

## SELECTION METHODS OF FLY ASH AND BOTTOM ASH UTILIZATION FROM STEAM POWER PLANT 350 – 500 MW AS BUILDING SUBSTITUTION MATERIAL

TITIEN SETIYO RINI<sup>1\*</sup>, YUWONO BUDI PRATIKNYO<sup>2</sup>, MARITHA NILAM KUSUMA<sup>3</sup>, WAHID  
DIANBUDIYANTO<sup>4\*</sup> AND NURINA FITRIANI<sup>4</sup>

<sup>1</sup>Study Program of Environmental Engineering, Faculty of Engineering, Universitas Wijaya Kusuma,  
Surabaya, Indonesia

<sup>2</sup>Study Program of Manufacture Engineering, Faculty of Engineering Universitas Surabaya, Surabaya, Indonesia.

<sup>3</sup>Study Program of Environmental Engineering, Faculty of Civil Engineering and Planning, Institut Teknologi Adhi  
Tama, Surabaya, Indonesia.

<sup>4</sup>Research Group of Technology and Environmental Innovation, Study Program of Environmental Engineering,  
Department of Biology, Universitas Airlangga, Surabaya, Indonesia

(Received 14 May, 2020; Accepted 25 June, 2020)

### ABSTRACT

Waste ash (fly ash and bottom ash) is the main waste in the operation of steam power plants, especially those that use coal fuel. Research on the use of this waste has been done a lot, as well as the use of this waste to make other products (brick, light brick, paving, mortar). But until now, each PLTU has not yet integrated to utilize this ash waste to its full potential. This paper aims to provide a selection method in optimizing and selecting alternative uses of ash (fly ash and bottom ash) so that it has a benefit value by examining waste utilization in detail in terms of production aspects, environmental aspects and economic aspects. The method used in selecting the utilization of ash waste as building substitution material is carried out gradually in terms of technical, production, economic and market aspects.

**KEY WORDS:** Fly ash, Bottom ash, Power plant

### INTRODUCTION

Fly ash and bottom ash are waste generated from burning coal in steam power plants. Fly ash is flying dust that is captured using an electrostatic precipitator. While bottom ash is the residual combustion that does not fly. Coal combustion waste itself is divided into 2 groups (Van Gerven *et al.*, 2015), there are bottom ash that is heavy ash and fly ash, which is fly ash/light.

The use of fly ash in various construction needs is based on considerations (Iyer and Scott, 2001) technical (benefits derived from the nature and property/character of fly ash material), environment (utilizing waste for useful purposes), and economy (produce more useful products).

Some objections to the use of fly ash, other than

because of technical factors that cause adverse effects, are due to the influence of hazardous substances in fly ash. Both bottom ash and fly ash can be used for various purposes. Based on Nurhayati *et al.* (2018), filtration membrane can be made using slip casting method. Other uses of ash are for concrete brick, lightweight bricks, and paving block. Concrete brick making is a product of building materials that is stronger than the brick making which is generally available on the market and is environmentally friendly because it reduces the hazardous waste produced by industry (Eliche-Quesada *et al.*, 2015). The advantage of this product is that its strength exceeds that which does not use an additional fly ash brick, a brick that does not use fly ash is a quality II can be upgraded to quality I with an optimum composition of fly ash. Light brick

is generally used to build high-rise buildings and residential buildings. Light brick has a lighter weight than red brick. This light weight causes lower load on the structure and lightweight bricks to be easily transported. Paving block is a product made from concrete that is used for floors with various purposes. The product to be produced can be used depending on the quality produced, quality A can be used for roads, quality B is used for parking equipment, quality C is used for pedestrians, quality D is used for parks and other uses. This is in accordance with the applicable standards for concrete bricks, SNI 03-0691-1996. In the use of fly ash and bottom ash to make paving blocks, fly ash serves to replace some cement because of its small particle size and is pollozonic (Chindaprasirt *et al.*, 2007). While bottom ash is used to replace aggregates which generally use sand, the use of aggregates with the right size is needed to ensure good compressive strength of concrete bricks, because if the aggregate is too large then there will be parts of concrete that are not filled with aggregate (Castonguay and Thomassen, 2005).

Concrete roof tile is a building material used for roofing made from an even mixture of portland cement or the like with aggregates and water with or without the use of pigments (Qin *et al.*, 2017). the special characteristic of concrete roof tiles is its strength against the flexural load regulated in SNI 0096: 2007 and tiles must be impermeable. Similar with concrete roof tile, ready mix concrete ready mix concrete is concrete that is mixed before being sent using a Molen truck to the construction site (Sobolev, 2009).

