



International Conference on Environment,
Sustainability Issues, and Community
Development

CERTIFICATE OF APPRECIATION

No. : 1554/UN7.P/HK/2021

This certificate is presented to

Sri Hartini

for contributions as a

PRESENTER

in the 3rd International Conference on Environment, Sustainability Issues, and Community Development
“*Research and Innovation in Environmental Towards Sustainability in Disruptive Post-global Pandemic Situation*”
on September 9th, 2021



Dean

Prof. Ir. M. Agung Wibowo, M.M., M.Sc., Ph.D.
NIP. 196702081994031005



General Chair

Prof. Dr. Ir. Syafrudin, CES, M.T.
NIP. 195811071988031001



1 of 1

[Download](#) [Print](#) [Save to PDF](#) [Add to List](#) [More... >](#)

IOP Conference Series: Earth and Environmental Science • Open Access • Volume 896, Issue 1 • 12 November 2021 • Article number 012066 • 3rd International Conference on Environment, Sustainability Issues, and Community Development, INCRID 2021 • Semarang, Virtual • 9 September 2021 • Code 174583

Document type

Conference Paper • Bronze Open Access

Source type

Conference Proceedings

ISSN

17551307

DOI

10.1088/1755-1315/896/1/012066

View more

Eco-efficiency analysis of waste cooking oil recycling into liquid dish soap using life cycle assessment

[Hartini S.^a](#) ; [Widharto Y.^a](#); [Indarto S.R.^a](#); [Murdikaningrum G.^b](#)

Save all to author list

^a Department of Industrial Engineering, Diponegoro University, Indonesia^b Departement of Chemical Engineering, Insan Cendekia Mandiri University, Indonesia
 4^{97th} percentile
Citations in Scopus

 7,18
FWCI

 42
Views count
[View all metrics >](#)

Full text options Export

Abstract

Reaxys Chemistry database information

Sustainable Development Goals 2022

SciVal Topics

Metrics

Funding details

Abstract

Waste Cooking Oil (WCO) is an oil with a chemical composition containing carcinogenic compounds formed during frying and unsaturated fatty acids. Improper handling of WCO can cause environmental pollution, especially water and soil. However, several studies have provided information that WCO can

Cited by 4 documents

Impact of Environmental Economic Transformation Based on Sustainable Development on Financial Eco-Efficiency

Yin, L. , Liu, J.
(2023) *Sustainability (Switzerland)*

Strategies to improve the sustainability of the heterogeneous catalysed biodiesel production from waste cooking oil

Alanis, C. , Ávila Córdoba, L.I. , Álvarez-Arteaga, G.
(2022) *Journal of Cleaner Production*

Circular Economy-based Product Substitution Design Rationale

Hartini, S. , Prastawa, H. , Tjahjono, B.
(2022) *Journal of Industrial Engineering and Management*

[View all 4 citing documents](#)

Inform me when this document is cited in Scopus:

Set citation alert >

Related documents

Optimal treatment combination for dishwashing liquid soap based on waste cooking oil according to the requirement of Indonesian quality standards

Hartini, S. , Fiantika, Y. , Widharto, Y.
(2021) *Evergreen*

The use of consumer behavior to identify the flow mapping of waste cooking oil: A finding from Semarang, Indonesia

Hartini, S. , Sari, D.P. , Utami, A.A.
(2019) *IOP Conference Series: Materials Science and Engineering*

Circular Economy-based Product Substitution Design Rationale

Hartini, S. , Prastawa, H. , Tjahjono, B.
(2022) *Journal of Industrial Engineering and Management*



Semarang, Indonesia | Virtual Conference | 9th September 2021

The 3rd International Conference on Environment, Sustainability Issues and Community Development

“Research and Innovation in Environment Towards Sustainability in
Disruptive and Post-Global Pandemic Situation”

Registration

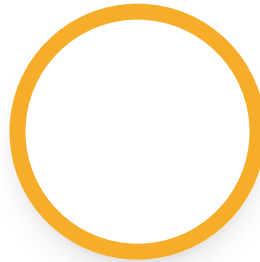
Schedule & Payment

Topics



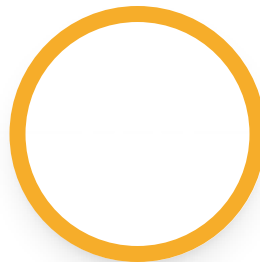
Environment, Health, & Safety

- Environment, health, and safety system
- Environmental modelling and computation
- Risk analysis



