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Low Cost Filtration for Grey- Water with Constructed Wetland

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ABSTRACT: The main purpose of grey water treatment process is to fulfilling the water demand whenever necessary and to avoid several of pollution that damages the evergreen environment. Vegetation are the most important processers of waste water contaminants. Plant also provides microorganisms with a source of carbon. Stands of vegetation reduce current velocity, allowing solid to settle out of water column. Plants assimilate nutrients, but as the plants senesce, some nutrients are released back into the water. A portion of the nutrients is retain in the undecomposed fraction of the plants litter and accumulates in the soils. Plants oxygenate the root zone by release of oxygen from their roots, and provide aerobic microorganisms a habitat within the reduce soil. Plants have additional site-specific value by providing habitat for wild life and making waste water treatment system aesthetically pleasing. Wetland species of all growth forms have been used in treatment wetlands.

These manual discuss the capabilities of constructed wetland, a functional design approach, and the management requirement to achieve the design purpose. The manual also attempts to put the proper perspective on the appropriate use, design and performance of constructed wetlands.

KEYWORDS: E. coli, green roof water recycling system, indicator, recycling, Re-use, water quality

I. INTRODUCTION

Water is finite and essential source of life. Due to the limited source it is required to be properly managed and recycled. There are important efforts made for improving water management, with main focus on distribution system, storage and sanitation. Rapid Population growth has laid to an increase of water consumption.

Waste Water Treatment is a vast universe, and is produce in different condition with different proportion. The issue of grey water management- which is define as all sources of domestic waste water excluding toilet waste water is gaining more and more importance, especially in developing countries where improper management is one of most important causes of environmental pollution and fatal disease.

As there is unavailability of water in many areas, so by reusing the waste water we can achieve the water demand and it will also avoid the wastes of water.

II. EXPERIMENTAL STUDIES

1. **Anwar Ahmad, Sultan Ghadeer** state that, Constructed wetland systems are natural technologies which constitute an alternate to activated sludge systems for urban and industrial wastewater treatment thanks to their low cost, low energy requirement and straightforward operation and maintenance (Arden and Ma, 2018; Vymazal, 2014). Specifically, they need been proved to be an appropriate solution for winery wastewater treatment. Recovered grey water must adhere to the water quality standards for various requirements and end usage to ensure safe and hygienic reuse of water (Vuppaladadiyam et al. 2019). Besides available physical, chemical, and biological treatments, there are various other technologies reported for grey water.

2. **Mukul Bajpai, Surjit Singh, Katoch Manjari Singh**•The application of constructed wetlands (CWs) for grey water treatment is described as massive and productive approach [43]. However, the disadvantage is that it needs large areas of land, complex construction, and operation.
3. **Fasil Ejigu Eregno, Adam M. Paruch, Trond Mæhlum**•TWs are proven to be efficient in treatment and reuse of grey water (Arden & Ma, 2018; Scheumann et al., 2009) and may play a fundamental role in future circular economy approaches to wastewater treatment with nature based solutions (NBS). GW are often treated on site by NBS like TWs located within the external available space, and just in case of lack of such availability also by indoor treatment units.
4. **Günter Langergraber, Gabriela, DotroJaime, Nivala, Otto R. Stein**• High pollutant loading rates and toxic substances are often effectively treated with CWs; Thus, they need great potential for implementation in low-income countries and rural areas [21]. More recently, CWs are also proposed for the treatment of grey water in urban areas, including by coupling CW with disinfection units like ultraviolet disinfection and chlorination to reliably meet the standards for reuse [22]. However, further concerns arise when it involves the potential contamination by pharmaceuticals and other emerging contaminants.
5. **K. Neetha, P. Vijayalakshmi**• Constructed wetland (CW) systems are often used for the decentralized treatment of grey water (Arden and Ma 2018), which is that the fraction of domestic sewage that doesn't receive the contribution of loo flushing, while light grey water (LGW) also excludes sink and dishwasher fractions (Eriksson et al. 2002; Ottoson and Stenström 2003). However, the appliance of constructed wetlands has evidenced such problems as methane release.
6. **Andrea G Capodaglio, Silvia Bolognesi, Daniele Ceconet**•At least 30%•40% of the bacterial contaminants were primarily removed by the DRF unit. Our results are consonant with those reported by Arden and Ma (2018) who mentioned that the possible mechanisms suggested for bacterial removal in CWs may include; Sedimentation, mechanical filtration, natural die off, predation, biofilm interaction, UV radiation, and exposure to biocides. The potential of plant exudates with antibacterial activity can't be understated.
7. **Robbert P. H. Snep, Joris Voeten Gerben Mol, Tim Van Hattum**• Water that's discharged from kitchen, canteens, sinks and washbasins excluding eau de toilette is termed as gray water. There are various physical, chemical and biological treatment technologies available for gray water like wetlands [8], membrane bioreactors [9], bio•film reactor [1], and rock filter [10], oxidation with photo catalysis [11], rotating biological contractors [12], and direct membrane filtration.



