Exam III will be based on material from Lessons 8a, 8b, 8c, team presentations & guest speaker. Sources include:
--Hackett chapters 11 thru 15
--lectures & lesson handouts since Exam II
--Course project team presentations & handouts
--guest lectures.
--optional homeworks
Exam questions will be drawn only from these sources with the following exception: as will be seen below, a few questions are reproduced from earlier parts of the course. Exam questions may be reproduced as they are shown here, or they may be revised or re-stated to focus on another aspect of the same question.

The entire exam will be in class on 20 Apr.

A. MULTIPLE CHOICE: Circle the best answer.

1. According to the Land Issues Team, which of the following farm types makes up the largest portion of farms?
   a. Small family
   b. large family
   c. very large family
   d. non-family
   e. corporate.

2. Real estate debt in 2001, according to the Land Issues Team, accounted for ____% of total farm debt.
   a. 8%
   b. 26%
   c. 54%
   d. 79%

3. Grazing fees, according to the Land Issues Team, are based on grazing units or animal unit months (AUM); for 2000, the average per AUM was:
   a. about $5
   b. $12-13
   c. $25
   d. near zero

4. The rise in fuel prices, according to lecture, is
   a. only temporary
   b. cyclical, and will soon decline
   c. a trend that suggests no end in sight
   d. trending up exponentially
5. According to the Water Issues Team, most of the pollutants entering US waters come from:
   a. wastewater treatment plants
   b. runoff from fields and streets
   c. factories along rivers
   d. utility companies

6. Sediment damage, according to the Water Issues Team, is up to $8 billion/year and is:
   a. relatively minor compared to other pollutants
   b. is primarily a farm problem
   c. the largest contaminant of surface water
   d. cannot be affected by management practices

7. The average cost for general water use in a US home, according to the Water Issues Team, is about:
   a. $1/100 gallons
   b. $2/1000 gallons
   c. $5/500 gallons
   d. 1% of the cost of development

8. According to the Biological Resources Team, varieties of crops that evolved and were improved by farmers over many generations, without the use of modern breeding techniques:
   a. are made through selective breeding
   b. are called GMOs
   c. is the basis for genetic engineering
   d. are called landraces

9. Private returns to biological diversity are lower than the social returns, according to the Biological Resources Team,
   a. in ex-situ conservation
   b. in in-situ conservation
   c. in landraces
   d. in corporate GMO development

10. The Second Law of Thermodynamics:
    a. is entropy, states that energy moves from order to disorder and is important because it suggests that energy costs will rise in the future.
    b. is the law of conservation of matter and energy; states that energy levels remain constant, and is important because it proves we don't have to worry about future energy sources.
    c. is entropy: states that energy moves from order to disorder, and is important because it proves we don't have to worry about future energy sources.
    d. None of the above
11. The four basic services required for wildlife habitat are: food, cover, interspersion and ________________, according to the Biological Resources Team.
   a. vegetation
   b. water
   c. conservation practices
   d. fire
   e. option value

12. ________________, according to the Production Management Team, can play a significant role in conserving soil, maintaining soil fertility, controlling pests, and also helps break up insect and disease cycles.
   a. Moldboard plowing
   b. No-till farming
   c. Rotational cropping
   d. Irrigation

13. According to the Production Management Team, all of the following are major methods for municipal and industrial waste disposal, except _________________.
   a. land filling
   b. river dumping
   c. recoveries for recycle
   d. incineration

14. According to the Production Management Team, factors reflected in erosion productivity loss include erosion rates, soil depth and _________________.
   a. international trade
   b. the tax structure
   c. biodiversity
   d. rental value of the land

15. According to the Production Management Team, __________________ limit(s) using animal waste as fertilizer.
   a. transportation costs
   b. animal species
   c. spreading disease
   d. water availability

16. According to the Biological Resources Team, ________________ is thought to affect the survival of more than half of the species listed by the Federal government as threatened or endangered in the US.
   a. deforestation
   b. agriculture
   c. pollution
   d. urban development
17. Kim Barker discussed the importance of decision-making in his alternative agriculture operation, including evaluation and consideration of ecosystem processes such as the water cycle, mineral cycle and
   a. energy flow
   b. food chain
   c. the price of beef
   d. alternative practices

18. Which of the following factors is NOT SUBTRACTED from consumption to arrive at the Genuine Progress Indicator (GPI)?
   a. The cost of crime.
   b. The value of services provided by government-owned capital.
   c. The loss of valuable leisure time.
   d. The cost of ozone depletion.

