Introduction to Environmental Science

Lecture 1

ENHL 220

OUTLINE

- 1- Few Basic Definitions

- 2- Few Basic Terminologies

✓ 2.1- Natural Resources

✓ 2.2- Ecological Footprint

✓ 2.3- Pollution

✓ 2.4- Sustainability

✓ 2.5- Economic Growth & Development

- 3- Environmental Problems, Causes & Connections

- 4- Humans' Direct & Indirect Negative Effects on the Environment

Reference Book for this Lecture: Miller, T. & Spoolman, S. (2009).Living in the Environment (16th ed.). Canada : Cengage Learning
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1- Few Basic Definitions

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1- Few Basic Definitions

- Environment:

✓ definition → all living and nonliving things that surround and affect any living organism.

- Environmental Science:

✓ an interdisciplinary science that integrates information from natural science and social science.

✓ it is the connection between the earth's life support system and the human culture sphere.

✓ it is a study of how the earth works, how we interact with the earth and how to deal with environmental problems.

✓ its goal is to learn how nature works, how the environment affects us, how we affect the environment, and how we can live more sustainably without degrading our life-support system.

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1- Few Basic Definitions (Cont'd)

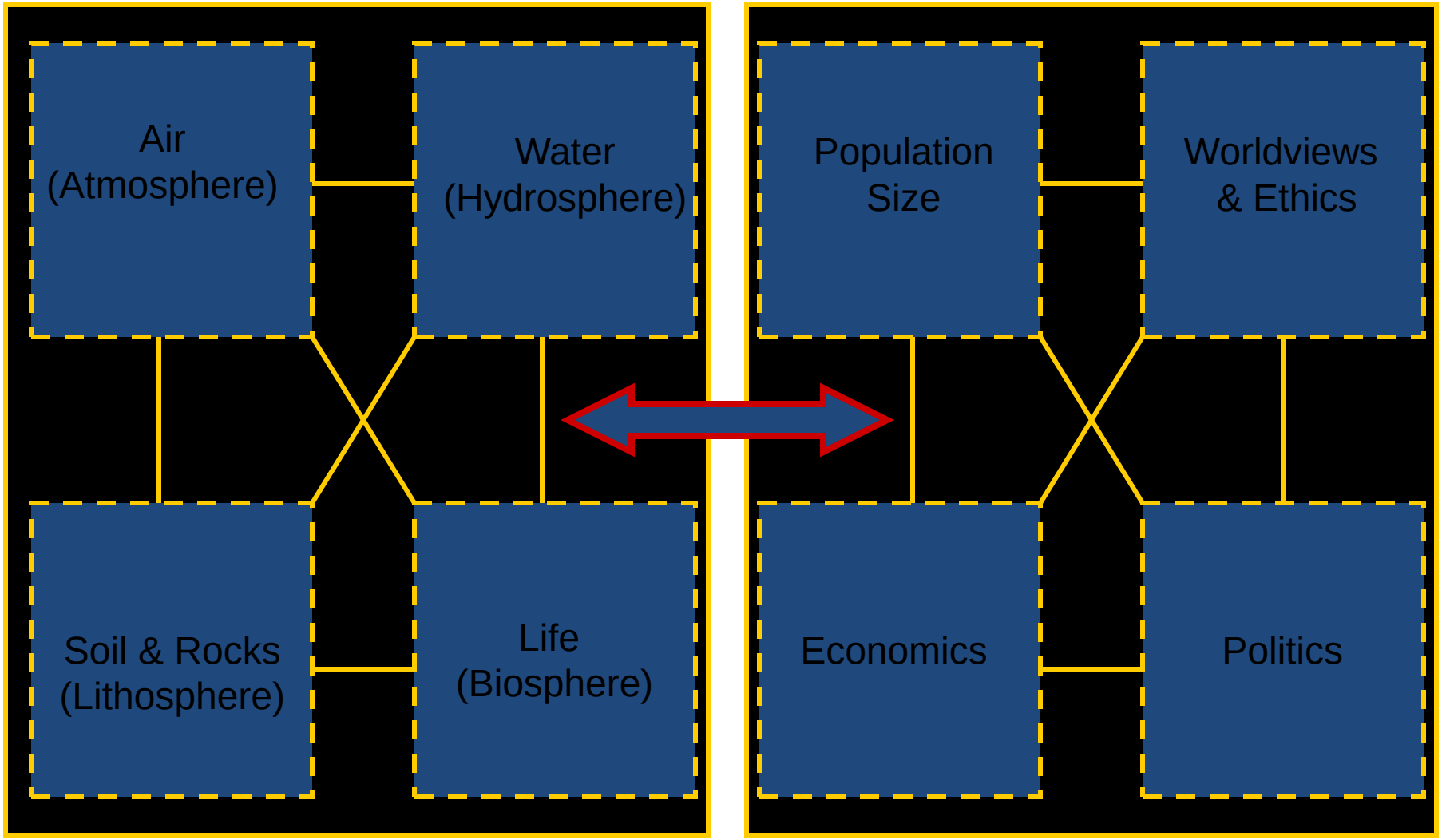

Figure 1: Environmental Science; An Interdisciplinary Science

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1- Few Basic Definitions (Cont'd)

- Environmentalism:

✓ definition → a social movement dedicated to protecting the earth's life support system for us and other species

(ex: working to pass a law, protesting harmful environmental degradation…).

- Environmental Degradation:

✓ definition → the process of exceeding a resources' natural replacement rate resulting in the shrinking of the available supply.

✓ "Tragedy of the Commons" →

- concept: degradation of renewable free access resources
- reason: "if I do not use this resource someone else will"
- solutions: use at rates lower than sustainable yield or privatize
- consequence: exploitation → no one can use it anymore.

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1- Few Basic Definitions (Cont'd)

- Natural Capital: includes the natural resources & natural services.

