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**Economics 797EM:
Ecological Macroeconomics
Spring 2022**

The focus of this course is on two fundamental challenges: 1) how to reduce greenhouse gas emissions, and especially carbon dioxide emissions, sufficiently to stabilize the climate; and 2) to accomplish this goal in a way that also supports rising living standards for economies at all levels of development.

These are huge questions. It is not an exaggeration to say that the fate of humankind may well depend on how we answer them. We will therefore consider that the pursuit of these challenges constitutes the core of ecological macroeconomics. But we will see that there are other perspectives as to what constitutes the core of ecological macro. Part of what we will therefore do in the class is regularly engage with these alternative perspectives.

Requirements. You will be graded based on four sets of requirements:

- 1. Four short essay papers** (20 percent total of grade; 5 percent for each assignment;). These will be spread over the course of the semester. The form will be responses to questions that will be based on the literature and our classroom discussions.
- 2. Two in-class presentations** (20 percent of total grade; 10 percent for each assignment).
- 3. Class participation.** (10 percent of total grade). If we are going to do some serious learning collectively in this course, it is incumbent on everyone to come to class, and to come prepared, and to share your perspectives with the rest of the class.
- 4. Term paper (50 percent of total grade).**

Readings and Topics

1. Specifying the Problem and Scope of Issues

IPCC 2021) *Climate Change 2021: The Physical Science Basis, Summary for Policymakers*, https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM_final.pdf
IPCC (2018) *Global Warming of 1.5°C*, <https://www.ipcc.ch/sr15/chapter/spm/>
Raymond Pierrehumbert (2019) "There is No Plan B for Dealing with the Climate Crisis," <https://thebulletin.org/2019/08/there-is-no-plan-b-for-dealing-with-the-climate-crisis/>
Articles in Green New Deal Special Issue of *American Prospect* by Jeff Sachs, Mara Prentiss and myself (Robert Pollin), <https://prospect.org/greennewdeal>

- Noam Chomsky and Robert Pollin, *Climate Crisis and the Global Green New Deal*, Ch. 1.
Pollin, *Greening the Global Economy*, Ch. 1.
James Hansen et al. (2017) "Young People's Burden: Requirements of Negative CO² Emissions, *Earth System Dynamics*, <https://www.earth-syst-dynam.net/8/577/2017/esd-8-577-2017.pdf>
Rezai, A., Taylor, L. and Mechler, R. (2013) 'Ecological macroeconomics: An application to climate change', *Ecological Economics*. Elsevier (Ecological Economics), 85(C), pp. 69–76.
Roger Fouquet, Introduction to Elgar Handbook on Green Growth (2019),
<https://www.elgaronline.com/view/edcoll/9781788110679/9781788110679.00005.xm>
Raymond Pierrehumbert (2016) "How to Decarbonize? Look to Sweden," *Bulletin of the Atomic Scientists*,
<https://www.tandfonline.com/doi/full/10.1080/00963402.2016.1145908?scroll=top&needAccess=true>
Giuseppe Fontana and Malcolm Sawyer (2013) "Post Keynesian and Kaleckian Thoughts on Ecological Macroeconomics," *European Journal of Economics and Economic Policies*,
<https://www.elgaronline.com/abstract/journals/ejeep/10-2/ejeep.2013.02.09.xml>
Robert Pollin et al. (2017 – 2021) *Green Economy Transition Programs for U.S. States*,
<https://peri.umass.edu/publication/item/1032-green-new-deal-for-u-s-states>
Robert Pollin et al. (2022) *A Clean Energy Transition Program for South Korea*,
forthcoming.

2. Mainstream Overviews and Critiques

- William Nordhaus (2018) "Climate Change: The Ultimate Challenge for Economics," Nobel Prize Lecture
William Nordhaus (2015), *The Climate Casino*
Nicholas Stern (2008) The Economics of Climate Change, *American Economic Review*,
<https://www.aeaweb.org/articles?id=10.1257/aer.98.2.1>
Nicholas Stern (2015) *Why Are We Waiting?*
Nicholas Stern et al. (2006) *The Stern Review: The Economics of Climate Change*
Weitzman, Martin L. 2014. "Fat Tails and the Social Cost of Carbon." *American Economic Review* 104 (5): 544–46. <https://doi.org/10.1257/aer.104.5.544.G>
Gernot Wagner and Martin L. Weitzman (2015) *Climate Shock: The Economic Consequences of a Hotter Climate*
Frank Ackerman (2017) *Worst Case Economics: Extreme Events in Climate and Finance*.
James Boyce (2018) "Carbon Pricing: Effectiveness and Equity," *Ecological Economics*
James Boyce and Raymond Bradley (2018) "3.5°C in 2100?" Political Economy Research Institute, file:///C:/Users/RPollin/Downloads/boycebradleyFinal_2018.pdf

