

Migration and the Environment: Introductory Remarks

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Introduction

Migration is movement, and movement means disruption. Along with the reality of migration comes much concern in policy circles and elsewhere about its consequences, both environmental and social. I suggest we can rethink some of the ways in which migration is related to environmental change and economic development.

In this paper I have four objectives. *First*, in order to better understand environmental links, I will encourage us to reorient “migration” per se as “population distribution and redistribution.” This rather workaday alternative will allow us to subsume migration and get more directly to some matters bearing on environmental consequences. It will also allow us to incorporate urbanization, a development phenomenon linked both to migration and often-times to environmental deterioration.

Second, I concentrate here on how human population location and relocation induces environmental consequences, rather than the other way around. The effect of environmental change on human geographic mobility is a crucial topic (and a growing phenomenon) but for the moment it is beyond my orbit. *Third*, I want to give some examples of how research can help us understand relationships in this policy arena. I’ll draw on my own research findings but refrain – in keeping with what I was told of the conference’s purpose and orientation – from offering a research paper. *Fourth*, I conclude with thoughts about policy.

1. Orientation

The topic for this segment of the conference is “*Migration, Development, and Environment.*” As I see it, the topic sees the causal or predictive arrow points in both directions:

$\Delta\text{ENV} \rightarrow \Delta\text{MIG}$

$\Delta\text{MIG} \rightarrow \Delta\text{ENV}$

My own emphasis will be on the M→E direction, and I hope that our conversations will take us to a look in the other direction as well.

Consider this statement in the publication, *People on the Move*, released in fall 2007 and jointly sponsored by WWF and Conservation International:

Human migration poses huge challenges to conserving the Earth's rich biodiversity, yet conservationists are often unsure about what steps, if any, they can take to reduce its negative impacts. Conservation International (CI) and World Wildlife Fund-US (WWF) undertook this review to explore the scope of negative impacts and possible interventions (Oglethorpe et al., 2007).

The implicit assumption here – perhaps justified – is that migration is detrimental to the environment, or perhaps more modestly, that migration must be managed to avoid environmental deterioration. Some anecdotal evidence certainly supports the view: urban sprawl of apparent newcomers, indigenous populations moving into or extracting resources from forest reserves, over-fishing in water bodies experiencing population and economic growth, settlers new cutting down rainforest, etc.

As seemingly and comfortably self-evident as the $\Delta\text{MIG} \rightarrow \Delta\text{ENV}$, I want to suggest that we look more systematically at the relationship.

2. Models and Myths

Some myths are worth telling, and like much in mythology the narrative often originates in or retains an element of truth. Below I review a few myths and models that relate to migration and the environment. I then offer a few comments on them.

IPAT. Perhaps the most basic place to start the discussion is with the IPAT “equation.” Avoiding for the moment the tired argument of whether IPAT is a mathematical identity or a convenient conceptual device, consider how the components relate. In the formulation, *Population* is seen as one of the “drivers,” or highly linked components, of environmental change.

- $I = PAT$
- $\text{Impact} = (\text{Population})(\text{Affluence})(\text{Technology})$

If one believes that the IPAT relationship carries some meaning, to predict or decompose effects, one could rewrite the relationship in a form that could be estimated in a regression-style analysis:

- $\log(I) = \beta_0 + \beta_1 \log P + \beta_2 \log A + \beta_3 \log T$

We can ask, “What about the β 's?” How about β_1 especially, the coefficient on

Population? Might it be close to zero? Does it change with circumstances? In the now-nearly-abandoned early use of IPAT, each increment in population was seen to produce large and almost uniformly negative impacts on the natural environment.

Note that in this interpretation, it is aggregate population that is the driver. As evidence and thinking began to accumulate about IPAT, the conversation surely moved away from simple aggregate drivers with large impact coefficients. What is more, this population “driver” has had its ups and downs in policy discussions. After some years of centrality in various policy debates, the population bomb diminished as a clear and present danger. But it was not entirely defused, and as recently as 2007, we have seen the *Return of the Population Growth Factor*. This was the title of the All Party Parliamentary Group on Population, Development, and Reproductive Health (UK Parliament) report. A *Science* article by several notable population analysts offered the same title (Campbell et al, 2007). Both groups linked the population factor to the Millennium Development Goals (MDG’s), and notably, one of these (MDG7) is to “Ensure Environmental Sustainability.”

