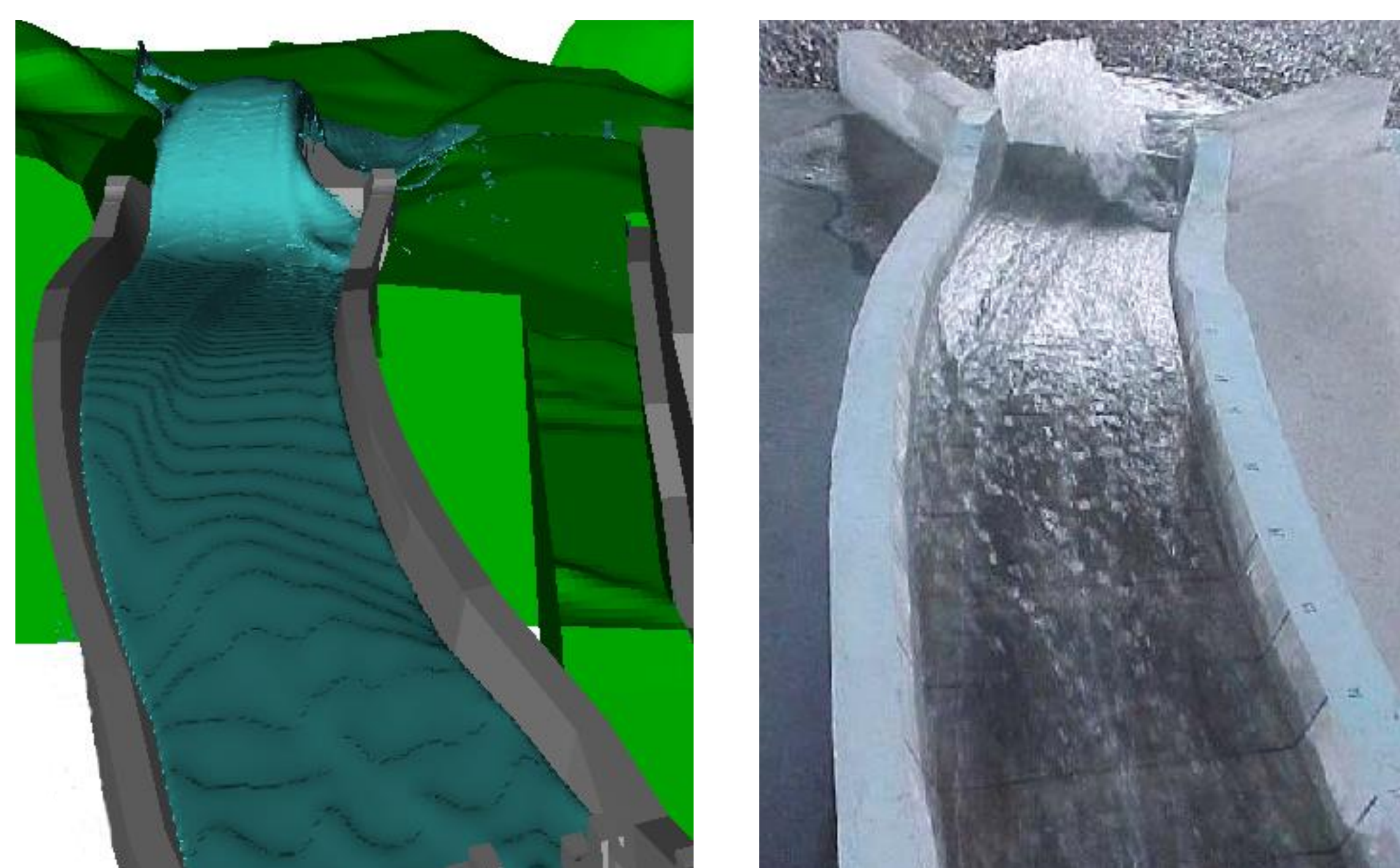
