Visualizing Environmental Science

The Ocean and Fisheries

Chapter 11

Franco Banfi/ Water Frame/GettyImages

The Global Ocean

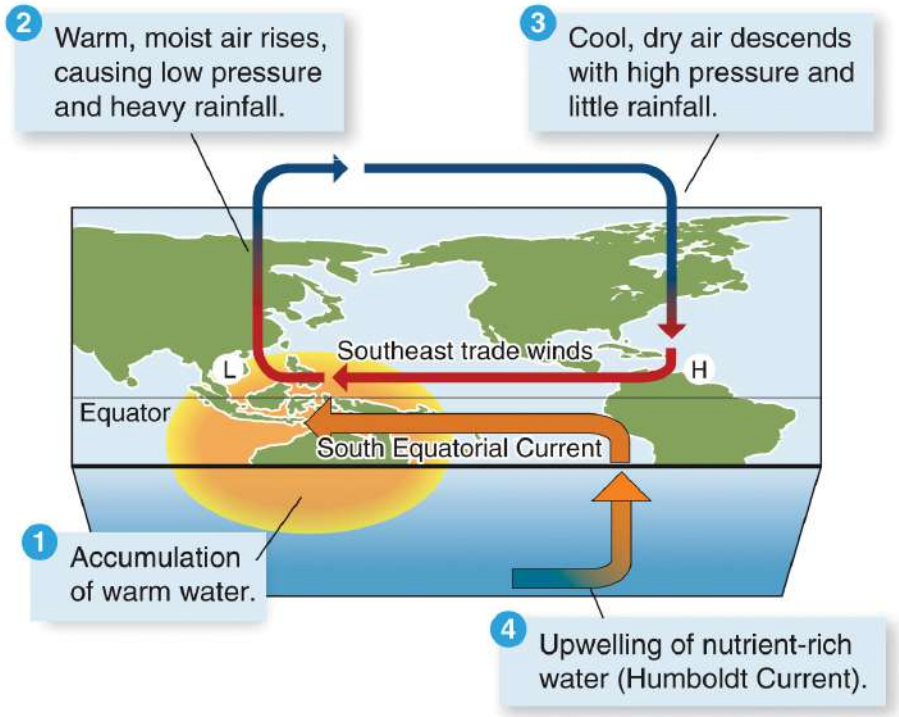
- Huge body of water
  - Surrounds continents
  - Covers ___ of world's surface
  - Single continuous body of _____
    - Four sections separated by continents
      - Pacific, Atlantic, Indian and Arctic oceans
      - The Pacific is the _____, covering 1/3 of the Earth's surface and containing more than half of Earth's water

Ocean-Atmosphere Interaction

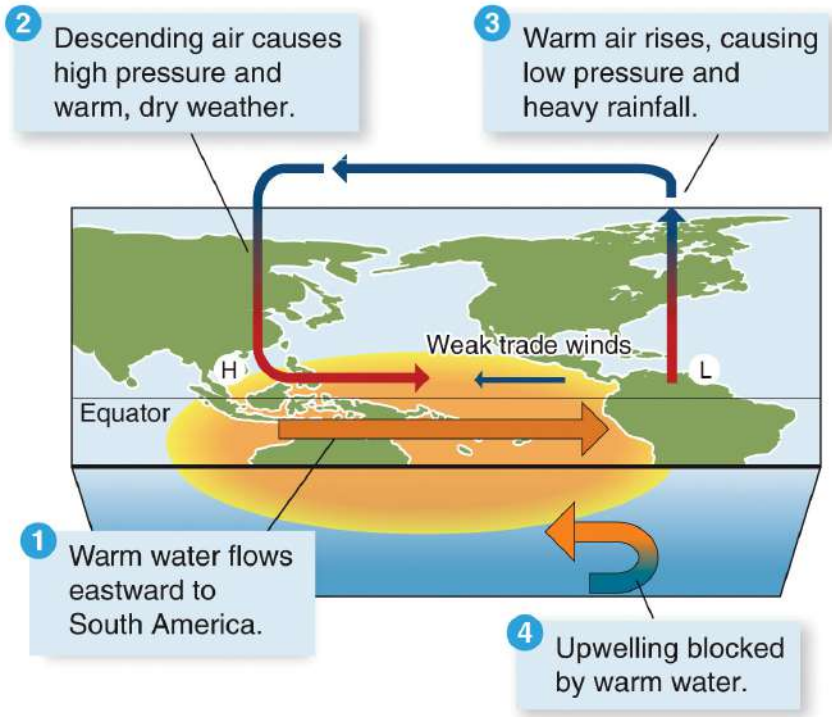
- Wind from atmosphere affects ocean _____
- Heat from ocean affects atmospheric circulation

