



UNIVERSITY OF ANTANANARIVO
FACULTY OF SCIENCES
WATER-ENVIRONMENT ENGINEERING



JACQUELYN JESTINE SANDERS FOUNDATION

FELLOWSHIP 3A:

RAINWATER COLLECTION AND STORAGE

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INTRODUCTION :

In Madagasikara, during the stormy season and the rainy season ; the rainwater submerges certain surfaces. However,they are underexploited , thus creating problematic factors at the societal level,especially in the University site.

Can we exploit rainwater to reduce the water shortages in the campus ? we can store them followed by various processes (capture, filtration,) before using it . To be able to satisfy the needs of the university from ANTANANARIVO, the tanks can be introduced inside the site to store rainwater which can be used in most cases as source of water use laboratory,elements which all need water . It will therefore be a question in this research as an essentially technical object and more generally, our ambition is to contribute to awareness of the important of treatment and to the management especially of rainwater at the end in a holistic and integrated manner in thinking about water and sanitation.We need to have the information for the tanks which exist on the site of University.

AREAS OF SUBJECT

I. SOME DEFINITION :

THE IMPLUVIUM is a rainwater collection system made up of a surface, gutters, pipes circulating rainwater to the tank, and a storage tank. (1)

STORAGE TANK is a equipment of various volumes and different shapes to store water to be consumed or used. (2)

II. RAINWTER BACKGROUND :

The rainwater that is going to be stored must first be intercepted on a surface called IMPLUVIUM which can be judged according to two criteria : healthiness and the coefficient of runoff. The protection of impluvium must therefore be a primary concern , including the installation of a fence,to prevent the approach of animals and the passage of people is essential. It will have a twist slope of 10%

The quality of the atmosphere through which rainwater passes must be considered depending on the context project location. Indeed ,before even arriving on a roof surface, rainwater presents an acidic character and may contain traces of pesticides, hydrocarbons, organisms pathogens, or certain heavy metals. (3)

Local rainfall and weather conditions can also cause strong variations in the quality of collected rainwater depending on the intensity and frequency of rain. Thus ,a regime of heavy precipitation with alternation of long periods of dry weather will cause great variation in rainwater quality recovered.

In a rainwater harvesting system which consists of a collection system (the roof), recovery (gutters and pipes) and storage(tank). (4)

The quality of rainwater runoff downstream from roofs varies greatly . She depends on both from the receiving environment, roof materials,design and nature recovery system,tank materials, and storage conditions. (4)

THE STORAGE TANKS ONSITE-QUALITATIVE LOGISTICAL ANALYSIS :

Location of storage tanks near a heat source (solar exposure ,proximity to the boiler room system,...)should be avoided,because it is likely to promote the development of microorganisms . Polyvinyl chloride recovery tanks (PVC) or high density polyethylene (HDPE) must be analyzed for the rainwater recovery,inert concerning water, subject to atmospheric pressure. (5)

Currently, at the UNIVERSITY OF ANTANANARIVO, different tanks are installed near buildings, some are placed in the garden and they are powered by JIRAMA industry (JIro sy RAno MAlagasy).



FIGURE 1 : Three tanks near the science department

They can stored 50 000 liters of water. Before we use dit for cleaning the toilets and now, the are no longer functional.

