The contribution of ecosystem services to place utility as a determinant of migration decision-making

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Abstract

Environment migration research has sought to provide an account of how environmental risks and resources affect migration and mobility. Part of that effort has focused on the role of the environment in providing secure livelihoods through provisioning ecosystem services. However, many of the models of environment migration linkages fail to acknowledge the importance of social and psychological factors in the decision to migrate. Here, we seek to provide a more comprehensive model of migration decision-making under environmental change by investigating the attachment people form to place, and the role of the environment in creating that attachment. We hypothesize that environmental factors enter the migration decision-making process through their contribution to place utility, defined as a function of both affective and instrumental bonds to location, and that ecosystem services, the aspects of ecosystems that create wellbeing, contribute to both components of place utility. We test these ideas in four rural highland settlements in Peru sampled along an altitudinal gradient. We find that non-economic ecosystem services are important in creating place attachment and that ecological place attachment exists independently of use of provisioning ecosystem services. Individuals’ attitudes to ecosystem services vary with the type of ecosystem services available at a location and the degree of rurality. While social and economic factors are the dominant drivers of migration in these locations, a loss of non-provisioning ecosystem services leads to a decrease in place utility and commitment to place, determining factors in the decision to migrate. The findings suggest that policy interventions encouraging migration as an adaptation to environmental change will have limited success if they only focus on provisioning services. A much wider set of individuals will experience a decrease in place utility, and migration will be unable to alleviate that decrease since the factors that create it are specific to place.

Keywords: migration decision-making, place utility, ecosystem services, place attachment, environmental change, environmental migration

1. Introduction

While research shows a significant association between the environment and migration the nature of that relationship remains highly context specific. Environmental change is, in various circumstances, associated with either increases or decreases in migration flows. The impacts have been explained as dependent on the location and context, the nature of the environmental change, and the dominant social structures that drive migration (Ruitenbeek 1996, Henry et al 2004, Gray 2010, Massey et al 2010, Kniveton et al 2011, McLeman and Ploeger 2011, Gray and Mueller 2012a, 2012b).
Much research on environmental migration has involved either a neo-classical economic model of migration, focusing on the labour aspects of the decision to migrate, or some incorporation of the New Economics of Labour Migration and the livelihoods framework, where migration represents a household risk management strategy. In doing so, these models fail to take into account the body of knowledge on the role of social and psychological factors in the decision to migrate and the affective attachment people form to place. Recent work on migration flows and environmental risks in small island states, for example, highlights the importance of considering the subjective aspects of the decision to migrate in the context of environmental change. Cultural norms and personal values influence the ways in which people use the resources available to them which in turn affects their vulnerability to climate change (Kuruppu 2009). Attachment to place and to the lifestyle afforded by a location can be an important reason not to migrate, even in a situation of increased climate risk (Mortreux and Barnett 2009). Furthermore, many societies have migration systems that are embedded in lifestyle choice and livelihood strategies (Shen and Gemenne 2011) with migration being bounded by local politics, social factors and expectations (Carr 2005).

Here we focus on the interplay between the environment as a set of resources and cultural dimensions of the environment as manifest in attachment to place. Individuals gain utility from the environment in ways beyond its ability to provide an income: aesthetic, cultural and religious values play an important role in cultural heritage, social relations and sense of place (Millennium Ecosystem Assessment 2005a). The loss of such cultural services has serious implications for wellbeing (Orlove et al. 2008, Adger et al. 2013) and reveals some of the potential limits of adaptation (Adger et al. 2009). The Millennium Ecosystem Assessment (2005b) categorizes the services provided by ecosystems into four groups: supporting, regulating, provisioning and cultural. While this typology has been criticized (e.g. Fisher et al. 2009) and much amended to fit the reality on the ground (e.g. Daw et al. 2011), it has formed the basis for work on ecosystem services. To date the emphasis has been on the provisioning services offered by ecosystems (products such as food, fibre and water and fuel), while cultural services have been poorly incorporated into analyses (Rodríguez et al. 2006).