3. De-Growth, Anti-Capitalism, and Green New Deal 2 as Climate Stabilization Frameworks

- Tim Jackson and Peter Victor (2019) "Unraveling the Claims for (and against) Green Growth," *Science*, <https://www.science.org/doi/10.1126/science.aay0749>
Tim Jackson (2017), *Prosperity without Growth*, 2nd edition
Peter Victor (2019) *Managing without Growth*, 2nd edition

Victor, Peter A. 2012. "Growth, Degrowth and Climate Change: A Scenario Analysis." *Ecological Economics* 84:206–12. <https://doi.org/10.1016/j.ecolecon.2011.04.013>.

Robert Pollin (2018) "Degrowth vs. the Green New Deal," *New Left Review*, July-August, <https://newleftreview.org/issues/III12/articles/robert-pollin-de-growth-vs-a-green-new-deal>

Mark Burton and Peter Somerville (2019) "Degrowth: A Defense," *New Left Review*, February <https://newleftreview.org/issues/III15/articles/mark-burton-peter-somerville-degrowth-a-defence>

Lola Seaton (2019) "Green Questions," *New Left Review*, February, <https://newleftreview.org/issues/III15/articles/lola-seaton-green-questions>

Juliet Schor and Andrew Jorgenson (2019) "Is it Too Late For Growth?" and "Response to Bob Pollin," *Review of Radical Political Economics*, May.

Robert Pollin (2019) "Advancing a Viable Global Climate Stabilization Project: De-Growth vs. the Green New Deal," and "Response to Juliet Schor and Andrew Jorgenson," *Review of Radical Political Economics*, May.

Chomsky and Pollin (2020), Ch. 2 - 3.

Tyler Hansen (2021) *Three Essays on the Political Economy of Global Inaction on Climate Change*, Ch. 1, https://scholarworks.umass.edu/cgi/viewcontent.cgi?article=3333&context=dissertations_2

Enno Schroder and Servaas Storm (2018), "Economic Growth and Carbon Emissions: The Road to 'Hothouse Earth' is Paved with Good Intentions," INET Working Paper No. 84, November, https://www.ineteconomics.org/uploads/papers/WP_84.pdf

Michael Grubb (2018), "Conditional Optimism: Economic Perspectives on Deep Decarbonization," INET working paper <https://www.ineteconomics.org/perspectives/blog/growth-with-decarbonization-is-not-an-oxymoron>

Jeroen van den Bergh (2017), "A Third Option for Climate Policy within Potential Limits to Growth," *Nature Climate Change*, February.

Jason Hickel & Giorgos Kallis (2021) "A Green New Deal without Growth?" *Ecological Economics*,

Burkett, Paul. 2017. "An Eco-Revolutionary Tipping Point?" *Monthly Review* 69 (1). <https://monthlyreview.org/2017/05/01/an-eco-revolutionary-tipping-point/>.

Malm, Andreas. 2013. "The Origins of Fossil Capital," *Historical Materialism*.

John Bellamy Foster (2019) "On Fire This Time," *Monthly Review* (September), <https://monthlyreview.org/2019/11/01/on-fire-this-time/>

Max Aji (2021) *A People's Green New Deal*.

Ann Pettifor (2019) *The Case for the Green New Deal*.

4. Role of Fossil Fuels in Climate Stabilization Framework

--Coal to Natural Gas Fuel Switching

-- Carbon Capture and Sequestration

Lawrence, Mark et al (2018) "Evaluating Climate Geoengineering Proposals in the Context of the Paris Agreement Temperature Goals," *Nature Communications*, <https://www.nature.com/articles/s41467-018-05938-3#citeas>

Anderson, K. and Peters, G. (2016) 'The trouble with negative emissions', *Science*, 354(6309), pp. 182 LP – 183. doi: 10.1126/science.aah4567 <https://science.sciencemag.org/content/354/6309/182.full>

Pollin et al. *Global Green Growth*, Ch. 2

Joseph Romm, "Is Coal with Carbon Capture a Core Climate Solution?"

