Courses at PKU —LSE-PKU DOUBLE MASTERS IN ENVIRONMENTAL POLICY, TECHNOLOGY AND HEALTH

Eight core courses (about 16 credits) will be provided covered from the science of environment and health, technologies, research methods and Environmental policies;

Course arrangement is briefly summarized below, detail syllabus will be provided before the start of new semester.

Courses in the First Semester

Environmental Pollution: Air, Water, and Soil **环境污染：大气、水、土壤**	
Teaching Staff	LI Shao-meng 李少萌
Course Description：	
Graduate students in the studies of environmental economics and management need to have an in-depth understanding of environmental pollution phenomena that can result from the modern day society activities. Addressing this need, this course is intended as a required course for the master-level graduate students enrolled in the PKU-LSE joint program but is open to regular master-level graduate students at PKU as an elective course. In this course, broad topics in major aspects of environmental pollution, ranging from air, water, and soil pollution will be presented to allow the students a comprehensive understanding of these issues. The topics will cover acid deposition, smog including particulate matter and ozone pollution, stratospheric ozone depletion, to greenhouse gas emissions; water pollution from surface and ground water pollution to marine pollution; soil pollution, from local to regional scale soil pollution resulting from discharge of industrial waste into the soil, percolation of contaminated water, rupture of underground storage tanks, excess application of pesticides, herbicides or fertilizer, solid waste seepage. Students of this course are expected to acquire a comprehensive knowledge of these environmental pollution phenomena, including the types and sources of pollutants, the interplay of pollutants among the different compartments of the environment, and effects of pollution.	
Core Content	
1. Air pollution: Types and sources of air pollutants, atmospheric chemical processes leading to acid deposition and smog, impacts of primary and secondary air pollutants. 2. Water pollution: surface water pollution, ground water pollution, marine pollution; types and sources of pollutants; chemical and biological processes of water pollutants; impacts of water pollutants. 3. Soil pollution: Main causes of soil pollution; type and sources of soil pollutants; distribution, transport, and fate of pollutants in soil; impacts of soil pollution. 4. Pollution transport between environmental compartments: Transport and fate of pollutants in the three major environmental compartments.	

5. Detection and remediation of pollutants

Evaluation Details

1. Essay on Air Pollution Topic 1: 20%
2. Essay on Air Pollution Topic 2: 25%
3. Essay on Water Pollution Topic 1：25%
4. Essay on Soil Pollution Topic 1：20%

Readings

1. Gurjar B , Molina L , Ojha C . Air Pollution: Health and Environmental Impacts.[J]. Crc Press, 2010, 10.1201/EBK1439809624:249-274.

2. Paton G I . Soil Pollution: From Monitoring to Remediation. By A.Duarte, A.Cachada & T.Rocha-Santos (eds). 2017. Published byAcademic Press/Elsevier, paperback xvi + 296 pp. 82.60. eBook 99.12. ISBN 978-0-12-849873-6[J]. Soil Use and Management, 2018, 34(3).

3. Perk M V D . Soil and water contamination: From molecular to catchment scale[M]. Taylor & Francis, 2011.

Global Environmental Health: Principles and Case Studies

全球环境健康：原理与案例

Teaching Staff	ZHANG Junfeng 张军峰, and/or ZHU Tong 朱彤

Course Description：

As many environmental problems occur on a global scale but may have differential local impacts, both local and global perspectives are important in understanding and addressing the problems. The objective of this course is to engage students to learn and think of global and local impacts of most important contemporary environmental issues such as climate change, air pollution, water scarcity and pollution, waste disposal, and exposure to chemicals found in consumer products, among others. This course will include a series of live and video-taped lectures that students can watch online at their own pace and their convenient time within a defined time period. Live sessions will be arranged so the students have a chance to meet in person with the instructor and their fellow students. Students are required to interact via online 'Forum' or email with each other and with the instructor and the TA. Office hours will be arranged for students to ask questions in person. One-on-one discussions with the instructor and group discussions will be scheduled. Furthermore, live sessions will be arranged for students to present their term papers.