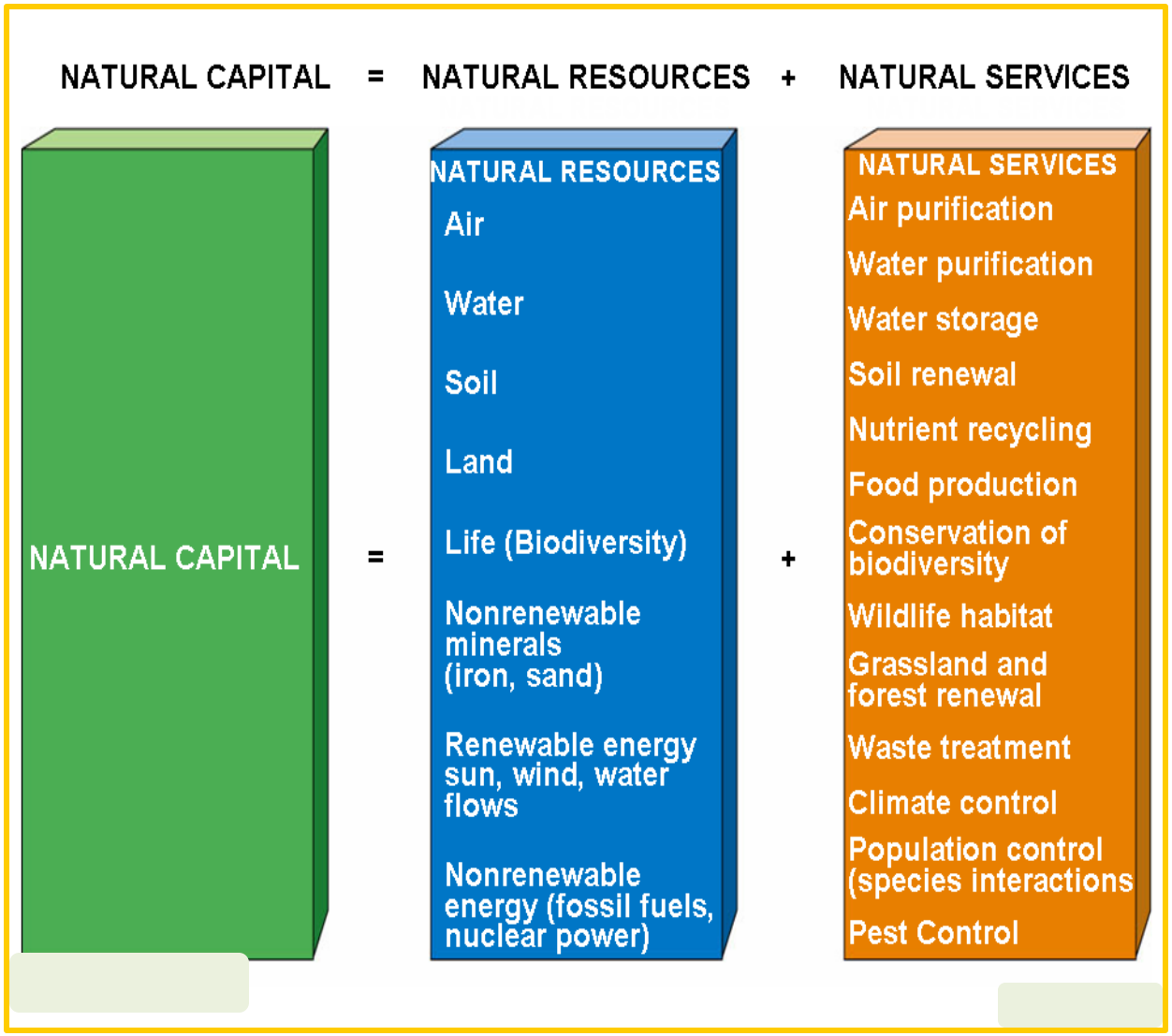

Figure 2: The Natural Capital

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2- Few Basic Terminologies

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2.1- Natural Resources

- Resource: anything obtained from the environment to meet our needs and wants.

- Resources are classified, on a human time scale, as:

✓ 1- Perpetual: continuous and not affected by human use of them (ex: sun…)

✓ 2- Renewable: can be replenished fairly rapidly through natural processes, if not used up faster than it is replaced (ex: forests, wild animals, water…)

✓ 3- Nonrenewable: can't be replenished or they do so at a very slow rate. They are usually present in fixed quantities (ex: {energy resources: coal, oil & natural gas…} – {metallic mineral resources: iron, copper…} – {nonmetallic mineral resources: salt, clay, sand…}).

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2.1- Natural Resources (Cont'd)

- Economically Depleted Resource:

✓ definition → when the cost of extracting & using what is left of the resource exceeds the economic value of that resource.

- Major solutions to nonrenewable resources' depletion are:

✓ 1- Reducing: reducing the use of nonrenewable resources.

✓ 2- Reusing: using a resource over and over again in the same form.

✓ 3- Recycling: collecting waste material, processing them into new material and selling these new products.

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2.2- Ecological Footprint

- Ecological Footprint:

✓ an estimate of the average environmental impact of individuals in a given country or area.

- Per Capita Ecological Footprint:

✓ average ecological footprint of an individual in an area.

- Humanity's Ecological Footprints exceeds by about 39% the earth's ecological capacity to replenish its renewable resources and absorb the resulting waste products and pollution.

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2.2- Ecological Footprint (Cont'd)

- ***Environmental Impact (I)*** of a given population on a given area depends on the interaction of 3 factors. These are:

✓ 1- ***Population Size (P)***

✓ 2- ***Resources Consumption per person or Affluenza (A)***

✓ 3- ***Technological Effects (T)***

* developed v/s developing countries…

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2.2- Ecological Footprint (Cont'd)

- Currently, the United States, European Union, China, India and Japan → use about 74% of the earth's ecological capacity → major polluters.

