LAND USE AND FOOD

Berenika Pel
Yilmaz Hajizada
Agnieszka Nguyen
Ewelina Antonowicz
Kseniia Rozhniatovska
Harikrishnan Karunalayam Unnikrishnapanicker

POINTS OF DISCUSSION

Introduction

Land degradation and desertification

Land use & food production influences

climate change

Food security

Sustainable land management

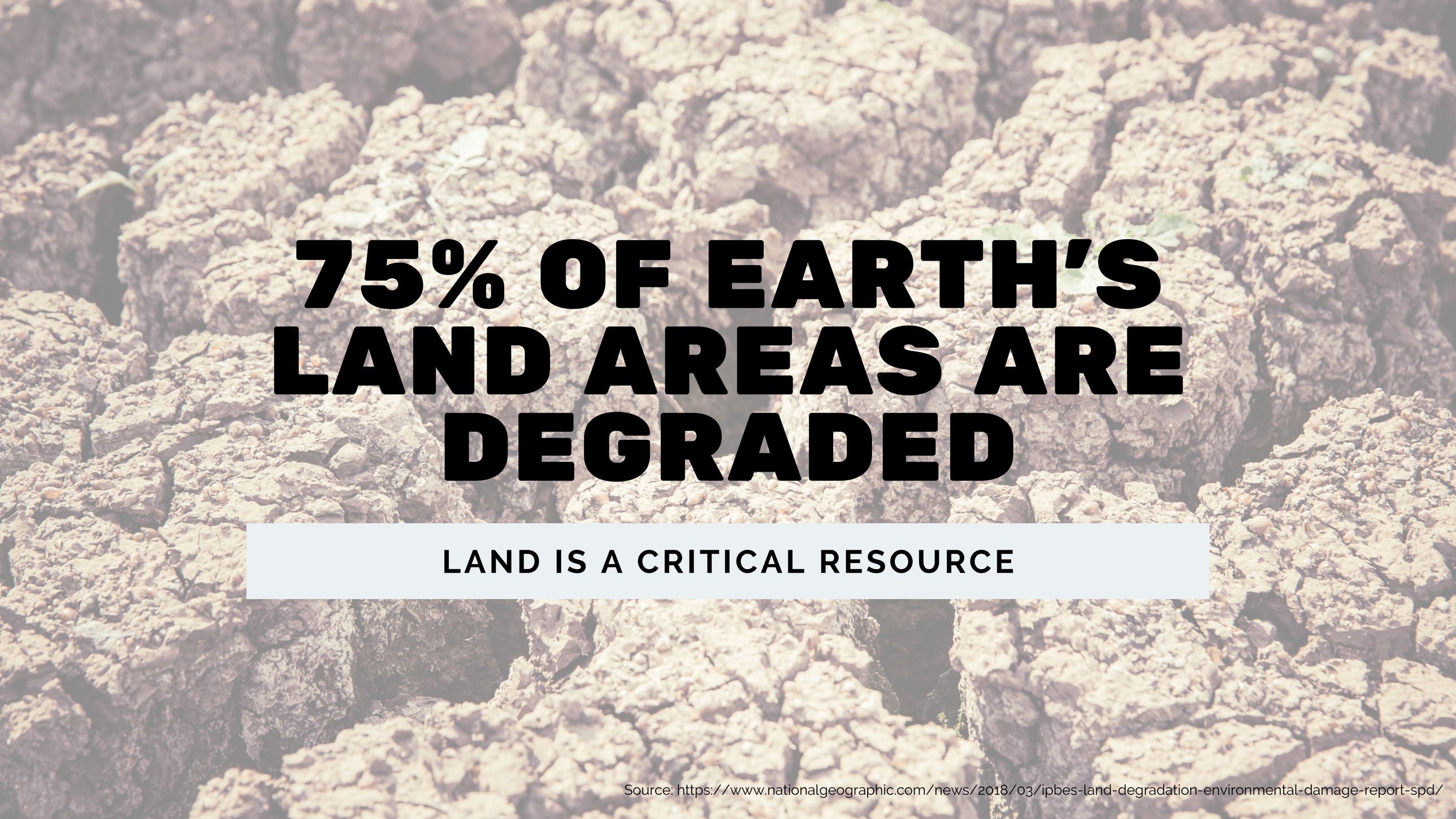
Solutions

Conclusion

INTRODUCTION

The Special Report on Climate Change and Land (SRCCL) defines land as “the terrestrial portion of the biosphere that comprises the natural resources (soil, near surface air, vegetation and other biota and water), the ecological processes, topography, and human settlements and infrastructure that operate within that system”

(HENRY ET AL. 2018), ADAPTED FROM (FAO 2007; UNCCD 1994)



75% OF EARTH'S LAND AREAS ARE DEGRADED

LAND IS A CRITICAL RESOURCE

Source: https://www.nationalgeographic.com/news/2018/03/ipbes-land-degradation-environmental-damage-report-spd/


Connections

/

The Idea of a Land Ethic
The Art of Human Connection to the Land

Aboriginal law and spirituality are intertwined with the land, the people and creation, and this forms their culture and sovereignty. They have a profound spiritual connection to land.

The health of land and water is central to their culture. Land is their mother, is steeped in their culture, but also gives them the responsibility to care for it.

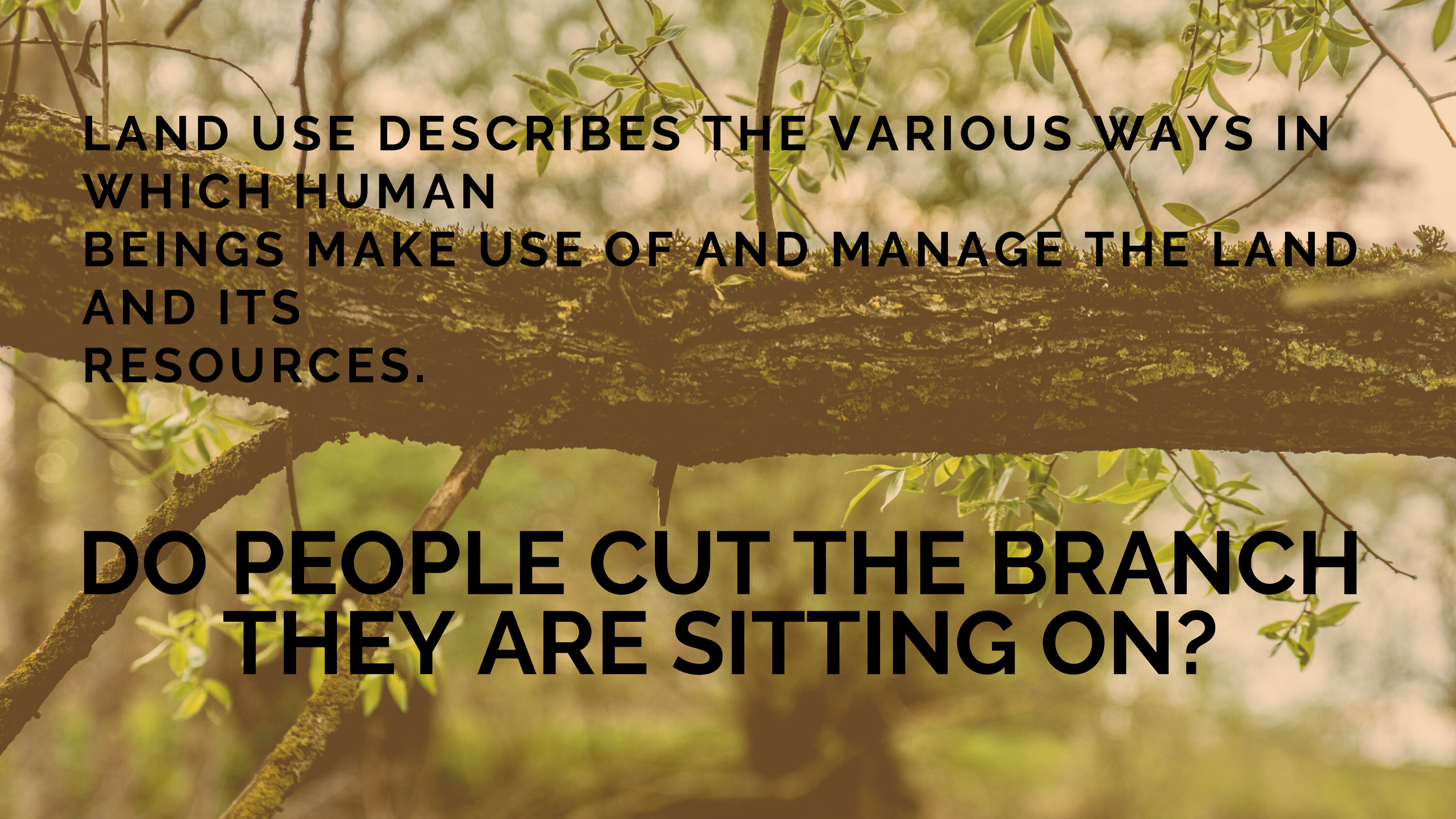
Source: Meaning of land to Aboriginal people - Creative Spirits, retrieved from https://www.creativespirits.info/aboriginalculture/land/meaning-of-land-to-aboriginal-people
photo: https://www.thkgallery.com/douglas-kirkland/david-gulpilil-australia-2007

Pharaohs and nobles participated in hunting, fishing and fowling expeditions, a means of recreation that had ritualistic and religious significance.

https://www.historymuseum.ca/cmc/exhibitions/civil/egypt/egcl02e.html

Environmental scientists have studied the impact of humanity on theEarth for decades, with a recent focus on categorising and mapping how humans use the land—not just now, but in the past. And his team’s results show some startling changes.

Three centuries ago, humans were intensely using just around 5 percent of the planet, with nearly half the world’s land effectively wild. Today, more than half of Earth’s land is occupied by agriculture or human settlements.



