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UNIT 1 The Global Environment: An Emerging World View

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1. **Climate Change 2007: The Physical Science Basics, Summary for Policymakers**, Susan Solomon et al. (eds.) In: *Climate Change 2007: The Physical Science Basis*. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change 2007

This article summarizes the results of the 2007 Nobel Peace Prize winning effort by the Intergovernmental Panel on Climate Change (*IPCC*) report on our “understanding of the human and natural drivers of climate change.” Importantly, it presents estimates of how **global warming** will affect future climates. The degree of confidence of the assessments is indicated. Even the cautious consensus reached by this large group of scientists from around the world is troubling.

2

2. **Global Warming Battlefields: How Climate Change Threatens Security**, Michael T. Klare, *Current History*, Vol. 106, 2007

What are the **societal effects** of climate change identified by the IPCC report on “Climate Change Impacts, Adaptation and Vulnerability?” They are not limited to humanitarian disasters. It is likely that ethnic conflict, insurgencies, and civil violence due to diminished supplies of vital resources will occur. Diminished rainfall and river flow, rising sea level, and more frequent and severe storms will affect the ability of underdeveloped societies to meet basic **sustainability levels**. Water scarcity, limited food availability, and coastal inundation are all effects that will be felt across the entire planet.

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3. **China Needs Help with Climate Change**, Kelly Sims Gallagher, *Current History*, Vol. 106, 2007

Until recently, the United States was the ‘bad boy’ of climate change, emitting 25% of CO₂ while having only 5% of the population. While the United States remains a high *per capita* emitter, overall, **China** has overtaken the United States as the biggest CO₂ emitter. China’s growth rate is breathtaking, doubling every three and a half years. In this article, the author argues that the United States and China need to work together to develop technologies and strategies to lower CO₂ emissions.

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4. **Where Oil and Water Do Mix: Environmental Scarcity and Future Conflict in the Middle East and North Africa**, Jason J. Morrisette and Douglas A. Borer, *Parameters*, Winter 2004–2005

Much of the past history of conflict in the North African/Southwest Asian culture realm has been based in religion, ideology, and territory. Future conflict in this area is more likely to be based in **environmental scarcity**—too little oil and not enough water—to support the **population growth** that is far outpacing economic growth.

28

5. **A Safe Operating Space for Humanity**, Johan Rockström et al., *Nature*, Vol. 461, September. 24, 2009

The authors have identified planetary boundaries that must not be crossed in order to avoid significant **environmental degradation**. Of the 10 factors considered, three of these, **biodiversity loss**, **climate change**, and **agricultural pollution** have already crossed the threshold for a sustainable planet.

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UNIT 2 Policy and Economy

Unit Overview

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6. **Paying for Climate Change**, Benjamin Jones, Michael Keen, and Jon Strand, *Finance & Development*, Vol. 45, No. 1, March 2008

How much should be spent on climate change **remediation**? To address this question, Jones et al. argue that **economists** are needed to assess the costs of the threat and the remedies. Individuals, firms, and governments do not have monetary **incentives** to limit carbon emissions, and any benefits from voluntary reductions benefit the entire community rather than those making the sacrifice. Assessing the cost-benefit analysis of taxing emissions, predicting R&D breakthroughs and the very long term effects baffle economic theory. And if that's not enough, who sacrifices, who pays?

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7. **High-Tech Trash: Will Your Discarded TV or Computer End up in a Ditch in Ghana?**, Chris Carroll, *National Geographic*, Vol. 213, January 2008

Over the next few years, 30 to 40 million PCs will become obsolete. How does one dispose of a PC, and what is its fate? More than 70% go to **landfill**, toxic components be damned. Of the 20% that is **recycled**, a large amount ends up in third-world countries, where valuable components, such as silver and gold, are extracted. Unfortunately, the environmental conditions of such recycling are appalling.

48

8. **Down with Carbon: Scientists Work to Put the Greenhouse Gas in Its Place**, Sid Perkins, *Science News*, May 10, 2008

If we can't stop burning it, how about getting rid of it? *Down with Carbon* discusses possible **carbon sequestration** (or **carbon storage**) possibilities. Ideas such as fertilization of the oceans (to increase algal blooms), extracting CO₂ directly from smoke stacks and pumping it back into the ground, and burying dead wood are all considered. Each idea has pros and cons.

52

9. **Clean, Green, Safe and Smart**, Michael T. Klare, *The Nation*, August 2/9 11–15.

The recent Gulf Oil Spill highlights the ecological hazards of ever-riskier oil exploration, and more Americans than ever believe that a new energy policy is needed. Significant reductions in fossil fuel use could be achieved by switching to more fuel-efficient cars and switching to alternative energies. Such a shift could be realized by shifting subsidies from fossil fuel extraction and nuclear energies toward clean renewables.

