

Gaming the Gap: A Small World Simulation of Human Migration Response to Stressors

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ABSTRACT

Significant societal disruptions are anticipated from mass human migration due to environmental factors, e.g., climate change. Understanding human behavioral responses to these disruptions are critical for informed policy decisions. However this is hindered by a significant data gap. Black et al. defines this gap as the difference between agency (the ability of migrants to self-report) and inference (from quantitative population data) [1]. While the general dynamics of human migration are known, the particulars remain elusive. To help address this gap, we have developed an online game called *Island World*, which is devised as a small world simulation. Our contribution is a design exploration of a game for the purpose of illuminating our understanding of human migration.

Keywords

human migration, human migration behavior, small world simulation

INTRODUCTION

By 2050, two hundred million humans may be displaced or suffer forced migration due to factors such as climate change, water shortage, and reduced land productivity [2]. Understanding human responses help inform and evaluate policy options to mitigate disruption triggered by mass migration. Prior scholarship presents a fragmented understanding of human migration behavior in the face of environmental stress [1]. From a qualitative perspective, interview and survey data seem to skew towards being post-hoc rationalizations. From a quantitative perspective, census data and other sources remain patchy and incomplete at best, with researchers undertaking “heroic extrapolations” to infer behavior patterns [2]. We devised an online game—a small world simulation called *Island World* to bridge the data gap in understanding human migration behavior in response to environmental stressors.

We seek to use *Island World* as a data collection tool to augment offline data gathered about human migration in response to environmental stressors and will address the data gap in three ways: 1) provide insights into the interplay between different drivers of migration, 2) uncover patterns between the drivers and other decision inputs for migration, and 3) provide correlations between drivers, decisions inputs, and resultant migration behavior. By using a gaming approach, we have an opportunity to help demystify this phenomenon by providing an additional means of triangulating migration

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data. *Island World* is designed to enable self-reporting through different opportunities for disclosure (closed and open-ended questions). Our goal is to augment this data with quantitative behavioral data that players exhibit in the game, in addition to system logs generated by the game itself.

Human migration response to stressors

About 700 natural disasters affected more than 450 million people worldwide between 2010-2012 (Laframboise & Loko, 2012). And when natural disasters strike in geographic areas already facing issues such as famine, water shortage, or economic/political instability, populations facing such multiple stressors may be forced to migrate as a behavioral response. Understanding human migration behavior is complex, requiring the fusion of economic, socio-political, demographic, climatological, and environmental data. A conceptual framework by Black et al. (2011) summarizes (figure 1) what is effectively known about human migration response to stressors.

