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Human Security and the Relocation of Internally Displaced Environmental Refugees in Cameroon

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ABSTRACT

The more frequent occurrence of natural disasters due to climate change will doubt-lessly blow up the number of environmental refugees, not the least in sub-Saharan Africa. Not all of them flee their countries, many being internally displaced. Ideally, abandonment of the homelands is not permanent. In order to improve our under-standing of internally displaced environmental refugees and the framing conditions to either return or not, this contribution uses the human security concept of the United Nations to construct a unique micro-level human security index, consisting of seven dimensions. The human security index is employed on a sample of environmental refugees, who became internally displaced in 1986 during the Lake Nyos natural disaster in Cameroon. A number of these households has decided to return, although legally prohibited. The majority is still in the resettlement camps, waiting to return. Binominal logit analysis of actual and potential return behaviour in relation to the human security index revealed, among others that health security is a self-selection variable, increasing the odds of returning. The perception of self-efficacy may be important here. A major incentive for returnee households is the potentially higher economic security due to the meanwhile improved agro-ecological situation in the homelands.

KEYWORDS: Internally displaced environmental refugees, returnees to disaster-prone areas, micro-level human security indicator, natural disaster, Cameroon

1. INTRODUCTION

The involuntary movement of persons within national boundaries, so-called internally displaced persons (IDPs), has not only attracted political but also increasing scientific attention. The role of IDPs for peace, stability, and security is part of international debates. The United Nations High Commissioner for Refugees (UNHCR) Global Trends report finds 65.3 million people, or one person in 113,

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were displaced in 2015, and around 34 million of them were IDPs.[1] Almost 70 per cent of them fled their homesteads due to natural hazards or disasters. In other words, most of the global internal displacement was of environmental origin. Over 50 per cent of these IDPs are located in about 20 countries on the African continent, with the highest concentration in East and Central Africa.[2] These figures illustrate that international and internally displaced environmental refugees[3] pose one of the foremost human crises of our times.[4] Until recently, however, they have been viewed as a peripheral concern. One reason why IDPs in general, and internally displaced environmental refugees in particular, have not received as much attention as international refugees[5] stems from the fact that the latter often attract media attention and, given that the causes of flight fall under the United Nations (UN) Convention relating to the Status of Refugees, are reasonably well protected.[6] In contrast, IDPs live under the jurisdiction of their own State[7] and in principle have the same rights as other citizens.[8] But internal displacement nearly always generates conditions of

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1 See: UNHCR Global trends report 2015, available at: http://www.unhcr.org/global-trends-2015.html (last visited 2 Jun. 2017).

2 See for instance: Internal Displacement Monitoring Centre (IDMC), 2016 Global Report on Internal Displacement (GRID 2016), Geneva, (ISMC), 2016, available at: http://www.internal-displacement.org/assets/publications/2016/2016-global-report-internal-displacement-IDMC.pdf (last visited 15 Jun. 2016); United Nations Development Programme (UNDP) & Regional Office for Central and East Africa (OCHA), Displaced Populations Report. Nairobi, UNDP & OCHA, 2009; UNHCR, *UNHCR Global Appeal 2007*, Geneva, UNHCR, 2007, available at: http://www.unhcr.org/publ/PUBL/4565a5742.pdf (last visited 3 Jun. 2015).

3 Environmental refugees are, according to Norman Meyers, those people who have been forced to leave their homelands, temporarily or permanently, because of a marked environmental disruption that has jeopardised their existence and/or seriously affected the quality of their life. Essam El-Hinnawi specified the term "environmental disruptions" such that it includes any physical, chemical, and/or biological changes in the ecosystem (or the resource base) that render it, temporarily or permanently, unsuitable to support human life. Some seek sanctuary abroad, others in their home countries. Those staying within their national borders can be termed internally displaced environmental refugees.

4 See: N. Meyers, "Environmental Refugees: A Growing Phenomenon of the 21st Century", *The Royal Society*, 357, 2001, 609–613; E. El-Hinnawi, *Environmental Refugees*, United Nations Environmental Programme (UNEP), 1985.

5 Interestingly, Art. 1A(2) of the 1951 UN Refugee Convention only entitles rights to refugees who satisfy the following definition: A refugee is "a person who is outside his or her country of nationality or habitual residence; has a well-founded fear of being persecuted because of his or her race, religion, nationality, membership of a particular social group or political opinion; and is unable or unwilling to avail him or herself of the protection of that country, or to return there, for fear of persecution (see Article 1A(2)). People who fulfil this definition are entitled to the rights [. . .]": 189 UNTS 150, 28 Jul. 1951 (entry into force: 22 Apr. 1954).

6 See for instance: C. Brun, "Local Citizens or Internally Displaced Persons? Dilemmas of Long Term Displacement in Sri Lanka", *Journal of Refugee Studies*, 16(4), 2003, 376–396; UNHCR, *The Protection of Internally Displaced Persons and the Role of the UNHCR*, Informal Consultative Meeting, 2007, available at: http://www.unhcr.org/en-us/protection/idps/50f951df9/protection-internally-displaced-persons-role-unhcr-excom-informal-consultative.html (last visited 3 Jun. 2016).

7 In fact, the UN states that IDPs "shall enjoy, in full equality, the same rights and freedoms under international and domestic law as do other persons in their country. They shall not be discriminated against in the enjoyment of any rights and freedoms on the ground that they are internally displaced": UN Commission on Human Rights, *Report of the Representative of the Secretary General, Mr. Francis M. Deng, Submitted Pursuant to Commission Resolution 1997/39. Addendum. Guiding Principles on Internal Displacement, E/CN.4/1998/53/Add. 2*, 1998, 5.

8 *Ibid.*

severe hardship, in spite of the UN prescriptions that such persons should be at least elevated to have the same rights and obligations as other co-citizens.[9]

The fact that internal displacement is managed within territorial boundaries by the Government suggests that research on IDPs can be best enriched through country case studies. The increasing occurrence of natural disasters[10] in the last two decades,[11] and the accompanying political, social, and economic problems, provide sufficient support for such a research agenda. Amongst the conceptual frameworks suggested for modelling IDPs is that of human security, introduced by the United Nations Development Programme (UNDP) in 1994.[12] The human security concept in combination with IDPs is an ideal match because it does not focus on the territorial security of individuals *qua* citizens but more universally on the security of individuals *qua* persons. Subsequently, it could also be applied to international refugees and other causes of displacement.

This article examines the state of human security of Cameroonian households that have been internally displaced for a prolonged period, namely 30 years, due to a marked environmental disruption, i.e., the Lake Nyos natural hazard.[13] A violent volcanic eruption with a release of suffocating carbon dioxide gas at Lake Nyos[14] in the north-west of Cameroon on 21 August 1986 killed almost all livestock and some 1,746 persons within an area of 25 km diameter around the lake. The 1,979 survivors were resettled in seven camps,[15] where the majority of them still live today.[16] The shock-affected villages of Nyos, Cha, and Subum were declared a disaster zone by the Government and resettlement was, and still is, legally prohibited.[17] With a natural increase of population in the resettlement camps[18] next to the host villages to about 12,000 inhabitants,[19] a number of the formerly displaced households have

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9   Brun, "Local Citizens", 16.

10   Natural disasters exert an enormous toll on development. Eighty-five per cent of the people exposed to earthquakes, tropical cyclones, floods, and droughts live in developing countries. See: United Nations Development Programme (UNDP), *Reducing Disaster Risk: A Challenge for Development*, New York, UNDP, Bureau for Crisis Prevention and Recovery, 2004.

11   World Bank, *Natural Disaster Hotspots: A Global Risk Analysis*, Disaster Risk Management Series No. 5, Washington, DC, USA, World Bank, Hazard Management Unit, 2005.

12   UNDP, *Human Development Report 1994. New Dimensions of Human Security*, New York, UNDP, 1994, available at: http://hdr.undp.org/en/reports/global/hdr1994/ (last visited 3 Jun. 2015).

13   With regard to the Lake Nyos Disaster, the term environmental hazard may be appropriate. In the following, however, we will use the more general term "environmental disruption" as specified earlier in the article and with reference to El-Hinnawi, *Environmental Refugees*, 1985.