- Footprints of China and India people are projected to increase very rapidly as their economies continue to grow at the current rate.

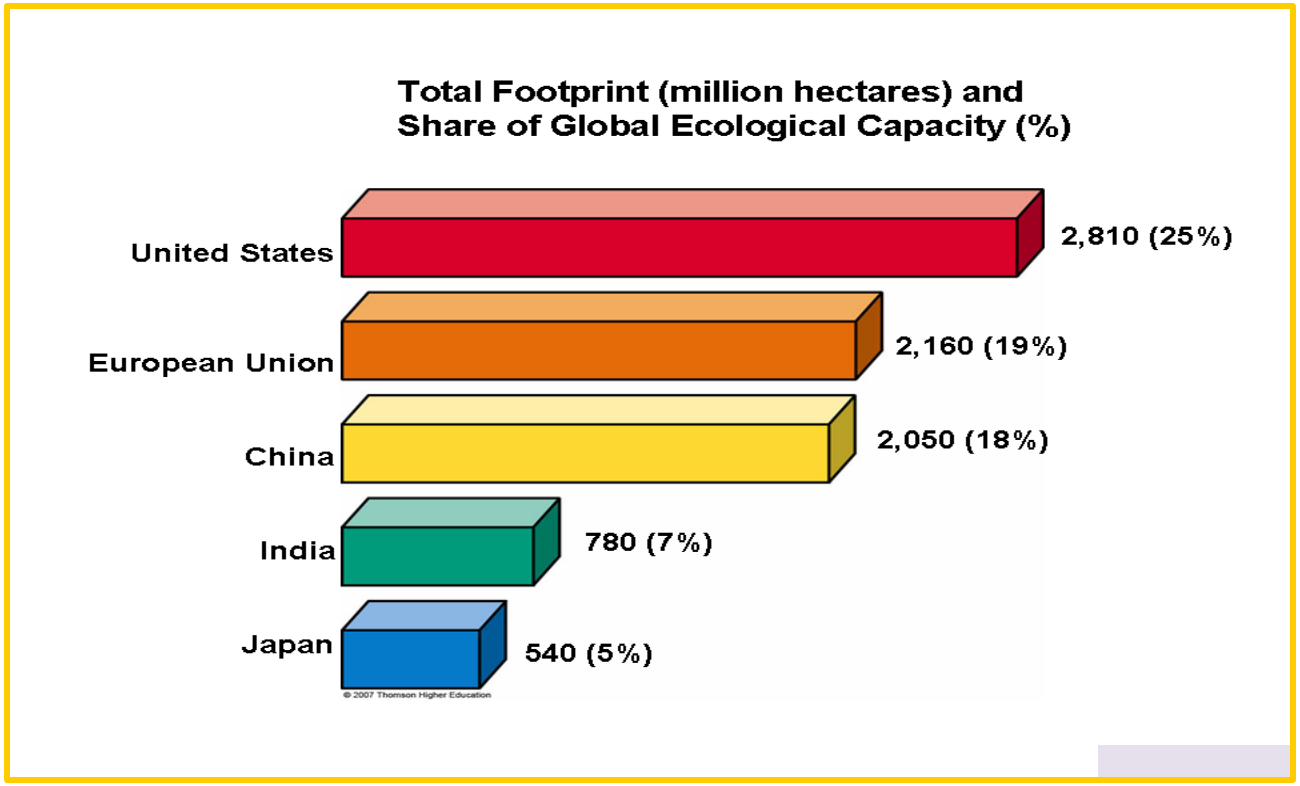

Figure 3:Total Ecological Footprints of selected countries in 2002

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2.3- Pollution

- Definition → the presence of chemicals or microorganisms at high enough amounts in the water, air, soil and food to threaten the health, survival or activities of humans or other living organisms.

- Pollutants can enter the environment naturally (ex: volcanic eruptions…) or through human activities (ex: agriculture, industries, cars…).

- Pollutants humans produce come from 2 types of sources:

✓ 1- Point Sources: single, identifiable sources.
(ex: smokestack of an industrial plant…).

