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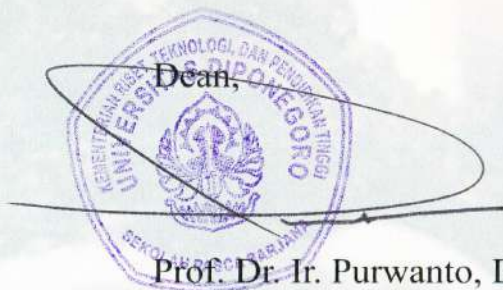
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Potential of Electric Power Production from Microbial Fuel Cell (MFC) in Evapotranspiration Reactor for Leachate Treatment Using Alocasia macrorrhiza Plant and Eleusine indica Grass

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Abstract

Microbial fuel cell is one of attractive electric power generator from nature bacterial activity. While, Evapotranspiration is one of the waste water treatment system which developed to eliminate biological weakness that utilize the natural evaporation process and bacterial activity on plant roots and plant media. This study aims to determine the potential of electrical energy from leachate treatment using evapotranspiration reactor. The study was conducted using local plant, namely Alocasia macrorrhiza and local grass, namely Eleusine Indica. The system was using horizontal

Cited by 3 documents

Identification of sugars as root exudates of the macrophyte species *Juncus effusus* and *Philodendron cordatum* in constructed wetland-microbial fuel cells during bioelectricity production

Guadarrama-Pérez, O. , Moeller-Chávez, G.E. , Bustos-Terrones, V.

(2022) *Environmental Technology (United Kingdom)*

Comparative Performance Analysis of Constructed Wetland-Microbial Fuel Cells Operated under Batch and Continuous Mode for Treating Wastewater with RO Concentrate

Thakur, S. , Ghosh, D. , Das, B. (2021) *Journal of Environmental Engineering (United States)*

Recent advances in constructed wetland-microbial fuel cells for simultaneous bioelectricity production and wastewater treatment: A review

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**15 – 16 August 2017
Semarang, INDONESIA**

Proceedings editor(s):

Prof. Dr. Hadiyanto, MSc

Dr.- Ing. Sudarmo, MSc

Dr. Eng. Maryono, MT

Date and editor's signature: **January 20, 2018**

Preface

Population growth has significant impacts to sustainability of the natural and energy resources. Some problems arose from the uncontrolled exploitation of natural and energy resources. Several substantial efforts have been conducted by managing the environment through the instruments. The major efforts have yielded positive results in several aspects; however, some aspects have not improved. Innovation efforts, by academics, researchers, bureaucrats and entrepreneurs, are still needed to ensure a sustainable environmental management.

The 2nd International Conference on Energy, Environmental and Information System (**ICENIS**) 2017 organized by School of Postgraduate Studies, Universitas Diponegoro (UNDIP) has been conducted 15-16th August 2017. The conference has successfully enabled the exchange of research results of researchers on the fundamentals and applications of energy, environment, and information system. More than 250 participants and presenters from several countries i.e. Indonesia, Malaysia, Germany, Sudan, Nepal, Australia, Japan, Libya have attended the conference to share their significant contributions in research related to Energy, Environment and Information System. This proceeding contains of 202 selected papers from the conferences.

We would like to express our gratitude to all authors and the members of scientific committee, reviewers and also organizing committee for their contribution to the success of the conference.

Guest Editors

Prof. Hadiyanto
Dr. -Ing. Sudarno
Dr. Eng. Maryono

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Biogas Production from Rice Husk Waste by using Solid State Anaerobic Digestion (SSAD) Method 02007

Hashfi Hawali Abdul Matin and Hadiyanto

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Hilma Muthi'ah, Glory Natalia Sinaga and Rahmat Tubagus Hakiem

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Luqman Buchori, I. Istadi, P. Purwanto, Louis Claudia Marpaung and Rahmatika Luthfiani Safitri

