IB Environmental Systems and Societies SL Course Guide

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Course Objectives and Aims

Big questions

The following big questions are intended as a guide to shape an overall concept-based approach to the delivery of this subject, and to encourage a holistic perspective on the relationship between human societies and natural systems. They have been designed to engender a vision of the overarching principles that are central to the course, and to encourage students to revisit central ideas in different contexts.

1. Which strengths and weaknesses of the systems approach and of the use of models have been revealed through this topic?
2. To what extent have the solutions emerging from this topic been directed at **preventing** environmental impacts, **limiting** the extent of the environmental impacts or **restoring** systems in which environmental impacts have already occurred?
3. What value systems are at play in the causes and approaches to resolving the issues addressed in this topic?
4. How does your personal value system compare with the others you have encountered in the context of issues raised in this topic?
5. How are the issues addressed in this topic relevant to sustainability or sustainable development?
6. In which ways might the solutions explored in this topic alter your predictions for the state of human societies and the biosphere decades from now?

The **aims and objectives** of this course are to promote students' understanding of environmental processes at a variety of scales, from local to global, and enable students to apply this understanding, along with field methodologies and skills, towards a critical evaluation of environmental issues. Students will become more aware of different cultural, economic and political perspectives on environmental issues and begin to appreciate the value of international collaboration in resolving these issues. They will understand the human connection to the environment at multiple levels. The curriculum outline presented is designed to be a one-year course.

International-mindedness will be a strand through all curricular units. By studying the historical perspective of science knowledge over time and the discovery and innovations of new science, students will be exposed to the collaborative efforts of a global scientific community. Ethics plays a role in scientific decisions. Each global community has their own beliefs concerning moral, ethical, socio economic issues, which have global environmental implications (TOK). By exploring these issues, students will gain an understanding of other people and their perspectives.

Environmental Systems and Societies AIMS

The AIMS enable students to:

1. Acquire the knowledge and understandings of environmental systems at a variety of scales
2. Apply the knowledge, methodologies and skills to analyse environmental systems and issues at a variety of scales
3. Appreciate the dynamic interconnectedness between environmental systems and societies
4. Value the combination of personal, local and global perspectives in making informed decisions and taking responsible actions on environmental issues
5. Be critically aware that resources are finite, and that these could be inequitably distributed and exploited, and that management of these inequities is the key to sustainability
6. Develop awareness of the diversity of environmental value systems
7. Develop critical awareness that environmental problems are caused and solved by decisions made by individuals and societies that are based on different areas of knowledge
8. Engage with the controversies that surround a variety of environmental issues
9. Create innovative solutions to environmental issues by engaging actively in local and global contexts.

Learner Profile Application:
In IB Environmental Systems and Societies SL, students will experience learning opportunities that reinforce the following characteristics.

- *Inquirers*: Develop skills necessary to conduct research and show independent learning
- *Knowledgeable*: Students must acquire the necessary background information before venturing into hypothesis formulation.
- *Risk Takers:* Able to develop creative correlations to scientific information; takes an imaginative leap that may not always feel comfortable
- *Balanced*: Students will have to balance the needs of many people in order to propose compromises to case scenario dilemmas
- *Communicators*: Within their research teams, students will acquire the skills to work cooperatively and will effectively communicate their results for peer review, emulating true science in the publication of results in scientific journals and at conferences.
- *Reflective*: Analyzing and communicating the outcome of investigations; monitor their own learning and developing remediation plans
- *Principled:* able to present their information accurately and honestly.

Course Delivery

Instructional Approach: Classroom Practices that Support the IB Philosophy

Learning activities are developed to provide IB students the opportunity to be active learners and are designed to support the Group 4 (Investigative Sciences) and Group 3 (Individuals and Societies) objectives and aims. Throughout this course of study, students will perform laboratory investigations, research real world case studies, and use/develop models to understand environmental systems. Below is a description of how each instructional activity supports the IB philosophy.

Laboratory Investigations:
IB Environmental Systems and Societies is a laboratory-based curriculum, in which students develop, conduct, analyze and conclude numerous investigations and report findings by way of informal and formal laboratory reports and peer-reviewed presentations.

Investigative Teams will be formed and the students will explore different environmental concepts through laboratory investigations. They will propose hypotheses; develop experimental design; conduct the investigations; analyze the results; validate or propose alternative hypotheses to the investigation. Experimental collaboration will occur within each of the research teams. Teams will present their data for peer review, reflecting the true nature of science review.

