strength of its expertise in sustainable spatial planning, the Marchica Med Agency has been approached by other African countries such as Mali, Niger and Madagascar.



Development and enhancement project for the Marchica Lagoon site

Nouveau parc ornithologique

- The Marchica Lagoon has more than 100 species of migratory and nesting birds.
- The Marchica-Med agency is working on the establishment of the largest ornithological park in Morocco.
- Morocco aims to create the **largest ornithological park in the southern Mediterranean**



Development and enhancement project for the Marchica Lagoon site

Un parc «pédagogique et scientifique»

- Carried out on 74 hectares, with 10 km of paths around the lagoon of Marchica.
- To promote ecological tourism, an "educational and scientific" park project intended to be educational and scientific
- The park has a capacity to welcome 150,000 visitors per year.

Observatoire de la Lagune de Marchica

Oualidia lagoon

- The Oualidia lagoon is one of the **largest coastal wetlands** of great ecologic, economic and touristic importance in Morocco.
- Mainly in relation to its **ornithological importance**, it was classified as a SIBE and was registered as a RAMSAR site (International convention of wetlands conservation) since 2005.
- The Oualidia lagoon **provides important ecosystem services**, such as fishing, aquaculture, tourism and high biological and ecological productivity.



Biodiversity of Oualidia Lagoon

- This site of international value is a migratory stopover and winter refuge appreciated by various shore bird species.
- It is also a refuge of several species such as turtles and lizards.
- Presence of two algae which only exist in Morocco in the lagoons of Oualidia and Sidi Moussa: *Fucus lutarius* and *Fucus axillaris*
- Amphibians and Reptiles:
 - 19 species are known, including 4 endemic to Morocco.
 - The endemic Varaldi Pelobate here reaches its southern limit of distribution.

Biodiversity of Oualidia Lagoon

- Remarkable avifauna:
 - wintering of nearly 10,000 waders, between 3 and 5,500 Anatidae, several hundred Audouin's Gulls, several hundred Pink Flamingos or Curlews, several white stork nests, often along the road.
 - Reproduction of numerous pairs of White Stilts, Little Terns, Ring-necked Plover and Collared Pratincole in the salt flats
- Local residents exploit mussels (*Perna perna* and *Mytilus galloprovincialis*) fixed on the rocks and reef flats and collect clams (*Ruditapes decussatus*).

The Oualidia wetland is highly threatened

- The lagoon of Oualidia is experiencing a malfunction related to confinement, climate change, pollution by metals and land cover.
- Local land use can lead to vegetation damage, soil, water and land degradation.
- The anthropogenic pollution may restrict the potential of the lagoons for shellfish farming and harvesting because of the sanitary risk presented by the consumption of these contaminated shellfish:
- Many studies showed the prevalence of enteroviruses, Hepatitis A Virus RNA, *Escherichia coli* in waters, oysters or sediment collected from Oualidia lagoon



Domestic pollution



The Oualidia wetland is being destroyed. A drainage channel is being dug towards the Atlantic Ocean.