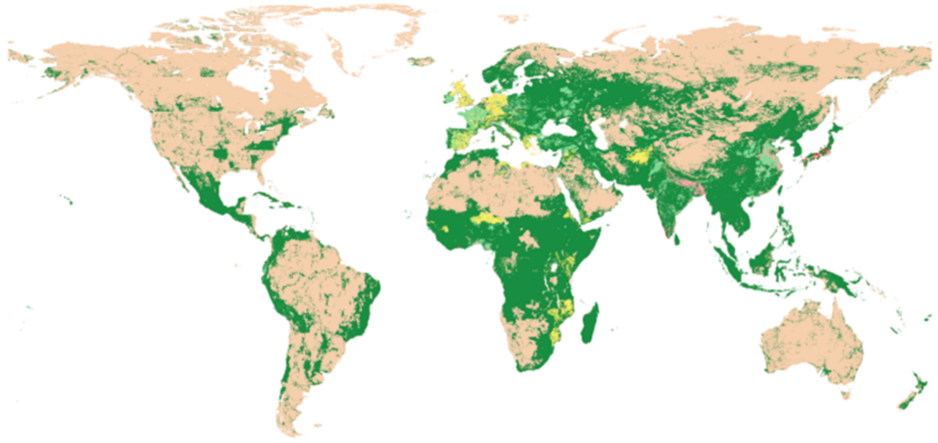
LAND USE DESCRIBES THE VARIOUS WAYS IN WHICH HUMAN BEINGS MAKE USE OF AND MANAGE THE LAND AND ITS RESOURCES.

DO PEOPLE CUT THE BRANCH THEY ARE SITTING ON?

HOW HUMANS USE LAND:

- agricultural
- residential
- recreational
- commercial
- transport

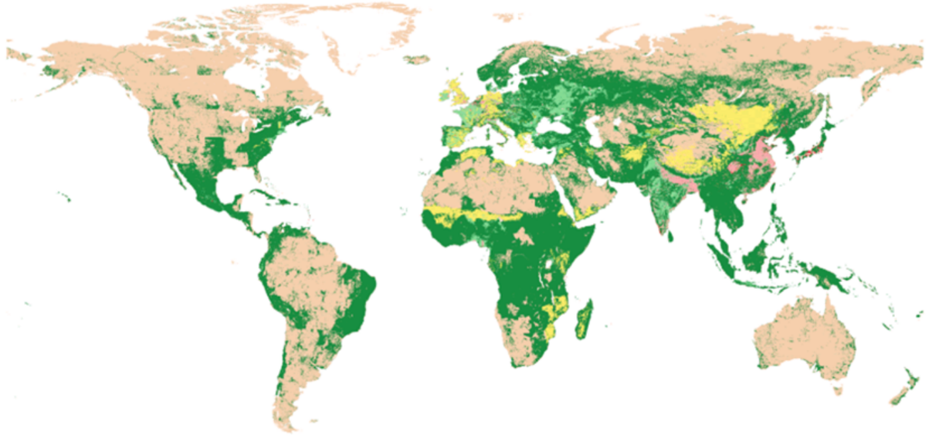
Land use in 1700



Urban / Villages · Cropland / Rangeland · Woodland / Wild

Source: ecotope.org (David H. Montgomery / CityLab)

Land use in 1800



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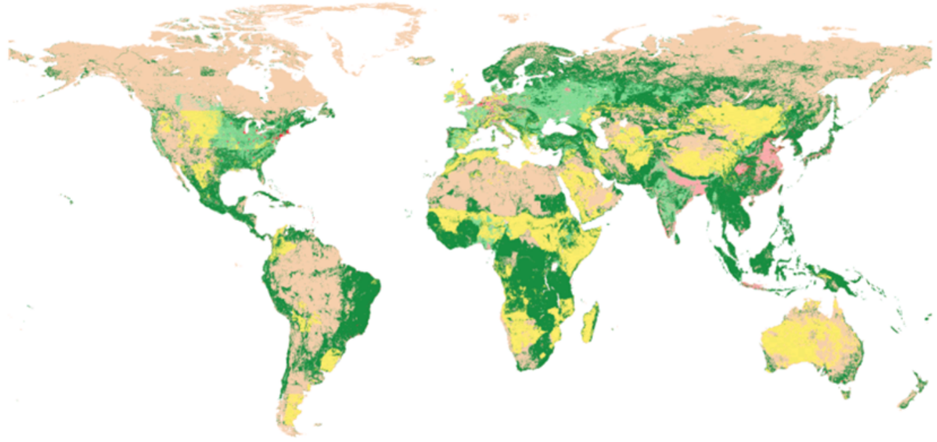
Source: ecotope.org (David H. Montgomery / CityLab)

Land use in 1900



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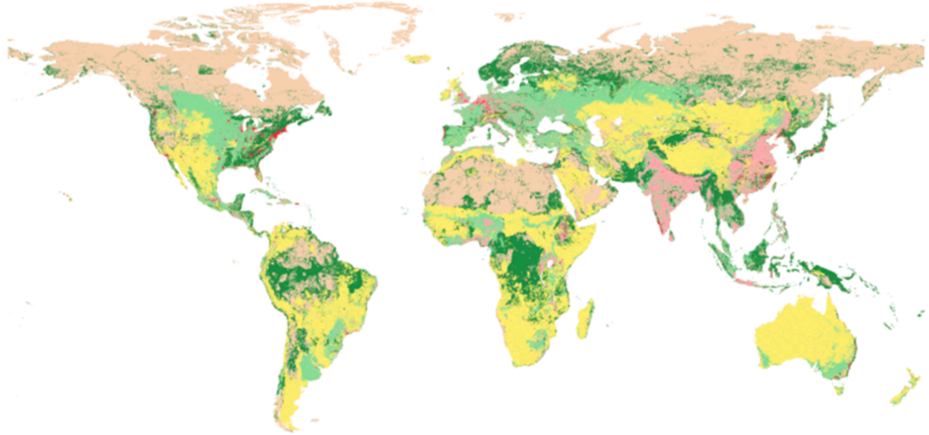
Source: ecotope.org (David H. Montgomery / CityLab)

Land use in 2000



Urban / Villages · Cropland / Rangeland · Woodland / Wild

Source: ecotope.org (David H. Montgomery / CityLab)

LAND DEGRADATION

LAND DEGRADATION

„a negative trend in land condition, caused by direct or indirect human-induced processes (including anthropogenic climate change!)

• expressed as long-term reduction or loss of at least one of the following:

a) biological productivity,

b) ecological integrity,

c) value to humans."

