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PUBLIC INTEGRATED SUPPLY SYSTEM'S IMPLEMENTATION TO IMPROVE THE HYDRIC SAFETY TO PARAOPEBA AND CAETANÓPOLIS'S DURING DROUGHT SEVERE EVENTS

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Highlights:

- **Public water supply system;**
- **Hydric safety;**
- **Alternatives of integrated public water supply.**

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INTRODUCTION

Guarantee access to quality water, considering an adequate quantity for personal use, is linked to fundamental human rights (SILVA, D., & PONZILACQUA M., 2020). In this context, situations that could compromise water security stand out, as was the B1 dam's rupture, in Ferro-Carvão stream, in Paraopeba river's tributary, in 2019. In front of this, the Instituto Mineiro de Gestão das Águas – IGAM– suspended, temporarily, the Paraopeba surface water uses (RAMOS et al. 2020).

However, part of the Paraopeba and Caetanópolis water demand was guaranteed, until the failure of the B1 dam, by the surface water concession on the Paraopeba River, that the responsible company for the local public water supply had. In front of the suspension, this company reestablished their Cedro's surface water abstraction concession (35,8 L/s daily average), but this hydric source is not enough to meet the entire water demand of these two municipalities, moreover, Cedro's stream of water can presents reductions during drought occasions.

Considering that Vale is responsible for the B1 dam, this mining company committed to establishing new water supply forms for the Paraopeba and Caetanópolis. Therefore, to meet these municipalities water demand, of 80 L/s, Vale drilled 8 and reactivated 16 water tube wells, that's represents more than 100 L/s of water daily average. In addition, Vale investigated the Raw

Water Reservoir, "RWR" implantation the, to provide more hydric safety to these municipalities. The RWR will be filled during the greatest water availability period with the Cedro stream excess flow part. During drought events, the stored water, after pass through the Water Treatment Plant, can will be used to complement the Paraopeba and Caetanópolis water supply demand.

METHODOLOGY

The Cedro's stream water availability was analyzed, considering the water consumptive use permits on the contribution basin limits and in the downstream section of the Cedro stream up to Paraopeba rivers confluence. This information was obtained through the "Infraestrutura de Dados Espaciais do Sistema Estadual de Meio Ambiente e Recursos Hídricos -IDE-System – "platform. The rainfall-runoff model, WIN_IPH2, was used to generate a continuous flow series calibrated. From the flows series obtained (1984-2020), the monthly flows were calculated for the Cedro's stream using the log-Pearson Type III probability distribution function. As a criterion for estimating the available flow, the upstream water flow consumption was subtracted by 50% of residual flow rate according to IGAM Portaria n° 48/2019 (RHAMA., 2022a,b).

RESULTS AND CONCLUSIONS

Cedro stream basin has a drainage area of around 87 km², that represents around less than 1% of total Paraopeba river basin. The upstream water consumptive use is 5.7 L/s on an average daily. There is a significant variation in monthly flow, with a critical period from August to October, as can be seen in Figure 1.