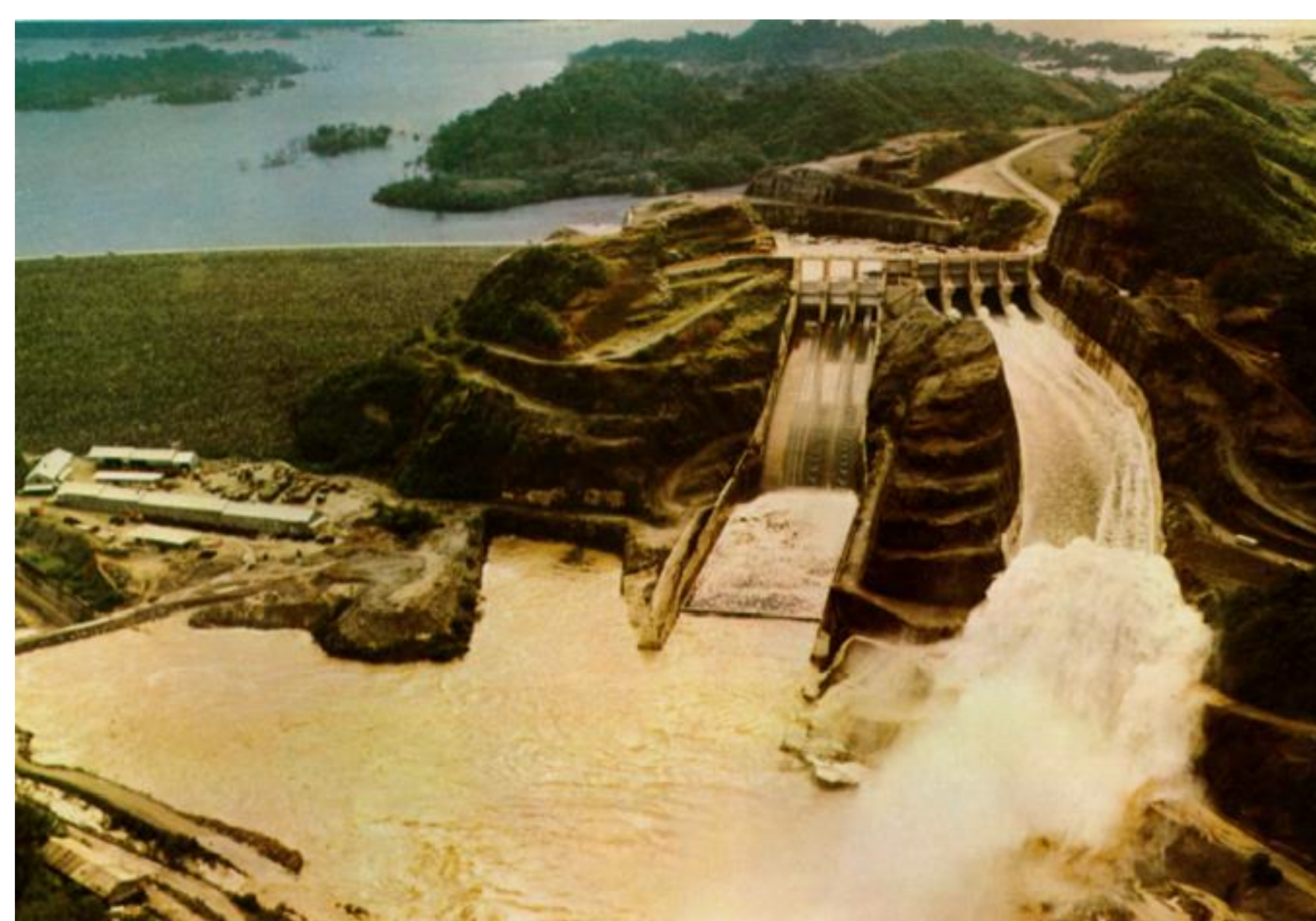


