

GLOBAL ISSUES AND CHALLENGES

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Module Overview

This module fosters an understanding of the global issues and challenges at play and how they impact Eco Health. At the end of the course, students should have a sufficient understanding of ecosystems dynamics so that they can work with environmental professionals to analyze how natural and anthropogenic changes to the environment can affect animal and human health locally, regionally, and nationally.

Module Competencies

Competencies#1	Learning Objectives to Develop Competencies
Understand the scope and nature of global issues and challenges	a) Understand/ explaining the impact of activities/ events on ecology, ecosystems as well as challenges to ecosystems, human and animal health

A. INTRODUCTION TO ECOSYSTEM HEALTH

An ecosystem is a community of living organism (plants, animals, and microbes) in conjunction with the nonliving components of their environment (things like air, water, and mineral soil), interacting as a system. These biotic and abiotic components are regarded as linked together through nutrient cycles and energy flows. Healthy ecosystem are stable and sustainable, maintaining its character in composition, organization and function over time, and its resilience to stress.

Many activities and events can affect ecosystem health, both direct and indirect. A direct effect is anything that will cause a change – negative or positive on an ecosystem. Changes in local and regional land use that could affect ecosystems includes the conversion of forests to agriculture or urban/suburban areas. Removal of vegetation will change the hydrology of the area, the climate, and the ability of the area to weather storms. By changing land use or constructing roads, habitats can be lost, degraded or fragmented. Many species need a minimum size of uninterrupted to survive – they either have migration corridors or they can need a certain amount of space in which to hunt. If habitat is degraded, species may be lost. As we discussed there are some species that have very specific habitat requirements. It may be that they need to have conditions that require them to be in the center of the forest.

Indirect effects are those effects that do not directly cause changes to ecosystems but can result in other activities/actions that can alter ecosystems. For example- human population increase can lead to an increase in fertilizer use to increase food production. However the increase in fertilizer if not done properly can increase the nutrient load of nitrogen and phosphorus to streams, rivers, and lakes. This can lead to eutrophication.

How do impacts to ecosystem affect public health?

Ecosystems are the planet's life-support systems – for human species and for all other forms of life. The causal links between environmental change and human health are complex, because they are often indirect, displaced in space and time, and dependent on a number of modifying forces (www.millenniumassessment.org). Changes in ecosystem influence all components of human well-being, because humans are fully dependent on Earth's ecosystems and the services that they provide, such as food, clean water, disease regulation, climate regulation, spiritual fulfillment, and aesthetic enjoyment (www.greenfacts.org).

For example deforestation in some cases can increase the breeding habitats of Anopheles mosquitos and in other decrease. There are some Anopheles mosquitos that breed in shaded water bodies. Other Anopheles have increased survival rates in deforested environments so the seasonal transmission of malaria is prolonged. In Malaysia, clearing for rubber plantations in the 1990s increased the incidence of malaria. Other places where fruit trees were planted also experienced an increased incidence of malaria because the ecological conditions favored an Anopheles mosquito. As a result there was a local reemergence of malaria. Irrigation system often increase the density of breeding habitats and an increase in malaria incidence. Deforestation for mine development is one of the examples that not only create breeding sites, but also significantly increase human contacts with vectors. Where settlement and mining activities took place in the Amazon, An. darlingi increased because of the increase in breeding sites, including borrow pits after road or settlement constructions, drains, and opencast mine workings. As a result, malaria, which was present in the Amazon's indigenous population, was spread to immigrants and miners.

Another example is in Thailand, the transformation from forest to cassava or sugarcane cultivations eliminated shady breeding habitats for the primary vector species, but created widespread breeding grounds for An. minimus, which have greater sun preference and was the predominant species throughout the year. Consequently, malaria transmission among resettled cultivators became high.

EXERCISE#1

Discussion

- ✓ How do changes to ecosystems affect health (direct and indirect)?

Notes:

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B. CLIMATE CHANGE

The earth's climate has changed throughout history. Just in the last 650,000 years there have been seven cycles of glacial advance retreat, with the abrupt end of the last ice age about 7,000 years ago marking the beginning of the modern climate era – and of human civilization (www.climate.nasa.gov). Over the last 50 years, human activities have released sufficient quantities of carbon dioxide and other greenhouse gases to trap additional heat in the lower atmosphere and affect the global climate (www.who.int).

