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Prospective impact of forest fire on Mass Movement events

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Mass Movement (MM) has always been one of the main natural hazards that threatened both the natural and human environments of Lebanon and their occurrence has increased by almost 60% between 1956 and 2008. On the other hand, Forest Fire (FF) has emerged to impose as another natural hazard that has destroyed more than 25 % of Lebanon's forests in less than 40 years. The increased FF occurrence is one of the potential detrimental impacts of anthropogenic climate change where high temperatures and current-year drought are strongly associated with an increase in the number of fires and area burned in a variety of forest types. A simple observation shows the coincident trends between MM and FF. This paper investigates the potential impact of FF on MM occurrence in Damour and Nahr Ibrahim watersheds in Lebanon. Preconditioning factors taken into consideration were topography, soil, geology, mean annual precipitation and land cover maps. MM and FF inventory maps were produced through Remote Sensing (RS) using aerial (1956 and 2008) and satellite images (2005 and 2011) in addition to Google Earth Timeline. Furthermore, FF was introduced as the inducing factor whose impact was assessed by the calculation of FF burn severity. This burn severity was extracted from Landsat images (1986-2011) through the Normalized Burn Ratio (NBR) index. A field study was carried out in order to substantiate the MM inventory. Furthermore, the burn index maps were validated through the Mini-Disk Infiltrometer (MDI), a device which supplies the soil infiltration rate usually after a fire. Following the standardization of the impact factors into layers using Geographic Information System (GIS), the relative importance of these layers for causing MM has been evaluated using modified InfoVal method and a MM Susceptibility Map (MMSM) was generated. Hence, every factor obtained a weight that shows its impact on MM occurrence. Preceded only by Land Cover change, NBR obtained the highest weight making FF burn severity the second highest impacting factor on MM occurrence in our study areas. Testing was performed by comparing a previously extracted 30% of the MM inventory to the MMSM. It has been observed that 84.79% of the existing MM falls in predicted high susceptibility zone.