

Econ 638
Fall 2007
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Office hrs: Wed. 1:30-3:00 and by appt

ENVIRONMENTAL RESOURCE ECONOMICS: Tentative Syllabus

Overview:

Modern economic policy analysis for both private and public sectors requires the ability to deal with current environmental challenges and regulations. We review the methods of static and dynamic optimization to deal with pollution, congestion, waste disposal and management of environmental resources including water, forests, soil, and marine. We develop the principles of sustainable development and sustainability science in contrast to popular representations. Students are encouraged to apply the basic principles to publishable research and/or to policy questions of interest. Topics include pollution as a public bad, pollution solutions, property and institutional mechanisms of environmental cooperation, sustainable economic growth, measuring the “environomy,” unsustainable recycling, conjunctive water management, policies for resource management in developing countries, and “smart,” “greedy,” and “win-win” growth.

Text: Perman et al., *Natural Resource and Environmental Economics*, 3rd ed.

Other references

Oates (ed.), *The Economics of the Environment*

Nordhaus, *Nature's Numbers*

Course requirements & Grading

Midterm	24%
Final ¹	36%
Paper ²	24%
Homework and citizenship ³	16%

Preliminary Course Outline Students are encouraged to indicate their preferences for topics (especially areas not already reflected below) and for readings to be added or downgraded to optional status.

I. Environmental Welfare Economics

- A. Intro and “market failure”
- A. Externalities (Pigouvian, Coasian, and market solutions)
- B. Public goods
- C. Hybrids
- D. Environmental justice
- E. Readings
 - 1. Perman, ch 5.
 - 2. Welfare Economics and the Minimal Role of Government (course notes)
 - 4. Coase, “The Problem of Social Cost,” JLE, 10/60 and in both Oates and Stavins

¹ Please consult UHM schedule of courses.

² Any topic related to course subject matter. Proposals due Sept 17 (refer to sample proposal outline from lecture).
Papers due Dec 5.

³ Contributions to the learning community (including class participation, additional presentations, facilitating availability of course materials, bringing pertinent current articles, websites etc. to class’s attention).

5. Johansson and R'set, "Apples, Bees, and Contracts: A Coase-Cheung Theorem for Positive Spillover Effects"

II. Resources and Sustainability

- A. Perman, ch. 1-4 & 14.
- B. Endress and Roumasset, "The Yin and Yang of Sustainable Development: The Case for Win-Win Environmentalism," in *Asia-Pacific Economy*, v. 1, n. 2. Also "Sustainable Development w/o Constraints" UH WP (2000).
- C. Arrow al. (2004), "Are We Consuming Too Much," *JEP*, v. 18, n. 3, pp. 147-172.
- D. Anand and Sen, (2000) "Human Development and Economic Sustainability," *World Development*, Vol. 28, No. 12, pp. 2029-2049.
- F. Solow, "On the Intergenerational Allocation of Natural Resources," *Scandinavian Journal of Economics*, 88(1), 141±149.* "Intergenerational Equity and Exhaustible Resources," *Review of Economic Studies*, (December, 1974).* Solow, R. M., 1993, "Sustainability, An Economists Perspective," in Dorfman and Dorfman, *Economics of the Environment*, Third Edition and in Stavins, *Economics of the Environment: Selected Readings*, 5th ed.
- E. Endress, Roumasset, and Zhou, "Sustainable Growth w/ Environmental Spillovers," *JEBO*, 2005, available as WP 02-04. Ancestors include 00-9, "Sustainability w/o Constraints," <http://ideas.repec.org/p/hai/wpaper/200009.html> , "Is Sustainability Necessary" (xeroxed), and "Golden Rules for Sustainable Resource Management," <http://authors.repec.org/research/identified!5c693245> .
- F. Pezzey, "One-Sided tests for Sustainability," *JEEM*, July '04.*
- G. Heal, "Optimality or sustainability" in Festschrift for J. Stiglitz, 2003, MIT Press*