Core Content

1. Environmental determinants of global health, and methodological framework
2. Exposure assessment: principles and methods
3. Introduction to environmental epidemiology
4. Water scarcity and pollution
5. Introduction to environmental toxicology, case studies in environmental toxicology
6. Principles of climate change and health
7. Climate and malaria risk in Amazon
8. Valuation of clear air for air quality and climate
9. Principles of air pollution
10. Case studies of air pollution interventions:
11. Case studies in agriculture, food production, and solid waste
12. Chemicals in consumer products
13. Integrative summary of the course in relation to WHO SDGs
14. Case studies on flame retardant chemicals
15. Solid and hazardous waste

Evaluation Details

1. Homework: 30% (Late: -10%/day)
2. Exam: 25%
3. Term paper and presentation: 35%
4. Class participation/discussion: 10%

Readings

1. Howard Frumkin, Environmental Health: From Global to Local, 3rd Edition, ISBN 978-1118984765.

2. Cui X, Li F, Xiang J, Fang L, Chung MK, Day DB, Mo J, Weschler CJ, Gong J, He L, Zhu D, Lu C, Han H, Zhang Y, Zhang JJ. Cardiopulmonary effects of overnight indoor air filtration in healthy nonsmoking adults: A double-blind randomized crossover study. Environment International, 2018, 114:27-36.

3. Haines AH, Ebi K. The imperative for climate action to protect health. New England Journal of Medicine, 2019, 380: 263-273.

4. Lancet Commission on Pollution and Health, Special (Supplementary) Report, October 2017.

5. Li D, Suh S. Health risks of chemicals in consumer products: A review. Environmental International, 2019, 123: 580-587.

6. Rich DQ, Kipen HM, Huang W, Wang G, Wang Y, Zhu P, Ohman- Strickland P, Hu M, Philipp C, Diehl SR, Lu SE, Tong J, Gong J, Thomas D, Zhu T, Zhang J. Association between Changes in Air Pollution Levels during the Beijing Olympics and Biomarkers of Inflammation and Thrombosis in Healthy Young Adults. JAMA (Journal of American Medical Association). 307: 2068-2078,

2012.

7. Samet, J.M., Zhang J. “Climate Change and Health”. In: Routledge Handbook on Public Health in Asia: Global Perspectives. Edited by S. Griffith, J.L.Tang , and E.K. Yeoh. Routledge, Taylor and Francis Group, Oxon, UK. 2013.

8. Smith KR, McCracken JP, Weber MW, et al. Effect of reduction in household air pollution on childhood pneumonia in Guatemala (RESPIRE): a randomised controlled trial. Lancet. 2011;378(9804):1717-26. doi: 10.1016/S0140-6736(11)60921-5.

Energy Utilization and Sustainable Development

能源利用与可持续发展

Teaching Staff	CHEN Qi 陈琦

Course Description：

Energy is the driven force of the development of global economy. The use of energy shapes the society and changes the environment. China is the world’s second largest economy, the world’s largest consumer of coal, the second largest consumer of oil, and the world’s largest emitter of CO_2. Rapid economic developments in developing countries alter the global energy structure and lead to great environmental challenges. This course is structured for a scientific and technical understanding of energy sources, energy system, energy techniques and assessment methods as well as related environmental issues.

Core Content

- Energy fundamentals, storage and transfer, modeling and curtailment.
- Environmental Challenges Related to Coal and Oil.
- Nature Gas Exploration and Exploitation.
- Electricity as an Energy Sector.
- Heat-Loss Control and Reuse.

Evaluation Details

Class participation – flipped classroom (60%) and final essay (40%)

Readings

1. McElroy, Michael B. Energy and Climate. Oxford University Press, 2016
2. IEA Key World Energy Statistics (KWES), available online
3. IEA World Energy Outlook (WEO), available online
4. BP Statistical Review of World Energy (SRWE), available online
5. EIA, International Energy Outlook (IEO), available online

Seminars on China's environment and development

中国环境与发展系列讲座与研讨

Teaching Staff	ZHANG Shiqiu 张世秋

Course Description：

The seminar series is designed to help the students get more insights and indepth understanding to the major ecological and environmental challenges, promotion of the eco-civilization, green transition and green development, environmental & development strategy and plans, legislation and policies, governance, etc. Guest lecturers will be invited from Peking University and other universities, research institutes, government agencies. Field trip or institute visit may also be considered.

