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2024–2025 District Unit Planner

IB Biology Y2 Ecosystems: Human Impacts Unit 5 Planner

Teacher(s)	IB Biology PLC	**Subject group and course**	Group 4/IB Biology Y2 SL		
Course part and topic	Unit 5: Ecosystems: Human Impacts **D4.2**.1-4.2.11, **D4.3**.1-4.3.8	**SL or HL/Year 1 or 2**	SL Y2	**Dates**	6 weeks

Unit description and texts	**DP assessment(s) for unit**
Human activities can have many negative impacts on ecosystems, including: Pollution The introduction of pollutants into the environment, which can be natural or man-made. Pollutants can harm organisms by altering environmental conditions in the air, water, and land. Examples of pollution include garbage, agricultural runoffs, industrial waste, noise pollution, and light pollution. Invasive species Non-native species that become established in a new environment, often as a result of human travel or trade. These species can prey on native species, outcompete them for resources, and alter habitats. This can lead to extinctions of native plants and animals, reduced biodiversity, and disrupted ecosystems. Habitat destruction The destruction of ecosystems and habitats. This can be caused by deforestation, for example, due to the increase in human settlements. Overexploitation of natural resources	• Unit Summative assessment • Projects/Practicals • Formative/Summative assessment quizzes per subtopic to check for understanding **Application of skills:** D4.2.3 Deforestation of Amazon rainforest as an example of a possible tipping point in ecosystem stability - Calculate % change from original area of the forest

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The need to provide food and housing to an ever-growing human population can lead to the overexploitation of natural resources. Climate change Human activities like burning fossil fuels can contribute to climate change, which can lead to rising sea levels, hot temperatures, and other negative impacts. Other human activities that can impact ecosystems include: Industrialization and air pollution, Agricultural practices and soil degradation, Water pollution and contamination, and Overfishing and marine ecosystem depletion. Pearson Standard Level Biology for the IB Diploma Program 3rd Edition New IB Biology Guide First Assessment 2025	

INQUIRY: Establishing the purpose of the unit

Unit Statement of Inquiry: Humans modify the environment which can cause benefits to some populations while harming others.

Core Ideas: Stability of Ecosystems, Deforestation, Keystone Species, Human Impact: Pollution and Climate Change, Sustainability of Resource Harvesting, Eutrophication, Biomagnification, Succession

Phenomenon: Humans spray insecticides and modify the environment to decrease the population of mosquitoes carrying malaria.

Crosscutting Concepts-
- Stability and Change of Systems
- Cause and Effect
- Patterns

SEP:
- Use Mathematics and Computational Thinking
- Obtaining, Evaluating, and Communicating information

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- Analyzing and Interpreting Data

ACTION: teaching and learning through inquiry

Content/skills/concepts—essential understandingsU = Understandings NOS = Nature of Science **A = Applications S = Skills**	**Learning process** Check the boxes for any pedagogical approaches used during the unit. Aim for a variety of approaches to help facilitate learning.
D4.2 Stability and Change Continuity and Change Ecosystems **GQ-** **• What features of ecosystems allow stability over unlimited time periods?** **• What changes caused by humans threaten the stability of ecosystems?** **D4.2.1—Stability as a property of natural ecosystems** Illustrate ecosystem stability with evidence of forest, desert or other ecosystems that have shown continuity over long periods. There is evidence for some ecosystems persisting for millions of years. **D4.2.2—Requirements for stability in ecosystems** Include supply of energy, recycling of nutrients, genetic diversity and climatic variables remaining within tolerance levels. **D4.2.3—Deforestation of Amazon rainforest as an example of a possible tipping point in ecosystem stability** Include the need for a large area of rainforest for the generation of atmospheric water vapour by transpiration, with consequent cooling, air flows and rainfall. Include uncertainty over the minimum area of rainforest that is sufficient to maintain these processes. **Application of skills: Students should be able to calculate percentage change. In this case the extent of** **deforestation can be assessed by calculating the percentage change from the original area of forest.**	Learning experiences and strategies/planning for self-supporting learning: ❑ Lecture ❑ Socratic Seminar ✓ Small Group/Pair Work ✓ PowerPoint Lecture Notes ❑ Individual Presentations ✓ Group Presentations ✓ Student Lecture/Leading the class ❑ Interdisciplinary Learning Details: Modeling, Think/Pair/Share, CER, Writing Prompts, Videos, etc. Accommodations: SWD/504 – Accommodations Provided ELL – Reading & Vocabulary Support Intervention Support Extensions – Enrichment Tasks and Project **Guidance:** **Note: When students are referring to organisms in an**