<https://thinkprogress.org/is-coal-with-carbon-capture-and-storage-a-core-climate-solution-c2ba85f9a439#.bi112luam>

5. Role for Nuclear Energy

Jacopo Buongiorno et al. (2018) *The Future of Nuclear Energy in a Carbon-Constrained World*, <https://energy.mit.edu/wp-content/uploads/2018/09/The-Future-of-Nuclear-Energy-in-a-Carbon-Constrained-World.pdf>

Edward Lyman (2021) *Advanced Isn't Always Better*,
<https://ucsusa.org/sites/default/files/2021-03/advanced-isnt-always-better-full.pdf>

David McKay (2008) *Sustainable Energy without the Hot Air*,
<http://www.withouthotair.com/cft.pdf>, Ch 24 on nuclear energy.

James Hansen et al. (2015), "Nuclear Power Paves the Only Viable Path Forward on Climate Change," *The Guardian*, <https://www.theguardian.com/environment/2015/dec/03/nuclear-power-paves-the-only-viable-path-forward-on-climate-change>

Joseph Romm (2016), "Why James Hansen is Wrong about Nuclear Power,"
<https://thinkprogress.org/why-james-hansen-is-wrong-about-nuclear-power-44b486ed8a72/>

Alexander Sammon (2019), "The Tantalizing Nuclear Mirage," *American Prospect*,
<https://prospect.org/greennewdeal/the-tantalizing-nuclear-mirage/>

Miller and Sagan "Nuclear Power without Nuclear Proliferation?" *Daedalus*, Fall 2009,
<https://www.amacad.org/content/publications/pubContent.aspx?d=925> and accompanying articles.

Chomsky and Pollin, pp. 86 – 90.

6. Prospects for Energy Efficiency

- Efficiency measures for buildings, transportation systems, industrial processes
- Efficiency within advanced and developing country contexts
- Costs per Q-BTU of energy savings
- Rebound effects

Pollin et al. *Green Growth*, Ch. 2

National Academy of Sciences, *Real Prospects for Energy Efficiency in the United States*

Sarkar and Singh, "Financing Energy Efficiency in Developing Countries—Lessons Learned and Remaining Challenges," *Energy Policy*, 2010.

Grubler, A. et al. (2018) 'A low energy demand scenario for meeting the 1.5 °c target and sustainable development goals without negative emission technologies', *Nature Energy*. Springer US, 3(6), pp. 515–527. doi: 10.1038/s41560-018-0172-6
<https://www.nature.com/articles/s41560-018-0172-6>

Lovins, A. B. (2018) 'How big is the energy efficiency resource?', *Environmental Research Letters*, 13(9), p. 090401. doi: 10.1088/1748-9326/aad965.

Wolfram, C., Shelef, O. and Gertler, P. (2012) 'How Will Energy Demand Develop in the Developing World?', *Journal of Economic Perspectives*, 26(1), pp. 119–138.

Gillingham, K., Rapson, D. and Wagner, G. (2016) 'The Rebound Effect and Energy Efficiency Policy', *Review of Environmental Economics and Policy*, 10(1), pp. 68–88.
<https://academic.oup.com/reep/article/10/1/68/2583834?searchresult=1>

International Energy Agency, *World Energy Outlook 2019. Also summary data from IEA*,
<https://www.iea.org/reports/energy-efficiency-2019>

Gregor Semieniuk, Lance Taylor and Armon Rezai (2020), "Feasible Energy Demand Patterns in a Growing Global Economy with Climate Change Mitigation," XXX Brockway, Paul E., Steve Sorrell, Gregor Semieniuk, Matthew Kuperus Heun, and Victor Court. "Energy efficiency and economy-wide rebound effects: A review of the evidence and its implications." *Renewable and Sustainable Energy Reviews* (2021): 110781.

7. Prospects for Clean Renewable Energy

- History of development of renewables
- Costs per Q-BTU for alternative renewable sources
 - Production costs and capital expenditures
- System design for combining alternative clean energy sources
- Dealing with intermittency—storage and transmission
- Demand on minerals
- Bioenergy
 - High- versus low-emissions bioenergy sources
 - Substitution of low for high-emissions bioenergy
 - Food security and food prices through bioenergy usage
- Hydro power
 - Prospects for small-scale hydro vs. big dams

IRENA (2021) *Reaching Zero with Renewables*,
<https://www.irena.org/publications/2020/Sep/Reaching-Zero-with-Renewables>

Pollin et al. *Global Green Growth*, Ch. 3.