Climate change in IPCC usage refers to a change in the state of the climate that can be identified by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. It refers to any change in climate over time, whether due to natural variability or as result of human activity (www.unfccc.int). Global climate change is likely to change the frequency of extreme weather events: tropical cyclones may increase as sea surface waters warm; floods may increase as the hydrological cycle intensifies; and heat waves may increase in mid-continental locations. The IPCC states over the last two decades, the Greenland and Antarctic ice sheets have been losing mass, glaciers have continued to shrink almost worldwide, and Arctic sea ice and Northern Hemisphere spring snow cover have continued to decrease in extent (high confidence). The rate of sea level rise since the mid-19th century has been larger than the mean rate during the previous two millennia (high confidence). Over the period 1901–2010, global mean sea level rose by 0.19 [0.17 to 0.21]. Rising sea levels and increasingly extreme weather events will destroy homes, medical facilities, and other essential services. More than half of the world's population lives within 60 km of the sea. People may be forced to move, which in turn heightens to communicable diseases (www.who.int).

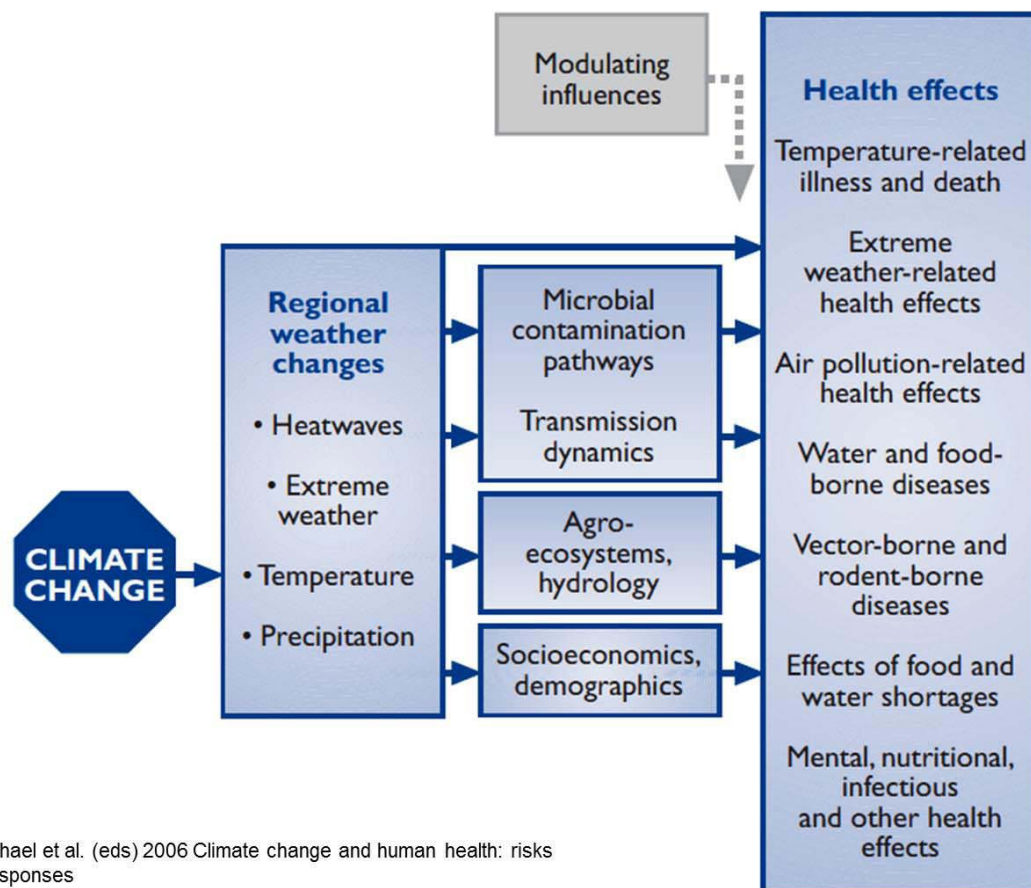
The changing of climate also impacts society and ecosystems in a broad variety of ways. For example climate change can increase or decrease rainfall, influence agricultural crop yields, affect human health, cause changes to forests and other ecosystems, or even impact our energy supply. Climate-related impacts are occurring across regions of country and across many sectors of our economy. Many state and local governments are already preparing for the impacts of climate change through “adaptation,” which is planning for the changes that are expected to occur.