III. Pollution solutions

- A. Command and control vs. emission trading
- B. Emission-trading vs. exposure trading
- C. Readings
 1. Perman chs. 6-8
 2. Montgomery (1972), *JET*, 5, 395-418, and ch. 12 in Oates*
 3. Roumasset and Smith, *JEEM* 1990; Shrestha and R'set on exposure trading*
 4. Baumol and Oates, ch 10 in Oates*
 5. Starrett (1974), "Fundamental Non-Convexities the Theory of Externalities," *JET**; Starrett (1973), "A Note on Externalities and the Core," *Econometrica*, v. 41, pp 179-83).⁴
 6. Bergstrom (1976), "Regulation of Externalities," *J. Public Econ* (v. 5, pp 131-8) and "Lindahl Eqblm and the Law," (1975, v42, 249-57) and on his web page. See also http://www.env-econ.net/2005/08/the_following_i.html#more
 6. Griffen, Environmental Policy for Spatial and Persistent Pollutants, *JEEM*, 14, 41-53(1987)*
 7. Weitzman, "Prices and Quantities," *RESTUD*, 10/74 and in Oates*
 8. Fullerton and Wolverton, "Two Generalizations of a Deposit-Refund System," *AER*, May, 2000.
 9. Smith, V. L. 1972. "Dynamics of Waste Accumulation: Disposal Versus Recycling." *Quarterly Journal of Economics* 86: 600-616.
 10. Parry et. al., "When Can Carbon Abatement Policies Increase Welfare? The Fundamental Role of Distorted Factor Markets," RFF WP 97-18-REV (revised 1998).
 11. Pitafi and Roumasset , "Second-best Emission Taxes with Flexible Abatement," 4/04.
 12. R. Shadbegian, Gray, W. and C. Morgan (2004). "The 1990 Clean Air Act Amendments: Who Got Cleaner Air – and Who Paid For It?*"
 13. Oates, "Green Taxes" in *Southern Economic Journal* (Apr 1995).*
 14. Bovenberg and Goulder, *AER*, 1996*

⁴ When one reading is starred and another not starred in the same item, only the starred one is optional.

IV. Environmental resources (water, forests, and soil)⁵

- A. Renewable and non-renewables
- B. Open access vs. common property
- C. Evolution of common and private property
- D. Readings
 - 1. Perman, 14-18.
 - 2. R'set, Fesharaki, Isaac, "Oil Prices w/o OPEC: A Walk on the Supply Side" and Chakravorty and R'set,, "Competive Oil Prices and Scarcity Rents when the Extraction Cost Function is Convex, *Resources and Energy*, December 1990.
 - 3. Krulce, D. Tom Wilson and J. Roumasset, Optimal Management of a Renewable and Replaceable Resource: The Case of Coastal Groundwater, *AJAE*, 11/97
 - 4. Chakravorty, U. and Roumasset, J. (1991), Efficient Spatial Allocation of Irrigation Water, *American Journal of Agricultural Economics*, February 1991: pp. 165-173.
 - 5. Harrington, ch. 32 in Oates*
 - 6. R'set and Smith R., "Interdistrict Water Allocation w/ Conjunctive Use," *Water Resources Update*, Jan '01*
 - 7. Caputo and J. E. Wilen. 1995. "Optimal Cleanup of Hazardous Wastes." *International Econ Rev* 36: 217-243.*
 - 8. McConnell, Kenneth. 1983. "An Economic Model of Soil Conservation." *AJAE* 65, n 1: 83-89.
 - 9. Plourde, "A Simple Model of Replenishable Natural Resource Exploitation." *AER* 60: 3 (518-22)* and Plourde, 1972, "A Model of Waste Accumulation and Disposal"*
 - 10. Brander, J and S Taylor. 1998. The Simple Economics of Easter Island: A Ricardo-Malthus Model of Renewable Resource Use. *American Economic Review*. 88: 119-138. *
 - 11. Heal, "Incentives to Reduce Tropical Deforestation" (with Kevin Conrad) *Journal of Forest Economics* vol 11 4 2006.
 - 12. Heal "Exhaustible Resources" *The New Palgrave Dictionary of Economics**
 - 13. Heal, "Are Oil Producers Rich?" and Sachs, "How to Handle the Macroeconomics of Oil Wealth, in *Escaping the Resource Curse*, Humphreys, Sachs and Stiglitz (Eds).

