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FOR ENGINEERING AND SCIENCE

Social Justice, Climate Change & Engineering Education Bibliography (UVa)

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Description

This bibliography was compiled by researchers at the University of Virginia as part of the NAE Climate Change Educational Partnership planning project. Jan. 20, 2012.

Body

Adger, Neil W., Jouni Paavola, Saleemul Huq, and M. J. Mace. *Fairness in Adaptation to Climate Change.* Cambridge: The MIT Press, 2006.

Fairness in Adapting to Climate Change is an interdisciplinary collection of papers analyzing the differential impacts and responsibilities of climate change. Social justice is at the forefront of the discussion; the authors argue that prioritizing the needs of the most vulnerable is a fair way to develop responses to climate change. Section 3 analyzes case studies in Bangladesh, Tanzania, Botswana, Namibia and Hungary, as a way to illustrate the differential impact climate change will have on social systems. Chapters of particular interest include: CH 1, Toward Justice in Adaptation to Climate Change; CH 4, Exploring the Social Justice Implication of Adaptation and Vulnerability; and CH 6, Climate Change, Insecurity, and Injustice.

Adger, W. Neil. "Climate Change, Human Well-Being and Insecurity." *New Political Economy* 15, no. 2 (2010): 275-293.

Climate change is a security issue at multiple scales; it will increase risks for individuals and threaten the stability of countries. Individuals and countries with insufficient adaptive capacity will face the greatest security risks from climate change. Adger argues that the security of the individual, the ability to live a life without harm, should be prioritized over the security of a state. Framing climate change with a human security perspective necessitates assessment of differential vulnerability, adaptive capacity and issues of just process in developing fair responses to climate change.

Adger, W. Neil, Jon Barnett, F. S. Chapin III, and Heidi Ellemor. "This Must Be the Place: Underrepresentation of Identity and Meaning in Climate Change Decision Making." *Global Environmental Politics* 11, no. 2 (May 2011): 1-25.

The authors argue that the loss of cultures and non-material losses will be significant impacts from climate change; currently policy frameworks undervalue the relationship between climate change impacts and social systems by focusing on value as it relates to material loss. The paper focuses on the emotional and spiritual value of place and the way in which individuals develop meaning. Human rights and justice are at the center of the argument. Changes in the integrity of the environment, whether compromised by degradation or as a result of climate change impacts, affects the meaning of place for community. The management of the environment reflects the values of society; are the frameworks inclusive or exclusive? The paper uses case studies in the Artic and the Pacific Atolls as examples to illustrate the valuable connection between environment and social systems. In the Pacific Atolls nation changes in the environment has already been observed, including shifts in harvesting timing and reduced productivity levels, coastal erosion and changes in tuna migration. Traditional ecological knowledge in these nations has pragmatic origins, motivated by cultural values. The paper argues that adaptive means that have historically been employed by endemic cultures should be understood and leveraged to develop effective adaptions measures. The Artic is warming at almost twice the rate of any region on the globe. In 2009 the Indigenous Peoples’ Global Summit on Climate Change declared that their rights and culture are threatened by climate change. One of the main challenges of including non-market values in the shaping of decision-making processes is the difficulty in

finding a unifying metric to quantify the value. The Stern report elaborates on the issue of non-market value and the lack of consensus on approaching the issue. The authors argue that climate policy must be grounded in the principles of justice and not simply an equitable distribution of burdens. Schneider proposes that justice metrics should include five components: “market costs, human lives lost, distributive effects, changes to quality of life, and people displaced.” (17) Caney argues that climate change impacts threaten fundamental human rights- health, access to resources and shelter. Universal Declaration of Human rights declares that everyone has the right to a nationality. UN’s Covenant on Civil and Political rights states that an individual can not be deprived of its own subsistence.” A human rights approach is “compelling” but difficult to implement. The authors argue for culturally specific risk assessment; Hess bolsters the argument statement by arguing, “a focus on place promotes resilience. Adaption is *context-specific*. (Incommensurability of social issues could be an issue for game approach.)

Amadei, Bernard, Robyn Sandekian, and Evan Thomas. "A Model for Sustainable Humanitarian Engineering Projects." *Sustainability*, 2009: 1087-1105.

The authors argue that challenges and opportunities exist for the engineers in the 21st century and highlight the need for humanitarian engineering projects. Engineering education will play a key part in helping to facilitate changes in engineering practice. The University of Colorado-Bolder partners with Engineers without Borders-USA (EWB-USA) for student focused engineering opportunities in international locations. The EWB-USA projects are not integrated into the engineering curriculum of the university; they are extra-curricular activities. Interestingly, the EWB-USA has a disproportionally high percentage of female members when compare to the percentage of women in the engineering workforce. In addition to transforming engineering education the authors argue for the need to develop a best management database and establish guiding principles for humanitarian engineering projects as a way to assess the effectiveness of a given project.

Amadei, Sandekian B., and R. S. Summers. "Engineering for Poverty Reduction: Challenges and Opportunites." *Developing Entrepreneurial Engineers for the Sustainable Growth of Latin America and the Caribbean.* Tampico: 5th Latin American and Caribbean Conference for Engineering and Technology, 2007. 1-8.

The paper was developed out of proceedings from the *Fifth LACCEI International Latin American and Caribbean Conference for Engineering and Technology*. The paper discusses the University of Colorado- Boulder's program, Engineering for Developing Communities (EDS) and the use of hands-on learning opportunities to foster a new generation of socially responsible engineers. As a foundation for its education curriculum and research the EDS program embraces goals outlined in the United Nations Millennium Development Goals. The authors argue engineering schools in the United States generally allocate insufficient, if any attention to issues of poverty, vulnerability and justice. In addition to global concerns the program addresses issues of poverty in the United States. EDS received part of its funding from a NSF grant and it included continuing education to help build urgently need capacity in sustainable development.

Bachofen, Carina, and Edward Cameron. "The Social Dimensions of Climate Change." *The Social Dimensions of Climate Change Learning Module.* UNICEF, September 9, 2009.

Social Dimension of Climate Change (SDCC) Learning Module, a program of The World Bank, mission is to raise awareness about those that are the most vulnerable to climate change impacts and to develop inclusive, effective climate change policies that work to reduce vulnerability. The Learning Module uses a flexible learning approach, prioritizing the impacts climate change will have on human systems. The Learning Modules have three dissemination methods including a lecture format, e-learning and webinars. In addition, SDCC is actively creating a database of context-based research studies.