D4.2.4—Use of a model to investigate the effect of variables on ecosystem stability Mesocosms can be set up in open tanks but sealed glass vessels are preferable because entry and exit of matter can be prevented but energy transfer is still possible. Aquatic or microbial ecosystems are likely to be more successful than terrestrial ones. **NOS: Care and maintenance of the mesocosms should follow IB experimental guidelines.** **D4.2.5—Role of keystone species in the stability of ecosystems** Students should appreciate the disproportionate impact on community structure of keystone species and the risk of ecosystem collapse if they are removed. **D4.2.6—Assessing sustainability of resource harvesting from natural ecosystems** Sustainability depends on the rate of harvesting being lower than the rate of replacement. Include one terrestrial plant species and one species of marine fish as examples of renewable resources and how sustainability of harvesting can be assessed. **D4.2.7—Factors affecting the sustainability of agriculture** **I**nclude the need to consider soil erosion, leaching of nutrients, supply of fertilizers and other inputs, pollution due to agrochemicals, and carbon footprint. **D4.2.8—Eutrophication of aquatic and marine ecosystems due to leaching** Students should understand the effects of eutrophication resulting from leaching of nitrogen and phosphate fertilizers, including increased biochemical oxygen demand (BOD). **D4.2.9—Biomagnification of pollutants in natural ecosystems** Students should understand how increased levels of toxins accumulate in the tissues of consumers in higher trophic levels. Include DDT and mercury as examples. **D4.2.10—Effects of microplastic and macroplastic pollution of the oceans** Students should understand that plastics are persistent in the natural environment due to nonbiodegradability. Include examples of the effects of plastic pollution on marine life. **NOS: Scientists can influence the actions of citizens if they provide clear information about their research findings. Popular media coverage of the effects of plastic pollution on marine life changed public perception globally, which has driven measures to address this problem.** **D4.2.11—Restoration of natural processes in ecosystems by rewilding**	**examination, either the common name or the scientific name is acceptable.** **All review items will be flipped Schoology lessons with connections to Unit materials in class.**

Methods should include reintroduction of apex predators and other keystone species, re-establishment of connectivity of habitats over large areas, and minimization of human impact including by ecological management. Include the example of Hinewai Reserve in New Zealand. LQ- • What is the distinction between artificial and natural processes? • Over what timescales do things change in different biological systems? **D4.3 Climate Change - Continuity and Change - Ecosystems** **GQ-** **• What are the drivers of climate change?** **• What are the impacts of climate change on ecosystems?** **D4.3.1—Anthropogenic causes of climate change** Limit to anthropogenic increases in atmospheric concentrations of carbon dioxide and methane. **NOS: Students should be able to distinguish between positive and negative correlation and should also distinguish between correlation and causation. For example, data from Antarctic ice cores shows a positive correlation between global temperatures and atmospheric carbon dioxide concentrations over hundreds of thousands of years. This correlation does not prove that carbon dioxide in the atmosphere increases global temperatures, although other evidence confirms the causal link.** **D4.3.2—Positive feedback cycles in global warming** Include release of carbon dioxide from deep ocean, increases in absorption of solar radiation due to loss of reflective snow and ice, accelerating rates of decomposition of peat and previously undecomposed organic matter in permafrost, release of methane from melting permafrost and increases in droughts and forest fires. **D4.3.3—Change from net carbon accumulation to net loss in boreal forests as an example of a tipping**	

point Include warmer temperatures and decreased winter snowfall leading to increased incidence of drought and reductions in primary production in taiga, with forest browning and increases in the frequency and intensity of forest fires, which result in legacy carbon combustion. **D4.3.4—Melting of landfast ice and sea ice as examples of polar habitat change** Include potential loss of breeding grounds of the emperor penguin (Aptenodytes forsteri) due to early breakout of landfast ice in the Antarctic and loss of sea ice habitat for walruses in the Arctic. **D4.3.5—Changes in ocean currents altering the timing and extent of nutrient upwelling** Warmer surface water can prevent nutrient upwelling to the surface, decreasing ocean primary production and energy flow through marine food chains. **D4.3.6—Poleward and upslope range shifts of temperate species** As evidence-based examples, include upslope range shifts for tropical-zone montane bird species in New Guinea and range contraction and northward spread in North American tree species. **D4.3.7—Threats to coral reefs as an example of potential ecosystem collapse** Increased carbon dioxide concentrations are the cause of ocean acidification and suppression of calcification in corals. Increases in water temperature are a cause of coral bleaching. Loss of corals causes the collapse of reef ecosystems. **D4.3.8—Afforestation, forest regeneration and restoration of peat-forming wetlands as approaches to** **carbon sequestration** **NOS: There is active scientific debate over whether plantations of non-native tree species or rewilding** **with native species offer the best approach to carbon sequestration. Peat formation naturally occurs in** **waterlogged soils in temperate and boreal zones and also very rapidly in some tropical ecosystems.**	

