Journal of Physics: Conference Series • *Open Access* • Volume 1217, Issue 1 • 17 June 2019 • Article number 12159 • 8th International Seminar on New Paradigm and Innovation on Natural Sciences and Its Application, ISNPINSA 2018 • Semarang, Central Java • 26 September 2018 • Code 148936

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Conference Proceedings

ISSN
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DOI
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Analysis of land use changes effect on erosion and sedimentation potential in Progo watershed

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Abstract

Progo Watershed is an ecosystem consists with Progo Rriver as the main river. One of the problems in the Progo River is the formation of sediment deposits in the downstream. The purpose of this study is to analyze the effect of land use on the erosion and sedimentation potential . Erosion prediction are based on Wischmeier and Smith's research which presents the Universal Soil Loss Equation (USLE). In this research, the erosion and sedimentation potential has different land uses; from 1990, 2000, and then 2011. Generally, there has been an increase in the average erosion rate at Progo watershed , from 165 tons/ha/year in 1999 to 184 tons/ha/ in 2011,;or if classified based on the erosion hazard level, it continues to become heavier. Sub-watersheds that have experienced a significant increase in erosion rates are Blongkeng Sub-watershed, Gemurung Sub-watershed, and Progo Hulu Sub-watershed, where the status differed from medium to heavy category. Some locations that were silting due to sediment became prone to floods. © Published under licence by IOP Publishing Ltd.

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PREFACE

The 8th International Seminar on New Paradigm and Innovation on Natural Sciences and Its Application (ISNPINSA-8) is annual seminars organized by Faculty of Sciences and Mathematics (FSM) Diponegoro University and has been successfully conducted since 2011. The ISNPINSA-8 was held in Semarang, Indonesia on September 26th 2018. The aims of ISNPINSA are to facilitate brain storming and state of the art information in field of sciences and mathematics; to increase innovation of technology that can be applied in industries; to contribute in formulating strategy to increase the role of science for community; and to stimulate collaboration between industries, researchers and government to increase community welfare. The theme of 8th ISNPINSA in 2018 is "*Science and Applied Science for Sustainable Development Goals*".

The number of participants of the seminar were 272 including keynote speakers, invited speakers, oral presenters, poster presenters, and non presenters coming from various institutions of various countries, including Japan, Philippines, Thailand, Malaysia, Australia, Bangladesh, China, Kazakhtan, Vietnam and those who come from all parts of Indonesia consist of researchers, lecturers, postgraduate and undergraduate students from various universities. There are 272 papers were presented in this seminar, consist of 5 keynote speakers, 237 oral presentations, and 30 poster presentations. After the selection process, there are 184 articles selected papers to be published in the present conference proceeding. This is the largest number of papers and participants for eight times the implementation of ISNPINSA. The scope of the field of participants comes from various fields including biology, physics, chemistry, statistics, mathematics, informatics, environment, public health, and relevant fields that contribute to sustainable development.

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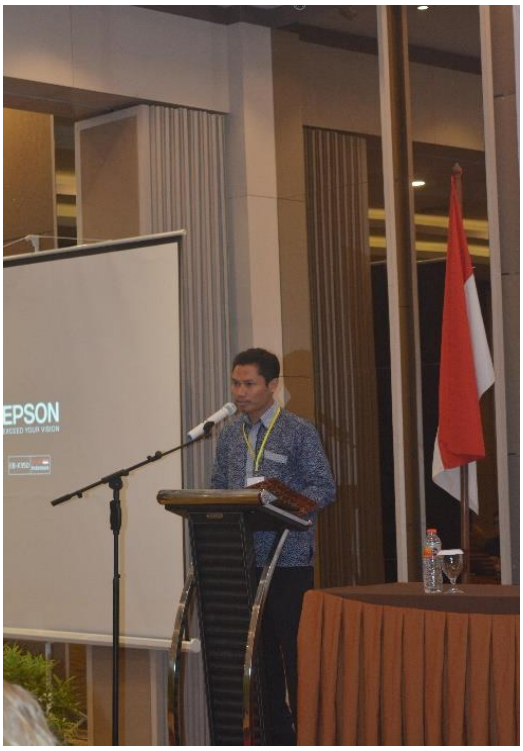

