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Bio-retention ponds for storm water treatment along road sides at curb inlets

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Curbs, which have emerged with the development of roads, have let the collected water of carriage ways to rush off from the road pavement to the line drains and then to the nearest water bodies. The water which flows may contain oil and grease, hydrocarbons, and metals such as Cu, Pb, Ni, and Zn, which are emitted by vehicle engines and break linings, drums etc., as well as organic matter from plants, garbage and particulate matter of industrial emissions. Thereby those get mixed with water bodies and are ultimately consumed by humans. Therefore, as a solution, retention ponds have been constructed to retain this polluted water, to prevent adding it to water bodies. This research was aimed to develop a model to treat the polluted storm water by using retaining ponds. The prototype was developed by using stream water in the Kirillapone canal, hypothesizing that water accumulated at curbs discharge into the nearby canals. Accordingly stream water was initially allowed to seep over biochar embedded grass strips to filter the visible flowing and mixed sediments, mainly the sand and floating substances. The flowing water was allowed to collect at the retaining pond. In the pond itself, biochar was used, and it was proven that system has effectively absorbed the heavy metals specially zinc and lead. As biochar floats on water, it were compacted with a plastic mesh, allowing it to float but retaining it within the system. Beyond those, the design allows the use of bricks with different sizes at the bottom for further absorption of hydrocarbons. In addition, the invented system was introduced to the CINEC campus as a case study and design was done using existing levels and natural slopes of the area. Aquatic plants such as *Typha latifolia*, *Urochloa mutica*, and *Phragmites australis* were proposed to increase the landscaping of the pond as well as to absorb nutrients. Apart from organic compounds, inorganic compounds such as nitrates and phosphate were absorbed by the biochar system. For this design, a regular maintenance is a must for efficiency and for beauty.

Keywords: Bio-retention ponds; Storm water treatment; Curb inlets; Heavy metals; Biochar; Aquatic plants

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