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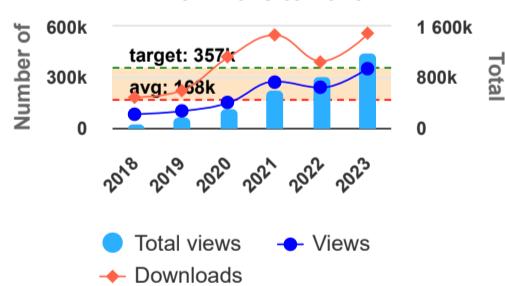
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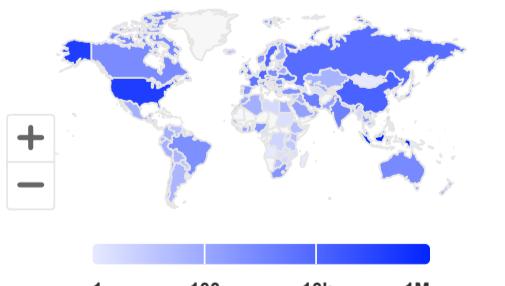
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The Social Life Cycle Assessment in Traditional Brick Production to Formulate Recommendation and Improve Environmental Working Condition

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ABSTRACT

Achieving sustainable manufacturing has been recognized as a critical need due to the decrease in non-renewable natural resources, strict regulations related to the environment, and occupational health and safety. The brick industry is favored because it has a wide market and requires simple equipment and manufacturing processes. However, there are complaints from residents regarding the smoke from the production process which is considered disturbing to residents. Therefore, the study is aimed to assess the life cycle of bricks from the social aspect of the stakeholders involved. Data is collected with the questionnaire and scored from three different stakeholders Workers, the Local Community, and Society. The method used in this study is Social Life Cycle Assessment (S-LCA) using UNEP-SETAC 2009 guidelines. From the seven social impact categories used in the study, it is found that the average score of seven subcategories is 3,53 which means that the brick factory has a positive social impact on the stakeholders. The category with the lowest score is Socio-Economic followed by Health and Safety. Both lied in the neutral area indicating the brick factory can improve its production process especially in managing the carbon emission that could affect workers and the local community.

Keywords: Social Life Cycle Assessment, Brick Production Evaluation, Sustainability, Social Impacts

ABSTRAK

Ketercapaian manufaktur berkelanjutan dianggap sebagai kebutuhan penting suatu perusahaan manufaktur karena adanya penurunan sumber daya alam tak terbarukan, peraturan lingkungan yang ketat, serta pentingnya kesehatan dan keselamatan kerja. Industri batu bata merupakan industri unggulan karena memiliki pasar yang luas dan hanya membutuhkan peralatan dan proses pembuatan yang sederhana. Namun, asap dari proses produksinya mengganggu dan menjadi keluhan warga. Oleh karena itu, penelitian ini bertujuan untuk menilai dampak hidup batu bata dari aspek sosial *stakeholder* yang terlibat. Pengumpulan data dilakukan melalui pembagian kuesioner yang dinilai oleh tiga *stakeholder* berbeda, yaitu *Workers*, *Local Community*, dan *Society*. Metode yang digunakan adalah *Social Life Cycle Assessment* (S-LCA) berdasarkan pedoman UNEP-SETAC 2009. Tujuh kategori dampak sosial yang digunakan memberikan nilai rata-rata sebesar 3,53 yang berarti bahwa pabrik batu bata memiliki dampak sosial yang positif bagi *stakeholder*. Nilai terendah didapatkan pada kategori *Socio-Economic*, kemudian diikuti oleh kategori *Health and Safety*. Kedua kategori tersebut berada di area netral yang menandakan bahwa pabrik batu bata dapat meningkatkan proses produksinya menjadi lebih baik terutama dalam mengelola emisi karbon yang dapat berdampak pada pekerja dan masyarakat sekitar.

Kata Kunci: Social Life Cycle Assessment, Evaluasi Produksi Batu Bata, Sustainabilitas, Dampak Sosial

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1. Introduction

The manufacturing industry has a significant impact on global growth and development due to the increasing population and increasing demand for products to improve the quality of life. Therefore, manufacturing plays a very important role both in the economic and social systems because it will contribute to job creation and increase the standard of living (Haapala et al., 2013). However, the

manufacturing industry is often blamed as a major source of environmental degradation and other social problems (Azapagic & Perdan, 2000).