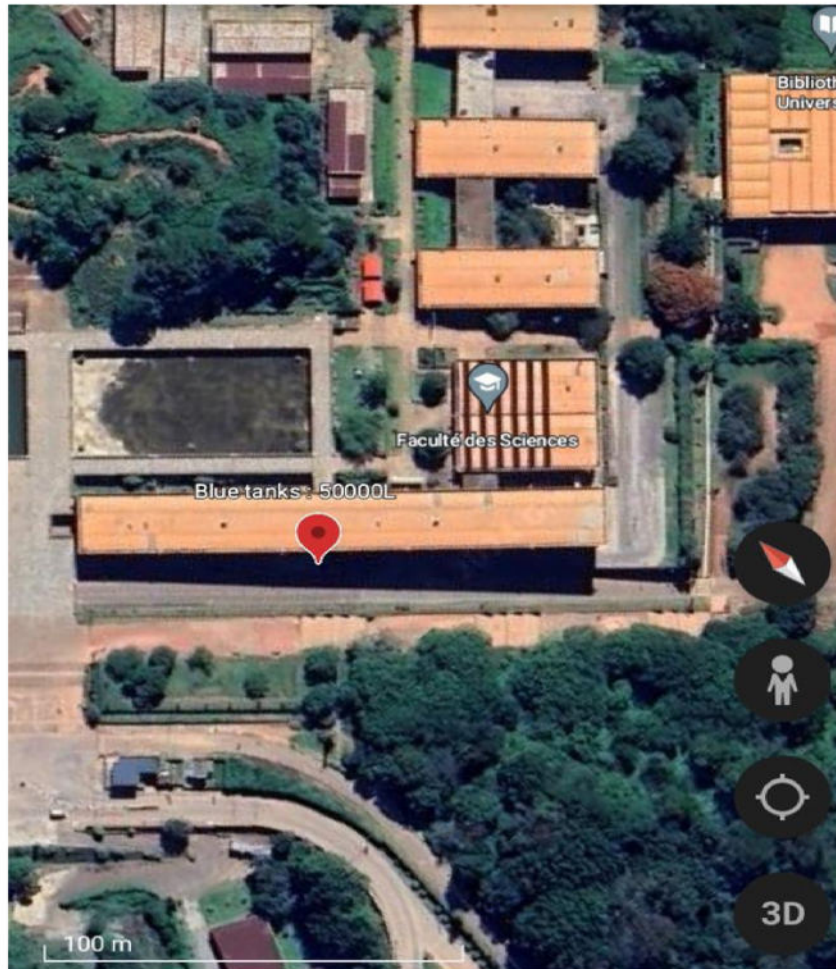


FIGURE 2 : MAP of the University of Antananarivo « the science departement » which exist the three tanks



FIGURE 3 : Tank in the garden of the economic department

According to the information, this tank can store 10 000 liters of water and it is powered with the water from IKOPA by a local company. The latter is transported by trucks.

The stored water is pumped in order to water the gardens, the flowers and even to minimize JIRAMA water.

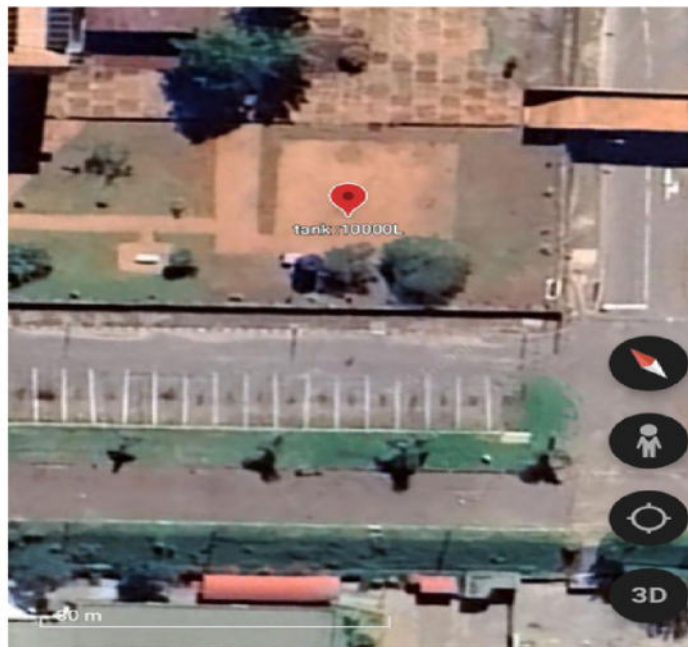


FIGURE 4 : MAP of the University of Antananarivo : « the garden of economics department » which exist an tanks



FIGURE 5 : An areal blue tank and the horizontal tank in the building of the « Madagascar Institute for Vaccine »

An aerial blue tank of 3000Liters located near the research of vaccine building, also have a horizontal tank for 3500 litres. There is a solar panel to provide energy and to pump the water stored in the horizontal tank to the overhead tank.