14   Lakes Nyos (and Lake Monoun) occupy the craters of supposedly extinct volcanoes. The region belongs to the so-called volcanic chain of Cameroon.

15   E.N. Ngwa, "Responding to Unmet Food Needs of Displaced Persons or Refugees: A Case Study of New Approaches in Koussseri Town and Nyos Area of the Republic of Cameroon", *Geothermal Journal*, 27(4), 1992, 323–330.

16   H. Bang, *Natural Disaster Risk, Vulnerability and Resettlement Relocation Decisions Following the Lake Nyos and Monoun Gas Disasters in Cameroon*, PhD Thesis, East Anglia, UK, University of East Anglia, 2009.

17   C. Loh, "Lake Nyos - Two Years for Survivors to Return to Ancestral Land", *Cameroon Tribune*, Mar. 2010, available at: http://allafrica.com/stories/201003241004.html (last visited 18 Jun. 2011).

18   The camps are next to the mentioned villages. Each internally displaced household was given a permanent house and a small piece of land for farm gardening.

19   UNDP & OCHA, *Lake Nyos Dam Assessment*, Nairobi, UNEP & OCHA, 2005, available at: https://docs.unocha.org/sites/dms/Documents/Lake_Nyos_Dam_Assessment.pdf (last visited 3 Jun. 2015).

decided, of their own accord, to return to their homelands, in spite of the Government restriction and the possibility of a re-occurring volcanic eruption.[20]

Two questions arise from this observation: (1) What distinguishes the households that have already returned to the disaster prone Lake Nyos area from the displaced households in the resettlement areas? (2) Would the households that have remained for now in the resettlement areas decide to return, if the governmental restriction were lifted or if the environmental hazard associated with Lake Nyos, i.e., the renewed release of huge amounts of lethal carbon dioxide gas, became negligible? This article addresses these questions by using the concept of human security[21] as an analytical framework.

Human security is concerned with two basic human entitlements, namely the freedom from want (developmental security pillar) and the freedom from fear (protective security pillar). These two pillars are framed by the right to live in dignity. In general, it can be said that human security emphasises the protection of individuals *qua* persons (and not *qua* citizens) from chronic and sudden threats and the safeguarding of their survival, livelihood, and dignity when faced with these threats. Thus, it is an ideal conceptual framework for analysing which of the seven human security dimensions influence the locational decision-making of refugees (be they "traditional" or internally displaced refugees), exemplified here by internally displaced environmental refugees. This is done by constructing a unique micro-level human security index (HSI) on the basis of the aforementioned security dimensions.

The article is set out as follows. Section 2 briefly discusses the conceptual framework of human security. It then continues by reviewing current scholarly indices of human security, before presenting the reasoning behind the composite micro-indicator of human security. In Section 3, econometric results using binary logistic regression models are presented and interpreted. The binary dependent variable relates to the locational decisions of the internally displaced environmental refugees, the explanatory regressors are the seven dimensions of the HSI. A discussion and conclusions are given in Section 4.

2. CONDENSING HUMAN SECURITY IN AN INDIVIDUAL INDICATOR

IDPs who flee their homesteads due to marked environmental disruptions often want to return once the state of human security has improved,[22] especially if this is supported by the respective Government.[23] In the case of Cameroon, however, to date returning to the Lake Nyos region is still legally prohibited. This is because of the particular natural hazard, namely the possibility of another suffocating gas emission from Lake Nyos, and in spite of Government efforts to reduce this risk by

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20 R.A. Balgah & G. Buchenrieder, "Natural Shocks and Risk Behaviour. Experimental Evidence from Cameroon", *Quarterly Journal of International Agriculture,* 50(2), 2011, 155–173.

21 See, UNDP, *Human Development Report 1994. New Dimensions of Human Security,* 23f.

22 Bang, *Natural Disaster Risk,* 203.

23 S. Tatsuki, "Impact Stabilization and Event Evaluation for Life Recovery Among the 1995 Kobe Earthquake Survivors", Paper presented at the International Conference in Commemoration of the 10th Anniversary of the 1999 Chi-Chi Earth, Taiwan, 17-21 Sep. 2009, available at: http://tatsuki-lab.doshisha. ac.jp/~statsuki/papers/921Chi-Chi10th/Tatsuki_10th_921_Conf_Paper.pdf (last visited Aug. 2016).

setting up pipes to extract, in a controlled way, the dissolved carbon dioxide from the lake. Another potential risk is the breaking of the natural dam (about 40 m high, having a width of 45 m at its narrowest point), which was a result of the volcanic eruption and which consists of pyroclastic material. If the dam were to collapse, it could lead to devastating floods that could affect a downstream area as far as Nigeria, 100 km away.[24] Yet, around 20 per cent of the households that were originally displaced by the Lake Nyos natural disaster have in the meantime returned to their homesteads.[25] We examine this phenomenon from a human security perspective.

2.1. Sketch of the human security concept

The term human security was prominently used by US President Franklin Roosevelt[26] during the Second World War[27] and was rejuvenated in the human development report "New Dimensions of Human Security" by the UNDP in 1994.[28] In this context, human security means safety from chronic threats such as hunger, disease, or repression. It also encompasses protection from sudden and hurtful disruptions in the patterns of daily life, including homesteads, jobs, and communities. Human security is therefore relevant to people in both poor and rich nations. The UNDP[29] introduced seven dimension of human security. They include: (1) economic security; (2) food security; (3) health security; (4) environmental security; (5) personal security; (6) community security; and (7) political security. Table 1 briefly summarises the meaning behind each dimension and gives a view to possible indicators representing each dimension.

These seven dimensions can be aligned in two directions: (1) freedom from want (dimensions 1–4), which is also called the developmental human security pillar because it implies safety from chronic threats such as hunger and/or disease; and (2) freedom from fear (dimensions 5–7), which is known as the protective human security pillar because it implies protection from sudden and hurtful disruptions in the patterns of daily life – in homes and/or in communities.

Overall, the human security concept is a people-centred concept, focusing on the most critical and pervasive threats below which the survival, livelihood, and dignity of individuals are seriously threatened. It aligns with the UN Declaration on the Right to Development, which states "[...] that the human person is the central

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24 M. Halbwachs, J. Grangeon, J.-Ch. Sabrou & B. Wong, *Degassing Nyos*, Savoie, F, Université of Savoie, Centre de Recherches Volcanologiques (CNRS), 2013, available at: http://mhalb.pagesperso-orange.fr/nyos/nyos.htm (last visited 17 Aug. 2016).

25 See, for instance, Bang, *Natural Disaster Risk*.

26 In 1941, US President Roosevelt argued for the US to enter the Second World War using four essential freedoms: (1) Freedom of speech and expression; (2) Freedom of every person to worship God in his own way; (3) Freedom from want, meaning economic understandings, which will secure to every nation a healthy peacetime life for its inhabitants; and (4) Freedom from fear, meaning a worldwide reduction of armaments to such a point and in such a thorough fashion that no nation will be in a position to commit an act of physical aggression against any neighbour.

27 G. Koehler, D. Gasper, R. Jolly & M. Simane, *Human Security and the Next Generation of Comprehensive Human Development Goals*, Brighton, UK, Institute of Development Studies (IDS), 2012, available at: http://www.ids.ac.uk/download.cfm?Objectid =26BF82A0-94FC-11E1-84D9005056AA4739 (last visited 15 Mar. 2015).

28 See, UNDP, *Human Development Report 1994. New Dimensions of Human Security*, 23ff.

29 *Ibid.*, see 25ff for a more elaborate description of the concept.