Agricultural pollution

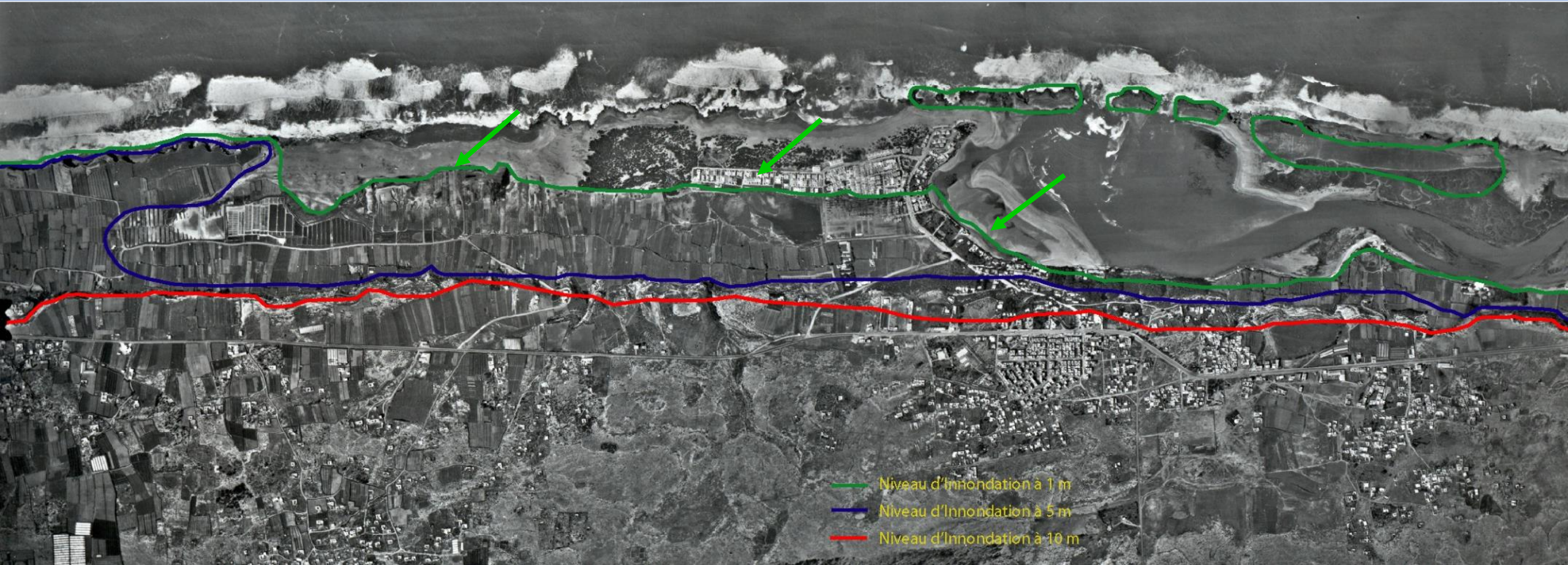


Frequent ban on the harvesting and marketing of oysters from the Oualidia lagoon breeding site.



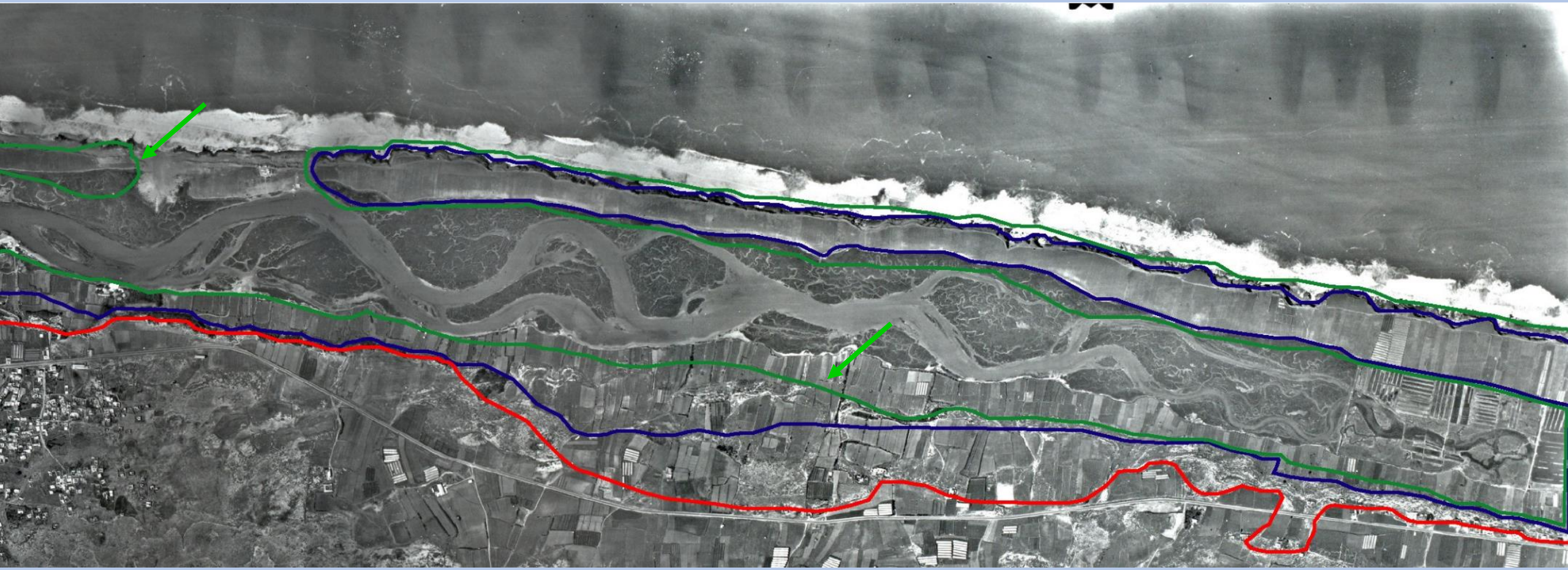
Unexplained mortalities among migratory birds

