UNU Institute for the Advanced Study of Sustainability (UNU-IAS)
Autum 2020 Semester Course

As of Sept 7, 2020

Title of Course: Resilience and Adaptation Science (RAS)
Coordinators: Dr. Riyanti Djalante
Course Schedule: From Oct 2020 until Jan 2021

Purpose and learning outcomes: This course will cover a range of issues on the science and impacts of climate change, adaptation and mitigation to climate change, governance and climate resilience. Topics include climate and atmospheric science, hazard, risks, vulnerability and resilience assessment, impacts of climate change on the environment and in different sectors, adaptation and mitigation to climate change, governance of climate change from theories to implementations.

Course Outline

Lecture	Date	Content	Instructor
Lecture 1	9 Oct 16:00-17:30	Introduction of the course Climate Change Science	Dr. Riyanti Djalante
		Assignment 1 (Lecture 1 to 14): Class summary due 1 day after class	
		Assignment 2: Annotated bibliography (Lecture 1 to 14) Class summary due 2 days after class	
Lecture 2	16 Oct 16:00-17:30	Climate Change Impacts: Air, Land, Biota, Water, Ocean	Dr. Riyanti Djalante
Lecture 3	23 Oct 16:00-17:30	The social impacts of climate change: livelihood and poverty, inequality, gender	Dr. Riyanti Djalante
Lecture 4	30 Oct 16:00-17:30	The social impacts of climate change: migration, displacement, conflicts	Dr. Riyanti Djalante
	TBC	Assignment 2: Annotated bibliography due	
Lecture 5	6 Nov 16:00-17:30	Key concepts of Hazards, vulnerability, risks	Dr. Riyanti Djalante
Lecture 6	13 Nov 16:00-17:30	Key concepts of , resilience adaptive capacity, transformation and the nexus approach	Dr. Riyanti Djalante
Lecture 7	20 Nov 16:00-17:30	Introduction to climate change adaptation, and planning for	Dr. Riyanti Djalante

Lecture	Date	Content	Instructor
		adaptation	
Lecture 8	27 Nov 16:00-17:30	Climate Change Impacts on disasters and Disaster risk reduction	Dr. Riyanti Djalante
Lecture 9	4 Dec 16:00-17:30	Climate Change Impacts on Land and Mitigation and Adaptation in water and agriculture sector	Dr. Riyanti Djalante
	TBC	Assignment 3 Research paper due	Dr. Riyanti Djalante
Lecture 10	11 Dec 16:00-17:30	Climate Change Impacts and Adaptation in Different Sectors: health, forestry, CB-DRR/CCA	Dr. Riyanti Djalante
Lecture 11	18 Dec 16:00-17:30	Climate Change Finance and Insurance	Dr. Riyanti Djalante
Lecture 12	8 Jan 16:00-17:30	Governing climate change	Dr. Riyanti Djalante
Lecture 13	15 Jan 16:00-17:30	Climate change mitigation: Key policies and progresses in different sectors	Dr. Riyanti Djalante
Lecture 14	22 Jan 16:00-17:30	Global coherence: Linking Paris Agreement and the SDGs	Dr. Riyanti Djalante
Lecture 15	29 Jan 16:00-17:30	Assignment 5 Class Presentation	Dr. Riyanti Djalante
	TBC	Assignment 4 Critical review due	

Assessment:

- Attendance and class participation: 10%
- Assignment 1: Annotated bibliography
    - Prorated for whole classes 20%
    - Write an annotated bibliography on key topics discussed (from Lecture 1 to 14)
    - 10 References @ 50-75words. (min 10 journal articles, and reports)
    - Arial 12, 1.5 space, double side, cover page,
    - Harvard referencing style
    - Due two days after each lecture, 23.55pm
- Assignment 2: Research paper of impacts of climate change on particular country's and how the impacts have been managed
    - 20% of total marks
    - Key topics to review:
        - Choose a particular region or country