TYPES OF LAND DEGRADATION

DIFFERENT TYPES OF EROSION

can be natural: by wind, rain or waves

DESERTIFICATION

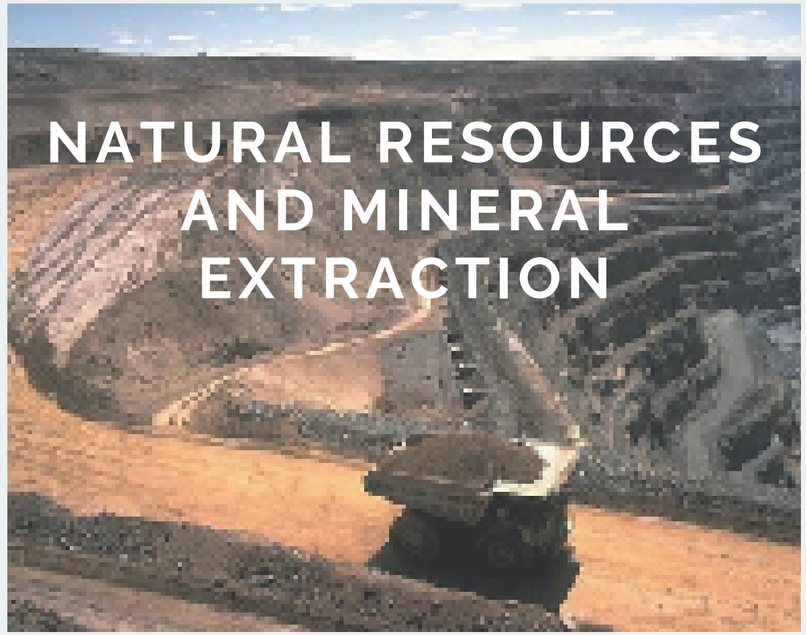
SALINIZATION

LOWERING OF THE WATER TABLE

WATERLOGGING

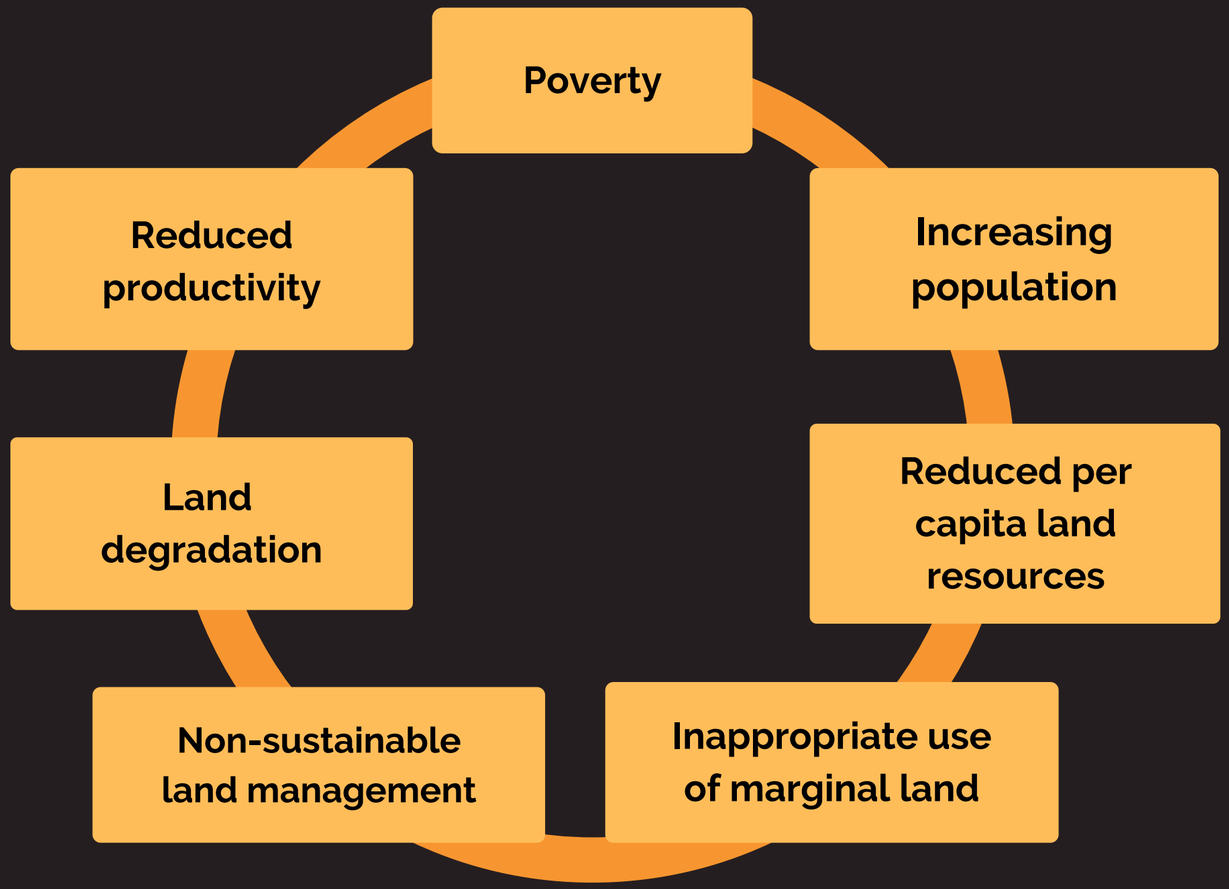
All of the above are exacerbated by anthropogenic activities

HUMAN ACTIVITIES DEGRADING LAND



+ increased occurrence of extreme weather events by climate change

WHAT DOES EXCESSIVE LAND DEGRADATION CAUSE?



The vicious cycle of land degradation

DIRECTLY

- higher GHG emissions
- loss of important ecosystem services (e.g. for water purification, negative CO2 emission, water storage, carbon storage)
- biodiversity loss

INDIRECTLY

- water and freshwater shortages
- diseases caused by food shortages and hunger
- poverty
- climate change
- migration from dry lands

If this trend continues, 95 percent of the Earth's land areas could become degraded by 2050.

That would potentially force hundreds of millions of people to migrate, as food production collapses in many places.

For developing regions like parts of Asia and Africa, the cost of inaction in the face of land degradation is at least three times higher than the cost of action. And the benefits of restoration are 10 times higher than the costs, the report found.

DESERTIFICATION

DESERTIFICATION

Land degradation in arid, semi-arid, and dry sub-humid areas, collectively known as drylands, resulting from many factors, including human activities and climatic variations

DESERTIFICATION

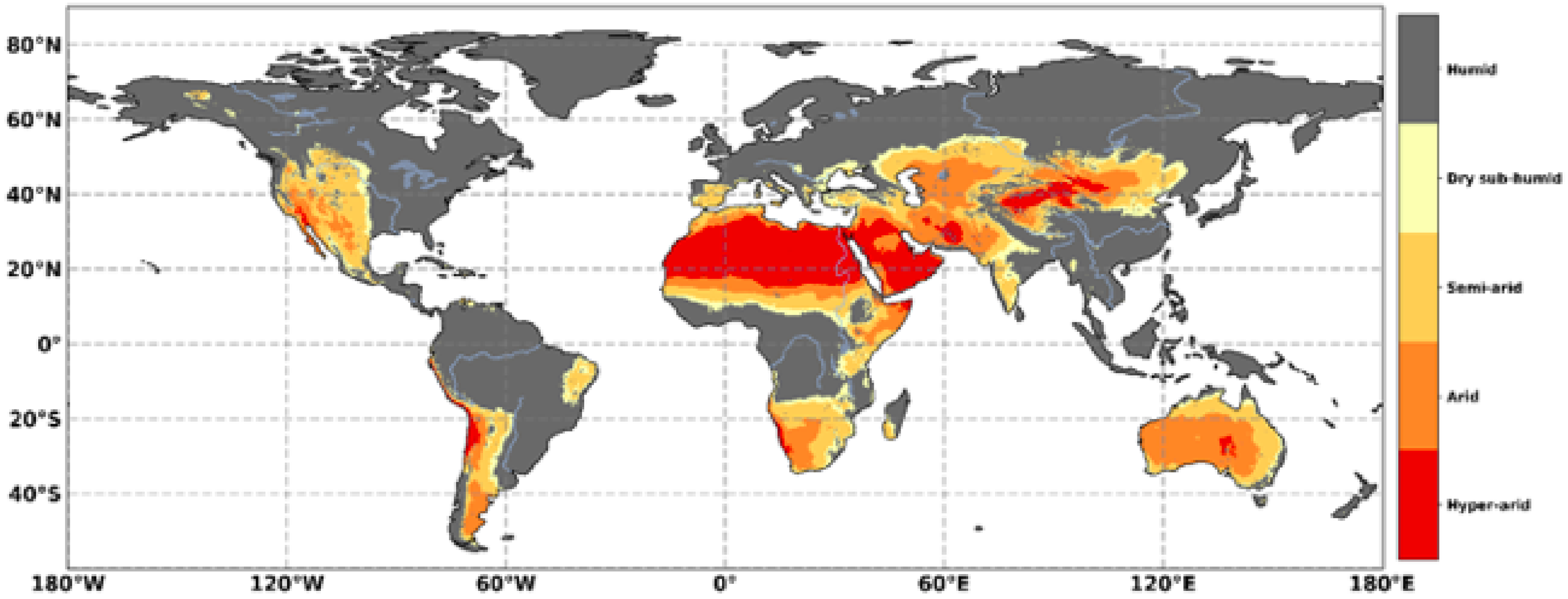
·LAND DEGRADATION CAN OCCUR ANYWHERE ACROSS THE WORLD, WHEN IT OCCURS IN DRY LANDS, IT IS CONSIDERED DESERTIFICATION

·DESERTIFICATION IS NOT LIMITED TO IRREVERSIBLE FORMS OF LAND DEGRADATION

- Drylands are home to approximately 38% of the global population
- 90% of the population in dry lands live in developing countries
- Dry land population predominantly dependent on agriculture; one of the sectors most susceptible to climate change

Desertification calculation is tricky and complex and estimates vary greatly due to missing and/or unreliable information

There are three main methods of assessing the extent of desertification – expert judgment, satellite images of vegetation change and biophysical models



Geographical distribution of drylands, based on the Aridity Index (AI)IPCC report fig 3.1

- There is an increasing concentration of poverty in the dry land areas of sub-Saharan Africa and South Asia where 41% and 12% of the total populations live in extreme poverty, respectively.
- Combination of agricultural productivity declines, changes in food prices and increases in extreme weather events is likely to exacerbate poverty for some dry land populations

- ·The major human drivers of desertification interacting with climate change are expansion of croplands, unsustainable land management practices and increased pressure on land from population and income growth.
- ·Increasing human pressures on land combined with climate change will reduce the resilience of dry land populations and constrain their adaptive capacities

DESERTIFICATION FEEDBACK TO CLIMATE

- ·Desertification can alter the local climate providing a feedback.
- These feedback can alter the carbon cycle, and hence the level of atmospheric CO 2 and its related global climate change.
- They can alter the surface energy and water budgets directly impacting the local climate