Oualidia Lagoon threatened by Sea Level Rise: risk of devastation



Future of the Oualidia Sénarios lagoon 1m - 5m - 10m

Oualidia Lagoon threatened by Sea Level Rise: risk of devastation



Future of the Oualidia S narios lagoon 1m - 5m - 10m

"Sustainable land use planning" in Oualidia Lagoon



His Majesty the King presides over the signing ceremony of the Convention on the upgrading of Oualidia and the preservation of its lagoon

"Sustainable land use planning" in Oualidia Lagoon

- Construction of wastewater treatment plant in the city of Oualidia (Cost: 4M Dollars)
- His Majesty King Mohammed VI chaired in 2010 in Oualidia a signing ceremony of the Convention on the upgrading of the region and the preservation of its lagoon.
- The lagoon had suffered a great deterioration of its sanitary conditions, which resulted in the ban on oyster farming.
- In 2014, Resumption of oyster farming activity in the Oualidia lagoon after an improvement in the circulation of water masses in the lagoon and a stabilization of the sanitary and microbiological state and the re-establishment of sanitary conditions

"Sustainable land use planning" in Oualidia Lagoon

- A rehabilitation plan for the Oualidia lagoon was launched in April 2010. This integrated action plan covers the measures necessary for the conservation, management and preservation of the lagoon.
- The plan made it possible to carry out
 - the installation of a settling Pond in the Oualidia Lagoon,
 - the construction a wastewater treatment station,
 - the construction of the sewerage network and the connections to the network,
 - the diversion of the rainwaters collector
 - reorganization of the grazing activity.



5. Conservation of marine biodiversity in Morocco

Conservation of marine biodiversity in Morocco

- Measures are needed to maintain the **resilience of ecosystems** so that they can continue to supply essential services
- Create marine protected areas
- Protected area management will need to be adapted, to address mitigation and adaptation needs, in addition to biodiversity management objectives.
- Encourage the application of ecosystem approaches
- Promote integrated coastal and ocean management
- Implement the action program for the protection of the marine environment against land-based activities

Conservation of marine biodiversity in Morocco

- Actions to conserve marine and coastal biodiversity in Morocco fall within the framework of the guidelines and recommendations of the conventions below:
 - United Nations Convention on the Law of the Sea
 - International Union for the Conservation of Nature (IUCN)
 - Ramsar Convention,
 - Barcelona Convention of 1976, amended in 1995,....

Sources

- *Zourarah et coll. (Faculté des Sciences d'El Jadida)*
- *El Moumni et coll. (Faculté des Sciences et Techniques de Tanger)*
- *Ait Fora et coll. (Faculté des Sciences Kénitra)*
- *Robin et coll. (Université de Nantes LETG)*
- *Mhamdi Alaoui A., Zourarah B., Carruesco C., Griboulard R., El Moumni B., Maanan M, Benmohammadi A (2006) : Evolution morpho dynamique de la zone des passes de Moulay Bousselham (Maroc) :. Les environnements côtiers VANNES Golfe du Morbihan. 6/7 Septembre 2006*
- *Niazi S. & Snoussi M. 2005. Evaluation des risques d'inondation dus a une élévation accelerando du niveau de la mer sur le littoral de Tétouan, Méditerranée Occidentale Marocaine. Troisièmes Journées Internationales des Géosciences de l'Environnement. El Jadida les 8 - 10 juin 2005*
- *Agoumi A.. Etudes de vulnérabilité de trois pays du Maghreb (Algérie, Maroc, Tunisie) face aux changements climatiques réalisées dans le cadre du projet PNUD-FEM RAB94G31 : 2000–2001*
- *Projet PNUE «Evaluation de l'Impact et de l'Adaptation aux Changements Climatiques (AIACC) dans les zones côtières du Maroc »*

NOTE: EARTH'S BIODIVERSITY AND ITS FRAGILITY

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The Earth's biodiversity represents its matrix of life in diverse forms of plants, bacteria, animals and human beings. Throughout the history these different components have managed to live in a shared harmony of mutual survival such as the pollination of flowers of different plants by different insects such as bees, converting the carbon dioxide CO₂ breathed out by different species into Oxygen necessary for life, purifying fresh water - the basic element for life, through differential filtration by different organic structures and subjected to sun shine, particularly, the UV part of solar spectrum. Furthermore, the appropriate chemical properties of some species helped the matrix of life to confront the other species that transmit different diseases that prosper as a function of atmospheric conditions.