        - Discuss the impacts of climate change impacts
        - Outline the progress of climate change adaptation and mitigation
        - Describe that governance at different level.
        - How you think the management and governance can be improved
    - 1500 words, Arial 12, 1.5 space, double side, cover page, references (min 10 journal articles, and reports)
    - Harvard referencing style
- Assignment 3: Critical review of climate change management at different sector
    - 35% of total marks
    - Key topics to review and critique:
        - Choose a particular development sector (include but not limited to fisheries, agriculture, disaster management, gender empowerment, etc)
        - Discuss the impacts of climate change impacts on that particular sector (globally and regionally)
        - Outline the finances available to deal with the impacts, discuss whether this is sufficient or not, and why
        - Describe and critique progress in planning and implementation (globally and regionally) (adaptation and mitigation if appropriate)
        - Discuss whether the planning and implementation has been able to reduce the the underlying causes vulnerability of particular places/targets, reduce poverty and address inequality
    - 2500 words, Arial 12, 1.5 space, double side, cover page, references (min 25 journal articles, and reports)
    - Harvard referencing style
- Assignment 3: Class Presentation
    - 15% of total marks
    - 5 minute presentation,
    - Maximum 5 slides
        - 1 on discussion of the impacts of climate change on that particular sector (globally and regionally)
        - 1 on review of finances and progress in planning and implementation (globally and regionally)
        - 1 on your review and critique progress in planning and implementation (globally and regionally)
        - 2 on your critique on whether they have address the underlying causes vulnerability, reduce poverty and address inequality

Text books and reading materials:

REQUIRED READING

Lecture	Content	Required (in bold) and recommended readings
Lecture 1	Introduction of the course	
	Climate Change Science	**Pachauri, Rajendra K., et al.** ***Climate change 2014: synthesis report. Contribution of Working Groups I, II and III to the fifth assessment report of the Intergovernmental Panel on Climate Change*****. IPCC, 2014.** Moss, R. H., Edmonds, J. A., Hibbard, K. A., Manning, M. R., Rose, S. K., Van Vuuren, D. P., ... & Meehl, G. A. (2010). The next generation of scenarios for climate change research and assessment. *Nature*, *463*(7282), 747.
Lecture 2	Climate Change Impacts: Air, Land, Biota, Water, Ocean	**Pachauri, Rajendra K., et al.** ***Climate change 2014: synthesis report. Contribution of Working Groups I, II and III to the fifth assessment report of the Intergovernmental Panel on Climate Change*****. IPCC, 2014.** Scheffer, M., Carpenter, S., Foley, J. A., Folke, C., & Walker, B. (2001). Catastrophic shifts in ecosystems. *Nature*, *413*(6856), 591. Walther, Gian-Reto, Eric Post, Peter Convey, Annette Menzel, Camille Parmesan, Trevor JC Beebee, Jean-Marc Fromentin, Ove Hoegh-Guldberg, and Franz Bairlein. "Ecological responses to recent climate change." *Nature* 416, no. 6879 (2002): 389. Parmesan, C., & Yohe, G. (2003). A globally coherent fingerprint of climate change impacts across natural systems. *Nature*, *421*(6918), 37. Allen, C. D., Macalady, A. K., Chenchouni, H., Bachelet, D., McDowell, N., Vennetier, M., ... & Gonzalez, P. (2010). A global overview of drought and heat-induced tree mortality reveals emerging climate change risks for forests. *Forest ecology and management*, *259*(4), 660-684. Hughes, T. P., Baird, A. H., Bellwood, D. R., Card, M., Connolly, S. R., Folke, C., ... & Lough, J. M. (2003). Climate change, human impacts, and the resilience of coral reefs. *science*, *301*(5635), 929-933. Shrestha, U. B., Gautam, S., & Bawa, K. S. (2012). Widespread climate change in the Himalayas and associated changes in local ecosystems. *PLoS One*, *7*(5), e36741. Kelly, A. E., & Goulden, M. L. (2008). Rapid shifts in plant distribution with recent climate change. *Proceedings of the National Academy of Sciences*, *105*(33), 11823-11826.
Lecture 3	Key	**Gallopín, Gilberto C. "Linkages between vulnerability, resilience, and adaptive capacity."** ***Global***