How climate change affects human health?

Global climate change has already had observable effects on the environment that both directly and indirectly affects human health; increased deaths in heat waves, and in natural disasters such as floods, as well as changing patterns of life-threatening vector-borne diseases. Increasingly variable rainfall patterns are likely to affect the supply of fresh water. A lack of safe water can compromise hygiene and increase the risk of diarrheal disease, which kills approximately 760,000 children aged under 5, every year. In extreme cases, water scarcity leads to drought and famine. By the late 21st century, climate change is likely to increase the frequency and intensity of drought at regional and global scale (www.who.int).

Floods are also increasing in frequency and intensity, and it is expected to continue to increase throughout the current century. Floods contaminate freshwater supplies, heighten the risk of water-borne diseases, and create breeding grounds for disease-carrying insects such as mosquitoes. They also cause drowning and physical injuries, damage homes and disrupt the supply medical and health services (www.who.int).

Climatic conditions strongly affect water borne diseases and diseases transmitted through insects, snails, or other cold blooded animals. Changes in climate are likely to lengthen the transmission seasons of important vector-borne diseases and to alter their geographic range. For example, climate change is projected to widen significantly the area of China where the snail-borne disease schistosomiasis occurs. Malaria is strongly influenced by climate. Transmitted by Anopheles mosquitoes, malaria kills almost 600,000 people every year – mainly African children under 5 years old. The Aedes mosquito vector of dengue is also highly sensitive to climate conditions, and studies suggest that climate change is likely to continue to increase exposure to dengue. (www.who.int).



The graphic explains that climate change will affect human health in multiple different ways. Changes will vary depending on location, environment, and vulnerability. There will be both positive and negative impacts. The direct impacts will occur due to weather extremes such as heat waves or winter cold or winter events such as floods or droughts. While these weather extremes could increase morbidity and/or mortality, winter temperatures may be milder in some areas.

An indirect effect would be the transmission of infectious disease. Ones like to be affected will be water, food, and vector-borne. The distribution and abundance of vectors and intermediate host are affected by many climatic factors such as temperature, precipitation, humidity, wind, and water.

Modelling studies have forecasted that an increase in ambient temperature worldwide would cause net increases in the geographical distribution of some vectors, such as malarial mosquitoes, although some decreases also might occur in certain areas. Temperature could also change the life-cycle dynamics of the vector species (mosquitos, sandflies, ticks) and the pathogens (flukes, protozoa, bacteria and viruses). This is likely to increase the potential transmission of many vector-borne diseases such as malaria (mosquito), dengue fever (mosquito) and leishmaniasis (sand-fly). But, schistosomiasis (water-snail) may undergo a net decrease in response to climate change.

EXERCISE#2

Discussion

✓ How can does climate change affect ecosystem, animal and human health?

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C. GLOBALIZATION

Globalization is the tendency of businesses, people, products, technologies, or philosophies to spread throughout the world, or the process of making this happen. The global economy is sometimes referred to as a globalism, characterized as a totally interconnected marketplace, unhampered by time zones or national boundaries.

For instance, according to the World Bank's survey on International inbound tourists (overnight visitors) are the number of tourists who travel to a country other than that in which they have their usual residence, but outside their usual environment, for a period not exceeding 12 months and whose main purpose in visiting is other than an activity remunerated from within the country visited. In 1995 the volume of tourists was 4,324,000, whereas in 2011 it was 7,650,000. This in turn has the effect of accelerating the transmission of disease through the movement of personnel.

