Chapter 33

GROWTH AND SUSTAINABILITY IN THE TWENTY-FIRST CENTURY

Principles of Economics in Context (Goodwin et al.), 2nd Edition

Chapter Overview

This chapter examines ecological challenges and their implications for macroeconomic growth. It considers the problems of population, resource depletion, climate change, and possible limits to economic growth, putting earlier analysis of aggregate demand and economic growth into a new framework emphasizing sustainability. The chapter discusses theories of the relationship between economic growth and the environment, such as the Environmental Kuznets Curve (EKC). It looks at possible alternatives to indefinite economic growth, including theories of the steady-state economy. Analyses of resource limits and environmental impacts raise serious challenges to the belief that economic growth and markets, on their own, will solve the social and environmental problems of the coming century. The chapter concludes with a discussion of institutions and policies to promote sustainable development.

Chapter Objectives

After reading and reviewing this chapter, you should be able to:

1. Recognize ecological sustainability as a major economic issue for the 21st century.
2. Identify major environmental challenges.
3. Understand the relationship of climate change to economic growth.
4. Be familiar with the Environmental Kuznets Curve and its limitations.
5. Understand the concepts of limits to growth and a steady-state economy
6. Describe several policies directed towards sustainable development.

Key Terms

weak sustainability
strong sustainability
ecological footprint
nonrenewable resources
social cost of carbon
social discount rate
environmental Kuznets curve (EKC) hypothesis
steady-state economy
throughput

Active Review

Fill in the Blank

1. The _____ approach measures the human impacts on the environment in terms of the land area required to supply a society's resources and assimilate its wastes and pollution.

2. Major environmental issues for the twenty-first century include _____, _____, and _____.

3. Resources that do not regenerate through natural processes, at least on a human time scale, such as oil, coal, and mineral ores are called _____.

4. Emissions of _____lead to global warming and climate change.

5. The _____ agreement allowed each country set their own emissions targets on a voluntary basis and enact national policies to meet these targets.

6. The two most prominent market-based policies for addressing climate change are _____ and _____.

7. The _____ curve posits an inverted U-shaped relationship between economic development and environmental damages, suggesting that as nations develop their damage to the environment decreases.

8. Taxes that are used as a means to internalize the negative externalities from pollution are called _____.

9. A discount rate that reflects social rather than market valuation of future costs and benefits, and is usually lower than the market discount rate, is called a _____.

10. An economy with no increase in population, or in the rate of use of raw-materials and energy is termed _____.

True or False

11. The world population exceeded 7.5 billion in 2018, and the United Nations medium range projections show global population of 10 billion people in 2050.

12. As of 2016, the OECD nations comprise the majority of global emissions of carbon dioxide.

13. According to leading scientists, global emissions of greenhouse gases will eventually need to be reduced significantly—up to 50 percent lower than current levels by 2050—if we are to avoid the most dangerous effects of climate change.

14. Environmental damage per capita tends to decline with increasing income for all major pollutants.

15. One of the limitations of green taxes is that they are regressive, likely falling disproportionately on lower-income households.

16. Tradable permit systems allow overall pollution to increase since businesses can purchase permits to pollute.

Short Answer

17. Distinguish between the "weak" and "strong" perspectives on sustainability. What are some of the indicators that can be used to measure each of these?

18. Identify three environmental issues that are closely related to economic growth.

19. What kinds of environmental problems are associated with the increasing global human population?

20. What are some of the problems predicted to occur with rising levels of greenhouse gas emissions?

21. What is the Environmental Kuznets Curve (EKC) hypothesis? And what is the evidence for this hypothesis?

22. Identify at least three policies for sustainable development.

Self Test

1. Which of the following statements describes the "strong" version of sustainability?

    a. Two trees are planted to replace each tree cut in the production of timber.
    b. Trees are cut for the production of timber, and the value of timber produced is estimated to be higher than the value of tree lost.
    c. Trees are cut for producing timber, and the value of timber produced is estimated to be lower than the value of tree lost.
    d. Both (a) and (b)
    e. None of the above.

2. According to United Nations median projections published in 2017, global population is expected to:

a. Increase to 8 billion by 2050
b. Decrease to 6 billion by 2050
c. Remain approximately constant
d. Increase to nearly 10 billion by 2050
e. Increase to 11 billion by 2050

3. Which of the following resources are currently being depleted or at risk of depletion?

a. Fisheries
b. Forests
c. Clean water for drinking and agriculture
d. Minerals and fossil fuels
e. All of the above.

4. Which of the following statements about the level of air pollution is FALSE?

a. Air pollution has mostly increased in both developing countries and developed countries in recent years.
b. Air pollution in most major cities in developing countries exceed the World Health Organization's recommended levels.
c. The most common air pollutants in the U.S. have declined by 73% since the 1970s.
d. Efforts to reduce pollution levels have generally been found to be cost-effective.
e. None of the above.

5. Which of the following are *not* among the adverse effects of greenhouse gas emissions?

a. Rising temperatures.
b. Rising sea-levels.
c. Ecological disruptions such as species extinction.
d. Increased frequency of severe weather events such as hurricanes, floods, and droughts.
e. Depletion of mineral resources.

