

# Lack of Sanitation: Algae Ponds for Wastewater Treatment in Remote and Rural Areas

Civil Engineering Students:

- Bruno Ibarra
- Ramiro Acosta

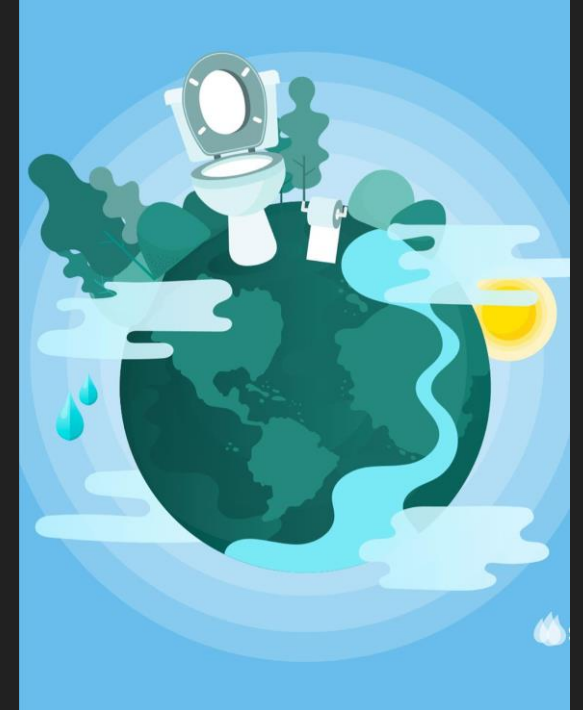
**This work is an EFL student project. The pictures in this presentation are only used for educational purposes. If there is a copyright conflict, they will be immediately removed.**



**UNIVERSIDAD TECNOLÓGICA NACIONAL FACULTAD  
REGIONAL PARANÁ**

# The Importance of Sanitation

- HEALTH
- SANITATION DEVELOPMENT
- ENVIRONMENT



# 6 CLEAN WATER AND SANITATION



Ensure availability and sustainable management of water and sanitation for all

## TARGET 6.2

“By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situation”.



## II. Analysis of the Causes and Consequences of the Lack of Sanitation in Rural Areas

- ❖ The sanitation problem in numbers
- ❖ Causes of sanitation issues
- ❖ Consequences

## III. Algae Ponds for Rural Domestic Sewage Treatment

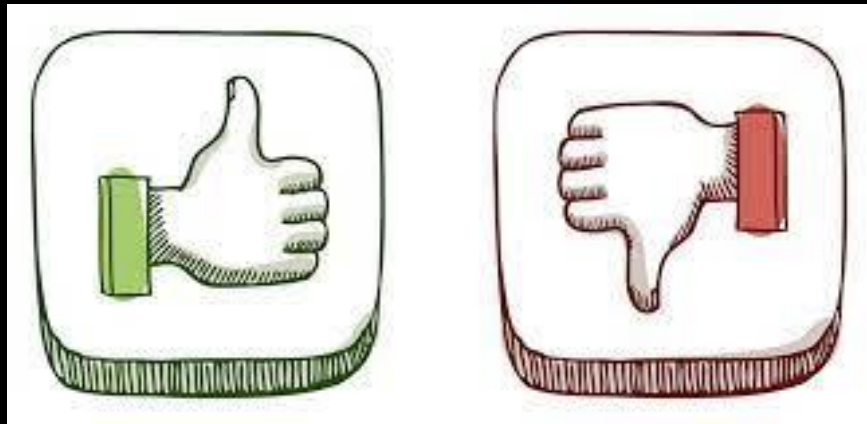
- ❖ Description
- ❖ Components
- ❖ Installation
- ❖ Use of Water

## IV. Feasibility Analysis of an Algae Pond: Advantages and Disadvantages

- ❖ Advantages
- ❖ Disadvantages

## Impact of this Work

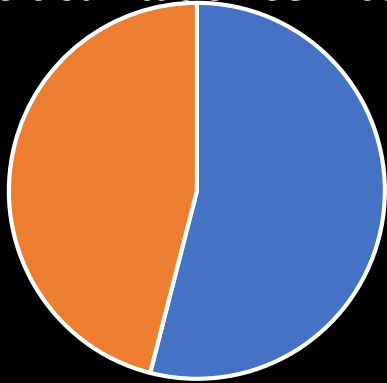
It is expected that this paper may promote the implementation of alternative and sustainable methods for wastewater treatment.



