

# Developments of innovative techniques on water treatments

Pr. Souad El HAJJAJI  
Centre Eau, Ressources Naturelles, Environnement  
et Développement Durable [CERNE2D]

## Biochar and activated carbons from feedstocks

Biochar has been explored as an adsorbent for pollutant adsorption, a soil amendment, and through the carbon sequestration method for climate change mitigation. Through the activation of biochar can be designed with qualities to suit the intended uses. Biochar samples were prepared from feedstocks. The effect of preparation conditions on the properties of the produced biochar was studied.

### Objective

The pyrolysis method is one of the new methods of processing organic waste. The principle of this method is to transform the most important part of the organic matter to obtain Biochar. The use of the AquaCrop model to simulate the behaviour of the soil-plant-atmosphere system during one or more agricultural seasons. This system is, on the one hand, bounded from above by the atmosphere, characterised by standard meteorological variables for production, AquaCrop assumes a linear relationship between biomass growth rate and transpiration through a water productivity parameter.

To examine soil quality, the proposed framework uses a moisture

### The Aim

This proposed work uses pyrolysis to transform agricultural residues into biochar which is then transformed into activated carbon by using an acid-base activation process. The objective of this study was to assess the physicochemical properties of the biochar and activated carbon produced.

### Collaborators

- Université d'umea Suède
- Université de Durban Afrique de Sud
- UM6P

## Développement d’un système intelligent pour la surveillance et la détection de la qualité de l’eau.

### Résumé

L’analyse de la qualité de l’eau joue un rôle important dans le contrôle de l’environnement. Chaque fois que la qualité de l’eau est mauvaise, elle peut affecter la vie aquatique et son environnement. En raison de l’importance de certains paramètres pour montrer la qualité de l’eau, nous allons concevoir un système intelligent capable de mesurer à distance les paramètres de l’eau. Les valeurs capturées sont envoyées à la base de données connectée à la plate-forme. La plateforme peut traiter les valeurs reçues. L’utilisateur peut se connecter à l’application via un protocole

### Collaborators

Laboratoire national des études et de surveillance de la pollution  
- Université Moulay Ismail - Meknès, Faculté des Sciences et Techniques –Errachidia  
- Office National de l’Electricité et de l’Eau Potable  
- Université Cadi Ayyad -Marrakech, Faculté Polydisciplinaire –Safi  
- Cité de l’innovation de l’UM5-RABAT

## Decentralized treatment wetlands for sustainable water management in rural and remote areas of semi-arid regions

### Résumé

The main objective of this initiative is to provide a sustainable solution for the management of polluted effluents in rural and remote areas under semi-arid climatic conditions using decentralized wetlands. In fact, constructed wetlands are treatment systems that use natural processes involving wetland vegetation, soils, and their associated microbial assemblages to improve water quality. However, using this treated water will protect natural water resources from overexploitation and contamination. Also, this technique contributes to climate change mitigation through carbon sequestration and minimum energy demands compared to

alternative treatment techniques. Actually four vertical flow constructed wetland units are used to treat domestic wastewater of rabat city. Three of them are planted by different types of vegetations and the fourth one is unplanted. Performances results shown higher removal efficiencies for the planted filters confirming that vegetations do contribute on waste removal. In addition, better results were recorded for the unit planted with two different types of vegetations in the same system reaching a Chemical Oxygen Demand removal [COD] of 96% and a Biochemical Oxygen Demand after 5 days [DBO5] removal of 99%.