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Potential of Electric Power Production from Microbial Fuel Cell (MFC) in Evapotranspiration Reactor for Leachate Treatment Using Alocasia macrorrhiza Plant and Eleusine indica Grass 02010

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Prevalence of Hookworm infection and Strongyloidiasis in Cats and Potential Risk Factor of Human Diseases 06002

Blego Sedionoto and Witthaya Anamnart

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Analysis Of Landslide Materials Spreading In Bendan Dhuwur Village Gajahmungkur Subdistrict Semarang City 08003

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Vulnerability Assessment of Mangrove Habitat to the Variables of the Oceanography Using CVI Method (Coastal Vulnerability Index) in Trimulyo Mangrove Area, Genuk District, Semarang 08004

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Potential of Electric Power Production from Microbial Fuel Cell (MFC) in Evapotranspiration Reactor for Leachate Treatment Using *Alocasia macrorrhiza* Plant and *Eleusine indica* Grass

Badrus Zaman^{1,*} and Irawan Wisnu Wardhana¹

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Abstract. Microbial fuel cell is one of attractive electric power generator from nature bacterial activity. While, Evapotranspiration is one of the waste water treatment system which developed to eliminate biological weakness that utilize the natural evaporation process and bacterial activity on plant roots and plant media. This study aims to determine the potential of electrical energy from leachate treatment using evapotranspiration reactor. The study was conducted using local plant, namely *Alocasia macrorrhiza* and local grass, namely *Eleusine Indica*. The system was using horizontal MFC by placing the cathodes and anodes at different chamber (i.e. in the leachate reactor and reactor with plant media). Carbon plates was used for cathode-anodes material with size of 40 cm x 10 cm x 1 cm. Electrical power production was measure by a digital multimeter for 30 days reactor operation. The result shows electric power production was fluctuated during reactor operation from all reactors. The electric power generated from each reactor was fluctuated, but from the reactor using *Alocasia macrorrhiza* plant reach to 70 μ watt average. From the reactor using *Eleusine Indica* grass was reached 60 μ watt average. Electric power production fluctuation is related to the bacterial growth pattern in the soil media and on the plant roots which undergo the adaptation process until the middle of the operational period and then in stable growth condition until the end of the reactor operation. The results indicate that the evapotranspiration reactor using *Alocasia macrorrhiza* plant was 60-95% higher electric power potential than using *Eleusine Indica* grass in short- term (30-day) operation. Although, MFC system in evapotranspiration reactor system was one of potential system for renewable electric power generation.

1 Introduction

Leachate generation is a major problem for municipal solid waste (MSW) landfills as a liquid that passes through a landfill and has extracted dissolved and suspended matter from it. Leachate results from precipitation entering the landfill from moisture that exists in the waste when it is composed [1]. The most critical aspect is related to several high concentrations pollutants that can be divided into four main groups namely: dissolved organic material, inorganic compounds, heavy metals and xenobiotic organic substances [2,3]. Evapotranspiration system which using plant and microbial activity on plant root and in planting media was promising for leachate treatment [4].

Meanwhile, the cleaner generation of energy is a vital concept to ensure the survival of our current lifestyle past the depletion of the Earth's fossil fuel supply, where MFC systems are recognized as one of energy production systems with great potentials [5]. MFC was believed as a promising technology that can be used to produce bioenergy in the form of hydrogen and/or electricity directly from various oxidation process of organic and inorganic compounds [6,7,8,9]. MFC can

generates electrical power while accomplishing simultaneous treatment of biodegradable contaminants in wastewater by utilizing microorganisms [10,11].

Most microbes can produce current if active oxidation- reduction (Redox) mediator was added into the system or settled on the electrode. In practice, the system was designed with self-mediated or directly transferable electron to anode through contact between membrane- anode (extracellular transfer Electrons through a protein membrane and/or a bacterial nano cable) [12].

