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Adaptive contribution to Intelligent Dasymetric mapping for estimation of daytime and nighttime populations at risk from natural disasters, case study Baalbek-Hermel-Lebanon

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Accurate population data is considered as the pillar for any successful action plan for disaster risk reduction. The Middle East and North Africa (MENA) region is considered as one of the most demographically evolving spots of the world subjected to natural hazards. With increasing population dynamics, precise information regarding the population's number and distribution are required by policy makers and authorities for any effective interference during crisis times. However, recent studies show either incomplete or absent distribution census particularly during times of natural disaster induced events. Absence of such information aggravates the vulnerability of people at risk and hinders any adequate response during these times. Several reasons underlie this state, notably political reasons. Lebanon, a county of the MENA region presents a lack in demographic data due to the delicate sectarian distribution in its political body that has led its government to deliberately avoid conducting a comprehensive update of the 1932 population census. Therefore this study aims to provide a technical support to fill the existing knowledge gap particularly in data-sparse regions such as the Lebanese Baalbek-Hermel Governorate through a pilot well-structured methodological approach to the country. The dasymetric method is applied to link Land Use and Land Cover maps (LU/LC) to administrative population ancillary data. The latter, obtained from population explorer worldwide source was downscaled as a first step to Baalbek-Hermel's scale. Through detailed analysis of LU/LC categories, weights for the different urban classes based on their densities were assigned for nighttime population distribution. An additional innovative step for computation of daytime population was the consideration of possible distribution sites (schools, workplaces, etc.) based on a logical distribution of age categories. As a result, the population distribution in Baalbek-Hermel governorate was revealed, and the diurnal activities were identified with pronounced differences between the derived daytime and nighttime population datasets for the main cities (daytime increase for cities of Baalbek accounted for 46%, 42% in Hermel and 36% in Aarsal). These results improve the understanding of population dynamics and day/night activities that can improve the accuracy of exposure assessments, preparedness plans and emergency management decisions. The relatively simple data requirement method may be extrapolated at the scale of data sparse countries of which the MENA region takes part.