V. Property rights, and institutional design

- 1. Hardin, Tragedy of the Commons, in Dorfman and Dorfman <http://dieoff.org/page95.htm>
- 2. Tietenberg, ch. 12*
- 3. Ostrom, E., (1990), Governing the Commons, chs. 1, 3 (pp. 69-101)*
- 4. Weitzman, M., (1974), Free Access vs. Private Ownership as Alternative Systems for Managing Common Property, *Journal of Economic Theory*, 8: 225-234*
- 5. Roumasset and La Croix, The Coevolution of Property Right and Political Orders: An Illustration from nineteenth-Century Hawaii*
- 6. Roumasset, (1989), Decentralization and Local Public Goods, Getting Incentives Right. *The Philippine Review of Economics and Business*, Vol. 26(1) June, pp. 1-13*

⁵ Classics in Resource Economics according to Trudy Cameron: Brown, Gardner, Jr, "An Optimal Program for Managing Common Property Resources with Congestion Externalities," *JPE*, ??? pp. 163-173. Brown, Gardner M. Jr. and B.C. Field, "Implications of Alternative Measures of Natural Resource Scarcity," *JPE*, 86(2) April 1978. Gordon, H. Scott (1958) "Economics and the Conservation Question," *Journal of Law and Economics*, October, 110-121. Gordon, H. Scott (1954) "The Economic Theory of a Common Property Resource: The Fishery," *JPE*, April, pp. Hotelling, Harold (1931) "The Economics of Exhaustible Resources," *JPE*, 39(2), April, pp. 137-175. Krutilla, John V. "Conservation Reconsidered," *AER*, 1967, pp. 777-786. Nordhaus, W.D. (1974) "Resources as a Constraint on Economic Growth," *AER*, 64, May, 22-26. Smith, Vernon L. (1977) "Control Theory Applied to Natural and Environmental Resources: An Exposition," *JEEM* 4, pp. 1-24. Smith, Vernon L. (????) "Economics of Production from Natural Resources," *AER*, ????, pp. 409-431. Solow, Robert M. (1974) "The Economics of Resources or the Resources of Economics," *AER*, May, pp. 1-14.

7. Roumasset, "Designing Institutions for Water Quality and Quality Management," in Parker and Tsur, *Decentralization and Coordination of Water Resource Management**
8. R'set, Designing Inst for Effective Forestry Mngmt (electronic).
9. Coevolution – Mkts & Const Order (pdf); see also ch 9 in B&O (electronic)
10. Alston, Review of Anderson & Hill's, *The Not So Wild, Wild West: Property Rights on the Frontier*
11. Kaiser & R'set, "Resources and Institutional Change in Hawaii"

VI. Ecological Economics, Cost-Benefit Analysis and Measurement problems

- A. Simpson, R. David. 1998. "Economic Analysis and Ecosystems: Some Concepts and Issues." *Ecological Applications*, 8 (2):342-349.
- B. Perman, Part III.
- C. Smith, "Pricing What is Priceless," in Folmer and Tietenberg (1997), ch. 6. Refer to his webpage for updates.
- D. Kaiser and Roumasset, "Valuation of Nature's Intermediate Products: the Koolau Forest's Contribution to the Pearl Harbor Aquifer," 1999. <http://www.uhero.hawaii.edu/> and/or "Valuing Indirect Ecosystem Services: the Case of Tropical Watersheds," *Environmental Economics and Development*, v7, n4 (2002), 701-14
- E. Symposium on Contingent Valuation in *Economic Perspectives*, Fall 1994
 1. Portney, P., The CV Debate: Why Economists Should Care
 2. Hanemann, W.M., Valuing the Environmental Through Contingent Valuation
 3. Diamond & Hausman, Contingent Valuation: Is Some Number Better than No Number?
- F. R'set, Wang, Burnett, Is China's Economy Sustainable? (2007)
- G. David Chapman and Paul Portney, "Ten Years' Later: Contingent Valuation after the Report to NOAA*": <http://www.rff.org/seminar/history.htm#11-20-02> *
- I. Shogren, Economics of Invasive Species: explosive invader, in Perrings.* Olson and Roy (2002)
- J. Burnett et al., Prevention, Eradication, and Removal of Invasive Species, *Agricultural and Resource Economics Review* 35(1): 63-77 at http://homepage.mac.com/ondinebak/HI_Research1_files/Kaiser%20ARER%202006.pdf see also <http://homepage.mac.com/ondinebak/> also PREISM final report (sent by email).
- K. Shogren, Economics of Invasive Species: explosive invader, in Perrings.* Olson and Roy (2002)
- L. R'set, Wang, Burnett, Is China's Economy Sustainable?, 2007.
- M. Vincent, Jeffrey, "Economic Depreciation of Timber Resources: Direct and Indirect Estimation Methods", Harvard Institute for International Development, June 1997, 13pp. <http://www.hiid.harvard.edu/pub/pdfs/585.pdf>
- N. Pearce and Moran, *Economic Value of Biodiversity*, 1994 and Pagiola et. al. (2004), *How much is an ecosystem worth?;* Go to <http://www.biodiversityeconomics.org/library/index.html> and use the key word search function.*
- O. Weitzman, "On Diversity," QJE, 102:363-405, 1992.*
- P. Montgomery et al., "Pricing Biodiversity," *Journal of Environmental Economics and Management* 38, 1]19 1999*
- Q. McFadden's advances in CV methods (<http://emlab.berkeley.edu/users/mcfadden/dlmcv10.html>)*
- R. Barbier&Heal, "Valuing Ecosystem Services" *The Economists' Voice* January 2006

