

Office of Research Services Funding Application (Large Grant)

DEADLINES: June 30 and December 31

Please read Funding Announcement Information at www.ucdenver.edu/ors before completing application.

NOTE WELL: THIS APPLICATION MUST BE WRITTEN FOR AND ACCESSIBLE TO LAY REVIEWERS. (LINE SPACING NO LESS THAN 1.5, FONT SIZE NO LESS THAN 12, FONT MUST BE TIMES NEW ROMAN)
PLEASE ATTACH A 2-PAGE CV.

Applicant Information

Name: Rumbach Andrew Date: 12/31/2016
Last *First*

Department: Urban and Regional Planning

Phone: 303-315-1007 Email andrew.rumbach@ucdenver.edu

Title of Project: Understanding risk to environmental disasters in India's urbanizing villages

Amount of Request: \$21,678

Required Match

A 20% match is required.

Please have the responsible party for the match send email verification to carie.carroll@ucdenver.edu.

Project Abstract

Provide a project abstract (one-third page)

Cities in the developing world are increasingly vulnerable to natural disasters and the effects of global climate change. Our understanding of urban environmental risk is based primarily on the experience of large cities, yet small cities will account for the majority of urban growth in the 21st century. The goal of this project is to generate new theories and testable hypotheses of environmental risk in small cities by developing detailed case studies of urbanizing villages in the Darjeeling-Sikkim Himalayas, a mountainous region in India vulnerable to earthquakes, floods and landslides. The central research question is: what factors influence household and community risk to disasters in urbanizing villages? We will answer this question by collecting data on the determinants of risk (hazard exposure, vulnerability, and adaptive capacity) in five case study communities. The project findings will be the basis for scholarly publications and future grant applications to study small city risk in the Himalayas.

Project Description

Provide a project description indicating the significance of the creative activity (limited to three and a half pages)

The urban population will double in the coming century, with the vast majority of city growth occurring in developing countries. One of the key challenges facing cities and urban policy makers is the increasing impact of environmental hazards and disasters like floods, earthquakes, and storms. Research shows that cities are sites of significant disaster risk, whether because of their location in hazardous geographies, the vulnerability of households, infrastructure and the built environment to hazard events, and/or changes in environmental conditions. Natural disasters have killed 1.2 million people and caused more than \$1.8 trillion in damages since 2000, with many of those losses occurring in developing cities (UN-ISDR 2013). Urban disasters are a critical barrier to sustainable economic development, and will likely become more frequent and severe due to the effects of global climate change (Cuny 1983; Pelling 2007; UNISDR 2014; IPCC 2015).

Disaster researchers have begun to document the complex linkages between urban growth and environmental risk, with the goal of building stronger and more resilient cities through improved planning and policy-making (Mitchell 1999; Pelling 2003; Rockefeller 2014). Urban disaster research has largely focused on the experience of large cities, however, those urban centers with significant economic, political, cultural, or technological power or importance (Rumbach 2016). Much of the anticipated growth in the urban population will actually take place in small cities, however, where more than half of the world's urban population (about 1.9 billion people) already lives. The population of small cities is more than three times that of megacities like Tokyo, Delhi, or Lagos (UN 2014).

Besides their cumulative population, small urban centers are also some of the fastest growing types of urban settlements, with decadal growth rates significantly higher than large cities.

India, one of the fastest urbanizing and most environmentally vulnerable countries in the world, is representative of these global trends. The urban population in India will nearly double in the coming decades, from 410 million in 2014 to 814 million in 2050 (UN 2014). Small cities will account for most of this increase; large villages (those with populations over 5,000) and small cities (populations under 100,000) were home to 315 million Indians in 2011, 26% of the total population (IIHS 2014). This compares to 15% of the population in 1951 and 18% in 1981, making it the fastest growing segment of urban settlement types in the country. India also suffers from frequent urban disasters, with large numbers of cities located along coastlines and in the earthquake and landslide-prone regions along the Himalayan Arc. Disasters in India kill an average of 3,000 people and cost more than \$10 billion per year, a number that is expected to rise with increasing populations and with the worsening effects of global warming (Revi 2008).

Despite their growing demographic importance in developing countries like India, small cities have received relatively little attention in the research literature on urban disasters and, in-turn, by international institutions and policy-makers concerned with urban resilience. In a recent article in the journal *Nature*, Birkmann et al. (2016) argue that the vulnerabilities of small and medium sized cities to disasters and climate change are severely underestimated by international institutions, in-part because of the lack of data necessary to understand risk. Their findings echo Mark Pelling (2012), who argues that disaster researchers and policymakers “know relatively little about smaller cities” and that it is “tempting to project knowledge gained from larger cities” when discussing small city disaster risk. The limited research we have on small cities demonstrates that they are fundamentally different from larger ones in terms of their economic structures (Kudva 2014), relationships to natural resources, and governance capacity (Miller & Douglass 2016). The lack of research and published data on small cities means that theories and models of urban disaster risk will likely produce policy prescriptions that are poorly suited to the context of such places (Bell & Jayne 2009).

