



Low-cost alternative water treatment for removal of PPCPs in Lagos wastewater, Nigeria



Lekan Abudu¹, David Adeyemi¹, Temilola Oluseyi², Luqman Adams², Heather Coleman³, Svetlana Tretsiakova-McNally⁴, Joerg Arnscheidt⁵

Affiliations: 1. Department of Pharmaceutical Chemistry, Faculty of Pharmacy, University of Lagos, Nigeria 2. Department of Chemistry, Faculty of Science, University of Lagos, Nigeria 3. School of Pharmacy and Pharmaceutical Science, Ulster University, UK 4. Belfast School of Architecture and the Built Environment, Ulster University, UK 5. School of Geography and Environmental Sciences, Ulster University, UK

Corresponding email: o9o8o4oo4@live.unilag.edu.ng

1. BACKGROUND

- Pharmaceuticals and personal care products (PPCPs) are emerging contaminants of concern (CEC) that have posed a lot of threats to human health and the environment.
- Sources in water bodies are WWTP effluents, untreated sewage and runoff from agricultural farms.
- Lagos, a highly populated city in Nigeria is faced with the challenges of PPCPs in the waterbodies and only limited studies have been carried out on their removal in the waterbodies¹.
- This study reports the potential use of cellulose pulp derived from saw dust for the removal of PPCPs in the wastewater.
- Saw dust is a commonly available agricultural waste in Lagos, Nigeria, and it consists of mainly three types of carbon-based polymers