Lecture	Content	Required (in bold) and recommended readings
	concepts and measuring Hazards, vulnerability, risks, resilience and adaptive capacity	***environmental change* 16.3 (2006): 293-303.** **Smit, Barry, and Johanna Wandel. "Adaptation, adaptive capacity and vulnerability." *Global environmental change* 16.3 (2006): 282-292.** Klein, Richard JT, Robert J. Nicholls, and Frank Thomalla. "Resilience to natural hazards: How useful is this concept?." *Global Environmental Change Part B: Environmental Hazards* 5.1 (2003): 35-45. Adger, W. Neil, et al. "Social-ecological resilience to coastal disasters." *Science* 309.5737 (2005): 1036-1039. Thomalla, Frank, et al. "Reducing hazard vulnerability: towards a common approach between disaster risk reduction and climate adaptation." *Disasters*30.1 (2006): 39-48. Folke, Carl, et al. "Resilience and sustainable development: building adaptive capacity in a world of transformations." *AMBIO: A journal of the human environment* 31.5 (2002): 437-440. Miller, Fiona, et al. "Resilience and vulnerability: complementary or conflicting concepts?." *Ecology and Society* 15.3 (2010). Walker, Brian, et al. "Resilience, adaptability and transformability in social–ecological systems." *Ecology and society* 9.2 (2004). Turner, Billie L., et al. "A framework for vulnerability analysis in sustainability science." *Proceedings of the national academy of sciences* 100.14 (2003): 8074-8079. Birkmann, Jorn. "Indicators and criteria for measuring vulnerability: Theoretical bases and requirements." *Measuring vulnerability to natural hazards: Towards disaster resilient societies* (2006): 55-77. Birkmann, Joern. "Risk and vulnerability indicators at different scales: Applicability, usefulness and policy implications." *Environmental hazards* 7.1 (2007): 20-31. Birkmann, Joern, et al. "Framing vulnerability, risk and societal responses: the MOVE framework." *Natural hazards* 67.2 (2013): 193-211. Adger, W. N., Hughes, T. P., Folke, C., Carpenter, S. R., & Rockström, J. (2005). Social-ecological resilience to coastal disasters. *Science*, *309*(5737), 1036-1039. Füssel, H. M., & Klein, R. J. (2006). Climate change vulnerability assessments: an evolution of conceptual thinking. *Climatic change*, *75*(3), 301-329. Füssel, H. M. (2007). Vulnerability: A generally applicable conceptual framework for climate change research. *Global environmental change*, *17*(2), 155-167. Adger, W. N. (2003). Social capital, collective action, and adaptation to climate change. *Economic geography*, *79*(4), 387-404.

Lecture	Content	Required (in bold) and recommended readings
		Adger, W. N., Dessai, S., Goulden, M., Hulme, M., Lorenzoni, I., Nelson, D. R., ... & Wreford, A. (2009). Are there social limits to adaptation to climate change?. *Climatic change*, *93*(3-4), 335-354. Kelly, P. M., & Adger, W. N. (2000). Theory and practice in assessing vulnerability to climate change andFacilitating adaptation. *Climatic change*, *47*(4), 325-352. O'BRIEN, K. A. R. E. N., Eriksen, S., Nygaard, L. P., & Schjolden, A. (2007). Why different interpretations of vulnerability matter in climate change discourses. *Climate policy*, *7*(1), 73-88.
Lecture 4	From climate resilience to transforming development	O'Brien, K. (2012). Global environmental change II: from adaptation to deliberate transformation. *Progress in Human Geography*, *36*(5), 667-676. Pelling, M., O'Brien, K., & Matyas, D. (2015). Adaptation and transformation. *Climatic Change*, *133*(1), 113-127. Park, S. E., Marshall, N. A., Jakku, E., Dowd, A. M., Howden, S. M., Mendham, E., & Fleming, A. (2012). Informing adaptation responses to climate change through theories of transformation. *Global Environmental Change*, *22*(1), 115-126. Wise, R. M., Fazey, I., Smith, M. S., Park, S. E., Eakin, H. C., Van Garderen, E. A., & Campbell, B. (2014). Reconceptualising adaptation to climate change as part of pathways of change and response. *Global Environmental Change*, *28*, 325-336. Kates, R. W., Travis, W. R., & Wilbanks, T. J. (2012). Transformational adaptation when incremental adaptations to climate change are insufficient. *Proceedings of the National Academy of Sciences*, *109*(19), 7156-7161. Adger, W. N., Quinn, T., Lorenzoni, I., Murphy, C., & Sweeney, J. (2013). Changing social contracts in climate-change adaptation. *Nature Climate Change*, *3*(4), 330. Thomalla, Frank, Michael Boyland, Karlee Johnson, Jonathan Ensor, Heidi Tuhkanen, Åsa Gerger Swartling, Guoyi Han, John Forrester, and Darin Wahl. "Transforming development and disaster risk." *Sustainability* (2018).
Lecture 5	Introduction to climate change adaptation, and planning for	**Füssel, H-M. "Adaptation planning for climate change: concepts, assessment approaches, and key lessons."** ***Sustainability science*** **2.2 (2007): 265-275.** **Huq, Saleemul, et al. "Mainstreaming adaptation to climate change in least developed countries (LDCs)."** ***Climate Policy*** **4.1 (2004): 25-43.** Adger, W. Neil, et al. "Adaptation to climate change in the developing world." *Progress in development studies* 3.3 (2003): 179-195.