III. GREYWATER SOURCES

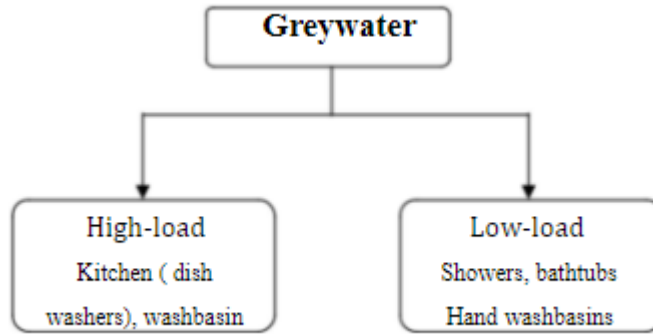
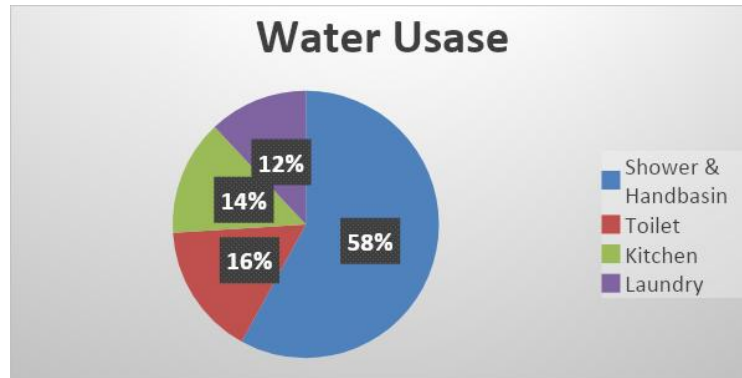


Table 1: Sources of Greywater

Water	Sources	Possible uses
Fresh water	Surface & ground water	Bathing, drinking, cooking
Grey water	Bathing, cloth washing	Irrigation, Toilet cleaning, floor washing, construction after treatment
Black water	Urinal, toilet	No use and requires extensive treatment

I. Daily Water Consumption

According to survey about 140 liters of water per day consumption for cleaning and washing greywater. The following table shows volume in liters from each grey water sources.



IV. GREYWATER THEATMENT PROCESS

A) Material Requirement

- One Transparent Plastic box 358* 23*31 cm
- One 20 liters of bucket
- One 2 liters of box
- 5kg of gravels 20-40 mm
- 5kg of gravels 4-16mm
- 3kg of gravels 2-4mm
- Coarse and fine sand
- Activated carbon and brick pieces
- 15 liters of expanded clay (LECA) 1-4 mm.
- 25 cm transparent plastic hoses, diameter 20 mm
- Two plastic water tap (with Screw and nut)
- Plant: - E.g. Indoor plants, umbrella papyrus, ruse.
- Addition equipment (cloth)

B) Procedure

- Pierce on hole of the size of the Pipe into the side of the sedimentation bucket. The hole should be located sidely and 2cm above the bottom. Place cotton cloth in the bucket so that the solid and other removable particles should detected properly.
- Install the box and the plastics tap tightly fix the plastic nut. Make sure that the connection is waterproof.
- Fix the transparent plastic hose in the corner of the box.