We hypothesize that cultural ecosystem services are important in migration decision-making through the contribution they make to place utility. Using data from rural settlements in highland Peru we investigate the role of non-provisioning ecosystem services in creating place utility, the types of ecosystems which contribute to the affective aspects of place utility, and how the contribution varies between income groups and locations. We show that a wider range of ecosystem services than provisioning services act as intermediate factors between environmental change and migration. Access to provisioning services is not a prerequisite for benefitting from non-provisioning services and attachment to services varies with the different endowment of services at the location. The paper concludes that environmental degradation will affect the migration decision-making process of a much wider set of individuals than usually included in analyses, that policy interventions focusing on farmers will overlook much of the affected population and that there are identifiable limits to migration as an adaption to environmental change.

The remainder of the paper is divided into four parts. The following section describes the key elements of the theoretical framework used in the analysis. This is followed by an outline of the research design and methods. The results of the analysis are presented in section 4, while section 5 discusses the wider implications of the results.

2. Theoretical framework

This research uses dimensions of behavioural migration theory to understand migration decision-making under environmental change. It focuses on the concept of place utility, a positive or negative quantity, expressing respectively the individual’s satisfaction or dissatisfaction with respect to that place (Wolpert 1965, p 162). These theories suggest that individuals initiate migration decision-making processes only when they begin to experience residential dissatisfaction and place utility moves from a positive to negative state (Brown and Moore 1970, Speare 1974). Whether migration takes place depends on other aspects of the decision-making process—the level of mobility of the individual, the scope and results of search and evaluation of other locations and the physical, bureaucratic and financial barriers to migration. This research focuses on the initial stage of migration decision-making and seeks to determine whether there is an ecological component to place utility. If so, then the migration decision-making process is susceptible to environmental change.

We seek to broaden the concept of place utility, making it closer to notions of wellbeing, using insights the literature on sense of place. Sense of place is the overarching term for the ways in which individuals attach meaning to the location in which they live. We define positive place utility as a function of place attachment and place dependence. Place attachment refers to the affective bonds that a person has with their location: place dependence describes instrumental bonds formed through the ability of a place to help a person meet goals and aspirations (Quinn et al. 2013, Fresque-Baxter and Armitage 2012, Devine-Wright 2013).

This letter therefore focuses on the place attachment component of place utility, and determines whether there is an ecological or environmental component to place attachment. It investigates the ecosystem services that are important in creating place attachment and whether these vary between income groups and location. Ecosystem services provide the critical analytical link between environmental change and migration decision-making through the contribution they make to human wellbeing. They can be defined as ‘the aspects of ecosystems utilized (actively or passively) to produce human wellbeing’ (Fisher et al. 2009, p 645).
3. Methods

To analyse migration flows, decision-making and place utility, a survey of 450 households was implemented between May and July 2012 in the Rímac valley, a small coastal valley of Peru (Huarochirí province, department of Lima). It is a region with long-term out-migration and subject to environmental change. Households in four settlements were randomly sampled and the household head (male or female; joint or single) targeted for interview. The analysis takes place at the level of the individual and addresses particular attitudes to place. An open-ended question on characteristics of life in the village from which respondents gained benefit provided information on contributors to sense of place. Responses were coded, categorized and analysed quantitatively.

Responses were analysed both at the aggregate level and by income group of respondent and settlement. Incomes were coded into five categories based on the stability of the form of income and the amount of security it provides (following the approach of Mayer 2001): formal dependent (21%); informal independent (16%); informal dependent (4%); householders dependent on other economically active household members (35%) and farmer (24%). The individuals were categorized by their own income activity, not the dominant income source of the household, to maintain the analysis at the level of the individual.

The study used locations along a distance and altitudinal gradient from Lima (see figure 1) to capture proximity to Lima as well as different ecological zones. The sampling thus stratified the population by different availability of ecosystem services in combination with different access to socio-economic opportunities. San Mateo (52%) and Surco (39%) represent two district centres in different climate zones along the Rímac valley, Chocna (5%) and Caruya (4%) are rural annexes in a tributary of the Rímac. Chocna has poor access to the district centre of San Mateo. Income sources are predominantly farming and limited to livestock and subsistence agriculture. Caruya, however, benefits from easy access to the main trunk road to Lima, mining centres and San Mateo. Incomes in the village are distributed between agricultural and off-farm sources. San Mateo is a commercial district centre, based around the mining industry, and so households demonstrate a diverse range of off-farm income sources and only a small percentage of the population is involved in farming. Surco is a district centre that is diverse within the kinds of agriculture carried out by households, and in the mix of farming and off-farm households. Table 1 provides summary statistics for each of the four settlements.

