Project Statement:

A critical step in confronting global climate change is the accounting for how individuals or groups of persons have ‘responsibility’ for shares of global carbon emissions—emissions that are intertwined with the activities of our daily lives but at the same time often occur in places and among communities seemingly quite distant from us. Much of the international conversation about accounting has apportioned responsibility to countries according to the emissions that occur within their borders, a ‘domestic production’ approach to accounting that has been most prominent in Kyoto and Copenhagen. Yet other accounting systems are also being debated, embodying different approaches to the webs of the global economy. A common alternative is consumption-based accounting schemes. As found in ‘ecological footprints’, the total emissions needed to produce a good or service are attributed to the final consumer, wherever in the world those emissions might occur. Consumption-based accounting systems suggest a different yet complementary set of reduction strategies than does production-based accounting, designed to shape both consumer choice and government policy.

Yet accounting schemes are not merely a set of numbers—each has different resonances with, and utility for, various policy approaches and academic communities. Each also has distinct ethical implications. Measurement systems shape how we think about carbon responsibilities and sustainability.

My proposed research will:

1) Critically analyze the assumptions behind several carbon accounting methods, some originating in the environmental sciences, highlighting the ethical implications of: their differing stances on the relative centrality of production, of consumption, of labor, and of investment to carbon responsibility; their conceptions of how and whether distant territories and peoples find themselves bound together; and the relationships posited between environment, economy, and development.

2) Develop several mathematical variations to existing accounting procedures, described below, which may be better suited to addressing the questions of developmental futures implicit in international disagreements between developed and developing countries.

3) Exemplify the differences among these procedures through comparing their estimations of the carbon embodied in 2007 U.S.-Chinese bilateral trade and production.

Step 1 entails critical discourse analyses of the assumptions behind mathematics and statistical frameworks (described in Step 2) applied to quantify carbon responsibility and to associate responsibility for carbon emissions with specific nation-states or social groups.
Step 2 extends two baseline accountings: The baseline notion of production-based accounting is that of the aggregate carbon emissions taking place within the domestic territories of nation-states compiled by United Nations Framework Convention on Climate Change. The baseline notion of consumption-based accounting, recently developed particularly within ecological economics and industrial ecology, aggregates the carbon emissions associated with all steps in the production of the goods and services a country needs in a year, wherever these occur in the world, to satisfy its final demand (Nakano et al. 2009). Consumption-based accounting often uses multi-regional input-output analysis, which applies linear algebra to a set of interlinked tables, published by different national statistical agencies, that quantify the average amounts of goods and services purchased from each sector in the economy to produce a unit of a given sector’s output, given prevailing technologies (Wiedmann 2009). Such methods thus estimate how distant peoples and places are directly and indirectly connected through economic flows.

These common accounting methods, while appropriate to exploring the relative efficiencies among present production possibilities, may be less suited to contemplating other questions within climate change debates, such as those voiced by developing countries (e.g., the historical responsibility of developed countries for the current carbon footprint, or the centrality of investments and capital to the relative fates of nations; Pan et al. 2008).

Such concerns can be partially expressed utilizing input-output analysis, depending on how the empirical models are ‘closed’ (determining which chains of responsibility are followed back through the production process; Leontief 1986). I will explore alternative ways of including the emissions costs of reproducing capital and/or labor power. Labor power is an input to production and requires consumption goods to (re)produce itself, but the baseline consumption model (above) only treats workers as consumers. Treating individuals simultaneously as workers and consumers has significant potential implications, given international differences in the relative capital and labor intensities of economies.

I also examine the impact of attributing responsibility to investment flows according not to the domestic territories in which they accrue, but according to [possibly transnational] ownership and control, where managers and owners are well positioned to understand the opportunities for carbon efficiencies in the production methods they develop, as well as to exercise more control over where and how the profits to production are reinvested.

Step 3 compares the empirical significance of various values assumptions within a question of great interest to present public policy debates: The net carbon embodiment to 2007 U.S.-China bilateral trade and production, combining the just-released 2007 Input-Output tables of China with the annual U.S. Input-Output tables, forming an inter-country input-output table using import data from OECD, UN
COMTRADE, and national statistical agencies, extended by sectoral CO2 emissions
data for U.S. and China from the IEA. To address questions regarding data
provenance, coverage, and interpretation, I propose to spend two weeks in Beijing
in conversation with scholars within the Chinese Academy of Sciences and at Peking
University. I have linguistic competencies in Mandarin, and have spent time in
Beijing identifying scholars and developing contacts.