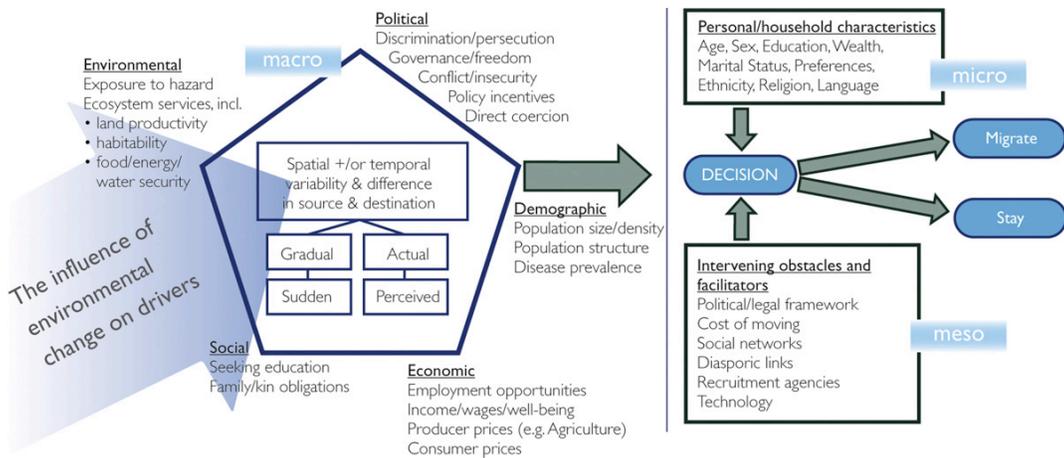


Figure 1: Conceptual Framework for “Drivers” of Migration

In this framework, there are five primary stressors driving migration: 1) environmental, 2) political, 3) demographic, 4) social, and 5) economic (actual or perceived differences across these drivers influence migration). It also distinguishes between different types of migration (internal vs. international) rather than types of migrant (e.g. environmental migrant). Furthermore, the framework identifies the agency of individuals/households as a contributing factor in determining whether drivers are barriers or facilitators to migration. Finally, environmental change is considered both an indirect influence through changes to other four drivers, and a direct influence through changes to environmental drivers. This framework demonstrates the complexity of the phenomena with the sheer number of drivers and decision inputs that feed into migration decisions; nested feedback loops exist along multiple spatio-temporal dimensions.

However, the particulars of exactly how the feedback occurs, the frequency, direction, or scope of the loops, remain unclear. The specifics of what occurs within the arrows are effectively like black boxes in understanding human migration. Questions arise such as: When facing multiple stressors, what motivates human populations to relocate? Are there significant differences between those who relocate (choose to migrate) versus those who are dislocated (forced to migrate)? Are there meaningful patterns of behavior that we can identify to help inform policy around human migration issues? Part of the challenge in

researching these questions is that stressors such as tsunamis and famine are difficult to study in a laboratory context. And as previously mentioned, much of the qualitative data tend to be post-hoc rationalizations of migration response, while the quantitative data has significant gaps.

GAME DESIGN CHALLENGES

In designing *Island World*, we encountered three primary areas of design tension that are summarized below:

- **Post-hoc offline data vs. online data:** In designing the game, we first had to determine whether to collect data from migrants who had faced multiple stressors or to collect data from across the population spectrum. We chose to design the game to collect data on the beliefs, preferences, and constraints (BPCs) across populations that may be faced with multiple stressors. According to the BPC model of human behavior (Gintis, 2005), factors influencing the behavior of humans can be understood by identifying underlying beliefs, preferences, and constraints. Thus we designed our game to identify BPCs around stressors by posing survey questions as a mini-game (e.g., popping balloons to submit an answer). For example, players can be asked attitudinal questions about different stressor types as well as preference questions around potential responses to stressors. To supplement this data, we also designed *Island World* to be useful in conducting behavioral game theory experiments (as in Kohli et al., 2012). The *Island World* narrative can be adjusted to run such “games” to help determine, for example, if players may be strong reciprocators or rational egoists in potential stressor situations.
- **Social media vs. avatar vs. augmented reality:** We had to determine the degree of realism required in capturing BPCs, as well as conducting different game theory experiments. In the end, practical constraints motivated us to create the least-resource intensive version of *Island World*. Our rationale was that we are seeking to capture pre-existing BPCs around stressors since they are indicators of what people anticipate they will need to do in response. Such data would likely be of value to policy-makers in helping to manage emergency situations prior to the actual events occurring such as famine or political instability. Consequently, we believe the extent of realism required effectively resides “inside one’s head” and that the game had to provide minimal elicitation to avoid interfering with a player’s BPCs around stressors such as tsunamis, earthquakes, or water shortage.
- **Entertaining game vs. research data collection tool:** We had to strike a balance between creating an entertaining and engaging game experience, while designing the game to collect BPCs and enable us to run behavioral game theory experiments. While the game narrative is somewhat helpful towards this goal, we seek to improve by addressing this design tension in a future version of the game.

CONCLUSION

We believe the design approach behind *Island World* as a research tool provides an alternative means for collecting data for insight into human migration behavior. We plan to use the alpha version of *Island World* we created to undertake a series of design iterations to continue resolving the tensions identified in the previous section.

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