VII. Win-win environmentalism

- A. Endress and Roumasset, "The Yin and Yang of Sustainable Development: The Case for Win-Win Environmentalism," in *Asia-Pacific Economy*, v. 1, n. 2
- B. Hartwick, J.M. (1990), Natural Resources, National Accounting and Economic Depreciation, *Journal of Public Economics*, 43:291-304.
- C. Dasgupta, P. & Maler, K. (1993), Poverty, Institutions, and the Environmental-Resource Base, for Behrman & Srinivasan (eds), *Handbook of Development Economics*, Vol 3*
- D. Krautkraemer, J., (1994), "Population growth, soil fertility, and agricultural intensification," *J. Dev. Econ.*, 44, 403-428; and *ReStud '85* on Optimal Growth and Preservation.

- E. R'set, Review of Opschoor et. al., *Environmental Economics and Development*, Edward Elgar, 1999.
 - F. M. Hammig , "Institutions and the Environmental Kuznets Curve for Deforestation: A Crosscountry Analysis* for Latin America, Africa and Asia," *World Development*, June, 2001, pp 995-1010*
 - G. Pender, John, "Pop growth, ag intensification, induced innovation, and resource sustainability," *Ag Econ*, 19, (1998), 99-112.
 - I. Wagner on green NNP http://www.env-econ.net/2005/07/from_the_answer_1.html and http://gwagner.net/work/040409Fixing_GDP.html . * Would green accounting make China look bad? Does productivity growth swamp environmental degradation (Weitzman)? Implications of EKC?
 - J. Dasgupta, Sustainable Economic Development in the World of Today's Poor, Population, Resources, and Welfare: An Exploration into Reproductive and Environmental Externalities,* and Evaluating Projects and Assessing Sustainable Development in Imperfect Economies,* all at www.econ.cam.ac.uk/faculty/dasgupta
 - K. Barrett, S., Optimal Control of Soil Erosion, ch. 18 in Dasgupta & Maler, v.2.*
 - L. Brock, W. and M.S. Taylor (June, 2004), "The Green Solow Model," NBER WP 10557, <http://www.nber.org/papers/w10557>
 - M. McConnell (Feb 1983), An Economic Model of Soil Conservation, AJAE.
 - N. Barbier, "The Economics of Soil Erosion: Theory, Methodology and Examples"
 - O. Weitzman, 1999. Pricing the Limits to Growth from Minerals Depletion., QJE, 114(2): 691-706.
 - P. Pitafi, Pongkijvorasin, R'set, "Pricing Renewable Resource Extraction with Negative Stock Externalities."
 - Q. Hoel and Karp, "Stock Pollution with Multiplicative Uncertainty," JPubEcon, <http://www.oekonomi.uio.no/memo/saertrykk/Hoel&Karp1.pdf>
 - R. Stern, David (2004), "The Rise and Fall of the Environmental Kuznets Curve," *World Development*, v. 32, n. 8, 1419-1439.*
 - S. Polasky, Economics of Biodiversity (Handbook chapter). See also http://www.apec.umn.edu/faculty/spolasky/documents/Biodiversity%207_06.pdf
- VIII. Energy, Global Warming, Growth, and International Cooperation**
- A. Nordhaus, W. (1992), An Optimal Transition Path for Controlling Green House Gases, *Science*, Vol 258:20 November*
 - B. Cline, *The Economics of Global Warming**
 - C. Chakravorty et.al., JPE Dec. 1997
 - D. Barrett, "Int. Cooperation for Environmental Protection," ch. 26 in DD*
 - E. Falk, I., and R. Mendelsohn. 1993. "The Economics of Controlling Stock Pollutants: An Efficient Solution for Greenhouse Gases." *Journal of Environmental Economics and Management* 25: 76-88.*
 - F. Asheim, Nordhaus, Dasgupta, Weitzman on the Stern report (2007). Class notes and their individual web pages.
 - H. Hoel, M. and S. Kverndokk (June '96), "Depletion of Fossil Fuels and the Impact of Global Warming," *Resource and Energy Economics*, v. 18, n. 2, 115-136.*
 - I. Carbon taxes vs. cap and trade: references to be announced.
 - J. Broecker, Wally, "A Businessman's Guide to Global Warming."
 - K. Stern Review, Executive Summary; Weitzman, "The Stern Review of the Economics of Climate Change," forthcoming in JEL, 2007; Dasgupta, Comment on the Stern Review.
 - L. Lawrence H. Goulder "California's Bold New Climate Policy".<http://www.bepress.com/ev/vol4/iss3/art5>; Scott Barrett "Proposal for a New Climate Change Treaty System".<http://www.bepress.com/ev/vol4/iss3/art6>; Joshua S. Gans "Do Voluntary Carbon Offsets Work?"

