Environmental Economics
Course Description

Mohammad Vesal
Graduate School of Management and Economics
sharif University of Technology

44627
January 2023

1 Aim of the course

Mankind's production and consumption activities often rely on the environment and alter the environment. Energy consumption in factories and other places results in emissions in the form of greenhouse gases and pollutants. Pollutants such as particles smaller than 2.5 microne (PM2.5) affect human health and cognitive functioning. Accumulation of greenhouse gases in the atmosphere has caused global warming and climate change with uncertain, hetergeneous and potentially large consequences across the world. Environmental economics studies the causes and consquences of environmental problems in relation to human activities. This young field builds on microeconomic theory to suggest solutions for regulating and reducing the environmental impacts of human activities.

The first part of this course discusses the evidence on the impact of various pollutants on humans as well as the impacts of climate change. The second part discusses the theory of environmental regulation and studies a sample of studies on the impact of various policies on reducing the damages to the environment. We discuss emissions markets, taxes and subsidies, payment for echosystem services, and as three common policy tools. The third part delves into the realm of environmental valuation and briefly discusses revealed and stated preference methods for valuation of environmental services. We then discuss cost-benefit analysis in this field. The fourth part is a brief introduction to resource economics. It first looks into the issues in water resources management. Then it discusses the management of natural resources for agricultural activities. We will briefly look into bioeconomic models of forest management as well. The final part of the course discusses the macroeconomic impact of climate change and offers a brief introduction to macro environmental models.

This course is a masters level course and requires a solid knowledge of microeconomic theory. Given the empirical focus of the course you need good familiarity with econometrics methods such as multiple regression and observational methods of causal identification. This means only PhD/MSc Economics students can take this course. Other interested students should first get permission from the instructor.

The aims of this course are to:

- discuss key issues in environmental economics;
- provide an overview of the empirical evidence on the impact of environmental pollutions and climate change;
- develop an understanding of policy design and its impact on environmental exeternalities;
- introduce key issues in the management of renewable natural resources (water, forests, and fisheries).

Students successfully completing this course should be able to:

- critically discuss key issues in environmental economics;
- understand and sythensize empirical evidence on the impact of pollutions and climate change;
- engage critically with the empirical environmental economics literature.

2 Course outline

Below is a brief list of topics. You can find the full reading list in section 4.

Part 0: A introduction to environmental economics

Part I: Environmental Externalities

- Impacts of air pollution
- Impacts of water pollution
- Impacts of climate change

Part II: Environmental Regulation

- Emissions markets
- Taxes and subsidies
- Payments for echosystem services
- Enforcement and cost of regulation

Part III: Valuing the Environment

- Revealed preference models
- Stated preference models
- Cost-benefit analysis

Part IV: Management of Natural Resources

- Water resources management
- Agriculture and the environment
- Fisheries and aquaculture

Part V: Macroeconomics and the Environment

- Macroeconomic impacts of climate change
- Macro environmental models

3 Course administration

Lectures and classes

Lectures will be held on *Saturday* and *Monday* 15:00-16:30 in class 2.

There will be tutorial classes where you will have a chance to discuss your solutions to assignments. Time and location to be confirmed. Pouya Arab is responsible for the tutorial classes.

Attendance in both lectures and classes is *mandatory* and I will monitor your record carefully.

Evaluation

- Midterm exam (30%): closed book three hour written exam, 1401/02/28, 9AM.
- Final exam (30%): closed book three hour written exam, 1401/04/30, 9AM.
- Assignments (15%): 12 assigments.
- Referee report (10%): You would need to write a referee report on the following paper:

  > Greenstone, M., Pande, R., Sudarshan, A., & Ryan, N. (2022). The benefits and costs of emissions trading: Experimental evidence from a new market for industrial particulate emissions. Working paper.

- Research Proposal (15%).
- Class participation (5% bonus)

4 Reading list

This course is mostly based on journal papers. There are not many graduate-level textbooks but you can use the following for some of the topics:

> [C] Conrad, J. M. (2010). Resource economics. Cambridge University Press.
>
> [CR] Conrad, J. M., & Rondeau, D. (2020). Natural resource economics: analysis, theory, and applications. Cambridge University Press. [link]
>
> [PMMC] Perman, Roger, Yue Ma, James McGilvray, and Michael Common. Natural resource and environmental economics. Pearson Education, 2011.
>
> [PR]: Phaneuf, D. J., & Requate, T. (2016). A course in environmental economics: theory, policy, and practice. Cambridge University Press.

The following handbooks provide useful reviews of various topics:

> Handbook of Environmental Economics, Volumes 1 (2003), 2 (2005), 3 (2005), and 4 (2018).
>
> Handbook of Agricultural Economics, Volumes 1A, 1B (2001), 2A, 2B (2002), 3 (2007), 4 (2010).

The following textbooks provide an undergraduate-level explanation of the topics and are very useful for understanding the broad view of topics. I recommend you read relevant chapters from one of these books for each topic.

[KO]: Keohane, M. N. O., & Olmstead, S. M. (2016). Markets and the Environment. Island Press.

[HR]: Harris, J. M., & Roach, B. (2017). Environmental and natural resource economics: A contemporary approach. Routledge.

Note: References with an asterisk (*) are required. Papers with [AS] are used in assignment and are required as well.

Part 0: A introduction to environmental economics

* PR Chapters 1, 2.

* HR Chapters 1, 2.

* KO Chapter 1.

Further readings

Overview

Auffhammer, M. (2018). Quantifying economic damages from climate change. Journal of Economic Perspectives, 32(4), 33-52.

Cropper, M. L., & Oates, W. E. (1992). Environmental economics: a survey. Journal of economic literature, 30(2), 675-740.

Freeman III, A. M. (2002). Environmental policy since Earth day I: what have we gained?. Journal of Economic Perspectives, 16(1), 125-146.

Greenstone, M., He, G., Li, S., & Zou, E. Y. (2021). China's war on pollution: Evidence from the first 5 years. Review of Environmental Economics and Policy, 15(2), 281-299.

Greenstone, M., & Jack, B. K. (2015). Envirodevonomics: A research agenda for an emerging field. Journal of Economic Literature, 53(1), 5-42.

Hamann, M., Berry, K., Chaigneau, T., Curry, T., Heilmayr, R., Henriksson, P. J., ... & Wu, T. (2018). Inequality and the biosphere. Annual Review of Environment and Resources, 43, 61-83.

Jayachandran, S. (2022). How economic development influences the environment. Annu. Rev. Econ, 14, 1-30.

Stern, N. (2013). The Structure of Economic Modeling of the Potential Impacts of Climate Change: Grafting Gross Underestimation of Risk onto Already Narrow Science Models. Journal of Economic Literature, 51(3), 838–859.

Methods

Harding, M. C., & Lamarche, C. (2021). Small Steps with Big Data: Using Machine Learning in Energy and Environmental Economics. Annual Review of Resource Economics, 13, 469-488.

Hsiang, S. (2016). Climate econometrics. Annual Review of Resource Economics, 8, 43-75.

Weersink, A., Fraser, E., Pannell, D., Duncan, E., & Rotz, S. (2018). Opportunities and challenges for big data in agricultural and environmental analysis. Annual Review of Resource Economics, 10, 19-37.

Part I: Environmental Externalities

Currie, J., Graff Zivin, J., Mullins, J., & Neidell, M. (2014). What do we know about short-and long-term effects of early-life exposure to pollution?. Annu. Rev. Resour. Econ., 6(1), 217-247.

Graff Zivin, J., & Neidell, M. (2013). Environment, health, and human capital. Journal of Economic Literature, 51(3), 689-730.

Zheng, S., & Kahn, M. E. (2017). A new era of pollution progress in urban China?. Journal of Economic Perspectives, 31(1), 71-92.

Topic 1: Impacts of Air pollution

Impact on health

*Currie, Janet, and Matthew Neidell, "Air Pollution and Infant Health: What Can We Learn from California's Recent Experience?", Quarterly Journal of Economics 120 (2005)

[AS] Ebenstein, A., Fan, M., Greenstone, M., He, G., & Zhou, M. (2017). New evidence on the impact of sustained exposure to air pollution on life expectancy from China's Huai River Policy. Proceedings of the National Academy of Sciences, 114(39), 10384-10389.