Currently, sustainable manufacturing is a very important issue among industries around the world. Achieving sustainable manufacturing has been recognized as a critical need due to the decrease in non-renewable natural resources, strict regulations related to the environment, occupational health, and

Pemetaan Sebaran Tempat Penampungan Sampah Sementara (TPS) di Kecamatan Sintang menggunakan Sistem Informasi Geografis (SIG)

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ABSTRAK

Konsekuensi dari pertumbuhan penduduk dan aktivitas manusia adalah peningkatan jumlah sampah. Kesadaran masyarakat yang cenderung masih kurang untuk membuang sampah pada tempat yang telah ditentukan menyebabkan munculnya TPS ilegal. Penelitian ini bertujuan untuk memetakan sebaran lokasi TPS legal dan ilegal menggunakan SIG dan menganalisis kesesuaian lahan yang digunakan sebagai lahan TPS legal di Kecamatan Sintang. Merupakan penelitian observasi deskriptif, dimana dilakukan survey untuk mengambil titik koordinat TPS legal dan ilegal menggunakan GPS, menentukan pola persebarannya menggunakan metode Analisis Tetangga Terdekat, dan menganalisis kesesuaian lahan yang digunakan untuk lokasi TPS legal menggunakan metode skoring. Hasil dari penelitian ini didapatkan jumlah TPS legal adalah 15 TPS yang tersebar di beberapa titik di Kecamatan Sintang dengan nilai indeks analisis tetangga terdekatnya 1,54 dan pola persebarannya menyebar (*dispersed*). Sementara jumlah TPS ilegal ada 8 titik dengan nilai indeks analisis tetangga terdekatnya 1,79 dan pola persebarannya menyebar (*dispersed*). Untuk kesesuaian lahan TPS legal didapatkan hasil 1 lokasi TPS legal termasuk dalam kelas 1 yang berkategori sangat sesuai, 6 lokasi TPS legal termasuk dalam kelas 3 yang berkategori kurang sesuai, dan 8 lokasi TPS legal termasuk dalam kelas 4 yang berkategori tidak sesuai.

Kata kunci: Tempat Pembuangan Sampah, Analisis Tetangga Terdekat, Skoring, Pemetaan, Kelas Kesesuaian Lahan, Kecamatan Sintang

ABSTRACT

The consequence of population growth and human activities is an increase in the amount of waste. Public awareness that tends to be lacking to dispose of waste in a predetermined place has led to the emergence of illegal waste shelters. This study aims to map the distribution of legal and illegal waste shelters locations using Geographic Information System (GIS) and analyze the suitability of land used as legal waste shelters land in Sintang District. This research is a descriptive observational study, in which a survey was conducted to take the coordinates of legal and illegal waste shelters using Global Positioning System (GPS), determine their distribution pattern using the Nearest Neighbor Analysis method, and analyze the suitability of the land used for legal waste shelters locations using the scoring method. The results of this study showed that the number of legal waste shelters was 15 waste shelters spread across several points in Sintang District with an index value of the Nearest Neighbor Analysis is 1.54 and the pattern of distribution is dispersed. Meanwhile, there are 8 illegal waste shelters with an index value of the Nearest Neighbor Analysis is 1.79 and the pattern of distribution is dispersed. For legal waste shelters land suitability, the results showed that 1 legal waste shelter location was included in grade 1 which is in the very suitable category, 6 legal waste shelters locations were included in grade 3 which is in the less suitable category, and 8 legal waste shelters locations were included in grade 4 which is not suitable.

Keywords: Waste Shelters, Nearest Neighbor Analysis, Scoring, Mapping, Land Suitability Class, Sintang District.

Citation: Saraswati, Y., Arifin, dan Irsan, R. (2023). Pemetaan Sebaran Tempat Penampungan Sampah Sementara (TPS) di Kecamatan Sintang menggunakan Sistem Informasi Geografis (SIG). Jurnal Ilmu Lingkungan 21(2), 238-244, doi:10.14710/jil.21.2.238-244

1. Pendahuluan

Permasalahan sampah saat ini menjadi salah satu problema besar di Indonesia dan negara-negara berkembang lainnya. Keberadaan sampah merupakan

salah satu konsekuensi dari adanya aktivitas manusia. Peningkatan jumlah penduduk dan kebiasaan membuang sampah sembarangan menjadi salah satu faktor utama meningkatnya keberadaan sampah.

