Complex Network Analysis as an Identifier of Critical Paths in Shocks and Threats in Disaster Management

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The Blessing in Disguise (BiD) hypothesis has, over the past years, been a focal point of applied and quantitative research in disaster resilience studies, both on a case study basis and on a global comparative basis. This hypothesis puts forward the idea that actual perturbations or shocks (e.g. extreme events that can transform into disasters) of a natural, manmade or technological nature may induce active responses in communities or society in case they are heavily affected by catastrophes. Such a highly responsive attitude and related action-oriented policy may, in the long run – under favourable conditions to be identified - generate new and sometimes unexpected innovation benefits for the economy that would not have been realised in the absence of such disasters. In the spirit of the BiD hypothesis also, a new challenging research question has emerged, namely whether societies or regions prone to risks or threats are able to develop pro-actively a range of preventive strategies and actions, including the necessary public investments, that would also generate long-run high revenues for the economy, even in the absence or non-occurrence of such disasters (the 'no-regret principle'). This variant of the BiD hypothesis is also increasingly addressed and investigated, with a major emphasis on the economic, technological, physical-geographic or institutional support conditions. Both versions of the BiD hypothesis have enjoyed much interest in the recent past and will likely attract much attention in the future, certainly in light of recent geo-political conflicts, climate change, and natural catastrophes. This research will be supported by worldwide open-access disaster databases, which can be encapsulated by digital data analytics, complex modelling experiments, spatial cluster analysis and advanced geoscience techniques. These new advances have led to a wide array of quantitative, statistical and econometric modelling studies modelling studies, which have also generated important policy guidelines, both as 'late warning' lessons and 'early warning' messages. It turns out that institutional quality, solidity of public agents, flexibility in prevention policy and political morality are key factors. The above propositions are tested by employing a new complex data approach inspired by Complex Network Analysis, as inter alia developed by Barabasi. This methodology will be applied to a range of global databases, both at the level of disaster incidents/events and at the level of disaster threats in risk-prone areas all over the world. The main emphasis of the study will be on the identification of distinct and characteristic clusters of areas ('clubs') whose outcomes support (or contradict) the BiD hypothesis so as to unveil their critical success factors. The BiD typology is an outcome that will make it possible to envisage some international strategies and cooperation policies between countries and global cities to discover appropriate mechanisms to transform potential threats and disasters into real opportunities.