The Migration Driver. Now move from P to M (or D, for distribution). If you like, write [$\log(I) = \gamma_0 + \gamma_1 \log M + \dots$]. What might be the value of some γ , a presumed impact coefficient for migration and population distribution: 0, <0, >0? The presumption, it would seem is that migration is negatively related to environmental outcomes. We see this not only in the WWF-CI report, but also in other commentary. Some of the key views seem to be that:

- migration generates the bulk of population growth in regional ecosystems
- migration is predominantly rural-to-urban
- migration disperses of population across the landscape
- migration weakens social norms that favor the environment

My response to these assertions is *Yes, but*.

Yes, migration is responsible for large shares of human population growth in some regions and their ecosystems, *but* often ignored, however, is the role of *natural increase*. In many developing countries, natural increase still plays a large role in population growth, including urban growth (NAS, 2003). The WWF-CI document wisely took cognizance of the continuing role of natural increase, and discussed policy regarding fertility as well as migration.

Yes, much migration is rural-urban, *but* in many settings this is not the predominant flow. As most analysts who work in developing settings know a very substantial portion of human migration (depending on one’s geographic

frame) is *rural-rural* (R-R) migration. Moreover, a large fraction of such R-R migration is related to marriage or is for seasonal economic livelihood. In any case it is sometimes R-R flows that are most directly implicated in threats to ecosystem reserves or other fragile territory (Liu et al, 2001; Oglethorpe et al., 2007). A better understanding of these flows would help enormously to inform policy.

Yes, migration is often associated with the population dispersal, *but* we need to more closely consider land consumption. To be sure migration along with *natural increase* produce larger cities, towns, and other aggregates, and these larger aggregates tend to take up more acreage. At the same time, consumption patterns matter much, and with rising incomes greater per capita land consumption is almost sure to follow. Urban sprawl may have as much to do with standards of living and land use regulatory policies as it does with migration of newcomers to the city.

Yes, migration challenges the application of social controls, both in origin and destination communities, *but* social science is also replete with examples of *resilient social structures*. Social ties may be maintained between origin and destination or reformed in destination communities. One does not doubt that incentives to act without social control or social approbation (with respect to environmental resources) exist; only that such characterizations are often incomplete.

Migration and Urbanization. Urbanization (**P, M, D**) is commonly thought to be linked to air and water pollution, loss of habitat, and other environmental threats (Cincotta and Engelman, 2000), with mega-cities even more problematically affected (Ash et al., 2008). How timely is the subject of urbanization and environment? Very. Consider that the AAAS publication *Science* devoted its 8 Feb 2008 issue to a special section on “Reimagining Cities.” Environmental concerns are prominently featured. The section is introduced by a few paragraphs that include the statement, “Without careful investment and planning, mega-cities (those with more than 10 million inhabitants) will be overwhelmed with burgeoning slums and environmental problems.” (Ash et al., 2008). More specifically, on the topic of the ecology of cities, Grimm and her co-authors invoke the role of migration:

It is also at the regional scale that land-use changes driven by and resulting from population movement are most apparent. Perceived opportunities in growing urban centers and lack of opportunities in rural settings, resulting from degraded landscapes and imbalanced economic systems, have made the migrations since the second half of the 20th century the greatest human-environmental experiment of all time. In China alone,

300 million more people likely will move to cities, transforming their home landscapes and continuing an already unbelievable juggernaut of urban construction. [Grimm, et al., 2008].

Added to this is concern for how migrants and urbanites relate to their natural surroundings. Consider the view expressed in the following background paper to the World Summit on Sustainable Development: “Urbanization and many aspects of globalization tend to distance people from their relation to ecosystem support....People become alienated from their dependence on access to resources and ecosystem functions outside the boundaries of their own jurisdiction” (Folke, et al., 2002, p. 39). Whether this perception is borne out by actual behavior remains to be seen. This is not to deny that urbanization is accompanied by a host of challenges; rather it is to argue that the connection between urban growth and environmental outcomes needs to be better understood.

Assessment. I would argue that one can find many additional expressions of concern along these lines, views that are consistent with mechanisms outlined above. For instance a few years ago the strong negative view of immigration held by some contesting for the US Sierra Club board of director was linked to presumed population growth (P through M) IPAT reasoning (Barringer, 2004). Similarly, in the run-up to some of the international population conferences advanced arguments about migration are sometimes quite negative. Certainly both population distribution and migration are implicated in discussion about managing urban growth and its environmental impact (Montgomery, 1988).

There is a further twist. Many policy makers, government officials, and the like have a negative view of urbanization. In a recent UN report, the majority of developing country national policymakers advocated policies to decelerate or reverse migration to metropolitan areas, and 80 percent of African country respondents felt the same way (United Nations, 2003). Another UN report argued that development agencies maintained an anti-urban stance in their programs (United Nations 2001). While one might not want to put too much stock in such solicitations of policy, it does suggest the rather negative light in which urban growth is often viewed.

