



## Valuing scenarios of water scarcity to enable actions to reduce water and climate risks

### EXECUTIVE SUMMARY

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Braskem is a Brazilian company of the chemical and petrochemical sector that works in the production of thermoplastic resins in the Americas, with industrial units in Brazil, United States, Germany and Mexico. Assuming the management of risks and opportunities related to climate change as a component to be inserted in its sustainability strategy in order to maintain and strengthen the business competitiveness, Braskem started, in 2014, the preparation of an adaptation plan, considering its 40 plants<sup>1</sup>.

During this process and subsequently reiterated by a study organized by the company, it was identified, for the Duque de Caxias unit, in Rio de Janeiro state, the scenario of high risk of water scarcity in the Hydrographic Basin of the *Guandu* River, which supplies the region. In this context, this study seeks to use the valuation of the water provision ecosystem services to elaborate simplified analyzes of some water scarcity scenarios with a focus of viability actions for water and climate risks reduction. Due to this objective, the analysis considered only the impact aspect, considering the year of 2022.

Four scenarios of water scarcity were evaluated: (i) reduction of water authorization by legislative measure and production loss; (ii) increased water use charges; (iii) reduction of water authorization due to hydrological risk and production loss; and (iv) reduction of water authorization and implementa-

tion of a project for water reuse to supply 100% of Braskem's operations. All the scenarios were evaluated by the Marginal Productivity Method (MPM), which considers the company's productivity variation due to the variation in the quantity of water available for consumption.

The results obtained demonstrate that a reduction of water grant as a result of a legislative measure in the Duque de Caxias region (considering the historical example of The Piracicaba, Capivari and Jundiá River Basins) could lead to an economic impact of over R\$ 120 million in 2022, due to the load reduction of the industrial plant. This impact is higher when compared to the one caused by the increase in the price paid for the acquisition of reused water in the region (assuming the implementation of a project with conditions similar to *Aquapolo*).

The results of this study will be used to subsidize the choice of risk management actions associated with water availability in a relevant region to the company's performance, with the economic valuation allowing the comparison of actions in different scenarios. This is a first exercise seeking to use the valuation tool to subsidize the actions choice in the context of a climate change adaptation plan, and, as next steps, the analyzes can be expanded to compare the cost of the actions to the estimated costs of the likely impacts of climate change.

<sup>1</sup> See a Braskem case of strategy development for adaptation to climate change at: <http://adaptacao.gvces.com.br/>



## Reporting of dependencies, impacts and externalities

Responsible for completing: Gustavo Deguti Kajiura

### Project drivers

**Goals:** Assess risks and opportunities; Compare options; Communicate internally or externally.

**Description:** After assessing the results of the potential impacts of climate risks on Braskem's operations, the severe drought scenario for the Duque de Caxias plant in Rio de Janeiro was identified. The study of the *Guandu* basin was carried out within the adaptation plan, confirming this scenario and the high risk of water scarcity. Based on this diagnosis, it is intended to use the TeSE methodology, considering some scenarios (i.e. water authorization scenario) to obtain results that enable solutions for the reduction of water and climate risks.

### Project scope

**Object of the project analysis:** Project.

**Description:** The project's object of analysis comprises Braskem's industrial units in Duque de Caxias (UNIB 4, PE 9, PP 5).

**Geographic Area:** *Guandu* Basin (Duque de Caxias, Rio de Janeiro, Brazil).

**Step(s) of the value chain included:** Own operations.

**Type of approach:** Prospective.

**Time horizon:** 2022.

**Ecosystem Services:** Water provision.

### Water provision

**Role of ecosystems in the hydrological cycle and their contribution in terms of water quantity, defined as total production of freshwater.**

**Method(s) used:** Marginal Productivity Method (MPM).

#### Results

**Dependency:** Not calculated

**Impact:** higher than R\$ 120 MM in 2022 (scenario 1)

**Externality:** Not calculated

#### Data used

#### Type of data

**Dependency on the quantity of water:** Dependency aspect was not evaluated.

**Hydrological balance of the water used by the business:** Externality aspect was not evaluated.

**Watershed from where water is collected, name and classification of the water body:** Secondary  
*Guandu* Basin – Class 2.

**Watershed used for water replacement, name and classification of the water body:** Not considered in the pilot project.

**Further information**

**Results of physical metrics:** Confidential data.

**Assumptions adopted in the valuation estimates:**

- Analyzes carried out considering 2022 as base year.
- Assuming that the Q4 will suffer a concession reduction similar to the one that occurred in the PCJ Basins in 2014/2015.
- For the conversion of the load reduction in monetary base, it was used the operating profit, and not the lost profit.
- All Q4 water consumption, in scenario 2022, would come from reuse water.
- The price paid for the reuse water in Q4 is identical to that paid for the reuse water of the *Aquapolo*.
- Braskem would establish a long-term contract for the acquisition of reusable water for a fixed time, but without providing an initial investment.
- The Q4 water supply is quantitatively identical to its water collection.

**Adjustments or derivations applied to the methods and tools used:** The tool used was the Corporate Guidelines for the Economic Valuation of Ecosystem Services (DEVESE, its Portuguese acronym), with some calculation adjustments: the water deficit (Dh) was estimated using, as a reference, the resolution ANA/DAEE 50 of the PCJ Basins. The valuation considered the dose-response, following the marginal productivity method, not the replacement cost method.

**Others:** N/A.

**Explanatory Notes:** N/A.

## Analysis of the results

Although the pilot project focused on the impacts for Braskem, it is important to highlight that several scenarios considered (reduction of water authorization by legislative measure, increase in the price paid for the water collected and reduction of concession due to the risk of shortage in the basin) may have impacts on the different users of the basin and, in many cases, may be a reflection of their performance. For this reason, Braskem reinforces the importance of thinking about solutions that involve different actors from the public-private sphere.

## Management of ecosystem services

**Use of ecosystem service valuation results:** Cost-benefit analysis; Risk assessment.

**Description:** Braskem seeks to use the results obtained from the pilot project to make tangible the scenario of water scarcity in the region, raise awareness of leaders and enable some adaptation actions geared to the risk of water shortages in the region.

Realização



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