Lecture	Content	Required (in bold) and recommended readings
	adaptation	Adger, W. Neil, Nigel W. Arnell, and Emma L. Tompkins. "Successful adaptation to climate change across scales." *Global environmental change*15.2 (2005): 77-86. Rosenzweig, Cynthia, et al. "Cities lead the way in climate-change action." *Nature* 467.7318 (2010): 909-911. Fankhauser, Samuel, Joel B. Smith, and Richard SJ Tol. "Weathering climate change: some simple rules to guide adaptation decisions." *Ecological economics* 30.1 (1999): 67-78. Tang, Zhenghong, et al. "Moving from agenda to action: evaluating local climate change action plans." *Journal of environmental planning and management* 53.1 (2010): 41-62. Füssel, H. M. (2007). Adaptation planning for climate change: concepts, assessment approaches, and key lessons. *Sustainability science*, *2*(2), 265-275. Davoudi, S., Crawford, J., & Mehmood, A. (Eds.). (2009). *Planning for climate change: strategies for mitigation and adaptation for spatial planners*. Routledge. Davoudi, S., Shaw, K., Haider, L. J., Quinlan, A. E., Peterson, G. D., Wilkinson, C., ... & Davoudi, S. (2012). Resilience: a bridging concept or a dead end?"Reframing" resilience: challenges for planning theory and practice interacting traps: resilience assessment of a pasture management system in Northern Afghanistan urban resilience: what does it mean in planning practice? Resilience as a useful concept for climate change adaptation? The politics of resilience for planning: a cautionary note: edited by Simin Davoudi and Libby Porter. *Planning theory & practice*, *13*(2), 299-333. Howard, J. (2009). Climate change mitigation and adaptation in developed nations: A critical perspective on the adaptation turn in urban climate planning. In *Planning for Climate Change*(pp. 43-56). Routledge. Adger, W. N., Arnell, N. W., & Tompkins, E. L. (2005). Successful adaptation to climate change across scales. *Global environmental change*, *15*(2), 77-86. Measham, T. G., Preston, B. L., Smith, T. F., Brooke, C., Gorddard, R., Withycombe, G., & Morrison, C. (2011). Adapting to climate change through local municipal planning: barriers and challenges. *Mitigation and adaptation strategies for global change*, *16*(8), 889-909. Wamsler, C., Brink, E., & Rivera, C. (2013). Planning for climate change in urban areas: from theory to practice. *Journal of Cleaner Production*, *50*, 68-81.
Lecture 6	Climate Change Impacts on disasters	**IPCC, 2012: Summary for Policymakers. In: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation [Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (eds.)]. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change.**

Lecture	Content	Required (in bold) and recommended readings
	and Disaster risk reduction	**Cambridge University Press, Cambridge, UK, and New York, NY, USA, pp. 1-19.** **UNISDR 2015 Sendai Framework for Disaster Risk Reduction 2015-2030** **Schipper, Lisa, and Mark Pelling. "Disaster risk, climate change and international development: scope for, and challenges to, integration."** ***Disasters*** **30.1 (2006): 19-38.** Alexander, David E. "Resilience and disaster risk reduction: an etymological journey." *Natural hazards and earth system sciences* 13.11 (2013): 2707-2716. UNDP 2010 Disaster Risk Reduction Governance and Mainstreaming (http://www.preventionweb.net/files/17429_4disasterriskreductiongovernance1.pdf) Djalante, R.: Review Article: "Adaptive governance and resilience: the role of multi-stakeholder platforms in disaster risk reduction", Nat. Hazards Earth Syst. Sci., 12, 2923-2942, https://doi.org/10.5194/nhess-12-2923-2012, 2012. Djalante, Riyanti, Cameron Holley, and Frank Thomalla. "Adaptive governance and managing resilience to natural hazards." *International Journal of Disaster Risk Science* 2.4 (2011): 1-14.
Lecture 7	The social impacts of climate change: livelihood and poverty, inequality, gender, indigenous communities	Bolt, B., Nes, E. H., Bathiany, S., Vollebregt, M. E., & Scheffer, M. (2018). Climate reddening increases the chance of critical transitions. *Nature Climate Change*, *8*(6), 478. Winsemius, H. C., Jongman, B., Veldkamp, T. I., Hallegatte, S., Bangalore, M., & Ward, P. J. (2018). Disaster risk, climate change, and poverty: assessing the global exposure of poor people to floods and droughts. *Environment and Development Economics*, 1-21. Tanner, Thomas, David Lewis, David Wrathall, Robin Bronen, Nick Cradock-Henry, Saleemul Huq, Chris Lawless et al. "Livelihood resilience in the face of climate change." *Nature Climate Change* 5, no. 1 (2015): 23. King, A. D., & Harrington, L. J. (2018). The Inequality of Climate Change from 1.5° C to 2° C of Global Warming. *Geophysical Research Letters*. Byers, Edward, Matthew Gidden, David Leclère, Juraj Balkovic, Peter Burek, Kristie Ebi, Peter Greve et al. "Global exposure and vulnerability to multi-sector development and climate change hotspots." *Environmental Research Letters* 13, no. 5 (2018): 055012. Reyer, Christopher PO, Kanta Kumari Rigaud, Erick Fernandes, William Hare, Olivia Serdeczny, and Hans Joachim Schellnhuber. "Turn down the heat: regional climate change impacts on development." (2017): 1563-1568. Otto, I. M., Reckien, D., Reyer, C. P., Marcus, R., Le Masson, V., Jones, L., ... & Serdeczny, O. (2017). Social