19. According to the Water Issues Team, agricultural producers using irrigation costs are associated with the expenses of developing and providing the resource and may
   a. not reflect the full social cost
   b. reflect the full social cost
   c. be unfair be they reflect the full social cost plus a fine for use
   d. usually be very high because non-farmers set the rates

20. Which of the following is a central element of weak-form sustainability theory?
   a. Human-made capital can effectively substitute for natural capital and the services provided by ecological systems.
   b. An emphasis on the ecological imperatives of carrying capacity, biodiversity, and biotic resilience, relative to conventional economic income and GDP.
   c. Both of the above are correct.
   d. Neither of the first two are correct.

21. \[ \text{______________________________} = (\text{Local Income Injection}) \times \frac{1}{(\text{leakage rate})} \]
   a. The Resource Depletion Rate.
   b. Total Economic Impact.
   c. Extended Producer Rate
   d. Net import multiplier/
   e. None of the above

22. The \__________ method(s) for waste management policy suggest(s) it is the oil companies responsibility to clean up the fuel wastes that create air pollution.
   a. EPR
   b. European
   c. Hard path
   d. Both a and b
   e. None of the above.
23. In product take-back programs, sometimes called _______________________, who has the burden of dealing with reusing or recycling waste that results from the end of a product's useful life?
   a. Mandatory Recycling Program; the local municipal government where the consumer of the product lives.
   b. Extended Producer Responsibility; the federal government in the country where the consumer of the product lives.
   c. Mandatory Recycling Program; the taxpayers in the poorest of developing countries where many goods are manufactured.
   d. Extended Producer Responsibility; the original producer of the product.
   e. none of the above

24. According to guest speaker Kim Barker, the preferred management model for agriculture is
   a. precision management
   b. prescription farming
   c. holistic management
   d. slash and burn farming

25. Government subsidies to the energy industry, according to Sanders
   a. have been relatively high for nuclear and petroleum and do matter.
   b. have been relatively high for wind and solar and do matter.
   c. have been low to nonexistent and do not matter.
   d. have been relatively uniform to all sectors and do not matter.
   e. none of the above

26. Government intervention options for sustainable production technology include:
   a. EPR
   b. Tax/subsidize
   c. Eco-labelling
   d. Education
   e. All of the above
   f. B & d
   g. None of the above.

27. A national energy strategy with sustainability, according to lecture notes, can be achieved by equating marginal costs to society with marginal benefits to society,
   a. market pollution permits
   b. chance
   c. letting the market do it
   d. liability and bonding systems
   e. exploitation of the cheapest resources
   f. fuel taxes
   g. b, c, e
   h. a, d, f
28. According to Lesson 8c, the issue of sustainability
   a. can only be resolved/achieved by the private sector alone
   b. cannot be resolved/achieved by the private sector
   c. can be resolved/achieved by initiatives in both the private and government sector
   d. has no place in profit-seeking private enterprise
   e. none of the above

29. ___________________________ is an example of a private commercial floor company that has in its mission and vision the achievement of ________________.
   a. Land Trust, partnership
   b. Interface Inc, sustainability
   c. Applewoods, profitability
   d. LeeGroup, market dominance
   e. none of the above

30. The Natural Step is an international non-profit organization that defines sustainability as
   a. maintaining human life on the planet
   b. maintaining profitability at all costs
   c. maintaining plant and animal habitat on earth
   d. maintaining effective foot care
   e. all of the above
   f. none of the above

31. Which of the following best describes human capital?
   a. The accumulation of stories, visions, and myths shared by people which provide the framework for how people view the world.
   b. The stock of civic virtues and network of civic engagement, involvement, and trust essential to democratic institutions.
   c. The knowledge, skills, and capabilities that people can deploy to create a flow of useful work for community and economy.
   d. All of the above.