Table 1. Human security and its seven dimensions

Dimension and its meaning		Specification examples
Economic Security	"Economic security requires an assured basic income – usually from productive and remunerative work or in the last resort from some publicly financed safety net."	• Un- and underemployment • Insecure working conditions • Real wages (inflation) • Poverty line • Social safety net, reliance on family or community • Gini coefficient
Food Security	"Food security means that all people at all times have both physical and economic access to basic food."	• Access to food: growing, buying or public food distribution • Availability, i.e. "poor distribution of food and a lack of purchasing power"
Health Security	"In developing countries, the major causes of death are infectious and parasitic diseases. Most of these deaths are linked with poor nutrition and an unsafe environment- particularly polluted water, […]."	• In both developing and industrial countries, the threats to health security are usually greater for the poorest, people in the rural areas and particularly children • Safe water • Access to health services • Maternal mortality • HIV and Aids
Environmental Security	"The environmental threats countries are facing are a combination of the degradation of local ecosystems and that of the global system." […]"Many environmental threats are chronic and long-lasting. Others take on a more sudden and violent character."	• In developing countries, one of the greatest environmental threats is that to water, i.e. water scarcity and water pollution • Pressure on land (deforestation, irrigation), i.e. desertification, salinisation • Air pollution • Droughts, floods, earthquakes, cyclones • Poverty and land shortage increase vulnerability to natural hazards
Personal Security	"In poor nations and rich, human life is increasingly threatened by sudden, unpredictable violence. […] For many people, the greatest source of anxiety is	• Threats from the State (physical torture) • Threats from other States (war) • Threats from other groups of people (ethnic tension)

(Continued)

Table 1. (Continued)

Dimension and its meaning		Specification examples
	crime, particularly violent crime."	• Threats from individuals or gangs (crime, street violence) • Threats directed against women (rape, domestic violence) • Threats directed at children (child abuse) • Threats to self (suicide, drug use). • Threats from industrial and traffic accidents • Violence, mobbing at workplace
Community Security	"Most people derive security from their membership in a group – a family, a community, an organisation, a racial or ethnic group that can provide a cultural identity and a reassuring set of values. Such groups also offer practical support."	• [...] but traditional communities can also perpetuate oppressive practices, employing bonded labour and slaves and treating women particularly harshly. • Some traditional practices of the extended family are breaking down under the steady process of modernisation, offering less support to a member in distress. • Traditional groups can come under direct attack from each other. • Indigenous people also face widening spirals of violence.
Political Security	"One of the most important aspects of human security is that people should be able to live in a society that honours their basic human rights."	• Democracy versus dictatorship • Political repression, systematic torture, ill treatment or disappearance [...] especially during periods of political unrest (political detention and imprisonment) • UNESCO's index of press freedom • Military strength • Ratio of military to social spending

Source: UNDP, Human Development Report 1994. New Dimensions of Human Security, 25ff.

subject of the development process and that development policy should therefore make the human being the main participant and beneficiary of development [...]".[30]

As stated by the UNDP, "a clear set of human security indicators, and an early warning system based on them, could help these countries [to] avoid reaching a crisis point". [31] Despite acknowledging this, the very broad definition of human security has been criticised for lacking precision and encompassing all kinds of threats. Critics, such as Roland Paris[32] along with Mary Martin and Taylor Owen,[33] argue that this leaves too much room for interpretation and does not offer guidance on how to operationalise the concept and to identify priorities. However, UNDP-TR emphasised in 2009 that "human security provides a dynamic framework that [...] builds on processes that are based on peoples' own perceptions of fear and vulnerability".[34] This flexibility allows for the different attempts to empirically operationalise human security in various contexts[35] – providing for "best fit" rather than "best practice".[36]

2.2. Review of scholarly human security indices

Since the inception of the human security concept in 1994, few indices have considered all seven dimensions. With one exception, these indices refer to the aggregated country level,[37] although the concept of human security explicitly addresses the individual level.[38] In this review, we concentrate on three country-level indices, namely those by David Hastings,[39] Steve Lonergan and colleagues,[40] and Sascha Werthes and colleagues,[41] and

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30 See, page 3, UN, *UN Declaration on the Right to Development*, (Article 2), New York, UN, 1986, available at: http://www.un.org/documents/ga/res/41/a41r128.htm (last visited 10 Jul. 2015).

31 UNDP, *Human Development Report 1994. New Dimensions of Human Security*, 3.

32 R. Paris, "Human Security - Paradigm Shift or Hot Air?", *International Security*, 26(2), 2001, 87–102.

33 M. Martin & T. Owen, "The Second Generation of Human Security: Lessons from the UN and EU Experience", *International Affairs*, 86(1), 2010, 211–224.

34 See page 7, UNDP & Trust Fund for Human Security (TR), *Human Security in Theory and Practice: An Overview of the Human Security Concept and the United Nations Trust Fund for Human Security*, New York, UNDP & TR, 2009, available at: http://www.un.org/humansecurity/sites/www.un.org.humansecurity/files/human_security_in_theory_and_practice_english.pdf (last visited 5 Aug. 2015).

35 Paris, *International Security*, 87ff.

36 UN, *Summary of the General Assembly Thematic Debate on Human Security*, 22 May 2008, New York, UN, 2008, available at: http://www.un.org/ga/president/ 62/ThematicDebates/humansecurity/summary.pdf (last visited 27 Mar. 2015).

37 In 2010, for instance, a webpage was launched comparing the state of human security among 232 countries (http://www.humansecurityindex.org/).

38 Other work on individual human security does so without introducing an index but illustrating threat levels using Geographic Information Systems. See, e.g., T. Owen & O. Slaymaker, "Toward Modeling Regionally Specific Human Security Using GIS: Case Study Cambodia", *Ambio*, 34(6), 2005, 445–449. Gary King and Christopher Murray reduce the comprehensiveness of the human security concept by concentrating on only four out of the seven dimensions but do not construct an index either. See: G. King, Ch. Murray, "Rethinking Human Security", *Political Science Quarterly*, 116(4), 2002, 585–610.

39 D. Hastings, *The Human Security Index: An Update and a New Release*, 2011, available at: http://www.humansecurityindex.org/?page_id=224 (last visited 15 May 2015).

40 S. Lonergan, K. Gustavson & B. Carter, "The Index of Human Insecurity", *Aviso*, 6, 2000, 1–7.

41 S. Werthes, C. Heaven & S. Vollnhals, *Assessing Human Insecurity Worldwide: The Way to a Human (In)Security Index*, INEF Report 102/2011. Essen, D, University of Duisburg Essen, Institute for Development and Peace, INEF, 2011, available at: http://edoc.vifapol.de/opus/volltexte/2013/4867/pdf/report102.pdf (last visited 3 Jun. 2015).

one individual level index by Rihards Bambals,[42] for reasons that will be explained below.

The (country-level) HSI by David Hastings is based on the idea that human security can be narrowed down to just three aspects, i.e., economic, environmental, and social "fabrics".[43] The sub-indices are normalised; that is, they are scaled between zero and one. The composite index is the arithmetical average of the three sub-indices (see Table 2 for details on each of the scholarly human security indices selected).

According to Steve Lonergan and his colleagues (country-level), human *insecurity* may result from "i) the actual risk of exposure to stresses; ii) the perception of risks; and, iii) whether the capacity exists to cope with stresses".[44] Their index consists of four components (i.e., environment, economy, society, and institutions), with each of these components being constructed based on four indicators. This set of 16 indicators was picked to avoid overlapping and highly correlated aspects of human security. The idea is that additional indicators that deal with specific issues (e.g., food security) may supplement the index flexibly according to context. The procedure implies that not all of the seven classical dimensions of human security can be reflected with appropriate indicators (see also Table 2 on this issue). All values are standardised between one and 10, which also means that all indicators are given the same weight in the composite, additively estimated index.[45]

Sascha Werthes and his colleagues[46] also developed a (country-level) human *insecurity* index. In contrast to the two aforementioned indices, this index closely follows the seven original human security dimensions of the UNDP (1994),[47] although personal and community security were combined into one dimension.[48] For each of the six dimensions, two indicators were chosen (see Table 2 for details). The intention behind this procedure is: (1) to identify the actual threat in each dimension to find priorities for each country; and (2) to reveal the overall human security in a given country to allow for cross-country comparison. To this end, all indicators are standardised and take values between zero and 100. To estimate each of the six dimensions, the arithmetical average from each indicator is taken; the composite index is calculated as the arithmetical mean of the six sub-indices. Since this particular country-level index measures insecurity (and not security as one would assume), higher values imply a higher level of insecurity.[49]

42   R. Bambals, "Human Security: An Analytical Tool for Disaster Perception Research", *Disaster Prevention and Management*, 24(2), 2015, 50–165.

43   Hastings, *The Human Security Index: An Update and a New Release*.

44   Lonergan *et al.*, "The Index of Human Insecurity", 2.

45   *Ibid.*, 4ff.