MFC technology in wetlands in rice plants was using rhizodeposition substrate to be oxidized by microbes, thus generating electrical energy [13]. MFC system utilization using waste residue at wetland forest as substrates that are oxidized by microbes, whereas in sediments it in eutrophication lake condition which generates maximum electricity was 294 mW/m² at the same time can remove of nitrate more than 90% [14,15]. MFC operated with continuous flow can remove of 50% COD from wastewater with the result of electrical energy was 464 mW/m² [16]. Constructed Wetlands (CW) to COD from textile waste when the system was combined with MFC. Thus CW-MFC system is capable

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Prevalence of Hookworm infection and Strongyloidiasis in Cats and Potential Risk Factor of Human Diseases

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²Department of Environmental Health, Faculty of Public Health, Mulawarman University, Samarinda- Indonesia

Abstract. Hookworm infection and Strongyloidiasis are public health problem in the worldwide which both of them could infective in human by penetrated on skin and they have potential risk from Gastrointestinal zoonotic helminths of pets, including cats. We investigated the prevalence soil transmitted helminths infection in human and cats used modified Formal-Ether Concentration and agar plate culture. Fecal samples of 23 cats and human from Naitung and Subua Villages (area study 1), and fecal samples of 15 cats and 17 humans from Thasala Beach villages (area study 2) were collected. Result of study in area study 1 showed prevalence of infection in human was not hookworm and strongyloidiasis but 10% humans have infected *Ascaris* and *Tricuris*, and in cats have infected by hookworm 75.2% and *S. stercoralis* 8.5%, *Toxocara* 13%, *Spirometra* 13% and overall prevalence 82.5%. In area study 2 showed in human has infected by *Trichuris* 100% and *S. stercoralis* 29.4% and in cats have infected by hookworm 100% and *S. stercoralis* 40%, *Toxocara* 20%, and *Spirometra* 20%. Helminth infection found in both humans in two areas study are *S. stercoralis*. Hookworms were the most common helminth in cats but did not connection with infection in human, while *S. stercoralis* was helminth infection in cats which has potential zoonotic disease to human.

1 Introduction

Dogs and cats play a significant role as reservoir hosts for gastrointestinal zoonotic parasites including protozoa, trematode, cestode and nematode [1, 2, 3]. Humans can be infected via contact with a dog or cat or via contamination of infective stages in food or water [4, 5].

Worldwide, there is a significant variation in the prevalence of gastrointestinal zoonotic helminths in dogs and cats [6, 3]. High infection rates of zoonotic parasites including hookworms, *Trichuris spp.*, *Spirometra spp.*, *Taenia spp.*, *Toxocara spp.* and *Opisthorchis spp.* have been reported [7,8,6,3]. Infection of zoonotic helminths has previously been researched in Thailand.

In the central area, a high prevalence of hookworm *Ancylostoma ceylanicum* was reported among dogs in temple communities in Bangkok [9]. The infections of zoonotic helminths, hookworms, *Trichuris spp.*, *Toxocara spp.* and *Spirometra spp.* were found in dogs and cats in animal refuges [10].

In the Northeastern area, a high infection rate of liver fluke, *Opisthorchis viverrini* (*O. viverrini*) in dogs and cats, was found in communities where *O. viverrini* infection in human was high [3]. In Thailand, infections of hookworms and *O. viverrini* are the major public health problems [11, 12, 13, 14, 9].

Infections of zoonotic hookworms, *A. ceylanicum* and *A. caninum*, have been reported in many areas [13, 9]. Molecular analysis showed *A. ceylanicum* is prevalent in humans and dogs in the Central and the Northeastern areas of Thailand [13, 9].

Another STH, *Strongyloides stercoralis*, is often neglected in helminth surveys [15, 9], yet previous studies show high *S. stercoralis* infection rates in Cambodia [16]. School-aged children in the developing world are at highest risk of morbidity due to STHs and intestinal protozoan infections [17].