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Students will be assessed daily with classwork, discussions, group work, and reflections using a variety of formats with a focus on the applications and skills provided in the syllabus.	**Formative assessment:** ✓ Quiz/Test ✓ Project/Model ✓ CER/Reflection ✓ Essay/Writing Assignment

Students will be assessed per subtopic and then at the end of the unit (Topic) to ensure understanding using IB exam style questions, modeling, reflection, lab reports, and writing prompts	**Summative assessment:** ✓ Quiz/Test ✓ Project/Model ❑ CER/Reflection ❑ Essay/Writing Assignment
Students may be aware of many of the concepts within this unit, so building on prior knowledge using scaffolding techniques to aid students in a deeper understanding and extending learning to ensure that students can meet the goals set by the unit.	Differentiation: ❑ Affirm Identity - build self-esteem ☐ Value Prior Knowledge ✓ Scaffold Learning ✓ Extend Learning Details: Many concepts may be familiar to the students and others will need more scaffolding and extension.

Approaches to learning (ATL)

Check the boxes for any explicit approaches to learning connections made during the unit. For more information on ATL, please see the guide.

- ✓ Thinking - Asking questions and defining problems
- ✓ Social Communication- Constructing Explanations/Engaging in Argument from Evidence
- ✓ Self-management - Carrying out Investigations
- ☐ Research- Developing and using models

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Language and learning Check the boxes for any explicit language and learning connections made during the unit. For more information on the IB's approach to language and learning, please see the guide.	**TOK connections** Check the boxes for any explicit TOK connections made during the unit	**CAS connections** Check the boxes for any explicit CAS connections. If you check any of the boxes, provide a brief note in the "details" section explaining how students engaged in CAS for this unit.
✓ Activating Background Knowledge ✓ Scaffolding for new learning ✓ Acquisition of new learning through practice ✓ Demonstrating proficiency	✓ Personal and Shared Knowledge ❑ Ways of Knowing ❑ Areas of Knowledge ✓ The Knowledge Framework Details: Humans have always left "footprints" in nature – to some degree, they have always influenced the ecosystems of which they were a component. During most of the more than 100,000 years of evolution of modern *Homo sapiens*, that ecological footprint was relatively shallow. This was because the capability of humans for exploiting their environment was not much different from that of other similarly abundant, large animals. However, during the cultural evolution of humans, the ecological changes associated with our activities progressively intensified. This process of cultural evolution has been characterized by the discovery and use of increasingly more sophisticated methods, tools, and social organizations to secure resources by exploiting the environment and other species. Certain innovations occurring during the cultural evolution of humans represented particularly	☐ Creativity ❑ Activity ❑ Service Details: Modeling and active participation in the learning process. Creating materials to aid their fellow classmates in understanding a particular concept through peer interaction and team/group activities.

	large increases in capability. Because of their great influence on human success, these advances are referred to as “revolutions.” The following are examples of early technological revolutions: ● The discovery of ways of making improved weapons for hunting animals ● Domestication of the dog, which also greatly facilitated hunting ● Domestication of fire, which provided warmth and allowed for cooked, more digestible foods ● Ways of cultivating and domesticating plants and livestock, which resulted in huge increases in food availability ● Techniques for working raw metals into tools, which were much better than those made of wood, stone, or bone The rate of new discoveries has increased enormously over time. More recent technological revolutions include the following: ● Methods of using machines and energy to perform work previously done by humans or draught animals ● Further advances in the domestication and cultivation of plants and animals ● Discoveries in medicine and sanitation ● Extraordinary strides in communications and information-processing technologies	
International Mindedness/Aims:		

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International Baccalaureate®
Baccalauréat International
Bachillerato Internacional

International Mindedness: (Research/Reflections/Writing) -

The course enables students, through the overarching theme of the NOS, to:

- Acquire and apply a body of knowledge, methods, tools, and techniques that characterize science
- Develop the ability to analyze, evaluate and synthesize scientific information and claims
- Develop an appreciation of the possibilities and limitations of science
- Develop the ability to communicate and collaborate effectively
- Develop awareness of the ethical, environmental, economic, cultural, and social impact of science.

Resources

MCS Science Resources

- Textbook Pearson Biology for the IB Diploma Standard and Higher Level
- IB Biology Guide First Assessment 2025
- Van de Lagemaat, R. www.inthinking.net: Andorra la Vella, Andorra, 2019.
- IB Biology Schoology Course
- Discovery Education Biology and Chemistry Resources

Stage 3: Reflection—considering the planning, process and impact of the inquiry

What worked well List the portions of the unit (content, assessment, planning) that were successful	**What didn't work well** List the portions of the unit (content, assessment, planning) that were not as successful as hoped	**Notes/changes/suggestions:** List any notes, suggestions, or considerations for the future teaching of this unit