Some of Nature's strong accidents on Earth have been caused by the events such as long-lasting volcanic eruptions spewing out highly toxic gases and dust or crashing into Earth of a huge meteor/asteroid creating a huge shock wave sending a vast amount vaporized rock in the atmosphere and blocking the Sun and creating a winter that could have lasted for decades leading to a strongly disturbed climatic dynamics which affected the existence of the Earth's biodiversity. However, CO₂ as a strong greenhouse gas and produced hugely by an intense and long-lasting volcanic activity has played a determining role in the creation of biodiversity extinction and over the last 500 million years triggered 9 extinction events with its atmospheric concentrations varying from 1000 ppm to 4000 ppm (Fig.1).

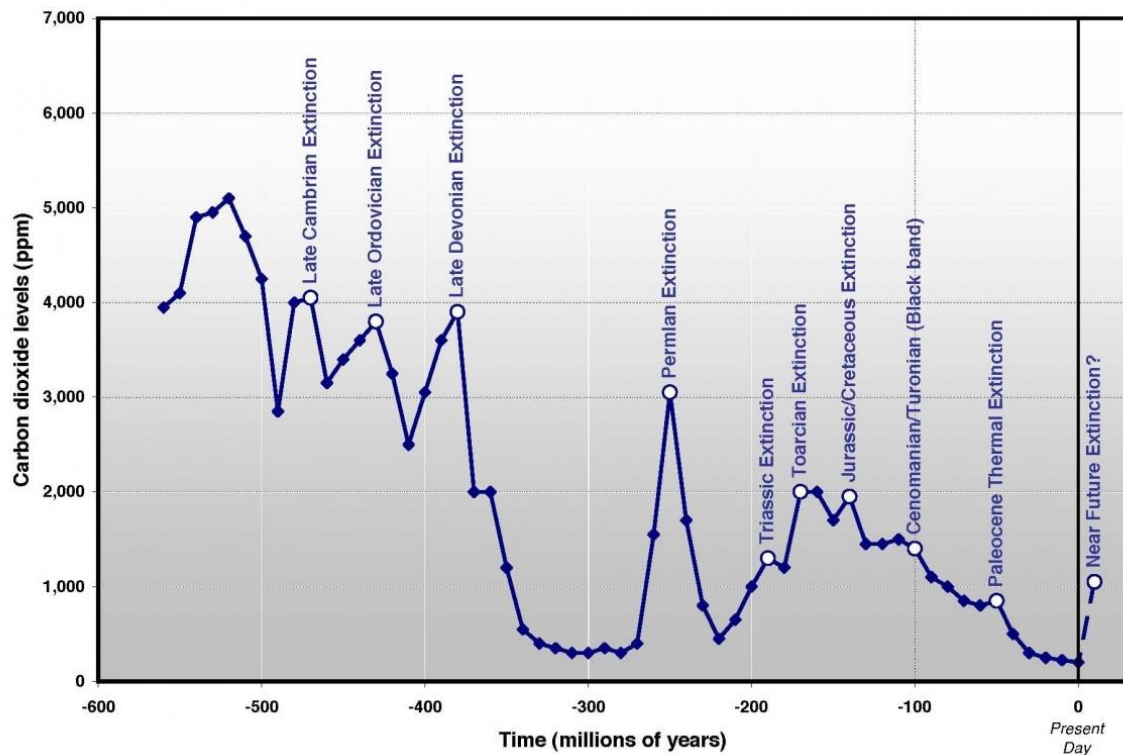


Fig.1. Carbon dioxide CO₂ concentration over the last 500 million years due to the intense volcanic activity and 9 biodiversity extinction events. Here the last extinction about 50 million years back, corresponds to a CO₂ concentration of about 1000 ppm. Credit: robertscribbler.com and johnenglander.net

These data show that a CO₂ concentration of 1000 ppm can trigger a biodiversity extinction.

