

EARTHQUAKES AND SUSTAINABLE INFRASTRUCTURE: NEODETERMINISTIC (NDSHA) APPROACH GUARANTEES PREVENTION RATHER THAN CURE

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Abstract – Academic paper.

The neodeterministic (NDSHA) approach is claimed to offer the 'state of the art', best available scientific knowledge on earthquakes and related seismic risks. Earthquakes occur in a seemingly random way and in some cases it is possible to trace seismicity back to the concept of deterministic chaos. Therefore, seismicity, apparently, can be explained by a deterministic mechanism that arises as a result of various convection movements in the Earth's mantle, expressed in the modern movement of lithospheric plates fuelled by tidal forces. The polarized plate tectonics and the complex nature of seismic phenomena highlight the need to avoid the use of overly simplistic models, particularly for the assessment of the risks associated with earthquakes. In a perspective of prevention, coherent and compatible with the most advanced theories, it is essential that at least the infrastructure installations and public structures [and indoor 'furniture/accessories'] are designed so as to resist (or sustain) future strong earthquakes and continue to operate in their original capacity. An earthquake compatible with the seismogenic characteristics of a certain area, even if sporadic and therefore labeled as "unlikely", can occur at any time.

When an earthquake occurs with a given magnitude M the same generates a seismic motion of the soil that certainly does not depend on its sporadicity in the study area. In this perspective, the anti-seismic design parameters must take into account the magnitude values defined according to the seismic history and to seismotectonics, as required by the neo-deterministic approach (NDSHA), rather be reduced or increased depending on the greater or lesser earthquake sporadicity, as foreseen by some people, adopting the probabilistic approach (PSHA). Consequently, to move from a perspective focused on response to emergencies to a new perspective based on prevention and sustainability, it is necessary to follow the neo-deterministic approach (NDSHA) to guarantee prevention and hence human life's saving. Noting the fluctuation in specified design values that occurs from code edition to code edition, structural engineers have expressed disbelief in the validity of the science upon which the maps are based and dissatisfaction with the ever-changing design requirements for buildings and installations. Further, as the definition of the maps has become more complex, designers have lost an understanding of the intent of the maps, and what they represent. Importantly, the maps portray precision in the design values that is inappropriate, given the substantial uncertainty in the values portrayed (Hamburger, 2016). The Legislation hence should be based on NDSHA approach, able to overcome most of, if not all, the obvious limitations and serious misconceptions of other prevailing approaches.

That comprehension may lead to improved merger between Disaster Prediction and Civil Preparedness. Timely prevention, preparedness and mitigation and response measures are principal to determine whether a natural phenomenon, involving NaTech emerges as a bearable experience or develops into a

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catastrophic large-scale-sudden-disaster [LSSD]. At present, there is no warning prior to earthquake-onset [$0 = T_p < \text{seconds}$]. Effective Prediction Time, T_p , based on viable prediction would trigger a process, based on pre-planned mechanisms to significantly exploit and augment operational capabilities, resulting in saving lives and reduce damage to peoples' health. A research group established in the 1960's and led by the late Prof. Keilis-Borok challenge empiric facts of lack of prediction, by alternative empiric facts that had predicted strong earthquakes, in terms of: Time-window, Space-window, and Magnitude [TSM]. Such operationally-meaningful information might be deduced and transformed by pro-active governments to windows of opportunity saving many lives. The progress is slow, and careful, yet, heralds hope for the emergency management community, for leaders and the public.

This means nothing less than a revolution!

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