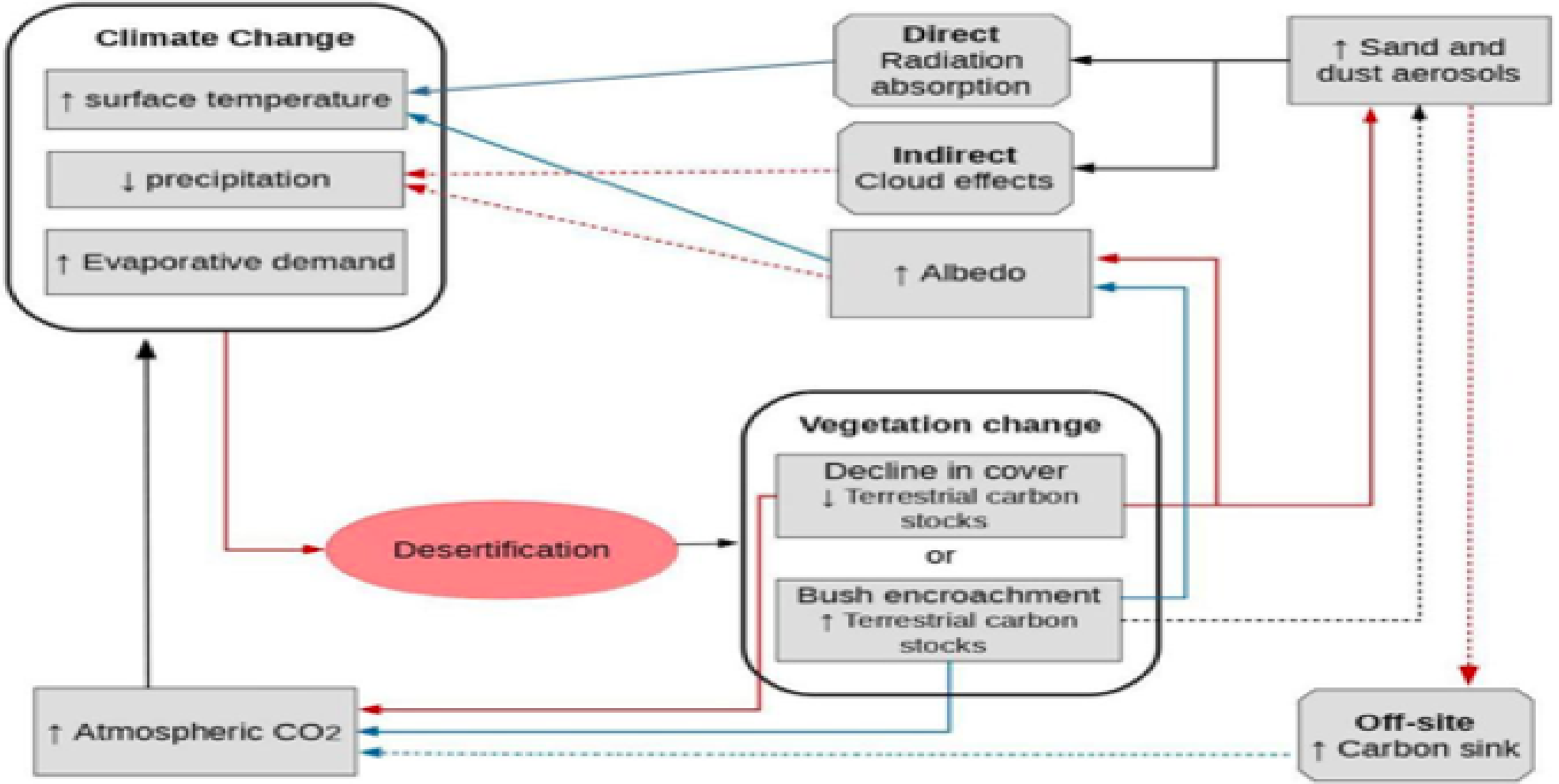
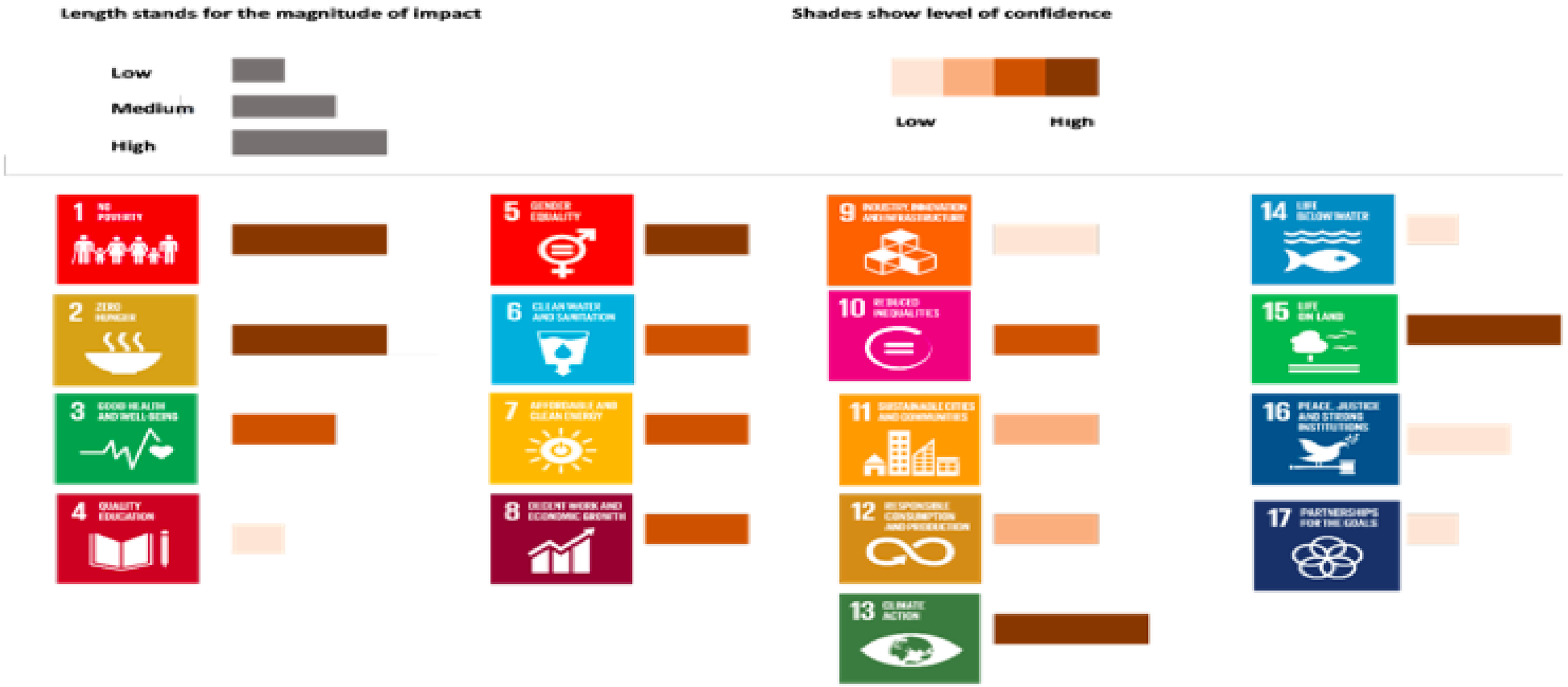


Illustration of the main pathways through which desertification can feedback on climate. Note: The colour of the arrows indicate a positive (red) or negative (blue) effect, or both (black). Solid arrows are direct while dashed arrows are indirect. Source:
Figure 3.8 from the IPCC land report

SOCIO-ECONOMIC IMPACTS OF DESERTIFICATION AND CLIMATE CHANGE WITH THE SDG FRAMEWORK



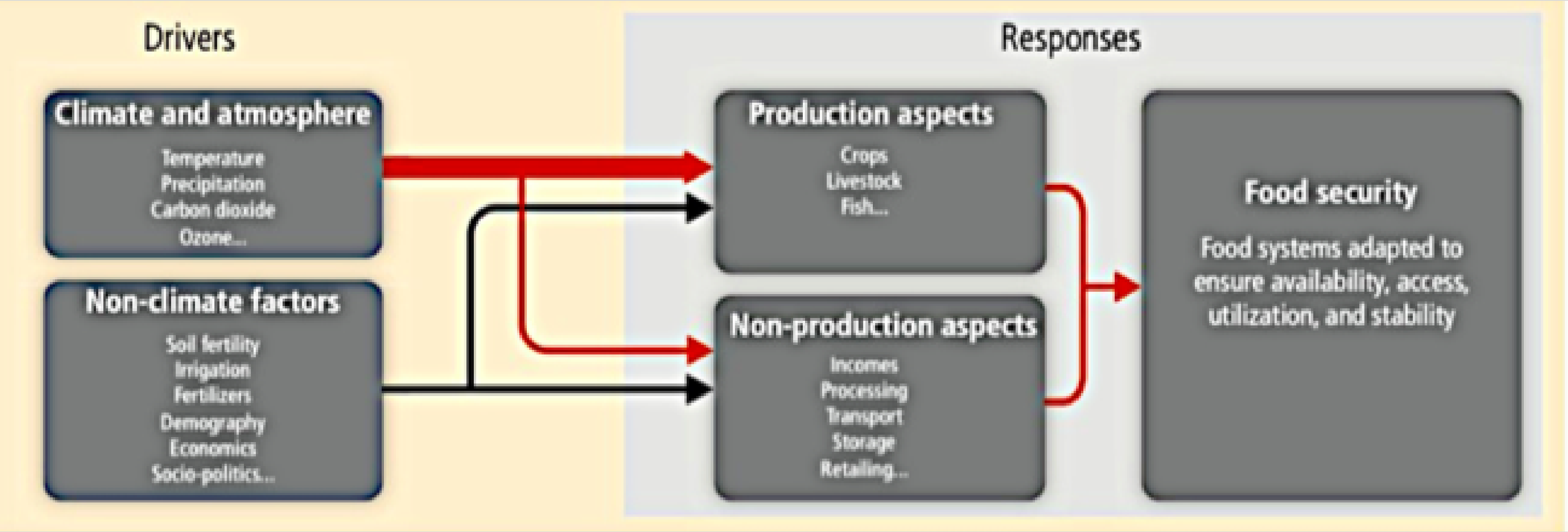
FUTURE PREDICTIONS OF DESERTIFICATION

- The population living in drylands across the world is projected to increase by 43% to four billion by 2050
- Different projections predicts drylands could make up 50% to 56%, respectively, of the Earth's land surface by the end of this century, up from around 38% today
- Climate model simulations suggest that rainfall will be more intense potentially increasing the risks of soil erosion

IMPACTS OF CLIMATE CHANGE ON FOOD SYSTEMS

FOOD SYSTEMS

A food system is all processes and infrastructure involved in satisfying a population's food security, that is, the gathering/catching, growing, harvesting, storing, processing, packaging, transporting, marketing, and consuming of food ad disposing of food waste.