Lecture	Content	Required (in bold) and recommended readings
		vulnerability to climate change: a review of concepts and evidence. *Regional environmental change*, *17*(6), 1651-1662. Hallegatte, S., Bangalore, M., Bonzanigo, L., Fay, M., Narloch, U., Rozenberg, J., & Vogt-Schilb, A. (2014). Climate change and poverty--an analytical framework. Agrawal, A., & Perrin, N. (2009). Climate adaptation, local institutions and rural livelihoods. *Adapting to climate change: thresholds, values, governance*, 350-367. Carr, E. R., & Thompson, M. C. (2014). Gender and climate change adaptation in agrarian settings: Current thinking, new directions, and research frontiers. *Geography Compass*, *8*(3), 182-197. Alston, M. (2014, November). Gender mainstreaming and climate change. In *Women's Studies International Forum* (Vol. 47, pp. 287-294). Pergamon. Kaijser, A., & Kronsell, A. (2014). Climate change through the lens of intersectionality. *Environmental politics*, *23*(3), 417-433. Bryan, E., Bernier, Q., Espinal, M., & Ringler, C. (2017). Making climate change adaptation programmes in sub-Saharan Africa more gender responsive: insights from implementing organizations on the barriers and opportunities. *Climate and Development*, 1-15. Gaard, G. (2015, March). Ecofeminism and climate change. In *Women's Studies International Forum* (Vol. 49, pp. 20-33). Pergamon. Eastin, J. (2018). Climate change and gender equality in developing states. *World Development*, *107*, 289-305. Sultana, F. (2014). Gendering climate change: Geographical insights. *The Professional Geographer*, *66*(3), 372-381. Moosa, C. S., & Tuana, N. (2014). Mapping a research agenda concerning gender and climate change: A review of the literature. *Hypatia*, *29*(3), 677-694. Jerneck, Anne. "What about Gender in Climate Change? Twelve Feminist Lessons from Development." *Sustainability*10.3 (2018): 627. Cameron, E. S. (2012). Securing Indigenous politics: A critique of the vulnerability and adaptation approach to the human dimensions of climate change in the Canadian Arctic. *Global environmental change*, *22*(1), 103-114. Green, D., & Raygorodetsky, G. (2010). Indigenous knowledge of a changing climate. *Climatic Change*, *100*(2), 239-242. Alexander, Clarence, Nora Bynum, Elizabeth Johnson, Ursula King, Tero Mustonen, Peter Neofotis, Noel

Lecture	Content	Required (in bold) and recommended readings
		Oettlé et al. "Linking indigenous and scientific knowledge of climate change." *BioScience* 61, no. 6 (2011): 477-484.
Lecture 8	The social impacts of climate change: migration, displacement, conflicts	Black, Richard, et al. "The effect of environmental change on human migration." *Global environmental change* 21 (2011): S3-S11. Tacoli, C. (2009). Crisis or adaptation? Migration and climate change in a context of high mobility. *Environment and urbanization*, *21*(2), 513-525. McLachlan, J. S., Hellmann, J. J., & Schwartz, M. W. (2007). A framework for debate of assisted migration in an era of climate change. *Conservation biology*, *21*(2), 297-302. McLeman, R., & Smit, B. (2006). Migration as an adaptation to climate change. *Climatic change*, *76*(1-2), 31-53. Barnett, J., & Adger, W. N. (2007). Climate change, human security and violent conflict. *Political geography*, *26*(6), 639-655. Reuveny, R. (2007). Climate change-induced migration and violent conflict. *Political geography*, *26*(6), 656-673. Raleigh, C., & Urdal, H. (2007). Climate change, environmental degradation and armed conflict. *Political geography*, *26*(6), 674-694. Hendrix, C. S., & Glaser, S. M. (2007). Trends and triggers: Climate, climate change and civil conflict in Sub-Saharan Africa. *Political geography*, *26*(6), 695-715. Kelley, C. P., Mohtadi, S., Cane, M. A., Seager, R., & Kushnir, Y. (2015). Climate change in the Fertile Crescent and implications of the recent Syrian drought. *Proceedings of the National Academy of Sciences*, *112*(11), 3241-3246. Klinsky, Sonja, Timmons Roberts, Saleemul Huq, Chukwumerije Okereke, Peter Newell, Peter Dauvergne, Karen O'Brien et al. "Why equity is fundamental in climate change policy research." *Global Environmental Change* 44 (2017): 170-173. Eriksen, S. H., Nightingale, A. J., & Eakin, H. (2015). Reframing adaptation: The political nature of climate change adaptation. *Global Environmental Change*, *35*, 523-533. Beck, U. (2015). Emancipatory catastrophism: What does it mean to climate change and risk society?. *Current Sociology*, *63*(1), 75-88. Schleussner, C. F., Donges, J. F., Donner, R. V., & Schellnhuber, H. J. (2016). Armed-conflict risks enhanced by climate-related disasters in ethnically fractionalized countries. *Proceedings of the National Academy of*