Understand the advantages and disadvantages of this solution.

# Sanitation Problem in Numbers

- ❖ More than 1.7 billion people still do not have access to basic sanitation services.



■ used a safely managed sanitation facility ■ rest facility

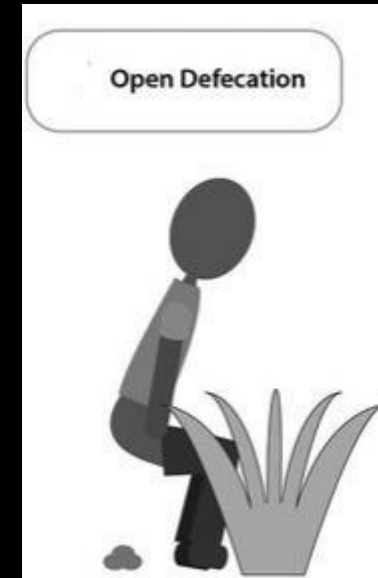
- ❖ Six million people do not have adequate sanitation facilities.

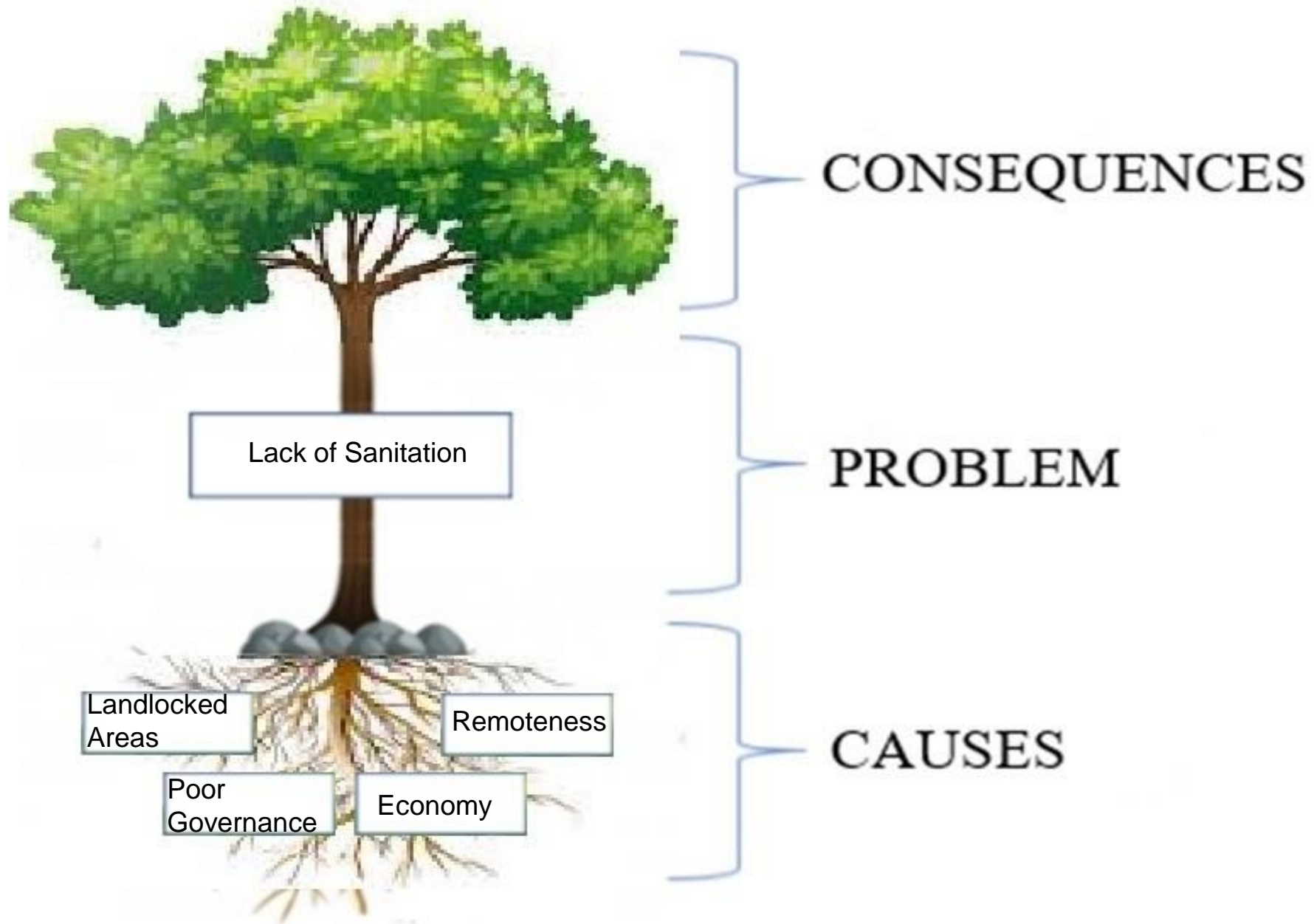


- ❖ 829,000 people die from diseases directly attributable to unsafe water.



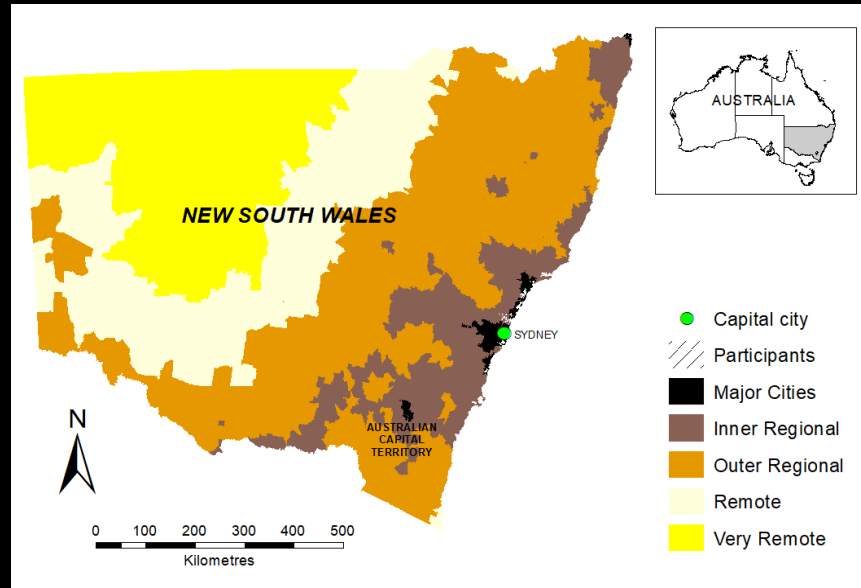
- ❖ In rural areas, 91 percent of the people defecate outdoors.