<http://www.bepress.com/ev/vol4/iss4/art7>; Joseph Stiglitz "A New Agenda for Global Warming". <http://www.bepress.com/ev/vol3/iss7/art3>; Sheila M. Olmstead and Robert N. Stavins "A Meaningful Second Commitment Period for the Kyoto Protocol". <http://www.bepress.com/ev/vol4/iss3/art1>; Kenneth J. Arrow "Global Climate Change: A Challenge to Policy". <http://www.bepress.com/ev/vol4/iss3/art2>; Thomas C. Schelling "Climate Change: The Uncertainties, the Certainties and What They Imply About Action". <http://www.bepress.com/ev/vol4/iss3/art3>; Rognvaldur Hannesson "Letter: The Other Problems with the Stern Report". <http://www.bepress.com/ev/vol4/iss3/art4>

IX. Trade and the Environment

- A. Bhagwati, J. (1993), AThe Case for Free Trade, Scientific American, November: 42-49*
- B. Daly, H. (1993), AThe Perils of Free Trade, Scientific American, November: 50-56*
- D. Polasky et. al., (2003), "On Trade, Land-Use and Biodiversity," search at <http://www.biodiversityeconomics.org/library/index.html> *
- E. Copeland and Taylor (July, 2003), "Trade, Growth and the Environment" NBER WP

*Optional. If one item, e.g. IIF, has multiple readings, only the starred ones are optional.

Tentative schedule of topics

Aug 20: Introduction (Env-Res taxonomy); first fundamental theorem of welfare economics. 2nd best as extra constraint (1. Opt tax theory. 2. Trans wedges. 3. G-S extension of optimal tax theory). Thm 1b illustrated.

Assignment: Perman, ch 5, and Welfare Econ handout.

Aug 22: Critique of 1b (UFF); Thms 2a&b. Weak and strong Coase theorems

Aug 27: Weak and strong are wrong or trivially tautological. Coasean agenda/mission; blackboard economics and Cheung to the rescue; Coase thm (3a&b).

Aug 29: "Apples, Bees and Contracts," (shrinking cores; presented by Chris); assignment: read Perman 3-4 and Bergstrom '76.