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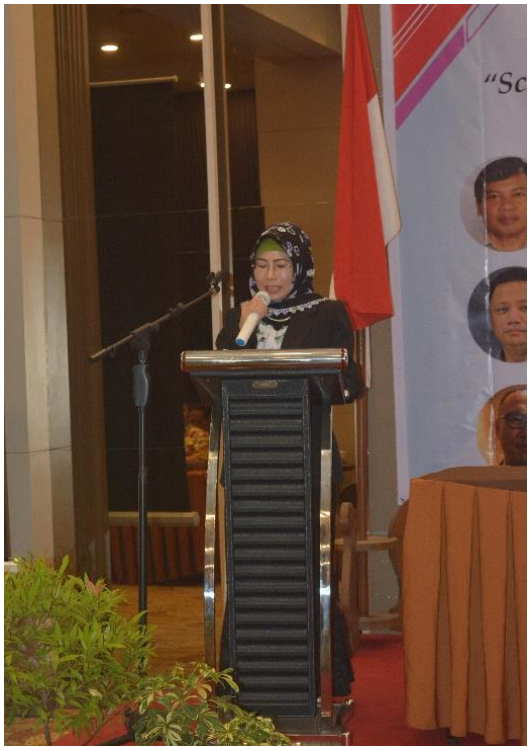

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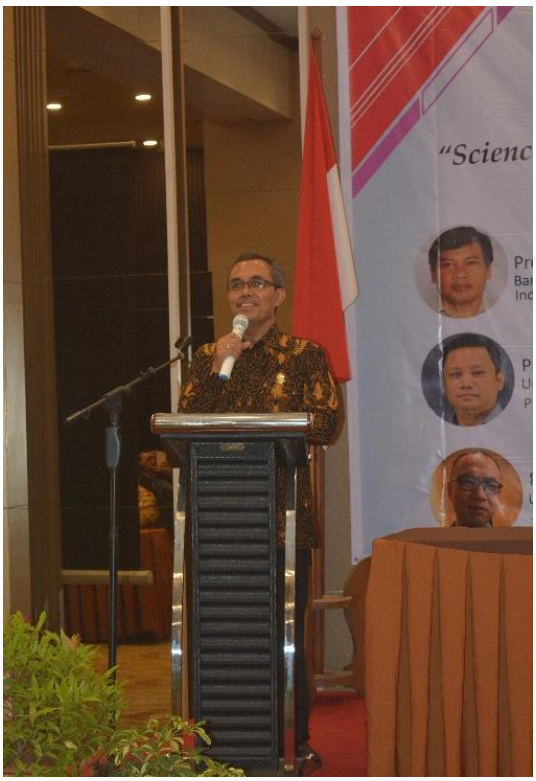

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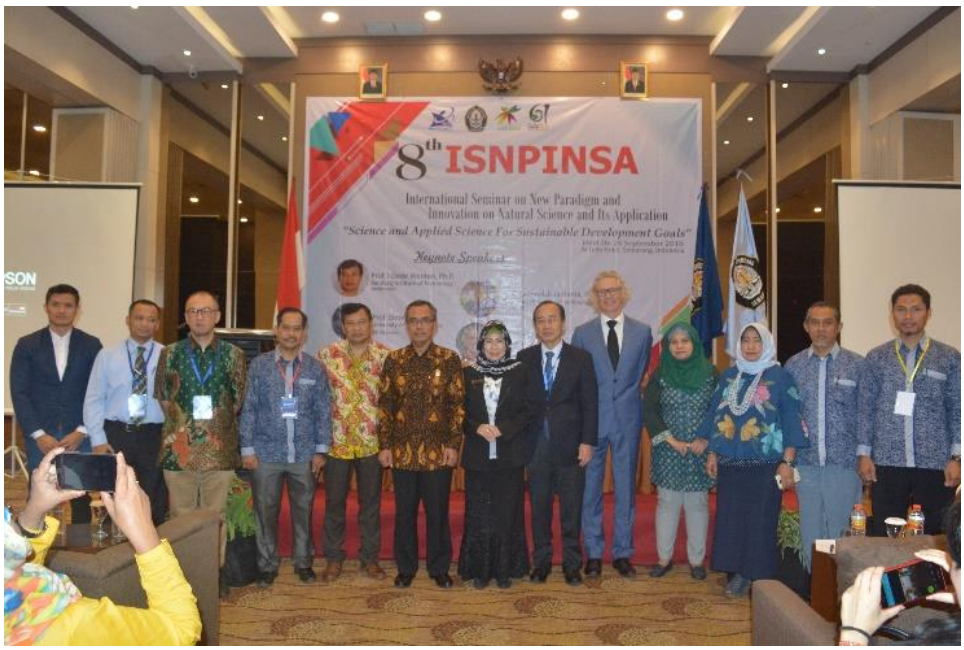

