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Vulnerability modeling for sub-Saharan Africa: An operationalized approach in Malawi

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A B S T R A C T

This study addresses the need for a policy-relevant climatic vulnerability model in sub-Saharan Africa, where data is typically poor and people are exposed to a wide range of environmental and socioeconomic stressors that are unique to the region. This research applies a multi-scale, multi-indicator methodology that allows policy-makers and experts flexibility to contextualize causal factors in the modeling process through selection of evidence-based variables of vulnerability. This process is easily scaled to stakeholders needs, whether at a state, district or local level. This article provides a framework to assist stakeholders and policy-makers in Malawi to determine what drives vulnerability at a household level, which areas in the country are most vulnerable and where development solutions should be applied. As financial assistance related to climate adaptation increases rapidly in Africa, this article presents timely results for Malawi and an auspicious methodology that can assist other vulnerable countries.

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Introduction

On 12 July 2013, President of Malawi, Dr. Joyce Banda, appointed Halimi Daudi to the position of Minister of Environment and Climate Change Management. During the ceremony, the President challenged Minister Daudi with addressing the problems that emerge from climate change and developing lasting solutions (Mogha, 2013). While Malawi is a forerunner in identifying social and environmental issues related to hydrometeorological events, developing long-term solutions to climate-related problems in Malawi will not be easy task. The challenges Minister Daudi will face include identifying climatically vulnerable populations, determining causal factors of this vulnerability, creating enduring solutions with development partners, and implementing programs that are sensitive to local needs. This monumental task can also be tied to Malawi's fiscal concerns.

Between 2005 and 2008, Malawi received $23,312,579 in financial aid dedicated to climate change assistance and adaptation projects (Weaver & Peratsakis, 2010). This figure only represents 0.83% of the total $2.8bn USD contributed to Malawi during that period (Tierney et al., 2011), but foreign financial assistance for climate adaptation is expected to increase rapidly. The World Bank reported that it lent $4.6bn USD in adaptation finances worldwide, doubling its adaptation lending from 2011 to 2012 (World Bank, 2013). This is part of the expected $30bn USD in fast-start funding pledged in Copenhagen in 2009, while developed countries have also promised to nearly double their current commitments of Official Development Assistance (ODA) by $100Bn USD – all toward climate-related adaptation and development (Weaver & Peratsakis, 2010). For Malawi, ensuring that new streams of development funding are allocated to the households that need it most is a major policy concern.

Malawi is an exceptionally appropriate location to introduce a new methodology to measure climatic vulnerability. Despite being dwarfed by many of its neighboring countries in size, Malawi has one of the densest populations in the region (Fig. 1) and Malawi's population of fifteen million is expected to double by 2035 (World Bank, 2010). Demographic pressure notwithstanding, 85% of the population is rural with most households highly dependent on rain-fed agriculture and limited nearby natural resources, and 80% of these subsistence farmers grow maize as their primary crop (FAO, 2011). Food security is often Malawi's most pronounced issue in this human–environment relationship. In Malawi, the expression "maize is food" is not an understatement. The intensification of maize cultivation has been the leading strategy of the government of Malawi and international development organizations to combat food security – an initiative that grew tremendous

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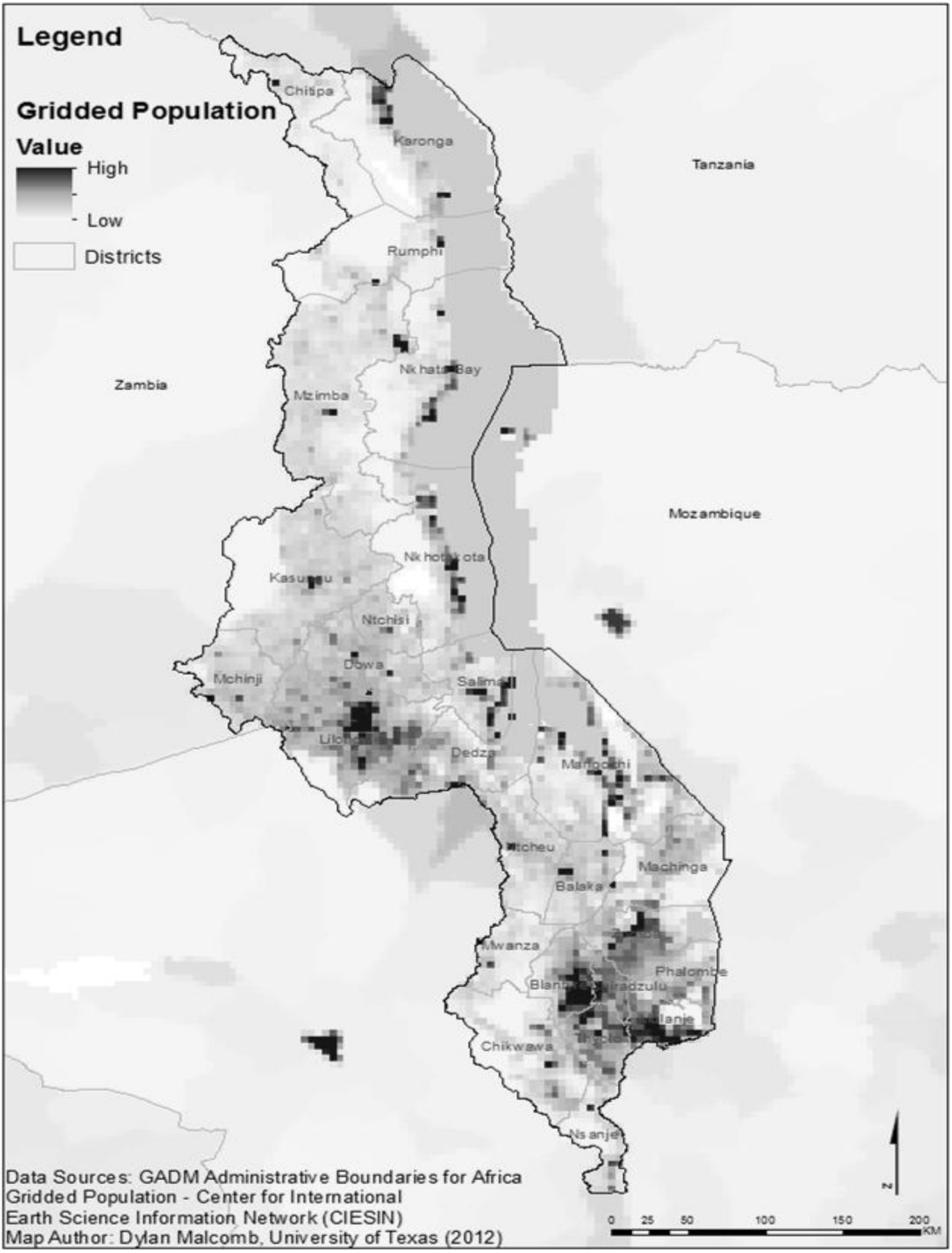

Fig. 1. Map of Malawi, Mozambique, Tanzania and Zambia showing gridded population density.