

WATER TREATMENT AND REUSE SYSTEM

IAPH/WPSP - SUSTAINABILITY AWARDS



WATER TREATMENT AND REUSE SYSTEM

CONTEXT



Water is the natural resource that presents the greatest concern regarding its scarcity in the near future. One of the factors that aggravates the shortage of this natural resource is the fact that each year, the few freshwater reserves with quality and easily accessible location are being polluted or contaminated at a very high speed.

Solid bulk terminals are places with high polluting potential and high consumption of water since it's the main resource to control and minimize the potential impacts of the movement of solid bulk in port terminals.

The operation of transporting solid bulk involves a considerable risk of emission of particulate matter. This is because practically all handling operations, such as unloading, transport, storage and ship loading, tend to suspend dust, especially when the bulk is dry, as low humidity makes the particles lighter and more susceptible to dispersion.

In addition, there is also the constant action of winds on the piles of bulk cargo and other areas that may be covered with dust, such as the internal roads of the terminal.

With that in mind, Porto Sudeste was designed with the concept of sustainability and reuse of water resources included in its operation. The mechanisms used to prevent and mitigate atmospheric emissions are the main consumers of water. It is used in the sprinkler system in the solid bulk storage yards, in the car dumpers, in the conveyor belts, in the wheel washers, in wetting the internal roads and in the washing of equipment and operational areas. These activities use what is called industrial water, which consists of groundwater extracted from wells and water from the Rainwater Treatment and Reuse Stations (ETRAPs) and the Sewage Treatment Station (ETE).



WATER TREATMENT AND REUSE SYSTEM



Since its design, Porto Sudeste has had a project to reuse water resources with three ETRAPs. Between 2015 and 2017, the water from the treatment for reuse was directed only to the sprinkler system in the solid bulk storage yards and, for other industrial uses, the water came from underground wells, duly granted by the competent environmental agency.

To reduce the amount of groundwater captured for industrial use, as well as reduce the amount of effluent generated on the site, Porto Sudeste developed and implemented two separate drainage systems, isolating rainwater that flows down the slopes and hills (clean water) from the one that flows through the stockyards (industrial effluent), in order to obtain a more sustainable terminal. The increased consumption of reuse water leads to a decrease in the use of groundwater, making more water available for the surroundings, for the ecosystem and for the community.

The search for continuous improvement to maximize reuse and reduce consumption contributes to the reuse rate increasing considerably year after year and the consumption of water from the wells has been gradually reducing. **In 2022, Porto Sudeste achieved surprising results. Out of the total water used in the operation, 80%, around 162,000m³ (162 million liters) of water, came from the Treatment Stations, reducing the consumption of water from the wells by 37%.**