Core Content

1. Emerging issues and challenges for China's environment and development.
2. Eco-civilization: concept, theory and practice.
3. China's mid-long-term plans for addressing environmental and development issues, climate change and SDGs.
4. Shifting Lanes and Green transition: green development and carbon neutrality, from High speed to high-quality development,
5. Environmental policies (carbon trade, environmental tax, green finance; ecologicals

Assignments (paper or other forms)

1. Homework (essays and literature review reports)
2. Final report (report and presentation)

Evaluation Details

1. Homework (40%);
2. Participation (20%);
3. Final paper (40%)

Readings

1. Liu, Jianguo, and Peter Raven. 2010. "China's Environmental Challenges and Implications for the World," Critical Reviews in Environmental Science and Technology, Vol 40, Issue 9-10, pp. 823-851.

2. Fergus Green and Nicholas Stern. 2014. An Innovative and Sustainable Growth Path for China: A Critical Decade. Available at http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2014/05/An-Innovative- and-Sustainable-Growth-Path-for-China-A-Critical-Decade1.pdf.

3. Jin, Y., Andersson, H., Zhang, S. 2016. "Air Pollution Control Policies in China: A Retrospective and Prospects," International Journal of Environmental Research and Public Health, 2

016, 13(12): 1219-124. Available at http://www.mdpi.com/1660- 4601/13/12/1219.

4. Alex Wang. 2012. "China's Environmental Tipping Point," Chapter 5 in China in and beyond the Headlines, Timothy Weston, Lionel Jensen, eds. Rowman and Littlefield Publishers. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2130452

5. CCICED.2020. Global Climate Governance and China's Role. http://en.cciced.net/POLICY/rr/prr/2020/202009/P020200917108654275502.pdf

6. CCICED.2020. Green Urbanization Strategy and Pathways towards Regional Integrated Development:Accelerating Green Urbanization in China Based on Eco-Civilization. http://en.cciced.net/POLICY/rr/prr/2020/202009/P020200917029698959994.pdf

7. CCICED. 2020. Issue Paper: Recovering Forward http://en.cciced.net/POLICY/rr/Issuespaper/202008/P020200806170667928489.pdf

8. CCICED. 2019. Issue Paper: The shift to High Quality, Green Development. http://www.cciced.net/cciceden/POLICY/rr/Issuespaper/201908/P020190830117600437205.pdf

9. Oran R. Young, Dan Guttman, et al. 2015, "Institutionalized governance processes: comparing environmental problem solving in China and the United States," Global Environmental Change, 31, pp. 16-173.

10. Ye Qi, Nicholas Stern, Tong Wu, Jiaqi Lu & Fergus Green. 2016. "China's Post Coal Growth," Nature Geoscience, 9: 564-566.

11. Other Background Readings

12. CCICED. 2019. Goals and Pathways for Environmental Improvement by 2035. http://en.cciced.net/POLICY/rr/prr/2019/201908/P020190830113636404374.pdf

13. CCICED. 2018. Issue paper: Shocks, Innovation and Ecological Civilization: A 'New Green Era' for China and for the World. http://www.cciced.net/cciceden/cmwy/download/201810/P020181128116519687834.pdf

14. Chi Chen etl. 2019. China and India lead in greening of the world through land-use management. Nature Sustainability | VOL 2 | FEBRUARY 2019 | 122–129 | www.nature.com/natsustain

15. IISD. 2016. Sustainability Impacts of Chinese Outward Direct Investment: A review of the literature 2016. http://www.iisd.org/sites/default/files/publications/sustainability-impacts-chinese-outward-directinvestment-literature-review.pdf

16. IISD 2015. Greening China's Financial System. https://www.iisd.org/publications/greeningchinas-financial-system

17. K He, Y Wu, MP Walsh, S Zhang, I Mylvakanam et al. 2016. A Review of Air Pollution Control in Beijing: 1998-2013. https://www.researchgate.net/publication/284177759_A_Review_of_Air_Pollution_Control_in_Beijing_1998-2013

18. NASA. 2019. Human Activity in China and India Dominates the Greening of Earth. https://www.nasa.gov/feature/ames/human-activity-in-china-and-india-dominates-the-greening-of-earth-nasa-study-shows

19. Michael Conathan and Scott Moore.2015. Developing a blue economy in China and in t

he USA https://cdn.americanprogress.org/wp- content/uploads/2015/05/ChinaBlueEcon-report-final.pdf

20. Mol, Arthur P. J. 2006. "Environment and Modernity in Transitional China: Frontiers of Ecological Modernization," Development and Change, Volume 37, Issue 1, pp. 29- 56.