CLIMATE DRIVERS RELEVANT TO FOOD PRODUCTION AND AVAILABILITY MAY BE CATEGORIZED AS:

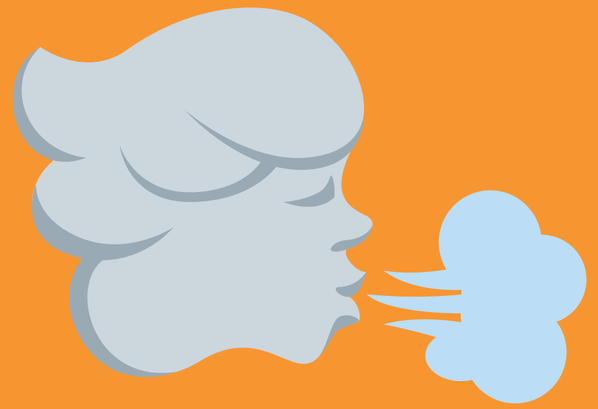
- seasonal changes
- modal climate changes
- extreme events
- atmospheric conditions

VARIABLES THAT CAN AFFECT THE FOOD SYSTEM

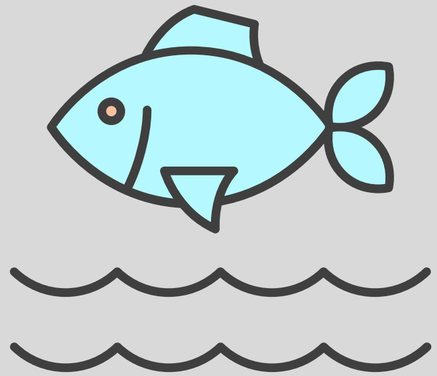
Changing rates of precipitation and evaporation, ground water levels, and dissolved oxygen content will affect water resources for food production

Solar radiation, wind, humidity, and salinisation and storm surge will affect agricultural production, processing, and/or transport

Extreme climate events resulting in inland and coastal flooding can affect the ability of people to obtain and prepare food.



IMPACTS ON FISHERIES AND AQUACULTURE



CLIMATE CHANGE

could lead to the spread of pathogens with impacts on wild and cultured aquatic resources.

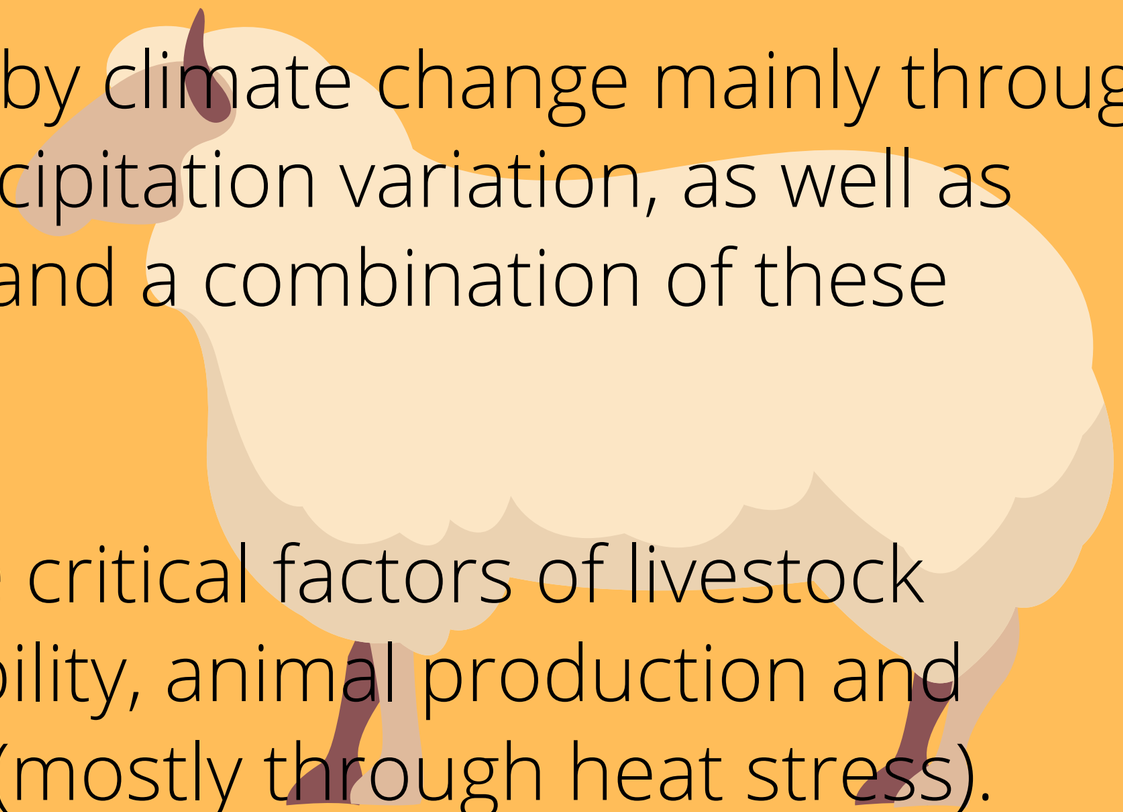
CHANGES IN MARINE AND FRESHWATER MEAN TEMPERATURES

will influence the distribution and productivity of fished and farmed aquatic species.

SEA LEVEL RISE, GLACIERS MELTING, OCEAN ACIDIFICATION

and changes in precipitation with associated changes in groundwater and river flows changes across a wide range of aquatic ecosystem types and regions with consequences for fisheries and aquaculture

IMPACTS ON LIVESTOCK PRODUCTION SYSTEM

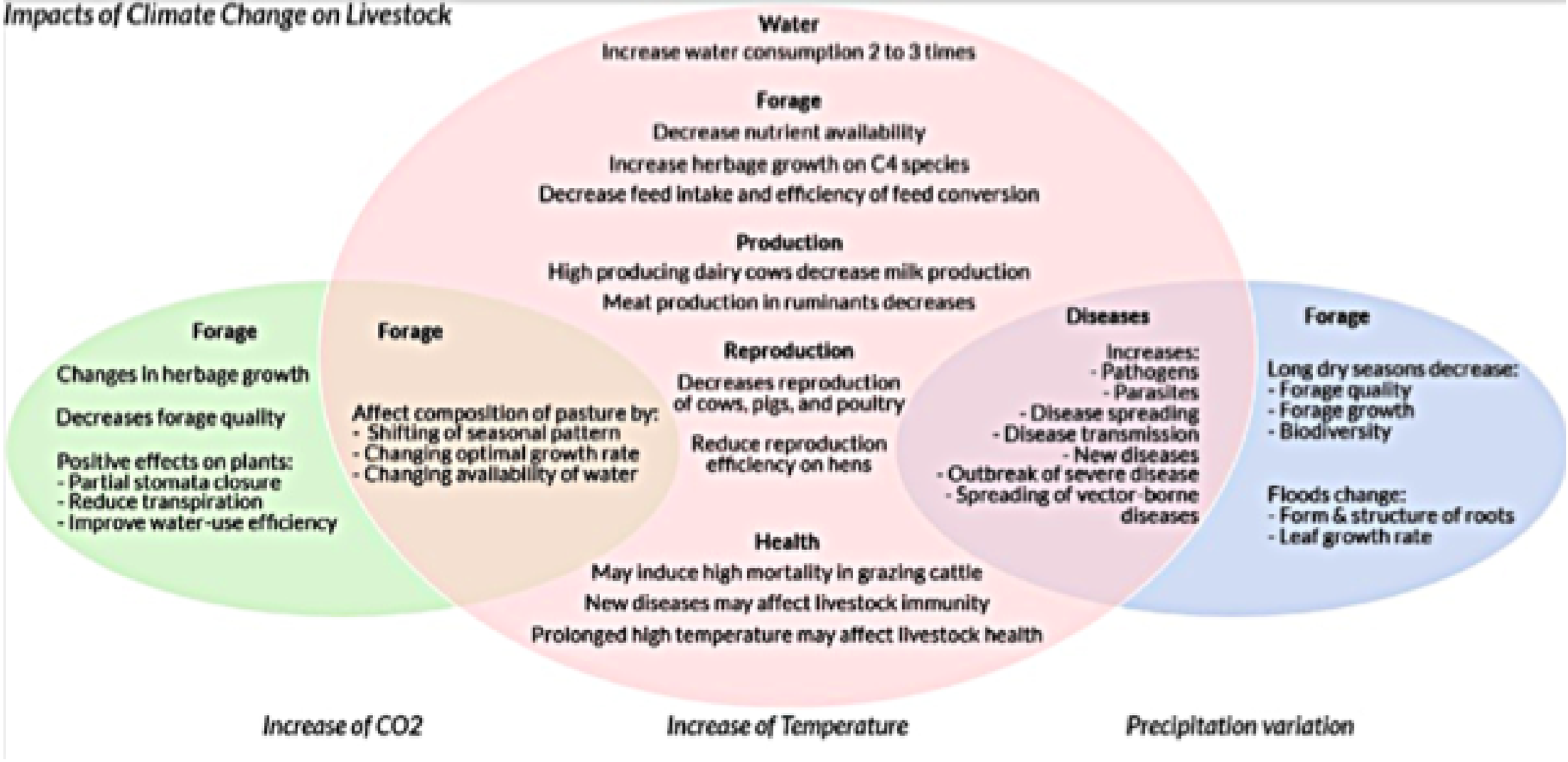


•Livestock systems are impacted by climate change mainly through increasing temperatures and precipitation variation, as well as atmospheric CO2 concentration and a combination of these factors.

•Temperature affects most of the critical factors of livestock production, such as water availability, animal production and reproduction, and animal health (mostly through heat stress).

•Livestock diseases are mostly affected by increases in temperature and precipitation variation.

Impacts of Climate Change on Livestock



IMPACTS OF FOOD SYSTEMS ON CLIMATE CHANGE

GREENHOUSE GAS EMISSIONS FROM FOOD SYSTEMS

Ca. 25-30% of total GHG emissions are attribute to the food system. These are form agriculture and land use, storage, transport, packaging, processing, retail, and consumption.