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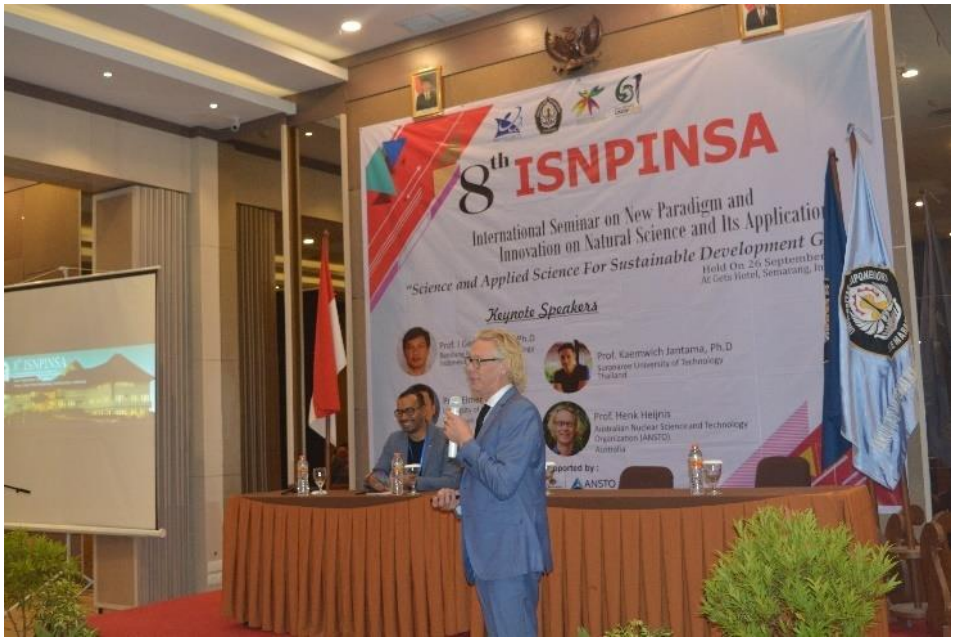

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Analysis of land use changes effect on erosion and sedimentation potential in Progo watershed

A Rezagama, A Sarminingsih, B Zaman, D S Handayani

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Abstract. Progo Watershed is an ecosystem consists with Progo Rriver as the main river. One of the problems in the Progo River is the formation of sediment deposits in the downstream. The purpose of this study is to analyze the effect of land use on the erosion and sedimentation potential. Erosion prediction are based on Wischmeier and Smith's research which presents the Universal Soil Loss Equation (USLE). In this research, the erosion and sedimentation potential has different land uses; from 1990, 2000, and then 2011. Generally, there has been an increase in the average erosion rate at Progo watershed, from 165 tons/ha/year in 1999 to 184 tons/ha/in 2011,;or if classified based on the erosion hazard level, it continues to become heavier. Sub-watersheds that have experienced a significant increase in erosion rates are Blongkeng Sub-watershed, Gemurung Sub-watershed, and Progo Hulu Sub-watershed, where the status differed from medium to heavy category. Some locations that were silting due to sediment became prone to floods.