21. Pan Jiahua 2015 China Environmental Governing and Ecological Civilization http://link.springer.com/book/10.1007/978-3-662-47429-7

22. Scherr, S.J. and Bennett, M.T. 2011.Buyer, Regulator, And Enabler—The Government's Role in Ecosystem Services Markets: International Lessons Learned for Payments for Ecological Services in The People's Republic of China. http://www.greengrowthknowledge.org/sites/default/files/downloads/resource/adb- buyer-regulatorenabler.pdf or http://www.forest- trends.org/documents/files/doc_99.pdf

23. Someno, Kenji, Breathing the Same Air: Outlook for Environmental Change in China, February 5, 2014, The Tokyo Foundation, http://www.tokyofoundation.org/en/articles/2014/breathing-same-air

24. UNEP. 2019. A Review of 20 Years' Air Pollution Control in Beijing. https://www.unenvironment.org/resources/report/review-20-years-air-pollution-control-beijing

25. UNEP 2016. Green is Gold. The Strategy and Actions of China's Ecological Civilization. UNEP. http://web.unep.org/greeneconomy/sites/unep.org.greeneconomy/files/publications/greenisgold_en_20160519.pdf

26. WWF China. China's Role in Global Trade. 2016. http://awsassets.wwfcn.panda.org/downloads/wwf_china_trade_report_en.pdf

Scientific Writing 科研论文写作

Teaching Staff	HU Yandi 胡焱弟

Course Description：

The course is designed to introduce logical structure and language features of scientific research papers. This course will combine lectures with in class discussion on paper revision. Meanwhile, the preparation of academic conference presentations will also be introduced in this course.

Core Content

- Logical structure of scientific research papers.
- Writing characteristics of scientific research papers.
- The preparation of academic conference presentations

Evaluation Details

- First paper revision(30%)
- Second paper revision (30%)

- Conference presentation (40%)

Readings

Writing Science: How to write papers that get cited and proposals that get funded, by Josh Schimel, Oxford University Press,

ISBN-10: 0199760241; ISBN-13: 978-0199760244

Courses in the Second Semester

Environmental Policy and Management

环境政策与管理

Teaching Staff	XU Jianhua 徐建华

Course Description：

Environmental issues are negative externalities of economic activities. They are manifestation of market failure, calling for governmental intervention. When and how government should step in is a question worthy of serious discussion. Centering on this question, this course will (i) introduce public goods, market failure, and the role of government, (ii) explain major types of policy instruments, and (iii) demystify the process of policy implementation. Knowledge will be introduced in a generic way, but China will be used as an example to reify the abstract concepts and theories. Students are expected to grasp the principles for designing public policies and acquire the skills to design public policies after taking this course.

Core Content

1. Private goods and public goods: to discuss the concept of externality and the necessity of limiting individual liberty , etc.
2. Policy instrument: property rights responses , taxes and subsidies, marketable permit, information-based instrument, and mixed policies.
3. Policy implementation: to introduce the role of the government as the enforcer of rules and the associated issues, etc.

Assignments (paper or other forms)

1. Essays
2. course project

Evaluation Details

1. Homework: 50%
2. Class participation: 20%
3. Course project: 30%

Readings

. Bing Zhang, Hanxun Fei, Pan He, Yuan Xu, Zhanfeng Dong & Oran R. Young (2016) The indecisiv narket in China's SO2 and COD emissions trading, Environmental Politics, 25:5, 875-898.

2. C. Qin, J. Xu, G. Wong-Parodi, L. Xue (2018). Change in public concern and behavioral intention toward air pollution Under the Dome. Risk Analysis, DOI: 10.1111/risa.13177

3. Elinor Ostrom (1990). Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge University Press.

4. James M. Buchanan (2000). The Limits of Liberty: Between Anarchy and Leviathan. Liberty Fund: Indianapolis.

5. Mancur Olson, Jr. (1971).The Logic of Collective Action: Public Goods and the Theory of Groups. Harvard University Press.

