For almost 20 years the South Iceland Seismic zone has been a test site for multinational earthquake prediction research. The approach was to explore the physics of processes leading up to large earthquakes. Significant findings are:

Earthquakes that occurred hundreds of years ago left scars in the crust, expressed in volumes of heterogeneity that demonstrate the size of their faults. Rheology and heterogeneity within these volumes are significantly variable in time and space. Crustal processes in and near such faults may be observed decades before the sudden onset of a new large earthquake.

Fluids migrating upward into the Earth’s brittle crust play a significant role in modifying crustal conditions.

Preparatory processes of various earthquakes can not be expected to be the same. We learn about an impending earthquake by observing long term preparatory processes at the fault, finding constitutive relationship that governs the processes, and then extrapolating that relationship into near space and future.

Useful warnings can be issued along the way, starting when we discover a fault showing signs of preparatory processes, to the time of rupture. Such warnings could be issued by government agencies in cooperation with scientists to the local Civil Protection committee closest to the fault with information about how to prepare, including directives about enhanced observations. For such a warning service we need a continuously operating geo-watching system, applying modern computing technology to the multidisciplinary data, and a rule based schedule to prepare adequate warnings.