# Causes of Sanitation Issues

## ❖ Remoteness



## ❖ Landlocked Areas



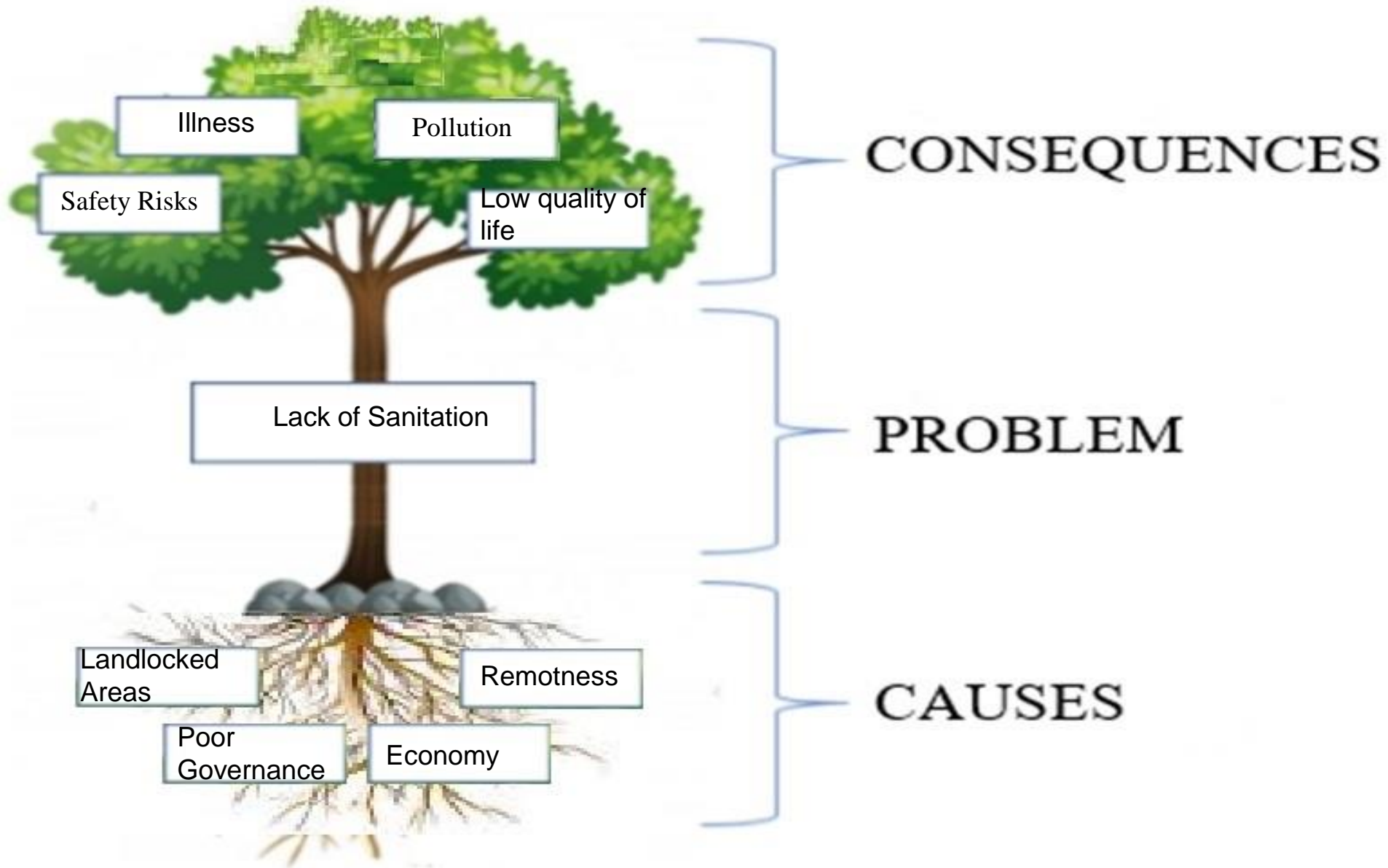
## ❖ Poor Governance



## ❖ Poor Economy







# Consequences

## ❖ Illness



## ❖ Low quality of life



## ❖ Pollution



## ❖ Safety risks



### **SAFETY RISKS**

Collecting water entails some risks: coming across snakes and other wildlife, as well as experiencing harassment and assault. Thus the risk of accidents and harm increases.