Further readings

Anderson, M. L., Hyun, M., & Lee, J. (2022). Bounds, Benefits, and Bad Air: Welfare Impacts of Pollution Alerts (No. w29637). National Bureau of Economic Research.

Arceo, E., Hanna, R., & Oliva, P. (2016). Does the effect of pollution on infant mortality differ between developing and developed countries? Evidence from Mexico City. The Economic Journal, 126(591), 257-280.

Chay, Kenneth Y. and Michael Greenstone, "The Impact of Air Pollution on Infant Mortality: Evidence from Geographic Variation in Pollution Shocks Induced by a Recession", Quarterly Journal of Economics (2003), 1121-1167.

Chen, Y., Ebenstein, A., Greenstone, M., & Li, H. (2013). Evidence on the impact of sustained exposure to air pollution on life expectancy from China's Huai River policy. Proceedings of the National Academy of Sciences, 110(32), 12936-12941.

Chen, S., Oliva, P., & Zhang, P. (2018). Air pollution and mental health: evidence from China (No. w24686). National Bureau of Economic Research.

Currie, J., & Walker, R. (2011). Traffic congestion and infant health: Evidence from E-ZPass. American Economic Journal: Applied Economics, 3(1), 65-90.

Currie, J., Graff Zivin, J., Mullins, J., & Neidell, M. (2014). What do we know about short-and long-term effects of early-life exposure to pollution?. Annu. Rev. Resour. Econ., 6(1), 217-247.

Deryugina, T., Heutel, G., Miller, N. H., Molitor, D., & Reif, J. (2019). The Mortality and Medical Costs of Air Pollution: Evidence from Changes in Wind Direction. The American Economic Review, 109(12), 4178–4219.

Deschenes, O., Greenstone, M., & Shapiro, J. S. (2017). Defensive investments and the demand for air quality: Evidence from the NOx budget program. American Economic Review, 107(10), 2958-89.

Deschenes, O., Wang, H., Wang, S., & Zhang, P. (2020). The effect of air pollution on body weight and obesity: evidence from China. Journal of Development Economics, 145, 102461.

Gehrsitz, M. (2017). The effect of low emission zones on air pollution and infant health. Journal of Environmental Economics and Management, 83, 121-144.

Herrnstadt, E., Heyes, A., Muehlegger, E., & Saberian, S. (2021). Air pollution and criminal activity: Microgeographic evidence from Chicago. American Economic Journal: Applied Economics, 13(4), 70-100.

Ito, K., & Zhang, S. (2020). Willingness to pay for clean air: Evidence from air purifier markets in China. Journal of Political Economy, 128(5), 1627-1672.

Jayachandran, S. (2009). Air quality and early-life mortality evidence from Indonesia's wildfires. Journal of Human resources, 44(4), 916-954.

Knittel, C. R., Miller, D. L., & Sanders, N. J. (2016). Caution, drivers! Children present: Traffic, pollution, and infant health. Review of Economics and Statistics, 98(2), 350-366.

Marcus, M. (2017). On the road to recovery: Gasoline content regulations and child health. Journal of health economics, 54, 98-123.

Moretti, E. and Neidell, M. (2011). Pollution, Health, and Avoidance Behavior: Evidence from the Ports of Los Angeles," Journal of Human Resources, 46(1), pp. 154-175.

Pattanayak, S. K., Pakhtigian, E. L., & Litzow, E. L. (2018). Chapter 4 Through the looking glass: Environmental health economics in low and middle income countries. In Handbook of Environmental Economics (Vol. 4, pp. 143-191). Elsevier.

Schlenker, W., & Walker, W. R. (2016). Airports, air pollution, and contemporaneous health. The Review of Economic Studies, 83(2), 768-809.

Zhang, X., Zhang, X., & Chen, X. (2017). Happiness in the air: How does a dirty sky affect mental health and subjective well-being?. Journal of environmental economics and management, 85, 81-94.

Impact on education

*Ebenstein, A., Lavy, V., & Roth, S. (2016). The long-run economic consequences of high-stakes examinations: Evidence from transitory variation in pollution. American Economic Journal: Applied Economics, 8(4), 36-65.

Further readings

Amanzadeh, N., Vesal, M., & Ardestani, S. F. F. (2020). The impact of short-term exposure to ambient air pollution on test scores in Iran. Population and Environment, 41(3), 253-285.

Bharadwaj, P., Gibson, M., Graff Zivin, J., & Neilson, C. (2017). Gray matters: Fetal pollution exposure and human capital formation. Journal of the Association of Environmental and Resource Economists, 4(2), 505-542.

Graff Zivin, J., Liu, T., Song, Y., Tang, Q., & Zhang, P. (2020). The Unintended Impacts of Agricultural Fires: Human Capital in China. Journal of Development Economics, 147, 102560.

Lai, W., Li, S., Li, Y., & Tian, X. (2022). Air pollution and cognitive functions: Evidence from straw burning in China. American Journal of Agricultural Economics, 104(1), 190-208.

Marcotte, D. E. (2017). Something in the air? Air quality and children's educational outcomes. Economics of Education Review, 56, 141-151.

Persico, C. L., & Venator, J. (2021). The effects of local industrial pollution on students and schools. Journal of Human Resources, 56(2), 406-445.

Sanders, N. J. (2012). What doesn't kill you makes you weaker prenatal pollution exposure and educational outcomes. Journal of Human Resources, 47(3), 826-850.

Zhang, X., Chen, X., & Zhang, X. (2018). The impact of exposure to air pollution on cognitive performance. Proceedings of the National Academy of Sciences, 115(37), 9193-9197.

Impact on productivity

*Graff Zivin, J., & Neidell, M. (2012). The impact of pollution on worker productivity. American Economic Review, 102(7), 3652-73.

[AS] He, J., Liu, H., & Salvo, A. (2019). Severe air pollution and labor productivity: Evidence from industrial towns in China. American Economic Journal: Applied Economics, 11(1), 173-201.

Further readings

Chang, T. Y., Graff Zivin, J., Gross, T., & Neidell, M. (2019). The effect of pollution on worker productivity: evidence from call center workers in China. American Economic Journal: Applied Economics, 11(1), 151-72.

Fu, S., Viard, V. B., & Zhang, P. (2021). Air pollution and manufacturing firm productivity: Nationwide estimates for China. The Economic Journal, 131(640), 3241-3273.

Lai, W., Li, S., Li, Y., & Tian, X. (2022). Air pollution and cognitive functions: Evidence from straw burning in China. American Journal of Agricultural Economics, 104(1), 190-208.

Xue, S., Zhang, B., & Zhao, X. (2021). Brain drain: The impact of air pollution on firm performance. Journal of Environmental Economics and Management, 110, 102546.

Other impacts

Aragon, F. M., Miranda, J. J., & Oliva, P. (2017). Particulate matter and labor supply: The role of caregiving and non-linearities. Journal of Environmental Economics and Management, 86, 295-309.

Bondy, M., Roth, S., & Sager, L. (2020). Crime is in the air: The contemporaneous relationship between air pollution and crime. Journal of the Association of Environmental and Resource Economists, 7(3), 555-585.

Chen, S., Oliva, P., & Zhang, P. (2022). The effect of air pollution on migration: evidence from China. Journal of Development Economics, 102833.

Currie, J., Davis, L., Greenstone, M., & Walker, R. (2015). Environmental health risks and housing values: evidence from 1,600 toxic plant openings and closings. American Economic Review, 105(2), 678-709.

Heblich, S., Trew, A., & Zylberberg, Y. (2021). East-side story: Historical pollution and persistent neighborhood sorting. Journal of Political Economy, 129(5), 1508-1552.

Heyes, A., Rivers, N., & Schaufele, B. (2019). Pollution and politician productivity: the effect of pm on mps. Land Economics, 95(2), 157-173.

Sager, L. (2019). Estimating the effect of air pollution on road safety using atmospheric temperature inversions. Journal of Environmental Economics and Management, 98, 102250.

Topic 2: Water pollution and health

*Galiani, Sebastian, Paul Gertler, and Ernesto Schargrodsky. "Water for life: The impact of the privatization of water services on child mortality." Journal of political economy 113.1 (2005): 83-120.