Lecture	Content	Required (in bold) and recommended readings
		Sciences, *113*(33), 9216-9221. Black, R., Adger, W. N., Arnell, N. W., Dercon, S., Geddes, A., & Thomas, D. (2011). The effect of environmental change on human migration. *Global environmental change*, *21*, S3-S11.
Lecture 9	Climate Change Impacts on Land and Mitigation and Adaptation in Agriculture and water sector	**Vörösmarty, Charles J., et al. "Global water resources: vulnerability from climate change and population growth." *science* 289.5477 (2000): 284-288.** Alcamo, Joseph, Martina Flörke, and Michael Märker. "Future long-term changes in global water resources driven by socio-economic and climatic changes." *Hydrological Sciences Journal* 52.2 (2007): 247-275. Immerzeel, W. W., Van Beek, L. P., & Bierkens, M. F. (2010). Climate change will affect the Asian water towers. *Science*, *328*(5984), 1382-1385. Taylor, Richard G., Bridget Scanlon, Petra Döll, Matt Rodell, Rens Van Beek, Yoshihide Wada, Laurent Longuevergne et al. "Ground water and climate change." *Nature Climate Change*3, no. 4 (2013): 322. Kelley, C. P., Mohtadi, S., Cane, M. A., Seager, R., & Kushnir, Y. (2015). Climate change in the Fertile Crescent and implications of the recent Syrian drought. *Proceedings of the National Academy of Sciences*, *112*(11), 3241-3246. Smit, Barry, and Mark W. Skinner. "Adaptation options in agriculture to climate change: a typology." *Mitigation and adaptation strategies for global change* 7.1 (2002): 85-114. Howden, S. M., Soussana, J. F., Tubiello, F. N., Chhetri, N., Dunlop, M., & Meinke, H. (2007). Adapting agriculture to climate change. *Proceedings of the national academy of sciences*, *104*(50), 19691-19696. Lobell, D. B., Burke, M. B., Tebaldi, C., Mastrandrea, M. D., Falcon, W. P., & Naylor, R. L. (2008). Prioritizing climate change adaptation needs for food security in 2030. *Science*, *319*(5863), 607-610. Mertz, O., Mbow, C., Reenberg, A., & Diouf, A. (2009). Farmers' perceptions of climate change and agricultural adaptation strategies in rural Sahel. *Environmental management*, *43*(5), 804-816. Rickards, L., & Howden, S. M. (2012). Transformational adaptation: agriculture and climate change. *Crop and Pasture Science*, *63*(3), 240-250. Rosenzweig, C., & Parry, M. L. (1994). Potential impact of climate change on world food supply. *Nature*, *367*(6459), 133-138.
Lecture 10	Climate Change	**Costello, Anthony, et al. "Managing the health effects of climate change." *The Lancet* 373.9676 (2009): 1693-1733.**