The water store is using for watering too the little garden and for cleaning equipment.

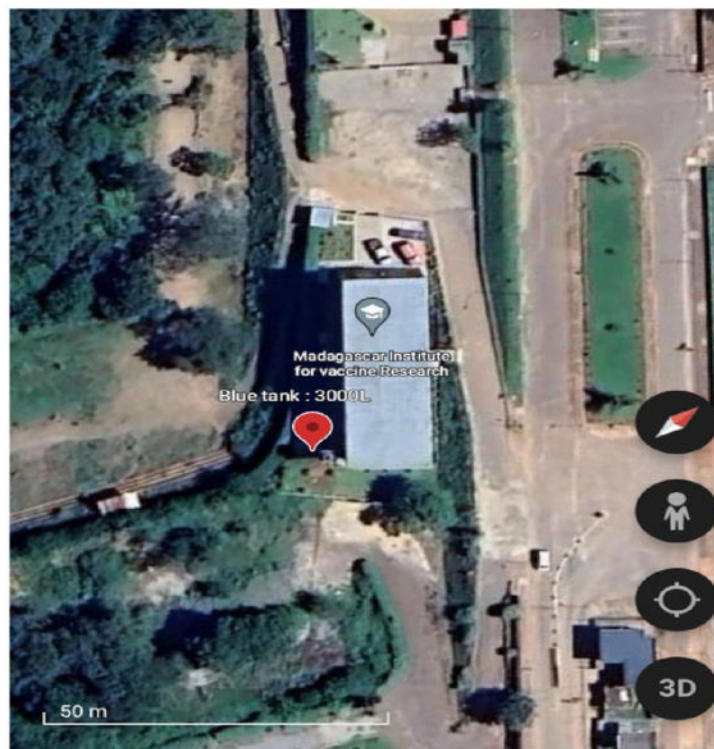


FIGURE 6 : MAP of the University of Antananarivo : « the building of the Madagascar Institute for Vaccine » which exist theirs tanks

Near from the DEGS Faculty, an underground cistern made manually by digging 3 successive cubes linked to each other by a pipe with a volume of 8 meter³, this storage can help the tanks in the garden with rainwater.



FIGURE 7 cistern underground « near of the economics department »