1. Introduction

One of the important indicators to determine the damage of a watershed is its hydrological conditions which is characterized by erosion, landslides, sedimentation, and unbalanced flow distribution (occurrence of floods and droughts). Another indicator can be seen from the shrinking area of forests and damage of land, especially protected areas around the watershed. This occurrence was caused by the increasing number of population which increased the intensity of land and water utilization [1].

Land management activities in a watershed that do not pay attention to conservation principles has the potential to increase land use change and the occurrence of land erosion; eroded soils will be carried to the river and cause river silting due to sediment deposition [2]. Damage of land resources, especially in the upstream of the watershed, will reduce land productivity, affect production function, ecological function, and hydrological function of the watershed [3]. The upstream part of the watershed is usually intended for water catchment areas. So, the success of downstream watershed management depents on the success of watershed management in the upstream [4]. Successful management of land resources in the upstream area can save downstream areas, because it can decrease sedimentation, water pollution, flood risk, and drought [5].

Previous studies on the effects of land cover changes on air sediment and soil erosion, mostly carried out by spatial, numerical, and hydrological modeling [6]–[9]. Most studies focus on changing forest land cover and settlements on water yields and sedimentation of soil erosion. In addition, scientific papers on the effects of land cover on water and sediment yields on a watershed in Indonesia are still difficult to find. The study area has a characteristic where rainfall is high from November to March and dry in the following month. The purpose of this study was to analyze trends in land use

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Growth and fabrication of 850 nm AlGaAs/GaAs vertical cavity surface emitting laser structure

N I Cabello*, P M Tingzon, H A Husay, J D Vasquez, R Jagus, K L Patrocenio, K C Gonzales, G A Catindig, E A Prieto, A Somintac, A Salvador and E Estacio

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Abstract. In this work, we demonstrate the NIP's all in-house development of a vertical cavity surface emitting laser structure. The VCSEL structure grown via MBE consists of an AlAs/AlGaAs distributed Bragg reflector and an AlGaAs/GaAs quantum well designed to issue at the 850 nm region. Reflectance spectroscopy showed that the stop band is centered around the designed wavelength. The electroluminescence spectra displayed that the maximum light emission corresponded to its design. This is a crucial step in the NIP's development of semiconductor lasers, leading towards future high-speed and highly-tunable VCSEL devices.

1. Introduction

Semiconductor lasers have been at the forefront of high-speed interconnects, thanks to the development of lasers capable of operating at gigahertz speeds [1]. Expansion to other applications such as proximity sensing [2] and light detection and ranging (LIDAR) [3] have driven further research on this field. For high-speed devices, switching speeds at the gigahertz range are desired [1], while high tuning speeds and increased tunability are sought for wavelength-tunable devices [4]. With its molecular beam epitaxy (MBE) and device fabrication facilities, the National Institute of Physics (NIP) has recently renewed its research thrust in this field, most notably on vertical cavity surface emitting lasers (VCSELs).

The VCSEL is a type of semiconductor laser with light emission orthogonal to the wafer plane. Its main advantages over other conventional semiconductor lasers such as edge-emitting lasers are the ease of coupling to optical fibers, direct wafer scale probing and low threshold operation [5]. A standard VCSEL design is composed of an optical cavity with an active region in the center, which is usually a quantum well (QW). The optical cavity is then sandwiched between two distributed Bragg reflectors (DBRs), which are highly reflecting mirrors composed of alternating high and low refractive index medium materials. The stop band of the DBR, which is the wavelength region with the highest reflectance, should coincide with the QW emission wavelength. Oxidation apertures, usually situated near the active region, are also employed for optical and current confinement [6].

In this paper, we report on the all in-house development of an AlGaAs/GaAs-based DBR VCSEL structure at the chip level. The whole process entails the whole production processes: the growth of the layers, device fabrication, and characterization of both as-grown and device-fabricated layers. Oxidation was also performed to explore the possibility of current and optical confinement effects [6].