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UNIT 3

Energy: Present and Future Problems

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10. **Wind Power: Obstacles and Opportunities**, Martin J. Pasqualetti, *Environment*, Vol. 46, No. 7, September 2004

Wind power is one of the oldest energy sources, used to power mills and water pumps for thousands of years. It is now one of the most promising of the **alternative energy** strategies. But in spite of its environmental attributes, wind power meets with considerable local resistance because of aesthetics, noise, and potential damage to bird populations. The proper strategy is to develop wind power in sites where it meets the least resistance.

62

11. **A Solar Grand Plan**, Ken Zweibel, James Mason, and Vasilis Fthenakis, *Scientific American*, January 2008

“By 2050 **solar power** could end U.S. dependence on foreign oil and slash greenhouse gas emissions.” Sound too good to be true? This article gives an overview of the state of the art and future possibilities in relation to how a significant portion of our electricity could be generated by this clean, **renewable resource**.

75

12. **Cold Comfort**, Michael Behar, *OnEarth Magazine*, Vol. 32

The air conditioner has changed the demographics of the United States. Taken for granted by most of us, air conditioning accounts for 16% of household energy consumption. But the **efficiency** and technology of air conditioners is nearly unchanged in the last 50 years. With only minor innovation, we can reduce our energy consumption, as explained by Michael Behar.

82

13. **A Path to Sustainable Energy by 2030**, Mark Z. Jacobson and Mark A. Delucchi, *Scientific American*, November 2009.

There is much discussion about what fraction of our energy consumption should come from renewable energies. The authors make the surprising case that we can achieve 100% of our energy needs from **clean technology** and do it in just a few decades.

87

14. **The Biofuel Future: Scientists Seek Ways to Make Green Energy Pay Off**, Rachel Ehrenberg, *Science News*, Vol. 176, 2009

Both fossil fuels and **biofuels** can be burned to generate electricity. The difference is that biofuel burning is **carbon neutral**; the CO₂ generated from biofuel burning was only recently drawn out of the atmosphere during plant photosynthesis. But biofuels can only work if they produce more energy than it takes to make them. And they cannot displace large amounts of valuable agricultural land that is needed for our food supply. Ehrenberg discusses the pros and cons of our biofuel future, describing the hurdles and promise.

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UNIT 4

Biosphere: Endangered Species

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15. **Forest Invades Tundra . . . and the New Tenants Could Aggravate Global Warming**, Janet Raloff, *Science News*, July 2008

Temperatures in the **arctic** are climbing at a rate of twice the global average. Scientists are now finding that the boundary between northern forests and

the arctic **tundra** is slowly creeping northward as temperatures rise. The snow covered tundra typically reflects light, keeping temperatures low. As trees invade the tundra, they absorb sunlight, raising temperatures. Drought and fire have hurt both the tundra and forests. Throw in advancing shrubs, active microbes, and you have a seriously disturbed **ecosystem**.

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16. **America's Coral Reefs: Awash with Problems**, Tundi Agardy, *Issues in Science and Technology*, Winter 2004

America's coral reefs—the rain forests of the oceans—are in trouble. This delicate ecosystem has declined by 80% over the last three decades. **Overfishing**, fertilizers, sediment input, and ocean warming all contribute to the dramatic decline in this invaluable resource, both a thing of intrinsic beauty and economic value. The public is generally unaware of the destruction going on beneath the waves, but as author Jeffrey McNeely explains, there is hope. Public and private efforts can ultimately reverse the fate of these national treasures.

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17. **Seabird Signals**, Doreen Cubie, *National Wildlife*, August/September 2008

Cassin's auklets are the 'canary in the coalmine' of the ocean. On a remote island, the nesting pairs have decreased by a factor of five. The ecosystem is changing, the food web is unraveling and the auklets' population is plunging. Possible explanations include **warming ocean temperature** or changing ocean circulation patterns.

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18. **Taming the Blue Frontier**, Sarah Simpson, *Conservation Magazine*, April/June 2009

Fish farms or **aquaculture** reduce overharvesting of the ocean's wild stocks. But large fish farms also generate huge amounts of fish waste and spread disease. Author Sarah Simpson discusses cutting-edge technologies that drastically reduce the environmental damage and create sustainable aquaculture practices. Some remarkable ideas are being tested.

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19. **What's the Catch?**, Bruce Barcott, *OnEarth Magazine*, May 27, 2010

"In 50 years we've taken (eaten) more than 90% of the big fish in the sea." Unfortunately, huge amounts of fish caught in nets are **bycatch**, unwanted animal life. Observers are now sailing with fishing vessels to determine the amount of bycatch, so that appropriate regulations can be made to protect the ocean's **biodiversity** and fish populations.