Environmental Science, Technology, and Education

- Waste management and treatment
- Water and wastewater engineering
- Environmental education



Green Infrastructure

- Life cycle assessment
- Green building and technology option

Energy Conservation and Efficiency

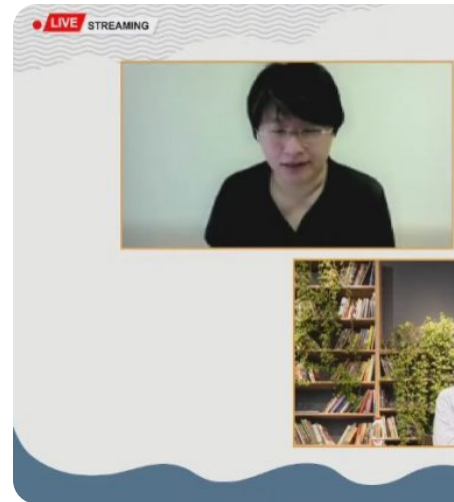
- Clean and renewable energy
- Climate change and global warming

About The 3rd INCRID

Engineering, Diponegoro University. With the theme of “Research and Innovation in Environment Towards Sustainability in Disruptive and Post-global Pandemic Situation”, this forum will promote all factors that related to environmental technology, science, education and innovation to achieve the desired sustainable development goals during this disruptive and pandemic situation. The previously accepted papers of INCRID 2020 have been published in IOP Conference Series: Earth and Environmental Science Vol. 623 (2021) ([see here](#)). This conference provides a unique platform for professionals, researchers, and academicians to share their experiences and explore the possible influence of sustainable living environment in the future.

After successfully held the 2nd INCRID 2020 with more than 100 selected papers published in the conference proceedings indexed by Scopus, we invite you to the Online Conference of 3rd INCRID 2021 on Sept 9th, 2021 with the theme “Research and Innovation in Environment Towards Sustainability in Disruptive and Post-global Pandemic Situation.” The conference will cover all research and development in the fields of environmental engineering and sciences related to sustainability development. Selected papers will be published in conference proceedings indexed by Scopus, and some national reputable journals: *Sustinere: Journal of Environment and Sustainability* (Indexed in Sinta 2) and *Jurnal Presipitasi: Media Komunikasi dan Pengembangan Teknik Lingkungan* (Indexed in Sinta 2)

Department of Environmental Engineering and the INCRID 2020 committees are concerned and take precautions regarding the transmission of COVID-19 (coronavirus). To maintain the health, safety, and security of the participants, the committee has plans to hold this conference through oral presentations remotely in live-streaming meetings if there is no better situation until August 2021.



Commitees

Steering Commitee



- Prof. Dr. rer. nat. Heru Susanto, M.M., M.T. (Universitas Diponegoro, Indonesia)
- Prof. Ir. Agung Wibowo, M.M., M.Sc., Ph.D. (Universitas Diponegoro, Indonesia)

Hosted By



Department of Environmental Engineering

Secretariat of INCRID

Department of Environmental Engineering, Faculty of Engineering,
Diponegoro University

Prof. H. Soedarto, S.H. – Tembalang, Semarang, Indonesia

Website: incrid.lingkungan.ft.undip.ac.id

Email: incrid@live.undip.ac.id

Preface

The International Conference on Environment, Sustainability Issues, and Community Development (INCRID) 2021 is the third annual international conference hosted by the Department of Environmental Engineering, Diponegoro University. With the theme of “Research and Innovation in Environment Towards Sustainability in Disruptive and Post-global Pandemic Situation”, this forum will promote all factors that related to environmental technology, science, education and innovation to achieve the desired sustainable development goals during this disruptive and pandemic situation. The INCRID 2021 was successfully held on 9th September 2021 in an online system where the 3rd floor of GKU, Faculty of Engineering, Universitas Diponegoro was used as conference host venue. The INCRID 2021 committees are concerned and take precautions regarding the transmission of COVID-19 (coronavirus). To maintain the health, safety, and security of the participants, the committee hold this conference through oral presentations remotely in live-streaming meetings using Zoom Application and youtube as the virtual platform (Please see this link for seeing how the virtual conference is going: <https://www.youtube.com/watch?v=VVBfCbLzVsA>). This meeting is important because the dissemination of research findings especially in the environmental science topics should be done annually, even in an virtual setting. The conference was attended by 255 participants came from 49 academic universities and institutions across the world which include as follows.