## INTRODUCTION

Due to a poor hydraulic performance presented in the Netzahualcoyotl's dam emergency spillway, it was necessary to propose alternatives to optimize the design. In order to improve the hydraulic operation of the spillway, the Federal Electricity Commission (CFE) implemented several mitigation actions that were evaluated and approved by the National Water Commission (CONAGUA), federal entity in Mexico that issues the permits of construction for hydraulic structures.

The actions performed were the construction of this elements:

- A central wall.
- A transversal slope along each channel.
- An aerator in each channel.
- Side deflectors and in the central wall.



Final simulation of the emergency spillway using the original design.

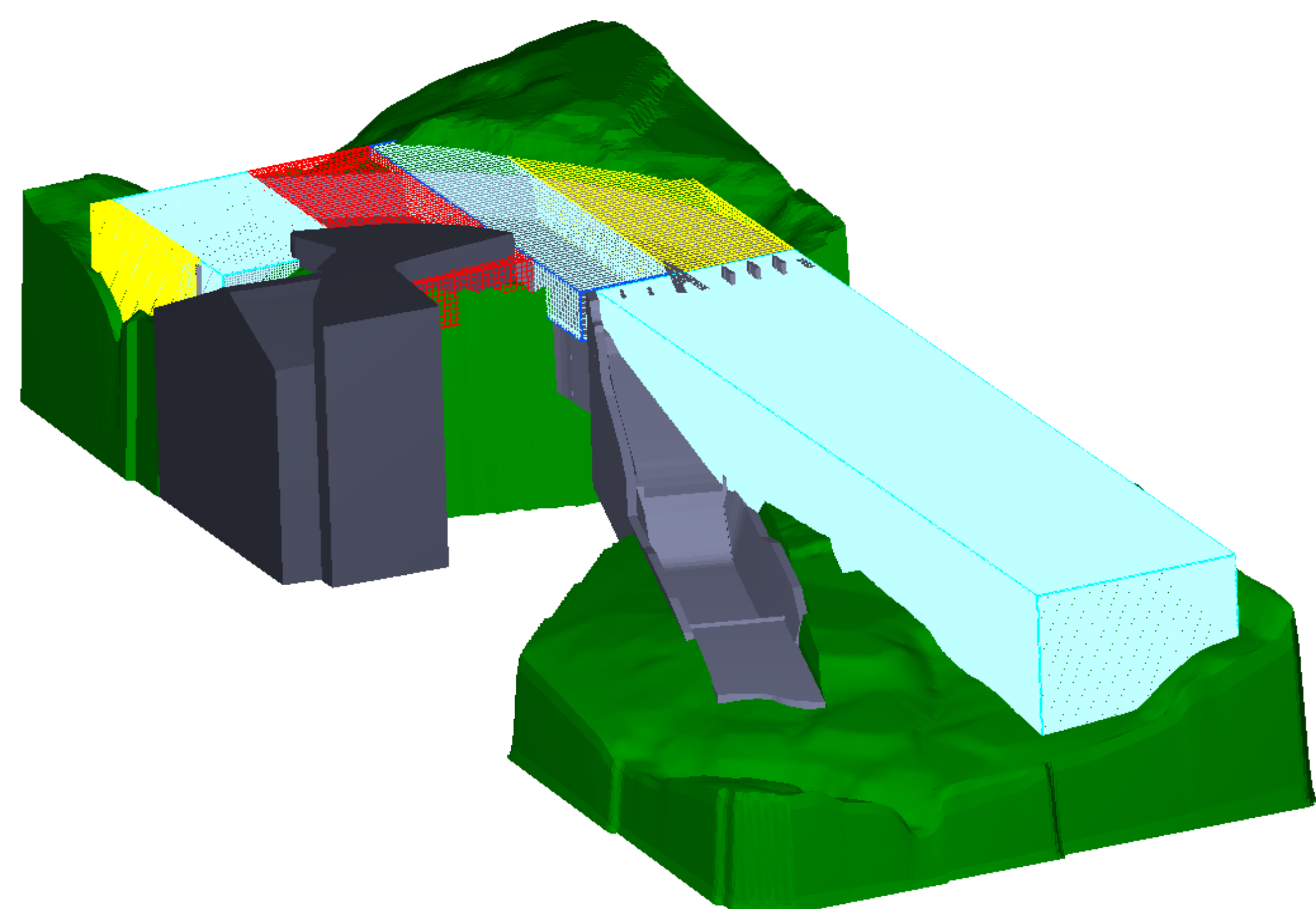
## OBJECTIVE

The aim of the work was to develop a numerical model of the Netzahualcoyotl's dam emergency spillway and validate the results with measurements in a physical model. With this study, it was possible to analyze the hydraulic operation of the structure with the modifications for the original design. The main scope was to validate the use of these modeling techniques to test their implementation in the design of hydraulic structures.