Bank, The World. *Social Resilience and Climate Change.* 2011. <http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2011/12/05/00038 2011).

Bell, Sarah. *Engineering, Society and Sustainability.* San Rafael: Morgan & Claypool Publishers, 2011.

Biello, David. "How Green is my City?" *Scientific American*, 09 2011: 66-69.

In terms of having the greatest, most immediate impacts on the largest number of people, Biello argues that retrofitting existing cities with innovative technologies and strategies, is more important than creating new eco-cites. The author argues that

eco-cities emphasize aesthetics over pressing issues of the majority of people living in cities today. Existing cities need innovative technology to achieve international goals in reductions in GHG emissions and improvement the quality of life of individuals.

Brown, Katrine, Emma L Tompkins, and Neil W Adger. *Making Waves: Integrating Coastal Conservation and Development.* London: Earthscan Publications Ltd., 2002.

Borrego, Maura, and Jonte Bernhard. "The Emergence of Engineering Education Research as an Internationally Connected Field of Inquiry." *Journal of Engineering Education* 100, no. 1 (2011): 14-47.

The authors argue engineering education research (EER) has the potential to make significant contributions to solving complex problems of the 21st century. Internationally connected fields of inquiry are emerging. The authors compare and contrast U.S. and European approaches to engineering research. Broadly, research in the U.S. favors empirical evidence while Northern and Central European research methods employ crosscutting, collaborative approaches. The paper highlights the NAE's report The Engineer of 2020, which prioritizes the need for "creativity, ingenuity, communication, business, leadership, ethics, professionalism, dynamism, agility, resilience, flexibility, and life long learning." (18) The authors call for studies to be done to gain a greater understanding of how students learn about engineering and the results from different pedagogical approaches. Page 26 has a list of Engineering Education Journals.

Canadian Medical Association Journal. "Katrina, climate change and the poor." *Canadian Medical Association Journal* 173, no. 8 (2005): 837.

A short editorial arguing that the Post-Katrina disaster was more than an inadequately managed disaster; the catastrophe was a result of inequities in social and economic capacities and the lack of attention dedicated to preparing for extreme climate threats.

Catalano, George D. *Engineering, Poverty, and the Earth.* San Rafael, CA: Morgan & Claypool Publishers, 2007.

Catalano opines that the engineering profession has a responsibility to consider environmental health and issues of poverty in the design of engineered systems. He

is particularly interested in revealing and addressing economic disparities in the American economy. He references Harrington's term the *invisible poor* to describe poverty in the America. The vast majority of domestic poverty takes a different form, a less perceptible manifestation, than international poverty. Harrington argues that poverty is a state of being not simply a lack of financial resources. Catalano uses the Post- Katrina catastrophe as a case study to illustrate his points of social inequities, delegating responsibilities and engineering ethics.

Catalano, George. *Tragedy in the Gulf: A Call for a New Engineering Ethic.* San Rafael: Morgan & Claypool Publishers, 2011.

Building on earlier research on Post-Katrina catastrophe, *Tragedy in the Gulf* is a detailed analysis of the pre-disaster context through the impacts on communities in the wake of the tragedy. Catalano discussed engineering ethics in a 21st century context, which requires a different way of negotiating the world. He outlines that historical approaches include Utilitarianism, right-based and virtue base theories. He proposes new approaches to engineering ethics that includes freedom, chaos, morally deep world, globalism and love. (25) The new approach to engineering ethics is followed by an analysis of professional engineering codes of ethics and educational societies and how they address urgent issues of the 21st century.

Catalano, George, Caroline Baillie, Donna Riley, and Dean Nieusma. "Engineering, Peace, Justice and the Earth: Developing Course Modules." *AC 2008-766.* American Society for Engineering Education, 2008.

Culley, Marci R., and Holly Angelique. "Participation, Power, and the Role of Community Psychology in Environmental Disputes: A Tale of Two Nuclear Cities." *American Journal of Community Psychology*, 12 2010: 410-426.

The authors argue that community psychology (CP) has not been at the forefront of environmental issues and particularly in the permitting process. The paper analyzes nuclear power through two cities Middletown, Pennsylvania and Waynesboro, Georgia, which are both intricately linked to the nuclear power industry. The authors argue that nuclear power in not a green energy source because it is not carbon neutral. In addition domestic sources of uranium are limited which brings into question the issue of energy independence. The article references Culley and Hughey's (2008) three-dimensional view of social power which includes the control

of resources, limiting the debate by creating obstacles to participation and the method used to shape community engagement and opinions. Although federal law mandates public participation in environmental issues the manifestations of the processes can be inequitable. There is a need to empower the underrepresented by fostering the ability to participate effectively.

Dodman, David, and Joann Carmin. *Urban adaptation planning: the use and limits of climate science.* Brief, London: International Institute for Environment and Development, 2011.

Cities and climate change are closely linked. Cities need to respond to climate change because the social and ecological risks are high. Developing adaptation plans are a critical part of the process for building resilience in cities. Scientific models will be important in helping to establish the priorities, but uncertainties exist even within the models. The authors argue for creating networks for the exchange of knowledge. The two partnerships were highlighted; (1) the need to build relationships between scientific research and the development of policy and (2) building closer relationships between city officials and engineers

Duvenager, Ian, Ros Taplin, and Lindsay C. Stringer. "Appropriate Climate Change Solutions: Towards Sustainable Bioenergy Agro-production in Africa for Energy Equity and Poverty Alleviation." *The International Journal of Climate Change: Impacts and Responses* 2, no. 4 (2011): 101-114.

The authors argue that biofuel production in Africa could be a way to foster both environmental and social sustainability. Sustainable biofuel production could provide necessary revenue to fund infrastructure and build social capacities in communities that are challenged by poverty. The authors outline a framework for establishing a sustainable biofuels industry. The ten components included in the framework include: efficiency, biophysical sustainability, effectiveness and fairness, responsiveness, inclusiveness, accountability, consensus orientation, transparency, clear and enforceable law and agro-management.

Ekardt, Felix. "The added Value of the Environment-Ethical Aspects of Climate Change." *Journal of International Business Ethics* 2, no. 1 (2009): 46-58.

Ekart argues that two significant challenges stand in the way of the development of effective climate policy, including social distributive justice and competitiveness.