[AS] Bartik, A. W., Currie, J., Greenstone, M., & Knittel, C. R. (2019). The local economic and welfare consequences of hydraulic fracturing. American Economic Journal: Applied Economics, 11(4), 105-55.

Further readings

Black, K. J., Boslett, A. J., Hill, E. L., Ma, L., & McCoy, S. J. (2021). Economic, Environmental, and Health Impacts of the Fracking Boom. Annual Review of Resource Economics, 13, 311-334.

Currie, J., Graff Zivin, J., Meckel, K., Neidell, M., & Schlenker, W. (2013). Something in the water: Contaminated drinking water and infant health. Canadian Journal of Economics, 46(3), 791-810.

Do, Q. T., Joshi, S., & Stolper, S. (2018). Can environmental policy reduce infant mortality? Evidence from the Ganga Pollution Cases. Journal of Development Economics, 133, 306-325.

Farrow, R. Scott, et al. "Pollution trading in water quality limited areas: Use of benefits assessment and cost-effective trading ratios." Land Economics 81.2 (2005): 191-205.

Garg, T., Hamilton, S. E., Hochard, J. P., Kresch, E. P., & Talbot, J. (2018). (Not so) gently down the stream: River pollution and health in Indonesia. Journal of Environmental Economics and Management, 92, 35-53.

Graff Zivin, Joshua, Matthew Neidell, and Wolfram Schlenker. "Water quality violations and avoidance behavior: Evidence from bottled water consumption." American Economic Review 101.3 (2011): 448-53.

Hill, E. L., & Ma, L. (2022). Drinking water, fracking, and infant health. Journal of Health Economics, 82, 102595.

Keiser, D. A., & Shapiro, J. S. (2019). Consequences of the Clean Water Act and the demand for water quality. The Quarterly Journal of Economics, 134(1), 349-396.

Keiser, D. A., & Shapiro, J. S. (2019). US water pollution regulation over the past half century: burning waters to crystal springs?. Journal of Economic Perspectives, 33(4), 51-75.

Marcus, M. (2021). Going beneath the surface: Petroleum pollution, regulation, and health. American Economic Journal: Applied Economics, 13(1), 1-37.

Olmstead, S., & Zheng, J. (2019). Policy instruments for water pollution control in developing countries. url.

Topic 3: Climate change

Impact on agriculture

*Deschenes, Olivier, and Michael Greenstone. "The economic impacts of climate change: evidence from agricultural output and random fluctuations in weather." The American Economic Review 97.1 (2007): 354-385.

*Deschênes, O., & Greenstone, M. (2012). The economic impacts of climate change: evidence from agricultural output and random fluctuations in weather: reply. American Economic Review, 102(7), 3761-73.

*Fisher, Anthony C., et al. "The economic impacts of climate change: evidence from agricultural output and random fluctuations in weather: comment." American Economic Review 102.7 (2012): 3749-3760.

*Hsiang, S., & Kopp, R. E. (2018). An economist's guide to climate change science. Journal of Economic Perspectives, 32(4), 3-32.

[AS] Burke, M., & Emerick, K. (2016). Adaptation to climate change: Evidence from US agriculture. American Economic Journal: Economic Policy, 8(3), 106-40.

Further readings

Albouy, D., Graf, W., Kellogg, R., & Wolff, H. (2016). Climate amenities, climate change, and American quality of life. Journal of the Association of Environmental and Resource Economists, 3(1), 205-246.

Auffhammer, M., & Kahn, M. E. (2018). Chapter 5 The farmer's climate change adaptation challenge in least developed countries. Handbook of Environmental Economics, Vol. 4, pp. 193-229. Elsevier.

Auffhammer, M., & Schlenker, W. (2014). Empirical studies on agricultural impacts and adaptation. Energy Economics, 46, 555-561.

Blanc, E., & Schlenker, W. (2017). The use of panel models in assessments of climate impacts on agriculture. Review of Environmental Economics and Policy, 11(2), 258-279.

Carter, C., Cui, X., Ghanem, D., & Mérel, P. (2018). Identifying the economic impacts of climate change on agriculture. Annual Review of Resource Economics, 10, 361-380.

Gammans, M., Mérel, P., & Ortiz-Bobea, A. (2017). Negative impacts of climate change on cereal yields: statistical evidence from France. Environmental Research Letters, 12(5), 054007.

Hsiang, S., Oliva, P., & Walker, R. (2020). The distribution of environmental damages. Review of Environmental Economics and Policy.

IPCC fifth assessment report, available at https://www.ipcc.ch/assessment-report/ar5/

Mendelsohn, R. (2007). Chapter 60 Past climate change impacts on agriculture. Handbook of agricultural economics, Volume 3, 3009-3031.

Mendelsohn, R. O., & Massetti, E. (2017). The use of cross-sectional analysis to measure climate impacts on agriculture: theory and evidence. Review of Environmental Economics and Policy, 11(2), 280-298.

Mérel, P., & Gammans, M. (2021). Climate Econometrics: Can the Panel Approach Account for Long-Run Adaptation?. American Journal of Agricultural Economics, 103(4), 1207-1238.

Schlenker, Wolfram, W. Michael Hanemann, and Anthony C. Fisher. "Will US agriculture really benefit from global warming? Accounting for irrigation in the hedonic approach." American Economic Review 95.1 (2005): 395-406.

Weitzman, M. L. (2009). On modeling and interpreting the economics of catastrophic climate change. The review of economics and statistics, 91(1), 1-19.

Zhang, P., Zhang, J., & Chen, M. (2017). Economic impacts of climate change on agriculture: The importance of additional climatic variables other than temperature and precipitation. Journal of Environmental Economics and Management, 83, 8-31.

Impact on mortality

*Burgess, R., Deschenes, O., Donaldson, D., & Greenstone, M. (2017). Weather, climate change and death in India. Working Paper.

Carleton, T. A., Jina, A., Delgado, M. T., Greenstone, M., Houser, T., Hsiang, S. M., ... & Zhang, A. T. (2020). Valuing the global mortality consequences of climate change accounting for adaptation costs and benefits (No. w27599). National Bureau of Economic Research.

Further readings

Barreca, A. I. (2012). Climate change, humidity, and mortality in the United States. Journal of Environmental Economics and Management, 63(1), 19-34.

Barreca, A., Clay, K., Deschênes, O., Greenstone, M., & Shapiro, J. S. (2015). Convergence in adaptation to climate change: Evidence from high temperatures and mortality, 1900-2004. American Economic Review, 105(5), 247-51.

Barreca, A., Clay, K., Deschenes, O., Greenstone, M., & Shapiro, J. S. (2016). Adapting to climate change: The remarkable decline in the US temperature-mortality relationship over the twentieth century. Journal of Political Economy, 124(1), 105-159.

Barrett, C., Ortiz-Bobea, A., & Pham, T. (2021). Structural Transformation, Agriculture, Climate and the Environment.

Cohen, F., & Dechezleprêtre, A. (2019). Mortality, temperature, and public health provision: evidence from Mexico. American Economic Journal: Economic Policy.

Deschenes, O. (2014). Temperature, human health, and adaptation: A review of the empirical literature. Energy Economics, 46, 606-619.

Deschênes, O., & Greenstone, M. (2011). Climate change, mortality, and adaptation: Evidence from annual fluctuations in weather in the US. American Economic Journal: Applied Economics, 3(4), 152-85.

Deschenes, O., & Moretti, E. (2009). Extreme weather events, mortality, and migration. The Review of Economics and Statistics, 91(4), 659-681.

Geruso, M., & Spears, D. (2018). Heat, humidity, and infant mortality in the developing world (No. w24870). National Bureau of Economic Research.

Hanlon, W. W., Hansen, C. W., & Kantor, J. (2021). Temperature, Disease, and Death in London: Analyzing Weekly Data for the Century from 1866 to 1965. The Journal of Economic History, 81(1), 40-80.

Maccini, S., & Yang, D. (2009). Under the weather: Health, schooling, and economic consequences of early-life rainfall. American Economic Review, 99(3), 1006-26.

Mullins, J. T., & White, C. (2020). Can access to health care mitigate the effects of temperature on mortality?. Journal of Public Economics, 191, 104259.

Randell, H. (2022). Heat, Mortality, and Health. In International Handbook of Population and Environment (pp. 283-299). Springer, Cham.