Pengaruh Gas CO₂ Terhadap Pertumbuhan, Kandungan Asam Lemak, Lipid, dan Karotenoid Total *Chlorella emersonii*

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ABSTRAK

Karbon dioksida (CO₂) yang berasal dari kegiatan industri, merupakan salah satu penyebab gas rumah kaca yang berkontribusi terhadap pemanasan global. Belakangan ini mikroalga banyak diminati karena kemampuannya dalam biofiksasi CO₂, sebagai sumber karbon pada proses fotosintesis. Mikroalga memiliki potensi untuk mengurangi emisi CO₂, serta biomassa yang dihasilkan dapat dimanfaatkan sebagai bahan baku obat, maupun bahan baku biodiesel. Penelitian ini bertujuan untuk menganalisis efek paparan gas CO₂ tinggi terhadap kandungan karotenoid dan lipid mikroalga *Chlorella emersonii*. Waktu pemaparan CO₂ 99,90% dilakukan setiap 5; 10; 15; 20 menit per hari selama 28 hari. Biomassa yang dihasilkan, diekstrak karotenoid total dan lipid total yang diukur menggunakan analisis spektrofotometri dan gravimetri. Lipid diesterifikasi dengan metode modifikasi metanol-HCl-transesterifikasi dan dikarakterisasi menggunakan *Gas Chromatography-Mass Spectroscopy* (GC-MS). Hasil penelitian menunjukkan bahwa, stres lingkungan yang disebabkan paparan gas CO₂ selama 10 menit, menurunkan biomassa sebesar 45,17%, disertai peningkatan lipid dan kandungan asam lemak sebesar 52,31% dan 73,42%, dengan kandungan karotenoid total optimal 8,54 µg/mL. Budidaya *Chlorella emersonii* merupakan solusi yang efisien dan berkelanjutan untuk mengatasi masalah cemaran gas CO₂, efek stres yang dihasilkan dapat menjadi strategi untuk meningkatkan kandungan karotenoid, lipid dan asam lemak yang berpotensi untuk biodiesel.

Kata kunci: Fiksasi CO₂, *Chlorella emersonii*, profil asam lemak

ABSTRACT

Carbon dioxide (CO₂) from industrial activity, is one of the most important greenhouse gasses contributing to global warming. Recently, microalgae have gained a lot of interest due to their ability to utilize CO₂ as a carbon source for photosynthesis. Microalgae have the potential to reduce CO₂ emissions, and biomass produced can be used as medicine materials and biodiesel feedstock. The aim of this research was to analyze the effect of exposure to high CO₂ gas on the carotenoid and lipid content of the microalgae *Chlorella emersonii*. CO₂ 99,90% gas exposure times were observed for 5; 10; 15; 20 minutes per day for as long as 28 days. Biomass was produced, extracted for total carotenoid and total lipid, measured using a spectrophotometer and gravimetric analysis. Lipid was esterified by a modified methanol-HCl-transesterification method and characterized using Gas Chromatography-Mass Spectroscopy (GC-MS). The results showed that due to environmental stress with CO₂ gas in 10 minutes of exposure, the decrease in biomass was 45,17%, accompanied by increased lipid and fatty Acid content levels of 52,31% and 73,42%, with carotenoid content optimal at 8,54 µg/mL. Cultivation of *Chlorella emersonii* is an efficient and sustainable solution to reduce CO₂ pollution, the effects of stress provide a strategy to increase carotenoid, lipid, and fatty acid content which have the potential for biodiesel.

Keywords: CO₂ fixation, *Chlorella emersonii*, fatty acid profile

Citation: Yani, R., Dharma, A., dan Rilda, Y. (2023). Pengaruh Gas CO₂ Terhadap Pertumbuhan, Kandungan Asam Lemak, Lipid, dan Karotenoid Total *Chlorella Emersonii*. Jurnal Ilmu Lingkungan, 21(2), 245-250, doi:10.14710/jil.21.2.245-250

1. Pendahuluan

Statistical Review of World Energy (2020) melaporkan bahwa, pada tahun 2009-2019 di Indonesia, terjadi peningkatan emisi gas CO₂ dari 388,3 juta ton menjadi 632,1 juta ton, oleh emisi industri, seperti industri energi, industri batubara, dan minyak (BP, 2020). Hal ini menjadi permasalahan terkait Indonesia berkomitmen untuk menurunkan emisi CO₂ sebesar 26% atau 0,767 Gton CO₂e (Pemerintahan Republik Indonesia, 2010). Oleh

karena itu, dibutuhkan pengembangan teknologi fiksasi CO₂ untuk mewujudkan komitmen tersebut. Mengangkat dari permasalahan ini, Teknologi yang tengah dikembangkan sebagai agen biofiksasi CO₂ yakni menggunakan mikroalga (Razzak et al., 2017). Mikroalga dapat memfiksasi CO₂ tanpa memerlukan lahan yang luas, ramah lingkungan serta 10-50 kali lebih efisien dibandingkan tumbuhan tingkat tinggi (Adamczyk et al., 2016).