6. T. H. Tietenberg (2006). Emissions Trading: Principles and Practice (2nd edition). Resources for the Future, Washington, DC, USA.

Environmental Health Research: Methods and Application

环境健康研究: 方法与应用

Teaching Staff	GONGG Jicheng 宫继成

Course Description：

This course is one of the required courses for the master students from PKU-LSE joint program, and can be given to other students who are interested in the environmental health research as well. The course will focus on the history and development of environmental epidemiology, the importance in the area of environmental health research, and the application of epidemiologic studies in the environment and health.

After taking the course, the students will master the principle of environmental epidemiology, the concepts, methods and the applications in environmental health studies. By reading the literatures of environmental health studies, the students will improve their knowledge and ability of solving real environmental health problems.

Pre-requisites

English proficiency, basic statistics

Assignments (paper or other forms)

1.Homework (Short essays and multiple literature review reports)

2.In-class midterm exam (close book)

3.Final report (Design an environmental health study, on-class presentation and submit a report)

Evaluation Details

1. Homework：30%
2. Midterm exam：30%
3. Final report：40%

Readings

1. Rich D Q, Kipen H M, Huang W, et al. Association between changes in air pollution levels during the Beijing Olympics and biomarkers of inflammation and thrombosis in healthy young adults[J]. Jama, 2012, 307(19): 2068-2078.

2. Zhang J, Zhu T, Kipen H, et al. Cardiorespiratory biomarker responses in healthy young adults to drastic air quality changes surrounding the 2008 Beijing Olympics[J]. Research Report (Health Effects Institute), 2013 (174): 5.

3.Messerli F H. Chocolate consumption, cognitive function, and Nobel laureates[J]. N Engl J Med, 2012, 367(16): 1562-1564.

4.CHEN Y, EBENSTEIN A, GREENSTONE M, et al. Evidence on the impact of sustained exposure to air pollution on life expectancy from China's Huai River policy [J]. P Natl Acad Sci USA, 2013, 110(32): 12936-41.

5. An association between air pollution and mortality in six US cities, N Eng J Med, 1993, 329: 1753-1759.

6. Air pollution and mortality in the medicare population, N Eng J Med, 2017, 376: 2513-2522.

Climate change mitigation and sustainable development

气候变化减缓与可持续发展

Teaching Staff	DAI Hancheng 戴瀚程

Course Description：

It is increasingly recognized that climate change is intricately linked to sustainable development, not just in terms of joint underlying drivers, but also with respect to synergistic policy choices. Well-designed climate change mitigation policy can lead to significant co-benefits for sustainable development in air pollution control, water management, energy security enhancement and resource efficiency improvement. To effectively inform decision making on these issues, whether at the national or international level, science must take an integrated and holistic perspective. The course aims to give an overview on sustainable development goals with a focus on the nexus between climate change mitigation and other selected goals such as air pollution control and human health improvement, water use, economic growth, energy security and food security. Furthermore, it introduces the widely used integrated assessment models (IAMs) to analyze the nexus. Finally, the students will analyze the co-benefit of climate change mitigation policies on water use, air pollution control with the help of an integrated assessment framework.

Assignments (paper or other forms)

1. Homework (Short essays and multiple literature review reports)
2. In-class midterm exam
3. Final report (Design an environmental health study, on-class presentation and submit a report)