46   Werthes *et al.*, *Assessing Human Insecurity Worldwide*.

47   UNDP, *Human Development Report 1994. New Dimensions of Human Security*.

48   Sascha Werthes and colleagues explain that "Personal security focuses on the basic threats caused by physical violence, be it from States, groups or individual persons, whilst community security aims at protecting people from their loss of traditional practices and membership in certain groups, be it a family, a community, an organisation or a racial or ethnic group from which people derive cultural identity. Tests in preparation of the index have shown that for now (due to the available statistical data) the linkage (and correlation) between these two dimensions is especially high". See: Werthes *et al.*, *Assessing Human Insecurity Worldwide*, 18.

49   *Ibid.*, 18ff.

Table 2. Comparative illustration of country-level human security indices

	Human security index Hastings (2011)	The Index of Human Insecurity Lonergan et al. (2000)	Human (In)Security Index Werthes et al. (2011)
Economic Security	• GDP per capita at PPP • Income distribution (Gini Coefficient) • Protection from financial catastrophe through stable macro-financial indicators • Literacy rate	• Real GDP per capita (US$) • GNP per capita growth (annual per cent) • Adult illiteracy rate • Value of imports and exports of goods and services (per cent of GDP) • Gross domestic fixed investment (per cent of GDP)	• GDP per capita at PPP • Bertelsmann Transformation Index
Food Security	• Per cent of population undernourished • Per cent of population below local poverty index • Food imports compared to exports and GDP • Per cent of population needing food emergency aid • Per cent of productive land per capita • Per cent change in productive land	• Potable water (per cent of population with access) [*also fitting health security*]	• Number of children under five underweight • Per cent of population that is undernourished
Health Security	• Life expectancy at birth • Per cent of life expectancy that is unhealthy • Per cent of population with improved water source • Health outcome equality • Health care delivery	• Maternal mortality ratio (per 100,000 live births) • Child mortality	• Number of total population affected by diseases • Child mortality rate

(Continued)

Table 2. (Continued)

	Human security index Hastings (2011)	The Index of Human Insecurity Lonergan et al. (2000)	Human (In)Security Index Werthes et al. (2011)
Environm. Security	• Environmental vulnerability index • Environmental performance index • Greenhouse gas emissions per capita • Population growth rate	• Net energy imports • Soil degradation • Arable land (ha/person) [*also fitting economic security*]	• Per cent of population that is affected by disasters • Mean of percentage of population with access to clean water [*also fitting health security*] • Per cent with access to improved water sanitation
Personal Security	• Global peace index • World prison population list/brief • [*also fitting political security*] • Political terror scale [*also fitting political security*]	[*No suitable variables*]	• Total number of people assisted by the UNHCR • Political Terror Scale • [*both also fitting community security, remember personal & community security were combined*]
Community Security	• Gender gap index • Connection index (telephone fixed lines, mobile telephone, internet user per capita)	• Urban population growth (annual per cent) • Male population (per cent of total aged 0–14 years)	[*See personal security*]
Political Security	• Political stability, no violence • Control of corruption • Press freedom index • [*also fitting personal security*]	• Public expenditures on defence versus education, primary and secondary (per cent of GDP) • Degree of democratisation • Human freedoms index • [*also fitting personal security*]	• Index of five indicators (disappearance, extrajudicial killing, political imprisonment, torture and assassination) • Press Freedom Index

Notes: GDP, gross domestic product; GNP, gross national product; PPP, purchasing power parity.

Several indices did not follow the seven dimensions of the classical human security concept. Nevertheless, in a scholarly exercise we reassigned the indicators to the seven dimensions in order to get an idea of whether or not the indices reflect the original idea of human security. Some variables may fit in more than one dimension. These are marked with comments in square brackets.

Rihards Bambals provides one of the rare micro-level applications of the human security concept.[50] His intention was to show the shift in perception of issues relevant for the human security of individuals in everyday life and in a post-disaster context, based on the case of a flood in Latvia. Therefore, one or two questions representing each of the seven dimensions of human security were asked for both the everyday life context and the post-disaster context. He not only closely followed the seven human security dimensions of the UNDP[51] (Table 3), but also considered objective and subjective issues (similar to

Table 3. Comparative illustration of micro-level human security index

	Bambals (2015)	
	Subjective changes of human security after the impact of natural hazard	General questions regarding the threats in context of daily life
Economic Security	• Fear/probability of losing job and/or means of subsistence • Fear of losing household and/or suffering significant financial losses	• Fear/felt probability of losing job or not being able to find one
Food Security	• Tap water/food: insufficient amount	• Fear/felt probability of staying without food or drinking water
Health Security	• Tap water: not safe for internal use • Existence of significant threats causing deterioration of health	• Fear/felt probability of not receiving adequate medical aid in case of becoming ill
Environm. Security	• Felt increase of pollution in your immediate neighbourhood	• Fear/felt probability of environmental pollution and natural hazards
Personal Security	• Fear/probability of crime • Fear/probability of accident	• Fear/felt probability of being the victim of a crime • Fear/felt probability of suffering an accident
Community Security	• Felt increase in inequality between person interviewed and rest of the society	• Fear/felt probability of suffering from society's unequal attitude
Political Security	• Felt decrease of political rights and/or freedom	• Fear/felt probability of suffering from a country's economic or political crisis • Fear/felt probability of not being able to freely exercise political views

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50 Bambals, *Disaster Prevention and Management*.
51 UNDP, *Human Development Report 1994. New Dimensions of Human Security*.

Steve Lonergan and his colleagues).[52] The first refers to the actual state of security and the latter to the socially constructed perception and sense of security. However, as the intention was to show the shift in perception, no composite indicator was developed.[53]

2.3. Constructing a micro-level, flexible human security indicator

We propose a composite micro-index to summarise the complex information with regard to the human security of internally displaced environmental refugees.[54] In the following, the methodological procedure[55] for selecting appropriate indicators and constructing a micro-level HSI is explained. As pointed out earlier, the human security concept is flexible and allows for attention to be paid to objective as well as subjective perceived threats to human security. The richness of our survey instrument allows us to closely follow all seven original dimensions of human security as defined by the UNDP.[56]

2.3.1. Selection of indicators for the HSI

The survey instrument provides a rich database for the identification of suitable indicators for the seven dimensions of the micro-level HSI. The database contains objective and subjective indicators. The UNDP-TR,[57] Steve Lonergan and his colleagues,[58] and Rihards Bambals[59] emphasise the importance of including peoples' perception as the subjective interpretation of human security. The database provides between two and 20 suitable indicators for each human security dimension. One (sometimes composite) parameter per dimension was calculated on the basis of its conformity with the original meaning of the dimension. The selection process for the dimension 'environmental security' is given as an example in Table 4. The selected indicators for each dimension are (see Table A1 for details):

1. Economic security: "Per capita annual expenditures on clothing and footwear".
2. Food security: "Meals served in household for the last two days".
3. Health security: "Expected health risks in the household in the next 12 months".
4. Environmental security: "Expected environmental or natural household risk in the next 12 months".
5. Personal security: "Perceived exposure to crime and violence".
6. Community security: "Number of close friends and family members and perceived trust in community and traditional council".

52   Lonergan *et al.*, "The Index of Human Insecurity".
53   Bambals, *Disaster Prevention and Management*.
54   A.L. Mayer, "Strengths and Weaknesses of Common Sustainability Indices for Multidimensional Systems", *Environment International*, 34(2), 2008, 277–291.
55   M. Nardo, M. Saisana, A. Saltelli, S. Tarantola, A. Hoffman & E. Giovannini, *Handbook on Constructing Composite Indicators: Methodology and User Guide*, Paris and Brussels, Organisation for Economic Cooperation and Development (OECD) and European Commission, 2005.
56   UNDP, *Human Development Report 1994. New Dimensions of Human Security*.
57   UNDP & TR, *Human Security in Theory and Practice*, 13.
58   Lonergan *et al.*, "The Index of Human Insecurity", 2.
59   Bambals, *Disaster Prevention and Management*, 153.

7. Political security: "Perceived level of trust in central and local level government officials and risk management institutions".