Prentiss, *Energy Revolution*, Chs. 1-2, 7-10

Jacobson et al. "Examining the feasibility of converting New York State's all-purpose energy infrastructure to one using wind, water, and sunlight," *Energy Policy*, 2013

Creutzig, F. et al. (2017) 'The underestimated potential of solar energy to mitigate climate change', *Nature Energy*, 2(9). doi: 10.1038/nenergy.2017.140.
<https://www.nature.com/articles/nenergy2017140>

Budischak, Cory et al. (2013) "Cost-Minimized Combinations of Wind Power, Solar Power and Electrochemical Storage, Powering the Grid up to 99.9% of the Time." *Journal of Power Sources* 225:60–74. <https://doi.org/10.1016/j.jpowsour.2012.09.054>.

IEA (2021) *The Role of Critical Minerals in the Clean Energy Transition*,
<https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions>

Alicia Valero et al. (2018) "Material Bottlenecks in the Future Development of Green Technologies," *Renewable and Sustainable Energy Reviews*, 178 – 200.

8. Estimating Emissions Reduction within Economic Growth Framework

- Global and country-by-country frameworks

Robert Pollin (2020) "An Industrial Policy Framework to Advance a Global Green New Deal," first half, in Arkebe et al., *The Oxford Handbook of Industrial Policy*.

IRENA (2021) *World Energy Transitions Outlook: 1.5°C Pathway*, [World Energy Transitions Outlook: 1.5°C Pathway \(irena.org\)](https://www.irena.org/publications/2021/04/World-Energy-Transitions-Outlook-1.5C-Pathway).

IEA (2021) *Net Zero by 2050: A Roadmap for the Global Energy Sector*, [Net Zero by 2050 – Analysis - IEA](https://www.iea.org/publications/net-zero-by-2050)

Pollin et al. *Global Green Growth*, Chs. 8 – 13

Pollin and Chakraborty, "An Egalitarian Green Growth Program for India," *Economic and Political Weekly*, October 2015,
http://www.epw.in/system/files/pdf/2015_50/42/An_Egalitarian_Green_Growth_Programme_for_India.pdf

UNEP (2019) *Emissions Gap Report*, esp. Chs. 2-3,
<https://wedocs.unep.org/bitstream/handle/20.500.11822/30797/EGR2019.pdf?sequence=1&isAllowed=y>

9. Employment Impacts of energy investments

- Input-output modeling to measure clean energy investments vs maintaining fossil fuel infrastructure
- Country-by-country framework
- Sectoral impacts of job creation
- Measures of job quality

Pollin et al. *Global Green Growth*, Ch. 7 and selected country-specific chapters, 8 – 12.

Pollin et al. (2017 - 2021) *Green Transition Programs for U.S. States*,
<https://peri.umass.edu/publication/item/1032-green-new-deal-for-u-s-states>

Pollin et al. (2022)

International Labour Organization (2018) *Greening with Jobs*, https://www.ilo.org/weso-greening/documents/WESO_Greening_EN_web2.pdf

R. Pollin (2019) "Green Economics and Decent Work: A Viable Unified Framework, *Development and Change*, <https://onlinelibrary.wiley.com/doi/full/10.1111/dech.12559?af=R>

Robert Pollin et al. (2022) *A Clean Energy Transition Program for South Korea*, forthcoming.

10. Industrial policies for clean energy transition

- Carbon tax or cap
- Development finance and industrial policies
- Alternative investment inducement measures in different country settings
- Employment policies
 - Job creation and worker transition
 - "Superfund for workers"

Robert Pollin (2020) "An Industrial Policy Framework to Advance a Global Green New Deal," second half.

Mazzucato, M. and Semieniuk, G. (2018) 'Financing renewable energy: Who is financing what and why it matters', *Technological Forecasting and Social Change*, 127, pp. 8–22. doi: 10.1016/j.techfore.2017.05.021.

<https://www.sciencedirect.com/science/article/pii/S0040162517306820>

Gregor Semieniuk and M. Mazzucato (2019) "Financing Green Growth,"
<https://www.elgaronline.com/view/edcoll/9781788110679/9781788110679.00019.xml>

Pollin et al. *Global Green Growth*, Ch. 5

Mazzucato, *The Entrepreneurial State*, Chs. 6-7.