✓ 2- Non Point Sources: large, dispersed and difficult to identify sources.
(ex: pesticide spaying, runoff of fertilizers and pesticides…).

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2.3- Pollution (Cont'd)

- Pollutants' undesirable effects:

✓ 1- Disruption or degradation of life support systems for humans and other species.
✓ 2- Damaging wildlife, human health and property.
✓ 3- Creation of nuisance (noise, smell, taste, sight).

- Pollution could be dealt with by 2 basic approaches:

✓ 1- Pollution Prevention or Input Pollution Control or Preventive Measures: reduces or eliminates the production of pollutants.

✓ 2- Pollution Cleanup or Output Pollution Control or Mitigation Measures: cleaning up or diluting pollutants after they have been produced.

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2.4 -Sustainability

- Sustainability:

✓ definition → the ability of the earth's various systems to survive and adapt to changing environmental conditions.

- Sustainable Development:

✓ definition → meeting the need of the present without compromising the ability of future generations to meet their own needs.

- Environmentally Sustainable Society:

✓ definition → a society that follows the sustainable development principle.

- Sustainable Yield:

✓ definition → the highest rate at which renewable resources can be used without reducing their availability.

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2.4- Sustainability (Cont'd)

- The "Path to Sustainability" includes:

✓ 1- Understand the components and importance of the "*Natural Capital*".

✓ 2- Recognize that human activities *degrade the natural capital*.

✓ 3- Search for workable *solutions* to the environmental problems.

✓ 4- Make *trade offs* or compromises to resolve conflicts in trying to find solutions (ex: promote planting of trees…).

✓ 5- *Individuals* have a role, as well, in trying to find solutions (ex: passing laws…).

Figure 4: The Path to Sustainability

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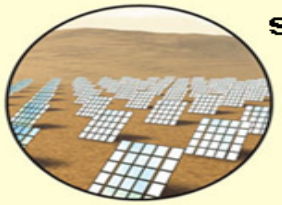
2.4 -Sustainability (Cont'd)

Solutions

Principles of Sustainability

How Nature Works	Lessons for Us
Runs on renewable solar energy.	Rely mostly on renewable solar energy.
Recycles nutrients and wastes. There is little waste in nature.	Prevent and reduce pollution and recycle and reuse resources.
Uses biodiversity to maintain itself and adapt to new environmental conditions.	Preserve biodiversity by protecting ecosystem services and habitats and preventing premature extinction of species.
Controls a species' population size and resource use by interactions with its environment and other species.	Reduce human births and wasteful resource use to prevent environmental overload and depletion and degradation of resources.



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2.5- Economic Growth & Development

- Economic Growth: an increase in the capacity of a country to provide people with goods and services.

- Economic Development: the improvement of human living standards by economic growth.

- Environmentally Sustainable Economic Development: encourage environmentally beneficial and more sustainable forms of economic development.

- Developed countries v/s Developing Countries: industrialization + value for money (GDP) …income.

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3- Environmental Problems: Causes & Connections

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3 -Environmental Problems: Causes & Connections

- Major environmental problems mainly relate to:

✓ 1- Air Pollution
✓ 2- Water Pollution
✓ 3- Waste Production
✓ 4- Biodiversity Depletion
✓ 5- Food Supply Problems

- Major causes of environmental problems are:

✓ **1- Population growth**
✓ **2- Unsustainable and Wasteful resource use**
✓ 3- Use of highly polluting technologies
✓ 4- Poverty and Affluenza (overconsumption)
✓ 5- Poor environmental accounting
✓ 6- Environmental ignorance

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3 - Environmental Problems: Causes & Connections (Cont'd)