## MATERIALS AND METHODS

The stages of research on optimization studies and alternative uses of PLTU ash waste in terms of production, environmental and economic aspects. Collecting primary data, secondary data, and literature studies as well as determining the characteristics of PLTU Ash waste. The next step is gives alternative utilization of ash waste so that alternatives can be selected that are appropriate for the utilization of ash waste. Preparation and analysis of the system is required, so that studies can be done optimizing the utilization of waste ash. The next is optimizing the utilization of ash waste in terms of production, environmental and economic systems. The final stage is validation the system by looking at a case study in one of the existing power plants in

Indonesia.

## RESULTS AND DISCUSSION

### The coal ash waste potential of the PLTU 50 MW to 500MW

The remaining combustion results with coal produce ash called ash (5-10%). The percentage of ash (fly ash and bottom ash) produced is fly ash (80-90%) and bottom ash (10-20%). Sources of Paiton PJB Based on the Environmental Protection Agency (EPA). So that in the next 10 years the amount of ash waste generated by the power plant is 62.95 - 125.9 billion tons, with details of fly ash waste of 50.36 - 113.31 billion tons and bottom ash waste of 6.295-25.18 billion tons.

### Economical Aspects

Net present value (NPV) is the difference between the present value of cash inflows and the present value of cash outflows over a period of time. NPV is used in capital budgeting and investment planning to analyzed the profitability of a projected investment or project. NPV Value (in USD) for utilization fly ash and bottom ash from steam power plant 350 – 500 MW can be seen in Figure 1.

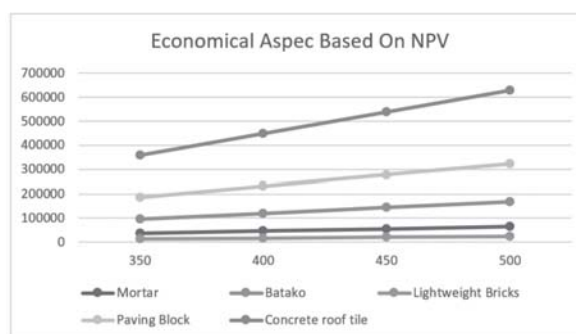


Fig. 1. Economical Aspect Based On NPV

The payback period refers to the amount of time it takes to recover the cost of an investment. Simply put, the payback period is the length of time an investment reaches a breakeven point. The desirability of an investment is directly related to its payback period. Shorter paybacks mean more attractive investment. Payback period (in year) for utilization fly ash and bottom ash from steam power plant 350 – 500 MW can be seen in Figure 2.

A benefit-cost ratio (BCR) is an indicator, used in cost-benefit analysis that attempts to summarize the overall value for money of a project or proposal. A

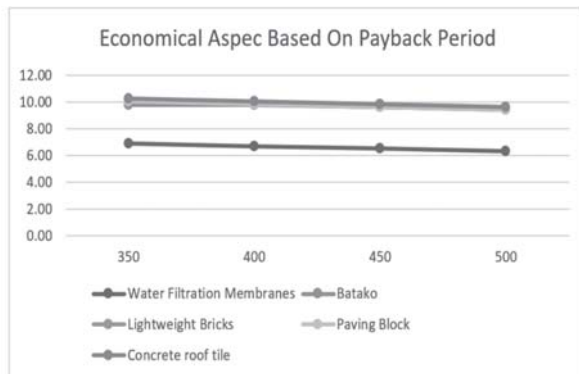


Fig. 2. Economical Aspect Based On Payback Period

BCR is the ratio of the benefits of a project or proposal, expressed in monetary terms, relative to its costs, also expressed in monetary terms. Benefit cost ratio (in percent) for utilization fly ash and bottom ash from steam power plant 350 – 500 MW shown in Figure 3.

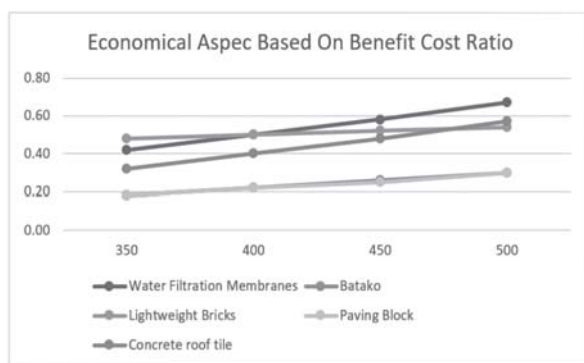


Fig. 3. Economical Aspect Based on Benefit Cost

Ratiodegradation, bio-removal treatments are beneficial for reducing food toxicity without losing the nutritional quality. The utilization of microorganisms in the removal of toxic heavy metals has been widely carried out. Lactic acid bacteria (LAC) microorganisms are widely known as safe probiotic microorganisms and are best known for reducing toxic metals from heavy metals. When fish eat food that contains probiotics, the microbes will help maintain the balance of the digestive tract and may be useful for the treatment of pathogens or infections. This bioremediation probiotic can adapt to extreme conditions exposed to Cd through resistance mechanisms either by heavy metal ion biosorption mechanisms, compiling complex cell walls, or inducing enzymatic systems to convert toxic heavy metals into non-toxic ones.