WATER TREATMENT AND REUSE SYSTEM

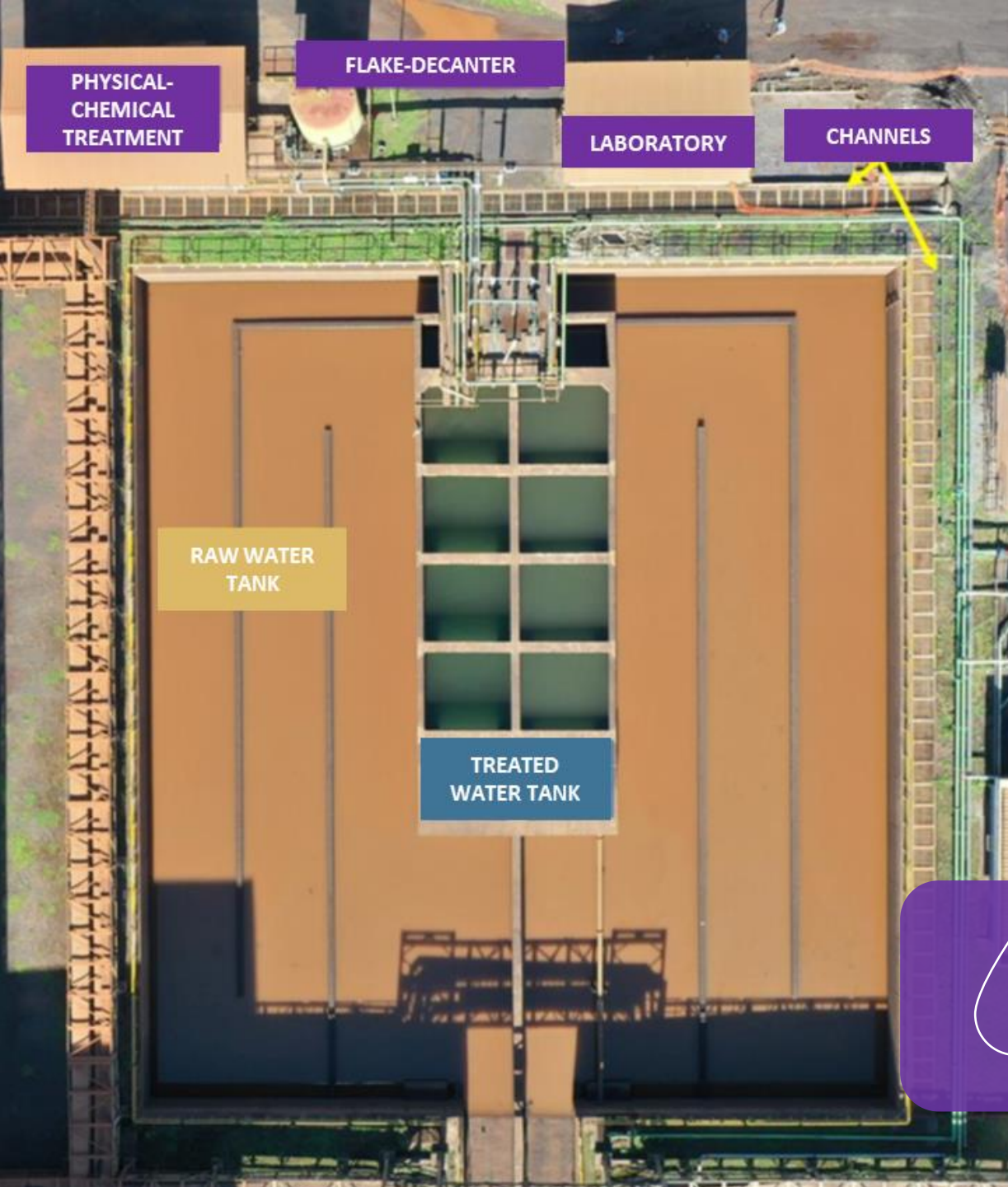


The Project

The main objective of the project is to reduce the consumption of underground water, transforming wastewater from bulk operations and sanitary effluent into reuse water, thus mitigating the environmental impact of port terminal operations.

That's why Porto Sudeste has 3 Rainwater Treatment and Reuse Stations (ETRAPs), with a total storage capacity of approximately 12,000 m³, and a Sewage Treatment Station (ETE), with capacity to treat 40m³/day.



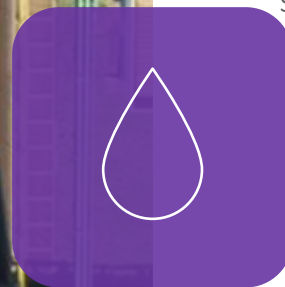


WATER TREATMENT AND REUSE SYSTEM

- ETRAPs -



Rainwater and industrial effluent containing ore from the yards and pier, after initial decantation in the sumps, are pumped to one of the Rainwater Treatment and Reuse Stations (ETRAP), present one in each yard and one at the pier. These stations are built to receive and treat wastewater in order to reuse it as a source of industrial water for the terminal. In the ETRAPs, the water undergoes a physical-chemical treatment with flocculants, to reduce turbidity, in addition to pH correction. Then, the liquid is ready to be reused, being stored in the treated water tanks until it is reused in the operation, directly in the sprinkler system of the stockyards or directed to supply the industrial water system of the Port.



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ETE

All sewage generated at Porto Sudeste undergoes a biological treatment at the ETE: the MBBR (Moving Bed Biofilm Reactor) or Biological Reactor with Moving Bed. The technology combines the formation of liquid biomass in suspension and adhered biomass (biofilm). Equipped with diffusers that guarantee the constant movement of the suspended support medium, the hybrid reactor, with greater surface area for biomass growth and increase in cell retention time, requires smaller volumes for high treatment efficiencies (BOD removal > 90%).

