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The protection of Canfranc Internation Railway Sattion against natural risks. Analysis and evaluation of its effectiveness 100 years later.

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In the late XIXth century and early XXth century, the international railway station in Canfranc “Los Arañones” is built in the Central Pyrenees of Huesca in Spain, along the border between France and Spain. Just after starting the construction of the huge station (250 m long), it was found that natural hazards such as flash floods, landslides, falling blocks and avalanches affected it and compromised the safety of users and infrastructures.Quickly, hydrological restoration works were carried out along “Los Arañones” gorgers basins to reduce joint residual risks. Longitudinal and transversal dams for floods, a large reforestation work to prevent against falling blocks, erosion, flooding and regarding avalanches stone walls were built, as well as benches of grit, snow rakes, and “empty dams”, which were created as experimental structures to dissipate the energy of the avalanche in the track zone and wich do not exist anywhere else in the world. All the works were carried out mainly by hand, with materials such as stone, cement and iron. Over 2,500,000 holes were made for planting more than 15 different species of trees, and more than 400,000 tons of stone were moved to build more than 12 different kinds of control measures.It is essential to emphasize the empirical nature of these works and Canfranc’s function as a "laboratory or field tests", with most of its structures still effective 100 years after its construction. The works involved about 30% of the total cost of the station in the early XX century. Nowadays to have an "equivalent protection" with the current technology, around 100 million euro should be invested. It is also necessary to validate the current effectiveness of such works, its maintenance task and the protective role of the forest.