## CONCLUSION

The selection of alternative uses of ash (fly ash and bottom ash) at the PLTU in accordance with the capacity and type of ash waste in detail in terms of production aspects and environmental aspects can be done more quickly so that it makes it easier for decision makers to choose alternative uses of ash waste. Reducing the effect of Fly ash and bottom ash waste globally can be done, so that within the next 10 years the amount of ash waste generated by the power plant is 62.95 - 125.9 billion tons, with details of Fly ash waste amounting to 50.36 – 113.31 billion tons and bottom ash of 6.295-25.18 billion tons.

## REFERENCES

- Castonguay, B. and Thomassen, M. 2005. U.S. Patent Application No. 29/203, 963.
- Chindaprasirt, P., Jaturapitakkul, C. and Sinsiri, T. 2007. Effect of fly ash fineness on microstructure of blended cement paste. *Construction and Building Materials*. 21 (7) : 1534-1541.
- Eliche-Quesada, D., Sandalio-Pérez, J. A., Martínez-Martínez, S., Pérez-Villarejo, L. and Sánchez-Soto, P. J. 2018. Investigation of use of coal fly ash in eco-friendly construction materials: fired clay bricks and silica-calcareous non fired bricks. *Ceramics International*. 44(4): 4400-4412.
- Iyer, R. S. and Scott, J. A. 2001. Power station fly ash—a review of value-added utilization outside of the construction industry. *Resources, Conservation and Recycling*. 31(3) : 217-228.
- Nurhayati, C. and Susanto, T. 2015. The Utilization of Coal Fly Ash as Ceramic Membranes for the Unit of Peat Water Treatment. *Journal of Industrial Research Dynamics*. 26 (2) : 95-105.
- Sobolev, K. 2009. Chapter 11: Methods of concrete manufacturing and curing. In ICE manual of Construction Materials: Volume I: Fundamentals and theory; Concrete; Asphalts in road construction; Masonry (pp. 101-116). Thomas Telford Ltd.
- Van Gerven, T., Van Keer, E., Arickx, S., Jaspers, M., Wauters, G. and Vandecasteele, C. 2005. Carbonation of MSWI-bottom ash to decrease heavy metal leaching, in view of recycling. *Waste Management*. 25 (3) : 291-300.
- Qin, Y., He, Y., Wu, B., Ma, S. and Zhang, X. 2017. Regulating top albedo and bottom emissivity of concrete roof tiles for reducing building heat gains. *Energy and Buildings*. 156 : 218-224. DOI://doi.org/10.1016/j.enbuild.2017.09.090

ISSN 0257-8050

# POLLUTION RESEARCH

EM INTERNATIONAL

VOL. 39 (4) : 2020

Ads by Google

[Stop seeing this ad](#) [Why this ad?](#)

## Pollution Research

### COUNTRY

India

Universities and research institutions in India

### SUBJECT AREA AND CATEGORY

Environmental Science  
Pollution  
Water Science and Technology

### PUBLISHER

EM International

### H-INDEX

**23**

### PUBLICATION TYPE

Journals

### ISSN

02578050

### COVERAGE

1997-2020

### INFORMATION

[Homepage](#)  
[How to publish in this journal](#)

Open Access Journal  
 NN Journals Are Double-Blind Peer-Reviewed Open Access  
 Available Online [nnpub.org](http://nnpub.org)



### SCOPE

POLLUTION RESEARCH is one of the leading environmental journals in world and is widely subscribed in India and abroad by Institutions and Individuals in Industry, Research and Govt. Departments.