2. Experimental Details

IOP Conf. Series: Journal of Physics: Conf. Series **1217** (2019) 012022 doi:10.1088/1742-6596/1217/1/012022

An investigation of a CT noise reduction using a modified of wiener filtering-edge detection

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Abstract. The aims of this study were to investigate the noise reduction in a CT image using a modified Wiener filtering-edge detection method. We modified the noise reduction algorithm of a combination of the Wiener filter and edge detection by addition of a dilation stage after edge detection. We then evaluated kernel size of the Wiener filter, threshold values in the edge detection, and size of structuring elements in the dilation process. Images of adult anthropomorphic and self-built wire phantoms were acquired by the new 4-row multislice CT Toshiba Alexion™. The images of the anthropomorphic phantom were used for a visual evaluation, while the images of the wire-phantom were used to obtain the spatial resolution and noise of the images. A Wiener filter-edge detection filter coupled with dilation, potentially reduced more CT noise. We found that the spatial resolution and noise of the filtered images were influenced by the size of the Wiener filter kernel, threshold of edge detection, and size of structuring element.

1. Introduction

Several approaches have been proposed to reduce CT dose without compromising image quality. One method has been proposed is the tube current modulation (TCM) [1, 2]. In TCM, tube currents decrease and increase proportionally with the decreasing and increasing attenuation of body parts [3]. Tube current modulation could be implemented by the rotation of the x-ray tube (angle-modulation) or by modulation in the direction of the longitudinal axis (Z-modulation), or a combination of both [4]. Another method proposed for reducing the dose is to utilize iterative reconstruction (IR) [5], instead of filtered back-projection (FBP). In fact, the IR technique is not only iterative during reconstruction but also iteratively processes in either the sinogram [6] or image spaces [7], in accordance with the specific physical modeling or statistical approaches. There are several IR software products used by major CT vendors including ASIR, AIDR, VEO, IRIS, SAFIRE, and iDose [8]. However, the details of the algorithms are very sparse, and they are still considered proprietary algorithms [5].

Another method that can be used for CT dose reduction is the use of noise reduction in the image space [8]. A noisy image due to acquisition with a small tube current-time (mAs) parameter can have

Implementation of lyapunov method to analyze the stability of pompano, cantang growth and nutrition dynamical systems

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Abstract. This study aims to determine the analysis stability of dynamical model of pompano, cantang growth, and nutrition on the Integrated Multi-Trophic Aquaculture (IMTA) systems by using the Lyapunov method. The analytical analysis was given to discuss the dynamic behavior of this model. Global stability analysis was performed based on the Lyapunov theory, i.e., construction the function $V(x)$ that is a definite positive scalar function and the derivative of $V(x)$ is defa inite negative. As a verification of the Lyapunov method, we conducted numerical simulations with data taken from IMTA systems in Sea Farming region, Kepulauan Seribu, Indonesia.

1. Introduction

IMTA system is a cultivation practice with the maintenance of more than one species of organism or a polyculture system, but the cultivated species are those that have a mutualistic relation ecologically as a food chain in the area. Polyculture cultivation is now widely researched and studied because it can improve water quality. The integration of seaweed Eucheuma and Gracilaria sp sp into the activities of polyculture of tiger shrimp (Penaeus monodon) and milkfish (Chanos Chanos) in an integrated manner to get maximum yields than monoculture cultivation and more efficient use of land [1]

Cultivation is also widely developed in an attempt to fulfill the nutritional needs of humans [2]. The development of polyculture cultivation Integrated Multi-Trophic Aquaculture (IMTA) can increase economic benefits and minimize the negative impact of aquaculture on the environment [3], the impact of sediment and water quality [4]. During the process of growing fish need good nutrition. Feeding too much of an impact on the environment such as the analysis of water quality due to floating net cages [5, 6].

In the culture system IMTA types of marine life that are often cultivated as pompano fish farming and cantang star because the value of consumption is very high. The market demand for this fish is good enough both of the pompano and cantang besides the rapid growth and relatively high resale value [7].

There are many studies on the management cultivation of monoculture and polyculture system. However, a most mathematical model developed to predict the growth is a dynamical model in monoculture. On the other hand, the mathematical model for the polyculture system is still minimal with the stability analysis of this mathematical model only in the analysis of local stability around the