32. ___________________________ are collectively produced or consumed resources where individual ownership is not assigned.
   a. Natural resources
   b. Environmental resources
   c. Entropic resources
   d. Global resources
   e. all of the above
   f. none of the above
33. Sanders’ lecture on sustainable systems modifies Hackett’s imperatives to be
   a. Economy
   b. Environment
   c. Individual/community
   d. All of the above
   e. none of the above

34. Global energy trends include:
   a. oil production is down
   b. wind/solar generation is up
   c. coal use is steady
   d. nuclear power has peaked
   e. All of the above
   f. None of the above
   g. b, c, and d only

35. Hackett cites ___________________ as a reason that there is little long term thinking in industry or agriculture today.
   a. Government regulation
   b. Democracy
   c. Pollution
   d. Market myopia
   e. None of the above.

36. __________ estimated in 1972 that we would run out of petroleum between 1992 and 2003, and natural gas between 1994 and 2010. What was overlooked?
   a. Malthus; new reserves
   b. Carson; conservation
   c. Meadows et al; the price mechanism (the power of the market)
   d. None of the above

37. The ____________________________ is an example of a non-government organization that has developed a village bank microcredit program in India for ____________________________.
   a. United Nations, village chiefs
   b. Bank of America, mid-size businesses
   c. FEMA, venture capitalists
   d. Foundation for Women, the poorest women to start home-based businesses
   e. none of the above

38. Lesson 8a notes indicate that hydrocarbon production will peak
   a. around 2050
   b. around 2010
   c. not in this century
   d. no; it has already peaked between 2000 and 2004
39. Guest speaker Kim Barker noted the feedback loop in planning was to plan, monitor, control and re-plan, with the assumption that
   a. the plan is wrong
   b. careful planning achieves success
   c. planning is costly
   d. planning is cheap

40. __________________ reserves of hydrocarbon and other nonrenewable resources are demonstrated or inferred, suggesting they are ______________ and technologically and geologically feasible.
   a. Hypothetical, speculative
   b. Known, economic
   c. Synthetic, discoverable
   d. Exponential, statistically predictable
   e. none of the above

41. Sanders suggests that petroleum fuel estimates are historically conservative because
   a. liquid reserves revisions plus new discoveries have kept ahead of consumption.
   b. estimates are proven accurate.
   c. confirmed resources vary widely
   d. consumption rates continue to fall
   e. all of the above
   f. none of the above

42. __________________ forms of renewable energy are projected to be competitive between 2005 and 2015, according to the Union of Concerned Scientists.
   a. Hydrogen
   b. Wind electricity
   c. Fusion
   d. Solar electricity
   e. both b & d
   f. all of the above
   g. none of the above

43. Which of the following is NOT an argument supporting strong-form sustainability over weak-form sustainability?
   a. The irreversibility of the environmental impacts of so many human activities.
   b. The discontinuities and threshold effects associated with cumulative human activities.
   c. The ease with which technology can replace depleted ecosystems and natural resources.
   d. The uncertainty associated with the consequences of drawing down natural capital.
44. _______________, as defined by ____________, is a community's control and prudent use of all forms of capital--nature's capital, human capital, human created capital, social capital, and ______________ capital--to ensure to the degree possible, that present and future generations can attain a high degree of economic security and achieve democracy while maintaining the integrity of the ecological systems upon which all life and production depends.
   a. Sustainability; Barker; environmental  
   b. A free market; Ostrom; local  
   c. Sustainability; Viederman; cultural  
   d. A free market; Sanders; human-created, environmental  
   e. Sustainability; Kimball; cultural  
   f. none of the above

45. Which of the following best describes the impact that large-scale international development lending has had on many developing countries?
   a. Creation of a greater sense of community along with increased standards of living.  
   b. A strengthening of environmental regulations, leading toward a more sustainable society.  
   c. In many cases failed large-scale projects, external debt, economic restructuring aimed at resource extraction and exportation, and displacement of local indigenous peoples.  
   d. In most cases improved environmental health, increased standards of living, and protection of indigenous property rights systems, cultural capital, and the commons that they depend upon for their livelihood.