Overall, I would argue, that despite the extensive writing now done on human impacts on environmental change, and the more balanced tone that such writing now takes, our knowledge about regarding coupled human-natural systems still falls woefully short of understanding the interaction. Consider that in 2001 a UN report stated:

... how population size and growth, environmental change

and development interact on each other is not well established.
[UN, *Population, Environment, and Development: The Concise Report* (2001) emphasis added]

The conclusions of this report still ring true, and all the more so for migration and population distribution.

3. Some illustrative Results

Although the intention here is to avoid a research paper, I take the liberty of drawing on a few empirical findings from my fieldwork in coastal Ghana to illustrate a few of these items. That project [see <http://www.pstc.brown.edu/ghana/index.htm>] was conceptualized to look at the relationship between urbanization (including migration and population density) and the environment. Coastal areas are of interest, because they are generally increasing in population and economic activity, potentially threatening sensitive ecosystems (Hunter, 2000). Internal rural-urban migration is implicated in these changes, and a better understanding of its determinants, both economic and social could help with the development of policies of coastal resource management (Bilsborrow and DeLargy, 1991; Curran et al., 2002).

The key environmental variable of interest to our multidisciplinary international research team was water, both coastal lagoon water bodies and household drinking water. Of course we were interested in any contamination of water bodies. The coastal lagoons represent a very important economic and natural resource. One expectation our project could test was whether urbanization was associated with deteriorating water quality. While the initial expectation might be a simple and obvious positive association with urbanization (watershed population density) and pollution, the argument made above suggests that such tight and automatic relationships between overall population and environmental outcomes might be questioned.

What did we find? In fact our group did find an association between population density in the watershed and nutrient loading (Nixon et al., 2007). The solid circles of Figure 1 below and the fitted line shows the relationship.

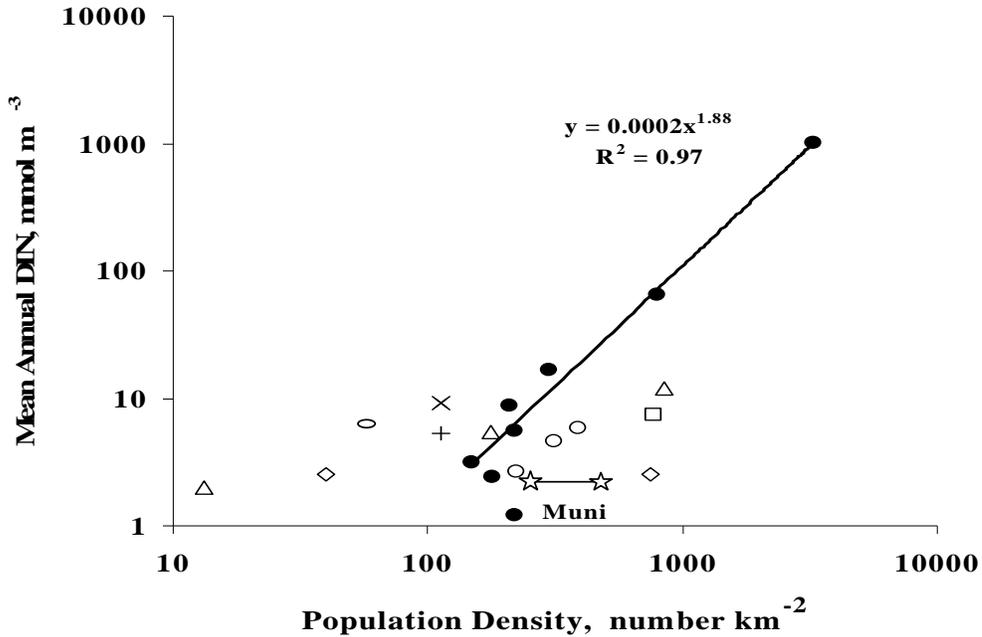


Figure 1: Mean annual concentrations of dissolved inorganic nitrogen in the coastal lagoons of Ghana (solid circles) and some coastal lagoons on the Atlantic coast of the US (open symbols, X, and +) as a function population density in the watershed. Source: Nixon et al., 2007.

