Academic-public-private partnerships for sustainable herding under increasing frequency of climate hazards

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Socio-ecological damage from climate-related disasters has increased worldwide, including a slow-onset cold-season disaster that is unique to Mongolia, known as *dzud*. *Dzuds* are defined, bio-geophysically, as anomalous climatic and/or land-surface (i.e. snow) conditions that lead to reduced accessibility and/or availability of pastures, and ultimately to significant livestock mortality during winter–spring. Our studies showed that recent *dzuds* were caused by a half-to-half combination of multi-climate hazards and man-made vulnerability, including inadequate pasture management, poverty, and insufficient winter preparedness. With this background, for the first time, our academia produced a new *dzud* risk map to predict risky areas at the national level for the 2015/2016 winter. Subsequently, the early warning system developed together with the risk map has been implemented and successfully applied for sustainable herding under the framework of partnerships among universities/research institutes, Mongolian government, international aid organizations, and herders. This action was supported by the Grant-in-Aid for Scientific Research from the Japan Society for the Promotion of Science ‘Integrating Dryland Disaster Science’ and nominated as a top case study of early warning early action at the Asian Ministerial Conference on Disaster Risk Reduction in July 2018.

キーワード：Transdisciplinary approach、Disaster risk map、Climate disaster、Livestock mortality、Mongolia
Keywords: Transdisciplinary approach, Disaster risk map, Climate disaster, Livestock mortality, Mongolia

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