# Algae Ponds: Description





# Algae Ponds: Components

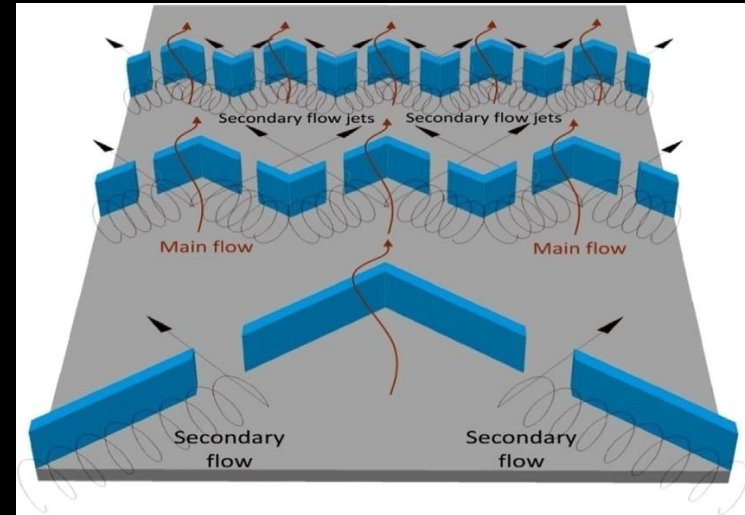
## ❖ Shells



## ❖ Light-emitting diode (LED) plant growth lamps



## ❖ Flow baffles

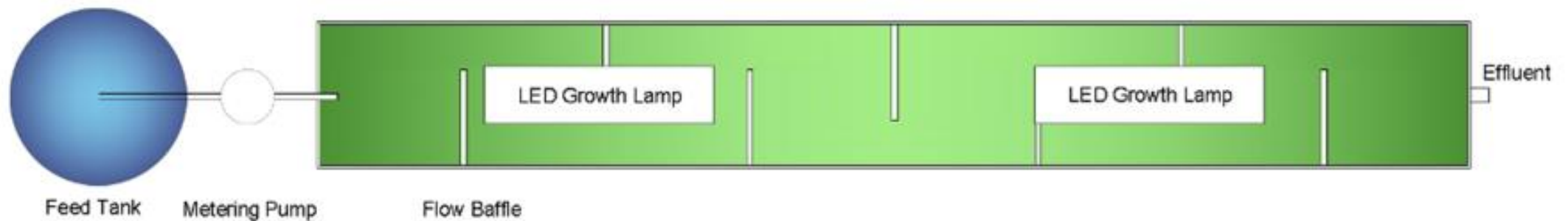
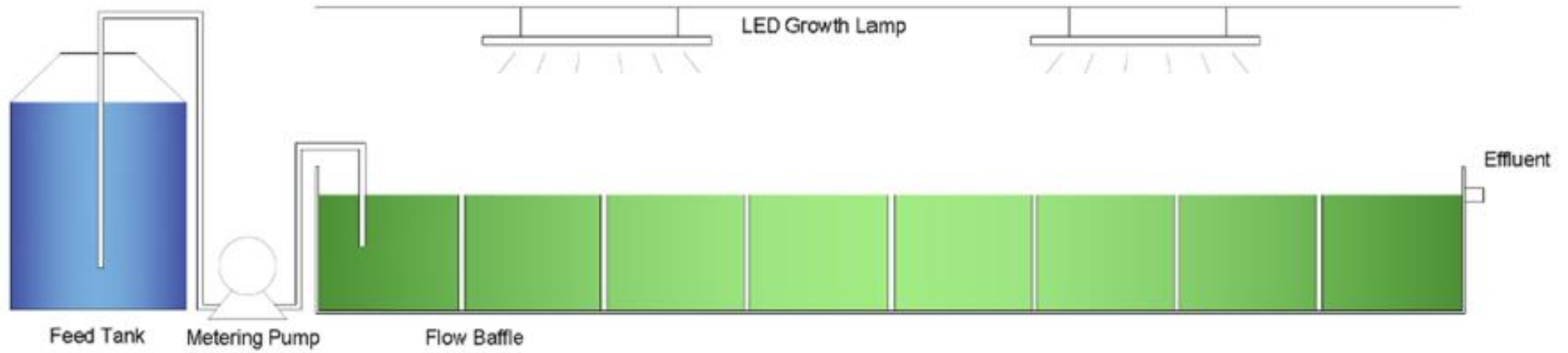