Wilde, J., Apouey, B. H., & Jung, T. (2017). The effect of ambient temperature shocks during conception and early pregnancy on later life outcomes. European Economic Review, 97, 87-107.

Impact on other outcomes

Burke, M., Hsiang, S. M., & Miguel, E. (2015). Climate and conflict. Annu. Rev. Econ., 7(1), 577-617.

Fankhauser, S. (2017). Adaptation to climate change. Annual Review of Resource Economics, 9, 209-230.

Feng, S., Krueger, A. B., & Oppenheimer, M. (2010). Linkages among climate change, crop yields and Mexico–US cross-border migration. Proceedings of the National Academy of Sciences, 107(32), 14257-14262.

Garg, T., Jagnani, M., & Taraz, V. (2020). Temperature and human capital in India. Journal of the Association of Environmental and Resource Economists, 7(6), 1113-1150.

Graff Zivin, J., & Neidell, M. (2014). Temperature and the allocation of time: Implications for climate change. Journal of Labor Economics, 32(1), 1-26.

Graff Zivin, J., & Kahn, M. E. (2016). Industrial productivity in a hotter world: the aggregate implications of heterogeneous firm investment in air conditioning (No. w22962). National Bureau of Economic Research.

Hsiang, S. M., Burke, M., & Miguel, E. (2013). Quantifying the influence of climate on human conflict. Science, 341(6151), 1235367.

Marchiori, L., Maystadt, J. F., & Schumacher, I. (2012). The impact of weather anomalies on migration in sub-Saharan Africa. Journal of Environmental Economics and Management, 63(3), 355-374.

Somanathan, E., Somanathan, R., Sudarshan, A., & Tewari, M. (2021). The impact of temperature on productivity and labor supply: Evidence from Indian manufacturing. Journal of Political Economy, 129(6), 1797-1827.

Part II: Environmental regulation

General References

[PR] various chapters.

Aldy, J. E., Auffhammer, M., Cropper, M., Fraas, A., & Morgenstern, R. (2022). Looking back at 50 years of the Clean Air Act. Journal of Economic Literature, 60(1), 179-232.

Baliga, S., & Maskin, E. (2003). Mechanism design for the environment. In Handbook of environmental economics (Vol. 1, pp. 305-324). Elsevier.

Blackman, A., Li, Z., & Liu, A. A. (2018). Efficacy of command-and-control and market-based environmental regulation in developing countries. Annual Review of Resource Economics, 10, 381-404.

Bohm, P. (2003). Experimental evaluations of policy instruments. In Handbook of environmental economics (Vol. 1, pp. 437-460). Elsevier.

Helfand, G. E., Berck, P., & Maull, T. (2003). The theory of pollution policy. In Handbook of environmental economics (Vol. 1, pp. 249-303). Elsevier.

Holland, S. P., Mansur, E. T., Muller, N. Z., & Yates, A. J. (2020). Decompositions and policy consequences of an extraordinary decline in air pollution from electricity generation. American Economic Journal: Economic Policy, 12(4), 244-74.

Kolstad, C. D., & Toman, M. (2005). The economics of climate policy. In Handbook of environmental economics (Vol. 3, pp. 1561-1618). Elsevier.

MWG, Chapter 11.

Oates, W. E., & Portney, P. R. (2003). The political economy of environmental policy. In Handbook of environmental economics (Vol. 1, pp. 325-354). Elsevier.

Stavins, R. N. (2003). Experience with market-based environmental policy instruments. In Handbook of environmental economics (Vol. 1, pp. 355-435). Elsevier.

Sterner, T., & Robinson, E. J. (2018). Chapter 6 Selection and design of environmental policy instruments. In Handbook of environmental economics (Vol. 4, pp. 231-284). Elsevier.

OECD (2019), Taxing Energy Use 2019: Using Taxes for Climate Action, OECD Publishing, Paris.

Olmstead, Sheila M., and Robert N. Stavins. 2009. "Comparing Price and Nonprice Approaches to Urban Water Conservation." Water Resources Research 45 (4).

Shapiro, J. S., & Walker, R. (2018). Why is pollution from US manufacturing declining? The roles of environmental regulation, productivity, and trade. American Economic Review, 108(12), 3814-54.

Zou, E. Y. (2021). Unwatched pollution: The effect of intermittent monitoring on air quality. American Economic Review, 111(7), 2101-26.

Topic 4: Emissions Markets

*Fowlie, M., Holland, S. P., and Mansur, E. T., 2012. "What Do Emissions Markets Deliver and to Whom? Evidence from Southern California's NOx Trading Program." American Economic Review, 102(2): 965–93.

[AS] Hernandez-Cortes, D., & Meng, K. C. (2020). Do environmental markets cause environmental injustice? Evidence from California's carbon market (No. w27205). National Bureau of Economic Research.

Further readings

Borenstein, S., Bushnell, J., Wolak, F. A., & Zaragoza-Watkins, M. (2019). Expecting the unexpected: Emissions uncertainty and environmental market design. American Economic Review, 109(11), 3953-77.

Burtraw, D., Linn, J., Palmer, K., & Paul, A. (2014). The costs and consequences of clean air act regulation of CO2 from power plants. American Economic Review, 104(5), 557-62.

Bushnell, J., & Chen, Y. (2012). Allocation and leakage in regional cap-and-trade markets for CO2. Resource and Energy Economics, 34(4), 647-668.

Bushnell, J. B., Chong, H., & Mansur, E. T. (2013). Profiting from Regulation: Evidence from the European Carbon Market. American Economic Journal: Economic Policy, 5(4), 78–106.

Calel, R. (2020). Adopt or innovate: Understanding technological responses to cap-and-trade. American Economic Journal: Economic Policy, 12(3), 170-201.

Carlson, C., Burtraw, D., Cropper, M., & Palmer, K. L. (2000). Sulfur Dioxide Control by Electric Utilities: What Are the Gains from Trade? Journal of Political Economy, 108(6), 1292–1326.

Chen, S., & Li, T. (2020). The effect of air pollution on criminal activities: Evidence from the NOx Budget Trading Program. Regional Science and Urban Economics, 83, 103528.

Cullen, J. A., & Mansur, E. T. (2017). Inferring carbon abatement costs in electricity markets: A revealed preference approach using the shale revolution. American Economic Journal: Economic Policy, 9(3), 106-33.

Fowlie, M. (2010). "Emissions Trading, Electricity Restructuring, and Investment in Pollution Abatement." The American Economic Review, 100:837–869.

Fowlie, M., & Muller, N. (2019). Market-based emissions regulation when damages vary across sources: What are the gains from differentiation?. Journal of the Association of Environmental and Resource Economists, 6(3), 593-632.

Hasegawa, M., & Salant, S. (2015). The dynamics of pollution permits. Annu. Rev. Resour. Econ., 7(1), 61-79.

Linda T. M. Bui. (1998). Gains from Trade and Strategic Interaction: Equilibrium Acid Rain Abatement in the Eastern United States and Canada. The American Economic Review, 88(4), 984–1001.

MacKenzie, I. A. (2022). The Evolution of Pollution Auctions. Review of Environmental Economics and Policy, 16(1), 000-000.

Martin, R., Muûls, M., & Wagner, U. J. (2020). The impact of the European Union Emissions Trading Scheme on regulated firms: what is the evidence after ten years?. Review of environmental economics and policy.

Muller, N. Z., & Mendelsohn, R. (2009). Efficient Pollution Regulation: Getting the Prices Right. The American Economic Review, 99(5), 1714–1739.

Newell, R. G., Pizer, W. A., & Raimi, D. (2013). Carbon markets 15 years after Kyoto: Lessons learned, new challenges. Journal of Economic Perspectives, 27(1), 123-46.

Sadayuki, T., & Arimura, T. H. (2021). Do regional emission trading schemes lead to carbon leakage within firms? Evidence from Japan. Energy Economics, 104, 105664.

Schmalensee, R., & Stavins, R. N. (2017). Lessons learned from three decades of experience with cap and trade. Review of Environmental Economics and Policy.

Stavins, R. N. (1998). What Can We Learn from the Grand Policy Experiment? Lessons from SO2 Allowance Trading. The Journal of Economic Perspectives, 12(3), 69–88.