Trying to develop an equitable framework for mitigation policies is a particular challenge because inherent inequities exist. Inequitable policies will impact individuals with the least capacity to adapt. Ironically the poor contribute less to the loading of GHG into the atmosphere. The authors call for the need for distributive justice derived from Habermas' theory of justice. In the context of climate change and justice, the authors summarize, "a) Freedom presupposes certain equal preconditions which have to be preserved. b) Freedom of future generations and those on other continents has to be taken into account. C) Rules are necessary in order to secure freedom in the long term." (49)

Esbjorn-Hargens, Sean. "An Ontology of Climate Change: Integrating Pluralism and the Enactment of Mutiple Objects." ***Journal of Integral Theory and Practice*** **5, no. 1 (3 2010): 143-174.**

Esbjorn-Hargens argues that climate change must be understood as ontological pluralistic object from both a philosophical point of view and from a pragmatic stance. Climate change is not a single object; it is an issue with multiplicity. Understanding and embracing its diversity will lead to a richer understanding of how to respond to the urgent issue. Table 01 charts different professional understanding of how climate change is understood. (147) The diversity of responses in the how and what climate change is starts to reveal it complexity; it is simultaneously understood as a system, behavior, experience and culture. It is not is single object. It is multiple objects that overlap. One barrier to understanding climate change is that it requires "vision-logic", because it is abstract and it requires an understanding of space-time. Climate change is so captivating because it is both a social and ecological global problem. The author references Law and Urry's (2003) definition of ontological pluralism, "(n)o longer different perspectives on a single reality, they become instead the enactment of different realities." Therefore each discipline occupies different realities. In ontological pluralism there are multiple worlds and the interplay between them leads to question of ethics. There are multiple perspectives with multiple objects. Multiplicity in climate change can be understood from an epistemological, methodological or ontological perspective. Enactment involves the subject (who) method (how) object (what).

Ferreira, Leila da Costa, et al. "Governing Climate Change in Brazilian Coastal Cities: Risk and Stratgies." ***Journal of US-China Public Administration*** **8, no. 1 (2011): 51-65.**

Environmental sociology and environmental politics provide a critical way to review environmental problems. The author surveys risk theories. Beck's (2000) theory of risk is closely linked to globalization; he argues that climate change risks are universal, but they will have differential impacts related to adaptive capacities. Giddens defines two types of risk: an external one and manufactured one. Climate change is a manufactured, which is a new typology of risk. Ferrira goes on to state, "risk is the dynamics that mobilizes the societies that change, evolve and adapt." (55) In Brazil, major cities are located in coastal zones; climate change and sea level rise is an important issue for the future of the cities. The author argues that significant focus has been given to analyzing mega city's adaptation to climate change. However, there is a lack of study on climate change adaptation for small to medium sized cities. In Brazil San Paulo is taking the lead by setting a goal of reducing GHG emissions by 30 % and targeting transportation systems as the most critical system to rethink. The paper concludes local governments will play a key part in providing leadership and mobilizing efforts to confront climate change.

Gabriele, Gary A. "Advancing Engineering Education in a Flattened World." *Journal of Engineering Education*, July 2005: 285-6.

Gabriele argues for the need to diversify engineering students and the workforce to include a greater percentage of women and minorities. Gabriele calls for engineering education to start with tackling complex problems instead of simple, linear problems. He highlights that some companies have taken the lead by learning how to innovate and compete in complexity. In academia, research opportunities hold the same potential for innovation in complex problems. Engineering Education and Centers Division at NSF emphasize the need for innovative research not just reform in education. He advocates for "disruptive breakthroughs" to move engineering education away from out dated pedagogical approaches.

Glaeser, Edward. "Engines of Innovation." *Scientific American*, 09 2011: 50-55.

Cities are compact places with a wide array of infrastructural resources, a diverse range of intellectual expertise and economic resources. These are critical components for innovation that will effectively respond to the complex issue of climate change. Increases in population outpace the need for expanding infrastructure, which leads to greater efficiency in resource consumption in cities. Technology is important in developing smart, resilient cities. The article emphasizes

one of the most important advantages in cities is the higher rate of human collaboration and exchange of ideas. Technology supports collaborative processes, but the ability to meet in person is an essential part of creative exchanges between individuals. For many individuals, and particularly women, cities have provided methods for upward mobility that do not exist in rural communities. Cities have the potential to improve the economic capacity and the health of individuals, when designed in an intelligent way.

GHGMI. *Greenhouse Gas and Climate Change Workforce Needs Assessment Survey.* Survey, Washington D.C.: Greenhouse Gas Management institute, 2009.

Climate change is the issue that will define our time. Creating an effective workforce to address the problems for this and future generations will be critical. The Green House Gas (GHG) management institute report assesses global skills needed for collecting and analyzing climate data. There is a deficit of talent for responding to climate change, particularly GHG professionals. The workforce provides a critical link between policies and implementation of policies. Getting the issue of climate change into university curriculum provides a critical link to developing the skill needed for the climate change workforce. http://greenhousegassurvey.com/index.html [archived webpage].

Giddens, Anthony. *The Politics of Climate Change.* Cambridge: Polity Press, 2011.

Harrington, Michael. *The Other America: Poverty in the United States.* New York, NY: Touchstone, 1997.

Harrington's seminal book, *The Other America: Poverty in the United States* published in 1962 was a call to take the issue of poverty seriously and started the war on poverty in the United States. Harrington defines poverty as, "those who are denied the minimal levels of health, housing, food and education that our present stage of scientific knowledge specifies as necessary for life as it is now lived in the United States." (xiii) Harrington argues that poverty is not an adjective it is an entire state of being that is shrouded in a sense of hopelessness, loneliness, passiveness and isolation. He argues that poverty in America is invisible; increasingly those in poverty are physically isolated from affluent communities. Individuals suffering from poverty lack a political voice; to equitably address issues of climate change the most

vulnerable to risk have to be at the table.

Hollander , Rachelle, and Nathan Kahl. *Engineering, Social Justice and Sustainable Community Development.* Summary, National Academy of Engineering of the National Academies, Washington D.C.: National Academy of Sciences, 2010.

Humphrey, Stephen, and Robert Archer. *Climate Change and Human Rights: A Rough Guide.* Summary, Geneva: International Council on Human Rights Policy, 2008.