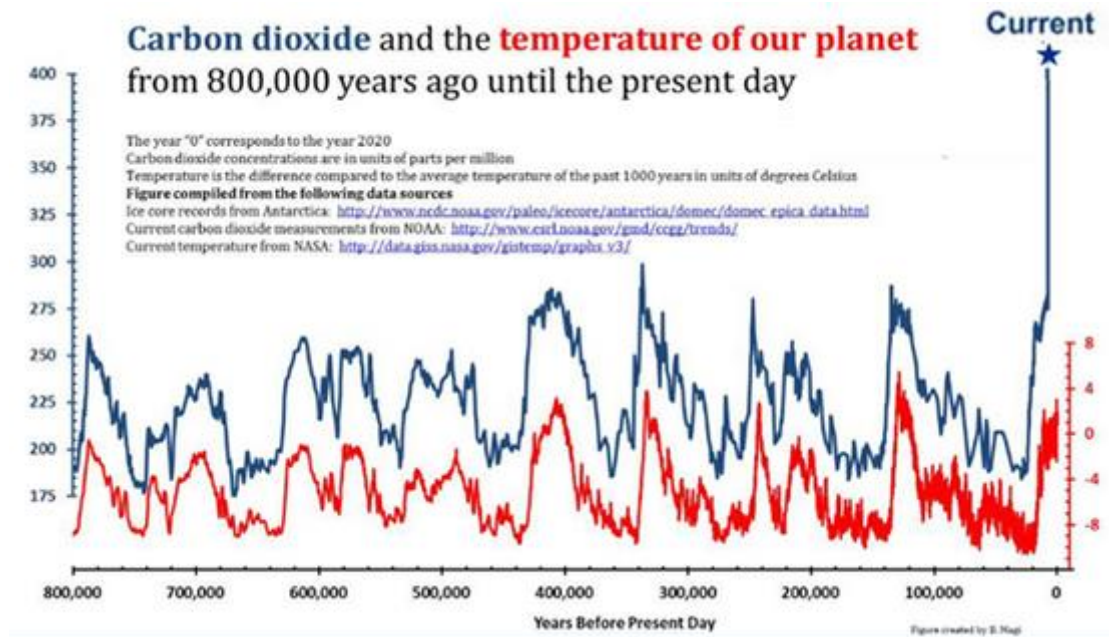


Fig.2, Distribution of atmospheric CO₂ and temperature over the last 800 thousand years; Credit: B. Magi

Since the last 800 thousand years (Fig.2.), the atmospheric content of CO₂ varied between 180 ppm and 300 ppm with the peaks and valleys tracking the ice age (low CO₂) and warm interglacial (high CO₂ and high), and these variations are correlated with the corresponding temperature variations also shown in Fig.2. During this period the different elements of the biodiversity coexisted under the constraints of the evolutionary process dictated by the rule of “survival of the fittest.”

However, since the start of the industrial period (around 1850), due to **human industrial activity** using more and more extensively the fossil fuels of coal, gas and petrol, the CO₂ concentration has gone up fast reaching 413 ppm in 2020 compared to the average value of around 240 ppm before. If the present trend in the CO₂ increase continues, one may reach the fatidic **human-caused extinction** value of 1000 ppm in a few hundred years which will be thousands of times faster than the natural rhythm along with the corresponding temperature increase.

In this context, the Intergovernmental Panel on Climate Change (IPCC) during the Paris climate talks in 2015 committed to a target of temperature change well below 2 degrees compared to the preindustrial epoch and if possible to prevent a change greater than 1.5 degrees by the end of the century. However, the present situation indicates strongly that there will be increase of 1.5 degrees in the 2030s, 2 degrees in the 2050s, and a higher value of 3-4 degrees by the end of the century.

Even in the present situation, there are clear signs of developing new climatic dynamics: tropical weather zone is expanding to the north and to the south leading already to local, violent tropical storms with a high frequency and tropical torrential rain falls thousands of kms away from it such as, at present, in Europe. Moreover, the

high biodiversity density in the tropical region is being pushed towards the low biodiversity density regions away from the tropical region. This new out-of-balance situation coupled to the corresponding increase in temperature aided by the increased atmospheric and fresh-water pollution, are already causing serious harmful effects on the survival of biodiversity and are helping further the proliferation of existing diseases and the introduction of new ones. Moreover, this climatic fragility of biodiversity is worsening fast also by the increased human-activity encroachment on its traditional habitat.