## ❖ Outlet pipes





# Algae Ponds: Installation



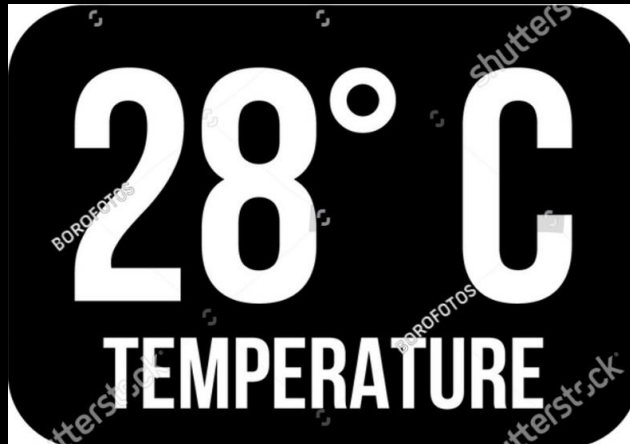
# Algae Ponds: Use of Water

An aerial photograph of a vast algae pond facility. The facility consists of numerous long, parallel rows of shallow water channels, each filled with vibrant green algae. The rows are separated by narrow, raised earthen paths. The perspective is from a high angle, looking down the length of the rows, which recede into the distance. In the background, a line of trees and a range of hazy mountains are visible under a clear sky.



# Advantages

High Temperatures



28 degrees maximum

Short Pipe Extension

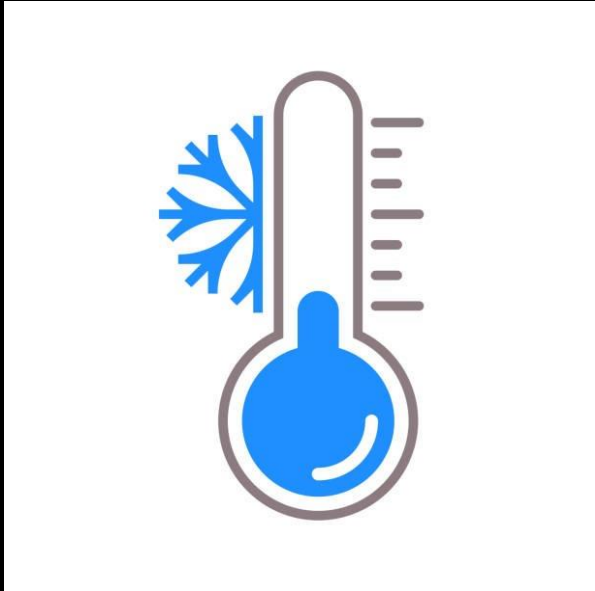


Zero Water Wastage



# Disadvantages

## Low Temperatures



## Daylight (low light)



At night or areas with low daylight density

## Contextual Characteristics





# Conclusion

## Algae ponds

- ❖ Are a good option for some rural and remotes areas.
- ❖ Water in agriculture Algae pond are will be used for wastewater treatment so that the premises can have better sanitation conditions.
- ❖ Reuse the wastewater in agricultural activities.