4. Contribution of ecosystem services to residential satisfaction

Forty-four per cent of the individuals surveyed gain nonmaterial benefit from ecosystem services. Other benefits gained from location can be clustered into five further groups: neighbours, family and social interactions (15%); the secure and safe environment (14%); convenience for work (7%); services and amenities specific to the town (7%); the quiet nature of village life (6%). A further 6% of respondents mentioned a general attachment to their village expressed through responses such as ‘I like everything!’ These responses demonstrate the ‘ruralphilic’ nature of the population, gaining benefit from the services associated with a rural location—safety, tranquillity, a sense of belonging. Responses related to work and amenities tend to be associated with residents who have moved from more remote settlements for access to schools and jobs.

Disaggregating the population by the income group of the individual shows that use of provisioning ecosystem services is not necessary for an individual to gain benefit from nonmaterial ecosystem services. The only significant difference (at the 95% confidence interval) between groups,
Table 1. Summary statistics for the four settlements surveyed on altitude, ecological zone, population size, access to Lima, levels of education, access to land and access to off-farm labour markets.

| Town         | Chocna       | Caruya       | San Mateo    | Surco         |
|--------------|--------------|--------------|--------------|---------------|
| Altitude (masl) | 3940         | 3535         | 3149         | 2018          |
| Ecological level | Alpine pluvial tundra | Sub-alpine grassland | Sub-alpine grassland | Montane desert scrubland and dry forest |
| Population (at 2007 census) | 85           | 80           | 5280         | 1798          |
| Distance to Lima (km)     | 108          | 102          | 93           | 67            |
| Mean age               | 48           | 42           | 43           | 47            |
| Secondary education (% of pop.) | 48          | 81           | 70           | 58            |
| Access to land (% of pop.) | 91           | 94           | 27           | 86            |
| Households with mixed farming and off-farm income (%) | 10           | 67           | 25           | 41            |

Figure 2. Benefits gained from location by income group. The only significant difference exists between farmers and those with informal independent income sources.

The ecosystem services mentioned by respondents as benefits gained from location were coded and clustered into four categories: the climate (50%); the farming lifestyle (18%); a lack of pollution (17%) and the aesthetic or experiential value of the natural environment (15%). Table 2 provides empirical examples and maps these benefits against the Millennium Ecosystem Assessment typology. The climate and lack of pollution represent people gaining nonmaterial benefit from regulating ecosystem services, namely climate regulation and air quality maintenance. The climate is perceived as a benefit because of its positive impact on health; its desirability for farming and its benefits with respect to human comfort. A lack of pollution is often mentioned in comparison with the capital city of Lima. Gaining benefit from the farming lifestyle represents various cultural ecosystem services: the farming way of life creates and maintains social relations, builds sense of place and forms part of the cultural heritage of the individual and community. An appreciation of the natural beauty of the area represents another cultural ecosystem service, tied directly to aesthetic values, recreation and tourism, and contributing to sense of place.

The type of ecosystem service from which an individual gains benefit varies with settlement. The differences reflect the different endowment of ecosystem services at each of these locations. Climate is mentioned most frequently by residents of Surco (47%), followed by the inhabitants of San Mateo (37%), and Chocna and Caruya (20 and 19% respectively). The proportion of the population that values the climate increases as the climate becomes more amenable to agriculture and more desirable for humans. Attachment to the rural way of life is associated with increased dependence on agriculture for income in the community, hence San Mateo has the smallest percentage (5%), followed by Surco (17%) and Chocna and Caruya (60% and 50% respectively). Figure 3 shows the type of nonmaterial benefit by settlement.