- _____-Southern Oscillation (ENSO)
  - A periodic, large-scale warming of surface waters of the tropical eastern Pacific Ocean that temporarily alters both _____ and atmospheric circulation patterns
  - Responsible for world's interannual climate variability
  - Ocean currents slow down or _____; this is known as El Niño

Normal vs. El Niño (ENSO) Conditions



a. Normal climate conditions



b. ENSO conditions

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Ocean-Atmosphere Interaction

- La Niña
  - Often occurs after _____ event
  - More difficult to predict effects
  - Typically causes
    - Wetter than usual _____ in Pacific Northwest
    - Warmer weather in Southwest
    - Atlantic hurricanes are _____ and more numerous

Human Impacts on the Ocean

- Fisheries and _____, marine shipping, marine pollution, coastal development, offshore mining, and global _____ change, all contribute to marine environment degradation
- Paradox: ocean provides food but is used as _____ ground
  - Pollution increasingly threatens the world's fisheries
  - 80% of ocean pollution comes from _____ activities on land

Problems and Challenges for the Fishing Industry

- World's annual fish harvest
  - 1950 - 19 million tons
  - 2000 - 95 million tons
  - 2012 - ____ million tons
- No nation has legal claim to the open ocean
  - Resources are susceptible to overuse and degradation
  - Many species have been harvested to the point where their _____ are severely depleted
- Many nations have extended their limits of jurisdiction to 320km (200mi) offshore, to prevent _____

Problems and Challenges for the Fishing Industry

- At least 30% of world's fish stocks are _____, and 57% are fully exploited
  - Growing human population requires protein
  - _____ (the fishes, marine mammals, sea turtles, seabirds, and other animals caught unintentionally in a commercial fishing catch) exceeds 7.7 million tons annually
- Modern _____ fishing methods have led to the collapse of formerly productive fisheries due to overfishing
  - Drift _____, trawls, purse seines, and longlines are so efficient that they can depopulate a fishery past the point of recovery

Aquaculture: Fish Farming

- _____
  - Fish farming: Growing of aquatic organisms for human consumption
    - Developing nations produce more _____ from aquaculture than they harvest from the ocean
    - Fish farms have dense populations
      - Lots of polluting _____
      - Cause net loss of wild fish (raised fish tend to be carnivorous)
  - Ocean ranching: Deep-water, off-shore aquaculture
    - Doesn't harm coastline, but less oversight to prevent pollution
    - Risk of reduced _____ in wild fish populations due to interbreeding with farmed fish

Shipping, Ocean Dumping, and Plastic Debris

- Millions of ships dump _____ ballast and waste
- Ocean Dumping Ban Act – 1991
  - Cities used to dump _____ into ocean, disease-causing organisms contaminated shellfish

- _____ waste
  - Doesn't degrade, just breaks up into smaller pieces
  - Eastern Pacific garbage patch covers very large area in the North Pacific gyre
  - Plastic pieces _____ marine mammals and birds
  - Filter feeders ingest plastic pieces, carriers of PCBs

Coastal Development

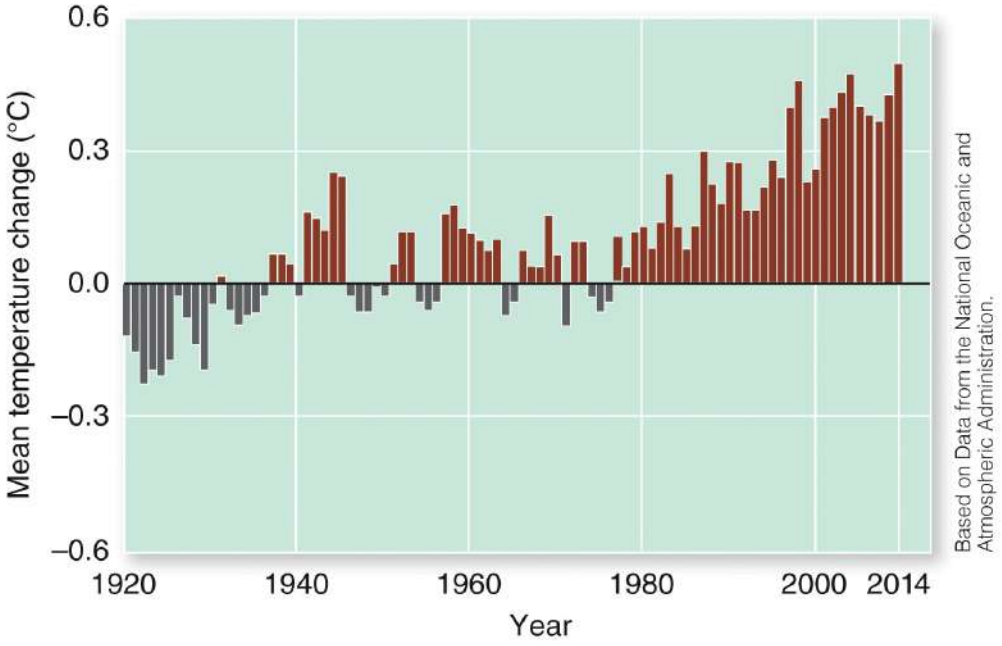
- Alters or _____ coastal ecosystems
  - Mangroves, salt marshes, sea grass beds, coral reefs
- Coastal areas are overdeveloped, highly _____, overfished
- Coastal management plans are inadequate
  - Biggest problem is human _____ size
  - _____ of world's population lives within 150 km (93 mi) of coastline