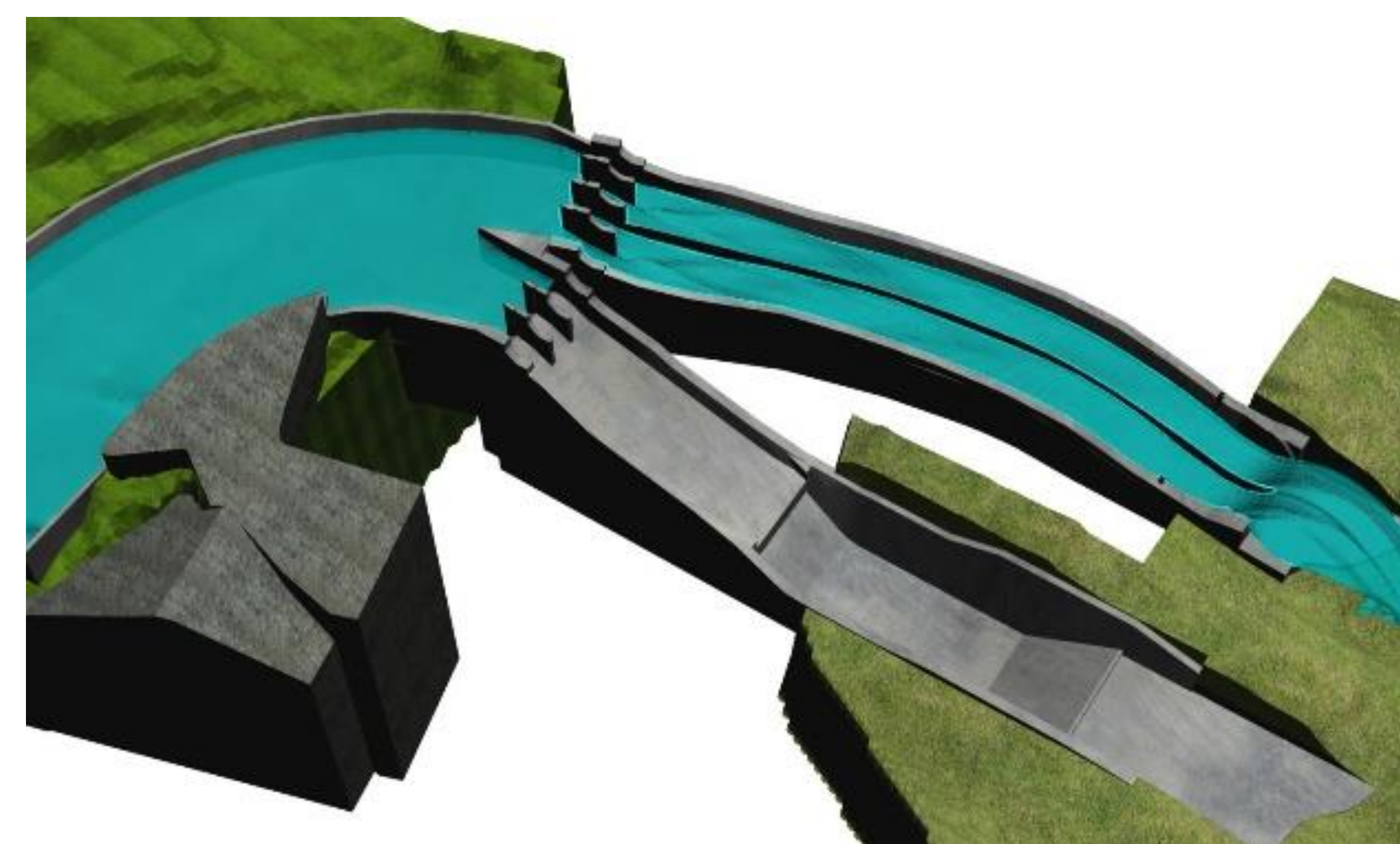


## NUMERICAL MODEL

The geometry is composed by two channels: service and emergency spillways, the conduction channel upstream and the topography of the terrain where the dam is located. To perform the simulation, six different mesh arrangements were tested.