This project will work to fill this gap in the urban disaster literature by documenting the drivers of household and community disaster risk in small cities in the Darjeeling-Sikkim Himalayas, a rapidly growing region in northeastern India. Located in the foothills of the Himalayan mountains, cities in the Darjeeling-Sikkim region are exposed to numerous environmental hazards, most importantly earthquakes, heavy monsoon rainfall and subsequent flooding, and landslides. The project will focus

specifically on disaster risk in *urbanizing villages*, the classification of small cities closest to rural communities (Census of India 2011). Urbanizing villages are characterized by the Indian government as having one or more of the following characteristics: changes in the local economy away from agricultural activities and towards the service and manufacturing sectors, increasing levels of basic infrastructure like paved roadways or electrical connections, increasing population and population density, and/or changes in the built environment like the construction of multi-storied concrete buildings. The goal of this project is to better understand how urbanization is shaping risk to environmental hazards in such communities, and in doing so, generate new theories and testable hypotheses about disaster risk in small cities in the Himalayan region generally. The central research question is: what factors influence household and community risk to disasters in urbanizing villages? The research team will answer this question by developing detailed case studies of five urban villages in the Darjeeling-Sikkim region, collecting multiple sources of qualitative and quantitative data (see methodology below). Crucially, the research design includes data from multiple scales of analysis, allowing for a robust understanding of disaster risk that incorporates household, community, and regional-level factors (Wisner et al. 2005). Through a variety of data collection instruments, the research team will document the determinants of disaster risk, the likelihood that a household or community will experience adverse effects from an environmental hazard like an earthquake or landslide. We will collect data specifically on: 1) hazard exposure - what hazards do household and community experience? 2) vulnerability – the diminished capacity of a household or group to anticipate, cope with, resist, or recover from an environmental hazard; and 3) adaptive capacity – the ability of a household or group to adapt to the adverse effects of environmental hazards.

Urbanizing villages in the Darjeeling-Sikkim region are typical of small urban centers throughout India and Asia, in that they have grown rapidly in size and population, are increasingly affected by natural hazards, and are likely have low capacity for managing growth and development. As case studies, they are ideal for developing generalizable theories of small city risk that can be later tested through broad-scale, empirical study (Eisenhardt 1989; Yin 2003).

The research team for this project will be the principal investigator (Rumbach) and two graduate research assistants (GRAs). The PI will supervise the overall project and be responsible for research design, case study selection, coordination of the research visit to India, creation of data collection instruments, facilitation of focus group interviews, oversight of the household survey data collection, data analysis, and write-up. The PI will work closely with two GRAs recruited from the graduate programs in urban and regional planning, public affairs, geography, or related disciplines at CU

Denver. The GRAs will be selected based on their skills and experience in qualitative research methods and Geographic Information Systems (GIS). They will be employed for a 10-week period in the summer of 2017 and assist the PI in each phase of the project, but especially with basic literature searches on urbanization and disaster risk, background research on case study communities, preparation of base maps for participatory mapping activities, data collection while in India, and data cleaning and entry. If the GRAs are PhD students, they will have the opportunity to contribute to a peer-reviewed publication, at no expense to this grant. Throughout the project, the PI will mentor the GRAs and provide them with hands-on training in research design and methods.

The project team will work closely with Save the Hills, a community based organization headquartered in the Darjeeling-Sikkim Himalayas. Save the Hills is dedicated to raising awareness about earthquake and landslide risk through public education, community-based research, and policy advocacy. The organization will provide vital logistical support for the project, including the facilitation of research visas from the Indian government, coordination of field research visits to case communities, translation of data collection instruments into local languages, translation and enumeration of household surveys, translation during community mapping exercises and interviews, and arrangement of vehicles and other travel-related details.

The results of the proposed project will have near and far-term importance for the study of disaster risk in small cities. The findings will inform at least two peer-reviewed academic articles in urban planning and disaster studies, where the PI will report the study's results and lay the theoretical and empirical groundwork for future study. The project team will also collaborate with Save the Hills to write a white paper that will be tailored to a policy audience. The goal of the white paper will be to inform more effective disaster mitigation policies for cities in the Darjeeling-Sikkim region, and to provide a replicable methodology for documenting environmental risk in other fast-growing areas. Save the Hills will ensure that the report has tangible policy impacts by disseminating it to through its policy partners at the National Disaster Management Authority (NDMA), state disaster management authorities, and the Geological Survey of India. Finally, the project findings will be the foundation for external grant applications to support a multi-year study in the broader Himalayan region. That study will test the hypotheses generated by this project by surveying households and community leaders in urbanizing villages in multiple states along the Indian Himalayan belt including Himachal Pradesh, Uttarkhand, Sikkim, West Bengal, and Arunchal Pradesh.