Human Impacts on Coral Reefs

- _____ formations are important ecosystems, and they are being degraded and destroyed
  - Silt washing downstream from clear-cut forests is smothering reefs
  - _____ = stressed corals expel zooxanthellae; correlated with warming ocean waters and increased dissolved _____ levels
  - High salinity from freshwater diversion projects
  - Overfishing of top _____
  - Pollution from ocean dumping and coastal pollution

Climate Change, Sea-Level Rise, and Warmer Ocean Temperatures

- The ocean is _____ along with global climate, but it is difficult to accurately predict all future consequences
  - –Rise in sea levels due to _____ melting is already occurring
    - Coastal flooding, wetlands loss, flooding risks, and saltwater _____ possible



Annual global mean temperature changes of the ocean surface

Visualizing Environmental Science

Agriculture and Food Resources

Chapter 14

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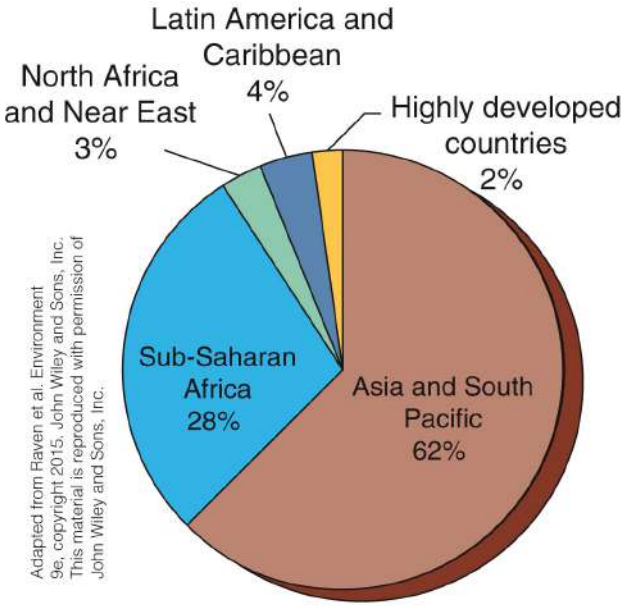
World Food Problems

- Undernutrition: Type of malnutrition in which there is underconsumption of _____ or nutrients that leaves the body weakened and susceptible to disease
  - —Even if receiving enough calories, _____ happens if not enough essential nutrients (protein, _____, minerals) are present in the diet



Most of the world's undernourished people live in Asia and sub-Saharan Africa.

World Food Problems

- _____: Amount of food consumed exceeds necessary calories or essential nutrients

  - —Usually from diets high in saturated fats, _____, and salt
  - —Results in high blood pressure, obesity, and increased likelihood of _____, heart disease, etc.
  - —Most common in the _____ and other highly developed nations, and in urban areas of developing nations

Poverty and Food

- Main cause of undernutrition and food insecurity is _____
- Solutions
  - Increase _____ production of food
  - Improve food distribution
  - Promote economic development
  - Ensure education and opportunities for _____ and small scale farmers, who produce significant amounts of basic _____ in some regions

The Principal Types of Agriculture

- Industrialized agriculture
  - Utilized in _____ developed and some developing countries
  - High-input: Requires large capital and _____ inputs, less land, and less manual labor than traditional methods
    - Significantly dependent on _____
    - Produces _____ yields
    - Monoculture cultivation predominates
    - Soil degradation, pesticide resistance common