R. Azad and S. Chakraborty (2019) "Balancing the Climate Injustice: A Proposal for a Differential Global Carbon Tax," <https://www.peri.umass.edu/component/k2/item/1223-balancing-the-climate-injustice-a-proposal-for-a-differential-global-carbon-tax>

Spratt et al. *Mobilizing Investment for Inclusive Green Growth in Low-Income Countries*, 2013, http://www.enterprise-development.org/wp-content/uploads/Investment_Green_Growth.pdf

Griffith-Jones, Stephanie (2016) "National Development Banks and Sustainable Infrastructure: The Case of KfW," Boston University, Global Economic Governance Initiative (GEGI), GEGI Working Paper #6, July.

G Fontana and M. Sawyer (2015) "Macroeconomic and Financial System Requirements for a Sustainable Future," in Arestis and Sawyer eds., *Finance and Macroeconomics of Environmental Policies*

Carley and Lawrence, *Energy-Based Economic Development*

Pollin and Callaci (2018), "The Economics of Just Transition," *Labor Studies Journal*, <https://journals.sagepub.com/doi/abs/10.1177/0160449X18787051>

Pollin et al. (2017 – 2021) *Green Transition Programs for U.S. States*
https://www.greengrowthknowledge.org/sites/default/files/downloads/resource/African%20Development%20Report%202012_4.pdf

11. Structural Change through Clean Energy Transformation

- Fossil fuels and "stranded assets"
- Impacts on national and regional trade balances
- Prospects for alternative ownership forms in clean energy framework
 - Small-scale cooperative ownership
 - Off-grid distributed energy

Tyler Hansen (2022) "Stranded Assets and Reduced Profits," *Renewable and Sustainable Energy Reviews*, <https://www.sciencedirect.com/science/article/pii/S1364032122000727>

Gregor Semieniuk et al. (2021) "Stranded Fossil Fuel Assets Translate into Major Losses for Investors in Advanced Economies," <https://peri.umass.edu/component/k2/item/1529-stranded-fossil-fuel-assets-translate-into-major-losses-for-investors-in-advanced-economies#:~:text=PERI%20researcher%20Gregor%20Semieniuk%20and,to%20be%20US%20%241.4%20trillion.>

Pollin, *Greening the Global Economy*, Ch. 8.

Carbon Tracker, *Unburnable Carbon*, <http://carbontracker.live.kiln.digital/Unburnable-Carbon-2-Web-Version.pdf>

Bollinger, "Making European-Style Community Wind Power Development Work in the United States," *Renewable and Sustainable Energy Reviews*, 2005.

Li et al, "Transitioning to Community-Owned Renewable Energy: Lessons from Germany," *Procedia Environmental Sciences*, 2013.

12. GHG Emissions through Deforestation and Industrial Agriculture

IPCC (2019) *Climate Change and Land Use*,
https://www.ipcc.ch/site/assets/uploads/2019/08/4.-SPM_Approved_Microsite_FINAL.pdf

FAO (2016) *The State of Food and Agriculture: Climate Change, Agriculture and Food Security*, <http://www.fao.org/3/a-i6030e.pdf>

ILO (2018) *Greening with Jobs*, pp. 45 – 53.

J. Foley et al. (2011) "Solutions for a Cultivated Planet," *Nature*,
http://www.soest.hawaii.edu/oceanography/courses/OCN310_2/Fall14/files/essay4/foley.pdf

N. Hosonuma et al. (2012) "An Assessment of Deforestation and Forest Degradation Drivers in Developing Countries," *Environmental Research Letters*, <https://iopscience.iop.org/article/10.1088/1748-9326/7/4/044009/pdf>

Rod Taylor and Charlotte Streck, "The Elusive Impact of the Deforestation-Free Supply Chain Movement," World Resources Institute, June 2018.

Stibniati Atmadja and Louis Verchot, "A Review of the State of Research, Policies and Strategies in Addressing Leakage from Reducing Emissions from Deforestation and Forest Degradation (REDD+)," *Mitigation and Adaptation Strategies for Global Change* 17:3, 2012.

Jonah Busch and Jens Engelmann (2017) "Cost-effectiveness of reducing emissions from tropical deforestation, 2016 – 2020," *Environmental Research Letters*, <https://iopscience.iop.org/article/10.1088/1748-9326/aa907c>

Sabine Fuss et al. (2018) "Negative Emissions—Part 2: Costs, potentials and side effects," *Environmental Research Letters*, <https://iopscience.iop.org/article/10.1088/1748-9326/aabf9f> "unlikely"