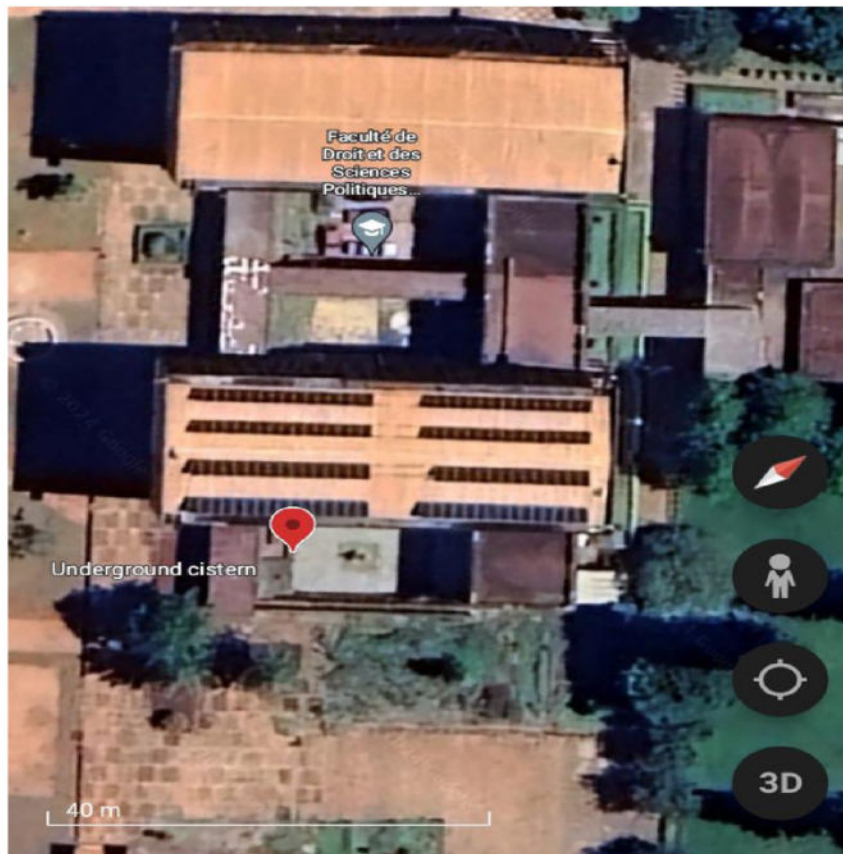


FIGURE 8 MAP of the University of Antananarivo : « near of the economics department » which exist an underground cistern



FIGURE 8 : An tank near the swimming pool with the volumes : 5000liters

This tanks is needed for storage the water to wash the toilet near the swimming pool and it is too powered by JIRAMA

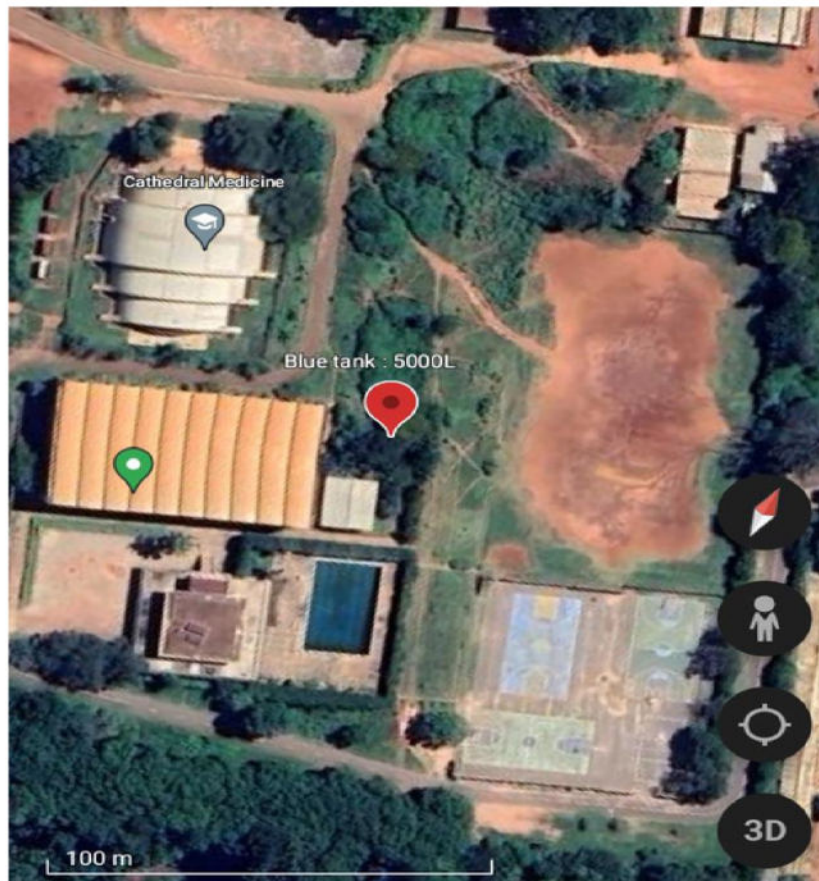


FIGURE 9 : MAP of the University of Antananarivo : « near of the swimming pool » which exist a blue tank



FIGURE 10 : An tank above « the AMPHI building »with the volumes : 2500liters

This tank of 2500L is used for the buildings « AMPHI and the BIG AMPHI » in the toilets and it help too the underground storage to store the water for the department.JIRAMA powered this tanks.

