Science of Post 2012 Global Climate Change Treaty
POSC333 – Sustainability Science
Spring 2009
Carleton College, Northfield, MN

The Problem Statement

President Obama has invited your team to advise him in grappling with his administration's main question on global climate change and the global responses to it. The question his administration asks your team is: what scientific finding should be a guide to post 2012 climate change treaty and how can that climate change science and political economic interests of five major emitting countries be reconciled so as to achieve a sensible and threat-thwarting climate change treaty after Kyoto Protocol expires in 2012? He specifically asked you to look top five countries' positions on climate change science and their political economic interests and use their positions as a global political position and evaluate how the United States should respond to them.

Learning Goals

There are three learning goals in this project for students: (1) to understand the role of science in global climate change treaty; (2) to analyze how science and political socioeconomic factors interplay in making global climate change treaty; and (3) to examine diversity of approaches in addition to the global climate change treaty approach to global climate change. For each of these goals, students are required to demonstrate qualitative and quantitative reasoning in their analysis and projection.

Processes of the Project

Step 1: Your team will identify top five GHG emitting countries and select one of top five countries as a case study. Meanwhile, students will identify top four credible scientific findings regarding factors that explain the global climate changes due to GHGs (independent and governmental reports) and identify the top influential body of science (such as IPCC, Government's reports, independent scientist findings). Then differentiate among them. Chapter 3 "Climate Change: present scientific knowledge and uncertainties" in *The Science and Politics of Global Climate Change: A Guide to the Debate* by Andrew Dressler and Edward A. Parson, Cambridge University, 2006 will be provided as an initial text to help in this step. Danya Leebaw, a Reference and Instruction Librarian for Social Sciences Librarian, at the Gould Library and I are working to compose a research guide website for team projects as well.

Step 2: Identify cost and benefits of the selected country based on political and economic interests for top four scientific findings and project what position the country might take. In this section, quantitative assessment of implementing the science and position of your selected country should be the focus.

Step 3: Based on the findings from step 2, identify approaches and prioritize them in line with the position of selected country on the science of climate change. The country may take one or more approaches such as mitigation, adaptation, technological innovation approaches and etc. Similarly,

some countries may desire to approach the issue based on economic sectors responsible for GHG emission; based on levels of economic development among countries (grouping countries and their responsibilities rather than treating them equally and individually); and/or traditional treaty approaches regardless of the state of economic conditions. Identify one or two approaches that your country should take onto UNFCC conference in 2012.

Step 4: After completing step 1 to 3, your team should be prepared to conduct analysis of how climate change science will be interpreted in different countries, different sectors or economy, and how your selected country will/should respond to the challenge of the post 2012 global climate change treaty negotiations. Analyze the selected country's position based on the findings from step 1 to 3 and provide recommendations for the country.

Suggested sections for this team paper are: (1) Introduction; (2) Method; (3) Climate Change Sciences; (4) Country Positions; (5) Political and Economic Dimensions of Science based on selected country; (6) Analysis; (7) Synthesis; and (8) Conclusion.

Carbon Sequestration of Eastside Neighborhood Trees
POSC333 – Sustainability Science
Spring 2009
Carleton College, Northfield, MN

The Problem Statement

This project seeks to investigate the science of carbon sequestration of urban trees so as to evaluate whether there would be potential benefits to the public for reducing GHG emission to the atmosphere. The central question this project seeks to answer is: how many trees are needed in the Eastside Neighborhood of Northfield, MN in order to absorb all carbon dioxide emitted by human activities in the residential area. In answering this question, the team will investigate social, economic, legal, and political dimensions of this carbon sequestration of trees in the neighborhood.

Learning Goals

There are three learning goals for this project: (1) to understand the science of carbon sequestration; (2) to understand economic, legal, political, and social dimensions of urban forest which is meaningful not only for human residents but also for a whole host of living animals and insects; and (3) to understand dynamic linkages between science and society relating to urban forest and carbon sequestration.

Step 1: This team will first conduct mini-field research to estimate number of trees in the neighborhood. In so doing, the team will walk through 2nd East Street between the division and second street corner to the corner of 2nd East Street and Oak Street (Carleton College's Headley House) and count trees on both sides of the street. At the same time, identify tree species by asking neighbors. Use the data you collected to estimate the number of trees in entire neighborhood. The United States Department of Energy has developed a Method for Calculating Carbon Sequestration by Trees in Urban and Suburban Settings. This method paper is provided for this step and the project. You can also obtain very useful and relevant information at the DOE's Energy Information Administration's website at http://www.eia.doe.gov/environment.html. In addition, the neighborhood maintains its presence in the web at http://northfieldeastside.org/ which can be a useful resource. The Environmental Quality Commission of Northfield at http://www.ci.northfield.mn.us/government/boards/environmentalquality should be a useful source for this project. Perhaps some study has been done in counting trees and species.

Step 2: While estimating trees, species, and conducting field work, the team should also obtain population data and estimate average carbon emission per capita per month or annual corresponding to the rate of carbon sequestration by trees. For instance, if you plan to calculate carbon sequestration per month by trees, you would want to estimate carbon emission per capita per month. Danya Leebaw at the Gould Library is willing to work with your team to locate this data. It will also be useful to have social economic data such as household income, professions, car ownership, and utility bills.

Step 3: City codes, zoning laws, state laws, and federal incentive programs for keeping trees and governing green spaces and urban trees should also be investigated to understand the social and political dynamics of urban trees.

Step 4: Critically interpret your data collected in step 1 to 3 to answer the main questions and to analyze social ecological dynamics of carbon sequestration by urban trees in the neighborhood.