The Principal Types of Agriculture

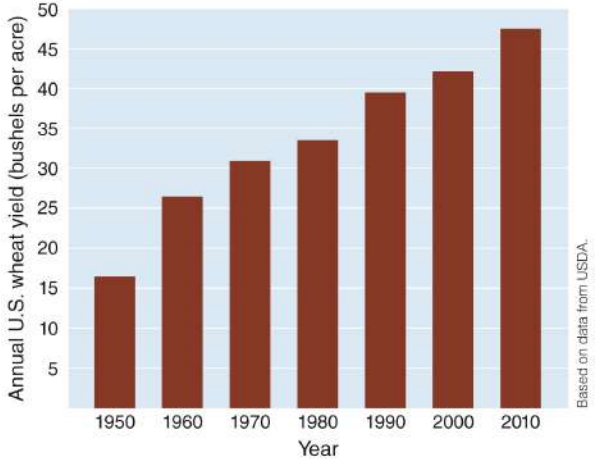
- _____ agriculture
  - Utilized by most farmers in most developing countries
  - Traditional agricultural methods that depend on _____ and a large amount of land
    - Just enough food to feed farmer and family
  - Cultivation methods vary depending on area
    - Shifting cultivation
    - _____ agriculture
    - Nomadic herding
    - Intercropping
    - _____

Challenges of Producing More Crops and Livestock

- Challenges
  - Decline in _____
  - Declining numbers of domesticated varieties
  - Continuing to improve crop and livestock yields
  - Addressing _____ impacts
  - Agribusiness conglomerates are replacing the _____ farm
- _____ of urbanization, suburban sprawl
  - Parking lots, housing developments, shopping malls

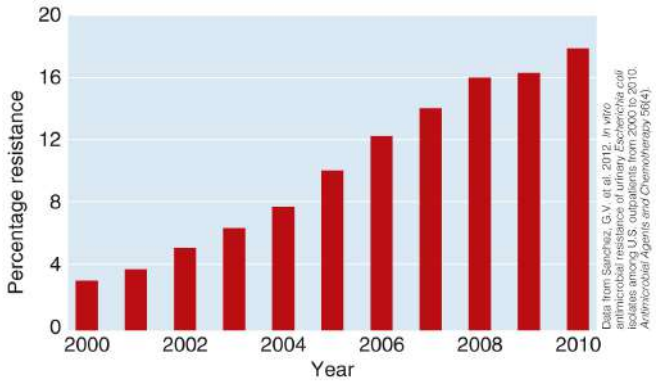
Increasing Crop Yields

- _____
  - By the 1960s, the combination of selective breeding and pesticide and _____ use led to significantly increased crop yields around the world.
  - Some drawbacks:
    - High _____ and infrastructure costs
    - Environmental costs of high fertilizer and pesticide use
    - Loss of local varieties with important _____ characteristics useful for their regions



Increasing Livestock Yields

- Hormones promote _____ growth
  - Fear that hormones may affect child development, promote _____
- Antibiotics improve livestock weight gain, less _____
  - Indiscriminate use leads to development of resistant strains of bacteria—reduces antibiotic efficacy in _____