Stranlund, J. K., & Moffitt, L. J. (2014). Enforcement and price controls in emissions trading. Journal of Environmental Economics and Management, 67(1), 20-38.

Topic 5: Taxes and subsidies

*Levinson, A. (1999). State taxes and interstate hazardous waste shipments. American Economic Review, 89(3), 666-677.

[AS] Shapiro, J. S., & Walker, R. (2018). Why is pollution from US manufacturing declining? The roles of environmental regulation, productivity, and trade. American Economic Review, 108(12), 3814-54.

Further readings

Andersson, J. J. (2019). Carbon taxes and CO 2 emissions: Sweden as a case study. American Economic Journal: Economic Policy, 11(4), 1-30.

Banzhaf, Spencer H., and Randall P. Walsh. "Do people vote with their feet? An empirical test of Tiebout's mechanism." The American Economic Review 98.3 (2008): 843-863.

Douenne, T., & Fabre, A. (2022). Yellow vests, pessimistic beliefs, and carbon tax aversion. American Economic Journal: Economic Policy, 14(1), 81-110.

Engström, G., & Gars, J. (2015). Optimal taxation in the macroeconomics of climate change. Annu. Rev. Resour. Econ., 7(1), 127-150.

Goulder, L. H. (1995). Environmental taxation and the double dividend: a reader's guide. International tax and public finance, 2(2), 157-183.

Hahn, R. W., & Metcalfe, R. D. (2021). Efficiency and equity impacts of energy subsidies. American Economic Review, 111(5), 1658-88.

Hughes, J. E., & Podolefsky, M. (2015). Getting green with solar subsidies: evidence from the California solar initiative. Journal of the Association of Environmental and Resource Economists, 2(2), 235-275.

Martin, R., De Preux, L. B., & Wagner, U. J. (2014). The impact of a carbon tax on manufacturing: Evidence from microdata. Journal of Public Economics, 117, 1-14.

Metcalf, G. E. (2021). Carbon Taxes in Theory and Practice. Annual Review of Resource Economics, 13, 245-265.

Mideksa, T. K., & Weitzman, M. L. (2019). Prices versus quantities across jurisdictions. Journal of the Association of Environmental and Resource Economists, 6(5), 883-891.

Parry, I. W. H., Norregaard, J., & Heine, D. (2012). Environmental Tax Reform: Principles from Theory and Practice. Annual Review of Resource Economics, 4, 101-C3.

Stavins, R. N. (2022). The Relative Merits of Carbon Pricing Instruments: Taxes versus Trading. Review of Environmental Economics and Policy, 16(1), 000-000.

Weitzman, M. L. (1974). Prices vs. quantities. The review of economic studies, 41(4), 477-491.

Topic 6: Payment for Ecosystem Services

*Sims, K.R.E., and J.M. Alix-Garcia. 2016. "Parks versus PES: Evaluating direct and incentive-based land conservation in Mexico." Journal of Environmental Economics and Management.

Further readings

Alix-Garcia, Jennifer, Katharine Sims, Victor Hugo Orozco-Olvera, Laura Costica, Jorge David Fernandez Medina, Sofia Romo Monroy, Stefano Pagiola, "Can Environmental Cash Transfers Reduce Deforestation and Improve Social Outcomes? A Regression Discontinuity Analysis of Mexico's National Program (2011-2014) " World Bank Policy Research Working Paper 8707, January 2019.

Alix-Garcia, J. M., Sims, K. R. E., & Yañez-Pagans, P. (2015). Only One Tree from Each Seed? Environmental Effectiveness and Poverty Alleviation in Mexico's Payments for Ecosystem Services Program. American Economic Journal: Economic Policy, 7(4), 1–40.

Alix-Garcia, J., Wolff, H., 2014. Payment for ecosystem services from forests. Annu. Rev. Resour. Econ. 6 (1).

Assunção, J., Gandour, C., Rocha, R., & Rocha, R. (2020). The effect of rural credit on deforestation: evidence from the Brazilian Amazon. The Economic Journal, 130(626), 290-330.

Jack, B. K., & Jayachandran, S. (2019). Self-selection into payments for ecosystem services programs. Proceedings of the National Academy of Sciences, 116(12), 5326-5333.

Jayachandran, S. (2013). Liquidity constraints and deforestation: The limitations of payments for ecosystem services. American Economic Review, 103(3), 309-13.

Jayachandran, S., De Laat, J., Lambin, E. F., & Stanton, C. Y. (2016). Cash for carbon: a randomized controlled trial of payments for ecosystem services to reduce deforestation (No. w22378). National Bureau of Economic Research.

Moffette F. and Alix-Garcia J., "Agricultural Subsidies: Cutting into Forest Conservation?", Working paper 2022.

Ovando, P., Beguería, S., & Campos, P. (2019). Carbon sequestration or water yield? The effect of payments for ecosystem services on forest management decisions in Mediterranean forests. Water Resources and Economics, 28, 100119.

Pattanayak, S.K., Wunder, S., Ferraro, P.J., 2010. Show me the money: do payments supply environmental services in developing countries? Rev. Environ. Econ. Policy: 4(2), 254–274.

Miteva, D.A., Pattanayak, S.K., Ferraro, P.J., 2012. Evaluation of biodiversity policy instruments: what works and what doesn't? Oxford Review of Economic Policy: 28(1), 69–92.

Wu, J., & Yu, J. (2017). Efficiency-equity tradeoffs in targeting payments for ecosystem services. American Journal of Agricultural Economics, 99(4), 894-913.

Wunder, S., Börner, J., Ezzine-de-Blas, D., Feder, S., & Pagiola, S. (2020). Payments for environmental services: Past performance and pending potentials. Annual Review of Resource Economics, 12, 209-234.

Yan, Y. (2019). Unintended Land Use Effects of Afforestation in China's Grain for Green Program. American Journal of Agricultural Economics, 101(4), 1047-1067.

Topic: Protection Areas (not covered)

Miteva, D. A., & Pattanayak, S. K. (2021). The effectiveness of protected areas in the context of decentralization. World Development, 142, 105446.

Pfaff, A., & Robalino, J. (2017). Spillovers from conservation programs. Annual Review of Resource Economics, 9, 299-315.

Topic 7: Enforcement and cost of regulation

*Duflo, E., Greenstone, M., Pande, R., & Ryan, N. (2013). Truth-telling by third-party auditors and the response of polluting firms: Experimental evidence from India. The Quarterly Journal of Economics, 128(4), 1499-1545.

*Greenstone, M., 2002. "The Impacts of Environmental Regulations on Industrial Activity: Evidence from the 1970 and 1977 Clean Air Act Amendments and the Census of Manufactures." Journal of Political Economy 110: 1175-1219

*Walker, W. R. (2013). The transitional costs of sectoral reallocation: Evidence from the clean air act and the workforce. The Quarterly journal of economics, 128(4), 1787-1835.

[AS] He, G., Wang, S., & Zhang, B. (2020). Watering down environmental regulation in China. The Quarterly Journal of Economics, 135(4), 2135-2185.

Further readings

Bošković, B., & Nøstbakken, L. (2017). The cost of endangered species protection: Evidence from auctions for natural resources. Journal of environmental economics and management, 81, 174-192.

Cohen, M. A., & Tubb, A. (2018). The impact of environmental regulation on firm and country competitiveness: A meta-analysis of the porter hypothesis. Journal of the Association of Environmental and Resource Economists, 5(2), 371-399.

Duflo, E., Greenstone, M., Pande, R., & Ryan, N. (2018). The value of regulatory discretion: Estimates from environmental inspections in India. Econometrica, 86(6), 2123-2160.

Fan, H., Zivin, J. S. G., Kou, Z., Liu, X., & Wang, H. (2019). Going green in China: Firms' responses to stricter environmental regulations (No. w26540). National Bureau of Economic Research.

Fowlie, M. L. (2009). Incomplete environmental regulation, imperfect competition, and emissions leakage. American Economic Journal: Economic Policy, 1(2), 72-112.

Greenstone, M., & Hanna, R. (2014). Environmental Regulations, Air and Water Pollution, and Infant Mortality in India. The American Economic Review, 104(10), 3038–3072.

Greenstone, M., & Nath, I. (2020). Do renewable portfolio standards deliver cost-effective carbon abatement?. Becker-Friedman Institute Working Paper.