FOOD SYSTEMS
EMISSIONS INCLUDE CO_2 AND NON-CO_2 GASES, SPECIFICALLY THOSE GENERATED FROM:

- Crop and livestock activities within the farm gate
- Land use and land use change dynamics associated with agriculture
- Food processing, retail and consumption patterns, including upstream and downstream processes such as manufacture of chemical fertilisers and fuel

GHG EMISSIONS FROM THE FOOD SYSTEM AND THEIR CONTRIBUTIONS (%) TO TOTAL ANTHOPOGENIC EMISSIONS

Food system component	Emissions (Gt CO_2eq yr^{-1})	Share in mean total emissions (%)
Agriculture	6.2 ± 1.9 [a]	10-12%
Land use	4.8 ± 2.4 [a]	8-10%
Beyond farm gate	3.8 ± 1.3 [b]	5-10%
Food system (Total)	14.8 ± 3.4	25-30%

Notes: Food system emissions are estimated by combining emissions data from a) FAOSTAT (2018) and US EPA (See also Chapter 2) and b) Garnett (2011) and Poore and Nemecek (2018). Percentage shares were computed by using a total emissions value for the period 2007-2016 of nearly 51 Gt CO_2-eq yr^{-1} (See Chapter 2). GWP values used are those , and by using GWP values of the IPCC AR5 with no climate feedback (GWP-CH4=28; GWP-N2O=265)..

HOW DOES THE LAND CONTRIBUTE TO CLIMATE CHANGE?

01 The land plays a key role in storing greenhouse gases. From 2008-17, the land absorbed 30% of the world's greenhouse gas emissions, according to the report.

02 The land takes in CO_2 from the atmosphere when trees and other types of vegetation carry out photosynthesis.
Scientists estimate that up to 45% of carbon stored in the land is held by the world's forests.

03 Another major way that the land holds carbon is through its soils, which typically gain carbon through plant material, crop residues and animal manure.

04 Though the land acts as a major store of carbon, it can also be a greenhouse gas emitter.

The report finds that around 23% of global greenhouse gas emissions released from 2007-16 came from agriculture, deforestation, peatland degradation and other types of land use.

Deforestation to make way for palm oil
plantations in Sabah, Malaysia. Credit: RDW Aerial Imaging / Alamy Stock Photo.

Rice emissions are responsible for about 24% of agricultural methane emissions – and 89% of emissions come from Asia.

Terraced rice field in Chiang Mai, Thailand. Credit: Prasit Rodphan / Alamy Stock Photo.

GREENHOUSE GAS EMISSIONS FROM LIVESTOCK

01 Emissions from livestock emissions are those from enteric fermentation from ruminant animals and from anaerobic fermentation

02 All estimates agree that cattle are the main source of global livestock emissions (65-77%).

03 Livestock in low and middle-income countries contribute 70% of the emissions from ruminants and 53% from monogastric, and these are expected to increase as demand for livestock products increases in these countries.

04 Products like red meat remain the most inefficient in terms of emissions per kg of protein produced in comparison to milk, pork, eggs and all crop products

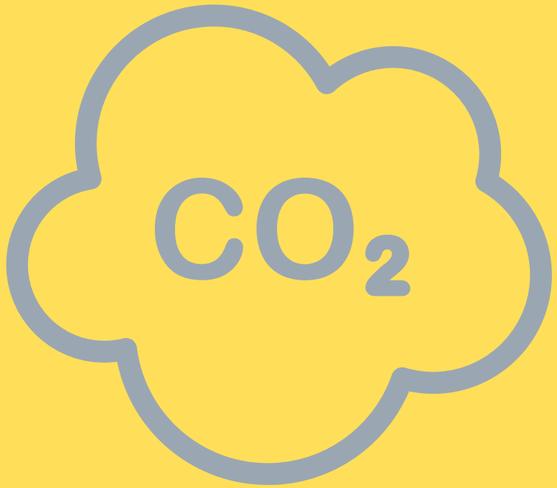
GREENHOUSE GAS EMISSIONS FROM INPUTS, PROCESSING, STORAGE, AND TRANSPORT

Apart from emissions from agricultural activities within the farm gate, food systems also generate emissions from the pre- and post-production stages in the form of input manufacturing (fertilisers, pesticides, feed production):

- processing,
- storage
- refrigeration
- retail
- waste disposal
- food service
- transport.

- refrigerated trucks
- trailers
- shipping containers
- warehouses and retail displays

that are vital parts of food supply chains all require energy and are direct sources of GHG emissions.



Most of the GHG emitted from food processing are a result of the use of electricity,

natural gas, coal, diesel, gasoline or other energy sources.

FOOD SECURITY

exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life

World Food Summit, 1996

2 ZERO HUNGER

to “ensure access by all people to safe, nutritious and sufficient food all year round” (SDG Target 2.1) and to “eradicate all forms of malnutrition” (SDG Target 2.2)

SUSTAINABLE DEVELOPMENT GOALS

FOOD SECURITY PILLARS

The Four Main Components of Food Security

1. AVAILABILITY
There is a reliable and consistent source of quality food.

2. ACCESS
People have sufficient resources to produce and/or purchase food.

3. UTILIZATION
People have the knowledge and basic sanitary conditions to choose, prepare, and distribute food in a way that results in good nutrition.

4. STABILITY
People's ability to access and utilize food that remains stable and sustained over time.

FOOD SECURITY VS FOOD INSECURITY

The state of being without reliable access to a sufficient quantity of affordable, nutritious food

Moderate: ability to obtain food and have been forced to compromised on the quality

Severe: run out of food or gone a day without eating food

Source: http://www.livehealthynapacounty.org/food-insecurity.html

MALNUTRITION AND UNDERNOURISHMENT: WHO IS MOST AT RISK OF HUNGER?

THE RURAL POOR

Directly involved in producing food. They cultivate crops. Many have no land of their own and work as hired hands. Seasonal work

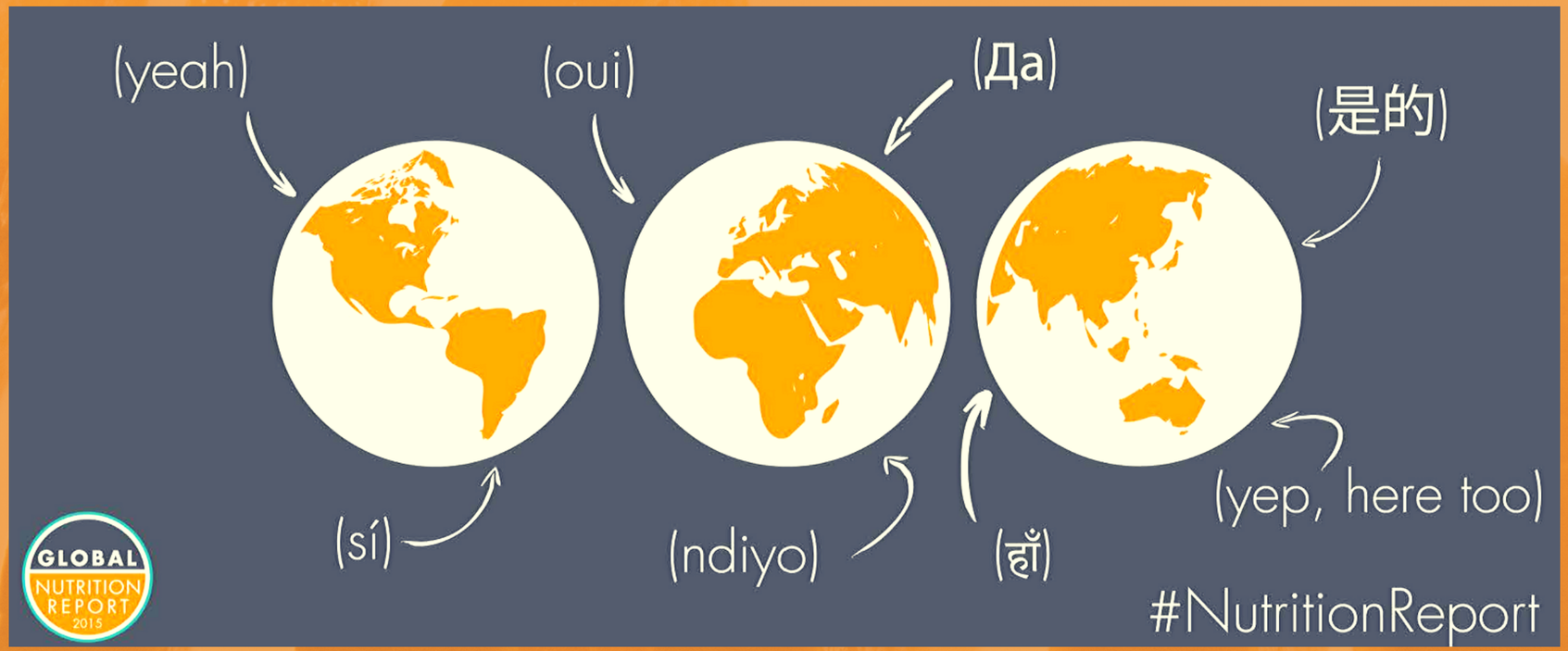
THE URBAN POOR

They produce little or no food and frequently lack the means to buy food. Cities are expanding constantly. Migration

VICTIMS OF CATASTROPHES

Natural disasters as well as armed conflicts cause widespread destruction and force families to abandon their homes and farms.

MALNUTRITION AFFECTS EVERY COUNTRY ON EARTH



820
MILLION HUNGRY

1,9
BILLION OVERWEIGHT & OBESE

2
BILLION MICRONUTRIENT DEFICIENT

160
MILLION UNDER 5'S STUNTED

Source: FAO, 2019

FOOD PRODUCTION

NOW

70% OF ALL FRESH WATER

- produces around a third of all GHG emissions
- contributes to biodiversity loss and soil degradation

2050

120% MORE WATER

42% MORE CROPLAND

LOSE 14% MORE FOREST

PRODUCE 77% MORE GHG EMISSIONS

it provides the primary source of livelihood

36% of the world's total workforce (40-50% Asia and the Pacific)

it produces the food people eat

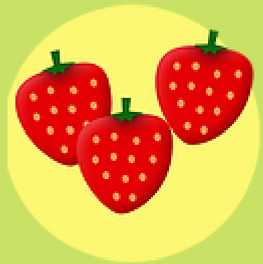
foodmiles.com

From Veggie Trumps

How far?