The IPPC reports have dedicated little attention to the issue of human rights in climate change. The International Council on Human Rights Policy (ICHRP) explores the linkages between climate change and social systems. Climate change will affect social systems in many important ways (i.e. access to food, gender equity, distribution of sanitary water and health. Mitigation and adaptation have human rights dimensions. In either case, they will be developed in the context of inherited injustices. Mitigation efforts will affect economic development patterns, access to food, distribution of water and allocation of land use. Adaption strategies face concerns of social equity in two important ways. First, the timing for implementing an adaptive measure is critical. Implementation of adaptations in the aftermath of a disaster results in human catastrophes, affecting those with the least ability to cope to the greatest extent. Secondly, if adaptation strategies are developed without equitable participatory process then injustices will continue. The report identifies critical areas for cross cutting research (i.e. enhanced ways to forecast human right impacts), information to policy tools, technology transfer, guides for governing adaptation processes, biofuels and climate change modeling. Climate change is an opportunity to work to ameliorate past inequities.

Irwin, Ruth, ed. *Climate Change and Philosophy: Transformational Possibilities.* New York, NY: Continuum International Publishing Group, 2010.

(review Chapter 07)

In chapter 8, Glazebook argues we are passed the point of debating if climate change is real; it is reality. Citing uncertainties in scientific research as a reason not to move forward is stalling efforts to respond to the urgent problem. Certainty, a pillar of modernist thinking, will not provide an effective framework for the issue

of climate change. She argues that, *” . . . what is certain concerning climate change: that suffering in consequences of climate change will accrue with inverse proportion to wealth.*" (164) The author uses Ghana as a case study for her arguments.

IPPC. *Cliamte Chnage 2007: Impacts, Adaptation and Vulnerability.* 2007. http://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_rep (accessed 2011).

Jamieson, Dale. "Climate Change, Responsibility, and Justice." *Science Engineering Ethics* 16 (10 2009): 431-445.

Jamieson argues there are two main types of risk associated with climate change: First, there is a long-term linear trend of change. Secondly there are periodic incidents of extreme change. He opines that anthropogenic climate change requires *practical responsibility*. He defines practical responsibility as, “concerns what we are responsible for doing while theoretical responsibility concerns what we are responsible for thinking.” (432) In terms of the moral responsibility he argues that climate change does not fit into the normative paradigm moral problem. In climate change ambiguity exists in three ways: in drawing a direct relationship between an individual doing harm to another; that the culprit and the victim are identifiable; and there is a close link in time and space between the incident and the affect. (432) In the normative context of moral responsibility climate change falls outside of the normal mold. The author sites Daniel Gilbert, a professor in psychology at Harvard, as “(m)oral emotions are the brain’s call to action. Although all human societies have moral rules about food and sex, none has a moral rule about atmospheric chemistry.” In addition, Jamieson argues that the ethical responsibilities of climate change fall out side a normative understanding of global justice. It is not one country directly asserting power over another. Again the situation is more ambiguous in climate change impacts. He refers to Nicolas Stern’s work, which calls for climate change to be understood as a risk management problem with components that cannot be quantified. Stern argues to prioritize the ethical dimensions over, “ the best economic study.” (435) An alarming statistic referenced in the paper is the 2009 Rasmussen Report, which concluded that 44% of American does not believe climate change is cause by human causes.

Kasperson, Roger E., and Jeanne X. Kasperson. *Climate Change, Vulnerability and Social Justice.* Assessment, Stockholm Environment

Institute, Stockholm: Stockholm Environment Institute, 2001.

It is an attempt to assess the potential impact of climate change, both existing and projected. Published in 2001, it was an early call to conceptualize the issue of climate change through the lens of social justice. The authors argue that climate change is occurring and there are inherent differentials in vulnerability, both socially and ecologically. Vulnerability is the capacity to be ill affected from environmental or social stress. Some of the key impacts climate change will have on social systems include food and water insecurities, access to resources, changes in cultural patterns and risks to human health. Due to sea level rise marine ecosystems, particularly coastal, are some of the most vulnerable ecosystems systems. They are also one of the most productive ecosystems. Arguing for social justice in climate change to be moved to the forefront, the authors argue to adopt Agarwal and Narain's (1999) two principals of social justice. They include, "the principal of convergence and the principle of equitable entitlement." (14) Industrial nations should take urgent measures to reduce GHG emissions and developing nations should work to limit their emission amounts. The authors argue that risk management is one part of a two-part equation for combating climate change. The other part is differential vulnerability to create effective resilience strategies. Resilient strategies will include: broad transitional strategies, addressing poverty and inequities, technical flow, governance and knowledge gaps. (14)

Klinsky, Sonja, and Hadi Dowlatabadi. "Conceptualization of justice in climate policy." *Climate Policy* 9 (2009): 88-108.

(3.3 Technology) Climate change policies have ethical implications. The authors analyze the role of distributive and procedural justice in climate change policies. The authors opine the way in which climate change technology is developed, implemented and the degree to which it is accessible is important in distributive justice. The transfer of technology is important. (95) "Throughout this article, technology's maverick ability to transform the climate policy landscape has been stressed." (102) Klinsky and Dowlatabadi argue to include distributive justice in climate policy, three pieces of information must be included: which distribution rules are used; how climate change and policy is understood; and the way in which the cost and benefits are quantified. (89) A framework for understanding the "burden" that will be shared is an important concept in conceptualizing policy. The authors reference Rawls' theory where justice and fairness are intricately linked. Rawls writings on distribution stipulate that additional harm is not caused to the

poorest. The authors argue that distributive justice in climate change includes equal protection from climate change impacts, equal entitlement to the atmosphere, and equal share in climate change costs. Procedural justice in climate change will require that all countries are involved in negotiations and at a local scale adaptation measures will require representation from inclusive stakeholder group. Page 97-98 a is graphic representation of different characteristics of climate change policies; “technology central” is one the characteristics. Page 13 has a schematic of the conceptualization of distributive justice in climate change policy.

Lynch, Mathew. *A systematic approach to project social risk and opportunity management.* Summary, Engineers against poverty, London: Engineers against poverty.

The article published by Engineers Against Poverty (EAP) outlines a method for incorporating social risk and opportunity management into engineering projects. Social risk is often overlooked or not adequately engaged because it is not well understood by project managers. The framework for including social dimensions into engineered systems starts with building genuine relationships with community stakeholders and focusing on the concerns that are raised. The framework includes three key components including understanding social risk, strategies for managing social risks and modifications to risk analysis and management. EAP as arguing that projects need a legal license for a project, this is the norm and a social license to operate (SLO). Components of the SLO include, context-specific, dynamic process, inherently non-determinant process, understanding stakeholders issues and the authenticity and wide range of understanding for potential risks. Box 4 has a list of case studies of both poor and positive management practices for community involvement. Key components of successful engagement include quality outreach, getting the community involved early in the process and maintaining engagement throughout the process.