Case Studies: In science, case studies are stories that explore real life environmental, ethical, political, economic and philosophical issues with real world application. They require cooperative research, analysis, and a proposal of possible solutions and/or outcomes

Internal assessment is based upon students developing and using these skills on an independent research investigation. They will transfer the skills learned cooperatively into an independent research situation.

Use of Models: Students will need to understand mechanisms of life that are not directly observable. A variety of models are used (mathematical, diagrams, and computer animations) in science to illustrate and explain these different mechanisms (e.g. energy flow, predator-prey relationships, ecosystems, climate change, population growth)
Students will be asked to understand, explain, and illustrate scientific models. They will also be asked to develop their own models either through illustrations, 3-D, or metaphorically.

TOK Application: Scientific Investigations directly correlate to TOK.

- *Ways of Knowing***:** "Driven by emotion, using sense perception enhanced by technology and combined with reason, it "science" communicates through language, principally the universal language of mathematics."
- *Technology*: Experimental investigations will include the use of Computer Based Learning (CBL) technology. Probe-ware will be used to collect and analyze the data. e.g. pressure sensors, pH sensors, dissolved oxygen, colorimeters.
- *Scientific Method*: There is not one scientific method. Application and discussion of inductive, deductive methods and naturalistic approaches will be used in the implementation of science investigations.
- *Limitations*: Mathematical evaluation will be used to assess the data within the limitations of science. Error analysis will be conducted to explain the limitations of the experimental design and conduction of the investigation.
- *Reason and Knowledge*: What part does emotion play in the acquisition of knowledge? Does the role of emotion vary across the different areas of knowledge?
- Ability to identify *relevant knowledge* embedded in a real-life situation.
- *Global and ethical issues* are discussed in detail. Students will come to understand the cultural differences that lead to different approaches to environmental issues.
- *International Open-mindedness* and *Caring*: students will discover the economic and social differences existing in different areas around the world by researching a variety of case studies. In order to propose solutions to these cases, students must be able to look outside of their perceptions and face the reality of what other people experience.
- *Limitations of Knowledge*: Requires an understanding of the limitations of science and technology may be different depending upon the country.
- *Limitations of science and technology*: Requires an understanding of the limits of the information based upon the limits of the technology used. Understands that models change as new information is obtained.

Human commonality, diversity and multiple perspectives.
A cornerstone of the ESS course is the idea of environmental value systems (EVSs). Each individual, or group of individuals, will have his or her own EVS arising from his or her beliefs and circumstances. One's perception of the importance and impact of environmental threats varies according to individual circumstances, cultures and traditions, and is subject to change over time. Studying this course will lead students to critically examine and develop their own value systems. They should also become acquainted with the diverse range of EVSs of people from different cultures and backgrounds. These too can be critically examined, but this should be done in an atmosphere of tolerance and respect towards others.

CAS and EE: The IB Core team supports Creativity, Action, and Service and Extended Essay work by serving as CAS and EE sponsors for students.

Classroom Policies

All students have the right to learn and participate to the best of their abilities. I follow the TRHS...

- Academic Honesty Policy
- Inclusion Policy
- Language Policy
- Assessment Policy
- Resolution Process

Assessment Policy

Students are expected to be active learners. Self-evaluation and creation of learning plans is a requirement of all students. The grade will reflect what a student knows and the skills obtained over the course of year.

IB Environmental Systems and Societies SL Grade distribution

Semester 1	Semester 2
50% Assessments (includes final exam)	50% Assessments
40% Investigative work	30% Investigative Work
10% Homework/Responsibility	10% Internal Assessment Work
	10% Homework/Responsibility

IB Assessments and Criteria

Internal Assessment (IA) 25% of IB Grade for the course.

The internal assessment task involves the completion of an individual investigation of an ESS research question that has been designed and implemented by the student. The investigation is submitted as a written report.

IA Assessment Criteria (30)

- Identifying the Context (6)
- Planning (6)
- Results, Analysis and Conclusion (6)
- Discussion and Evaluation (6)
- Application (3)
- Communication (3)

The External Assessment (EA) consists of two papers (examinations) in May and is 75% of the IB grade for the course.