- 1) Universitas Diponegoro – **Indonesia**
- 2) Universitas Sebelas Maret – Indonesia
- 3) Universitas Negeri Semarang – Indonesia
- 4) Universitas Gadjah Mada – Indonesia
- 5) UIN Sunan Ampel Surabaya – Indonesia
- 6) Universitas Kebangsaan – Indonesia
- 7) Universitas Syiah Kuala – Indonesia
- 8) Universitas Andalas – Indonesia
- 9) Institute Teknologi Bandung – Indonesia
- 10) Universitas Sumatera Utara – Indonesia
- 11) Universitas Surabaya – Indonesia
- 12) Universitas Islam Agung (UNISSULA) – Indonesia
- 13) Universitas Negeri Padang – Indonesia
- 14) Universitas Indonesia – Indonesia
- 15) Institut Teknologi Kalimantan – Indonesia
- 16) Institut Teknologi Adhi Tama Surabaya – Indonesia
- 17) Centre of Industrial Pollution Prevention Technology (BBTPPI) – Indonesia
- 18) Center for Pulp and Paper, Ministry of Industry of the Republic of Indonesia – Indonesia
- 19) National Research and Innovation Agency Republic of Indonesia – Indonesia
- 20) Universitas Trisakti – Indonesia
- 21) Universitas IPB – Indonesia
- 22) Universitas Pendidikan Sultan Idris – Indonesia
- 23) Universitas Pasundan – Indonesia
- 24) Universitas Jenderal Soedirman – Indonesia
- 25) Institute Teknologi Sepuluh Nopember – Indonesia



- 26) Universitas Mahasarakswati Denpasar – Indonesia
- 27) Politeknik Indonesia Venezuela – Indonesia
- 28) Universitas Abulyatama – Indonesia
- 29) Insan Cendekia Mandiri Univeristy – Indonesia
- 30) Balai Besar Teknologi Pencegahan Pencemaran Industri – Indonesia
- 31) Visvesvaraya Technological University – India
- 32) University of Hyderabad – India
- 33) Makere University – Uganda
- 34) Ndejje University – Uganda
- 35) Frères Mentouri Constantine 1 University – Algeria
- 36) Skikda University – Algeria
- 37) Khenchela University – Algeria
- 38) HSE Department, Cooperation Petroleum – Egypt
- 39) University of Antananarivo – Madagascar
- 40) Hassan II Institute of Agronomic and Veterinary Medicine – Morocco
- 41) Department of Public Health Services, Ministry of Health – Gambia
- 42) Toyohashi University of Technology – Japan
- 43) Keio University – Japan
- 44) Kansai University – Japan
- 45) The University of Kitakyushu - Japan
- 46) National Central University – Taiwan
- 47) National Taiwan University – Taiwan
- 48) Queensland University of Technology – Australia
- 49) Sultan Idris Education University – Malaysia

The invited speakers for plenary sessions are as follows: Prof. Majeti Naramsiha Vara Prasad (University of Hyderabad, India), Prof. Takanobu Inoue (Toyohashi University of Technology, Japan), Prof. Ashanta Goonetilleke (Queensland University of Technology, Australia), Prof. Hsin-Hsin Tung (National Taiwan University, Taiwan), Prof. Dr. Ir. Purwanto, DEA (Diponegoro University, Indonesia), and A. Suko Widigdo, S.T., M. Eng. (Director of Operations I PT Adhi Karya (Persero) Tbk). Each of them are given 25 minutes to talk and 10 minutes to discussion. During the presentation, the committee share the link for collecting the questions from the audiences which can be seen from this link: <https://app.sli.do/event/lzwhmoea/live/questions>.