Manzo, Kate. "Imaging vulnerability: the iconography of climate change." *Area* 42, no. 1 (2010): 96-107.

Ad campaigns have the potential to raise consciousness about climate change, but how it is conceptualized will affects its impact. The article examines climate change campaign iconography in the United Kingdom. The article contrasts two different campaigns, one targeting “social engineering”, individual responsibility for action and the second a “bearing witness” to climate change. The images show the

vulnerability of an individual in a dangerous situation. The author argues there are three categories of campaign images including the globe, the environment and living beings; each of the categories has a certain types of corresponding images. (Why do they need to be separated into categories?) There are different approaches in a campaign, it can focus on “observed evidence” or take a “scenario” approach. The tone of many campaigns is gloom and doom; is that the most effective way to motivate people to change behaviors? Do we need an ad campaigns like the ones in England to raise awareness about climate change in the U.S.? I cannot think of a more important campaign!

Meadows, Donella H. *Thinking in Systems.* Edited by Diana Wright. White River Junction, VT: Chelsea Green Publishing, 2008

Thinking in Systems explores methods for problem solving from the scale of an individual to the global community. She translates systems thinking from computer systems to the rest of the world in an accessible manner. Thinking in systems outlines an effective way to approach understanding socio-ecological systems. Part two, *Systems and Us,* is particularly useful for understanding why systems work, why they can be surprising and what are system traps. Meadows argues, “(s)ystems need to be managed not only for productivity or stability, they also need to be managed for resilience-the ability to recover from perturbation, the ability to restore or repair themselves.” Climate change will necessitate building resilience into engineered systems.

Mearns, Robin. *The Social Dimensions of Climate Change: Equity and Vulnerability in a Warming World.* Edited by Andrew Norton. Washington D.C.: The World Bank, 2009.

Mitcham, Carl, and David Munoz. *Humanitarian Engineering.* San Rafael, CA: Morgan & Claypool, 2010.

Moorthy, Ravichandran, Sivapalan Selvadurai, Er Ah Choy, and Novel Lyndon. "Bioethics Principles in the Teaching of Climate Change." *American Journal of Applied Sciences* 8, no. 10 (2011): 962-966.

The paper analyzes why and how bioethics- the philosophical study of the ethical relationships between the humans and the environment- can be used to effectively teach about the complexity of climate change. The authors conducted an assessment of their case study approach and concluded that using a bioethics

framework is an effective way to engage the students in the complexities of climate change. A bioethics approach provides a way to develop critical thinking skills and awareness about ethical responsibility. The case study- Real, Urgent and Personal- was implemented in a course at the University of Kebangsaan in Malaysia. The case study developed into a twenty-one page report focusing on climate change and then its ethical implications. The Interchurch Bioethics Council in New Zealand wrote the report. A 90-minute teaching period complemented the case study report. To assess the knowledge and understanding that students developed through the case study method the assessment survey used Bloom (’56) and Lee’s (‘99) taxonomy of cognitive domains.

Mutizwa-Mangiza, Naison D., Ben C. Arimah, Inge Jensen, Edlam Abera Yemeru, and Michael K. Kinyanjui. *Cities and Climate Change.* Global Report on Human Settlements, UN-Habitat, United Nations Human Settlement Programme, Washington D.C.: Earthscan, 2011.

Newman, Alizabeth. "Bridging the Justice Gap: Building Community by Responding to Individual Need." *Clinical Law Review* 17, no. 615 (2011): 615-669.

Nordas, Ragnhild, and Petter Nils Gleditsch. "Climate change and conflict." *Political Geography*, 2007: 627-638.

Odenbaugh, Jay. "Subsistence versus Sustainable Emissions? Equity and Climate Change." *Environmental Philosophy* 7, no. 1 (2010): 1-15.

Climate change is a moral issue; it requires fairness in benefits and burdens in reducing GHG emissions. Achieving equity in mitigating climate change requires two types of principles: historical and time-slice principles. (5) The historical principle argues that developed nations have contributed more to the GHG emissions therefore share a greater level of responsibility and obligation to compensate developing nations. The worth of the historical principle is challenged from two angles: (1) to developing a level of compensation that would find all parties in consensus would be an obstacle; and (2) many believe that in order to be morally responsible for consequence there would have to have been a reasonable understand of the impacts of industrialization on the atmosphere. On the other hand the historical principle cannot fully be discounted because awareness the detrimental effects of pollution on the atmosphere has existed for a period of time.

In 1956 President Lyndon Johnson's Environmental Pollution Board warned that changes in the climate would occur as a result of the burning of fossil fuels in the atmosphere. The time slice principle is based on equal per capita share for the atmospheric sink. The author contrasts two writers. Singer argues for a utilitarian approach. He claims that to establish fix equity on a per capita *maximum* a cap and trade system should be adopted. Shue argues that a fair distribution of GHG emission is determined by *subsistence* per capita basis; each individual would have access to minimum emission levels. According to Odenbaugh, The *subsistence minimum* will allow for greater amount of GHG emission than *sustainable maximum*.

Odoemene, Akache. "Social Consequences of Environmental Change in the Niger Delta of Nigeria." *Journal of Sustainable Development* 4, no. 2 (2011): 123-135.

This paper explores the socio-environmental interdependencies in the Niger delta; it focuses on the social impacts from environmental change. The region has been dramatically altered by the development patterns of petrochemical companies. Since the 1990's 25% of the GDP is in petroleum production. It is an important case study for the linkages between environmental degradation, economic development and social justice. The paper uses Beck's Risk Society Theory; he argues that traditional social institutions are being replaced by individual, global and reflective society. Beck's theory explores the relationship between technology and society. A difference in perception exist, there are significant economic benefits to extracting the oil, but at the same time people living in the Niger delta view it as a threat to the environment that has sustained them. The destruction of the mangrove community has left the region more vulnerable to potential climate change impacts. Social impacts from the insertion of the petrochemical company include the expansion of youth militancy, increasing rates of kidnapping and hostages, increasing incidents of state violence and suppression, higher rates of violence between communities, designation of cultural values, higher rates of poverty, exasperated social and economic inequities, marginalization and oppression of women. The iron of the Niger delta region is that success has increased risk, which is analogous to Beck's Risk Society Theory. The article ends with a warning that the Niger Delta could be the next Gulf. (131) (Additional research needed on the climate change vulnerability as a result of mangrove depletion and other changes in environment.)