- Lift one end of the land fill in first gravel, the coarse sand, fine sand, activated carbon, brick pieces and the expanded clay.
- Remove the pots from the plants and carefully take away most of the soil from the roots. Implant the indoor plants (pupils brought along) or the umbrella papyrus in the expanded clay (be care full with roots)
- Connect tap in the box so that it be used for irrigation purpose.
- Install one pipe to the box and connected that pipe to disinfectant bucket, so that the water be free from bacteria and it be used in other multipurpose ways.
- Place the wetland at a safe place, put bucket below the outlet slowly pour approximately 5 l of water to the inlet of the system. Use measuring cup. If the outlet water is turbid, repeat the procedure until the out flowing water is clear. Pour 1 l artificial waste water into the system and full up with clean water to a water level of 10cm.
- Take a water sample, once and analysis the water quality.
- After taking the water sample, once a week pour 1 l of artificial waste water into the system and fill up with cleaner water to a water level of 10 cm.

V. ADVANTAGES & DISADVANTAGES

Advantages:

1. Constructed wetlands treatment system is a cheaper alternative for a waste water treatment using local resources.
2. It is more landscaped looking wetland side as compare to conventional waste water treatment plant.
3. The system release promotes sustainable use of local resources which is more environment friendly biological wastewater treatment system.
4. The system release on renewable energy sources such as solar and kinetic energy, and wetland plants and micro-organisms, which are active agents in the treatment processes.
5. This system indirectly will contribute greatly in the reduction of use of natural resources in conventional treatment plants, and wastewater discharges to natural water ways are also reduced.

Disadvantages:

1. Performance is less predictable than chemical treatment system.
2. The need for a preliminary treatment before the wastewater treated by the system.
3. The performance of wetlands may vary based on usage at climatic conditions

VI. RESULTS AND DISCUSSION

Wetlands absorb nutrients from pollutants discharged through its plant roots to disinfect the Grey water. Treated grey water received from filtration and on-site mini wetland (Single household) analyze for pollutant reduction efficiency. As presented in Figure 1 and 2 the highest reduction of pollutants after treatment was BOD (81.42%) and COD (84.57%). It signifies that the treatment system was capable to reduce the solid fraction of BOD. Thus, the remaining part after treatment is probably soluble. Therefore, the reduction of organic matter through this treated system is significant. Although, the treatment system affects COD the most. This result is in accordance with that



concludes the reduction efficiency was satisfactorily. Organic constituents decompose for plant growth. The minerals in turn is converted into protein, as it has the ability to remove organic materials due to its ability to use organic compounds and uptake them as carbohydrate and different amino acids.

The overall percentage of SS reduction reached 54.7% as shown in Figure 3. These results show some efficiency in the system. As suspended solid are mainly achieved by physical sedimentation. The outcome from the process indicates in-sufficiency to provide acceptable removal efficiency. A study made by on colour removal suggests further degradation as the result might be better.

