

## **Natural Hazards**

John F. Dewey FRS

University College, Oxford

We live on a very dangerous Earth. There are many objective natural geohazards of varying duration and magnitude, some driven by internal forces, others by our solar system, mainly the sun. Some hazards are man-made or enhanced. Natural hazards become risks when man interfaces with them and they become a chronic nuisance (floods), disaster or catastrophe (earthquakes, volcanoes). The central problem is whether a particular hazard has a wholly uncertain random occurrence, is episodic, or has a periodic repeat time. Prediction that a particular event will happen sometime in the future is easy, trivial and of little socio-economic value but forecasting precisely when, exactly where, and the magnitude, of an event is what Government and the Public need and is what earth scientists are striving to understand. Event periodicity or repeat time may become a crude and ineffective tool in prediction but forecasting will only come with a full understanding by continuous monitoring and modeling of geohazards on scales from local to global. The components that will lead to effective forecasting are as follows. Following the identification of a hazard, continuous monitoring and measurement, and modeling lead to assessment, risk and vulnerability analysis for the 1, 10, 100, 1000 etc. year event and, perhaps, understanding of the geology and physics. Modeling is important and useful but must be used with real world observation. There is a spectacular array of new techniques of monitoring and measurement available to the geologist investigating geohazards. Then comes the sociologically most difficult phase of planning and preparedness, which may involve engineering and avoidance pre-event mitigation solutions, civil defence, warning, evacuation, and post-event mitigation “solutions”. Of course, these components are not strictly sequential but are iteratively developed, all of which involve serious long-term commitment and money. Sadly, human memory in these matters is short; many humans live in and reoccupy, almost immediately, seriously-hazardous sites and complain and demand compensation when the hazard strikes again. National and local government must encourage the dissemination of knowledge and understanding via the internet. Governmental and individual responsibility must be encouraged to avoid problems as far as is feasible. For those uninformed people who live in hazardous conditions because of the greed and ignorance of local government and developers, there should be a one-off compensation scheme paid for by the developers and local councils responsible. Insurance companies must adopt the responsible position of refusing insurance to those who knowingly and willingly live in hazardous circumstance. Insurance must return to a strictly risk-based system without government interference. We need a new world of national, local, and individual understanding and responsibility in which data and ideas are shared, and warning systems can be developed. Certainty can never be delivered to Government and the Public; science is about testing ideas not about certainty.

The following topics in **bold lettering** will be covered. Other topics may be covered time permitting. **Earthquakes, Tsunamis/freak waves, Volcanoes, Floods, Landslides, Bolides,** Climate change, Hurricanes/tornados/typhoons/storms, Heave/land subsidence, Mines/quarries, Land degradation/soil erosion, Hydrology/water supply, Gas hydrates

Geology and health; asbestos, arsenic, methylated mercury, heavy metals, depleted uranium, Garbage, toxic waste, nuclear waste management, disposal/storage, Planetary exploration/biocontacts