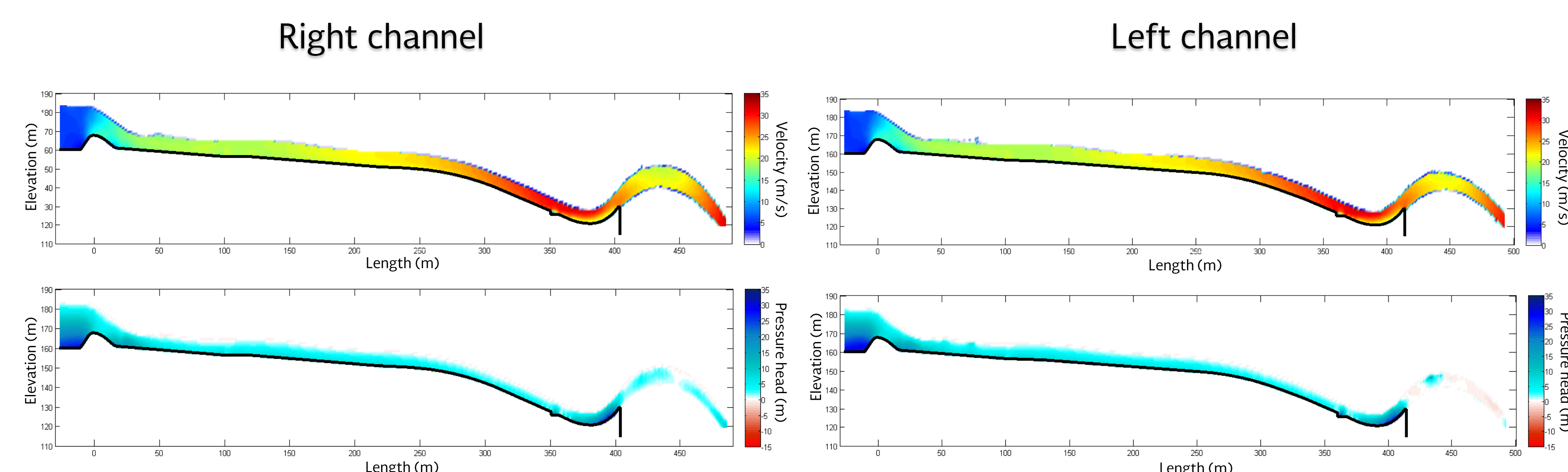
Final configuration of the mesh and geometry elements for simulation.