Lecture	Content	Required (in bold) and recommended readings
	Impacts and Adaptation in Different Sectors: health, forestry, CB-DRR/CCA	**Rosenzweig, Cynthia, and Martin L. Parry. "Potential impact of climate change on world food supply." *Nature* 367.6459 (1994): 133-138.** **Kirilenko, Andrei P., and Roger A. Sedjo. "Climate change impacts on forestry." *Proceedings of the National Academy of Sciences* 104.50 (2007): 19697-19702.** Bonan, G. B. (2008). Forests and climate change: forcings, feedbacks, and the climate benefits of forests. *science*, *320*(5882), 1444-1449. **Heller, Nicole E., and Erika S. Zavaleta. "Biodiversity management in the face of climate change: a review of 22 years of recommendations." *Biological conservation* 142.1 (2009): 14-32.** Haines, Andy, et al. "Climate change and human health: impacts, vulnerability and public health." *Public health* 120.7 (2006): 585-596.
Lecture 11	Climate Change Finance and Insurance	**Porter, Gareth, et al. "New finance for climate change and the environment." *WWF and Heinrich Böll Stiftung Foundation* (2008): 30-48. (Executive Summary only)** **Linnerooth-Bayer, Joanne, and Reinhard Mechler. "Insurance for assisting adaptation to climate change in developing countries: a proposed strategy." *Climate policy* 6.6 (2006): 621-636.** Hallegatte, Stéphane. "Strategies to adapt to an uncertain climate change." *Global environmental change* 19.2 (2009): 240-247. Dasgupta, Partha. "The Stern Review's economics of climate change." *National institute economic review* 199.1 (2007): 4-7. Bouwer, Laurens M. "Have disaster losses increased due to anthropogenic climate change?." *Bulletin of the American Meteorological Society* 92.1 (2011): 39-46. Mills, E. (2009). A global review of insurance industry responses to climate change. *The Geneva Papers on Risk and Insurance-Issues and Practice*, *34*(3), 323-359. Linnerooth-Bayer, J., & Mechler, R. (2015). Insurance for assisting adaptation to climate change in developing countries: a proposed strategy. In *Climate Change and Insurance* (pp. 29-44). Routledge. Collier, B., Skees, J., & Barnett, B. (2009). Weather index insurance and climate change: opportunities and challenges in lower income countries. *The Geneva Papers on Risk and Insurance-Issues and Practice*, *34*(3), 401-424. Stern, N. (2008). The economics of climate change. *American Economic Review*, *98*(2), 1-37.
Lecture	Governing	**Betsill, M. M., & Bulkeley, H. (2006). Cities and the multilevel governance of global climate**

Lecture	Content	Required (in bold) and recommended readings
12	climate change	**change. *Global Governance: A Review of Multilateralism and International Organizations*, *12*(2), 141-159.**Folke, Carl, et al. **Termeer, Catrien, Art Dewulf, and Maartje Lieshout. "Disentangling scale approaches in governance research: comparing monocentric, multilevel, and adaptive governance." *Ecology and society* 15.4 (2010).** "Adaptive governance of social-ecological systems." *Annu. Rev. Environ. Resour.* 30 (2005): 441-473. Lebel, Louis, et al. "Governance and the capacity to manage resilience in regional social-ecological systems." *Ecology and Society* 11.1 (2006). Smit, B., & Pilifosova, O. (2003). Adaptation to climate change in the context of sustainable development and equity. *Sustainable Development*, *8*(9), 9. Dodman, D., & Satterthwaite, D. (2008). Institutional capacity, climate change adaptation and the urban poor. *IDS Bulletin*, *39*(4), 67-74. Kern, K., & Alber, G. (2008). Governing climate change in cities: modes of urban climate governance in multi-level systems. Bulkeley, H., Andonova, L., Bäckstrand, K., Betsill, M., Compagnon, D., Duffy, R., ... & Milledge, T. (2012). Governing climate change transnationally: assessing the evidence from a database of sixty initiatives. *Environment and Planning C: Government and Policy*, *30*(4), 591-612. Bulkeley, H. (2010). Cities and the governing of climate change. *Annual Review of Environment and Resources*, *35*. Betsill, M. M., & Bulkeley, H. (2006). Cities and the multilevel governance of global climate change. *Global Governance: A Review of Multilateralism and International Organizations*, *12*(2), 141-159. Broto, V. C., & Bulkeley, H. (2013). A survey of urban climate change experiments in 100 cities. *Global Environmental Change*, *23*(1), 92-102. Pahl-Wostl, C. (2009). A conceptual framework for analysing adaptive capacity and multi-level learning processes in resource governance regimes. *Global Environmental Change*, *19*(3), 354-365. Biermann, F., & Boas, I. (2010). Preparing for a warmer world: Towards a global governance system to protect climate refugees. *Global environmental politics*, *10*(1), 60-88. Barnett, Jon. "Security and climate change." *Global environmental change* 13.1 (2003): 7-17. Black, R., Bennett, S. R., Thomas, S. M., & Beddington, J. R. (2011). Climate change: Migration as adaptation. *Nature*, *478*(7370), 447. Hartmann, B. (2010). Rethinking climate refugees and climate conflict: rhetoric, reality and the politics of