FOOD MILES

as low as possible



to reduce emissions

the distance food is transported from the time of its production until it reaches the consumer

POTENTIAL IMPACTS OF CLIMATE CHANGE ON FOOD SYSTEM STABILITY

STABILITY OF ACCESS

Global food markets may exhibit greater price volatility, the access to purchased food of both farming and non-farming poor people.

STABILITY OF SUPPLY

Many crops have annual cycles, and yields fluctuate with climate variability, particularly rainfall and temperature. Maintaining the continuity of food supply when production is seasonal is therefore challenging.

FOOD EMERGENCY

Increasing instability of supply, attributable to the consequences of climate change, will most likely lead to increases in the frequency and magnitude of food. Grain reserves are used in emergency-prone areas to compensate for crop losses and support food relief programmes for displaced people and refugees.

SUSTAINABLE LAND MANAGEMENT

NATURAL RESOURCE MANAGEMENT AREAS

- **BIODIVERSITY**
- **INTERNATIONAL WATERS**
- **LAND DEGRADATION**
- **SUSTAINABLE LAND MANAGEMENT**

STRATEGIES ADDRESSED TO SUSTAINABILITY AND EFFECTIVE IMPLEMENTATION

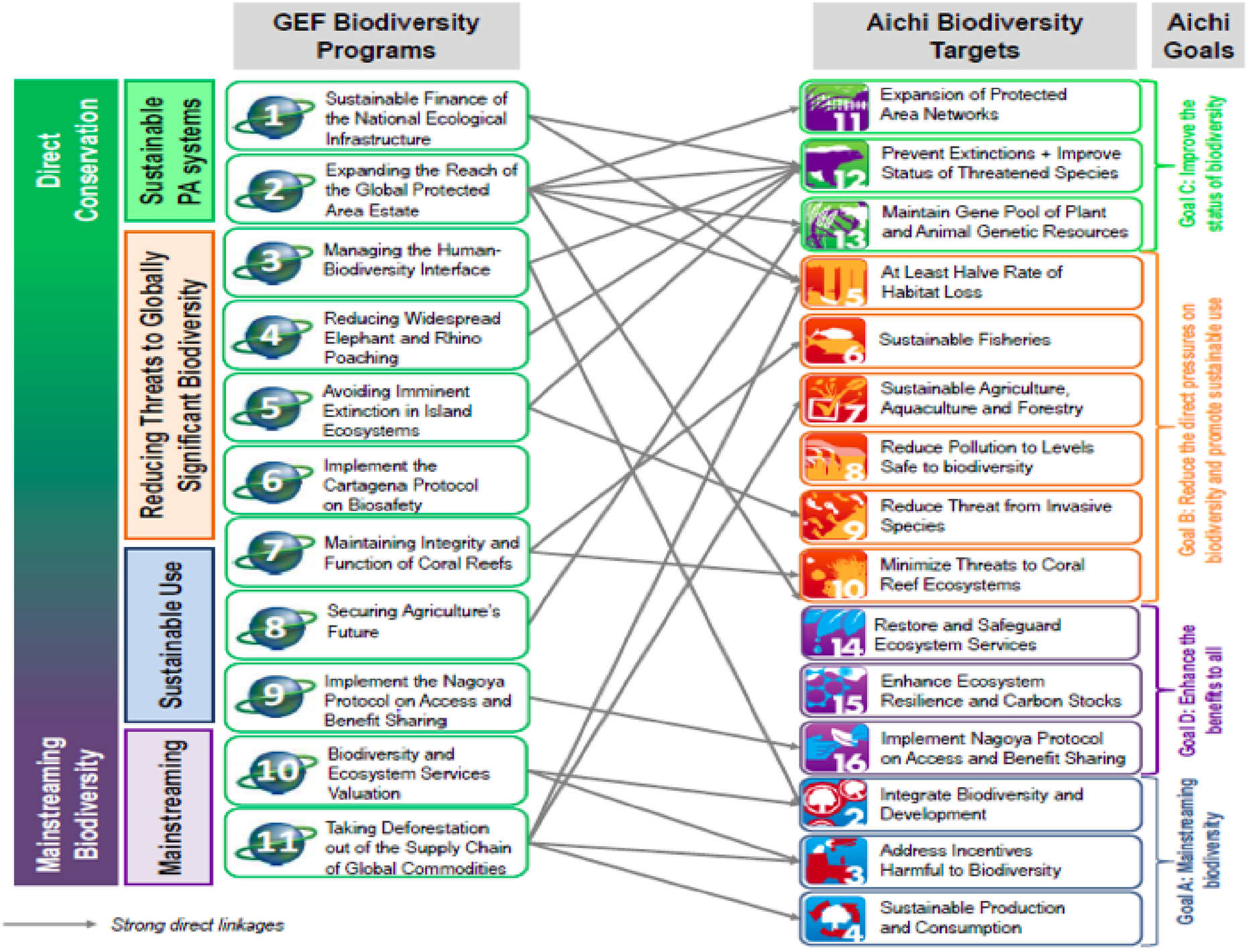
BIODIVERSITY STRATEGY

OBJECTIVE

To preserve globally significant biodiversity, as well as the accessibility to society of the ecosystem goods and services they provide.