O'Neill, Saffron J., Mike Hulme, John Turnpenny, and James A. Screen. "Disciplines, Geography, and Gender in the Framing of Climate Change." *American Meteorological Society*, 2010: 997-1002.

Good introductory overview on the multiple framings of climate change. Epistemological hierarchy: certain aspect of climate change is promoted while other aspects of it are neglected. IPPCC 3rd assessment report has been biased toward physical and economic. The Copenhagen Climate Congress (2009) established six key areas of response, base on the IPCC's fourth assessment report, including Climate trends, Social and Environmental Disruption, Long-term Strategy, Equity Dimensions, Inaction Is Inexcusable and meeting the challenge. The CC Congress had a greater degree of epistemological diversity represented rather than IPPC report. The paper highlights four key ideas from the abstract presented at the conference including: the *disciplinary representation* of climate change in which the geosciences, through the use of catastrophes is predominate; the need for greater representation for all geographic regions for a better informed understanding of the variable impacts of climate change; women's voices are underrepresented in the global climate change discussion and women are more vulnerable to climate change impacts; and there is a *knowledge hierarchy* in climate change that assumes a linear progression of knowledge from science to social sciences when real world situations deviate from a linear construct.

Paavola, Jouni. "Science and Social Justice in the governance of adaptation to climate change." *Environmental Politics* 17, no. 2 (2008): 644-659.

Uncertainty complicates the decisions and policy development for climate change. The article argues that depending on scientific data is not enough for the development of effective policies; policies are about values and ethics. Science and social justice are part of a two-part approach for developing effective climate governance. In uncertain, using a rational choice model can be an effective approach; rational choice approach has three assumptions: (1) actors want to improve their own utility, (2) actors have accurate knowledge about what will improve their utility, and (3) actors have limited cognitive capacity. It is impossible to have perfect knowledge so actors have to find way to deal with their limited cognitive capacity. Radical pluralism, same choice with difference motivations, does not show the preferences of the individual agents. Conflict often goes hand in hand with environmental governance and therefore the decision making process cannot be reduced to a cost benefit analysis. Therefore in a decision making process it is

good to start with what are the goals and the values that will shape the decision making process. Paavola and Adger define social justice as “(t)he justification of environmental decisions related to both distributive and procedural justice.” (652) The author cites Walzer theory of *complex equity,* which “requires the absence of domination of one group across ‘spheres of justice.’” Climate justice is multi-dimensional with complex linkages.

Parenti, Christian. "Pakistan One Year after the Floods." *The Nation*, 2011: 23-26.

Parks, Bradley C., and J. Timmons Roberts. "Climate Change, Social Theory and Justice." *Theory Culture Society* 27, no. 134 (2010): 134-166.

An assessment of the human impacts from the Indus’ floods in 2010, affecting over 20 million people; it left over 10 million homeless. The catastrophic flood occurred after years of drought in the Indus Basin. The floods exasperated already existing social inequities such as poverty in the region. Pakistani is in a precarious condition as the impact of climate change increase; the country has a high level of risk because of its vulnerability to extreme weather and the existing social disparities. After the waters have receded and the aid is winding down, people have refused to return to their homes because of the risk and inhuman conditions enforced by the powerful landlords. The climate refugees would prefer to stay in the desolate camps rather than return home. The structure of Pakistani politics lends it self to corruption and bribery; when a serious planning project is needed the work is often outsourced to those with greater expertise, like the World Bank. Compounding the political corruption in Pakistani, the Indian government is altering the flow of tributaries of the Indus River by adding dams and tunnels.

Ragnild Nordas, Nils Petter Gleditsch. "Climate change and conflict." *Political Geography*, 2007: 627-638.

Written in 2007 the paper analyzes the security and social impacts of climate change. The 2001 IPPC report defined climate change as a global, political issue. The 2007 IPPC report projected a wide range of impacts climate change will have on environmental systems, which in turn will affect human systems. The paper argues that there is a gap between climate change research and the study of conflicts and this is evident in the 2007 IPPC report because little attention is given to the security threats from climate change. Some U.S. generals have recognized that climate

change will exasperate existing insecurities and inequities. The IPCC links climate change and conflict because of increased risk of political instability, mass migration of individuals, the distribution of response to climate change, increased water insecurities and increased food insecurities. At the time of the publication of the paper the authors point out that there are not many peer-reviewed papers on the causal relationship between climate change and conflict. Five papers are cited as analyzing the issue: Barnett and Adger (2007); Hendrix and Glaser (2007); Meier Bond and Bond (2007); Raleigh and Urdal (2007); and Fearon and Laitin (2003). Is there a link between migration and conflict? How effective are conflict models? The paper argues for a closer link between climate change models and conflict models. The authors cite a paper by Theisen and Brandsegg (2007), which argues future conflicts will be the result of scarcities rather than conflicts between states. The authors argue that the causal links need to be mapped and analyzed; better models need to be developed to assess technical and social capabilities to develop a better method for predicting high-risk conflict areas that will be more susceptible to climate change impacts. (635)

Rao, Mala, and Amit Samarth. "Population Dynamics and Climate Change: Links and Issues for Development." ***Journal of Public Health*** **32, no. 2 (2010): 163-164.**

Ratti, Carlo, and Anthony Townsend. "The Social Nexus." ***Scientific American*****, 09 2011: 42-48.**

The article argues that the best way for innovation in cities is to support and bolster human capital. Gathering and analyzing quantifiable data will be critical for making effective, efficient changes in cities. Portable technological devices are being used to monitor cities in different capacities and subsequently lay the foundation for innovate change. City dwellers are already contributing to experiments in city laboratories through the use of personal technological devices. In addition, the city of Copenhagen has installed monitoring devices on public bikes to assess pollution and noise levels in the city. The distributed, low cost systems expedites the collection of data faster than traditional, expensive infrastructure systems. Participation in city laboratory projects is a bottom up approach to create innovation in cities. Through the process individuals are gaining a better understanding of their impact on the overall quality of life in the city. Both bottom up and top down strategies will be needed to make efficient change at the pace needed for climate change; bottom up approaches are critical for innovation.

Riley, Donna. *Engineering and Social Justice.* San Rafael, CA: Morgan & Claypool Publishers, 2008.

Riley, Donna, and Dean Nieusma. "Designs on development: engineering, globalization and social justice." *Engineering Studies*, 2010: 29-59.