- PAPER 1 (25%) - Case Study -Students will be provided with a range of data in a variety of forms relating to a specific, previously unseen case study. Questions will be based on the analysis and evaluation of the data in the case study
- PAPER 2 (50%) - Short answer and data-based questions and structured essays, students answer 2 from a choice of 4.

Throughout the course I adhere to the TRHS IA/EA calendar in order to balance student assignments with other courses within the IB Diploma program.

Curriculum Details

IB Environmental Systems and Societies SL Curriculum Overview and Alignment:
The following curriculum overview includes all topics from the ESS curriculum guide listed in the order of presentation. The IB Environmental Systems and Societies SL teacher collaborates with other science teachers in order to align the IB curriculum for the optimum sequence and to build from the TRHS lower level sciences.

Topic 1- Foundations of environmental systems and societies

1.1 Environmental value systems
- Historical events, among other influences, affect the development of environmental value systems (EVSs) and environmental movements. There is a wide spectrum of EVSs, each with its own premises and implications.

1.2 Systems and models
- A systems approach can help in the study of complex environmental issues. The use of systems and models simplifies interactions but may provide a more holistic view without reducing issues to single processes.

1.3 Energy and equilibria
- The laws of thermodynamics govern the flow of energy in a system and the ability to do work.
- Systems can exist in alternative stable states or as equilibria between which there are tipping points.
- Destabilizing positive feedback mechanisms will drive systems towards these tipping points, whereas stabilizing negative feedback mechanisms will resist such changes.

1.4 Sustainability
- All systems can be viewed through the lens of sustainability.
- Sustainable development meets the needs of the present without compromising the ability of future generations to meet their own needs.
- Environmental indicators and ecological footprints can be used to assess sustainability.
- Environmental impact assessments (EIAs) play an important role in sustainable development.

1.5 Humans and pollution
- Pollution is a highly diverse phenomenon of human disturbance in ecosystems.
- Pollution management strategies can be applied at different levels.

Labs/Activities
- Study of different ecosystem models
- Interactives about the laws of thermodynamics and how they relate to an ecosystem
- Negative and positive feedback information through predator-prey relationships lab
- Transfer and transformation processes explanation through food web/chains and cycles of the Earth
- Evaluate their environmental footprint using computer modeling
- Tragedy of the Commons article and simulation

Theory of Knowledge Links
- Models are simplified constructions of reality—in the construction of a model, how can we know which aspects of the world to include and which to ignore?
- Environmental Impact Assessments (EIA) incorporate baseline studies before a development project is undertaken—to what extent should environmental concerns limit our pursuit of knowledge?
- Experts sometimes disagree about pollution management strategies— on what basis might we decide between the judgments of the experts if they disagree?

Internationalism Links
- Ecosystems may often cross national boundaries and conflict may arise from the clash of different value systems about exploitation of resources (for example, migration of wildlife across borders in southern Africa).
- The use of models facilitates international collaboration in science by removing language barriers that may exist.
- The use of energy in one part of the globe may lead to a tipping point or time lag that influences the entire planet's ecological equilibrium.
- International summits and conferences aim to produce international tools (bodies, treaties, agreements) that address environmental issues.
- EIAs vary across national borders.
- Pollution cannot be contained by national boundaries and therefore can act either locally, regionally or globally.

Topic 2—Ecosystems and Ecology

2.1 Species and populations
- A species interacts with its abiotic and biotic environments, and its niche is described by these interactions.
- Populations change and respond to interactions with the environment.
- Any system has a carrying capacity for a given species

2.2 Communities and ecosystems
- The interactions of species with their environment result in energy and nutrient flows.
- Photosynthesis and respiration play a significant role in the flow of energy in communities.
- The feeding relationships of species in a system can be modelled using food chains, food webs and ecological pyramids.

2.3 Flows of energy and matter
- Ecosystems are linked together by energy and matter flows.
- The Sun's energy drives these flows, and humans are impacting the flows of energy and matter both locally and globally.

2.4 Biomes, zonation and succession
- Climate determines the type of biome in a given area, although individual ecosystems may vary due to many local abiotic and biotic factors.
- Succession leads to climax communities that may vary due to random events and interactions over time. This leads to a pattern of alternative stable states for a given ecosystem.
- Ecosystem stability, succession and biodiversity are intrinsically linked

2.5 Investigating ecosystems
- The description and investigation of ecosystems allows for comparisons to be made between different ecosystems and for them to be monitored, modelled and evaluated over time, measuring both natural change and human impacts.
- Ecosystems can be better understood through the investigation and quantification of their components.