Comparison of these methods will contribute to an interdisciplinary conversation
between the environmental and social sciences by exploring how different methods
for biophysical accounting of environmental damage do or do not relate to various
questions, primarily raised within the social sciences, about development within the
disequilibrium dynamics of the global economy. Different ways of assigning
responsibility for carbon emissions to different groups of people within the global
economic system embody different ethical stances. My research will enable me to
contribute to an expanded constructive interdisciplinary discussion that these
issues require.

**Timeline:**

| June 2010 | Theoretical comparison of different carbon accounting schemes. |
| August 2010 | Comparison of approaches, writing. |

Word Count: 996

**Biography:**

Luke R. Bergmann is a doctoral candidate in geography at the University of
Minnesota. The proposed research will be incorporated as a chapter of his
dissertation, which investigates relationships between biophysical and monetary
perspectives on the global economy, with empirical contributions centered on
understanding China’s changing role within global economic flows. Such work
builds on several of his previous academic publications: on examining the
theoretical dynamics of the capitalist space economy, on the agroecological and
economic contexts to the evolution of pandemic influenzas in a globalized southern
China, on potentials for methodological synergies between computational and
social-theoretic approaches in social science, as well as on pedagogy and
sustainability.

The applicant is a past recipient of a National Science Foundation Graduate
Research Fellowship (2004-2009), of fellowships from the U.S. Department of
Education and from the University of Minnesota Graduate School, and of the Angier B. Duke full-tuition merit scholarship at Duke University (1998-2002), where he graduated *summa cum laude* with a Bachelor’s of Science degree in Physics and a minor in English. He was born in rural Maryland.

**Key Works Cited:**


## Applicant Information

<table>
<thead>
<tr>
<th><strong>Applicant Name:</strong></th>
<th>Luke R. Bergmann</th>
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<tbody>
<tr>
<td><strong>Project Title:</strong></td>
<td>Competing Values in Carbon Accounting</td>
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<td><strong>Department:</strong></td>
<td>Geography</td>
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**How did you hear about this funding opportunity?**
Through email notices and a fellow student who received funding in the past.

## Funding

| **Total amount of funding requested:** | $7809.60 |

**Executive summary (maximum 200 words)**

The proposed research examines the values implicit in several methods for carbon emissions accounting, through which responsibility for emissions across the global economy may be assigned to groups or nation-states. It examines whether different schemes may be more appropriate depending on which ethical, historical, and theoretical interpretations of global economic development are adopted—issues over which there is considerable present international dispute. This research then proposes mathematical variations on accounting methods that are potentially more attentive to different perspectives in such debates. Finally, it proposes to analyze the empirical differences made by employing these various accounting methods, making several estimations of the carbon emissions associated with U.S. and Chinese trade and production in 2007. It thus contributes to an interdisciplinary conversation between the environmental and social sciences on the social and ethical implications of different methods for the biophysical accounting of environmental damage.

The funding request will supply the research stipend needed to complete the project between June 1 and August 31, 2010. Two weeks will be spent in Beijing consulting with research contacts regarding data provenance, coverage, and interpretation. The results from this project will also be incorporated into the applicant’s Ph.D. dissertation.

## Approvals

| **Check all appropriate approvals required for your proposal. Approvals must be obtained prior to receipt of funding. If you have applied for approval but have not yet received it, indicate that below.** |
|-----------------|-----------------|
| IRB Status      | N/A             |
| IACUC Status    | N/A             |
| Other Status    | N/A             |

## Checklist

- The proposal is 1000 words or less excluding budget, biographies, references and citations.
- The proposal includes a work plan with a specific timeline using months or quarters to identify work to be done and completion dates.
- The proposal includes a 1-2 paragraph biography of the applicant and all co-investigators.
- The budget form is complete including the funds sought for this project, other pending applications for this project, and the amount/source of matching or other funds.
- The applicant’s faculty advisor is copied on the application email. Professional students w/o advisors check NA.
- All necessary approvals are pending or received.