### The design of the constructed wetland units depending on feeding mode

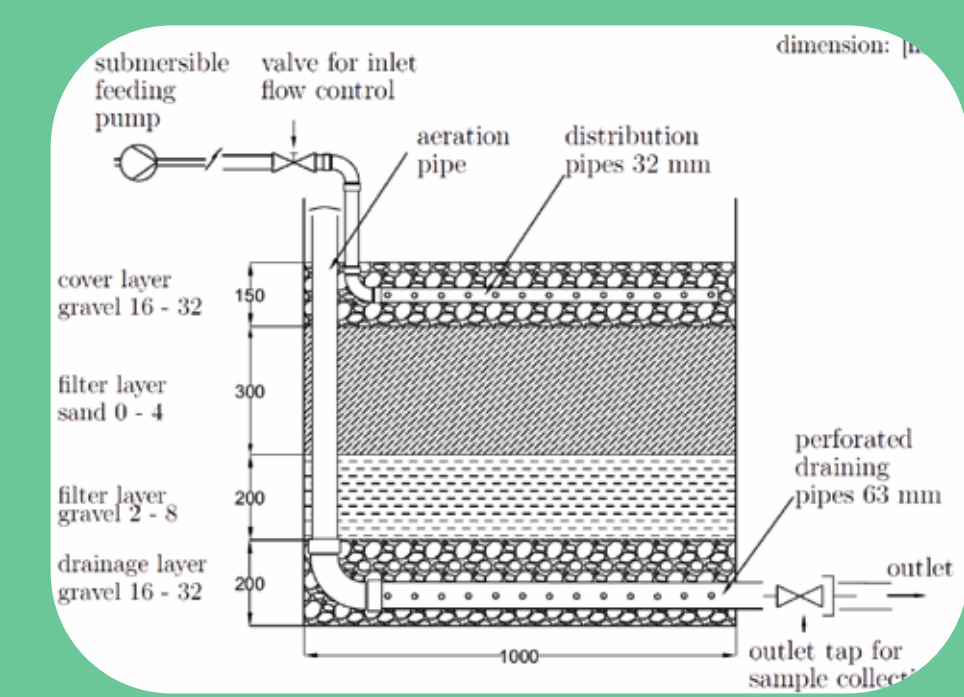


Figure 1. Vertical flow constructed wetland unit design

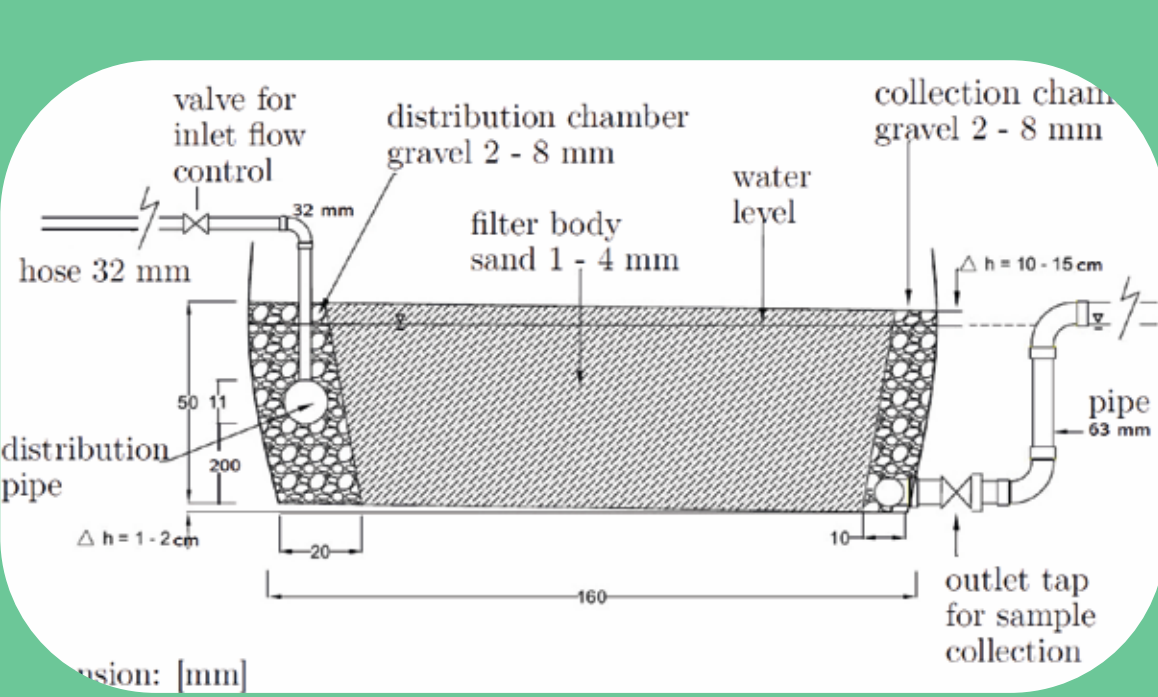


Figure 2. Horizontal flow constructed wetland unit design

### The four Vertical flow constructed wertlands units used to treat domestic wastewater of rabat city



### Pyrolysis and activation

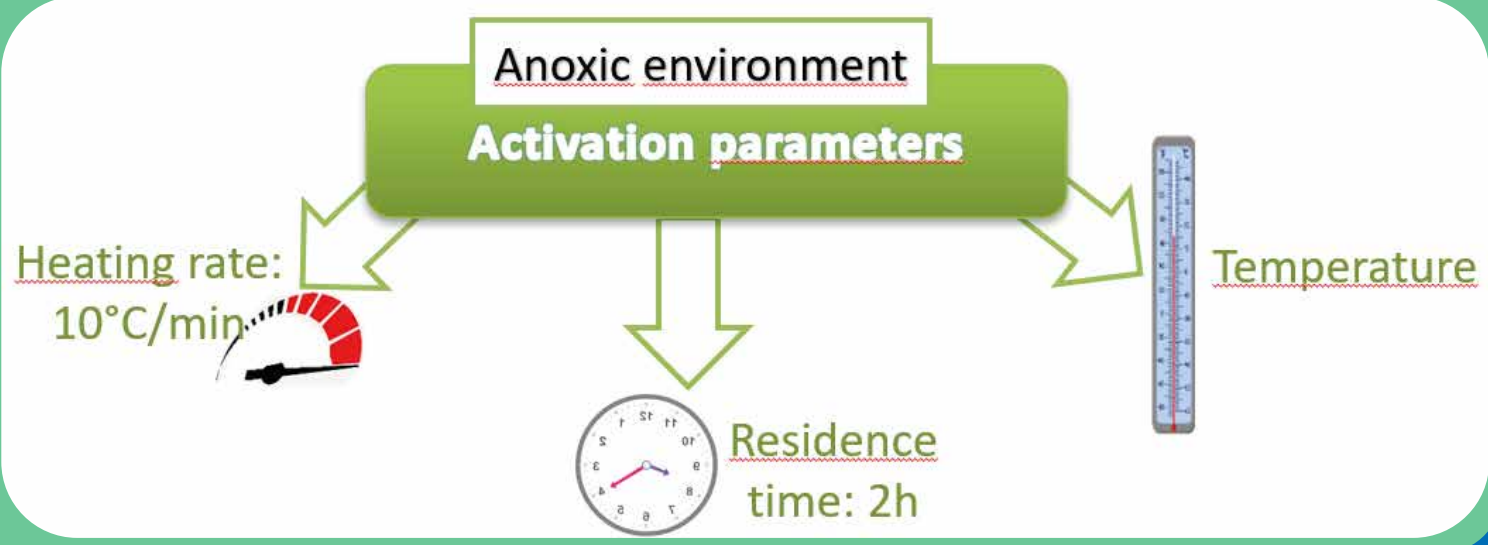
sensor, a temperature sensor and an NPK sensor to obtain information on soil moisture content, ambient temperature and the substance nitrogen, phosphorus and potassium. The sensors are associated with the programming board. A wife module is associated with the card and allows information to be sent to the data cloud to process the information collected by the different sensors. The information collected is temperature, humidity and NPK values. A Smartphone application allows the information to be viewed.

Use of biochars for wastewater treatment.

Sequestration of CO2; ....

The pyrolysis of samples was carried out at different temperature and in an anoxic environment. The pyrolysis time will be kept constant at 2 hours and the heating rate was maintained at 10°C/min in a muffle furnace.

The biochar of agricultural residue was activated by acidic and basic activator under the following conditions:



Specific surface and mass yield of biochar