In the parallel sessions, there are 10 breakout rooms where 10-13 presenters were delivering their speech. The presenters were given 10 minutes of research presentation and 5 minutes of question and answer session. The participants could join the rooms by confirming to the committee which rooms they like. During the online meeting, the forum were still interactive where each of the presenter and audience have a nice discussion and exchange their knowledge. The parallel session also attract many potential research collaboration especially in the environmental science, engineering, education, and health research field. Most of the papers are sent to IOP Conference Series: Earth and Environmental Science for publication. The proceeding includes some topics of environmental science and system. The manuscripts are peer-reviewed by some researchers who are coming from many countries and expert in the environmental research field.

The committee wants to acknowledge the participants including the keynote speakers, presenters, reviewers, moderators, and also viewers who coming to this conference. The committee also acknowledge to the IOPP as the main publisher of our conference proceedings. We hope that the readers can gain many new and interesting scientific knowledge from the manuscripts which are published. The committee also wants to apologize for all of the mistakes that make unpleasant situation during the conference and also the published papers.

Scientific Committee of INCRID 2021

INCRID 2021 Committees**Steering Committee**

Prof. Dr. rer. nat. Heru Susanto, M.M., M.T. (Universitas Diponegoro, Indonesia) Prof. Ir. Agung Wibowo, M.M., M.Sc., Ph.D. (Universitas Diponegoro, Indonesia)

Scientific Committee

Prof. Dr. Ir. Ambariyanto, M.Sc. (Universitas Diponegoro, Indonesia)
 Emeritus Prof. M. N. V. Prasad (University of Hyderabad)
 Prof. Hamid Nikraz (Curtin University, Australia)
 Prof. Eddy Saputra (Universitas Riau, Indonesia)
 Prof. Takanobu Inoue (Toyohashi University of Technology, Japan)
 Prof. Ashanta Goonetilleke (Queensland University of Technology, Australia)
 Prof. Hsin-hsin Tung (National Taiwan University, Taiwan)
 Prof. Dr. Ir. Purwanto, DEA (Universitas Diponegoro, Indonesia) Dr. Haryono Setiyo Huboyo, S.T., M.T. (Universitas Diponegoro, Indonesia) Dr. Budi Prasetyo Samadikun, S.T., M.Si. (Universitas Diponegoro, Indonesia) Dr. Ir. Anik Sarminingsih, M.T. (Universitas Diponegoro, Indonesia) Pertiwi Andarani, S.T., M.T., M.Eng., Ph.D. (Universitas Diponegoro, Indonesia)
 (Dr. Cand.) Ganjar Samudro, S.T., M.T. (Yamaguchi University – Universitas Diponegoro) (Dr. Cand.) Titik Istirokhatun, S.T., M.Sc. (Kobe University – Universitas Diponegoro)

Organizing Committee

Prof. Ir. Syafrudin, CES., M.T. (Chairman)
 Dr. Ing. Sudarno, S.T., M.Si. (Vice Chairman)
 Bimastyaji Surya Ramadan, S.T., M.T. (Member)
 M. Arief Budihardjo, S.T., M.Eng.Sc., Ph.D. (Member) Dr. Ling. Sri Sumiyati, S.T., M.Si. (Member)
 Dr. Badrus Zaman, S.T., M.T. (Member)
 Nurandani Hardyanti, S.T., M.T. (Member) Dr. Budi Prasetyo Samadikun, S.T. M.Si. (Member) Arya Rezagama, S.T., M.T. (Member)

Table of contents

Volume 896

2021

◀ Previous issue Next issue ▶

The 3rd International Conference on Environment, Sustainability Issues, and Community Development 9 September 2021, Semarang, Indonesia (Virtual)

Accepted papers received: 13 October 2021

Published online: 12 November 2021

Open all abstracts

Preface

OPEN ACCESS 011001

Preface

+ Open abstract  View article  PDF

OPEN ACCESS 011002

Photographs

+ Open abstract  View article  PDF

OPEN ACCESS 011003

Peer Review Declaration

+ Open abstract  View article  PDF

Papers

OPEN ACCESS 012001

Stability performance of demolition waste composite as landfill liner

M A Budihardjo, M Hadiwidodo, I W Wardhana, E G Praptomo, B P Samadikun, A S Puspita and B S Ramadan

+ Open abstract  View article  PDF

OPEN ACCESS 012002

The effect of demolition waste composition on the landfill liner physical characteristic

M A Budihardjo, M Hadiwidodo, I W Wardhana, M R N A Tuasykal, B P Samadikun, I S Arumdani and B S Ramadan

This site uses cookies. By continuing to use this site, you agree to our use of cookies. To find out more, see our Privacy and Cookies policy.