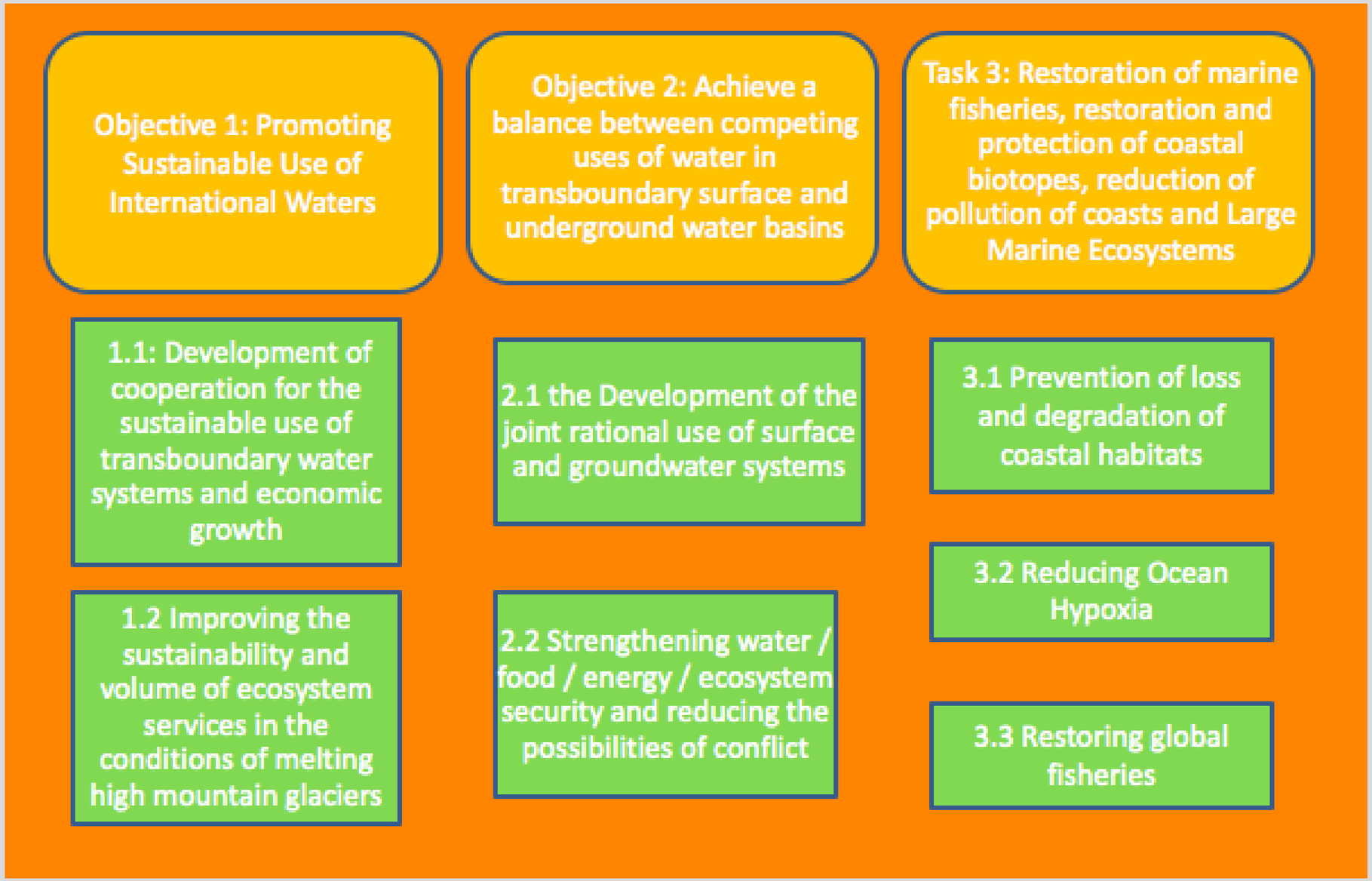
TASKS

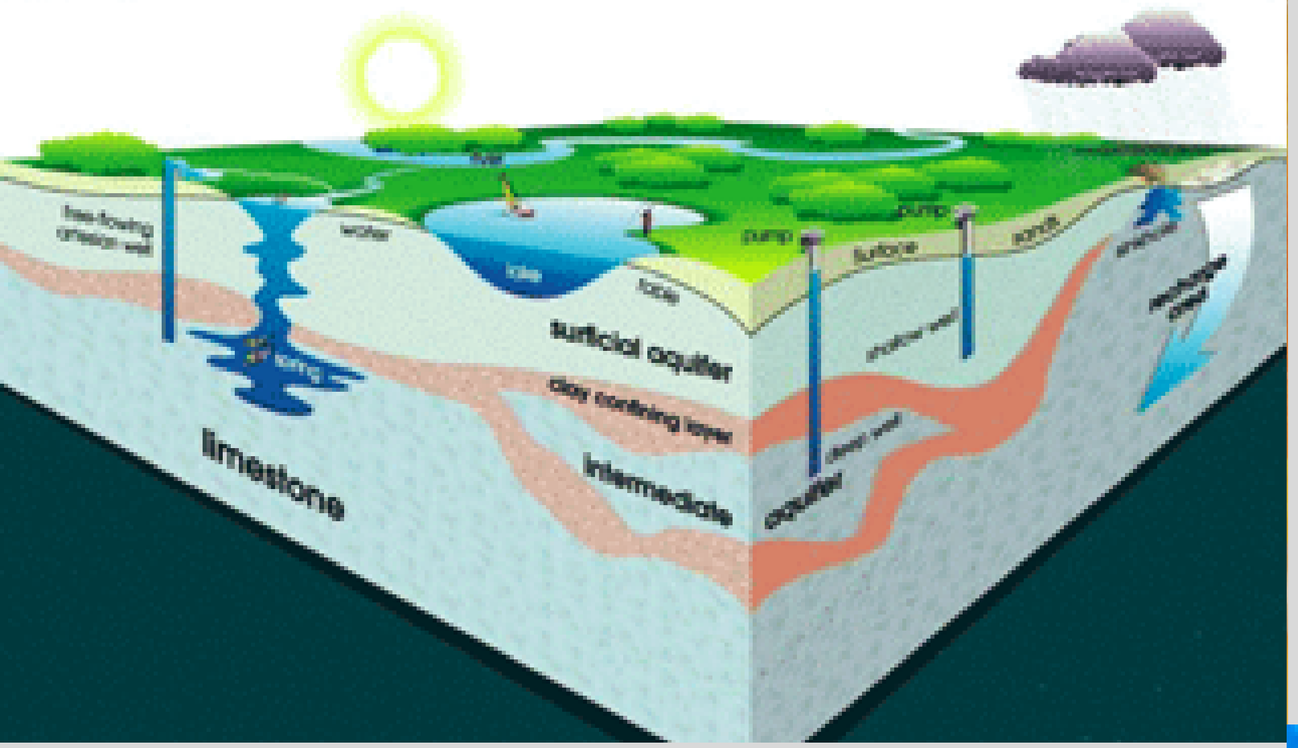
- Improving the sustainability of protected area systems
- Reducing threats to biodiversity
- Sustainable use of biodiversity
- Integration of conservation and sustainable use of biodiversity into activities in productive landscapes/ marine lands and sectors


GEF Biodiversity Programs
Aichi Biodiversity Targets
Aichi Goals
Direct Conservation
Mainstreaming Biodiversity
Sustainable PA systems
Reducing Threats to Globally Significant Biodiversity
Sustainable Use
Mainstreaming
1 Sustainable Finance of the National Ecological Infrastructure
2 Expanding the Reach of the Global Protected Area Estate
3 Managing the Human-Biodiversity Interface
4 Reducing Widespread Elephant and Rhino Poaching
5 Avoiding Imminent Extinction in Island Ecosystems
6 Implement the Cartagena Protocol on Biosafety
7 Maintaining Integrity and Function of Coral Reefs
8 Securing Agriculture's Future
9 Implement the Nagoya Protocol on Access and Benefit Sharing
10 Biodiversity and Ecosystem Services Valuation
11 Taking Deforestation out of the Supply Chain of Global Commodities
11 Expansion of Protected Area Networks
12 Prevent Extinctions + Improve Status of Threatened Species
13 Maintain Gene Pool of Plant and Animal Genetic Resources
5 At Least Halve Rate of Habitat Loss
6 Sustainable Fisheries
7 Sustainable Agriculture, Aquaculture and Forestry
8 Reduce Pollution to Levels Safe to biodiversity
9 Reduce Threat from Invasive Species
10 Minimize Threats to Coral Reef Ecosystems
14 Restore and Safeguard Ecosystem Services
15 Enhance Ecosystem Resilience and Carbon Stocks
16 Implement Nagoya Protocol on Access and Benefit Sharing
2 Integrate Biodiversity and Development
3 Address Incentives Harmful to Biodiversity
4 Sustainable Production and Consumption
Goal C: Improve the status of biodiversity
Goal B: Reduce the direct pressures on biodiversity and promote sustainable use
Goal D: Enhance the benefits to all
Goal A: Mainstreaming biodiversity
Strong direct linkages

CONSIDERATION OF THE DANGER THAT CAN CAUSE

INTERNATIONAL WATERS: TASKS AND PROGRAMS





EFFECTIVE MANAGEMENT OF

SURFACE RESOURCES AND GROUNDWATER SYSTEMS

FISHERIES

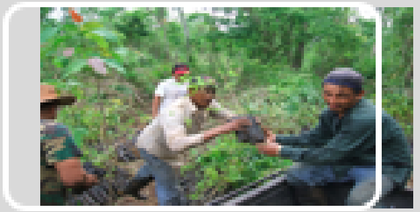
STRATEGY OF LAND DEGRADATION: TASKS AND PROGRAMS

MAIN GOAL TO BE IMPLEMENTED:

Stop or reverse land degradation (desertification and deforestation)

Agricultural and pasture systems

- Agroecological intensification
- Sustainable land use
- Contributing to agricultural resilience to climate change



Forest landscapes

Efficient management and landscape restoration

Complex landscapes

Developing the sustainable agriculture

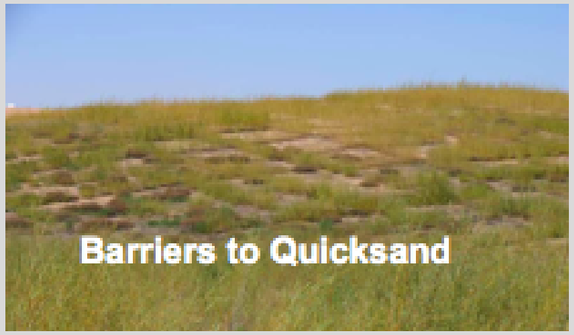
Institutional and Political Structures

- Integration of into all aspects of sustainable agriculture development

PRIORITIES

1. Agro-ecological intensification - the efficient use of natural capital (land, soil, water, vegetation) in crop production and livestock production systems.
2. Sustainable agriculture, contributing to agricultural resilience to climate change - innovative methods to increase vegetation and soil organic carbon.
3. Rational management and restoration of landscapes - options for increasing forest and vegetation cover, focused on the needs of the local population and means of life support.
4. Developing sustainable agriculture - taking appropriate measures to increase crop and rangeland productivity. Integrating sustainable agriculture into all aspects of development - influencing on institutions, law and governance structures

SUSTAINABLE LAND MANAGEMENT



SUSTAINABLE FOREST MANAGEMENT: TASKS AND PROGRAMS

IMPROVING SUSTAINABLE FOREST MANAGEMENT

- Development and implementation of model implementation projects for Ecosystem Services Fees
- Capacity development of SFM among the local population.
- Support for SFM from financing mechanisms

CONSERVATION OF FOREST RESOURCES:

- Integrated Land Use Planning
- Identification and monitoring of the state of forests of high ecological value
- Identification and monitoring of forest cover loss

MAIN TASK:

Obtaining multiple environmental, social and economic benefits by improving the rational use of forests of all types and plantations outside the forest.

SUSTAINABLE FOREST MANAGEMENT: TASKS AND PROGRAMS

FOREST ECOSYSTEM RESTORATION

- Building technical and institutional capacity to identify degraded forest landscapes and monitor forest restoration.
- Integration of forest management into landscape restoration programs

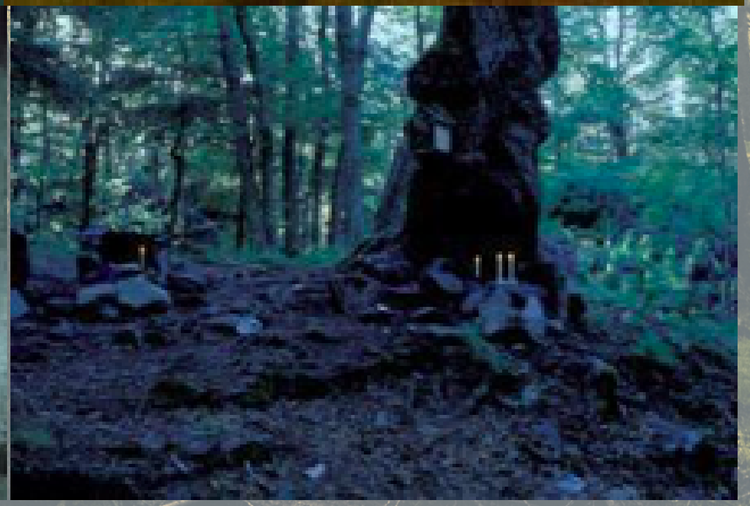
ENHANCED REGIONAL AND GLOBAL COOPERATION

- Private Sector Engagement.
- Global technology for national progress.

RATIONAL USE OF FORESTS FOR MULTIPLE BENEFITS





IMPORTANT PROGRAMS

FIVE "LANDMARK PROGRAMS"

1. Prevent the extinction of forests in the Amazon
2. Withdrawing forestry property from the supply chain
3. Food Security
4. Sustainable fish resources
5. Sustainable cities

«Important Programs »

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necessary decisions for environment system mechanisms

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THANK YOU
Keep in mind what we said!