There is more, however. If we add to the chart some data for US Atlantic Coast lagoons (background data available to my colleagues), the relationship weakens visually and disappears statistically. Our unsurprising interpretation is that high income societies can put more resources into various kinds of pollution control (in this case treatment of human waste figures prominently), and therefore, the density-pollution relationship begins to weaken. But there is even more than this. The identified Muni point indicates a Ghanaian lagoon that was set aside as a protected wetland under the international Ramsar treaty. This level of impact, lower than predicted by population density in the watershed, points to something about institutions, regulation, and capacity, something to which I will return in my final section. Before leaving this study, let me note that we examined many other parameters, and while the full picture has more detail, our overall conclusion is as I have represented it here.

Permit me to take another example from this same project. This one focuses more directly on migration and local environmental attitudes. Our project conducted a household based survey in the study region. In a random sample of adults, we gathered information about demographic traits, household behaviors, knowledge about health, and environmental attitudes. This last included a question about the trade-off between environmental preservation

and economic growth. We used a regression analysis to predict the likelihood the respondent expressed a preference for environmental preservation. Figure 2 below presents a graphical summary of these results, with the height of bars above 1.0 indicating more environmental sentiment, and the shortfall beneath 1.0 indicating economic growth sentiment.

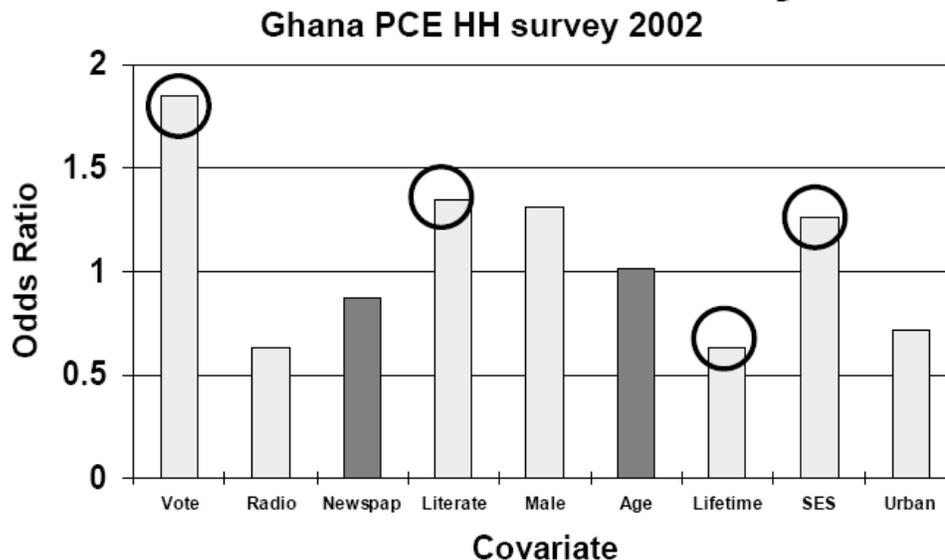


Figure 2: Logit regression model; Response “yes” to “environment is a priority” over economic growth; N=2209 persons ≥ 18 yrs; white bars indicate statistically significant at $p < 0.05$; SES effect is 3 units * coeff.; Age effect 10 * coeff; others 1 unit. Standard Errors adjusted for household clustering. Source: White & Hunter, 2005.

Omitting some of the analytical detail, one noteworthy finding is that migrants (the complementary fraction to “lifetime” residents depicted in Figure 1) are, if anything, more likely to express the view that environment is a priority. The argument that migrants are “detached” or alienated from the local natural environment does not find much support here. Our own assessment is that local long-term residents may, in fact, be keener to see local resource exploitation for their own livelihoods. (We are now trying to understand more about these views from a companion textual analysis of in-depth interviews.) Whatever the ultimate explanation, these results again show us that initial assumptions and predictions might not always hold.

4. Conclusions: Migration, Environment, and Policy

Policy is crucial, problematic, and accessible in the case of Migration (or Population Distribution) and the Environment. To be sure, policy intervention at several scales is necessary for environmental protection and

amelioration. The global-to-local discussions underway now all suggest various policy interventions: carbon tax, eliminating or reducing release of certain noxious compounds into the atmosphere, regulating the fleet of vehicles on the road, stepping up land use regulations.

Migration (again more broadly population distribution and redistribution) is both intriguing and problematic in the policy arena. Catherine Marquette sets out the issue rather well across multiple scales:

Policy makers often reflect a sedentary bias towards migration from rural areas in developing countries. They see these flows as an exceptional response, a 'last resort,' or a 'survival strategy' for individuals or households in the face of no alternative. In receiving countries in Europe and North America, this negative view of rural migration drives evermore restrictive migration policies and, ultimately, the irregular migration, which goes with it. In developing countries from where migrants originate, this sedentary view of migration results in an emphasis on stay-at-home or rural growth-linkage policies, which see development as an important deterrent to migration. [Marquette, 2007]

Plenty of policy-makers, in both developed and developing countries, see migration as something to be reduced, slowed, or even stopped. Yet, that is not likely to be a productive strategy. In most settings there is limited opportunity or capacity to slow migration. The relatively unfettered irregular migration of the "floating population" of China offers just the single largest and most visible example of the challenge of regulating migration when growth is desirable in a globalizing economy. Many other such streams of human movement exist, within and across national borders.

