

Green Tinted Glasses - Constructed Wetlands

No-one can be oblivious of the impending crisis which threatens our lifestyle, livelihood and very existence. Water in its various forms is becoming more problematic as each day passes (too much, too little, too dirty....). One can regularly see reports of water issues throughout the country, in April 2008 there were floods by Lake Victoria whilst simultaneously droughts in Tana River as a result of the late arrival of the long rains. Contamination of groundwater near to cities and industries renders water toxic and unusable. How can we manage this ever more fickle resource? How can we protect that which we already have from the multiple pressures of a rising population? How can we encourage people to start taking responsibility for the impact they have on the environment and work towards reducing this? In short, how can one make waste water treatment a more attractive and economical activity?

A housing estate on the outskirts of Mombasa may have come up with a winning solution to this dilemma. The estate was constructed throughout the 70s and 80s and offered affordable, good quality houses in a model environment. The years, however, took their toll and a lack of maintenance resulted in areas of the estate becoming dilapidated, particularly the drainage system. For years, blocked drainage lines overflowed (*ref photo 7*), insufficient soakpits took the brunt of the waste (*ref photo 4*) and the estate became associated with unsanitary conditions. Lots of expense, lots of trouble and lots of unhappy residents.

However, in October 2007, the developers brought online a system which solved all of these drainage problems. A series of gravel beds and plant filled ponds were constructed and by creating a beautiful and diverse environment, they also succeeded in cleaning up their waste water. Not only that, but the system produces a huge quantity of biomass which is then used in a nearby biodigester to create methane for cooking school dinners. (*ref photo 1, 2*)

The ponds form a "Constructed Wetland System" which utilises natural processes, in particular aquatic plants, to reduce the nutrient content of the water. The nutrients are actually a result of human waste products, but in the eyes of a hungry ecosystem, food is food. Nutrients are taken up, given out, digested and transformed by a number of processes within the system without the need of any artificial additives or use of energy. Pathogens are reduced by UV radiation, predation and simple sedimentation within the ponds. If nature is given the optimum chance to perform, startling results may be obtained; in this case, a final effluent which is safe to discharge to the local water course (within the NEMA consent values¹). Not only that, the unpleasant and unsanitary environment which existed before has now become an oasis supporting a diversity of flora and fauna. Waste water that was formerly viewed as a problematic issue has now become a resource as it may be used for other site activities, such as irrigation, building uses and clearing blocked pipes. By utilising a number of removal mechanisms, the system is very robust and will never experience a sudden failure. If it is not working in an optimal fashion, failure is slow, non critical and will not require any exotic spare parts. (*ref photo 5*)

¹ Indicator values of >30mg/l BOD, >50mg/l COD and >30mg/l TSS are all achieved

Why isn't everyone doing this then? Well... in a lot of cases they could be, or at least using something along similar lines specifically adapted to each site. Ponds create areas of great beauty, but do take up space which is not always available. In such a case, a series of gravel beds may be incorporated into the design (known as reed beds) as these are more space efficient. The ponds attract a great diversity of wildlife, most of which are of benefit to the system, although problems may be encountered if this includes large animals and predators. A number of imaginative techniques exist for keeping these visitors away, although the most basic is to provide an alternative point of access for the animals to drink from (using the recycled water). At a number of lodges, being able to provide clean recycled water year round for wildlife has even been the main focus of the project such as Campi ya Kanzi in the Chyulu Hills.

Ecotourism Kenya and NEMA have realised the benefit these on-site systems can contribute in terms of protecting the environment and recognise them accordingly (such as gaining points towards EK awards). As with any construction, they do require an EIA and there will be some design restrictions based on each particular site. They do, however, offer an environmentally friendly way to achieve the discharge to environment standards (NEMA – Third Schedule Water Quality Guidelines 2006) (*ref photo 9*). The systems are relatively new in Kenya, but have been well tested internationally with a plethora of research to support them (see box). Their maintenance requirement is little more than gardening and the tropical conditions in Kenya encourage beneficial bacteria to work even faster.

Many countries, especially in Asia, have been carrying out similar practices for hundreds of years whereby wastewater is seen as a valuable resource from which marketable products may be obtained (fish, fertilizer, animal fodder etc). This has happened to such a degree that wastewater may be purchased or even fought over! We shouldn't go this far, but we can start to complete the nutrient cycle between humans and the land rather than continuing to pollute. All of you who call yourselves environmentalists, it's time to start looking at wastewater through green-tinted glasses!

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