The calculation procedure for each normalised sub-index is provided in the Appendix, Table A1. A frequently applied method for normalising data for indices is to apply the min–max approach, which results in the values lying between zero and one.[60] This approach was used, for instance, in the well-known Human Development Index (HDI) of the UNDP[61] and the HSI developed by David Hastings.[62] The human insecurity index by Sascha Werthes and colleagues[63] adopted a similar methodology with the sole difference that the values range between zero and 100. Furthermore, values that differ by more than three standard deviations from the mean value were defined as outliers and therefore excluded from forming the upper and lower limits of the sub-index.[64] We opted for normalising the data for the sub-indices reflecting the human security categories by applying a method similar to the min-max approach, with the difference being that the lowest observed value was not taken as the minimum. Instead, the lowest possible value reflecting zero human security was used. This approach was chosen because of the fact that, if all households had high values in one dimension, the lowest of these values would reflect a zero in this dimension.

Table 4. Possible indicators suitable for the dimension of "environmental security" and justification of choice

Suitable indicators in the database	Justification for choice of indicator
• Have you had any recent information of a possible eruption or natural problem at Nyos in the near future? (Yes/No) • If yes, do you believe this information? (Yes/No) • How would you describe the present level of recovery from the 1986 Lake Nyos disaster? (Likert scale) • Expected environmental or natural risks in the next 12 months? (Likert scale)	Expected environmental or natural household risk in the next 12 months This indicator was chosen due to the following reasoning: • It reflects a subjective perception of environmental risks • The scaling of the indicator • Only about 70 households expected natural/environmental risks

Source: Own illustration.

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60 Organisation for Economic Cooperation and Development (OECD), *Handbook on Constructing Composite Indicators: Methodology and User Guide.* Paris, F, OECD, 2008, 28.

61 UNDP, *Human Development Report 2013: The Rise of the South: Human Progress in a Diverse World, Technical Notes*, New York, UNDP, 2013, available at: http://hdr.undp.org/sites/default/files/hdr_2013_en_technotes.pdf (last visited 3 Jun. 2015).

62 Hastings, *The Human Security Index: An Update and a New Release.*

63 Werthes *et al., Assessing Human Insecurity Worldwide.*

64 *Ibid.*, 27, we adopted the approach of Sascha Werthes and colleagues with regard of handling outliers.

2.3.2. Weighting of indicators for the HSI

On the one hand, one could argue that equal weights for each of the human security dimensions are applicable because of the normative judgement that all dimensions are equally important.[65] On the other hand, one could emphasise the fact that giving different weights would show the true importance of each dimension of human security. This is important because there are overlaps between the indicators pointed out by UNDP[66] for the seven dimensions. For instance, water pollution may be associated with health security and environmental security (see also Table 1). Economic access to food (and purchasing power) is one of the indicators for food security but, at the same time, this is an important aspect of economic security.

For the purposes of this article, equal weights are given to the seven dimensions when estimating the aggregated HSI. This is justified by arguing that indicators that could potentially lead to improvements, not only in one but in two or more dimensions of the HSI, may be allowed to count more as they actually have a greater impact on improving individual human security. Another reason is that the Spearman Rho correlation between the chosen indicators is low (data not shown here).

2.3.3. Aggregating the composite HSI

For computing the HSI, two approaches compete with each other:

1. the normalised geometric aggregation $HSI_{geo} = (HSI_{Sub1} \cdot HSI_{Sub2} \cdot \ldots \cdot HSI_{Sub7})^{\frac{1}{7}}$ and
2. the normalised additive aggregation $HSI_{add} = \frac{(HSI_{Sub1} + HSI_{Sub2} + \ldots + HSI_{Sub7})}{7}$.

The geometric aggregation would be preferred because the lower the absolute score of a dimension is, the greater the marginal utility obtained by a given absolute increase in this dimension. This implies that a low score in one dimension produces a greater incentive to address this specific dimension as it contributes more to increasing the overall score.[67] For instance, in 2010, UNDP changed the aggregation of the HDI from using the arithmetic mean to using the normalised geometric mean. The reasons were firstly to reduce the level of substitutability among the three dimensions and secondly to ensure that a one per cent increase in one area has the same impact on the index as a one per cent increase in another dimension. This methodological procedure substantiated the assumption that the state of human security was as strong as the indicator, that is, the dimension with the lowest score.[68] Non-compensability is an essential aspect of human security.

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65 This normative judgment has been done also for the HDI of the UNDP. Several scholars provide a statistical justification for this approach. These are: F. Noorkbakhsh, "The Human Development Index: Some Technical Issues and Alternative Indices", *Journal of International Development*, 10(5), 1998, 589–605; K. Decanq & M.A. Lugo, *Weights in Multidimensional Indices of Well-being – An Overview*, Center for Economic Studies Discussions Paper Series (DPS) 10.06, Leuven, BE, Katholieke University Leuven, 2010.

66 UNDP, *Human Development Report 1994. New Dimensions of Human Security*.

67 OECD, *Handbook on Constructing Composite Indicators: Methodology and User Guide*, 32f.

68 UNDP & TR, *Human Security in Theory and Practice*, 7.

In other words, lack of fulfilment of one dimension cannot be cancelled out by a particularly good score in another dimension.

The additive aggregation gives rise to the methodological assumption that the dimensions are mutually preferentially independent. In other words, there are no synergies or conflicts between the dimensions.[69] Another aspect to be considered is that additive aggregation implies full compensability, which means that the lack of the fulfilment of one dimension can be cancelled out by a good score in another dimension.[70] Nevertheless, these assumptions do not apply to the human security concept, since "threats to human security are mutually reinforcing and interconnected".[71] The higher the HSI score, the higher the level of human security (and vice versa).[72] Due to the methodological superiority with regard to the socioeconomic interpretation, this work applies the normalised geometric aggregation to compute the HSI.

3. INDIVIDUAL HSI – RESULTS AND INTERPRETATION

The sampling unit applied in this micro-level research is the internally displaced environmental refugee household. Unique primary data were collected using a standardised questionnaire covering all livelihood areas. The questionnaire contained modules on socioeconomic characteristics, natural, physical, and social capital, risks, perceptions, and management mechanisms, shock impacts, and annual household consumption expenditures. The 2009–2010 survey included 100 per cent of all those former Lake Nyos disaster households that had illegally returned to the disaster-prone zone (currently living in the disaster-affected villages of Cha, Nyos, and Subum) and over 80 per cent of all those households that, at the time of the research, were still living in six of the seven resettlement camps (Buabua, Kimbi, Yemngeh, Kumfutu, Esu, and Upkwa). A total of 301 household heads surveyed were retained for the analysis. Of these, 71 had illegally returned to their disaster-prone homestead and 230 lived in resettlement camps. For 287 households the HSI could be constructed. Due to missing data, the other households could not be retained for the analysis.

Looking at the descriptive HSI summary statistics for the Cameroonian internally displaced refugee households, several observations can be made. The mean HSI value is 0.481, indicating a relatively low level of average human security with a narrow standard deviation of 0.111. The minimum value lies at 0.190 (low human security) and the maximum value at 0.780 (high human security). Interestingly, both households with the minimum and maximum values were living in a resettlement camp (see Table 5 for summary statistics).

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69 Taking the example of an OECD environmental index, it was shown that a combination of fertilizers has a much bigger impact on plant growth than (linear) addition of the impacts of each of these substances alone. Therefore, using additive aggregation would lead to a downward biased composite indicator.

70 OECD, *Handbook on Constructing Composite Indicators: Methodology and User Guide*, 103.

71 UNDP & TR, *Human Security in Theory and Practice*, 6ff.

72 We use the same cut-off points for the HSI classification as used in the HDI. The cut-off point for low human security is less than 0.550, 0.550–0.699 for medium human security, 0.700–0.799 for high human security, and 0.800 or greater for very high human security.

Table 5. Summary statistics of HIS

		Mean	Std. Dev.	Min	Max
Geometric HSI		0.481	0.111	0.190	0.780
Sub-indices of HSI					
Developmental human security	Economic	0.320	0.183	0.037	1.000
	Food	0.818	0.215	0.333	1.000
	Health	0.653	0.290	0.125	0.875
	Environmental	0.727	0.266	0.125	0.875
Protective human security	Personal	0.430	0.283	0.100	0.900
	Community	0.477	0.141	0.075	0.867
	Political	0.548	0.256	0.100	0.900

Source: Own data.