The technology allows the removal of nutrients (nitrogen and phosphorus) with the configuration of recirculation of effluent and secondary sludge, in an anoxic environment (pre-denitrification, nitrification and denitrification).

After treatment, the water is sent for reuse and the generated sludge is used as fertilizer in internal landscaping.



TREATMENT RESULTS

WATER REUSE

FOR INDUSTRIAL ACTIVITIES

ETRAP



ETE





WATER REUSE

Industrial water is used for the following purposes:

- Sprinkler system for stockyards: the sprinkling of the piles is carried out with polymer, thus avoiding the emission of particulate matter in cases of strong winds;
- Car Dumper Sprinkler System;
- Sprinkling of conveyor belts;
- Wheel washer: installed at strategic points, thus avoiding the carriage of particulate matter to the internal and external roads during the movement of vehicles leaving the operational areas;
- Wetting the roads: it is carried out with a polymer suitable for roads, a dust suppressor which, due to its effectiveness in controlling particulate matter, increases the wetting interval, preventing the entrainment of particulates with the movement of vehicles and equipment;
- Industrial Cleaning;
- Fire line supply.



GOALS



The goal is to reduce, each year, the consumption of new water from groundwater wells, granted by the state environmental agency, and/or potable water, which comes from the state concessionaire, thus mitigating the environmental impact of port terminal operations.

In addition, the project also aims to:

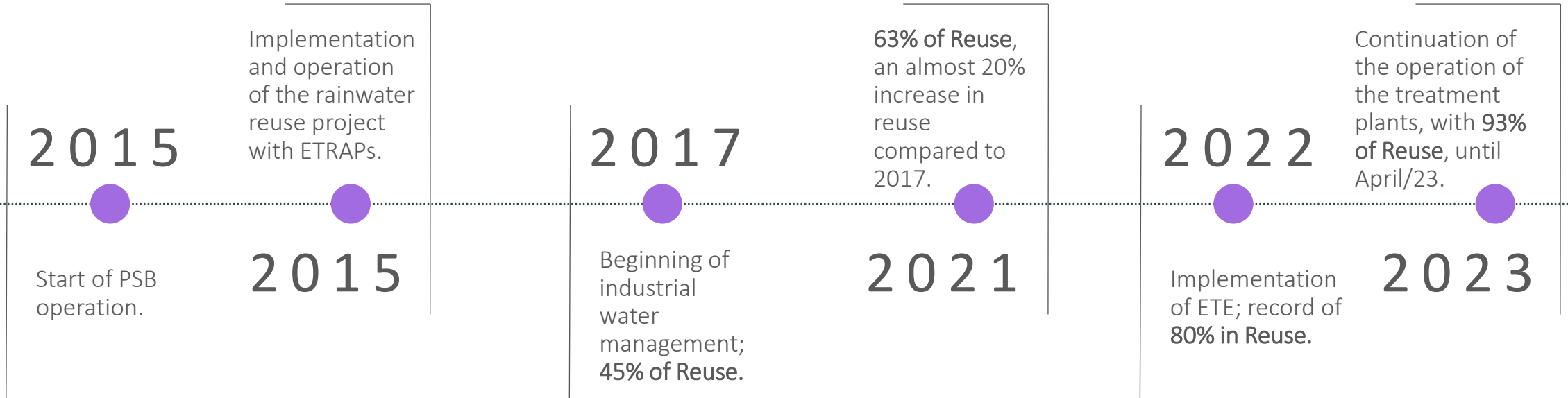
- Follow premises of good environmental management practices recognized worldwide, through practices aimed at preventing pollution and complying with our Sustainable Development Policy;
- Reduce groundwater consumption in industrial activities, through effective environmental management and in partnership with the operation;
- Reusing treated rainwater in operational activities, such as cleaning machines and equipment;
- Reusing treated rainwater to control the emission of particulate matter, through the sprinkler system in the storage yards, car dumpers, conveyor belts and wetting the roads.
- Avoid the release of industrial effluents from the port operation, using them as a resource and not as effluent to be treated and discarded;
- Reinforce our commitment to the UN's 2030 Agenda with the gradual increase in the efficiency of water use in all sectors, evaluating the results and outlining action plans for the continuous improvement of the project, in order to keep our actions aligned with SDG 6, which aims to ensure availability and sustainable management of water and sanitation for all and SDG 12, which aims to ensure sustainable consumption and production patterns.
- Reduce the pressure on the water system in Rio de Janeiro, Brazil and thus leave a greater supply of water for the surrounding community.