Sept 3: Labor Day

Sept 5: Thms 4a&b. Bergstrom, JPubEcon, '76 (presented by Duong). Introduction to sustainability. Assign: read Solow (unstarred one in IIF) and Arrow et al., "Are We Consuming Too Much."

Sept 10. Starrett problems (LE not in alpha core and "fundamental nonconvexity"). First problem solved by restricting core to legal actions, e.g. cannot pollute w/o tickets (Bergstrom '75, '76). Second solved by limiting number of tickets printed, e.g. to Gmax or less. Bergstrom '76 showed that core shrinks if govt chooses the quantity of pollution, and ticket trading serves only to ensure that abatement costs are minimized. Two Johansson papers show that core shrinks (i.e., 3b and 3d go through) for bilateral spillovers. Thms 5a and 5b. Modified H, Hotelling, naïve H.

Hartwick satisfies weak sust and results in maximin path. Assign: Perman 14 and E&R, "Sustainable Development w/o constraints" (IIB).

Sept 12: Sustainability continued. Weak and strong sustainability; Weitzman-World Bank sustainability, genuine savings, GNNP; opsustainability, golden rule sustainability.

Sept 17: Overview of possible midterm questions. Competitive price shocks (Zbar, b, r, demand). Departures from competition. Extended Hotelling rule for renewable resource economics (MUC does not converge to zero). Sustainable growth w/o environmental spillovers (IIE). For stock externality, if no M depreciation, strong sustainability. Assign: read Perman ch. 6.

Sept 19: Spatial pollution; homework assignment.

Sept 24: Sustainability review. Why not zero utility discounting? Stern, Nordhaus, and Dasgupta on GW discounting. Groundwater as a renewable resource. Reading assignment: IVD3 and 4 (Krucze and Chak).

Sept 26: Dynamic w/ distribution costs (see Pitafi paper from Chris). $P_H = a - bQ$. $P_H = P_L + d$. $P_L = a - bQ - d$. Add demand curves for high and low elevations, equate agg demand to total mg cost: $c + MUC$. Show consumption for

each, P_H and P_L . Distribution costs as water loss (Chakravorty, IVD4). Research question: generalize such that two distribution costs above (transportation costs and water loss cost) are special cases.

Double dividend: carbon tax reduces excess burden of pollution and excess burden from taxation. Goulder, Bovenberg, Oates, Ian Parry, Robertson Williams say no: tax interaction effect outweighs tax recycling effect => second-best carbon tax is lower than first-best. Fallacies to look for: taxing emissions not separable from taxing dirty good. Labor is only input. Conjecture: second-best carbon tax higher than first-best. See also Fullerton. Assignment: review ch 8. Read Fullerton and Wolverton, "Two Generalizations of a Deposit-Refund System," AER, May, 2000.

Oct 1: Hao presentation of Ful and Wol. Pollution under uncertainty hwk: $MB = 96 - 2G$ or $48 - 2G$, 50% probability each. $MDC = 24 + .5G$. Does pollution tax or cap & trade have lower excess burden? Which has lower excess burden if MDC is uncertain instead of MB?

Extra Credit: $C = C(L_C)$; $D = D(L_D, G)$; $U = U(C, D) - DC(G) - LC(L)$. If $R_{bar} > 1^{st}$ -best Pigouvian revenue, is 2^{nd} -best pollution tax greater or less than 1^{st} -best tax? Assign: Read "Incentives to Reduce Tropical Deforestation" and "Designing Institutions for Effective Forestry Management."

Oct 3: Forestry. Assignment: read Broecker and Stern papers.

Oct 8: Stern thoughts, Nori Tarui.

Oct 10: Majah on Sachs. Curse of Paradise. Chris on unconscionable savings rates. Review of Nori rates.

Nordhaus: $r = \eta * g + \delta$. First-best r graph => 5% (observed). $g = 2\%$, $\delta = 3\%$ => $\eta = 1$. Stern: $g = 1.3\%$; $\delta = .1\%$; $\eta = 1$. This implies social discount rate = 1.4%.