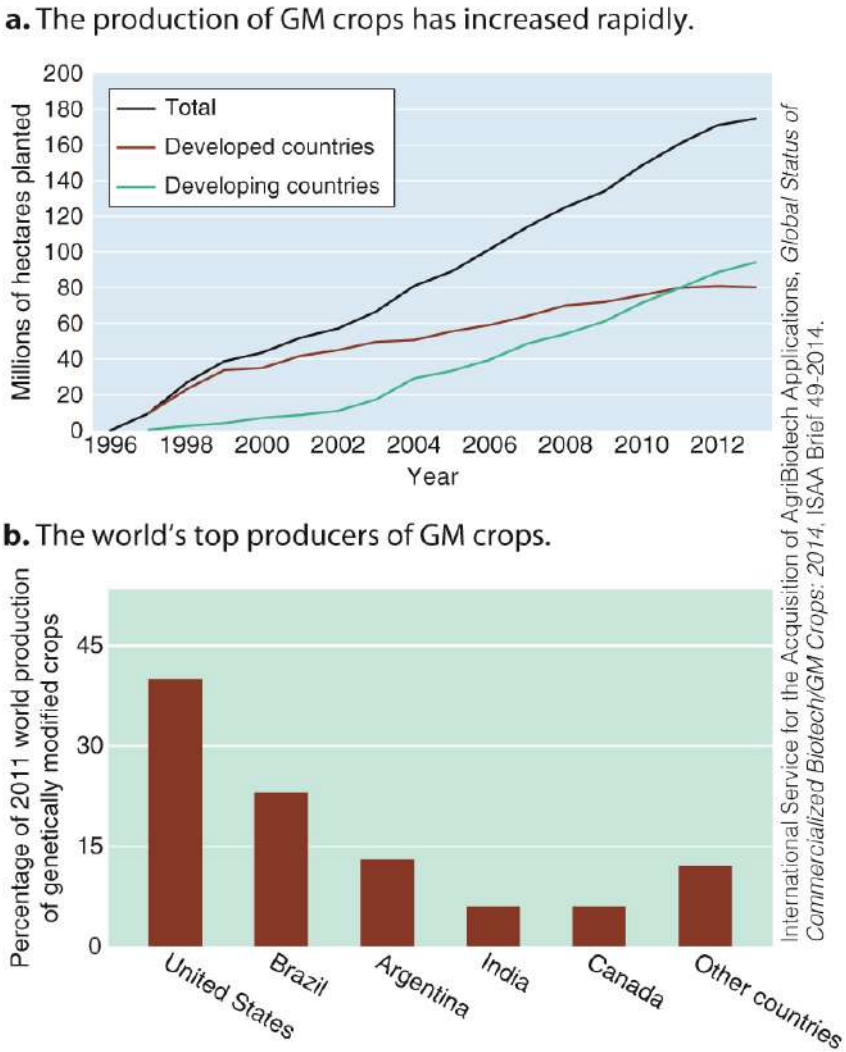


Genetic Modification

- Genetic engineering
  - Manipulation of genes to produce a particular trait
  - _____
  - Has the potential to produce genetically _____ (GM) plants that can be:
    - More _____ food plants that contain all essential amino acids or that would be rich in vitamins
    - Resistant to viral diseases, drought, heat, cold, herbicides, _____, insect pests, etc.

Genetic Modification

- Concerns about genetically modified foods
  - _____ of inserted genes to weeds or non-related crops
  - Potential for food _____ development in some consumers
  - Non-GM farmers may lose genetic integrity of crops due to ____ pollen transfer



Environmental Impacts

- Industrialized agriculture has many environmental _____
  - Increased carbon footprint
  - Water _____
    - Animal wastes, fertilizers, and pesticides, are an important cause of surface water pollution
  - _____ pollution
    - Due to agricultural use of fossil fuels, pesticides, fertilizers
- Impacts of industrialized agriculture:
  - _____ (toxic chemicals used to kill pests) resistance and residues

Environmental Impacts

- Impacts of industrialized agriculture:
  - _____ degradation
    - Reduction in the potential ability of the land to support crops/livestock
    - _____, compaction, salinization
  - Habitat fragmentation
    - Breakup of large areas of habitat into _____, isolated patches
    - Many species are _____ due to habitat loss to agriculture

Moving to Sustainable Agriculture

- Food production in its current state may not be _____
- Sustainable agriculture combines _____ with traditional techniques
  - Diversification of crops and livestock
  - Breeding of disease _____ varieties
  - Water and energy conservation
  - Crop rotation, _____ farming to preserve soil quality (No-till farming involves planting crops over the previous dead crops without disturbing the soil)
  - Pesticides which are used should disintegrate rapidly and not persist in the environment

Controlling Agricultural Pests

- Pest
  - Any organism that _____ in some way with human welfare or activity
- _____
  - The agent used to reduce pest populations
  - Can be grouped by target organisms
    - Insecticides
    - _____
    - Rodenticides
    - Fungicides

Benefits of Pesticides

- Effectively control organisms that spread disease
- Protect _____ from pests and pathogens
  - 1/3 of crops are destroyed by pests
- _____ (single species grown in large areas) amplify effect of pests
- Genetic resistance
  - In the 60 years of wide pesticide use, at least 520 species of insects and mites and at least _____ plant species have evolved genetic _____ to certain pesticides

Case Study

- Organic agriculture
  - No use of commercial inorganic fertilizers or _____
  - Organic Food Production Act of 1990
    - Specifies _____ for organic production and labeling
    - Federal standards for organic certification went into effect in _____
  - In 2011, 2 million hectares farmed organically in the U.S.
  - Rapid growth in organic agriculture in U.S. today
    - U.S. sales of organic products increased from $3 billion in 2008 to $ ____ billion in 2014