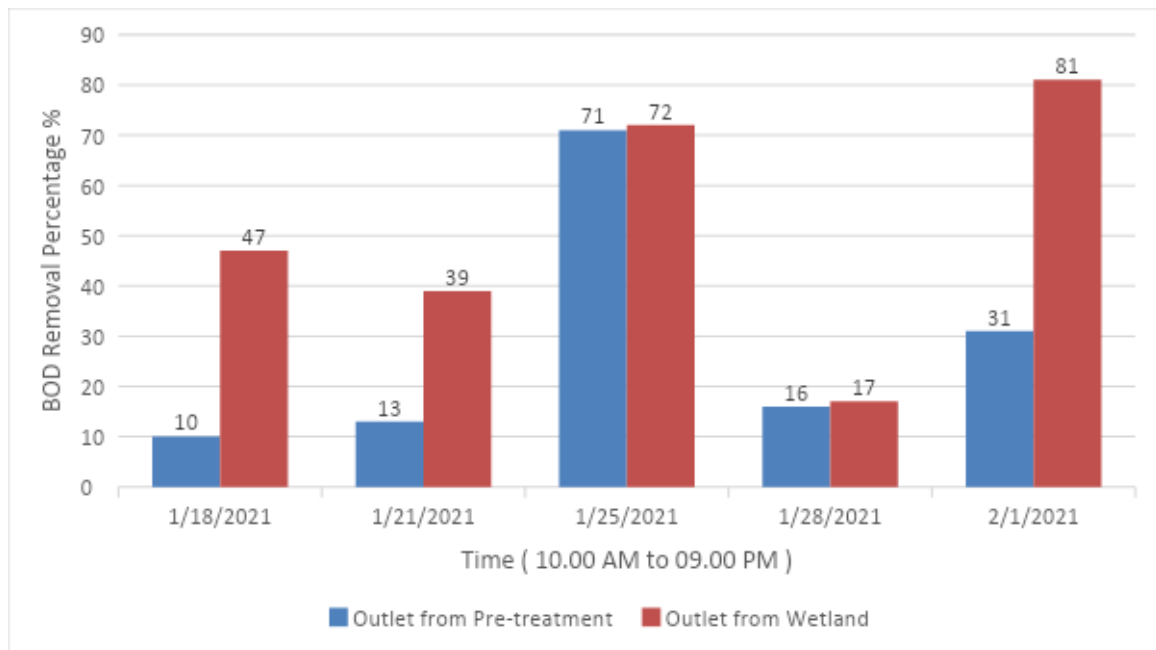


Fig 1 . Concentration of BOD Removal % between Morning and Night Sampling

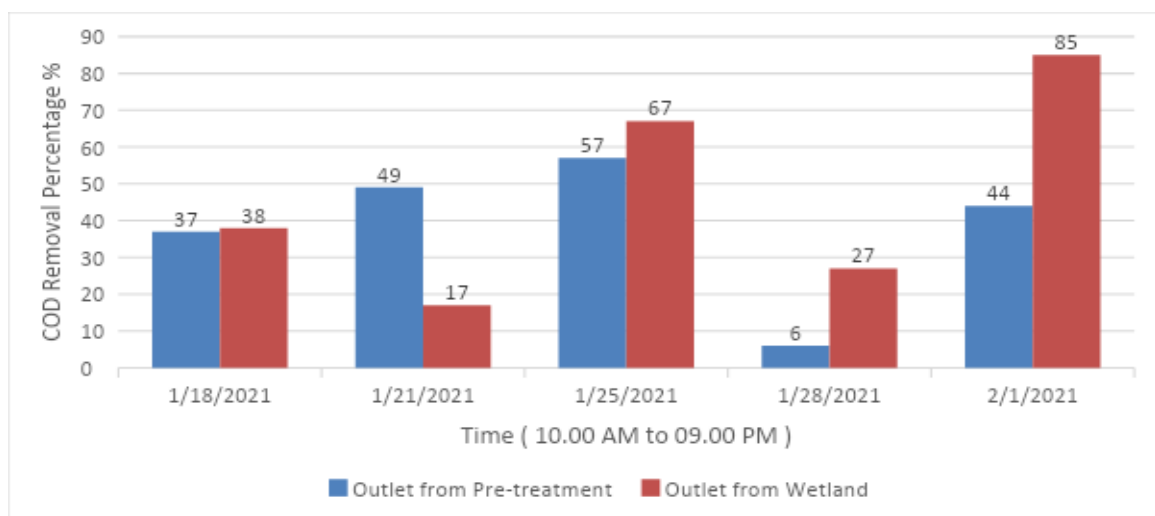


Fig 2 . Concentration of COD Removal % between Morning and Night Sampling

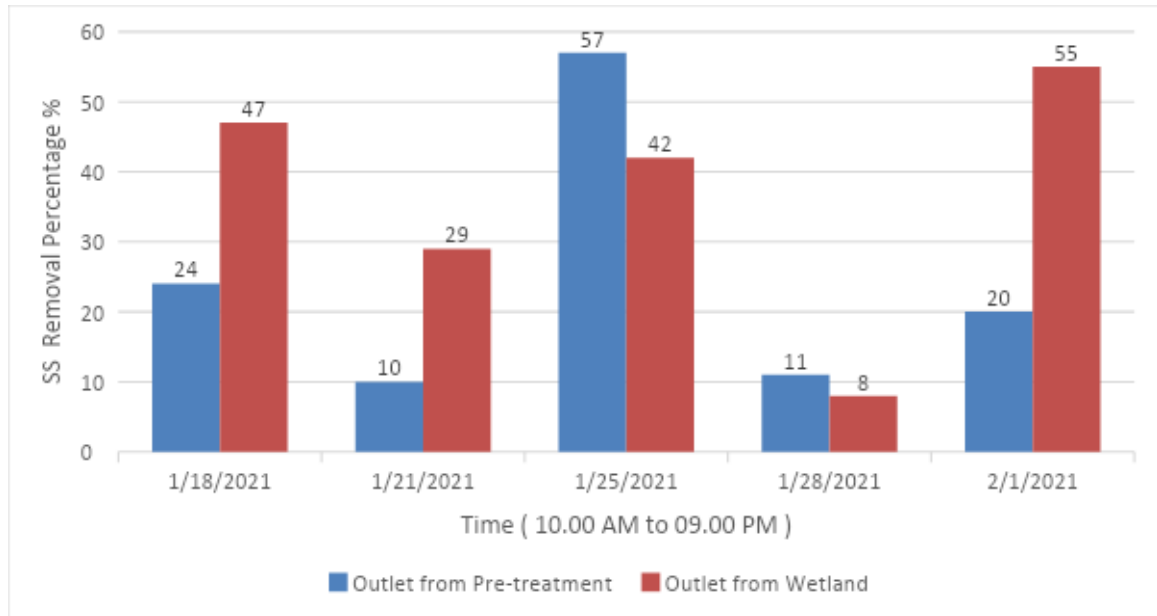


Fig 3 . Concentration of SS Removal % between Morning and Night Sampling

VII. CONCLUSION

1. A successful technical project involves integration of various field. This is an attempt to combine several aspect of environmental, biological, chemical and civil engineering.
2. Since, In India there is no proper treatment for grey water, it is necessary to constructing wetland for grey water treatment. The mini wetland is constructed to meet the future expansion for the coming next year in accordance with Indian codal provisions. This project consist the constructing wetland for a grey water treatment from receiving sink and bathroom.
3. So, Main aim of this project is reuse of waste water irrigation purposes like a gardening, domestic use etc. And also increase the water level in the ground.

VIII. FUTURE SCOPE

Grey water treatment has very important in future internationally and in India because, the quality of water in ground level decreasing day by day and this is due to the domestic waste and pollution which causes dangerous diseases so, developing countries are now performing on waste water. It has very good scope. After coming next years from now it is hoped that higher efficiencies in and effectiveness of the system would allow less waste and better recycling of the resources. We may see various technologies applied new trends. Perhaps water and waste treatment will combined, and less waste water will be discharged to the rivers. Perhaps more facilities will utilize closed cycle systems, making rivers safer and environmentally friendlier .Constructed wetland for grey water filtration with better waste treatment and delivery systems the public is increasingly concerned about whether we remove all of the harmful pathogens.

In the future mini constructed wetland is more useful because improve water quality for various irrigation purposes such gardening, domestic uses etc. And also rise the ground water level.

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