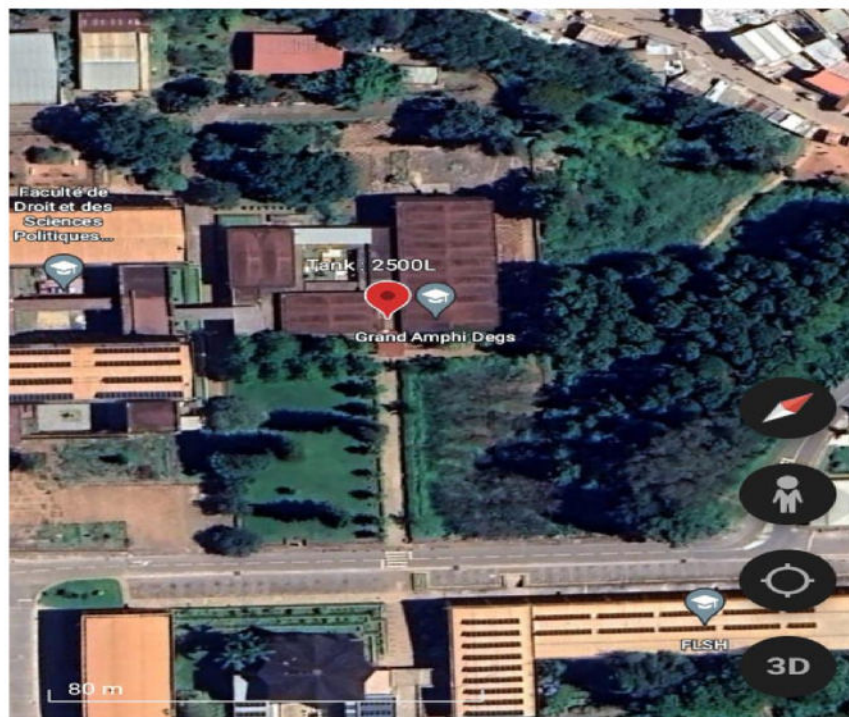


FIGURE 12 : MAP of the University of Antananarivo : « AMPHI DEGS » which exist a blue tank



FIGURE 10: MAP of the University of Antananarivo : An tank in « the presidency building »with the volumes : 15000liters
The storage at the presidency has a capacity of 15000liters and supplies water to several faculty.

It is price vary depending on the storage volumes,for 10m³ or 10 000 liters, they cost **12 588 000Ariary or 62 942 000Francs** and for volumes of 7,5m³ therefore **9 840 000Ariary or 49 200 000Francs**. Indeed, cistern for 3000liters cost **7 248 000Ariary 36 240 000Francs** and **8 028 000 Ariary or 40 140 000 Francs** for the volumes of HORIZONTAL containers. (6) Considering the diameters of the lids , we can enter the tanks. Furthermore we can clean these tanks on the outside but it is a bit difficult on the inside.(6)

CONCLUSION :

On the ANTANANARIVO university, there is an underground storage near the economics department with the volumes :24000liters and in its garden, a tank of 10000liters ;In the building of Madagascar institute of vaccine ,there is 3000liters an 3500liters.It exist 3 large tanks of 50000liters near the science department .An tanks in the presidency building with 15000liters. There is too an tanks near the swimming pool with 5000liters of volumes and above the AMPHI building, a blue tank of 2500liters. The total volume of existing tanks on the university site is 213000liters .

REFERENCES:

- (1)Rédaction : « Fiche technique de CREPA » -page 1
- (2)<http://www.tubao.fr/reservoir-stockage-eau-potable-pehd-weholite>
- (3)Article in Techniques Sciences Methods : January 2015-page 22
- (4)NCDE Stormwater Design Manual-C7. credit for rainwater harvesting systems
- (5)<http://www.fontaine-ingenerie.fr> « Fontaine Ingenerie-optimiser la récupération des eaux de pluie »
- (6)<http://www.makiplast.mg>