# References

1. United Nations “The 2030 Agenda and the Sustainable Development Goals”, UN, New York, United States 2018. Accessed: 5 June 2023. [Online]. Available: <https://acrobat.adobe.com/id/urn:aaid:sc:US:dafe18f1-fb84-4c32-a974-8dcb32d9525e>
2. World Health Organization, “Water for human consumption” Report 2022, Ginebra, Suiza. <https://www.who.int/news-room/fact-sheets/detail/drinking-water> (accessed Jun. 5, 2023)
3. World Health Organization, “Sanitation Report 2023”, Ginebra, Suiza. 2023. Accessed: Jun. 15, 2023. [Online]. Available: <https://www.who.int/es/news-room/fact-sheets/detail/sanitation>
4. Multimedia Posibl, “Argentina: More than 6 million people do not have adequate sanitary facilities”. <https://www.posibl.com/es/news/pobreza/argentina-mas-de-6-millones-de-personas-no-cuentan-con-instalaciones-sanitarias-adecuadas-223e5f41> (accessed Jun. 15, 2023).
5. The World Bank, “Equitable and Sustainable Rural Sanitation at Scale”, Report October 7, 2019, Washington DC United State. <https://www.worldbank.org/en/news/feature/2019/10/07/rural-sanitation-matters> (accessed Jun. 15, 2023)
6. United Nation, “SDG#6”, Report 2020, New York, United States. <https://unstats.un.org/sdgs/report/2022/goal-06/> (accessed Jun. 15, 2023)
7. Ministerio de obras publicas, “Access to Water, Sanitation and Hygiene Programme in dispersed rural areas”, report 2022, Argentina. <https://www.argentina.gob.ar/obras-publicas/agua-potable-y-saneamiento/programa-de-acceso-al-agua-el-saneamiento-y-la-higiene-en> (accessed Jul. 12, 2023)
8. National Geographic, “Water Inequality”, Report 2023, United State. <https://education.nationalgeographic.org/resource/water-inequality/> (accessed Jul. 13, 2023)
9. UNICEF “Accountability in wash explaining the concept”, UNICEF New York, United State 2015. Accessed: 13, Jul 2023. [Online]. Available: <https://www.unicef.org/media/91311/file/Accountability-in-WASH-Explaining-the-Concept.pdf>
10. E. Perard, “Economic and financial aspects of the sanitation challenge: A practitioner approach”, ScienceDirect.com, June 2018. <https://www.sciencedirect.com/science/article/abs/pii/S0957178718301073> (accessed Jul. 13, 2023)
11. Newspaper Elentrierios, “Master pipe repaired and water service could suffer”. <https://www.elentrierios.com/actualidad/reparan-caao-maestro-y-podraa-resentirse-el-servicio-de-agua.htm> (accessed Sep. 11, 2023)
12. SIWI, “Water governance”. <https://siwi.org/why-water/water-governance/> (accessed Oct. 5, 2023)
13. Y. Mao, H. Tan, K. Wang, Y. Zhang, Z. Jin, M. Zhao, Y. Li, X. Zheng, “Enhancement of algae ponds for rural domestic sewage treatment by prolonging daylight using artificial lamps”, ElSevier 2021. Accessed: 25, Sep 2023. [Online]. Available: <https://acrobat.adobe.com/id/urn:aaid:sc:US:54a274a1-7144-4f68-bd03-f72dbcaa6a83>
14. Y.N. Kumar, S. Poong, C. Gachon, J. Brodie, A. Sade, P. Lim, “Impact of elevated temperature on the physiological and biochemical responses of *Kappaphycus alvarezii* (Rhodophyta)”, 2020. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7489555/#:~:text=In%20general%2C%20the%20growth%20and,above%20the%20optimum%20%5B33%5D> (accessed Sep. 25, 2023)
15. UNICEF, “Triple Threat”, UNICEF, New York, United State 2023. Accessed: 3 Nov 202. [Online]. Available: <https://www.unicef.org/media/137206/file/triple-threat-wash-EN.pdf>
16. Splash Supply Company, “How to Control Winter Pond Algae” <https://splashsupplyco.com/how-to-control-winter-pond-algae/#:~:text=Pond%20algae%20usually%20has%20a,needs%20from%20reaching%20the%20pond.> (accessed Oct. 5, 2023).

# Lack of Sanitation: Algae Ponds for Wastewater Treatment in Remote and Rural Areas

Civil Engineering Students:

- Bruno Ibarra
- Ramiro Acosta

**This work is an EFL student project. The pictures in this presentation are only used for educational purposes. If there is a copyright conflict, they will be immediately removed.**



**UNIVERSIDAD TECNOLÓGICA NACIONAL FACULTAD  
REGIONAL PARANÁ**