A Innovative Single Use-Plastic Collector System for Use in Open Channels and Drains in Sub-Urban and Urban Areas in Kenya: A Case Study of Nairobi

Limbani, Priti (School: Shree Cutchi Leva Patel Samaj School)
Patel, Adeeti (School: Shree Cutchi Leva Patel Samaj School)
Afonso, Manel (School: Shree Cutchi Leva Patel Samaj School)

There is an urgent need for an awareness campaign to educate the public on the hazards of haphazard littering in urban centers, especially with plastic bottles and papers, these products are not biodegradable and have a major impact on the drainage. (Agency, 2018) Most of the drainage systems have been blocked by waste meaning that the waste is not disposed of well and ends up clogging the systems that have been made to ensure the smooth flow of water. (News, 2019) This project aims to solve the problem of clogging in drains by using a system that incorporates the design of a bell siphon, Archimedes screw, radial turbine, and waste container all within V-shaped drains. The prototype works by water passing through a bell siphon, this ensures a constant water flow. The flow of water rotates a radial turbine, which turns bevel gears through shafts, which then rotates an Archimedes screw. As it rotates, the design of the screw turns in such a way that it traps single-use plastics, lifts this material above the water line, and deposits it into a waste bin. The volumetric flow rate through the storm drain is 5.7857m^3/s. The flow velocity was found to be 24.376 m/s. This flow rate produced sufficient energy to turn the turbine to 116 RPM and with a gear ratio of 10:1, the screw would turn 11.6 RPM. This transfers plastics at about 213cm from the bottom of the Screw in 1.2 minutes.