Labs/Activities
- Short Grass Prairie food webbing activity
- Investigating food webs using owl pellets
- Quadrat and Transect studies for population sampling
- Plant and Insect Population diversity of various local ecosystems using Simpson's Diversity Index.
- Predator-Prey simulation Lab
- Energy Transfer in an Ecosystem activity
- Flows through an ecosystem- diagrams and graphs used to describe how energy is transferred in a system- Owl Pellet Lab
- Building Models for Matter Cycles study
- Interpretation of survivorship curves including logarithmic scales
- Various power points, note takers, study guide questions and vocabulary

Theory of Knowledge Links
- Feeding relationships can be represented by different models—how can we decide when one model is better than another?
- The Sun's energy drives energy flows, and throughout history there have been "myths" about the importance of the Sun—what role can mythology and anecdotes play in the passing on of scientific knowledge?
- Ecosystems are studied by measuring biotic and abiotic factors—how can you know in advance which of these factors are significant to the study?
- When is quantitative data superior to qualitative data in giving us knowledge about the world?

Internationalism Links
- The change in one community can impact other communities (butterfly effect).
- Ecosystems such as lakes and forests can exist across political boundaries.
- Human impacts on the flows of energy and matter occur on a global scale**.**
- Zonation occurs on different scales that can be both local and global.
- The use of internationally standardized methods of ecological study are necessary when making comparisons across international boundaries.

Topic 3—Biodiversity and conservation

3.1 An introduction to biodiversity
- Biodiversity can be identified in a variety of forms, including species diversity, habitat diversity and genetic diversity.
- The ability to both understand and quantify biodiversity is important to conservation efforts.

3.2 Origins of biodiversity
- Evolution is a gradual change in the genetic character of populations over many generations, achieved largely through the mechanism of natural selection.
- Environmental change gives new challenges to species, which drives the evolution of diversity.There have been major mass extinction events in the geological past.

3.3 Threats to biodiversity
- While global biodiversity is difficult to quantify, it is decreasing rapidly due to human activity. Classification of species conservation status can provide a useful tool in the conservation of biodiversity.

3.4 Conservation of biodiversity
- The impact of losing biodiversity drives conservation efforts.
- The variety of arguments given for the conservation of biodiversity will depend on EVSs.
- There are various approaches to the conservation of biodiversity, each with associated strengths and limitations.

Labs and Activities
- HHMI Biointeractive Natural selection labs explaining the concepts of natural selection in a given environment
- HHMI Biointeractive Video and Activity "Discovering the Wallace Line"
- Concept of Pangaea and the splitting of different environments and its relationship to speciation, reassembly of maps with species distribution evidence supporting the existence of Pangea and interpreting that information
- Ecology powerpoints and information covering key vocabulary terms and explain the vulnerability and biodiversity in different habitats.
- Ecosystem BioBlitz to discover the Biodiversity on our school grounds.

Theory of Knowledge Links
- The term "biodiversity" has replaced the term "nature" in much literature on conservation issues—does this represent a paradigm shift?
- Diversity index is not a measure in the true sense of a word, but merely a number (index), as it involves a subjective judgment on the combination of two measures: proportion and richness. Are there examples in other areas of knowledge of the subjective use of numbers?
- The theory of evolution by natural selection tells us that change in populations is achieved through the process of natural selection—is there a difference between a convincing theory and a correct one?
- There may be long-term consequences when biodiversity is lost—should people be held morally responsible for the long-term consequences of their actions?

Internationalism Links
- International scientific collaboration is important in the conservation of biodiverse regions.
- Human impact has increased the rate at which some mass extinctions have occurred on a global scale.
- Conservation needs to work at the local grassroots level to create meaningful change in the communities that live alongside conservation areas. International organizations are important for enforcing the Convention on International Trade in Endangered Species (CITES) agreement, assessing global status of species' numbers and influencing governments.

Topic 4—Water and aquatic food production systems and societies

4.1 Introduction to water systems
- The hydrological cycle is a system of water flows and storages that may be disrupted by human activity. The ocean circulatory system (ocean conveyor belt) influences the climate and global distribution of water (matter and energy).