As for trade the World Trade Organization reported that Indonesia carried out \$45.4M (USD) in 1995, whereas in 2011 it was \$200.8M (USD). Trade allows more products and goods to be shipped amongst various trading partners. This in turn has the effect of providing another transmission route for disease through the shipment of infected goods, product, animals, pests, insects etc. In this case, communication has a role in allowing people to be informed about what is happening in the next village, city, country, and continent. These have an impact on mobility and trade, which in turn has an impact on public health.

The increased movement of both goods and people increases opportunities for the spread of disease around the world. The outbreak of BSE, or "mad cow disease," in several European countries is only one example of how trade can promote the spread of dangerous diseases. Mosquitoes that carry malaria have been found aboard planes thousands of miles from their primary habitats, and infected seafood carrying cholera bacteria have been shipped from Latin America to the United States and Europe (www.globalization101.com). Twenty years ago only 20% of the world's population was living in areas where malaria is endemic but now that number has risen to 40%. While globalization increases the risk of the spread of infectious disease, it also facilitates more collaboration and better communication that will allow for a more comprehensive global effort towards controlling these diseases (www.needtoknow.nas.edu).

Global marketing also brings contribution in leading the spread of consumption habits through advertising and other influences (smoking, changing pattern of food consumption). The illegal trade in drugs, alcohol, cigarettes, counterfeit medicines and the trafficking of people is also a product of globalization, with severe negative consequences for health.

Besides the negative impacts, globalization also has the potential for positive effects on development and health of the country. Global communications technology has helped to increase scientific and technological knowledge-sharing for the development of medicines, vaccines and medical appliances, enabling the development of new forms of treatment and prevention. It has also improved communication and transport possibilities and, thereby, reduced the technical barriers to access to medical education, information and treatment. Internet communication has also dramatically improved the possibility of tracking and monitoring outbreaks of infectious diseases (www.globalhealththeurope.org). On the other hand, modern technology potentially enables the health community to respond more quickly to such emergencies. For example, an international network of institutions coordinated by the WHO via global telecommunications can readily detect and rapidly respond to changes in the influenza virus, such as capacity was unavailable after the First World War, when an estimated 20 million people died of influenza worldwide (Lee, 2004).

EXERCISE#3

Discussion

✓ How does globalization affect ecosystem, animal, and human health?

Notes:

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D. EMERGING AND RE-EMERGING INFECTIOUS DISEASE

Emerging and re-emerging disease are challenges global health issues that need to address. Sixty percent of the human pathogen are the animal origin. The seventy percent of it are emerging disease which could transmit from animal to human. It is required to develop strategies and policies for unities of addressing zoonotic disease by veterinary, medicine, public health, and environmental health.

Emerging diseases are new microorganisms capable of causing disease in humans continue to be detected. Whether an emerging microorganism develops into a public health threat depends on factors related to the microorganism and its environment, or the infected human and his/her environment. Such factors include ease of transmission between animals and people and among people, potential for spread beyond the immediate outbreak site, severity of illness, availability of effective tools to prevent and control the outbreak, and ability to treat the disease. Some of the new agents detected in the past 25 years are now genuine public health problems on a local, regional or global scale. Emerging infectious diseases (EIDs) range from novel zoonotic infections to infective organisms with new patterns of antimicrobial resistance. Infections can travel both ways at the interface between animals and people; animal health has an intrinsic link to human health. The environment also contributes in the connection between human and animals, either it influences the habitat of animal or human population. Surveillance as a tool for monitoring the spreading of disease needs to improve. It needs to bring the human, animal, and environmental sectors to improve the ability to combat EID threats. A Recent example of emerging diseases in various parts of the world includes SARS, MERS, Ebola, avian flu, swine flu, and most recently, Zika.

Re-emerging infectious diseases are due to the reappearance of, and an increase in, the number of infections from a disease which is known, but which had formerly caused so few infections that it had no longer been considered a public health problem. The re-emergence of the disease in the human population indicates that there are changes in the ecological balance. Controlling the re-emerging disease requires a focused and collaborative effort across multiple disciplines – a One Health approach. Some example of re-emerging infectious diseases are dengue, diphtheria, malaria, measles, meningitis, pertussis, rabies, rubella, schistosomiasis, tuberculosis, and yellow fever.