Methodology Description

Provide a description of the methodology to be used in approaching the project (one-half page)

For the proposed project we will use a case study research design and collect data from five representative villages in the Darjeeling-Sikkim region. Our selection criteria for case communities will include: population size and growth rate; distance to nearby urban centers; level of infrastructure development; and major economic activities. After conducting background demographic and environmental research, we will visit each case community to complete: 1) a community oral history with long-time residents; 2) key informant and focus group interviews with political leaders and representatives of major stakeholder groups; 3) participatory mapping of environmental hazards and risk with community members, including infrastructure, community assets, and environmental change; and 4) a household survey with ~25 households per village that gathers information on the three determinants of risk: exposure to hazards, vulnerability (socio-economic factors like caste, household income, and education) and coping capacity (e.g. social capital networks, insurance). We will then analyze our data by 1) transcribing and coding interviews and community oral histories; 2) mapping community risk and vulnerability in a Geographic Information System (GIS); and 3) entering household survey data into SPSS. Finally, we will write and analyze our case studies with an emphasis on generating testable and generalizable theories about the accumulation of disaster risk in urbanizing villages and on policy recommendations for hazard mitigation in the region.

Additional Project Information

(i) How does this project advance the applicant's career

The proposed project will advance my career in both research and teaching. The project will address a significant gap in the current literature on urban disaster risk in developing countries and provide data for peer-reviewed publications, important as I advance towards tenure review. I will also present my findings at several national conferences, which will garner critical feedback and help build relationships with future collaborators. The data collected will inform external grant applications to fund a broader, multi-year study, which would provide support for faculty and graduate students and additional publishing opportunities. The project will also allow me to develop new approaches to field-based learning, which would be the basis for future international courses in disaster planning.

(ii) Provide future funding activities, agency, program name, program officer, and deadlines identified

- National Science Foundation's Infrastructure Management and Extreme Events (IMEE) program (program officer David Mendonca). Deadline February 15th.
- American Institute of Indian Studies (AIIS) senior research fellowship (program officer by committee). Deadline July 1st.
- National Endowment for the Humanities collaborative research grant (program officer is Division of Research Programs). Deadline is December 7th.

(iii) What specific outlets for the work accomplished in the project are likely (exhibits, journal articles, etc.,)

- Project would result in at least 2 article submissions, to a top peer-reviewed journal in urban and regional planning (e.g. *JAPA*, *Urban Studies*, *Environment and Planning C*) and/or disaster studies (e.g. *Disasters*, *Climatic Change*, *Journal of Extreme Events*)

Applicant's Pending and Current Funding

(a) Pending proposals: (title, agency, amount, date submitted, when will decisions be made)

None (currently preparing proposal to National Science Foundation IMEE program, with a deadline of July 15th, 2017).

(b) Current funding: (title, agency, amount, duration)

None

Detailed Budget

Provide a detailed budget

The proposed budget includes resources for personnel, research travel, and materials:

- Graduate research assistant salaries (2 x 240 hours @ \$16/hour) + benefits (2%): \$7,834
- Community organization support (logistics, translation, and research assistance): \$4,000
- International airfare + airfare within India for PI and 2 GRAs: \$5,850
- Lodging + meals + per-diem for faculty and 2 GRAs for 17-day research visit: \$4,240
- Transportation during research visit - airport transfers and daily car hire with driver: \$2,200
- Research visa fees for PI and 2 GRAs: \$600
- Community workshop costs, including space rental, facilitation and refreshments: \$1,500
- Materials, including production of maps and survey forms: \$300

Total budget = \$26,524 | ORS budget request = \$21,219 | 20% match from CAP = \$5,395

Detailed Budget Justification

Provide a short detailed budget justification

The **personnel** category would support the hiring of two graduate research assistants (GRAs) to assist the PI with all phases of research. The budget includes funds for 480 hours of GRA time at \$16 per hour and benefits of 2%. The **travel** category will allow the team to travel to India for an intensive 17-day data collection visit. The travel budget items are: research visa fees; airport transfers; round-trip economy air travel from Denver to Delhi; domestic air travel within India; ground transportation; hotel accommodation; and a daily per-diem at ~40% of the allowable rate. The **research support** category will provide for on-the-ground assistance from Save the Hills, a NGO based in the Darjeeling-Sikkim Himalayas. Save the Hills' involvement is critical to the success of the project because of their expertise in landslide hazards and their relationships with case study communities. Save the Hills will arrange local transportation and accommodations, translate surveys and focus group interview materials; translate during field research visits; and schedule community workshops. The **events** category will support the hosting of community workshops in each of the case study communities. The expenses would include space rentals, community facilitation fees, and refreshments for workshop participants. The **materials** budget would cover costs associated with the production of materials for field research like survey forms, paper maps, and interview guides.

Pledge to Report Signature

I pledge to report to the Office of Research Services the projects outcomes at its conclusion and to update ORS on future developments related to the initial funding.

Signature: _____



Date: **12/31/2016**