TIMELINE



WATER TREATMENT AND REUSE SYSTEM





CURRENT STATUS



Since the implementation of the systems, Porto Sudeste expanded the distribution of the use of industrial water from the ETRAPs for the use in spraying car dumpers and conveyor belts, wetting internal roads, supplying wheel washers and carrying out industrial cleaning of the site, machines and equipment. In March 2022, the results were even more potentiated with the implementation of the Sanitary Effluent Treatment Station (ETE) and its collection and distribution system, which captures all the sanitary effluent generated within the Porto Sudeste facility and uses a biological treatment to make this effluent available for reuse on the industrial water system.

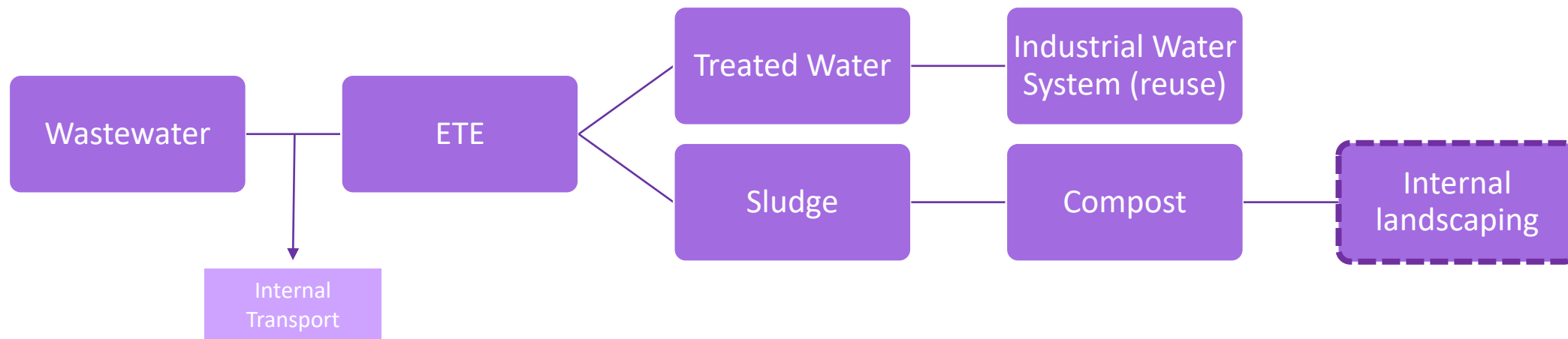
With its own ETE, integrated into the industrial water system, the terminal further reduced the need to use water from wells and maximized the reuse of water/effluent. In addition, the sludge resulting from the biological treatment is transformed into fertilizer, generating input for landscaping projects at Porto Sudeste, adhering to the circular economy strategy. This way, Porto Sudeste has been ensuring the closure of the effluent cycle within the terminal, avoiding disposal in the environment, even if it's treated and within the release standards established by law, and in line with SDG 6, which aims to ensure availability and sustainable management of water and sanitation for all and SDG 12, which aims to ensure sustainable consumption and production patterns.