Table 6. Classification of correctly predicted observations

Observed	Predicted		Per cent correct
	1	0	
	Returnees in former disaster zone versus those remaining in resettlement camps		
1 = Returnee household	53	18	74.6
0 = Household in resettlement camp	69	147	68.1
Overall per cent correct predicted			69.7
	Would you return to disaster zone if permitted by government?		
1 = Returning if permitted by government	55	15	78.6
0 = Continuing to stay in camp	436	95	68.8
Overall per cent correct predicted			72.1
	Would you return to disaster zone if certain that environmental hazard is negligible?		
1 = Returning if hazard negligible	79	30	72.5
0 = Continuing to stay in camp	27	72	72.7
Overall per cent correct predicted			72.6

Source: Own data.

In the following, we first compare the internally displaced households that have decided to return to their villages situated in the Lake Nyos disaster-prone zone with those remaining in the resettlement camps (section 3.1). They have returned despite the fact that this is illegal. The question is, what motivated their decision? We expect to find answers in their state of human security. Next, we are interested in the potential behaviour of the households still residing in the resettlement camps, under more favourable exogenous environmental changes. We asked if households would be

Table 7. Link between human security and preference for a particular location among internally displaced households: the case of the Lake Nyos disaster in Cameroon

Sub-indices		Returnees in former disaster zone versus those remaining in resettlement camps (1 = returnees, 0 = otherwise)		Would you return to disaster zone if permitted by the government? (1 = yes, 0 = otherwise)		Would you return to disaster zone if certain that environmental hazard were negligible? (1 = yes, 0 = otherwise)	
		β	Exp(β)	β	Exp(β)	β	Exp(β)
Developmental human security	Economic	2.331	10.288***	−0.681	0.506	−1.513	0.220*
	Food	−1.012	0.364	−0.583	0.558	0.440	1.552
	Health	1.992	7.329***	0.884	2.421*	1.682	5.378***
	Environmental	0.021	1.042	0.475	1.608	1.600	4.952**
Protective human security	Personal	−3.364	0.035***	−1.707	0.181***	−2.800	0.061***
	Community	0.025	1.025	−1.946	0.143(*)	2.042	7.708*
	Political	1.036	2.818(*)	−1.574	0.207**	−1.500	0.223**
Intercept		−1.827	0.161*	1.607	4.989	0.798	0.450
−2 Log-Likelihood		264.453		230.333		239.086	
Chi-Square		56.669***		35.371***		48.783***	
Nagelkerke-pseudo R^2		0.266		0.217		0.279	
Iterations		5		4		4	
Total observations		287		208		208	

Note: ***Significant at the 1% level; **significant at the 5% level; *significant at the 10% level; (*) significant at 15% level.
Interpretation of the parameters: The categorical dependent variable is a function of the probability that a particular subject will be in one of the categories (i.e., will take the value of one), in other words, we can use it to classify subjects with respect to what group we think they will be in or what decision we think they will make.

willing to return to their former homestead around Lake Nyos, given Government permission (section 3.2) and given that returning is becoming less risky (section 3.3). Each section contains the results of a two-sample *t*-test as well as the results of a binary logit analysis.

Binary logistic regression analyses were employed to predict the probability that a particular household would be in one of the categories outlined above. The models classified between 70 and 73 per cent of all observations correctly (Table 6). With regard to the Omnibus tests of model coefficients, all Chi-Squares are significant at the 1 per cent level, indicating that the seven explanatory human security sub-indices have increased our ability to predict the decisions made by the internally displaced households. The Nagelkerke-pseudo R^2 ranges between 22 and 28 per cent, which can be considered a good model fit (Table 7). The Nagelkerke-pseudo R^2 indicates what percentage of the model fit is explained by the variables.[73]

3.1. Households still in resettlement camps versus returnees to disaster-prone zone

All households that had been displaced by the Lake Nyos disaster and had returned in the meantime to their homestead were interviewed ($n = 71$). The sample of displaced households still residing in the resettlement camps was 230. Of these, 216 observations are included in the estimation of the geometric HSI (Table 8). Two control variables were used for plausibility checks: age and self-assessment of present recovery from the Lake Nyos disaster.

Overall, the Levene-test for equality of variances shows that variability of the HSI for those households still living in a resettlement camp and those that are not is significantly different while the means are not.[74] The results for the sub-indices of the HSI reveal surprising insights. First and foremost, the respondents did not perceive their environmental security as significantly different – both groups considered their environmental security as high. With regard to the group that had already returned to the disaster-prone villages around Lake Nyos, this result could be interpreted such that those who moved back have a higher threshold for this particular risk or, being back in the area, their perception may have been such that the situation is not much different from that in the resettlement camps. We were assuming that the agro-ecological conditions in the Lake Nyos zone had improved substantially because the land had been left idle for the last few decades. Therefore, returnees would benefit from this by higher yields and thus higher incomes, particularly subsistence income. This assumption appears plausible as can be seen from the significantly higher mean of economic security for the returnees. The self-assessment of the returnee group was also such that they considered themselves as having recovered by slightly more than half as compared to before the disaster, while the households staying in the camps reported to have recovered about half way (p-value: 0.086). Overall however, both groups displayed low economic security. Despite very high average food security, average health security was perceived to differ significantly between the two

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73   T. Gautschi, "Maximum Likelihood Schätztheorie", in Ch. Wolf & H. Best (ed.), *Handbuch der sozialwissenschaftlichen Datenanalyse*, Wiesbaden, D, Springer, 2010, 205–238.

74   Significance levels, based on the two-sample *t*-test with equal variances are reported at least at the (P) = 0.05 level, if not stipulated differently.

Table 8. Two-sample *t*-test for equality of means – internally displaced households in resettlement camps versus returnee households to disaster-prone Lake Nyos zone

		Relocated	Mean	Std. Dev.	*t*-Test
Geometric HSI		No	0.483	0.119	
		Yes	0.475	0.082	
Sub-indices of HSI					
Developmental human security	Economic	No	0.301	0.180	−3.227***
		Yes	0.380	0.178	
	Food	No	0.821	0.214	
		Yes	0.808	0.217	
	Health	No	0.624	0.296	−3.373***
		Yes	0.745	0.253	
	Environmental	No	0.729	0.263	
		Yes	0.717	0.278	
Protective human security	Personal	No	0.482	0.284	6.935***
		Yes	0.266	0.208	
	Community	No	0.480	0.145	
		Yes	0.468	0.131	
	Political	No	0.544	0.266	
		Yes	0.560	0.224	

Source: Own data.
Notes: Number of relocated households = 71; Households still in resettlement camps = 216.
Significance levels: 1% = ***, 5% = **, 10% = *, 15% = (*).

groups, whereby the returnee group expected fewer health risks in the household in the next 12 months than the resettlement camp group. We suggest that this result is the outcome of a self-selection process. Households with a better overall health situation were more likely to return to the disaster-prone villages as compared to those with more health risks. One could speculate that the resettlement camps with governmentally supported health centres are particularly attractive to the latter group. While the means are statistically not significantly different, the oldest household member in the returnee group was on average two years younger (47 years) than in the households remaining in the resettlement camps. This can also partly explain the overall better health situation. Within the protective human security belt, the sub-indices are low with personal security being significantly different between the two groups. The returnee group perceived a higher exposure to crime and violence than the group in the resettlement camps. This perception becomes plausible when keeping in mind that the returnees reside in an area without functioning judicial and executive security forces, and are in constant fear of eviction, given that their return is illegal.

