

## Environmental drivers of human migration in drylands – A spatial picture



Kathleen Neumann<sup>a, b, \*</sup>, Diana Sietz<sup>a</sup>, Henk Hilderink<sup>b</sup>, Peter Janssen<sup>c</sup>, Marcel Kok<sup>c</sup>, Han van Dijk<sup>a</sup>

<sup>a</sup> *Sociology of Development and Change Group, Wageningen University, P.O. Box 8130, 6700 EW Wageningen, The Netherlands*

<sup>b</sup> *Laboratory of Geo-information Science and Remote Sensing, Wageningen University, P.O. Box 47, 6700 AA Wageningen, The Netherlands*

<sup>c</sup> *PBL Netherlands Environmental Assessment Agency, PO box 303, 3720 AH Bilthoven, The Netherlands*

### ARTICLE INFO

*Article history:*  
Available online

*Keywords:*  
Drylands  
Environmental pressure  
Human migration  
Cluster analysis  
Spatial data

### ABSTRACT

It is widely accepted that environmental change can influence human migration. In particular, the environment plays a role in migration processes in drylands, in which environmental change—including increasing variability of rainfall, increasing frequency of droughts, chronic water shortage, and land degradation—can heavily influence migration. However, systematic large-scale studies of the relationship between environmental factors and human migration are rare, and a global, consistent picture of environmental drivers of migration is lacking. In this study, we sought to fill this gap by analysing spatial patterns of environmental drivers of migration in drylands by performing a cluster analysis on spatially explicit global data. In this analysis, we focused explicitly on precipitation, aridity, drought, land degradation, soil constraints, and availability of cropland and pastures as potential environmental drivers of migration in drylands. In addition, we linked the identified clusters to two observed hotspots of out-migration—Burkina Faso and Northeast Brazil—to gauge the cluster results. Our results show that environmental drivers can be grouped into eight distinct clusters, and we identified the most severe environmental constraints for each cluster. These results suggest that out-migration—both in absolute and relative terms—occurs most frequently in a cluster that is constrained primarily by land degradation rather than water availability.

© 2014 Elsevier Ltd. All rights reserved.

### Introduction

It is generally accepted that environmental change can influence human migration (Foresight, 2011; Adger et al., 2014); this process is called environment-induced migration. In drylands, migration is a commonly used strategy to cope with environmental change, as the natural resource base—which is highly susceptible to climate change—largely determines the livelihood of rural populations. Drylands cover approximately 40% of the Earth's land surface and has more than 2 billion inhabitants, 90% of whom are located in developing countries (IIED, 2008). Today, more than half of the world's impoverished live in drylands (IIED, 2008; Safriel & Adeel,

2005). Hunger- and poverty-related vulnerability are likely to increase in drylands as a result of environmental changes such as land degradation, increasing variability of rainfall, chronic water shortage, and an increasing frequency of droughts (IIED, 2008; Sissoko, Keulen, Verhagen, Tekken, & Battaglini, 2011; van der Geest & Dietz, 2004). These environmental changes are recognized as potential drivers of out-migration and are acknowledged to contribute to the migration of large numbers of people (Foresight, 2011; IOM, 2008a).

Since the 1980s, after a period of neglect, the interest in migration-driving environmental factors has been growing (Piguet, 2012). Recently, an increasing number of scholars used theoretical frameworks to acknowledge the complex role that environmental change plays in migration processes (Black et al., 2011; McLeman & Smit, 2006; Perch-Nielsen, Bättig, & Imboden, 2008). These frameworks extend beyond the simple assumption that adverse environmental conditions straightforwardly cause migration. Moreover, a growing number of case studies illustrate that migration can be a valuable climate adaptation strategy to improve

\* Corresponding author. Laboratory of Geo-information Science and Remote Sensing, Wageningen University, P.O. Box 47, 6700 AA Wageningen, The Netherlands. Tel.: +31 0317 481834; fax: +31 0317 419000.

E-mail addresses: [Kathleen.neumann@wur.nl](mailto:Kathleen.neumann@wur.nl) (K. Neumann), [Diana.sietz@wur.nl](mailto:Diana.sietz@wur.nl) (D. Sietz), [Henk.hilderink@rivm.nl](mailto:Henk.hilderink@rivm.nl) (H. Hilderink), [Peter.janssen@pbl.nl](mailto:Peter.janssen@pbl.nl) (P. Janssen), [Marcel.kok@pbl.nl](mailto:Marcel.kok@pbl.nl) (M. Kok), [Han.vandijk@wur.nl](mailto:Han.vandijk@wur.nl) (H. van Dijk).

livelihoods in drylands (Brockhaus, Djoudi, & Locatelli, 2013; McLeman & Hunter, 2010; McLeman & Smit, 2006; Meze-Hausken, 2000; Roncoli, Ingram, & Kirshen, 2001; Scheffran, Marmer, & Sow, 2012). However, analytical and spatially explicit studies regarding the interaction between environmental change and human migration are relatively rare. Studies that empirically explore relationships between environmental pressure and human migration in drylands are typically restricted to particular stress factors in selected regions, for example, droughts in Ethiopia (Gray & Müller, 2012), vegetation changes in Ghana (Van der Geest, Vrieling, & Dietz, 2010), or changes in rainfall patterns in Burkina Faso (Henry, Schoumaker, & Beauchemin, 2004). However, there is a general paucity of integrated analyses of the interplay between multiple environmental pressures and human migration at the macro-scale. Moreover, systematic large-scale projects that employ a consistent and comparable approach at several sites are rare and meta-studies are virtually missing (Piguët, Pécouc, & de Guchteneire, 2011). In addition, there is a lack of insight regarding the mechanisms that lead to environment-induced migration. As a result, no globally consistent picture of the environmental drivers of human migration in drylands has emerged.