Rosales, Jon. "Economic Growth, Climate Change, Biodiversity Loss: Distributive Justice for the Global North and South." *Conservation Biology* 22, no. 6 (2008): 1406-1417.

Argues for understanding the links between climate change, economic expansion, consumption rates and changes in the biophysical world. The impacts of climate change have already affected the distribution and biodiversity of species across ecological systems. Climate change will require rethinking economic growth patterns and subsequently creating equitable global policies on growth. There are four international policy principles to consider: polluters are responsible for compensation, basic needs must be met, the capability to pay and common but differentiated responsibilities. (1420) Rosales argues for using distributive justice as a basis for developing an equitable, global response to climate change. The Northern hemisphere must take the lead, or the South hemisphere will be less likely to engage in mitigation efforts. The author argues for a coupling of caps and caps and trades as a method for redistributing international wealth. Rosales argues that Rawls (1971) theory of *justice and fairness* lays a good foundation for a framework of global economic growth that benefits those that are the most disadvantaged.

Rosenzweig, Cynthia. "All Climate is Local ." *Scientific American*, 09 2011: 70-73.

Innovative climate change solutions are starting at a municipal level because local leaders are the most aware of the context specific threats that face their communities. In the United States local government are already confronted with pressing, climate related issues and are moving forward without strong federal leadership. Rosenzeweig calls for the need to engage a more diverse group of citizens in the conversation about adapting to the impacts of climate change. She states that it is important to include those that are the most vulnerable to climate change and typically those are individual with the least ability to respond to change.

Rosenzweig, Cynthia, William Solecki, Stephen Hammer, and Shagun Mehrotra. *Climate Change and Cities: First Assessment Report of the Urban Climate Change Research Network.* Cambridge: Cambridge University Press, 2011.

Rosenzweig, Cynthia, William Solecki, Stephen A. Hammer, and Shagun Mehrotra. "Cities lead the way in climate-change action." *Nature* 467 (10 2010): 909-911.

Ryan-Collins, Lily, Karen Ellis, and Lemma Alberto. *Climate Compatible Development in the Infrastructure Sector.* Assessment, Engineers against Poverty & Overseas Development Institute, London: Institution of Civil Engineering (ICE), 2011.

The *Engineers Against Poverty* publication assesses the ”nexus of climate change, infrastructure and development.” Developing coherent policy frameworks will be critical for successfully meeting and building capacity to address climate change. Infrastructure policy makers and engineers are key players in both mitigating and adapting to the impacts of climate change. Infrastructure policy makers and engineers are key players in both mitigating and adapting to the impacts of climate change. Infrastructure is challenged by the structure of existing systems and institutional roadblocks. The IPPC report claims that vulnerability to climate change is the result of three conditions: “exposure to risk, sensitivity to risk and adaptive capacity.” (iiv) Infrastructure will need to be transformed by *(1)* the energy sector will respond by reducing demand, changing to low carbon energy sources and capturing and storing carbon; (2) the building sector has great potential for rapidly reducing emissions because technologies exist but there is a lack of awareness or ability to implement the changes; (3) transportation sector needs to transform to a modal structure; (4) development of adaptation infrastructure; and (5) baseline engineering stands will need to change to adjust to the impacts from climate change. The report outlines three *main challenges* to responding to climate change impacts: financial limitations, technological access and the capacity for States to respond to climate change. Technological development and innovation will be critical for mitigation efforts and it will play a part in adaptation measures. Technology will be used to increase capacity of existing technologies and developing innovative solutions. Transferring technology is critical because of the urgency of climate change; but local, context based solutions will also be important. Technological “leapfrogging”, skipping carbon intense energy structure,

will be an important strategy for developing economies. In adaptation transfer of technologies might be more relevant by region rather than from developed to developing country. Clean Development Mechanism (CDM) funds individual projects, not sector wide initiatives. Technology will transfer more successfully if innovative technologies are linked with initiatives, increasing adaptive capacities. *Technology transfer methods* include (1) Clean Technology Fund (CTC) (2) Multilateral Technology Acquisition Fund (MTAF), The Adaptation Fund and *regional technology innovation centers* have been proposed to respond to local needs and contexts. (UNDESA). *The paper includes a database of reference, by the Overseas Development Institute (ODI), by country (Bangladesh, China, Brazil, Ethiopia, Guyana, Malawi, Mexico, Nigeria, Rwanda, UK and Germany) for case studies research.*

Schienke, Erich W., et al. "The Role of the National Science Foundation Broader Impacts Criterion in Enhancing Research Ethics Pedagogy." *Social Epistemology* 23 (2009): 317-336.

NSF broader impacts expand the role of science to identifying, understanding and responding to social needs. NSF desired outcomes of its investments: (1) inquires and the development of knowledge at the frontier of science and engineering; (2) connecting discovery to service to society; (3) diverse and globally conscious workforce; (4) improve science and math proficiency; (5) timely and relevant information. NSF is interested in projects with positive social impacts. NSF believes that pedagogy in research ethics underrepresents ethical issues. Science should be “responsible” and “responsive”. In America COMPETES Act (ACA) universities requires that all students that are funded by NSF grants must be trained in responsible and ethical research conduct. “Ethics education is particularly critical to the science and engineering community as it faces an increasingly competitive funding environment; rising collaboration with internationals colleagues who may follow different guidelines; and growing recognition of the relevance of science and engineering to social, economic, and ethical issues of wide public an political interest.”

Singleton, David. "Poverty alleviation: the role of the engineer." *The ARUP journal*, 2003: 3-9.

This piece highlights case studies (all ARUP projects) that have focused on engineering solutions with the objective of reducing poverty. The section *Sound*

engineering solutions to poverty alleviation, outlines a three-point framework for socially responsible engineering solutions. First, when engineering solutions are developed, engineers need to be cognizant of the solutions dependence on and consumption of natural resources. Secondly, the life cycle of an engineering project must be appropriate for the context and affordable. Finally engineering solutions should be developed with the local expertise and the outcomes should strive to empower the surrounding community.

Stern, Nicholas. *The Economics of Climate Change.* Cambridge University Press, 2007.

Terry, Geraldine, ed. *Climate Change and Gender Justice.* Warwickshire: Practical Action Publishing, 2009.

UNDP. *Making Progress on Environmental Sustainability.* Analysis, Environment and Energy Group, New York: United Nations Development Programme, 2006.

UNDP. *Millennium Development Goals.* 2011. http://www.undp.org/mdg/index.shtml (accessed 2011).