46. According to lecture notes, world hunger
   a. is a relatively insignificant problem and is not related to natural resource management.  
   b. is a significant problem but it can be resolved with more production.  
   c. is a significant problem causing 7-20 children to die each minute.  
   d. is an economic problem with education being the key to economic development.  
   e. both c and d  
   f. none of the above

47. Income distribution, according to lecture notes, is increasingly skewed, with the wealthiest 20% of the world population having ____________% of world income, and the poorest 20% having ____________% of world income.
   a. over 80; less than 2  
   b. 50; 50  
   c. 60; 5  
   d. 25; 10  
   e. 75; 3
48. The primary US energy by sources include coal, natural gas and
   a. nuclear
   b. wood
   c. hydro
   d. crude oil
   e. geothermal

49. Unknown reserves, according to lecture notes, are
   a. inferred
   b. speculative
   c. demonstrated
   d. irreplaceable
   e. both b and d

50. Poor countries’ problems with access to clean air and water, according to lecture notes, has led to one-fifth of the world population lacking access to safe drinking water and
   a. half the world suffers from hunger
   b. 2 billion don’t have adequate sanitation
   c. 3/4 of world population can’t afford petroleum for transportation
   d. 1/3 of world land mass is suffering from deforestation

51. Energy costs as a share of cost of production (COP) show that ____________ has the highest at 40%
   a. wheat
   b. corn
   c. tree nuts
   d. cotton

52. During the lecture on carrying capacity, student guesses on the earth’s carrying capacity ranged from _____ to __________ billion.
   a. 500 million; 20
   b. 3 billion; 15 billion
   c. 6 billion; 10
   d. 12 billion; 50

53. According to lecture, environmentalists are more likely to embrace
   a. weak-form sustainability and the soft path
   b. strong-form sustainability and the hard path
   c. high carrying capacity and high ecological footprint
   d. GDP and GNP as measures of sustainability
B. SHORT ANSWER: Fill-in the-blank the best answer or respond as appropriate:

54. Based on lecture notes and the text, briefly apply the concept of sustainability to agriculture and define “sustainable agriculture”.

55. With respect to the course project of which you were part, briefly:
   a. summarize the issue(s).
   b. review key points (not topics).

56. List and briefly explain Viedermann’s “5 capitals”.
57. Hackett discusses sustainable production and consumption issues in chapter 14. Briefly discuss the hard vs. soft path, and the challenge for sustainable production technology.

58. List Ostrom's characteristics of a sustainable local community, as summarized in lecture lesson notes.

59. Briefly discuss the challenges and issues for sustainable local communities.

60. Briefly discuss microlending based on the lecture notes and the text.
61. Using Hackett’s sustainable community examples, (1) briefly explain the situation and (2) what makes it an example.

a. Torbel, Switzerland
   (1)
   (2)

b. Japanese Village Commons & Spanish Irrigation Commons (3 points)
   (1)
   (2)

c. Brazilian Fisheries (3 points)
   (1)
   (2)

d. Panchayat Community Forests (3 points)
   (1)
   (2)

e. What lessons are there for local communities in Oklahoma?

63. Question 2, p. 282 Hackett.
64. A close friend has asked for your help in making a decision about a vehicle purchase because of what you learned in this course. The friend's parents have agreed to give your friend an interest-free loan to purchase a new vehicle, assuming the friend will be graduating and getting a good job this next year. Here are the key variables:

(1) the choice is between a $20,000 truck and a $25,000 sedan;
(2) the truck gets about 15 miles per gallon (mpg), but that will drop to about 10 mpg after 2 years;
(3) the sedan gets about 35 mpg, and that will drop to about 30 mpg after 2 years;
(4) your friend estimates about 20,000 miles per year will be driven over the next 4 years;
(5) your friend assumes maintenance costs for the 2 vehicles will be the same or will be covered under warranty;
(6) you have estimated the cost of fuel, assuming an average of $2/gallon of fuel over the 4-year period, declining mpg for each vehicle and the mileage your friend expects as shown in the following table (numbers are rounded).

Vehicle & Fuel Costs for 2 vehicles over 4 year period

<table>
<thead>
<tr>
<th>Option</th>
<th>Year</th>
<th>Truck</th>
<th>Sedan</th>
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<tbody>
<tr>
<td>0</td>
<td></td>
<td>20,000</td>
<td>25,000</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>2667</td>
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<td>4</td>
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</tbody>
</table>

a. Determine which of the two vehicles has the lowest net present cost when your friend discounts the future at 5% (6 points). Show your work.

b. What do you recommend to your friend and why (2 points)?
65. There will be a few questions related to Dr. Jim Horne’s visit.

66. There will be a few questions related to David Roberts’ lecture.