Step 5: Analyze what you find in interpreting the data in step 4. Provide policy recommendations. For instance, if carbon sequestration by urban trees helps reduce carbon emission into the atmosphere significantly, should citizens who plant trees receive tax incentives through President Obama's favored Cap and Trade approach or "cap and dividend" approach proposed by Congressman Chris Van Hollen of Maryland who introduced climate legislation on April 1, 2009 in the U.S. Congress.

Suggested sections for this team paper are: (1) Introduction; (2) Method; (3) Trees and People in the Eastside Neighborhood; (4) Carbon Sequestration of the Neighborhood Trees; (5) Analysis of Science and Society Relations; (6) Synthesis and Recommendations.

Quantifying Boundary of Social and Ecological Systems
POSC333 – Sustainability Science
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Carleton College, Northfield, MN

The Problem Statement

Understanding how an individual livelihood system or a livelihood system of a community affects surrounding ecosystem and global ecosystem is crucial for identifying the boundaries of social and ecological system. This project asks: how can, if they are feasible, boundaries of social systems and ecosystems be identified so as to conceive a boundary of social ecological system. This is a central question for this project. In order to understand the validity of the question and to investigate possible methods and research approaches, we will confine this project to the Rice County, MN as a social system and investigate its relationship to immediate surrounding ecosystem.

Learning Goals

There are three learning goals for this project: (1) to understand whether boundaries of scales of social ecological systems can be methodologically conceived and to analyze how scale issue interplay in multilayered governance; (2) to apply regression analysis to understand correlation between social systems and ecosystems; (3) to understand whether and how the "problem of fit" between social system and ecosystem can be defined and analyzed.

The Processes of Executing the Project

Step 1: Identify, through team discussion, what the project's dependent variable would be to represent the consequences of social system to ecosystem. Possible variables are number of natural disasters that occurred in Rice County, MN over past 100 years. Another dependent variable can be climate change in temperature over past 100 years in Rice County, MN. And then locate the data of dependent variable with the help of librarian.

Step 2: Identify at least two hypotheses to be tested. One could be that carbon emission by human activities of Rice County residents (independent variables) induces increase in temperature (dependent variable) during the past 100 years. Another hypothesis will state that the increase in agricultural land induces more natural disasters in during the past 100 years in Rice County, MN. Collect data of these two independent variables.

Step 3: Set up for regression analysis using statistical software the team decide to use. And run regression analysis as appropriate to test these two hypotheses. Discuss validity of testing, method, and statistical interpretation of the data.

Step 4: Provide analysis of this regression analysis and the findings. And also discuss the answer to the central question of the project and its validity. Are there any other questions emerged to improve the approach and method to answer the central question? What are your team's suggestions?

Step 5: Synthesize your findings and discuss social and ecological dimensions of the project question, hypotheses, and your analysis. For instance, how does land use and land cover change (increase in agricultural farms/land) over time affect climate patterns or natural disasters? Is boundary identifiable in universal sense? If so what techniques or method might be more tenable to conduct future research? If boundaries are infeasible to define, then what factors serve as sources of complexity in this problem?

Suggested sections for this project paper are: (1) Introduction, (2) Method, (3) Description and Interpretation of Variables; (4) Statistical Analysis; (5) Analysis of Findings; (6) Synthesis and Recommendations; and (7) Conclusion.

Mystery in Alaska
POSC333 – Sustainability Science
Spring 2009
Carleton College, Northfield, MN

The Problem Statement

What is the role of ecosystem science in the Alaskan fishing ban imposed in July 2000 in light of the concerns over the decline of Steller's sea Lions in Alaska? This question was unpacked in the documentary film broadcasted in Nature Program of PBS on August 24, 2008. This project will investigate hidden connections between science and society related to the case by following through the documentary and answering three main questions: *(1) how do ecosystem and social systems interact and what is the role of this interaction in decline of Steller's sea lions?; (2) can July 2000 fishing ban be justified by the findings?; and (3) what hypotheses and theories of sustainability we read (such as gaia hypothesis, DNA-centered view of life, cell-centered views of life, theory of emergent properties, complex adaptive system theory etc) are tenable to explain this complexity or mystery?*

Learning Goals

To investigate science and society relations in the case of Steller's sea lion and the Alaskan fishing ban imposed in July 2000.

Processes of Executing the Project

Step 1: Watch the documentary and identify major questions governing the problem statement above. Interpret the documentary and organize the major puzzle, the case, and the issues of dynamic relationship between science of Steller's sea lions and human activities (research, fishing, trade, and political institutions).

Step 2: Conduct literature reviews of finishing trade, laws, regulations, industrial economic activities, size, and the role of fishing industry in livelihoods of Alaskans. Identify key societal issues involved in the mystery. See article on July 2000 fishing ban at http://www.pmel.noaa.gov/np/pages/news_072100.html

Step 3: Identify key linkages between social systems and ecological systems relating to the case. And interpret them qualitatively and quantitatively.

Step 4: Analyze the role of science in policy making, the dynamic relationships among species, and ecosystem rules within the ecosystem surrounding Steller's sea lions, and the role of human beings in the decline of Steller's sea lions.

Step 5: Based on the science you unpacked and societal factors you investigated, answer the mystery or complexity in Steller's sea lion case in Alaska.

Suggested sections for the project paper are: (1) Introduction; (2) The Case of Steller's sea Lions; (3) Relationship between Science and Society in the Case; (4) Key Ecosystem Actors and Social System Actors; (5) The Science of Steller's Sea Lions Case; (6) Analysis of Fishing Trade and Industries and the Fishing Ban Regulation; (7) Understanding Sustainability Science; and (8) Conclusion.