CURRENT STATUS



New ETE and environment gains



LESS
10
TONS
CO₂
without the wastewater
external transport



REUSE
72 Kg
OF COMPOST GENERATED
PER MONTH

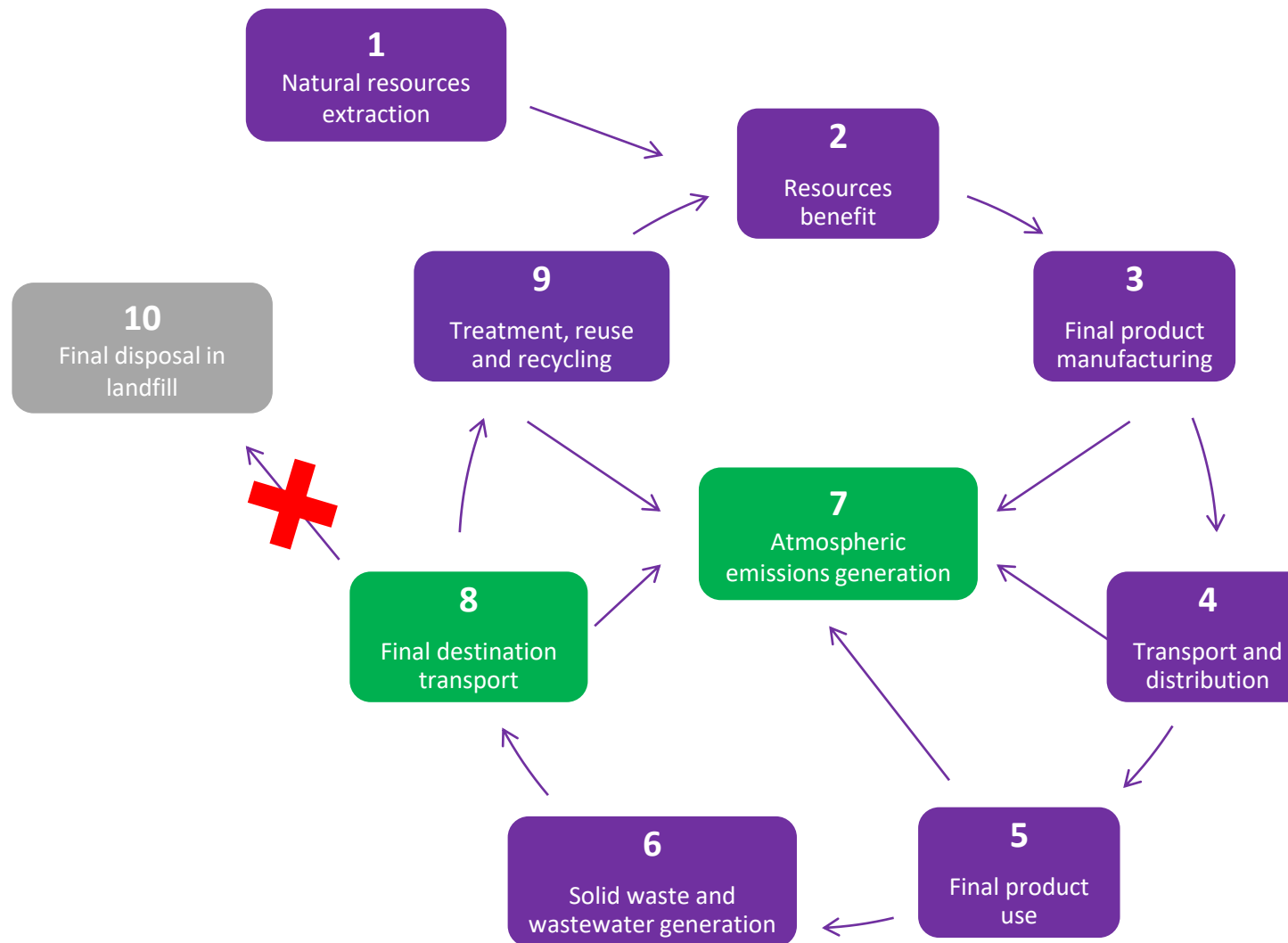


CURRENT STATUS



Life Cycle

- With the new ETE, the sanitary effluent Life Cycle is closed, where we eliminate the generation of waste that is treated and destined (step 10), and we ensure that the treated material is totally reused.
- We also reduced atmospheric emissions (**step 7**) in the stages, especially in step 8.





RESOURCES



For the implementation of the rainwater reuse project during the installation of Porto Sudeste, it is estimated that approximately R\$ 22 million were invested (approximately US\$ 4 million in the current conversion), including in this amount the construction of channels and ETRAP's, in addition to equipment, adaptations and improvements to the rainwater reuse system. Approximately R\$ 500,000.00 (approximately US\$ 100.000) is invested annually in the project's operation.

In 2022, four station operators were directly involved (coming from a specialized and contracted company) a contract inspector and a contract manager. In addition, there are another 80 employees involved indirectly. Of these, 10 are part of the Environment Management sector, responsible for carrying out field inspections and checking the operational area, including the conditions of channels and treatment stations, in addition to the use of industrial water and maintenance of the port's environmental controls. The other 70 employees are from the Industrial Cleaning and Operation sector, responsible for the conscientious use of produced water. That adds up to 80 people directly and indirectly involved in maintaining the water reuse project at the port terminal.