4.2 Access to fresh water
- The supplies of freshwater resources are inequitably available and unevenly distributed, which can lead to conflict and concerns over water security.
- Freshwater resources can be sustainably managed using a variety of different approaches.

4.3 Aquatic food production systems
- Aquatic systems provide a source of food production.
- Unsustainable use of aquatic ecosystems can lead to environmental degradation and collapse of wild fisheries.
- Aquaculture provides potential for increased food production.

4.4 Water pollution
- Water pollution, both to groundwater and surface water, is a major global problem, the effects of which influence human and other biological systems.

Labs and Activities
- Water Footprint Interactive to determine their impact on the use of water resources
- Video- "The End of the Line" about unsustainable global fishing practices
- Case studies on Water Issues of a variety of countries
- Water Quality Testing Lab- Students collect Water samples from local bodies of water and run water quality tests to determine the overall water quality

Theory of Knowledge Links
- The hydrological cycle is represented as a systems model—to what extent can systems diagrams effectively model reality, given that they are only based on limited observable features?

- The Inuit people have an historical tradition of whaling—to what extent does our culture determine or shape our ethical judgments?
- A wide range of parameters are used to test the quality of water and judgments are made about causes and effects of water quality—how can we effectively identify cause–effect relationships, given that we can only ever observe correlation?

Internationalism Links

- Many hydrological cycles are shared by various nations. This can lead to international disputes.
- Unequal access to fresh water can cause conflict between countries that have an abundance of freshwater and those that do not.
- Successful management of marine and some freshwater fisheries requires partnership between different nations. Countries with limited access to clean water often have higher incidences of water-borne illnesses.

Topic 5—Soil systems and terrestrial food production systems and societies

5.1 Introduction to soil systems

- The soil system is a dynamic ecosystem that has inputs, outputs, storages and flows.
- The quality of soil influences the primary productivity of an area.

5.2 Terrestrial food production systems and food choices

- The sustainability of terrestrial food production systems is influenced by sociopolitical, economic and ecological factors.
- Consumers have a role to play through their support of different terrestrial food production systems.
- The supply of food is inequitably available and land suitable for food production is unevenly distributed among societies, and this can lead to conflict and concerns.

5.3 Soil degradation and conservation

- Fertile soils require significant time to develop through the process of succession.
- Human activities may reduce soil fertility and increase soil erosion.
- Soil conservation strategies exist and may be used to preserve soil fertility and reduce soil erosion.

Labs and Activities

- Video- “Dirt- the Movie” tells the story of the relationship between humans and dirt.
- Soil Labs - Students collect samples of local soils and test the soils for a variety of characteristics and nutrients.
- Sustainable Agriculture project- Students are assigned a country and must design a sustainable farm taking many factors into consideration.

Theory of Knowledge Links

- Consumer behaviour plays an important role in food production systems— are there general laws that can describe human behaviour?
- Fertile soil can be considered as a non-renewable resource because once depleted, it can take significant time to restore the fertility—how does our perception of time influence our understanding of change?
- Our understanding of soil conservation has progressed in recent years—what constitutes progress in different areas of knowledge?

Internationalism Links

- Significant differences exist in arable (potential to promote primary productivity) soil availability around the world. These differences have sociopolitical, economic and ecological influences.
- Food choices can be influenced by culture, religion or regional food production differences.
- Variant use of soil systems can lead to different degradation and conservation.

Topic 6—Atmospheric systems and societies

6.1 Introduction to the atmosphere

- The atmosphere is a dynamic system that is essential to life on Earth.
- The behaviour, structure and composition of the atmosphere influence variations in all ecosystems.

6.2 Stratospheric ozone

- Stratospheric ozone is a key component of the atmospheric system because it protects living systems from the negative effects of ultraviolet radiation from the Sun.
- Human activities have disturbed the dynamic equilibrium of stratospheric ozone formation.
- Pollution management strategies are being employed to conserve stratospheric ozone.

6.3 Photochemical smog

- The combustion of fossil fuels produces primary pollutants that may generate secondary pollutants and lead to photochemical smog, the levels of which can vary by topography, population density and climate.
- Photochemical smog has significant impacts on societies and living systems.
- Photochemical smog can be reduced by decreasing human reliance on fossil fuels.

