

GEO Research Transition Studies: A White Paper

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Note: All of the sections are in draft form and can benefit by improvement. Those marked with ** are especially in need of filling out. But we need to keep it short. No more than a page or so per research area.

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Transition Studies**

Humanity, all of it, is facing two immensely challenging transitions. Both transitions are necessary because of global warming and climate change. The first is the transition to “clean energy,” that is, energy whose production does not result in emissions of greenhouse gases. It is typically

called the climate change mitigation transition. The second great transition is the transition of the built environment to a much more hardened and resilient condition, able to withstand costly damage from extreme weather and environmental events brought about by climate change. It is typically called the climate change adaptation transition.

Climate science, system engineering (wind, solar, storage, etc.), and transition studies. All three are important, appropriate, and needed in GEO contexts. That said, transition studies, centering on the social factors involved in the two grand transitions, are likely at the core of what is useful in a GEO context.

1. Policy research

The focus of GEO is in the main local, befitting its agricultural extension inspiration.

The *Local Sustainability Policies and Programs Handbook for Deliberation Support* report https://github.com/stevenokimbrough/sokpapers/blob/master/ClimateDecisionsLab/Climate_Decisions_Lab_Workbook_Local.pdf lists more than 40 policies and programs that can be undertaken locally. Examples include: electric buses and garbage trucks, curbside composting, food rescue, and building electrification. Any such policy can benefit from research, and even requires it for implementation. In this category alone there is virtually an unlimited amount of research to do, including data collection and analysis, system modeling, and policy analysis.

2. Sensor data collection and analysis**

Availability of fine-grained collection of data about air pollution and noise pollution is invaluable for regional management, particularly with regard to health maintenance. See “Racial and ethnic disparities in pollutant exposure,” PNAS Science Sessions podcast, September 20, 2021, at <https://podcasts.apple.com/us/podcast/pnas-science-sessions/id1367460245?i=1000536019201>

Similarly, collection of traffic data, weather (especially rainfall) data, water flow data, and noise data.

[sk: This section needs beefing up. Jae? We need to identify the promise of real benefit, not just “smart cities” hype from IBM.]

3. General data collection and analysis**

Various kinds of traffic are obvious targets. Polling and survey data. Infrastructure census and monitoring data.

Example of infrastructure and monitoring data: bus stops!

Brown, A. & Moran, M. E. (2021). Are Shelters in Place?: Mapping the Distribution of Transit Amenities via a Bus-Stop Census of San Francisco. *Journal of Public Transportation*, 29.
https://escholarship.org/content/qt3gj1t495/qt3gj1t495_noSplash_414b4583354f5a46ca2dd75ba0ad7a1d.pdf

4. Urban and regional design

Studies of walkable cities (and suburbs), food deserts, transportation oriented development, etc.

State of the art planning and optimization tools, used for deep research as well as release for public use and exploration. Based on GIS applications used for research and design as well as optimization languages and solvers, and simulation including ABM (agent-based modeling).

Example journalistic report:

Birenbaum, G. (2021, September 12). How to end the American obsession with driving. *Vox*.
<https://www.vox.com/22662963/end-driving-obsession-connectivity-zoning-parking>

5. Health and safety

Naturally drawing on sensor or other monitoring data. Air pollution within buildings that have gas burning should be a major focus. Can we find, or observe, health data and studies pertaining to water heating, cooking, space heating, clothes drying?

6. Diffusion of beliefs and practices

How and how rapidly uptake of new products and innovations occurs has long been a staple of research in schools of business and of communication. The field has broadened recently to encompass social and cultural evolution generally. GEO operations offer the prospect of facilitating collection of valuable data about diffusion of beliefs and practices. Conversely, knowledge of social evolution holds promise of assistance to decision makers and communities in navigating the two transitions.

7. Decision sciences

There is a strong precedent and a record of success in using methods from the decision sciences in natural resources management. In a prototypical application, stakeholders are convened, and a group process is run in order to choose one or more programs for implementation.

In general, decisions must be taken on the basis of multiple, partially-conflicting criteria. In consequence, difficult tradeoffs must be confronted in making choices. A long-standing and extensive scientific community has contributed a substantial literature on the general subject, including group decision methods and empirical studies.

GEO operations offer the prospect of offering occasions and contexts for group discussions and decision making. These in turn offer the prospect of improving and enriching methodologies for discussion and decision making.

8. Other scientific possibilities**

Climate science: This is normally conducted on a global scale, but of course microclimate studies are scientifically valid and needed, and may well be useful at a local or regional level.

Engineering: Development of energy technologies, such as wind, solar, and storage, is not done on a local scale. It is funded by organizations and national governments having a general, non-local mandate focus of attention. Design and configuration, and experimental deployment, however, may often have a regional level of concern, whether or not they are funded locally. Also, some areas of engineering, such as transportation science, very much of civil engineering, as well as urban studies and design

Life sciences: niche areas exist that focus on, e.g., horticulture or entomology, biology in interaction with human settlement.

Social science: various specializations exist in economics, anthropology, political science, and sociology focusing on contexts of human settlement. Penn example: Linguist Bill Labov's Philadelphia Neighborhood Corpus, created by students over several decades, documenting speech and language use in Philadelphia. Work like this can be linked to GEO activities.

Arts and humanities: These may often receive inspiration and appreciative uptake on a local and regional level.

The overriding point for this category, and in general, is that a flourishing GEO affords opportunity for research in the problematics of engineering, arts, humanities, and the sciences generally.