Figure 1 : Heap of saw dust at oko baba area, lagos, nigeria

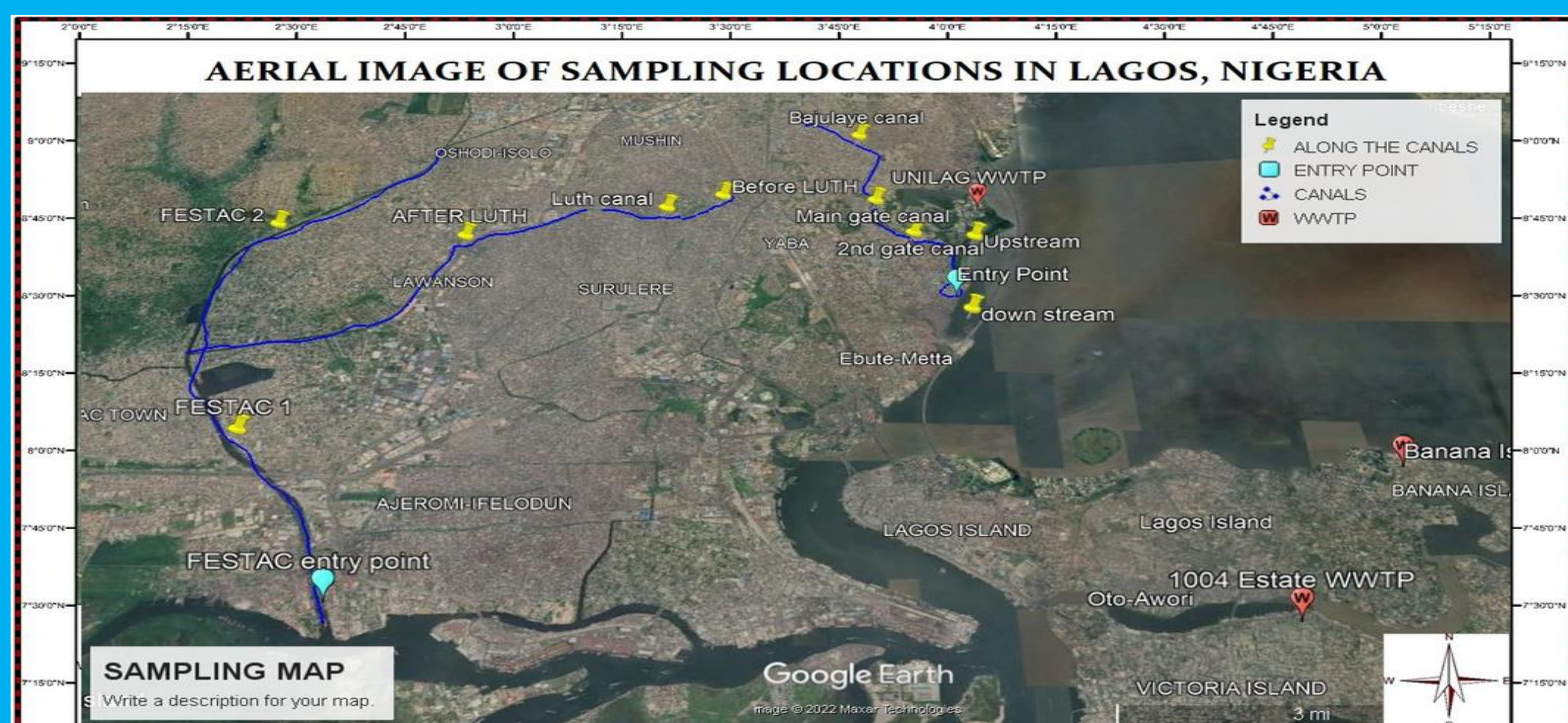


Figure 2 : Aerial image of Sampling Locations in Lagos, Nigera

2. AIM AND OBJECTIVES

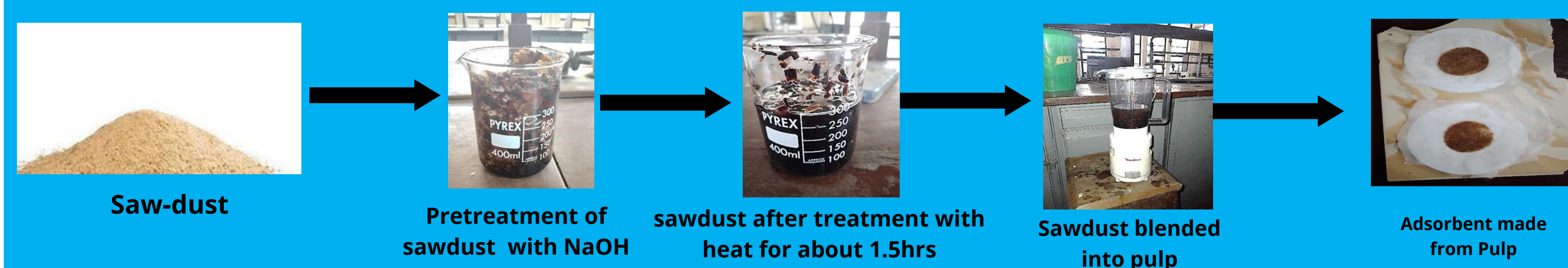
The aim of this study is to determine the fate and removal of PPCPs in the waste water samples from drainages, canals, WWTP and the Lagos lagoon, Nigeria.

The objective of this current study include:

- Characterize wastewater for specific PPCPs in some effluent of the wastewater treatment plants and hotspots/canals in the Lagos, Nigeria
- Synthesize and characterise low-cost adsorbents from saw dust obtained from different species of wood and agricultural wastes from plant materials.
- Run adsorption experiments to optimize the removal efficiency of PPCPs using the adsorbent as a low-cost alternative water treatment

3. METHODOLOGY

- The sample collection points are spread across the socioeconomic spectrum in Lagos as shown in Figure 2
- Quantify the levels of PPCPs in wastewater samples and the Lagos lagoon water using SPE and LCMS
- Sawdust is converted into cellulosic pulp by alkaline delignification, Cellulosic pulp is moulded into a film-like shape after the addition of the binders^{2,3}.
- Use of XRD, SEM, EDX, FTIR, and UV-vis to characterise the adsorbent materials
- Different adsorbents are varied to test the removal efficiency of PPCPs in wastewater samples
- Effect of varied temperature, pH, mass of adsorbent, and contact time will all be determined during the batch study.



4. EXPECTED OUTCOMES

- Generate a baseline data of selected PPCPs in the wastewater samples and the Lagos lagoon water.
- Data of the concentrations of PPCPs obtained from the different sampling points will reveal the levels of their consumption across the different socioeconomic areas of Lagos
- Produce an effective, low-cost adsorbent with a good absorptivity property that will remove specific PPCPs from wastewater.
- Explore the reusability of the produced adsorbent materials using different types of binders.

5. CONCLUSION

- The success of this work will provide answers for the effective removal of Pharmaceuticals and personal care products in wastewater and surface water across the city of Lagos.
- The use of low cost agricultural waste as a cheap alternative method for the removal of PPCPs will solve the problem of waste disposal in the city

6. REFERENCES

- Ebele, A.J., Abdallah M.A.E. and Harrad S., 2017. Pharmaceuticals and personal care products (PPCPs) in the freshwater aquatic environment. *Emerging Contaminants*. 3 (1), 1-16.
- Yahya, M., Lee, H. V., Zain, S. K., and Abd Hamid, S. B. 2015. Chemical conversion of palm-based lignocellulosic biomass to nano-cellulose. *Polymers Research Journal*, 9(4), 385.
- Benyoucef, S., Harrache, D., Djaroud, S., Sail, K., Gallart-Mateu, D., & de la Guardia, M. (2020). Preparation and characterization of novel microstructure cellulosic sawdust material: application as potential adsorbent for wastewater treatment. *Cellulose*, 27(14), 8169-8180