6. Which of the following countries is the world's top emitter of carbon dioxide?

a. India
b. United States
c. Russia
d. Saudi Arabia
e. China

7. Which of the following was the conclusion of the 2006 British government report written by former World Bank chief economist Nicholas Stern?

a. The costs of climate change in the twenty-first century are estimated as equivalent to 5–20 percent of global GDP, while the most severe effects of climate change could be avoided at a cost of around only 1 percent of global GDP.
b. The costs of climate change in the twenty-first century are estimated as equivalent to 1 percent of global GDP, while the most severe effects of climate change could only be avoided at a cost of around 5 - 20 percent of global GDP.
c. It now appears that the benefits of current actions to minimize climate change significantly exceed the costs.
d. (a) and (c)
e. None of the above.

8. If nothing is done now to stem the effects of climate change, what group will face the most dangerous impacts from climate change?

a. Current generations
b. Future generations living several decades from now or later
c. Developed countries
d. Developing countries
e. (b) and (d)

9. Why do some researchers suggest that when economic development increases, environmental damage (per capita) will decrease?

a. Because the greater availability of wealth and technology allows nations to adopt cleaner production methods.
b. Because as countries develop, they move to a service-based economy which does less harm to the environment.
c. Because as people become wealthier, they demand higher environmental quality standards.
d. All of the above.
e. None of the above.

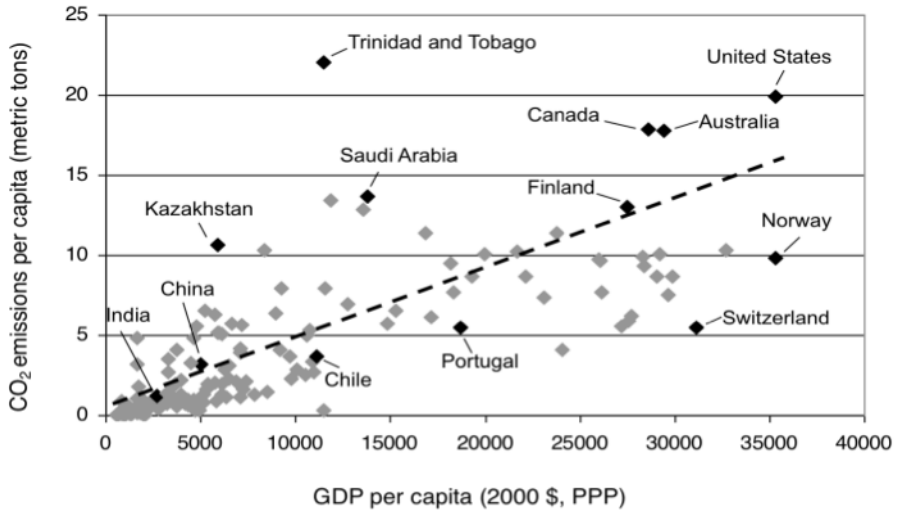
10. The Environmental Kuznets Curve (EKC) hypothesis posits that:

a. Environmental damage per capita increases in the early stages of economic development, reaches a maximum, and then diminishes as a nation attains higher levels of income.
b. Environmental damage per capita falls in the early stages of economic development, reaches a minimum, and then rises as a nation attains higher levels of income.
c. Environmental damage per capita steadily rises during all stages of economic development.
d. Environmental damage per capita steadily falls during all stages of economic development.
e. There is no clear relationship between environmental damage per capita and economic development, as it depends on the country, the pollutant, and other contingencies.

11. The evidence for the Environmental Kuznets Curve (EKC) suggests that:

a. The EKC relationship does seem to hold for all pollutants.
b. The EKC relationship does not seem to hold for any pollutants.
c. The EKC relationship does seem to hold for some pollutants, such as per capita sulfur dioxide emissions and other air pollutants, but not for CO_2 emissions.
d. The EKC relationship does seem to hold for the environmental impacts of CO_2 emissions, but not for per capita sulfur dioxide emissions and other air pollutants.
e. The EKC relationship does seem to hold for some countries, but not others.

For the following question, refer to the figure below.



12. The figure above, showing the relationship between GDP per capita and CO_2 emissions:

a. Indicates that developing countries typically have high per capita CO_2 emissions.
b. Show that there is no relationship between GDP and CO_2 emissions.
c. Provides evidence that confirms the Environmental Kuznets Curve hypothesis.
d. Provides evidence that does not support the Environmental Kuznets Curve hypothesis.
e. None of the above.

13. Which of the following is *not* a consequence of instituting carbon taxes on large emitters of CO_2?

a. reduction in overall levels of CO_2 emission
b. effective control on the overall level of emissions by the government
c. increase in tax revenue for the government
d. increased investment in renewable technology
e. higher utility bills for consumers

14. Which of the following statements about the 2015 Paris Climate Agreement is FALSE?

a. Each country is allowed set their own targets and participation is voluntary.
b. There are no enforceable penalties for failing to meet targets.
c. Most countries are on track to achieve the treaty's objective of limiting global warming to no more than 2°C above preindustrial levels.
d. An overall evaluation of the treaty shows that it has resulted in a reduction in the expected increase in temperature levels.
e. None of the above.