Hsiang, S., Oliva, P., & Walker, R. (2019). The distribution of environmental damages. Review of Environmental Economics and Policy, 13(1), 83-103.

Mansur, Erin T., and Sheila M. Olmstead. "The value of scarce water: Measuring the inefficiency of municipal regulations." Journal of Urban Economics 71.3 (2012): 332-346.

Oates, W. E., & Portney, P. R. (2003). Chapter 8: The political economy of environmental policy. In Handbook of environmental economics (Vol. 1, pp. 325-354). Elsevier.

Rassier, D. G., & Earnhart, D. (2010). Does the porter hypothesis explain expected future financial performance? The effect of clean water regulation on chemical manufacturing firms. Environmental and Resource Economics, 45(3), 353-377.

Ryan, Stephen P. "The costs of environmental regulation in a concentrated industry." Econometrica 80.3 (2012): 1019-1061.

Shapiro, J. S., & Walker, R. (2020). Is Air Pollution Regulation Too Stringent? (No. w28199). National Bureau of Economic Research.

Walker, W. R. (2011). Environmental regulation and labor reallocation: Evidence from the Clean Air Act. American Economic Review, 101(3), 442-47.

Topic: R & D and innovation in energy industry (not covered)

*Acemoglu, D., Akcigit, U., Hanley, D., & Kerr, W. (2016). Transition to clean technology. Journal of Political Economy, 124(1), 52-104.

*Newell, R., Jaffe, A., Stavins, R. (1999). "The induced innovation hypothesis and energy-saving technological change". The Quarterly Journal of Economics 114 (3), 41-975.

[AS] Aghion, P., Dechezleprêtre, A., Hemous, D., Martin, R., & Van Reenen, J. (2016). Carbon taxes, path dependency, and directed technical change: Evidence from the auto industry. Journal of Political Economy, 124(1), 1-51.

Further readings

Calel, R., & Dechezlepretre, A. (2016). Environmental policy and directed technological change: evidence from the European carbon market. Review of economics and statistics, 98(1), 173-191.

Fischer C., L. Preonas, and R. Newell R. 2017. "Environmental and Technology Policy Options in the Electricity Sector: Are We Deploying Too Many?" Journal of the Association of Environmental and Resource Economists. 4(4): 959-984.

Fu, W., Li, C., Ondrich, J., & Popp, D. (2018). Technological spillover effects of state renewable energy policy: Evidence from patent counts (No. w25390). National Bureau of Economic Research.

Jaffe, A.B. and K. Palmer. 1997. "Environmental Regulation and Innovation: A Panel Data Study." Review of Economics and Statistics. 79, 610-619.

Knittel, C.R. 2011. "Automobiles on Steroids: Product Attribute Trade-Offs and Technological Progress in the Automobile Sector." American Economic Review, 101 (7): 3368-3399.

Lazkano, I., L. Nøstbakken, and M. Pelli 2017. "From Fossil Fuels to Renewables: The Role of Electricity Storage." European Economic Review. 99: 113-129.

Lehmann, P. and P. Söderholm 2018. "Can Technology-Specific Deployment Policies Be Cost-Effective? The Case of Renewable Support Schemes." Environmental and Resource Economics. 71: 475-505.

Noailly, J. 2012. "Improving the Energy Efficiency of Buildings: The Impact of Environmental Policy on Technological Innovation." Energy Economics. 34: 795-806.

Popp, D. (2002). "Induced innovation and energy prices". American Economic Review 92 (1), 160-180.

Popp, D. (2019), "Environmental Policy and Innovation: A Decade of Research", International Review of Environmental and Resource Economics: Vol. 13: No. 3-4, pp 265-337.

Popp, David, Richard Newell and Adam Jaffe, 2010. "Energy, the environment, and technological change," in Hall, Bronwyn H. and Nathan Rosenberg, eds., Handbook of the Economics of Innovation, North Holland,

Rose, N., Joskow, P. (1990). "The diffusion of new technologies: Evidence from the electric utility industry". Rand Journal of Economics 21, 354-373.

Part III: Valuing the Environment

*Flores, N. 2002. "Conceptual framework for non-market valuation", Ch. 2 in "A primer on non-market valuation" Eds. Champ, Boyle & Brown

*[PMMC] Chapter 12.

Further readings

Mendelsohn, R., & Olmstead, S. (2009). The economic valuation of environmental amenities and disamenities: methods and applications. Annual Review of Environment and Resources, 34, 325-347.

Palmquist, R. B. (2005). Property value models. Handbook of environmental economics, 2, 763-819.

Topic 8: Revealed preference models

*[PR] Chapter 15.

*Kahn, M. E. (1995). A Revealed Preference Approach to Ranking City Quality of Life. Journal of Urban Economics, 38(2), 221-235.

[AS] Greenstone, M., & Gallagher, J. (2008). Does hazardous waste matter? Evidence from the housing market and the superfund program. Quarterly Journal of Economics, 123(3), 951-1003.

Further readings

Bockstael, N. E., & Freeman III, A. M. (2005). Welfare theory and valuation. Handbook of environmental economics, 2, 517-570.

Champ, P., Boyle, K. and T. C. Brown (2013), A Primer on Nonmarket Valuation, Springer.

Chay, K. Y., & Greenstone, M. (2005). Does air quality matter? Evidence from the housing market. Journal of political Economy, 113(2), 376-424.

Chen, W., Flatnes, J. E., Miteva, D. A., & Klaiber, H. A. (2021). The Impact of Deforestation on Nature-Based Recreation: Evidence from Citizen Science Data in Mexico. Land Economics, 031020-0036R1.

Coury, M., Kitagawa, T., Shertzer, A., & Turner, M. (2022). The Value of Piped Water and Sewers: Evidence from 19th Century Chicago (No. w29718). National Bureau of Economic Research.

Greenstone, M., & Gallagher, J. (2008). Does hazardous waste matter? Evidence from the housing market and the superfund program. The Quarterly Journal of Economics, 123(3), 951-1003.

Klaiber, H. A., & Phaneuf, D. J. (2010). Valuing open space in a residential sorting model of the Twin Cities. Journal of Environmental Economics and Management, 60(2), 57-77.

Kuminoff, N. V., Parmeter, C. F., & Pope, J. C. (2010). Which hedonic models can we trust to recover the marginal willingness to pay for environmental amenities?. Journal of environmental economics and management, 60(3), 145-160.

Pattanayak, S.K., and D.T. Butry. 2005. "Spatial Complementarity of Forests and Farms: Accounting for Ecosystem Services." American Journal of Agricultural Economics 87(4):995–1008.

Vincent, J.R., I. Ahmad, N. Adnan, W.B. Burwell, I.I.I. S.K. Pattanayak, and J.T.K. Thomas. 2016. "Valuing Water Purification by Forests: An Analysis of Malaysian Panel Data." Environmental and Resource Economics 64:59–80.

Topic 9: Stated preference models

* [PR] Chapter 19.

* Parsons, G. R., Firestone, J., Touissant, J. and L. Yan (2019). The Effect of Offshore Wind Power Projects on Recreational Beach Use: A Contingent-Behavior Study on the East Coast of the United States.

Further readings

Carson, R. T., & Hanemann, W. M. (2005). Contingent valuation. Handbook of environmental economics, 2, 821-936.

Diamond, P. and J. Hausman, "Contingent Valuation: Is Some Number Better than No Number?", Journal of Economic Perspectives, 8, Fall 1994, 45-64.

Kim, Y., Kling, C. L., & Zhao, J. (2015). Understanding behavioral explanations of the WTP-WTA divergence through a neoclassical lens: Implications for environmental policy. Annu. Rev. Resour. Econ., 7(1), 169-187.

Whittington, D. (2010). What have we learned from 20 years of stated preference research in less-developed countries?. Annu. Rev. Resour. Econ., 2(1), 209-236.

Whittington, D., Adamowicz, W., & Lloyd-Smith, P. (2017). Asking willingness-to-accept questions in stated preference surveys: a review and research agenda. Annual Review of Resource Economics, 9, 317-336.

Topic 10: Cost-Benefit Analysis

*[PR] Chapters 21, 22.

Further readings

[PMMC] Chapter 11.

