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Analyzes shows Paraopeba River recovering and tailings will not reach São Francisco River

More than four months after the breach of Dam I (B1) of the Córrego do Feijão Mine in Brumadinho, Minas Gerais, we can already verify that the water, after the beginning of the dry season, at some points along the Paraopeba river has begun returning to its original, pre-tragedy state. The highest turbidity area is 40 kilometers from the B1 dam. The analysis by Vale and the Minas Gerais Institute for Water Management (Igam), shows that the sediment plume did not reach the São Francisco River, remaining in the reservoir of the Baixo Retiro Plant, in Pompéu, just over 300km from B1. Since the end of March, Igam has not detected levels of mercury and lead above legal limits. The presence of these heavy metals led the state to prohibit direct water collection from the river. The ban is a preventive measure.

The above data was presented at the 'Technical Seminar - Paraopeba and São Francisco River Basins', held on May 30, in Nova Lima, Minas Gerais, which brought together 185 experts from Vale, public agencies and representatives of environmental consultancies and laboratories contracted by the company. Since January 25, Vale has begun detailed monitoring of the river, with daily samples of water, sediment and turbidity level evaluations, as well as the collection of tailings for the characterization and toxicity in aquatic organisms. Currently, there are 66 monitoring points, covering more than 2,600km. There are points installed upstream of the B1 breach along the Ferro-Carvão stream, the Paraopeba and São Francisco Rivers to the river mouth in the Atlantic Ocean, the reservoirs of the Retiro Baixo and Três Marias Plants, as well as the main tributaries of the Paraopeba River.

So far, approximately 1.4 million water, sediment and tailings analyzes have been performed, covering 393 parameters. In addition to surface water analysis, samples were also collected at a depth of two meters. The results are comparable to surface waters, being within the normal range. The work is being conducted by five specialized laboratories, involving approximately 250 professionals. Coppe-UFRJ (Coordination of Graduate Programs in Engineering, Federal University of Rio de Janeiro) was hired to evaluate the applied methodology and validate the data already presented by the laboratories.

"Considering what has already taken place, it is up to us to properly assess what the physical, biological, socioeconomic and cultural impacts are and then present and implement a solution. All studies indicate that the Paraopeba River can recover. The time has come to compensate for this damage," says Gleuza Jesué, Executive Manager of Vale's Special Repair and Development Department. The environmental recovery depends on a set of actions, among them the containment of tailings that are close to where the structure was. Two of the containment works - a fluvial water treatment plant and a reservoir made of a curtain of sheet pilings - are already in operation. The goal is for everything to be ready before the rainy season, which starts in October.

One reason why experts think that the river can be recovered is due to the ecotoxicology tests, which measure the effects of the chemical elements on organisms susceptible to environmental changes in the Paraopeba basin and the São Francisco river, including the river mouth. So far, 6,000 ecotoxicity analyzes have been carried-out on surface water and sediments. The technicians did not detect an acute change in any of the five microorganisms analyzed in the surface water.

The chronic toxicity in these organisms, was restricted to the region of the breach and to the first 40km of the Paraopeba River. It is mainly related to suspended solids in the water. In relation to sediment, the results indicated chronic toxicity in 62% of the samples along the whole river, including points upstream of B1 and downstream of the Três Marias Hydroelectric Plant, sites not affected by the tailings plume. Studies on domestic animals and agricultural crops in the surrounding area of the river that have come into contact with the water are being carried-out.

The highest concentrations of metals are directly correlated to the position of the tailings plume, predominantly being in the first 70km downstream of Dam I. However, there have been reductions in the concentrations of metals in the water in recent months. The results also show that, even without the presence of any influence of tailings, the technicians found heavy metals in the sediment above the legal limits downstream of the Três Marias Plant reservoir.

At the technical seminar, the Director of Igam, Marília Carvalho de Melo, gave a presentation outlining that the organisation currently has 14 collection points along the Paraopeba River up to the Três Marias. She noted that the presence of heavy metals - lead and mercury - was found in the first 40km from the dam. Since March 26, however, the organisation has not recorded any of these metals above legal limits. "Today the situation is very different from the first period. The data shows this, but of course we have preventative safety measures in place and all uses of the river water remain suspended. There is a definite trend of recovery and for the possibility of medium-term use of the Paraopeba River," said Marília.

Non-hazardous tailings

The analyzes carried out by Vale concluded that the tailings are not hazardous according to the NBR 10.004 standard of the Brazilian Association of Technical Standards (ABNT), since the toxicity indexes are below the legal limits for mining tailings. To date, 37 final reports have been made available and the tailings were classified as non-hazardous in all of them.

Most of the tailings characterization results show heavy metals below the maximum values found in the region and within the existing legal limits for soil, according to the parameters adopted by the National Environment Council (Conama). The technicians compared the results with a study on the soil of the Paraopeba River basin conducted by the Brazilian Geological Survey (CPRM) between 2011 and 2014. At that time, 254 soil samples were collected for the analysis of arsenic, lead, nickel, zinc, iron and manganese. The results of the Vale analysis showed an enrichment of iron, aluminum and manganese in the tailings samples, which are not considered heavy metals.

São Francisco

The Vale and Igam studies show that the tailings plume remains in the reservoir of the Retiro Baixo Plant, in Pompéu, located in a region of the Paraopeba River prior to the Três Marias plant and the São Francisco river. "Igam included three monitoring points in the Três Marias reservoir, because some information was reported that the plume had reached the São Francisco River, but our data did not validate this," said Director of Igam at the seminar.

The prediction of Vale's technicians is that the sediment coming from the breach of the dam will not reach the São Francisco River. This is because, with conservative preliminary approximations, about 77% will be retained in the reservoir of the Baixo Retiro plant and the remaining 23% in the reservoir of the Três Marias hydroelectric plant. Both reservoirs have ample sediment retention capabilities.

History of the Paraopeba River

A special report titled " Data Evaluation between 2000 and 2018", published by the Mining Institute of Water Management, on February 12, 2019, evaluated the behavior of some Paraopeba River parameters at eight monitoring stations operated by the agency. The historical data showed that during rainy periods, the turbidity of the river exceeded the legal limit allowed by 18 times.

Over the years, Igam experts have noted an increase in the presence of heavy metals - zinc, copper, arsenic, lead and nickel - above environmental legislation for a Class 2 river, whose waters maybe, according to Conama, intended for irrigation, recreation, fishing and human consumption, after conventional treatment. Only mercury analyzes did not exceed the legal standard.

Other metals not considered heavy (iron, aluminum and manganese) were also above the limit. The Igam study allows a comparison of water and soil quality of the Paraopeba before and after the B1 breach. The work of the state agency and the Brazilian Geological Survey show that the metal content found in the tailings of the dam at the Córrego do Feijão Mine is of the same magnitude or lower than the maximum levels found in the Paraopeba basin. This indicates that the region is naturally rich in minerals containing these elements, hence also, its vocation for mining activities.

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