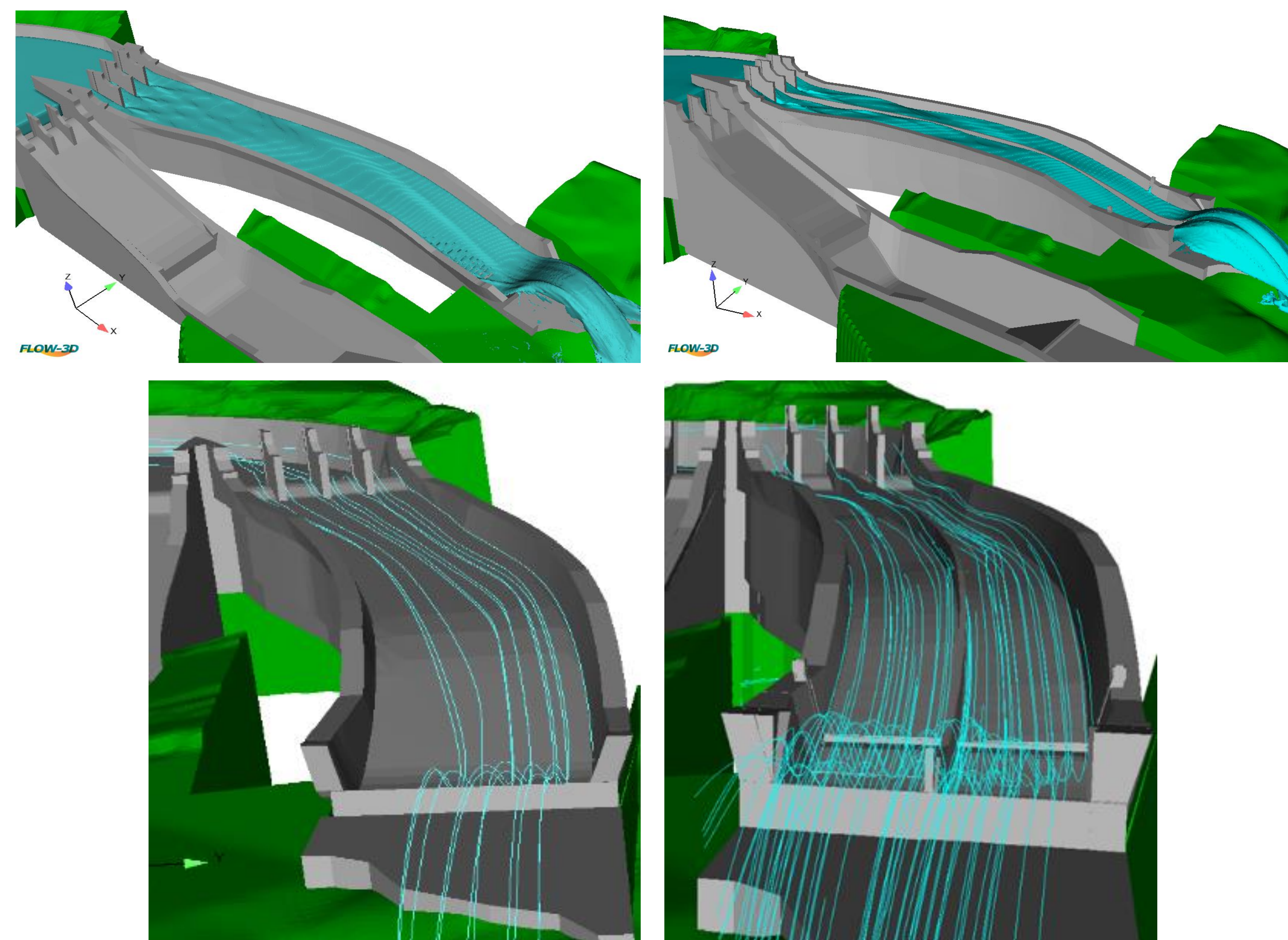
Final results of the simulation for the emergency spillway.

## RESULTS

In the post-process stage, the extraction of data generated by the processing is performed. These results can be obtained graphically or numerical, which are subsequently processed using toolboxes or databases to obtain their final interpretation. For example, the figures shown below represent the velocity and pressure in the longitudinal axis, for the right and left channel respectively.



Finally, the comparison between the original and the modified design is presented. It can be observed that in the original geometry there is a concentration of the flow in the left margin due to the slope of the curve that follows the trace of the discharge channel. This concentration of flow in the left margin also causes that the energy concentrates in a smaller space and restricts their dissipation, compared to the modified design.



## CONCLUSIONS

The hydraulic operation of the Netzahualcoyotl's dam emergency spillway, after the mitigation actions proposed by CFE and approved by CONAGUA were implemented, they had the following positive effects:

- The discharge of the spillway channel will be conducted in a better uniform way.
- The placement of vertical deflectors in both the central and sides walls, allows to dissipate the water energy.
- Initial discharge for operation will be reduced.
- The hydraulic behavior of the emergency spillway will be improved and will increase its functionality.
- The safety of the dam will be higher.