Aldy, J. E., Atkinson, G., & Kotchen, M. J. (2021). Environmental benefit-cost analysis: A comparative analysis between the United States and the United Kingdom. Annual Review of Resource Economics, 13, 267-288.

Arrow, K. J., Cropper, M. L., Gollier, C., Groom, B., Heal, G. M., Newell, R. G., ... & Weitzman, M. L. (2020). Should governments use a declining discount rate in project analysis?. Review of Environmental Economics and Policy.

Arrow, K., Cropper, M., Gollier, C., Groom, B., Heal, G., Newell, R., ... & Weitzman, M. (2013). Determining benefits and costs for future generations. Science, 341(6144), 349-350.

Atkinson, G., & Mourato, S. (2008). Environmental cost-benefit analysis. Annual review of environment and resources, 33, 317-344.

Gollier, C., & Weitzman, M. L. (2010). How should the distant future be discounted when discount rates are uncertain?. Economics Letters, 107(3), 350-353.

Part IV: Management of Natural Resources

Topic: Tragedy of commons

Copeland, B. R., & Taylor, M. S. (2009). Trade, tragedy, and the commons. American Economic Review, 99(3), 725-49.

Frischmann, B. M., Marciano, A., & Ramello, G. B. (2019). Retrospectives: Tragedy of the Commons after 50 Years. The Journal of Economic Perspectives, 33(4), 211–228.

Hardin, G. (1968). The Tragedy of the Commons. Science, 162(3859), 1243–1248.

Sekeris, P. G. (2014). The tragedy of the commons in a violent world. The RAND Journal of Economics, 45(3), 521–532.

Topic 11: Water Resources Management

*Olmstead, S. M. (2010). The economics of managing scarce water resources. Review of Environmental Economics and policy.

*Bruno, E. M., & Sexton, R. J. (2020). The gains from agricultural groundwater trade and the potential for market power: Theory and application. American Journal of Agricultural Economics, 102(3), 884-910.

[AS] Jones, M., Kondylis, F., Loeser, J., & Magruder, J. (forthcoming). Factor market failures and the adoption of irrigation in Rwanda. American Economic Review.

Further readings

General

Bournaris, T., Berbel, J., Manos, B., & Viaggi, D. (Eds.). (2014). Economics of water management in agriculture. CRC Press.

Bruno, E. M., & Jessoe, K. (2021). Using Price Elasticities of Water Demand to Inform Policy. Annual Review of Resource Economics, 13, 427-441.

Garrick, D. E., Hanemann, M., & Hepburn, C. (2020). Rethinking the economics of water: An assessment. Oxford Review of Economic Policy, 36(1), 1-23.

Grafton, R. Q., & Wheeler, S. A. (2018). Economics of water recovery in the Murray-Darling Basin, Australia. Annual Review of Resource Economics, 10, 487-510.

Green, C. (2003). Handbook of water economics: principles and practice. John Wiley & Sons.

Irrigation

Dillon, A., & Fishman, R. (2019). Dams: Effects of hydrological infrastructure on development. Annual Review of Resource Economics, 11, 125-148.

Drysdale, K. M., & Hendricks, N. P. (2018). Adaptation to an irrigation water restriction imposed through local governance. Journal of Environmental Economics and Management, 91, 150-165.

Larson, N., Sekhri, S., & Sidhu, R. (2016). Adoption of water-saving technology in agriculture: The case of laser levelers. Water Resources and Economics, 14, 44-64.

Schoengold, K., & Zilberman, D. (2007). Chapter 58 The economics of water, irrigation, and development. Handbook of agricultural economics, Volume 3, 2933-2977.

Groundwater

Asadi, G., & Mostafavi-Dehzooei, M. H. (2021). The Role of Learning in Adaptation to Technology: The Case of Groundwater Extraction. Available at SSRN 3887021.

Gisser, M. (1983). Groundwater: focusing on the real issue. Journal of Political Economy, 91(6), 1001-1027.

Guilfoos, T., Khanna, N., & Peterson, J. M. (2016). Efficiency of viable groundwater management policies. Land Economics, 92(4), 618-640.

Lin Lawell, C. Y. C. (2016). The management of groundwater: Irrigation efficiency, policy, institutions, and externalities. Annual Review of Resource Economics, 8, 247-259.

Liu, J., & Sekhri, S. (2021). Groundwater Accessibility and Firm Behavior, Working Paper.

Loeser, J. (2018). The treatment effect elasticity of demand: Estimating the welfare losses from groundwater depletion in India.

Sayre, S. S., & Taraz, V. (2019). Groundwater depletion in India: Social losses from costly well deepening. Journal of Environmental Economics and Management, 93, 85-100.

Sears, L., Lawell, C. Y. C. L., Torres, G., & Walter, M. T. (2022). Managing common pool resources: Lessons from groundwater resource extraction in California. Working paper, Cornell University.

Sekhri, S. (2011). Public provision and protection of natural resources: Groundwater irrigation in rural india. American Economic Journal: Applied Economics, 3(4), 29-55.

Sekhri, S. (2014). Wells, water, and welfare: the impact of access to groundwater on rural poverty and conflict. American Economic Journal: Applied Economics, 6(3), 76-102.

Sekhri, S. (2022). Agricultural trade and depletion of groundwater. Journal of Development Economics, 102800.

Water Markets

Bruno, E. M., & Jessoe, K. (2021). Missing markets: Evidence on agricultural groundwater demand from volumetric pricing. Journal of Public Economics, 196, 104374.

Burness, H. S., & Quirk, J. P. (1979). Appropriative water rights and the efficient allocation of resources. The American Economic Review, 69(1), 25-37.

Gine, X., & Jacoby, H. G. (2016). Markets, contracts, and uncertainty in a groundwater economy. World Bank Policy Research Working Paper, (7694).

Residential Water

Buck, S., Auffhammer, M., & Sunding, D. (2014). Land markets and the value of water: Hedonic analysis using repeat sales of farmland. American Journal of Agricultural Economics, 96(4), 953-969.

Buck, S., Auffhammer, M., Hamilton, S., & Sunding, D. (2016). Measuring welfare losses from urban water supply disruptions. Journal of the Association of Environmental and Resource Economists, 3(3), 743-778.

Ferraro, P. J., Miranda, J. J., & Price, M. K. (2011). The persistence of treatment effects with norm-based policy instruments: evidence from a randomized environmental policy experiment. American Economic Review, 101(3), 318-22.

Jessoe, K., Lade, G. E., Loge, F., & Spang, E. (2021). Spillovers from behavioral interventions: Experimental evidence from water and energy use. Journal of the Association of Environmental and Resource Economists, 8(2), 315-346.

Jessoe, K., Lade, G. E., Loge, F., & Spang, E. (2021). Residential water conservation during drought: Experimental evidence from three behavioral interventions. Journal of Environmental Economics and Management, 110, 102519.

Rupiper, A., Weill, J., Bruno, E., Jessoe, K., & Loge, F. (2022). Untapped potential: leak reduction is the most cost-effective urban water management tool. Environmental Research Letters, 17(3), 034021.

Topic 12: Agriculture and environment

*Blakeslee, D., Fishman, R., & Srinivasan, V. (2020). Way Down in the Hole: Adaptation to Long-Term Water Loss in Rural India. American Economic Review, 110(1), 200-224.

*Emerick, K., De Janvry, A., Sadoulet, E., & Dar, M. H. (2016). Technological innovations, downside risk, and the modernization of agriculture. American Economic Review, 106(6), 1537-61.

[AS] Hornbeck, R., & Keskin, P. (2015). Does agriculture generate local economic spillovers? Short-run and long-run evidence from the Ogallala Aquifer. American Economic Journal: Economic Policy, 7(2), 192-213.

Further readings

Crosson, P. (2007). Soil quality and agricultural development. Handbook of agricultural economics, 3, 2911-2932.

Emerick, K. (2018). Trading frictions in Indian village economies. Journal of Development Economics, 132, 32-56.

Hornbeck, R., & Keskin, P. (2014). The historically evolving impact of the ogallala aquifer: Agricultural adaptation to groundwater and drought. American Economic Journal: Applied Economics, 6(1), 190-219.

Heal, G. M., & Small, A. A. (2002). Chapter 25 Agriculture and ecosystem services. Handbook of agricultural economics, Volume 2, part A, 1341-1369.