15. Which of the following is *not* a policy to promote environmental sustainability?

a. Green taxes.
b. Grants, subsidies and tax breaks to support recycling, renewable energy, and efficient transportation systems.
c. Tax cuts to stimulate consumption spending.
d. Elimination of subsidies for environmental degrading activities.
e. Tradable pollution permits.

16. According to the macroeconomic model developed by the United Nations, an annual investment of 2% of the global GDP over 2010-2050 to fund sustainable technologies relative to the business-as-usual (BAU) scenario will:

a. initially reduce the global GDP per capita by about 1 percent.
b. increase the global GDP per capita by 2% by 2030.
c. increase the global GDP per capita by 14% by 2050.
d. Reduce global energy demand by 40%.
e. All of the above

17. Which of the following is *not* among the recommendations proposed by Tim Jackson in transitioning to a sustainable economy?

a. structural transition towards service-based activities
b. investment in infrastructure development
c. investment in ecological assets
d. a decline in working hours per week
e. Both (b) and (d)

18. Which of the following statements is FALSE?

a. Green taxes discourage energy-intensive economic activities.
b. Environmental taxes in industrial countries range from less than 3% to around 10%.
c. Green taxes are strongly supported by economic theory as a means of internalizing negative externalities.
d. Environmental taxes as a percentage of overall taxes is higher in United States than it is in Spain, Germany, Sweden or United Kingdom.
e. None of the above.

19. Which of the following policies is not favorable for transitioning to a more sustainable economy?

a. Increase subsidies to the fossil fuel industry.
b. Increase investment in agriculture systems to encourage crop diversification.
c. Impose taxes on large emitters of CO_2.
d. Invest in renewable energy.
e. Institute a system of tradable permits.

20. How can macroeconomic policy deal with environmental considerations?

a. Seek to modify both the level and composition of consumption spending.
b. Promote forms of investment that do not increase the "throughput" of natural resources and the creation of wastes.
c. Direct government spending towards promoting environmental sustainability.
d. Promote investments that are more future-oriented than those concerned with short-term considerations.
e. All of the above.

Answers to Active Review Questions

1. ecological footprint
2. population, resource depletion, and pollution and wastes
3. nonrenewable resources
4. greenhouse gases including CO_2
5. 2015 Paris Climate (Agreement)
6. carbon taxes; a system of tradable permits
7. Environmental Kuznets (Curve)
8. green taxes
9. social discount rate
10. steady-state economy
11. True.
12. False – OECD nations comprised the majority of global emissions of CO_2 until 2003, but by 2016 over 60% of the world's CO_2 was emitted by non-OECD nations.
13. False – scientific research indicates that the reduction in greenhouse gases needs to be 70 percent or more by 2050 to avoid major destructive impacts.
14. False – a declining trend is noted for some pollutants above about $5,000 in per capita income, but other pollutants continue to increase as incomes rise.
15. True.
16. False. Tradable permit systems allow individual business to purchase permits for pollution, but set an overall limit on the total amount of pollution emitted.
17. The "weak sustainability" perspective asserts that the depreciation of natural capital is justified as long as there is an adequate increase in any other types of capital, while the "strong sustainability" perspective argues that the depreciation of natural capital is only justified if there is an adequate increase in some form of natural capital. Indicators such as GPI and Green GDP can be used for "weak sustainability" and satellite accounts such as forested area, waste generation, and greenhouse gas emissions can be used for "strong sustainability".
18. Global population, depletion of renewable and non-renewable resources, and pollution and wastes.
19. The increasing global human population necessitates increasing food supplies, which has led to environmental problems such as: land degradation, pollution from fertilizers and pesticides, and overdraft of water supplies.
20. The problems include: Rising temperatures, rising sea-levels and coastal flooding, decrease in water supplies, declines in crop yields, increase in food insecurity, ecological disruptions such as species extinction, spread of malaria and other tropical diseases, and increased frequency of severe weather events such as hurricanes, floods, and droughts.
21. The Environmental Kuznets Curve (EKC) hypothesis says that environmental damage per capita increases in the early stages of economic development, reaches a maximum, and then diminishes as a nation attains higher levels of income. The EKC relationship does seem to hold for some pollutants, such as per capita sulfur dioxide emissions and other air pollutants, but not for the environmental impacts of municipal waste, energy use, and CO_2 emissions.

22. Green taxes and tradable pollution permits; Grants, subsidies and tax breaks to support recycling, renewable energy, and efficient transportation systems; Elimination of subsidies for environmental degrading activities.

Answers to Self Test Questions

1. A
2. D
3. E
4. A
5. E
6. E
7. D
8. E
9. D
10. A
11. C
12. D
13. B
14. C
15. C
16. E
17. B
18. D
19. A
20. E