Vongalis-Macrow, Athena. "Developing Pedagogies for Teaching about Climate Change." *The International Journal of Learning* 17, no. 9 (2010): 237-247.

Developing knowledge about climate change is complex and challenging. The paper is a response to Stevenson (2007) call for “constructing discourse of professional learning that reflexively build, sustain and develop such spaces and opportunities for enacting meaningful environmental education is school.” Typically the approach has focused on scientific facts. Applying scientific knowledge is multidimensional; first it requires understanding the science foundation and then it requires a reasoned application of the knowledge in a context. Therefore a socio-scientific approach is appropriate for teaching about the complexities of climate change. The paper analyzes the results from their empirical study to assess how to develop an effective pedagogical approach for teaching climate change. The results from the study found that social knowledge dominates over scientific knowledge in forming opinions about climate change. The study analyzed the *reasoning patterns* for forming opinions about climate change. Education can help to change behavioral patterns that are exasperating climate change impacts. If behavior change is an important response

to climate change then related theories on behavior change are references for teachers. Papers on *reasoned action* by Fishbein (1993) and Pruneau (2001) are citied. Social action theories based on agency help to develop a student's sense of responsibility. Inquiry based teaching methods promote active learning; guiding students to accurate information sources is critical. Polanyi (2009) wrote, "science's greatest gift to civilization is its acknowledgment of fallibility . . ." Climate change will have a wide range of impacts, which will require different learning frameworks. An effective approach to teaching about climate change starts a teacher's strengths as a point of entry for understanding the complexities of climate change.

Watkins, Kevin. *HDR Fighting Climate Change: Human solidarity in a divided world.* Human Development Report, The Human Development Report Office, United Nations, New York: United Nations development Programme, 2007.

Webb, Janette. "Making climate change governable: the case of the UK climate change risk assessment and adaptation planning." *Science and Public Policy*, 2011: 279-292.

Risk assessment is a typically approach to managing climate change adaptations strategies. This paper analyzes the first assessment by the UK Climate Change Risk Assessment (UK CCRA), particularly its framing of the problem; the assessment uses both risk and economic techniques to quantify its results. The UK CCRA project uses a predominately top-down approach. It conceptualizes climate change as a process by which biophysical systems will be altered and those changes will impact social and economic systems. The author argues that this approach frames society as an object that is acted upon; questioning if this is a stable framework for addressing climate change. Historically, risk assessments have been used to shape or adapt policies and regulations. Risk assessments define the acceptable levels of social, environmental and economic risk. Risk assessment depends on metrics. Limitation, assumptions and biases exist in risk assessment depending on the parameters incorporated in the model. Therefore risk assessment is inherently controversial; boundaries that are established to frame the risk problem can be challenged and proven inadequate. The author argues, "The technical devices of risk assessment and economic cost-benefit analysis can be interpreted not as providing objective solutions to pre-given problems, such as hot to adapt society to climate change, but as instrumental in problem definition itself, and as embodying and 'naturalizing' certain assumption about society, social values and political priorities, as well as

potentially obscuring or strategically deleting alternative.” (281) Analyzing the UK CCRA’s first report reveals gaps in knowledge about the risks and impacts of climate change: definitions of thresholds, assumptions, timing and analysis of fundamental issues. The CCRA recommends a comprehensive national plan for locally implemented adaptations. The report identifies 11 sectors with 575 potential impacts. The boundaries between sectors are controversial and open to debate. Even with climate uncertainty the report attempt to prioritize adaptation measures across sectors. Areas identified for further quantitative analysis include *cultural heritage, climate space and biodiversity and habits*. (285) The authors argue that civil society should aid in developing values; this is underdeveloped. Risk management tools have proven to be unable to understand critical risks and interconnected risks. Climate change is inherently an intensely complex, interconnected issue. The author concludes, “ Acknowledging the limits of knowledge is not, however, and excuse for delay, but a reason for acting according to the precautionary principle, through public deliberation, careful consideration of a range of alternative scenarios and allowance for space to fail. . .” Climate change requires that we understand how to make better decisions in an uncertain world. (Marshall and Picou, 2008). Can priorities for adaptation be ascertained through purely technical models with standardize metrics? The author and peers argue that climate change cannot be resolved using the normative structure between science and the development of policy. Rather than seeking the ‘perfect’ set of metrics, emphasis should be placed on excellent political leadership; decision about prioritizing adaptation are based in politics and society. The approach to the decision making process is critical to effectively and equitably adapting to climate change.

Wulf, W. A. "The Urgency of Engineering Education Reform." *Laboratory for Innovative Technology and Engineering Education 2002 Distinguished Lecture. .* July 2002.

In 1998 Wulf, the former president of the NAE, gave a speech calling for urgent reform in engineering education. He defines engineering as “creating, designing what can be, by is constrained by nature, by cost, by concerns of safety, reliability, environmental impact, manufacturability, maintainability, and many other ‘ilities.’ Engineering is not applied science.” He opines that the practice of engineering has changed and that there is an urgent need to reform education. He argues educational reform should include: changes in curriculum, pedagogy and diversity. In engineering a bachelor degree is considered a professional degree; stricken

curriculum requirements decreases the exposure an engineering student has to the social sciences. The engineering academic reward system for faculty favors research rather than professional practice experience; research is critical, but a diversity of experience and expertise would be beneficial for students. He warns of narrow specialization in education because engineered systems are increasingly complex and they involve linkages across systems. He discourages a purely lecture format, because it does not allow for valuable student-to-teacher or student-to-student interactions to occur. Wulf argues that effective a relevant careers in engineering necessitate the need to formalize life long learning.

Additional resources/references

THEORIES OF JUSTICE:

1. Beck. Risk society: towards a New Modernity. 1992
2. Beck. Risk Society theory adaptation (Niger paper)
3. Habermas' theory of justice

EXAMPLES:

1. (Bangladesh) - Baten, Khan. Gender Issue in Climate Change Discourse: Theory Versus Reality
2. (Pakistan) - Tropic of Chaos: Climate Change and the New Geography of Violence. Christian Parenti (Pakistan)
3. (Vietnam) - Adger, W. N., Kelly, P. M. and Ninh, N. H. (eds.) (2001) *Living with Environmental Change: Social Resilience, Adaptation and Vulnerability in Vietnam*, Routledge: London.
4. (Sudan) - Theisen, Brandsegg. The environment and not-state conflicts in sub-Saharan Africa. 2007

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