Given the caveat that environmental factors are only one of many factors that can potentially drive migration, here we present a global-scale approach used to analyse spatial patterns of environmental drivers of human migration in drylands, and we link these drivers to observed hotspots of out-migration. To achieve this objective, we applied a cluster analysis to spatially explicit global data (Janssen, Walther, & Lüdeke, 2012). Cluster analysis is a commonly used statistical method to classify observations based on their similarity. Our results reveal that environmental constraints in drylands can be grouped into eight distinct clusters, and the most distinctive indicators are related to water and land availability. These clusters can be used to better characterise regions of out-migration in drylands and to understand some of the dynamics that underlie out-migration.

## Drivers of migration

A broad range of terms and concepts are generally used to classify migration that results from environmental factors (IOM, 2008b). These concepts all draw on the classical migration theory of push and pull factors (Lee, 1966) by assigning relatively high importance to push factors that are linked to environmental conditions at the place of origin. However, environmental change is rarely the sole cause of out-migration, as migration usually occurs in a broader socio-economic and political context. If—and how—environmental change triggers migration can also depend on political, economic, and demographic constraints at various scales; therefore, measuring and isolating ‘pure’ environment-induced migration and making generalisation regarding the causes and consequences of migration is challenging (Black et al., 2011; De Haas, 2010; Richmond, 1995; Suhrke, 1993). Consequently, estimates of the current and future numbers of environmental migrants vary widely (Gemene, 2011). Moreover, the individual's expectations with respect to the benefits of migration—as well as the resulting financial and psychological costs—can affect the individual's decision whether to migrate or not. Here, we focus on migration that is linked to a gradual decline in environmental conditions within the context of population growth, low agricultural productivity, poverty, and fragile ecosystems (IOM, 2008b).

Building on the work of Black et al. (2011), we distinguished the following six interrelated categories of macro-level drivers of migration in drylands: political factors, demographic factors, economic factors, social factor, environmental factors, and food security (Fig. 1). Nevertheless, in our analysis, we only account for

environmental drivers, as reliable global grid cell data regarding the other categories of drivers in drylands are scarce. Political drivers of migration include governance types, conflicts, security, discrimination, and persecution as well as formalised resettlement programmes and/or policies. Economic drivers include technological development, investments, employment opportunities, income levels, and market integration. Economic and political drivers interact at various levels; for example, large-scale infrastructure programmes designed to stimulate economic development usually fall under the umbrella of national or sub-national government-based strategic development programmes and policies. Although economic development often attracts immigrants, it is usually impossible to attribute the resulting in-migration solely to either political or economic factors, as these factors are usually closely related. In contrast, an economic crisis can trigger political instability, thereby potentially causing a change in the political system and possible out-migration. Demographic drivers include population structure, growth, and the occurrence of diseases, all of which can depend strongly on the economic and/or political context. For example, to successfully curtail diseases such as malaria and HIV, providing health education programmes and access to medical care is essential. Typically, such programmes are part of—or are excluded from—the national health policy, which illustrates the tight relationship between demographic and political drivers. Furthermore, demographic drivers can determine economic development via mechanisms such as education, labour availability, and labour force. Environmental drivers of migration include *rapid-onset* changes (such as floods and hurricanes) as well as *slow-onset* changes, which include land degradation, desertification, and changes in climate variability. Both the severity and frequency of such environmental drivers are likely to be affected by global environmental change, which is considered to be—at least in part—a consequence of complex socio-economic changes that have been developing for decades. Food security is closely related to the other four categories of drivers (political, demographic, economic, and environmental) and plays a central role in migration. Therefore, food security is a function of agricultural production, investments in food production technologies, infrastructure for food storage and distribution, population pressure, trade policies, food prices, and political stability. The perceived and actual differences between the place of origin and the destination with respect to one or more of the illustrated drivers can influence whether people choose to migrate or not. In addition, social factors—including family obligations, culture, and access to migration networks—can influence an individual's decision of whether or not to migrate.

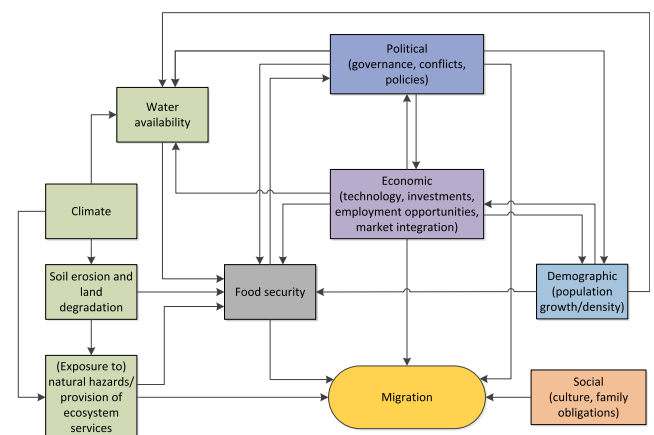


Fig. 1. Drivers of migration in drylands. Based on the scope of this study, the environmental drivers are described in more detail than the other drivers.

Download English Version:

<https://daneshyari.com/en/article/6538645>

Download Persian Version:

<https://daneshyari.com/article/6538645>

[Daneshyari.com](https://daneshyari.com)