Rainwater harvesting as an alternative of freshwater supply in Balikpapan city – a case study of Institut Teknologi Kalimantan

E T Mamangkey, R B Sukmara and Ariyaningsih

[+ Open abstract](#)

[View article](#)

[PDF](#)

Biosurfactant and chemical surfactant effectiveness test for oil spills treatment in a saline environment

M Leslie, E Kardena and Q Helmy

[+ Open abstract](#)

[View article](#)

[PDF](#)

Application of leachate recirculation on the concentration of landfill gases

I B Priyambada, B Widianarko, S B Sasongko and A S Puspita

[+ Open abstract](#)

[View article](#)

[PDF](#)

COD removal, decolorization, and energy consumption of electrocoagulation as a wastewater treatment process

E Marlina, P Purwanto and S Sudarno

[+ Open abstract](#)

[View article](#)

[PDF](#)

Comparison of wastewater treatment in oil and gas industry using conventional methods (chemical, physical and biological)

M Hamdy, Sudarno and H S Huboyo

[+ Open abstract](#)

[View article](#)

[PDF](#)

The challenges of Malay Kampung infrastructure as an Old Semarang cultural heritage area

M Rahdriawan, H Wahyono, S F Arief, F Amadeo and A Oktavian

[+ Open abstract](#)

[View article](#)

[PDF](#)

Environmental impact evaluation of crumb rubber industry production process by life cycle assessment (LCA) method (case study: PT FRP)

A Yerdianti and R Aziz

[+ Open abstract](#)

[View article](#)

[PDF](#)

Dry filtration technology application with activated carbon media to remove odor ammonia emissions from production process feed mill industry

N Harihastuti, S Djayanti and I R J Sari

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012048

Total mercury pathways from artisanal and small-scale gold mining in Sukabumi using system dynamics model

A Sunaryani and Y S Ridwan

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012049

Effect of electrode configuration and voltage variations on electrocoagulation process in surfactant removal from laundry wastewater

W Oktiawan, B P Samadikun, Junaidi, I G N Bramahesa, T A Taqiyya, M R Amrullah and C Basyar

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012050

Environmental impact of tofu production in West Jakarta using a life cycle assessment approach

I P Sari, W Kuniawan and F L Sia

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012051

Assessing enablers to a circular economy in Indonesian furniture industry using Fuzzy-DEMATEL

P A Wicaksono, T R Naufal, S Saptadi and A Susanty

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012052

Nitrate concentration and accumulation on vegetables related to altitude and sunlight intensity

H Agusta, J G Kartika and K R Sari

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012053

Urban river water quality improvement in Bandung City, Indonesia

Y M Yustiani and T Alfiah

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012054

This site uses cookies. By continuing to use this site you agree to our use of cookies. To find out more, see our Privacy and Cookies policy.



Estimation of greenhouse gas emission from household activities during the COVID-19 pandemic in Binjai City, North Sumatera

I Suryati, A Hijriani and I Indrawan

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012055

The potential and prospect of biomass as primary energy in Indonesia

A I D Lantasi, Syafrudin and Budiyo

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012056

The cellulose of *Boehmeria nivea* as natural flocculants: synthesis, modification, and flocculation analysis

D Fauzani, S Notodarmojo, M Handajani, Q Helmy and T Kardiansyah

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012057

Spatial distribution change of groundwater quality in deep aquifer of Semarang alluvial plains area in past five years

Susanto, Syafrudin and T T Putranto

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012058

A selection method of municipal solid waste reduction in East Lombok, West Nusa Tenggara Province

S Septarini, H S Huboyo and Sudarno

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012059

Proposing a new strategy to minimize domestic wastewater under the influence of human factor in Antananarivo, Madagascar

F F F V F Rasolonjatovo, H S Huboyo and Sudarno

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012060

The influence of bootstrapping in testing a model of motivation and visit intention of generation Z to the attractive building architecture destinations

R Purwaningsih, D A Sekarini, A Susanty and S N W Pramono

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012061

This site uses cookies. By continuing to use this site you agree to our use of cookies. To find out more, see our Privacy and Cookies policy.