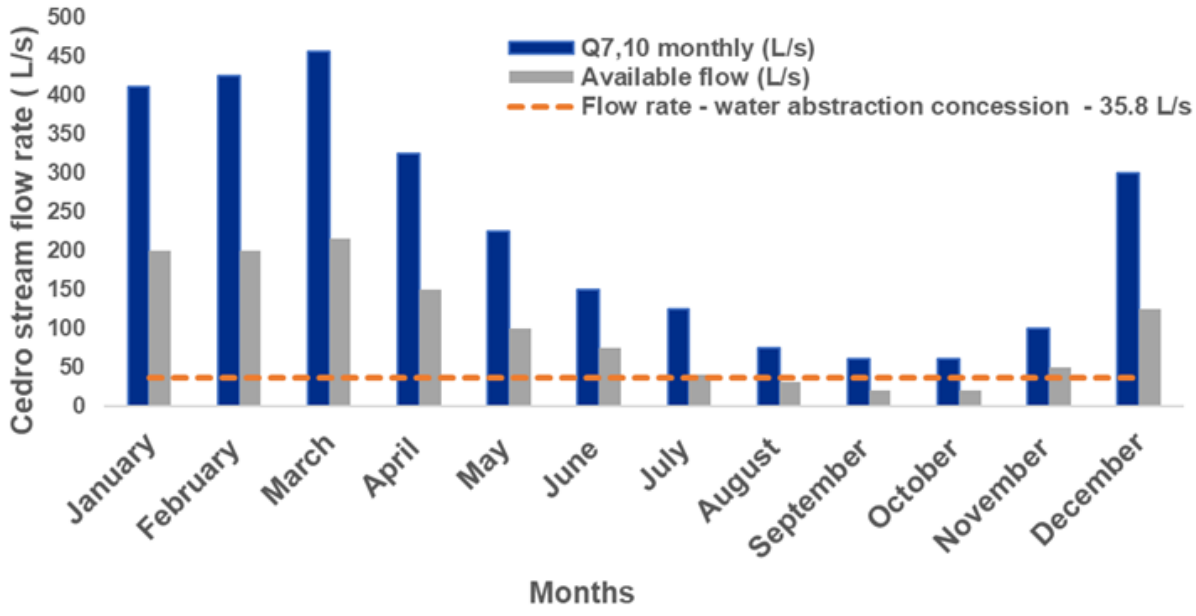

Figure 1: Monthly Q7.10 flows and monthly available Cedro stream flows (RHAMA ., 2022b)

Furthermore, April presents a higher average flow compared to the October, despite the average rainfall in that month being lower. This condition may be linked to the rainy period that precedes April, which reflects in greater water availability in the underground reservoir and, consequently, in base flows. On the other hand, the October is preceded by months with lower rainfall, and, although it presents the highest volume of average precipitation, compared to April, its effect is still not significant on river flows, as can be seen in Figure 2.

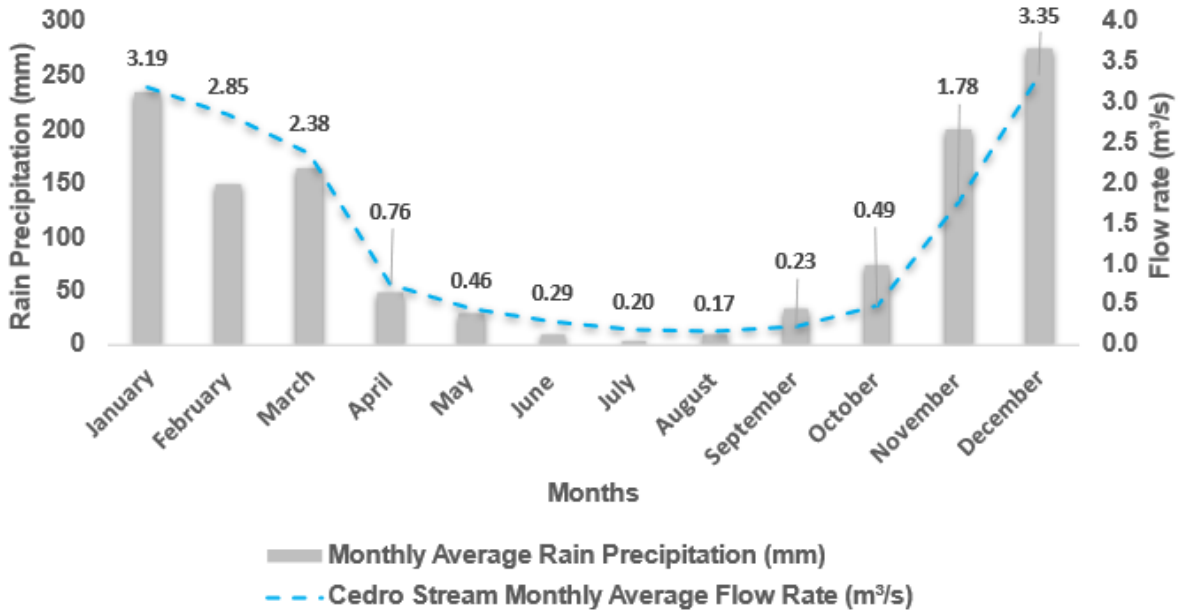

Figure 2: Average monthly flows and rain precipitation obtained for the Cedro stream basin (RHAMA ., 2022a)

During this period, RWR will be able to supplement the municipalities' supply with Cedro stream and tubular wells. It is worth noting that as the reservoir is being built outside the Cedro stream, it will not compromise this stream flow, as it will only be filled with the Cedro stream surplus flow during the period of greatest water availability.

Thus, responsible company for the local public water supply, who will be responsible for the RWR operation and maintenance, will have more operational flexibility, and will be able to use less of these two resources, which could contribute to maintaining the Cedro water residual flow during drought severe event or will could contribute to groundwater recharge, since it will be possible to do these wells use rotate, which will result in a more sustainable operation in the medium and long term.

The RWR implementation to store water during greater availability periods contributes to improving water management in the Paraopeba and Caetanópolis. In this sense, the public integrated supply system will allow the system's supply sources diversification, minimizing dependence on single source supply when necessary.

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