6.4 Acid deposition
- Acid deposition can impact living systems and the built environment.
- The pollution management of acid deposition often involves cross-border issues.

Labs and Activities
- Air Pollution Labs
- Air Pollution Case Study

Theory of Knowledge Links
- The atmosphere is a dynamic system—how should we react when we have evidence that does not fit with an existing theory?
- The Montreal Protocol was an international agreement created by the UN— can one group or organization decide what is best for the rest of the world?
- Environmental problems are often emotive—under what circumstances should we maintain a detached relationship with the subject matter under investigation?

Internationalism Links
- Pollutants released to the atmosphere are carried by currents in the atmosphere and may create damage in a location other than where they are produced.
- Impact to the atmosphere from pollutants can be localized, as evidenced by the destruction of the ozone layer over the poles of the Earth.
- The depletion of ozone has global implications to ocean productivity and oxygen production.
- National economic approaches may have an impact on international environmental discussions.

Topic 7—Climate change and energy production

7.1 Energy choices and security
- There is a range of different energy sources available to societies that vary in their sustainability, availability, cost and sociopolitical implications.
- The choice of energy sources is controversial and complex. Energy security is an important factor in making energy choices.

7.2 Climate change—causes and impacts
- Climate change has been a normal feature of the Earth's history, but human activity has contributed to recent changes.
- There has been significant debate about the causes of climate change.
- Climate change causes widespread and significant impacts on a global scale.

7.3 Climate change—mitigation and adaptation
- Mitigation attempts to reduce the causes of climate change.
- Adaptation attempts to manage the impacts of climate change.

Labs and Activities
- Energy Resources Project
- Pivot Labs on the Greenhouse Effect and various Greenhouse Gases
- Climate Interactive Research and Memo

Theory of Knowledge Link
- The choice of energy sources is controversial and complex—how can we distinguish between a scientific claim and a pseudoscience claim when making choices?
- There has been considerable debate about the causes of climate change— does our interpretation of knowledge from the past allow us to reliably predict the future?

Internationalism Links
- Choice of energy sources can have impacts at both local and global level as emissions of greenhouse gases can contribute to global climatic change.
- Political and economic situations around the world can affect energy security and choice of options
- The impacts of climate change are global and require coordinated international action.
- The impacts of climate change are global and require global mitigation.

Topic 8—Human systems and resource use

8.1 Human population dynamics
- A variety of models and indicators are employed to quantify human population dynamics.
- Human population growth rates are impacted by a complex range of changing factors.

8.2 Resource use in society
- The renewability of natural capital has implications for its sustainable use.
- The status and economic value of natural capital is dynamics

8.3 Solid domestic waste
- Solid domestic waste (SDW) is increasing as a result of growing human populations and consumption.
- Both the production and management of SDW can have significant influence on sustainability.

8.4 Human population carrying capacity
- Human carrying capacity is difficult to quantify.
- The EF is a model that makes it possible to determine whether human populations are living within carrying capacity.

Labs and Activities
- Models helping to explain the growth of human populations comparing MEDCs and LEDCs
- Diagrams showing demographic transition models of MEDCs and LEDCs, Use cemetery data to create demographic models.
- Information and explanations of raw data to calculate crude birth and death rates, fertility, doubling time and natural increase rate, used to create population pyramids in Excel.
- Circular Economy videos and Discussion
- Plastics Pollution calculator to determine an individual's impact on global plastic pollution

Theory of Knowledge Links
- A variety of models and indicators are employed to quantify human population dynamics—to what extent are the methods of the human sciences “scientific”?
- As resources become scarce, we have to make decisions about how to use them—to what extent should potential damage to the environment limit our pursuit of knowledge?
- The circular economy can be seen as a paradigm shift—does knowledge develop through paradigm shifts in all areas of knowledge?

Internationalism Links
- A country’s development depends on its economy and its demographics. It also depends on the policies of other countries and international organizations such as the World Bank, the International Monetary Fund (IMF) and the World Trade Organization (WTO).
- There are marked cultural differences in attitudes to the management of natural capital.
- Pollution can be transborder; the pollution from one country may affect another.
- Sustainability is the responsible use and management of global resources that allows natural regeneration and minimizes environmental damage.

Resources

Textbook- Environmental Systems and Societies- 2015 edition, Oxford University Press
IB Environmental Systems and Societies Guide- First Assessment 2017