Research trend on sustainable architecture: a bibliometric analysis emphasizing on building, material, façade, and thermal keywords

P U Pramesti, M I Hasan and M Ramandhika

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012062

Bioefficacy of microbial antagonists against *Zymoseptoria tritici* on wheat

I Barakat, N Chtaina, M E Guilli and B Ezzahiri

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012063

Analysis of waste composition as a source of refuse-derived fuel in Cilacap

D I Mustia, S Edy and A Nurul

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012064

Technical evaluation of ultrafiltration unit in Siwalanpaji's water treatment plant, PDAM Sidoarjo

F Rachmawati, B D Marsono, A Masduqi and A Purnomo

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012065

Environment carrying capacity of Pandawa Beach ecosystem and how to optimize it to support sustainable development

K Sumantra and I M W Wijaya

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012066

Eco-efficiency analysis of waste cooking oil recycling into liquid dish soap using life cycle assessment

S Hartini, Y Widharto, S R Indarto and G Murdikaningrum

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012067

Reduction of waste generation to extend the lifetime of landfill: review

R A Prasasti, M A Budihardjo and B P Samadikum

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012068

The Sendai Framework for disaster risk reduction: Insight from Covid-19 in Balikpapan City, Indonesia

Anyaningsih, R B Sukmara and L Pradita

This site uses cookies. By continuing to use this site you agree to our use of cookies. To find out more, see our Privacy and Cookies policy.



OPEN ACCESS

012069

Performance evaluation of waste management in MRF-3R (case study Sukoharjo District)

L S Wangi, S Sumiyati and A Sarminingsih

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012070

Effect of seawater intrusion on groundwater in the Demak coastal area Indonesia: a review

A W Pramita, S Syafrudin and D N Sugianto

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012071

Dynamic model of municipal solid waste management from households in Sukuta Nema, The Gambia

B Jassey, B Zaman and Syafrudin

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012072

Evaluation of river water quality by using hierarchical clustering analysis

B Warsito, S Sumiyati, H Yasin and H Faridah

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012073

Brackish water treatment for small community by using membrane technology

V R Auliya, B D Marsono, A Yuniarto and E Nurhayati

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012074

Comparative study on thermal comfort responses and sleep quality between Indonesian and Japanese students during summer in Japan

W Budiawan, K Tsuzuki and H Sakakibara

[+ Open abstract](#) [View article](#) [PDF](#)

OPEN ACCESS

012075

Removal of cyanide from alumina smelter wastewater using precipitation and filtration technique

M F Huda and Q Helmy



Eco-efficiency analysis of waste cooking oil recycling into liquid dish soap using life cycle assessment

S Hartini^{1*}, Y Widharto¹, S R Indarto¹, G Murdikaningrum²

¹Department of Industrial Engineering, Diponegoro University, Indonesia

²Departement of Chemical Engineering, Insan Cendekia Mandiri University, Indonesia

srihartini@lecturer.undip.ac.id

Abstract. Waste Cooking Oil (WCO) is an oil with a chemical composition containing carcinogenic compounds formed during frying and unsaturated fatty acids. Improper handling of WCO can cause environmental pollution, especially water and soil. However, several studies have provided information that WCO can be recycled into products that are more value-added and have economic potential. Previous research has succeeded in finding the best combination of treatments for making soap from waste cooking oil that meets the standards of SNI 06-2048-1990, namely with a concentration of 22.5% KOH, cooling method and adsorption of activated charcoal and kepok banana peels. This study intends to analyze the environmental impact if WCO is recycled into liquid dish soap. The analysis was carried out using Life Cycle Assessment with the help of simapro software. The recycling process has the most significant impact on indicators of climate change and acidification. The eco-efficiency index is included in the affordable and sustainable categories.