When a binary outcome variable is modelled using logistic regression, it is assumed that the logit transformation of the outcome variable has a linear relationship with the predictor variables. We can get the odds ratios by exponentiating the

model coefficients $(\exp(\beta))$.[75] Logistic regression analysis shows that economic, personal, and political security had significant partial effects with regard to predicting the probability that a household was in the group of returnees to the Lake Nyos area (Table 7). The signs of the β-parameter for economic, health, and political security are positive.[76] This implies that the probability of being in the group of returnees increases for higher values of these human security sub-indices. However, personal security shows a negative β-parameter. Consequently, those perceiving reduced personal security are more likely to be found in the returnee group. The odds ratios for economic, health, and political security are larger than one and thus can be interpreted straightforwardly. The odds ratios for these sub-indices indicate that, when holding all other variables constant, a household with perfect security in one of these particular sub-indices would be 10 times, 7 times, and about 3 times more likely to be in the returnee group as compared to a household with almost no security. With respect to economic, health, and political security, we could also say that for each one percentage point increase, we expect to see about a 2.3 per cent, 2 per cent, and 1 per cent increase, respectively, in the odds of the household being in the returnee group. Inverting the odds ratio for the personal security sub-index reveals that for each percentage point increase there is an equivalent percentage point increase in the odds that the household will not be in the returnee group but rather in the immobile group.

3.2. Possible relocation to disaster-prone zone given government permission

As indicated earlier, it is still prohibited for internally displaced environmental refugee households from the Lake Nyos zone to move back to their homesteads. Given permission from the Government, it would be plausible that the majority would want to return. However, when the households in the resettlement camps were confronted with this question, only a third (70 out of 208 valid responses) said they would then return (Table 9).

The aggregated HSI gives a hint of the reasoning. The HSI of those willing to return on the basis of Government consent is significantly lower than that of those wanting to stay (0.434 versus 0.509). This result could be interpreted such that the potential returnees might have the expectation of improving the status of their human security as a consequence of returning. Furthermore, the average age of the oldest household member in the potential returnee group is statistically and significantly higher (52 versus 48 years, P: 0.064). The self-assessment of recovery is not statistically different, but the group wanting to stay in the resettlement camps displays a lower average self-assessment of recovery from the shock of the Lake Nyos natural disaster.

Again, the health security of the potential returnees (despite their higher average age) is significantly higher than of those wanting to stay in the resettlement camps, implying some form of self-selection, given that in the Lake Nyos zone health centres

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75   The odds ratio $(\exp(\beta))$ tells us the odds of being in a particular category based on the considered explanatory variable.

76   If the β-parameter is negative, then increasing the corresponding parameter will reduce the probability that a particular subject will be in the category that takes the value of one (and vice versa).

Table 9. Two-sample *t*-test for equality of means – will you return to former homestead in disaster-prone Lake Nyos zone if permitted by Government?

		Relocated	Mean	Std. Dev.	*t*-Test
Geometric HSI		No	0.509	0.109	4.452***
		Yes	0.434	0.124	
Sub-indices of HSI					
Developmental human security	Economic	No	0.307	0.174	
		Yes	0.286	0.196	
	Food	No	0.833	0.219	
		Yes	0.793	0.207	
	Health	No	0.601	0.292	−1.458[(*)]
		Yes	0.664	0.309	
	Environmental	No	0.723	0.268	
		Yes	0.753	0.254	
Protective human security	Personal	No	0.534	0.278	3.934***
		Yes	0.377	0.267	
	Community	No	0.505	0.147	3.827***
		Yes	0.427	0.123	
	Political	No	0.596	0.231	3.795***
		Yes	0.439	0.306	

Source: Own data.
Notes: Number of households in resettlement camps willing to relocate = 70; not willing = 138.
Significance levels: 1% = ***, 5% = **, 10% = *, 15% = [(*)].

are missing. Except for the sub-index health security, there is no significant difference with regard to the developmental human security pillar between the two groups. Yet, each of the protective human security sub-indices varies significantly between the two groups. The potential returnees always show a significantly lower average level of personal, community, and political security than the group that wanted to remain in the resettlement camps. Obviously, the perception with regard to the exposure to crime and violence (personal security), the perceived trust in formal and informal community councils, and the perceived trust in Government institutions varies. It can be hypothesised that those who would be willing to leave the camps and thus the sphere of governmental influence are expecting an improvement in protective human security. In addition, if relocation is permitted by the Government, it would have to provide basic public services that would enhance protective human security in the receiving communities.

The logistic regression with regard to the decision to return to the disaster-prone Lake Nyos zone given Government permission, also points to the fact that the protective belt of human security plays a significant role in the decision-making. The *β*-parameters of the sub-indices are negative and the odds ratios are less than one. Again, inverting the odds ratios for these sub-indices reveals that for each percentage point increase, the odds increase by the same magnitude that the household will not return to the disaster-prone zone but rather remain in the resettlement camp (Table 7).

Those perceiving a higher degree of protective human security in the resettlement camps are less likely to return to the Lake Nyos area. Those who would decide to move are almost 2.5 times more likely to do so, given a perfect score for health security. Again, there seems to be a self-selection trend, with healthy household members being more likely to have already moved (see above) or being willing to move to the Lake Nyos area than those with higher health risks (see also below).

3.3. Possible relocation to disaster-prone zone if subjectively rendered less risky

While the willingness of the households still residing in the resettlement camps to return were the Government to permit them to do so was rather limited (32 per cent), a slight majority (52 per cent of 208 households) explained they would return to their homesteads around Lake Nyos given that it is less risky (Table 10). As before, those with a significantly lower human security and higher age level (51 years versus 47 years, *P*: 0.028) were significantly more willing to return.

It appears that those willing to return already displayed a significantly reduced expectation with regard to environmental security in the next 12 months. This perception, which is applicable to the situation around the resettlement camps, seems to be

Table 10. Two-sample *t*-test for equality of means – will you return to former homestead in disaster-prone Lake Nyos zone if rendered less risky?

		Relocated	Mean	Std. Dev.	*t*-Test
Geometric HSI		No	0.503	0.109	2.318**
		Yes	0.465	0.125	
Sub-indices of HSI					
Developmental human security	Economic	No	0.330	0.173	2.242**
		Yes	0.275	0.185	
	Food	No	0.828	0.223	
		Yes	0.817	0.206	
	Health	No	0.563	0.295	−2.675***
		Yes	0.670	0.294	
	Environmental	No	0.692	0.291	−2.143**
		Yes	0.769	0.233	
Protective human security	Personal	No	0.583	0.289	5.172***
		Yes	0.394	0.249	
	Community	No	0.485	0.135	
		Yes	0.477	0.151	
	Political	No	0.583	0.226	2.091**
		Yes	0.507	0.299	

Source: Own data.
Notes: Number of households in resettlement camps willing to relocate if less risky = 109; not willing = 99.
Significance levels: 1% = ***, 5% = **, 10% = *, 15% = (*).

projected to the Lake Nyos zone. Again, those who are already better off health-wise and therefore do not expect risks in this regard, were more willing to return. Interestingly, those wanting to remain in the resettlement camps were slightly better off economically. Those deciding to relocate might have the expectation that returning to the fertile lands of Lake Nyos would improve their economic situation too. Food security was not a significant determinant in any of the comparisons. This suggests that the Government and other partners are doing a reasonably good job with regard to food security, especially since this sub-index is continuously around 0.8, implying a high degree of food security.

Apart from the aspiration of improving the developmental human security pillar, it is again the deficiencies in the protective human security pillar, particularly the lack of personal and political security, which seems to motivate households in the resettlement camps to leave. The decision might incorporate the assumption that the rural areas around Lake Nyos constitute a lower personal risk and that the influence of governmental agencies is reduced. Overall, the levels are already low in this regard, but those who would want to return display particular deficits in this regard.

It should be emphasised that all of the odds ratios in the logistic regression are significant, with the exception of the one for food security. Interestingly, the odds ratio for community security in the protective human security pillar is larger than one and the β-parameter is positive. This can be interpreted such that a household with a perfect score on community security would be almost eight times as likely to return as a household with no community security. Put another way, for a one percentage point increase in community security, we expect to see about a 2 per cent growth in the odds of a household deciding to return to the Lake Nyos area. Inverting the odds ratios for personal and political security reveals that, for each percentage point increase, the odds that the household will not return to the disaster-prone zone but remain in the resettlement camp increase by the same magnitude (Table 7). One could speculate that households perceive community security as particularly important, assuming that they might again have to manage environmental disasters in the future. Previous studies[77] in the research region revealed that informal social networks are important for shock management in the absence of a functioning market and public risk management schemes.

