University Wastewater – Volume Projections Report

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Author note

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Abstract

Nowadays, Antananarivo, the capital of Madagascar is classified among the most polluted city in the world. Apart from air pollution and the wastes that fill the streets, wastewater are also a big part of the problem, especially the ones from the university campus of Antananarivo. This report contains assessment of the volume of wastewater produced daily and annually on Tanà campus with some details and its situation of everyday.

Divers students are living in the campus during their five years of study. That means, current students are using water for their meals, bath, laundry, dishes... Wastewater from those daily routines must be well treated before they get dumped. Today, infrastructures in the university campus are old, do not work as well as expected so that ARAFA made a study about the maintenance of water network and an efficient wastewater treatment system. Emergency repair work and some wastewater treatment through lagoons are mentioned in the document.

Nonetheless, a global analysis explored the extent of the amount of wastewater that could be produced and filtrated per day, with such benefits for the campus, economy and environmental protection.

Through a synthesis of that research exertion, this paper comments the solutions suggested by working on the daily volume of wastewater and evaluating where it goes. These points extend beyond wastewater treatment efficiency for a more wonderful way of environment protecting.

Keywords: wastewater, treatment, volume

Introduction

As universities strive for sustainability, wastewater management emerges as a critical aspect of campus operations. With diverse sources ranging from laboratories to dormitories, opportunities for treatment. Implementing advanced solutions and the wastewater generated presents unique challenges and innovative strategies, this project aims to minimize their environmental footprint while ensuring compliance with regulatory standards. To achieve this, an initial step involves assessing the volume of wastewater generated daily, mapping where it goes and evaluating if the solutions suggested by ARFA is accurate. Furthermore, understanding the current wastewater management practices, whether through onsite treatment facilities, municipal systems, or other means, provides insights into areas for improvement and optimization. Let's explore the tailored solutions and sustainable practices employed in treating wastewater from the diverse ecosystem university campus of Antananarivo.

Independent assessment of the volume of wastewater produced daily and annually on Tanà campus

Every year, 35 000 students frequent Ankatso University of Antananarivo including bachelors. It is to highlight that not all them are living in the campus because most of them reside in town and around the university. Those who come from province are those who really hold the campus and they are around 5 000 students per year.

Those who do not live in the campus just use water for laboratories and toilets but those in the campus use water for their cooking, bath, laundry and dishes, that generate a large amount of wastewater produced per day.

Let us put an average quantity of used water for those who do not live in the campus and for those who do.

- Students who do not leave in the campus: around 30 000 students just frequent university for studying. They do not really use water apart from going to the toilets and some of them use water during their experiments in the laboratory.

If all 200 students use toilets in one day, with 0,75 L of water and around 20 students use water in laboratory with 2L of water per day:

(0,5*200) + (2*20) = 140 L per day

- Students who live in the campus: around 5 000 students are staying in the campus to live during their five years of study.

Their daily use of water can be divided in 4 parts: meal, bath, dishes and laundry that is not that very frequent as the three main uses. If we put 0,5 L for meal, 1 L for dishes and 0,5 L for bath:

(0,5*5000) + (1*5000) + (0,5*5000) = 10 000 L per day

In addition, they can make their laundry sometimes so if they make it once a week with 35 L per week, it gives:

35/7 = 5 L per day

There is also a fact that teachers and employees of the university use water during their days at the campus. Around 2 000 teachers and employees frequent the university every day. If all of them use 0,25 L per day:

0,25*2000 = 500 L per day

After summing all this, we get:

140 + 10 000 + 5 + 500 = 10 645 or 10,645 m3 per day

A very larger flow rate compared to the ARAFA report that gives 6 m3 per day.

To sum up, the amount of water produced every year in the campus is:

10,645 * 365 = 3885,425 m3 per year

Where does the water go today?

Five principal exhaust nozzles of wastewater in Ankatso University,

- One in the field of agronomy department
- Two next to the football field of Ankatso University
- One at the east of 119
- One at the east CONACO Médecine

Wastewater that get out from the exhaust nozzle in the field of agronomy department

The wastewater from all laboratories situated on the hill, including Chemistry, Geology, BEC/ADD, BA/ECES, and Pharmacology, is channeled into a common system along with the wastewater from the PPC laboratory, as well as those from the Biochemistry

department and the Department of Plant Biology in Building I. Similarly, wastewater from facilities such as the FLSH department (restrooms, refreshment area) and all the offices of the presidency, including toilet wastewater, is also directed into this system, ultimately flowing towards the Agronomy field.

Wastewater that get out from the exhaust nozzls next to the football field of Ankatso University

The wastewater from the Physics, Chemical Thermodynamics, and restroom facilities in Building R is channeled through PVC pipes and converges into a common junction with the two laboratories in Buildings Q (Chemistry Laboratory, Environmental Chemistry Laboratory). Similarly, wastewater from the 28 laboratories, restrooms, and cafeteria in departments P and O is directed into another junction, linking back to the aforementioned laboratories and restrooms.
The wastewater from the hill laboratories and PPC is bifurcated: one stream heads towards the Agronomy field, while the others merge into a junction with wastewater from laboratories in Buildings P, O, and I, subsequently flowing towards two outlets.

Wastewater from the surroundings of the gymnasium, DEGS Cathedral, Medicine, and the Baccalaureate Office is interconnected, funneling towards two outlets situated on the Ankatso football field.

Wastewater that get out from the east of the bus stop 119:

The wastewater originating from the laboratories and restroom facilities at the Madagascar Institute for Vaccine Research, along with those from the medical-social service, are directed towards a drainage system. From there, they continue their flow towards a drainage outlet situated east of bus stop 119. Additionally, wastewater from Buildings A and B of the DEGS faculties is combined with wastewater from the building west of the DEGS parking lot. Subsequently, this amalgamated wastewater flows towards the same drainage outlet located east of bus stop 119.

Wastewater that get out from the exhaust nozzle at the east of CONACO Medecine

WASTEWATER TREATMENT

The wastewater generated by the Water Engineering, Environmental Engineering, and Geology laboratories is directed through two drainage systems, both linked to a central manhole. This manhole serves as a junction point for all wastewater from the Polytechnic Higher School of Antananarivo's laboratories, as well as wastewater from nearby buildings and the Conaco facility near Stichom. Subsequently, this collective wastewater is conveyed through pipelines and discharged eastward of the Medicine Conaco.

Does the ARAFA solution address the larger water challenges of the university?

Through this report, the ARAFA solution addresses partly the larger water challenges of the university because the amount of water produced every day is 10,645 m3 per day. So that the wastewater treatment system could be larger than ARAFA suggested in their report.

Anyway, the methods that ARAFA have suggested is efficient because they have studied all about the steps of treatment necessary and the rehabilitation of the infrastructures as well.

All the parameters that need to be verified were done such as COD or Chemical Oxygen Demand, BOD5 or Biochemical Oxygen Demand, suspended solids, volatile suspended solids, and organic matter. And we can see that wastewater from the University Campus is still easy to treat because, most of the parameters are under the standards effluent discharge.

The materials and the design suggested are also efficient because it shows innovation for the system.

To conclude, the ARAFA report is a good document to start a wastewater treatment for the Campus of Ankatso University, but it is also possible to think about extending the sizing of the design already suggested.

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