1. Introduction

The management of used cooking oil that has not been optimal causes the amount of WCO discharged into the environment to be still high and dangerous [1]. Therefore, the management of WCO has become a public concern in recent years [2]. Based on a survey in Semarang, 90% of households and 67.6% of culinary businesses dispose of noodles into sewers, soil, or garbage [3]. WCO waste is spread throughout Semarang City [4]. WCO can damage the water and soil environment [5], damage aquatic communities [6] and endangers human health. The discarded WCO waste causes the economic potential not to be utilized [7]. From previous studies, WCO disposed of without going through a recycling process contains a compound with an ecotoxicity effect (freshwater) of 0.43 PAF.m³.day. This value is equivalent to an eco-cost of 2.39x10⁻⁶ euros [8].

WCO recycling can produce more valuable products. WCO contains unsaturated fatty acids such as oleic acid, linoleic acid and triglyceride acid, which can be utilized in oil-based products, such as solid or liquid bath soap [9]. Bath soap is a compound of sodium or potassium with fatty acids from vegetable oils or animal fats in solid, soft, liquid and foamy and is used as a cleanser [10]. WCO can be used as raw material for making liquid soap after being filtered to remove spices, neutralized with KOH and the bleaching process. Hartini et al. [8] have conducted an experimental design for making liquid dish soap with 12 treatment combinations. The combination of treatments gave different effects on each parameter used. The pH parameter is influenced by the method of manufacture and KOH concentration, where the



Risk analysis-based reliability assessment approach under epistemic uncertainty using a dynamic evidential network

M Bougofa^{1*}, A Bouafia², A Baziz¹, S Aberkane³, R Kharzi¹, A Bellaouar¹

¹ Laboratory of Transportation Engineering and Environment, Frères Mentouri Constantine 1 University, BP 325 Constantine, 25017, Algeria.

² Chemical Engineering and Environment Laboratory, Skikda University, Skikda, 21000, Algeria

³ Department of psychology, Khenchela University, BP 1252 Road of Batna Khenchela, 40004, [Algeria](#)

mohamed.bogoffa@umc.edu.dz

Abstract. Probabilistic modeling is widely used in industrial practices, particularly for assessing complex systems' safety, risk analysis, and reliability. Conventional risk analysis methodologies generally have a limited ability to deal with dependence, failure behavior, and epistemic uncertainty such as parameter uncertainty. This work proposes a risk-based reliability assessment approach using a dynamic evidential network (DEN). The proposed model integrates Dempster-Shafer theory (DST) for describing parameter uncertainty with a dynamic Bayesian network (DBN) for dependency representation and multi-state system reliability. This approach treats uncertainty propagation across conditional belief mass tables (CBMT). According to the results acquired in an interval, it is possible to analyze the risk like interval theory, and ignoring this uncertainty may lead to prejudiced results. The epistemic uncertainty should be adequately defined before performing the risk analysis. A case study of a level control system is used to highlight the methodology's ability to capture dynamic changes in the process, uncertainty modeling, and sensitivity analysis that can serve decision making.

1. Introduction

In the last century, many industries have been complex and involved in the latest technological innovation. This technological development is accompanied by a continuous improvement of safety, which stays one of the main concerns in this field. Nowadays, the need for safety measures should be emphasized due to the possibility of catastrophic accidents resulting from this high innovation and development [1–2]. The safety engineer used many quantitative or qualitative methods for risk analysis such as failure mode and effects analysis (FMEA), what-if analysis, hazard and operability analysis (HAZOP), fault tree analysis (FTA), and Bayesian networks (B.N.) ... etc. Each method has its advantages and disadvantages. Most of these techniques are developed for treating aleatory and epistemic uncertainty using possibility theory, evidence theory, and fuzzy sets theory [3–4].

The B.N. has become more prevalent in reliability, availability, safety, and risk assessment for complex systems [5–7]. A review is presented in [8] that studied a recent brief statistical of B.N. applicability in the chemical and process industry. B.N. is applied as a dynamic safety analysis for a complex process. For example, Zarei et al. [9] applied a dynamic risk analysis approach for natural gas



Content from this work may be used under the terms of the [Creative Commons Attribution 3.0 licence](#). Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.