Evaluation Details

1. Weekly homework (30%);
2. Midterm presentation (30%);
3. Final presentation (40%: oral and report, 20%+20%).

Readings

1. Climate Economics: Economic Analysis of Climate, Climate Change and Climate Policy, Richard S.J. Tol, Edward Elgar Pub, Second Edition 2nd Edition, 2019
2. Xu, Z., et al., Impacts of international trade on global sustainable development. Nature Sustainability, 2020.
3. Sofiev, M., et al., Cleaner fuels for ships provide public health benefits with climate tradeoffs. Nature Communications, 2018. 9.
4. Haensel, M.C., et al., Climate economics support for the UN climate targets. Nature Climate Change, 2020. 10(8): p. 781-+.
5. Ou, Y., et al., Air pollution control strategies directly limiting national health damages in the US. Nature Communications, 2020. 11(1).
6. Kjellstrom, T., et al., Estimating population heat exposure and impacts on working people in conjunction with climate change. International Journal of Biometeorology, 2018. 62(3): p. 291-306.
7. Miller, S.A. and F.C. Moore, Climate and health damages from global concrete production. Nature Climate Change, 2020. 10(5): p. 439-+.
8. Guo, Y., et al., Quantifying excess deaths related to heatwaves under climate change scenarios: A multicountry time series modelling study. Plos Medicine, 2018. 15(7).
9. Hanssen, S.V., et al., The climate change mitigation potential of bioenergy with carbon capture and storage. Nature Climate Change, 2020.
10. Fuhrman, J., et al., Food-energy-water implications of negative emissions technologies in a+1.5 degrees C future. Nature Climate Change, 2020. 10(10): p. 920-+.
11. Tessum, C.W., et al., Inequity in consumption of goods and services adds to racial-ethnic disparities in air pollution exposure. Proceedings of the National Academy of Sciences of the United States of America, 2019. 116(13): p. 6001-6006.
12. Markandya, A., et al., Health co-benefits from air pollution and mitigation costs of the Paris Agreement: a modelling study. Lancet Planetary Health, 2018. 2(3): p. E126-E133.
13. Fang, K., et al., The distribution and drivers of PM2.5 in a rapidly urbanizing region: The Belt and Road Initiative in focus. Science of the Total Environment, 2020. 716.

Coupled human-environment system: interactions and integrated assessment

人地系统：交互影响与综合评估

Teaching Staff	QIN Yue 覃栎

Course Description：

Across the globe, human society has been facing increasing environmental challenges (e.g., air pollution and climate change) along with growing population, urbanization, and increasing energy consumption. In this course, we will introduce students to a scientific and engineering perspective to understand and model different components of the environmental system, as well as learn the corresponding mitigation strategies for tackling environmental challenges. We will focus on topics such as: modeling the population, basics of quantitative methods, understanding air pollution and modeling air pollutant emissions, climate change and greenhouse gas emissions, as well as fossil energy system and sustainable alternatives.

Core Content

1. To introduce the concept of Anthropocene
2. To introduce the major components of the environmental system
3. To introduce the impacts of human society on the environmental system
4. To introduce the feedbacks of the natural environment on the human society

Assignments (paper or other forms)

1. Problem sets: 3 in total
2. Midterm exam (close book)
3. Midterm group presentation: literature review on a environmental challenge of your group's interest, explain its historical evolvement, cutting-edge research about it, major drivers and potential solutions.
4. Final individual presentation: Design and conduct an engineering analysis on an environmental challenge of your selection. You have to demonstrate your ability in project design, data collection, data analysis, and results presentation.

Evaluation Details

1. In-class participation: 15%
2. Problem sets: 30%
3. Midterm group presentation: 25%
4. Final individual presentation: 30%

Readings

1. S Pacala and R Socolow, Stabilization wedges: Solving the climate problem for the next 50 years with current technology Science 305, 968-972, 2004.

2. Tong D. et al. Committed emissions from existing energy infrastructure jeopardize 1.5 C climate target. Nature 572 (7769), 373-377, 2020.

3. Zhang Q. et al. Asian emissions in 2006 for the NASA INTEX-B mission. Atmospheric Chemistry and Physics 9 (14), 5131-5153

4. Li M. et al. Anthropogenic emission inventories in China: a review. National Science Review 4 (6), 834-866 (2017)

5. Liu J. et al. Air Pollutant Emissions from Chinese Households: A Major and Underappreciated Ambient Pollution. Proceedings of the National Academy of Sciences (2016)

6. Qin Y. et al., Air quality, health, and climate implications of China's synthetic natural gas development. Proceedings of the National Academy of Sciences 114 (19), 4887-4892 (2017)

7. Qin Y. et al. Air quality–carbon–water synergies and trade-offs in China's natural gas industry. Nature Sustainability 1 (9), 505-511 (2018)

8. Vliet et al. Vulnerability of US and European electricity supply to climate change. Nature Climate Change 2, 676-681 (2012)

9. Wei Y.M. et al. The climate change mitigation potential of bioenergy with carbon capture and storage. Nature Climate Change 11, 112–118(2021)