5. Conclusion

The results show that in the socio-ecological systems studied in highland Peru, ecosystem services are important contributors to place attachment: 44% of the population gain benefit from non-provisioning ecosystem services. Other benefits of location are predominantly characteristics particular to rural locations—security, aesthetics, and good social networks. Importantly, the results in this case show that the use of provisioning services for income is not a prerequisite for an individual to form attachment to ecosystem services. Farmers were no more likely than other income groups to benefit from non-provisioning ecosystem services, apart from independent, informal traders. The benefits gained related to the climate, the farming lifestyle, lack of pollution and the aesthetics of the natural environment. These benefits vary with settlement, based on the endowment of ecosystem...
Table 2. Breakdown of nonmaterial ecosystem services. Utility gained from ecosystems fall into four categories: desirable climate; farming as a lifestyle; lack of pollution and aesthetic value of nature in order of importance.

| Benefit                  | Ecosystem service                           | Empirical example                                                                 |
|--------------------------|---------------------------------------------|-----------------------------------------------------------------------------------|
| Climate                  | Regulating: Climate regulation              | • The climate is a bit milder than in Pacota                                       |
| Farming lifestyle        | Cultural:                                    | • It’s quiet, I enjoy going to the chacra, going to see how the plants are doing   |
|                          | Social relations                            |                                                                                  |
|                          | Sense of place                              |                                                                                  |
|                          | Cultural heritage                           |                                                                                  |
| Lack of pollution        | Regulating: Air quality maintenance         | • Fresh air is good for your health                                               |
| Aesthetic/experiential value | Cultural:                                    | • The environment is clean and fresh, in Lima you breathe smoke and fumes        |
|                          | Aesthetic values                            | • Everything in Surco is really lovely, especially the scenery                    |
|                          | Recreation                                  | • This location is really beautiful                                               |
|                          | Sense of place                              | • The climate, the pristine environment, the plants, the nature                   |
|                          | • The scenery that takes your mind off things, it’s lovely, it relaxes you         |
|                          | • Lots of water, close to the river, can go and fish, head to the countryside, clean environment |

Figure 3. Benefits gained from nonmaterial ecosystem services by settlement. Benefits gained by the population relate to the endowment of ecosystem services at that location. More people benefit from the climate as it becomes milder; cultural benefits from the farming lifestyle increase with inaccessibility and dependence on farming.

services at each location. The implications of these findings are that the impacts of environmental change on place utility will extend beyond those engaged in farming.

Environmental migration studies have focused on the provisioning services that ecosystems provide and not the cultural ecosystem services that are equally important in creating the utility and commitment to place that prevents migration. Therefore, the results demonstrate the importance of investigating the fullest range of ecosystem services. Inequalities in access to natural resources and to migration are pervasive in all communities and social settings (Ribot and Peluso 2003, Carr 2005) and different social groups benefit to varying degrees and in diverse ways from the same set of ecosystem services (Daw et al. 2011). While some sub-populations may not be able to access the provisioning ecosystem services, that is not to say that they are not benefitting from other ecosystem services.

If ecosystem services contribute to place utility through place attachment and not only through farming, there are implications for the effectiveness of migration as an adaptation to climate change. The recent Foresight report on Migration and Global Environmental Change (Black et al. 2011, Foresight 2011) encourages governmental support for mobility and migration as an effective adaptation to environmental change. This research provides initial evidence on the limits of migration as an adaptation to environmental change. While migration may replace farming income lost due to land degradation, it is unable to replace those aspects of the natural environment to which the population has formed attachment and that are specific to place (Mortreux and Barnett 2009).

In migration systems, the dominant drivers of migration are social and economic, relating to family formation and breakup, the pursuit of education and economic opportunities. While these drivers are not sensitive to environmental change that is not to say environmental change will have no influence on the migration decision-making process. Ecosystems services form part of the suite of characteristics to which people form attachment. If environmental change degrades these services, residential satisfaction falls, and the relative pull or push of these other opportunities increases.

The research reveals a situation of high marginality with respect to income where people are observed to be attached to place. In these circumstances an important issue becomes whether climate change affects attachment to place. The research presented here implicitly suggests that when locations are already marginal with respect to income activities, a loss of the characteristics to which people form attachment may take on a greater role in the decision to migrate, among the usual social and economic factors. Environmental change does indeed have the potential to undermine attachment, as nonmaterial ecosystem services contribute to place utility in the context described here. The
study therefore highlights the need for in-depth understanding of how change and loss in ecosystem services affects migration directly as well as indirectly through place utility. It further suggests that interventions to manage migration flows in the context of environmental change will be limited in efficacy without incorporation of place utility of those at risk.

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