

## **Site Investigation and Pathology of Levees**

**TOUAHRI, B., KHALIFA, A.** Civil Engineering Laboratory of  
Nantes - Saint-Nazaire, Saint-Nazaire France

The recent disasters caused by floods in different regions of the world have revealed the inadequacy of our present knowledge regarding performances of earth structures such as levees. The main problem of these old structures lies in the fact that we have no information about their internal structure, since they have, sometimes, been built with nearby highly heterogeneous fluvial deposits some many centuries ago. Therefore, depending on the characteristics of the building materials used, levees are likely to show many different pathologies.

Here, we first make an inventory of the various disorders observed on different levees throughout the world and work out a list of the various failure modes occurring with these old structures. It emerges from this classification that the most common dysfunctions are mechanical or hydrodynamic. Eighty percent of the accidents are due to overflowing and piping and 20% are of diverse origins (slop instability, seisms, fluvial erosion, etc.). The susceptibility of a structure to such or such pathology can be apprehended through physical or numerical modelling if the structure composition is known. The thorough investigation of the structures is then necessary prior to modelling, when in fact continuous site geotechnical investigations are nearly impossible in structures which are often several tens or even hundreds of kilometers long. We therefore decided to compile the various geophysical methods available for the continuous investigation of levees and apply some of these methods (electric and electromagnetic methods, etc.) to the Divatte levee (France). These tests are then compared with the core drills previously carried out on the site. The result of this comparison is that, considering the restraints due to the site features (morphology, traffic, accessibility, etc.), the electric panel method appears as best appropriate provided that considerable precautions are taken for its implementation at the risk of obtaining aberrant measurements.