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20. **Tuna's End**, Paul Greenberg, *New York Times Magazine*, June 22, 2010

Bluefin tuna are a sushi prize. Reaching 10 feet long and more than a thousand pounds, a single prize tuna can command well over \$100,000. And so this gold of the sea is fished relentlessly. Unfortunately, at the present rate of capture, these magnificent creatures will soon go extinct.

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UNIT 5

Resources: Land and Water

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21. **Tracking U.S. Groundwater: Reserves for the Future?**, William M. Alley, *Environment*, Vol. 48, No. 3, April 2006

The term **groundwater** reserves implies that the supply of groundwater, like other limited natural resources, can be depleted. Current rates of extraction for irrigation and other uses far exceed the rates of natural replacement, placing this precious water resource in jeopardy. The depletion of groundwater reserves has gone from being a local problem to a national, and probably even global, one.

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- 22. How Much Is Clean Water Worth?**, Jim Morrison, *National Wildlife*, February/March 2005
 When the value of a clean water resource is calculated in monetary terms, it becomes increasingly clear that **conservation** methods make both economic and ecologic sense. The tricky part is manipulating the economic system that drives our behavior so that it makes sense to invest in and protect natural assets—like **clean water**. 139
- 23. Searching for Sustainability: Forest Policies, Smallholders, and the Trans-Amazon Highway**, Eirivelthon Lima et al., *Environment*, January/February 2006
 Commercial **logging** in the **Amazon** has traditionally been an ecologically-destructive process, as cleared areas were occupied by farmers who extended the clearing process. The development of the major economic corridor of the Trans-Amazon Highway illustrates how logging can be converted from a destructive force to one that promotes **sustainable development**. 142
- 24. Diet, Energy, and Global Warming**, Gidon Eshel and Pamela A. Martin, *Earth Interactions*, Vol. 10, No. 9, December 2006
 Want to save the planet? Forget driving a Prius. Become a **vegetarian** instead! Using a thorough set of facts, statistics, and calculations, the authors conclude that your **carbon footprint** can be drastically reduced if you change your diet to a less energy-intensive one. Animal-based foods require far more energy for their production, compared with vegetarian foods, and there appear to be no negative health effects associated with a balanced vegetarian diet. 150
- 25. Landfill-on-Sea**, Daisy Dumas, *The Ecologist*, February 7, 2008
 In the middle of the Pacific Ocean, in an area covering twice the size of France, there is a non-degradable **plastic garbage** dump. Hundred million tons of plastic are used each year, and discarded plastic entering the Pacific Ocean will ultimately end up in the **Central Pacific Gyre**, contributing to the **Great Pacific Garbage Patch**. And the garbage patch is growing. The toxic side-effects of the non-biodegradable plastic are very hazardous to animals at all trophic levels. 159



UNIT 6

The Politics of Climate Change

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- 26. The Truth about Denial**, Sharon Begley, *Newsweek*, August 13, 2007
 In this remarkable exposé, Sharon Begley describes the sophisticated efforts by the **oil industry and lobby** to dispel the science behind global warming. Much as the tobacco industry did a generation ago, big oil is working hard to sow doubt about global warming, and to even question whether it is such a bad thing in the first place. Although the overwhelming majority of climate scientists agree that global warming is a serious threat to humanity, Begley explains how the powerful oil-funded 'denial machine' is succeeding at spreading confusion, and thereby preventing any action to combat this global threat. 164
- 27. The Myth of the 1970s Global Cooling Scientific Consensus**, Thomas C. Peterson, William M. Connolley, and John Fleck, *American Meteorological Society*, September 2008
 One of the most common arguments used by climate change skeptics is that scientists don't really know what's going on. One has to only look back to the

1970s, when they thought the world was cooling, not warming. Or so the argument goes. Peterson et al. explore this common perception and find that the myth is not true. The overwhelming majority of peer-reviewed articles from the time predicted that temperatures would rise, not fall. The **global cooling** argument used so commonly by **climate skeptics** is simply not supported by the facts.

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28. How to Stop Climate Change: The Easy Way, Mark Lynas, *New Statesman*, November 8, 2007

We become further convinced that climate change is real and that something must be done. Are we doing anything? Mark Lynas suggests three straightforward ways to reduce our carbon consumption: 1) Stop debating, start doing; 2) Focus on big wins; and 3) Use technology. By looking at the overwhelming problems in pieces, it becomes clear that we can move forward with environmental protection.

183

29. Environmental Justice for All, Leyla Kokmen, *Utne Reader*, March/April 2008

Low-income communities suffer from **urban pollution** to a far greater extent than other groups. The reasons are obvious: property values are low, the financial resources of a low-income community to fight the incursion of a polluting factory are limited, as is the ability to litigate against health hazards. A new factory located in a depressed area brings not only pollution risks, but jobs. And so a delicate balancing act must be performed. The trick is to fight poverty (bring in the jobs) and pollution at the same time.

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