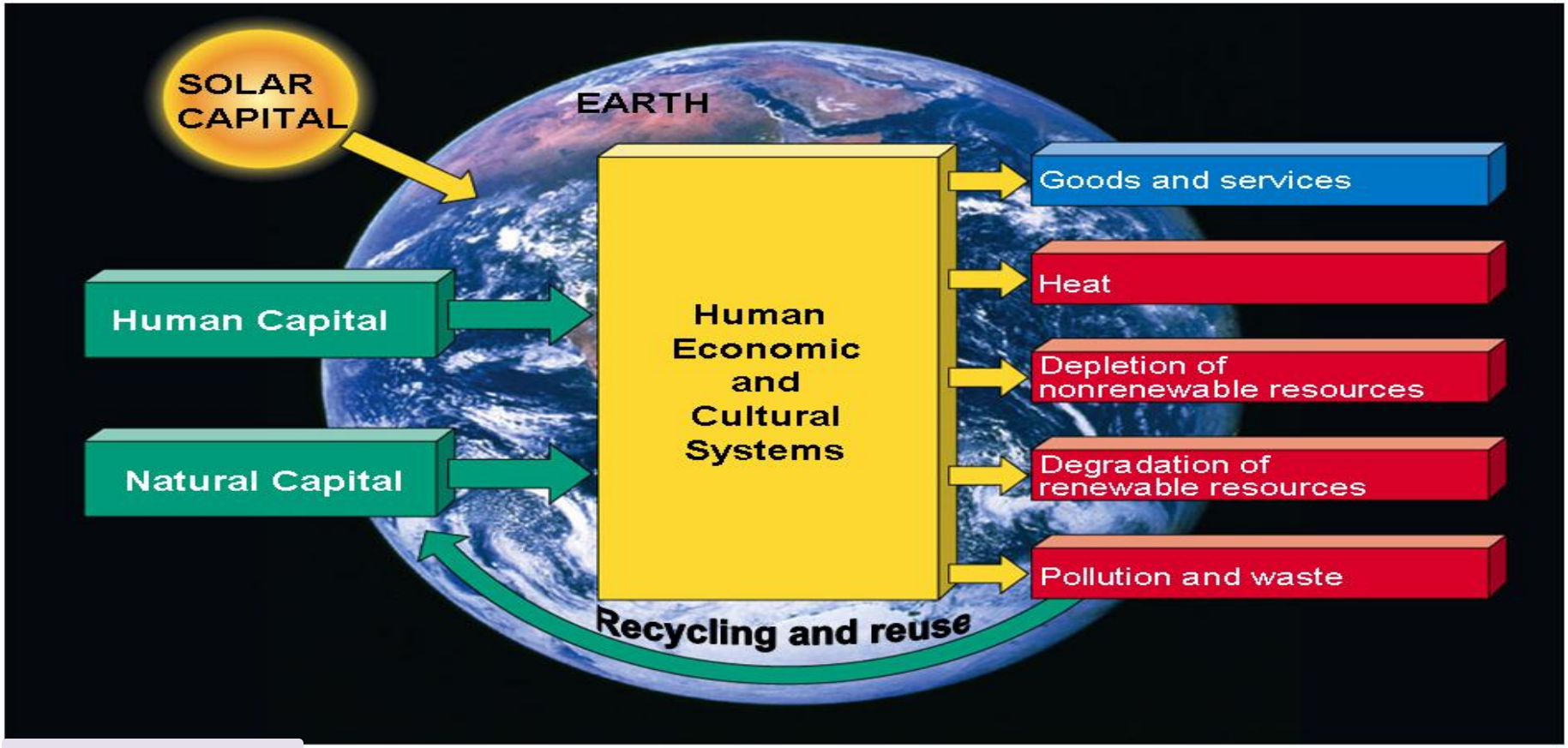

Figure 5: Occurrence of environmental problems

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4- Human's Direct & Indirect Negative Effects on the Environment