However, mass treatment only focuses on three major STHs (*Ascaris*/hookworm/*Trichuris*). Other nematodes like *S. stercoralis*, trematodes and protozoan infections are not addressed. In rural Southeast Asia, little is known about the zoonotic potential of IPIs in humans and animals. Therefore of domestic animals, such as cats, dogs and pigs, as contributors to human STHs and as reservoir hosts for zoonotic parasites remains unexplored and/or the data are inaccessible.

Although surveys of zoonotic gastrointestinal helminths in dogs and cats had been done in Thailand, most of the studies have focused on the Central or Northeastern region [18, 19, 10, 20]. This study to investigate prevalence of zoonotic helminth infection in cats that potential risk factors to human.

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Management to Insulate Ecosystem Services from the Effects of Catchment Development

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Abstract. Natural ecosystems provide amenity to human populations in the form of ecosystem services. These services are grouped into four broad categories: provisioning – food and water production; regulating – control of climate and disease; supporting – crop pollination; and cultural – spiritual and recreational benefits. Aquatic systems provide considerable service through the provision of potable water, fisheries and aquaculture production, nutrient mitigation and the psychological benefits that accrue from the aesthetic amenity provided from lakes, rivers and other wetlands. Further, littoral and riparian ecosystems, and aquifers, protect human communities from sea level encroachment, and tidal and river flooding. Catchment and water development provides critical resources for human consumption. Where these provisioning services are prioritized over others, the level and quality of production may be impacted. Further, the benefits from these provisioning services comes with the opportunity cost of diminishing regulating, supporting and cultural services. This imbalance flags concerns for humanity as it exceeds recognised safe operating spaces. These concepts are explored by reference to long term records of change in some of the world's largest river catchments and lessons are drawn that may enable other communities to consider the balance of ecosystems services in natural resource management.

1 Introduction

Human societies have reaped food, water and materials from river catchments. While climate variability at a range of time scales has mediated the supply of these resources at regional scales, the sedentarisation of human communities through the Holocene, and the attendant increases in population and technology, has increased the intensity of resource exploitation. The Millennium Ecosystem Assessment reveals the further amplification of impacts of human resource exploitation from the mid-20th century identifying the Great Acceleration, which has prompted calls for the demarcation of a new geological epoch, The Anthropocene [1,2].

While ethical arguments can be mounted that natural systems warrant conservation for intrinsic reasons, the Ecosystem Services they provide humans is increasingly being used to justify investment in wise management [3]. It is recognised that the demand for consumptive resources such as food, water, energy, timber and minerals for the construction of shelter and fibre for clothing is impacting negatively on the other services provided humanity by the natural environment. In market based economies there remain opportunities for the price of consumption to reflect merely the cost of production, with little requirement for it to reflect the trade-off in the loss of assets and services, that are valuable, but represent a challenge to quantify economically. Without full cost accounting of the trade-offs between services society risks undermining the

support afforded by the less quantifiable phenomena and, ultimately, the ongoing supply of provisioning services.

The most readily identifiable services provided by natural ecosystems are usually those that provide directly for human needs. These Provisioning Services comprise potable water and food, including those harvested directly such as fish and native fruit, as well as those sown by people such as crops and stock raised for milk and meat. As a resource timber was used by early hominids as an energy source and then for shelter as technology became more sophisticated. Extracted minerals have replaced timber as a provider of shelter and this fibre is now directed in large volumes to the creation of paper. Most of humanity's energy is now provided by extracted fossil fuels that were largely unavailable before the industrial revolution.

The natural environment also affords considerable benefit to humanity by means that are not defined as provisioning. Natural systems regulate the habitat used by people by moderating microclimatic extremes (e.g. shade, shelter) and by controlling irruptions of pests, predators and disease carrying organisms that may impact negatively on people. It may also mitigate the risk of environmental hazards – coastal and riparian vegetation play's a clear role in protecting human settlements from floods and, as witnessed in 2004, tsunamis. Natural ecosystems also provide support to society that underpins the provision of food and water through the pollination of flowers that beget seed and fruit and the purification of water to mitigate the

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