4. DISCUSSION AND CONCLUSIONS

This article discusses the human security context of environmental refugee households in Cameroon. In order to improve our understanding of the decision about whether or not to return to their homelands from resettlement camps, the human security concept of the UN was employed. We constructed a unique micro-level HSI by geometrically aggregating sub-indices framed within the seven dimensions of human security. This novel methodological approach was tested using the empirical example of the 1986 Lake Nyos natural disaster in the north-west region of

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77 See for instance R.A. Balgah & G. Buchenrieder, "Risk Uncertainty and Decision Making. An Empirical Test of Irving Fisher's Theory of Interest", *Global Advanced Research Journal of Peace, Gender and Development Studies* 1(2), 2012, 33–41. Furthermore, see Bang, *Natural Disaster Risk* as well as Balgah & Buchenrieder, "Natural Shocks and Risk Behaviour".

Cameroon. This case study provides a rare sample of internally displaced environmental refugee households, in which a number of them have returned to the potentially disastrous Lake Nyos region in recent years, in spite of the Government restriction. Nevertheless, the majority of households are still holding out in the resettlement camps, to which they were relocated about 30 years ago. By means of econometric analysis two pertinent issues were investigated: (1) the difference in human security between those internally displaced households that have already returned to the disaster-prone Lake Nyos area and those in the resettlement areas; (2) the willingness of those households that have remained for now in the resettlement camps to return, if the governmental restriction were lifted or the risk of a renewed environmental hazard at Lake Nyos became negligible.

Overall, the degree of human security was found to be low, regardless of the group considered. It is possible to explain this, since these mainly subsistence based households lost almost all of their livestock to the 1986 Lake Nyos disaster, and additionally have been displaced for a prolonged time from their fertile lands into resettlement camps. There are, however, significant differences with regard to the individual dimensions of human security. The dimensions in the protective pillar of human security appear to be decisive in the decision-making process of whether or not to eventually return to the homesteads around Lake Nyos, given either permission by the Government or assurance of less risk at the homestead. Those households that perceived the personal and political security in the resettlement camps as significantly dissatisfying were more likely to be in the group of potential returnees. To put it differently, those perceiving a high degree of protective human security were more prone to remain in the resettlement camps. With regard to the developmental pillar of human security, several interesting observations can be made. First, health security seems to function as a self-selector with regard to the return behaviour. This must be seen from the perspective that former disaster zones are likely to lack Government health facilities, at least in the early phase and as long as returning remains illegal. With regard to economic security, the analytical comparison of the returnees with the households in the camps showed that households with higher economic security are more likely to be in the returnee group. Not surprisingly, the internally displaced households still living in the resettlement camps having lower economic security are more likely to decide to return to the homelands given the preconditions outlined earlier. The expectation might be that economic security (including subsistence income) improves when returning to the now even more fertile lands of their homesteads. If permitted by the Government, they are also likely to benefit from Government-supported income generating activities. Frequently, food security is seen as a consequence of income security. This does not seem to be the case here, as food security was consistently, and overall, high among all the groups. Consideration of environmental security played a role in the decision-making process only for those deliberating about whether to return to the Lake Nyos area, if the situation became less risky. Those who already have a rather better perception of environmental security were more likely to then make a decision in favour of returning.

The political implications of these results are that the protective dimensions of human security, especially personal and political security, play an important role in

motivating internally displaced households to remain in resettlement camps. The same can be said with regard to economic security. Food security alone is probably not a sufficient condition. In general, households with significantly higher degrees of health security are more willing to return to their homelands. Obviously, they are aware of their "pioneer" status, presuming that they can only succeed on the basis of good health. In addition, better yields and increased access to food are likely to further enhance their health and income situation. If governments want to motivate internally displaced households to return, obviously they have to pay attention to health issues. Finally, with regard to environmental security it was surprising that the households that had already returned to Lake Nyos did not perceive the environmental security as significantly different from the households remaining in the resettlement camps. This can be explained by a lower discounting of future risks against the current need to sustain their livelihoods. Those willing to relocate to the Lake Nyos area depict a significantly higher average environmental risk perception. This indicates that such returnees have a higher threshold with regard to their environmental risk perception. For the others, convincing them to return will require additional effort. These issues must be considered and effectively addressed by policy-makers and governments who contemplate the return of IDPs to their original homesteads as a valid policy objective. The human security concept can appropriately support such efforts by pointing to crucial policy relevant areas.

Appendix 1

Table A1. Construction of the normalised indicators for the seven dimensions of human security, ranging between zero (no security) and one (max. security)

	Indicator and calculation
Economic Security	"Per capita annual expenditures on clothing and footwear"= $\frac{Household\ annual\ expenditures\ on\ clothing\ and\ footwear}{Number\ of\ household\ members}$
	Calculation of the normalised indicator:
	Lower limit: 0 (lowest possible value)
	Upper limit: 57,974.53 FCFA (medium value plus 3 times std. dev.)
Food Security	"Meals served in household for the last 2 days"
	Calculation of the normalised indicator:
	Lower limit: 0 (lowest possible value)
	Upper limit: 6 (assumption that an average of 3 meals per day is sufficient for food security)
	Interpretation of values
	0 meals: 0
	1 meal: 0.167
	2 meals: 0.333
	3 meals: 0.500

(Continued)

Table A1. (Continued)

	Indicator and calculation
	4 meals: 0.667
	5 meals: 0.833
	6+ meals: 1
Health Security	"Expected health risks in the household in the next 12 months"
	Answers were given by means of a 3 point Likert scale reflecting the perceived likelihood of occurrence. Additionally, the households that did not expect any health risk formed the fourth group. Based on the assumption that these categories cannot take the value zero or one because this would mean absolute certainty of no risk at all (one) or absolute certainty that a risk will occur (zero), values are assigned to take the values in-between the categorical values. If there were two expected health risks in one household, the smaller value has been chosen reflecting a conservative attitude towards possible risks.
	Very high health risk: 0.125
	High health risk: 0.375
	Medium health risk: 0.675
	Low health risk: 0.875
	No health risk: 1
Environment-al Security	"Expected environmental or natural household risk in the next 12 months"
	Calculation as for "Health security"
	Very high environmental risk: 0.125
	High environmental risk: 0.375
	Medium environmental risk: 0.675
	Low environmental risk: 0.875
	No environmental risk: 1
Personal Security	"Perceived exposure to crime and violence"
	Answers were given by means of a 5 point Likert Scale of perceived exposure to crime and violence. Based on the assumption that these categories cannot take the value 0 or 1 because this would mean absolute exposure (death) or absolute safety, values have been assigned to not take these values and to have the same distance between them.
	Interpretation of values
	Strongly exposed to crime and violence: 0.1
	Slightly exposed to crime and violence: 0.3
	Neither exposed to crime and violence nor safe: 0.5
	Hardly exposed to crime and violence: 0.7
	Very safe: 0.9

(Continued)

Table A1. (Continued)

	Indicator and calculation
Community Security	"Number of close friends and family members and perceived trust in community and traditional council" $= \frac{(sub\ indicator\ 1) + (sub\ indicator\ 2) + (sub\ indicator\ 3)}{3}$ Due to the availability of three suitable variables reflecting different aspects of community security, it was decided to form an additive index of the three variables that all accounted for one third of the community security indicator. 1. number of close friends and family members 2. level of trust in own community 3. level of trust in local traditional council Calculation of sub-indicator 1: $= Number\ of\ close\ friends + Number\ of\ household\ members - 1$ Lower limit: 0 Upper limit: 24 (medium value plus 3 times std. dev.) Calculation of sub-indicators 2 and 3: 5 point Likert Scale transformation as for personal security ranging from 0.1 to 0.9 No trust: 0.1 Little trust: 0.3 Medium: 0.5 Strong trust: 0.7 Very strong trust: 0.9
Political Security	"Perceived level of trust in government" $= \frac{(sub\ indicator\ 1) + (sub\ indicator\ 2) + (sub\ indicator\ 3)}{3}$ Due to the availability of three suitable variables reflecting different aspects of political security, it was decided to form an additive index of the three variables that all accounted for one third of the community security indicator. 1. level of trust in local level government officials 2. level of trust in governmental risk management institutions 3. level of trust in central government officials Calculation of the sub indicators 1) to 3): 5 point Likert scale transformation as for community security ranging from 0.1 to 0.9

Source: Own construction.