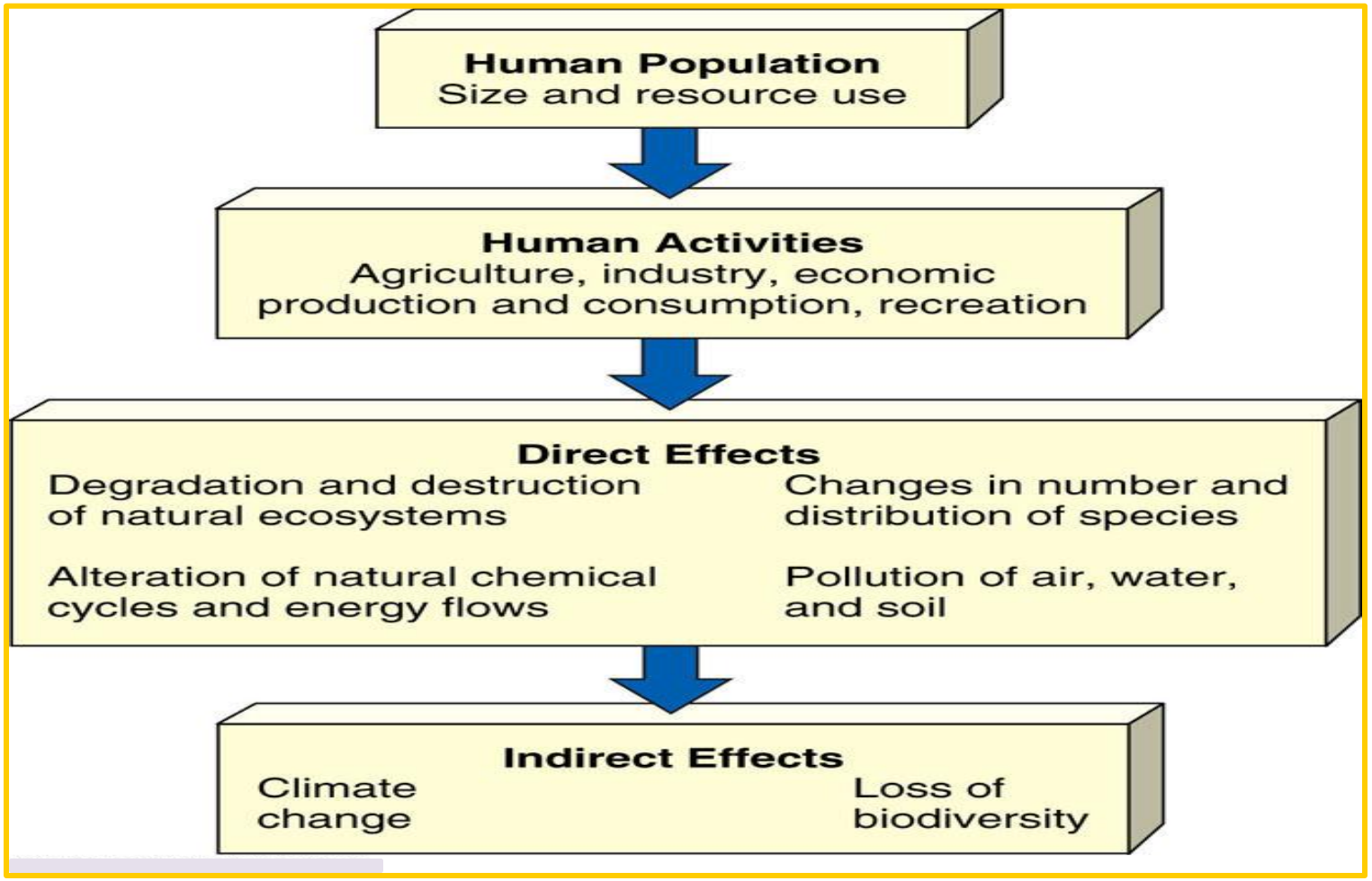

Figure 6: Human's Negative Effects on the Environment

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REFERENCES

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Miller, T. & Spoolman, S (2009). Living in the Environment (16th ed.) Canada: Cengage Learning – Brooks/Cole

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n.b: All the material in this presentation is taken from the previously mentioned reference book.