Lecture	Content	Required (in bold) and recommended readings
		policy discourse. *Journal of International Development*, *22*(2), 233-246. Adger, W. N. (2001). Scales of governance and environmental justice for adaptation and mitigation of climate change. *Journal of International development*, *13*(7), 921-931.
Lecture 13	Climate change mitigation: Key policies and progesses	**1) Two pages of the UNFCCC website:** *** a) 'FOCUS: Mitigation', available at: unfccc.int/focus/mitigation/items/7169.php** *** b) 'FOCUS: Mitigation – Action on mitigation: Reducing emissions and enhancing sinks', available at: unfccc.int/focus/mitigation/items/7171.php** **2) A report: Climate Transparency (2017), 'Brown to Green. The G20 transition to a low-carbon economy', Climate Transparency, c/o Humboldt-Viadrina Governance Platform, Berlin, Germany, www.climate-transparency.org.** Steinbacher, K. and M. Pahle (2016), 'Leadership and the Energiewende: German Leadership by Diffusion', Global Environmental Politics, 16(4), pp. 70-89. Ockwell, D. and A. Mallett (2012), Introduction', in: D. Ockwell and A. Mallett, Low-carbon Technology Transfer – From Rhetoric to Reality, Abingdon, Oxon, and New York: Routledge, pp. 3-19.
Lecture 14	Climate change mitigation at different sectors	Edenhofer, O., Pichs-Madruga, R., Sokona, Y., Seyboth, K., Matschoss, P., Kadner, S., ... & von Stechow, C. (2011). IPCC special report on renewable energy sources and climate change mitigation. *Prepared By Working Group III of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, UK*. Canadell, J. G., & Raupach, M. R. (2008). Managing forests for climate change mitigation. *science*, *320*(5882), 1456-1457. Zomer, R. J., Trabucco, A., Bossio, D. A., & Verchot, L. V. (2008). Climate change mitigation: A spatial analysis of global land suitability for clean development mechanism afforestation and reforestation. *Agriculture, ecosystems & environment*, *126*(1-2), 67-80. Bollen, J., Guay, B., Jamet, S., & Corfee-Morlot, J. (2009). *Co-benefits of climate change mitigation policies: literature review and new results* (No. 693). OECD Publishing. Marland, G., Pielke Sr, R. A., Apps, M., Avissar, R., Betts, R. A., Davis, K. J., ... & Katzenberger, J. (2003). The climatic impacts of land surface change and carbon management, and the implications for climate-change mitigation policy. *Climate policy*, *3*(2), 149-157. Gerber, Pierre J., Henning Steinfeld, Benjamin Henderson, Anne Mottet, Carolyn Opio, Jeroen Dijkman,

Lecture	Content	Required (in bold) and recommended readings
		Allessandra Falcucci, and Giuseppe Tempio. *Tackling climate change through livestock: a global assessment of emissions and mitigation opportunities*. Food and Agriculture Organization of the United Nations (FAO), 2013. Rogelj, J., McCollum, D. L., Reisinger, A., Meinshausen, M., & Riahi, K. (2013). Probabilistic cost estimates for climate change mitigation. *Nature*, *493*(7430), 79. Büchs, M., Bardsley, N., & Duwe, S. (2011). Who bears the brunt? Distributional effects of climate change mitigation policies. *Critical Social Policy*, *31*(2), 285-307. Mackey, B., Prentice, I. C., Steffen, W., House, J. I., Lindenmayer, D., Keith, H., & Berry, S. (2013). Untangling the confusion around land carbon science and climate change mitigation policy. *Nature Climate Change*, *3*(6), 552. Lybbert, T., & Sumner, D. (2010). Agricultural technologies for climate change mitigation and adaptation in developing countries: policy options for innovation and technology diffusion. Fellmann, T., Witzke, P., Weiss, F., Van Doorslaer, B., Drabik, D., Huck, I., ... & Leip, A. (2017). Major challenges of integrating agriculture into climate change mitigation policy frameworks. *Mitigation and Adaptation Strategies for Global Change*, 1-18. Anderson, B., Bernauer, T., & Balietti, S. (2017). Effects of fairness principles on willingness to pay for climate change mitigation. *Climatic Change*, *142*(3-4), 447-461. Brugnach, M., Craps, M., & Dewulf, A. R. P. J. (2017). Including indigenous peoples in climate change mitigation: addressing issues of scale, knowledge and power. *Climatic change*, *140*(1), 19-32. Riti, J. S., Shu, Y., Song, D., & Kamah, M. (2017). The contribution of energy use and financial development by source in climate change mitigation process: A global empirical perspective. *Journal of Cleaner Production*, *148*, 882-894.