Kemampuan Ampas Tahu dalam Proses Koagulasi Logam Berat Krom (Cr) pada Limbah Cair Pabrik Penyamakan Kulit

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Abstrak

Limbah cair penyamakan kulit merupakan limbah hasil produksi kulit mentah menjadi kulit yang sudah tersamakkan dengan menggunakan bahan penyamak krom. Pada proses produksi limbah cairnya masih mengandung krom sekitar 20-40% sebab saat produksi tidak semua bahan krom terikat pada kulit bila dibuang ke lingkungan maka dapat menyebabkan kanker paru-paru, kanker kulit, nekrosis tubulus ginjal, hiperpigmentasi kulit dan bahkan kematian. Berdasarkan hasil karakteristik limbah cair penyamakan kulit dengan menggunakan AAS (*Atomic Absorption Spectrometry*), dapat diketahui kadar logam berat krom(Cr) sebesar 501 mg/l. Ampas tahu merupakan salah satu bahan biosorben karena memiliki kandungan protein yang dapat mengikat logam berat. Kandungan protein dalam ampas tahu yang diperoleh sebesar 20,63%. Rancangan percobaan yang digunakan pada penelitian ini yaitu rancangan acak lengkap faktorial (RALF) dengan 2 faktor yaitu variasi berat ampas tahu (100 mg, 300 mg dan 500 mg) dan variasi waktu kontak (60 menit, 90 menit dan 120 menit). Ampas tahu memiliki kemampuan dalam menurunkan kadar logam berat krom (Cr) dari 35,97% sampai dengan 66,43% sehingga memiliki kemampuan sama dengan tawas yang ada dipasaran. Berat ampas tahu yang optimum dalam menurunkan kadar logam berat krom (Cr) yaitu variasi 100 mg. Waktu kontak optimum agar terjadi pengikatan logam berat krom (Cr) dengan ampas tahu yaitu selama 90 menit.

Kata kunci : limbah cair, pabrik penyamakan kulit, chromium (Cr), koagulasi, ampas tahu

Abstract

Leather tannery wastewater is a waste from the production of raw leather into leather that has been tanned using chrome tanning material. In the production process, the liquid waste still contains around 20-40% chromium because, during the production, not all of the chromium material is bound to the skin when discharged into the environment and because of that, it can cause lung cancer, skin cancer, renal tubular necrosis, skin hyperpigmentation even death. Based on the results of the characteristics of the tannery liquid waste using AAS (*Atomic Absorption Spectrometry*), it can be seen that the content of heavy metal chromium (Cr) is 501 mg / l. Tofu dregs is a biosorbent material because it contains protein that can bind heavy metals. The protein content in tofu dregs was 20.63%. The experimental design used in this study was a factorial completely randomized design (RALF) with 2 factors, namely variations in tofu pulp weight (100 mg, 300 mg, and 500 mg) and variations in contact time (60 minutes, 90 minutes and 120 minutes). Tofu dregs have the ability to reduce levels of heavy metal chromium (Cr) from 35.97% to 66.43% which means they have the same ability as an alum on the market. The optimum weight of tofu dregs to reduce heavy metal chromium (Cr) is a variation of 100mg. The optimum contact time of the heavy metal chrome (Cr) to bind tofu dregs is 90 minutes.

Keywords: liquid waste, leather tanning factory, chromium (Cr), coagulation, tofu dregs

Citation: Baun, J. Y., Yulianti, L. I. M., dan Pranata, F. S. (2023). Kemampuan Ampas Tahu dalam Proses Koagulasi Logam Berat Krom (Cr) pada Limbah Cair Pabrik Penyamakan Kulit. Jurnal Ilmu Lingkungan. 21(2), 228-237, doi:10.14710/jil.21.2.228-237

1. PENDAHULUAN

Industri penyamakan kulit merupakan industri yang mengolah berbagai macam kulit mentah, kulit setengah jadi (kulit pikel, kulit wet blue, kulit kras) menjadi kulit jadi. Industri ini sebagai salah satu penghasil devisa nonmigas bagi negara (Adib dkk, 2018). Industri ini tidak hanya berdampak positif bagi ekonomi negara, ada pula dampak negatif yang ditimbulkan bagi kualitas perairan di lingkungan sekitar pabrik, sebab dalam proses pembuatan kulit

menggunakan bahan penyamak yaitu krom (Cr). Penggunaan krom (Cr) memiliki dampak bagi kesehatan manusia dan biota perairan. Krom sebagai bahan penyamak ini penggunaannya memiliki tujuan lainnya yaitu agar komponen kolagen dan polipeptida dapat membentuk ikatan kompleks untuk mencegah penetrasi air pada pori-pori kulit sehingga menghambat pembusukan pada kulit (Mayasari dan Muhamad, 2016).