Book review

ICOLD Bulletin 137: Reservoirs and Seismicity – State of Knowledge

ICOLD, Paris, France, 2011, ISSN 0534-8293, €60-00, 110 pp.

International Commission on Large Dams (ICOLD) Bulletin 137 deals with the phenomenon of reservoir-triggered seismicity (RTS). The triggering of earthquakes by the filling of a large reservoir was first observed in 1935 in connection with Lake Mead (impounded by the 220 m-high Hoover dam). The bulletin lists 39 frequently cited cases of RTS, of which six were associated with earthquake magnitudes exceeding 5.7.

It was suggested in ICOLD Bulletin 72 (selecting seismic parameters for large dams) that RTS is principally associated with dams of more than 100 m high and with reservoirs with a capacity exceeding 500 million m³. This should, however, be regarded as a rough rule-of-thumb because there are cases of RTS associated with dams of lesser height and smaller capacity.

RTS refers to reservoir-induced seismicity but this term has been dropped in recognition of the perception that RTS is typically caused by the extra imposed weight of water and by lubrication, by water from the reservoir, of faults already under stress.

Relatively shallow earthquakes are the most likely outcome of RTS. There are, however, one or two significant exceptions including the Aswan dam where the RTS phenomena were documented at a depth of 25 km. Earthquakes due to the weight of water in the reservoir are likely to occur fairly soon after filling, whereas earthquakes caused by lubrication of faults are likely to take longer due to the time taken for diffusion of pore pressures to depth. Depending on the permeability and specific capacity of the rock, diffusion to a depth of 2.5 km is likely to take about 100 days while for greater depths much longer periods (up to several years) are needed. It is noted that Koyna in India started to fill in 1962 and the earthquake occurred 5 years later in 1967.

The earthquake at Koyna had a magnitude of 6.3, which is the largest example of RTS to date. It is thought unlikely that RTS would give rise to an earthquake significantly larger than this.

According to the 2004 issue of the World Register of Dams, the overall number of dams higher than 100 m is 670. If we relate the high-magnitude events ($M > 5.7$) with this group then the incidence of RTS is $6/670 = 0.9\%$. While RTS is an important phenomenon it is not, therefore, particularly common.

The bulletin will be helpful to engineers working overseas although it seems unlikely that there will be any new dams in the UK of sufficient size to cause an RTS.

J. Hinks