Holistic perspective to knowledge integration for performance of renewable and sustainable energy business

V Yadwad^{1*}, S R Bharamnaikar¹, U Bhushi¹

¹Visvesvaraya Technological University, Jnana Sangama, Belgaum, Karnataka 590018, [India](#)

v_yadwad@hotmail.com

Abstract. Power generation and consumption globally has always been on the top agenda for any country since it contributes to the basic needs of human beings. In the race of bridging the supply and demand gap, human beings created side effects in the name of environmental pollution. The alternate source of energy is renewable energy, and many nations are committed to adopting these new forms of energy generation; these still contribute lesser than one-fourth of global energy consumption and power generation. This study aims to focus on knowledge integration for the performance of the renewable business segment. It creates a more practical alternative against other forms of energy generations like Thermal, natural gas-based. There are areas like a waste of energy as an example where it is still a lesser-known world. Many measurement techniques are still explored, which suggests Knowledge plays a vital role in the Business Performance of Renewable and Sustainable energy and in implementing Global Climate Control Strategies. The study results indicate the energy sector's transformation into the renewable energy sector, highlighting innovations, knowledge integration, effect on performance, and role of management & government.

1. Introduction

Energy has many usages like power generation for electricity purposes, heat exchange requirements in process industries, and other services. The most generated energy was coal (thermal), water (hydro), natural gas, nuclear, oil. As every nation needed energy for primary usage like electricity, they have invested a lot of money and decades on these forms of energy. As the gap between supply and demand, the investment expanded from the government to private in most countries. However, this also has invited climate issues like environmental pollution, which is the biggest survival challenge of the earth and a threat to the future generation.

Here comes the importance of the new form of energies or earlier lesser prioritized form of energy sources like solar, wind, biofuel, geothermal, hydro, wave, tidal. The volume of energy (MW or GW) generated by earlier forms like thermal was not easy or even sometimes impossible in the new form of energy like solar and wind. Depend on the geography and other resources each nation has. However, the technologies and investments in research have explored out-of-the-box thinking ideas, and many nations already started investing in renewable and sustainable energy. It has created opportunities for more considerable change on a global level, but due to a gap of resources, including knowledge, the target time to achieve the transformation committed by most nations is challenging. Hence knowledge



Optimization of recycled polyethylene terephthalate plastic bottle fibers in grasscrete

A Etyangat^{1*}, P Tiboti², M Kayondo¹, H Bakamwesiga¹

¹Department of Civil and Environmental Science, School of Engineering, CEDAT, Makerere University, Kampala, Uganda

²Department of Civil Engineering, Faculty of Engineering, Ndejje University, Kampala, Uganda

aetyangat@gmail.com

Abstract. Cement and concrete production account for between 5% to 8% of global CO₂. Waste PET plastic and glass waste have also brought about rapid environmental degradation. Grasscrete was developed with glass powder of fewer than 75 microns (has pozzolanic properties) that performed 14% better than concrete at 90 days. So, to further this effort, this experimental research considered the glass create C20 (at 10% cement replacement) and added PET fibers (of aspect ratio 25) at different percentages of 1%, 2%, 3%, and 4% the weight of cement in a bid to optimize the grasscrete performance and its ability to absorb PET waste. Grasscrete being extremely brittle alone, failed by cracking at all percentage PET additions, thus improving its safety factor. A 1% PET fiber addition to grasscrete exhibited the highest strength properties compared to other percentage additions while having a durability of 1.5% better than concrete. It is thus recommended for structural uses as it outperforms concrete. Despite this, a 1% fiber addition decreased grasscrete's compressive strength by at least 3.5% at 28 days and 6% at 90 days but improved the flexural strength by 5.4% at 28 days and 0.8% at 90 days testing.

1. Introduction

Globally, fourteen million tons of waste glass and three hundred and eighty-one tons of waste plastic are disposed of annually [1]. 11 billion tonnes of concrete are consumed annually, making it the most used construction material in the world and contributes between 5% and 8% global CO₂ emissions [2]. To conserve the environment, engineers have constantly developed various ways to utilize recycled materials such as glass and plastics in various civil engineering applications. Studies have employed recycled polyethylene terephthalate bottles (PET) fibers in concrete and have recorded significant improvements in their mechanical properties [3]–[5].

This research will focus on finding improvements in the mechanical properties of grasscrete by the addition of recycled PET plastic fibers. So, engineers can better understand its performance in the field, especially in structural members. It will increase not only the recycling capacity of grasscrete but also its sustainability.