Migration and more generally population redistribution is linked to economic growth and development. There is really very little question about that. Despite policy concerns migrants are most often acting in their own best interests, and the redistribution of population comes alongside economic growth (National Research Council, 2003; White and Lindstrom, 2005). Ironically, the bigger problem might occur when migration and urbanization are not linked to economic growth. Such a view was raised a few years ago in the *World Bank Development Report*: "Cities in Africa are not serving as engines of growth and structural transformation" (World Bank, 2000a).

With respect to urbanization policy, such a view may align with that of Bloom and coauthors (2008). They acknowledge the concomitancy of urbanization and economic growth, but they are quite reserved about any claim that urbanization is a causal agent, and they do not see a pro- or anti-

urbanization (read also migration) policy as influencing economic development. The further effects of such policies on environmental issues associated with population redistribution (and economic growth) remains to be seen. Thus,

From a policy point of view it may be best to be relatively neutral to population movement per se, and work harder at responding to it, both socially and environmentally

Migration brings population redistribution, and here taps a more productive and perhaps more crucial arena for addressing the consequences of human-ecosystem interaction. My suggestion for analysts and policymakers is to work much harder at unpacking the population-environment link: understand the components and their individual effects. Above I expressed some skepticism about the universality and size of the P→E relationship: How large is β after all? Might it be close to zero? Does it change with circumstances? The same goes for migration. Since migration and population redistribution are associated with economic growth, the more productive policy route might be to understand (a) more specific links between population distribution and the environment; and (b) how best to respond to migration, urbanization, and settlement patterns so as to minimize impact on the environment.

The Environmental Kuznets Curve (EKC) might be offered as a *deus ex machina* for environmental problems. Under the EKC scenario, economic growth can eventually lead to environmentally beneficial behaviors, because the environment is a superior good. Whether time is sufficient for the EKC to play out as contemporary LDC's catch up to MDC's is a difficult and extraordinarily consequential issue. Even more, as the research stock about the EKC builds, there are attendant questions about how universally applicable it might be. That is, some pollution trajectories might not follow the EKC scenario at all. Thus,

Scholars must do the work to help policy-makers know what paths to environmental amelioration require the most intervention and what paths are relatively self-correcting.

If people are going to move anyway, what might policy-makers do, and how might research help? For example, one claim is that migrants are less engaged in the local community and less protective of natural resources. This deserves direct and systematic examination. Institutional factors need to be addressed when one takes up issues of the commons (Dietz et al, 2003; Ostrom et al 1999). I suggest that thinking about institutional forces that promote, restrain, redirect, and organize population distribution and

redistribution would pay significant dividends. While much migration is economic rational and market driven, there may also be externalities in the consequences of choices in redistribution and land settlement.

Finally, migration does bring with it alterations in the settlement system. Urbanization is quickly invoked for a host of ills (Cincotta et al, 2002), and patterns of human settlement figure prominently in considerations environmental impact. Within the environmental realm, it is Land Use Land Cover (LULC) that stands to be most directly affected by migration and urban development. Thus,

Research on the relationship between urbanization and environmental outcomes – at multiple scales – would do much to advance the state of knowledge about $P \rightarrow E$ relationships.

Here I am required to genuflect to the researcher's concern for more and better data. Often such commentary is self-serving, even gratuitous. To be sure, here in the case of migration, population distribution and the environment, such a criticism may be again advanced. I would like to suggest, however, that scholars and analysts do have a fairly good handle on major research questions and component analytical tools. We need to unite environmental and demographic data at multiple and detailed temporal and geographic scales to make progress. That is a big challenge. I hope the day arrives soon. Progress will follow for science and policy.

Where do we end up? My overall argument is that the consequences of migration – and more generally urbanization and population distribution – are crucial to environmental health of the 21st century. There is much cause for optimism: social and natural scientists of many sub-disciplines are speaking to one another; better data are being collected, and research is beginning to emerge. Migration and population re-settlement in a world of over six billion humans present enormous challenges, but challenges that can be met, as long as policy keeps up with knowledge.

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