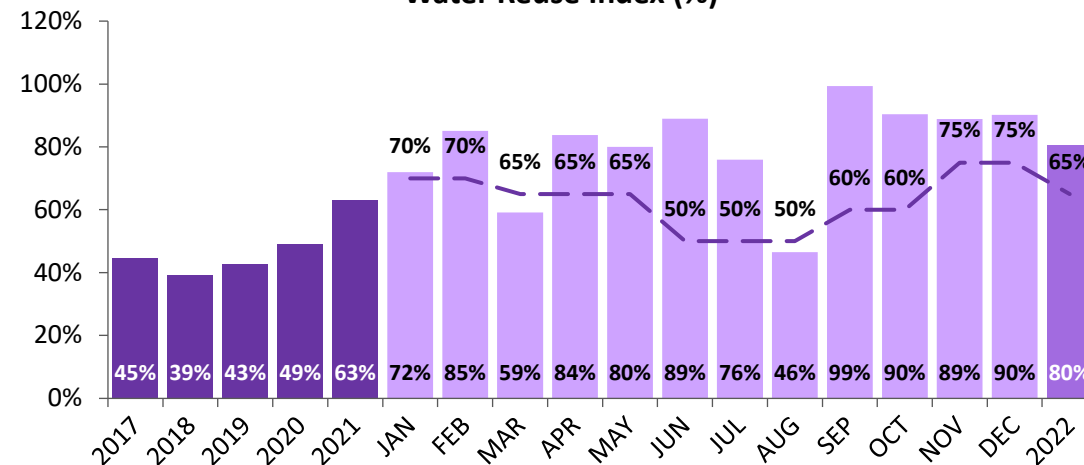
MEASURABLE RESULTS



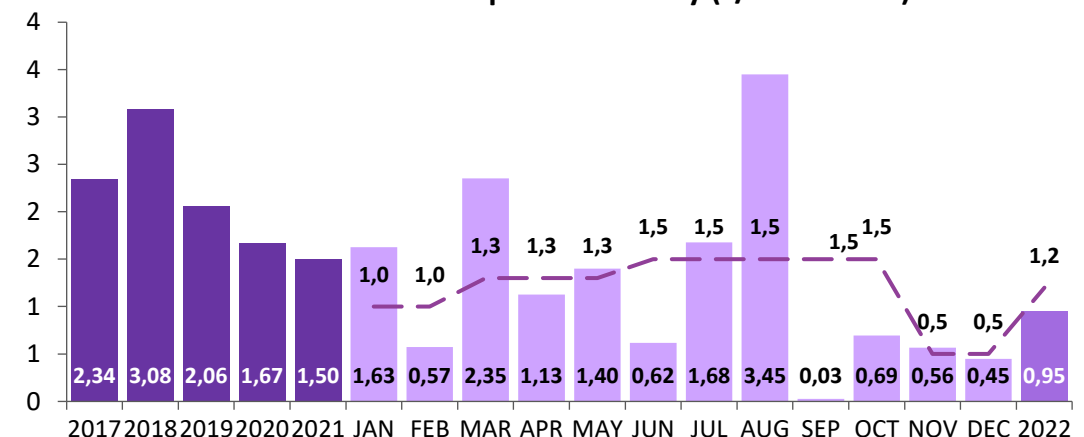
From the beginning of the project in 2017 to the present day, Porto Sudeste has continued to improve the system year after year and has already reached the reuse mark of **521.127.000 liters of water**, enough to fill 178 Olympic swimming pools.

The results show that the established objectives and targets have been achieved. The knowledge acquired over time in the management of water resources, combined with awareness campaigns and training, the search for continuous improvement to maximize reuse and reduce consumption, have generated better results for the reuse rate, which increases considerably year after year, while the consumption of water from the wells has been gradually reduced, making it possible to set increasingly challenging goals.

Water Reuse Index (%)



New Water Consumption Efficiency (L/ton of bulk)



SINCE
2017

521 MI
Liters of Reused
Water



MEASURABLE RESULTS



The results of the implemented efforts in ESG agenda can be seen in the Environmental Indicators' improvement, such as the Water Reuse Index and New Water Consumption Efficiency.