Nordhaus critique: If $\delta = .1\%$, η must be 2.45, i.e., $5\% = 2.45(2\%) + .1\%$. (Implicitly assumes that sum must conform to market 5%, but Stern disagrees.) This is the old OCC vs. SDR debate in disguise. If SDR = 1.4%, optimal carbon tax goes from 370 to 970 this century. If OCC used (Nordhaus), optimal carbon tax goes from 30 to 195 under option 1 and 30 to 270 under option 2. Stern fallacy: if SDR = 1.3%, massive policy reforms are implied that would increase savings rate, e.g. switch to consumption tax (subtract savings from taxable income) and PAYG social security.

Oct 15: Midterm

Oct 17: Sustainability summary:

1. Injunction to incorporate intergenerational equity and system interdependence
2. Property of above: sustainable or not.
3. Political movement (anti development, pro self sufficiency)

WSJ article on global delusions. Do not substitute panic for analysis. No consensus that catastrophe is immanent and that expensive action is urgently required.

New Institutional Economics and property rights: Ostrom on Demsetz, Hardin and common property. Anderson and Hill: making Demsetz and Williamson operational. Economic history of Hawaii: Unification (benefits up, enforcement costs down); Great Mahele (property benefits up; public finance benefits up; political costs of change down).

Oct 22: Sustainability science (from climate change to ecology). Optimal mining and preservation of the forest (extraction costs, distance, planting costs, and non-convexities).

Etiology of sustainability (Clintonization, Ahupaa or bust). Political economy of institutional change: North's primary action group introduces concept, but theory offers no guidance on when to use. In contrast, NIEAO prescribes 1^{st} -best level of analysis for terms, 2^{nd} -best for organizational form, and 3^{rd} best for constitutional choice, including economic policies, and race vs. inertia. (NIE rests on bounded rationality and opportunism, but these fail the test of Ockham's Razor.) OA can result in over, under, or 1^{st} -best efficient harvesting. With organizational costs, OA can be 2^{nd} -best efficient even if it's 1^{st} -best inefficient. Assign: read intra-inter (sent by Duong) and UH WP [07-3](#) .

Oct 24: Duong on intra-inter (Endress et al.). Kaiser Hawaii paper. Assign: Chris will pick two, one for emphasis and one to describe in very general terms.

Krautkraemer, J., (1994), "Population growth, soil fertility, and agricultural intensification," J. Dev. Econ., 44, 403-428; and ReStud '85 on Optimal Growth and Preservation.

Pender, John, "Pop growth, ag intensification, induced innovation, and resource sustainability," *Ag Econ*, 19, (1998), 99-112.

Barrett, S., Optimal Control of Soil Erosion, ch. 18 in Dasgupta & Maler, v.2.*

Brock, W. and M.S. Taylor (June, 2004), "The Green Solow Model," NBER WP 10557, <http://www.nber.org/papers/w10557>

Barbier, "The Economics of Soil Erosion: Theory, Methodology and Examples"

Anderson, Terry, and Peter J. Hill. "The Race for Property Rights." *Journal of Law and Economics* 33, no. 1 (April 1990): 177-98.

Oct 29: Chris on soil conservation

Oct 31: Book review of Hawken, *Blessed Unrest*. Neoclassical interventionism. Post-structural economics and political economy. Benefit-cost analysis – IRR and tricks (refer also to Perman ch 11). EKC and RKC. Overview of Chakravorty et al. JPE article on endogenous energy substitution and application to global warming.

Nov 5: Kaiser on Ko'olau watershed evaluation. Burnett et al. on China. Hao on Brock and Taylor

Nov 7: Majah and Duong: joint presentation of Perman, ch 12. Finish China. Q&A if any regarding terse notes above.

Nov 14: Attend sustainability science conference

Nov 19: Debrief sustainability science conference. Nordhaus as prototype for sustainability science. Another is watershed balance and the demand for water.

Nov 21: DICE (Nordhaus by Chris) and Chakravorty et al. (VIIC).

Nov 26-28: Finish Chak et al., JPE '97 paper. Offset trading, including California and Hawaii carbon caps (HB226/SB234); invasive species management (VIJ), Road Pricing, Millenium Ecosystem Assessment report; intro to trade and the environment.

Dec 3: Polasky presented by N. Tarui

Dec 5: Majah on trade and the environment. Duong on voluntary offset credits.