Johnson, D. Gale. "Agriculture and the Wealth of Nations." The American economic review 87.2 (1997): 1-12.

Kirwan, Barrett E. "The incidence of US agricultural subsidies on farmland rental rates." Journal of Political Economy 117.1 (2009): 138-164.

Lichtenberg, E. (2002). Chapter 23 Agriculture and the environment. Handbook of agricultural economics, Volume 2, part A, 1249-1313.

Lopez, R. (2002). The economics of agriculture in developing countries: the role of the environment. Handbook of Agricultural Economics, 2, 1213-1247.

Meemken, E. M., & Qaim, M. (2018). Organic agriculture, food security, and the environment. Annual Review of Resource Economics, 10, 39-63.

Michler, J. D., Tjernström, E., Verkaart, S., & Mausch, K. (2019). Money matters: The role of yields and profits in agricultural technology adoption. American Journal of Agricultural Economics, 101(3), 710-731.

Ryan, N., & Sudarshan, A. (2019). Rationing the Commons.

Sedjo, R. A., & Simpson, R. D. (2007). Chapter 59 Land use: forest, agriculture, and biodiversity competition. Handbook of Agricultural Economics, Volume 3, 2979-3007.

Topic 13: Fisheries and aquaculture

*[C] Chapter 4

*Isaksen, E. T., & Richter, A. (2019). Tragedy, property rights, and the commons: Investigating the causal relationship from institutions to ecosystem collapse. Journal of the Association of Environmental and Resource Economists, 6(4), 741-781.

Further readings

[PMMC] Chapter 17.

Anderson, J. L., Asche, F., & Garlock, T. (2019). Economics of aquaculture policy and regulation. Annual Review of Resource Economics, 11, 101-123.

Arnason, R. (2020). Property rights in fisheries: how much can individual transferable quotas accomplish? Review of Environmental Economics and Policy, 6(2), 217-236.

Chavas, J. P. (2015). Dynamics, viability, and resilience in bioeconomics. Annu. Rev. Resour. Econ., 7(1), 209-231.

Costello, C., & Grainger, C. A. (2018). Property rights, regulatory capture, and exploitation of natural resources. Journal of the Association of Environmental and Resource Economists, 5(2), 441-479.

Dépalle, M., Thébaud, O., & Sanchirico, J. N. (2020). Accounting for fleet heterogeneity in estimating the impacts of large-scale fishery closures. Marine Resource Economics, 35(4), 361-378.

Hannesson, R., & Kennedy, J. (2005). Landing Fees versus Fish Quotas. Land Economics, 81(4), 518–529.

Holland, D. S. (2018). Collective rights–based fishery management: a path to ecosystem-based fishery management. Annual Review of Resource Economics, 10, 469-485.

Huang, L., & Smith, M. D. (2014). The dynamic efficiency costs of common-pool resource exploitation. American Economic Review, 104(12), 4071-4103.

Noussair, C. N., van Soest, D., & Stoop, J. (2015). Cooperation in a Dynamic Fishing Game: A Framed Field Experiment. The American Economic Review, 105(5), 408–413.

Sanchirico, J. N., & Essington, T. E. (2021). Direct and ancillary benefits of ecosystem-based fisheries management in forage fish fisheries. Ecological Applications, 31(7), e02421.

Wu, X. (2021). Spatial-dynamic model of commercial fishing trip decision-making.

Wu, X. (2022). Modeling Ecosystem Service Conflicts in China's Lake Poyang.

Topic: Economics of Forestry

[C] Chapter 5

[PMMC] Chapter 18.

Abman, R., & Lundberg, C. (2020). Does free trade increase deforestation? The effects of regional trade agreements. Journal of the Association of Environmental and Resource Economists, 7(1), 35-72.

Börner, J., Schulz, D., Wunder, S., & Pfaff, A. (2020). The effectiveness of forest conservation policies and programs. Annual Review of Resource Economics, 12, 45-64.

Part V: Macroeconomics and the environment

Topic 14: Macroeconomic impacts of climate change

*Dell, M., Jones, B. F., & Olken, B. A. (2012). Temperature shocks and economic growth: Evidence from the last half century. American Economic Journal: Macroeconomics, 4(3), 66-95.

[AS] Cai, Y., & Lontzek, T. S. (2019). The social cost of carbon with economic and climate risks. Journal of Political Economy, 127(6), 2684-2734.

Further readings

Burke, M., Hsiang, S. M., & Miguel, E. (2015). Global non-linear effect of temperature on economic production. Nature, 527(7577), 235-239.

Damania, R., Desbureaux, S., & Zaveri, E. (2020). Does rainfall matter for economic growth? Evidence from global sub-national data (1990–2014). Journal of Environmental Economics and Management, 102, 102335.

Dell, M., Jones, B. F., & Olken, B. A. (2014). What do we learn from the weather? The new climate-economy literature. Journal of Economic Literature, 52(3), 740-98.

Dell, M., Jones, B. F., & Olken, B. A. (2009). Temperature and income: reconciling new cross-sectional and panel estimates. American Economic Review, 99(2), 198-204.

Deryugina, T., & Hsiang, S. (2017). The marginal product of climate (No. w24072). National Bureau of Economic Research.

Dietz, S., & Stern, N. (2015). Endogenous growth, convexity of damage and climate risk: how Nordhaus' framework supports deep cuts in carbon emissions. The Economic Journal, 125(583), 574-620.

Kahn, M. E., Mohaddes, K., Ng, R. N., Pesaran, M. H., Raissi, M., & Yang, J. C. (2021). Long-term macroeconomic effects of climate change: A cross-country analysis. Energy Economics, 104, 105624.

Kalkuhl, M., & Wenz, L. (2020). The impact of climate conditions on economic production. Evidence from a global panel of regions. Journal of Environmental Economics and Management, 103, 102360.

Newell, R. G., Prest, B. C., & Sexton, S. E. (2021). The GDP-temperature relationship: implications for climate change damages. Journal of Environmental Economics and Management, 108, 102445.

Tol, R. S. (2020). The economic impacts of climate change. Review of Environmental Economics and Policy.

Topic 15: Macro environmental models

*Xepapadeas, A. (2005). Economic growth and the environment. Chapter 23 in Handbook of Environmental Economics, vol. 3, 1219-1271, ed. by K.-G. Mäler and JR Vincent.

Further readings

[PMMC] Chapter 8.

Baland, J. M., Libois, F., & Mookherjee, D. (2018). Forest degradation and economic growth in Nepal, 2003–2010. Journal of the Association of Environmental and Resource Economists, 5(2), 401-439.

Bergman, L. (2005). CGE modeling of environmental policy and resource management. Handbook of environmental economics, 3, 1273-1306.

Besley, T. J., & Persson, T. (2022). The Political Economics of Green Transitions.

Besley, T. J., & Persson, T. (2021). Science as Civil Society: Implications for a Green Transition.

Besley, T., & Persson, T. (2020). Escaping the climate trap? Values, technologies, and politics. Unpublished paper.

Brock, W. A., & Taylor, M. S. (2005). Economic growth and the environment: a review of theory and empirics. In Handbook of economic growth (Vol. 1, pp. 1749-1821). Elsevier.

Brock, W. A., & Taylor, M. S. (2010). The green Solow model. Journal of Economic Growth, 15(2), 127-153.

Caron, J., & Fally, T. (2022). Per capita income, consumption patterns, and CO2 emissions. Journal of the Association of Environmental and Resource Economists, 9(2), 235-271.

Cherniwchan, J. (2012). Economic growth, industrialization, and the environment. Resource and Energy Economics, 34(4), 442-467.

Golosov, M., Hassler, J., Krusell, P., & Tsyvinski, A. (2014). Optimal taxes on fossil fuel in general equilibrium. Econometrica, 82(1), 41-88.

Grossman, G. M., & Krueger, A. B. (1995). Economic growth and the environment. The quarterly journal of economics, 110(2), 353-377.

Heal, G., & Kriström, B. (2005). National income and the environment. Handbook of environmental economics, 3, 1147-1217.

Harbaugh, W. T., Levinson, A., & Wilson, D. M. (2002). Reexamining the empirical evidence for an environmental Kuznets curve. Review of Economics and Statistics, 84(3), 541-551.