 Join the conversation about this journal

Ads by Google

[Stop seeing this ad](#) [Why this ad?](#)

Global decarbonization by 2040  
Energy Impact Center is a Washington, DC based research center. energyimpactcenter.org

FIND SIMILAR JOURNALS ?

options ⋮

- 1  
**Nature Environment and Pollution Technology**  
IND

**62%**  
similarity
- 2  
**International Journal of Environmental Research**  
CHE

**61%**  
similarity
- 3  
**International Journal of Environmental Science and IRN**

**60%**  
similarity
- 4  
**Indian Journal of Environmental Protection**  
IND

**58%**  
similarity
- 5  
**Journal of Environmental Management**  
USA

**54%**  
similarity



**Pollution Research**

← Show this widget in your own website

Just copy the code below and paste within your html code:

```
<a href="https://www.scimagojr.com" style="color: #e91e63; text-decoration: none;">

```

powered by scimagojr.com

**SCImago Graphica**

Explore, visually communicate and make sense of data with our **new free tool**.

Get it

**Open Access & Peer Reviewed**

Learn More About How to Publish and our Partnership with Hindawi.

Hindawi Open

Metrics based on Scopus® data as of April 2021

P **Prof PK Gupta** 1 month ago  
Is Pollution Research j is Scopus covered for 2021??

reply



**Melanie Ortiz** 1 month ago

SCImago Team

Dear Prof PK Gupta,  
Thank you very much for your comment.  
All the metadata have been provided by Scopus /Elsevier in their last update sent to SCImago, including the Coverage's period data. The SJR for 2020 was released on 17 May 2021. We suggest you consult the Scopus database directly to see the current index status as SJR is a static image of Scopus, which is changing every day.  
Best Regards, SCImago Team

**L** **Lycia Gitirana** 1 year ago

I would like to know why the works published in this magazine seem to have no "doi". In my country, this indication is fundamental. Is there any forecast by the journal to have this indicator in its works?

reply



**Melanie Ortiz** 1 year ago

SCImago Team

Dear Lycia, thank you very much for your comment. Unfortunately, we cannot help you with your request, we suggest you contact the journal's editorial staff so they could inform you more deeply. Best Regards, SCImago Team

**P** **PIJU DAS** 1 year ago

DEAR SIR/MADAM  
I AM NOT ABLE TO FIND THE ARTICLE IN SCOPUS WEB PUBLISHED IN POLLUTION RESEARCH JOURNAL WHICH IS SCOPUS INDEXED.

reply

**R** **Ranata** 1 year ago

I experienced something similar to you, my article in the journal Pollution Research Issue: Vol 38, Issue 3, 2019, until now I can not trace / not detected in Scopus, very sad to see this condition



**Melanie Ortiz** 1 year ago

SCImago Team

Dear Piju,  
thank you very much for your comment, unfortunately we cannot help you with your request. We suggest you contact Scopus support: [https://service.elsevier.com/app/answers/detail/a\\_id/14883/kw/scimago/supporthub/scopus/](https://service.elsevier.com/app/answers/detail/a_id/14883/kw/scimago/supporthub/scopus/)  
Best Regards, SCImago Team

**T** **Thivyanathan Nirmala** 1 year ago

is it approved by University Grants Commission. If this journal is approved by UGC, then i can publish papers in it. ans.pl.

reply



**Melanie Ortiz** 1 year ago

SCImago Team

Dear Thivyanathan,  
Thank you for contacting us. SJR is a portal with scientometric indicators of journals indexed in Elsevier/Scopus. Unfortunately, we cannot help you with your request referring to the index status. We suggest you to consult Scopus database (see the current status of the journal) or other databases (like WoS, UGC, etc.) for further information. You can also check that information in the journal's website or contact directly with the editorial staff.  
Best Regards, SCImago Team

**M** **meysam.noori** 3 years ago

Re: Cancer Risk Assessment from Benzene exposure for Gas Station's employees

As a Volatile Organic Compound (VOC), benzene is a carcinogen affecting the circulatory, respiratory, reproductive, and nervous systems. The main purpose of this research was to determine the risks of occupational exposure to benzene for the employees at Resalat Gas Station in the City of Tehran and people living in its vicinity. Thereby calculating the quantitative rates of cancer and non-cancer risks of benzene in the work place. In this empirical and analytical study, 8 air samples from Resalat Gas Station were randomly selected at 3 different times during: morning, noon, and at night. The air samples were collected by using a sampling pump (SKC Co., England) at a flow rate of 0.3 l/min based on the National Institute for Occupational Safety and Health (NIOSH) standards. The samples were analyzed using a Gas Chromatography-Flame Ionization Detector (GC-FID). Cancer risk for the employees exposed to benzene was quantitatively calculated to be  $6.271 \times 10^{-6}$ , the non-cancer risk was 0.00225 which is significantly below 1. The results were indicative of a relatively high cancer risk for the individual's exposure to benzene at Resalat Gas Station.

reply



**eddiwan kamaruddin** 3 years ago

This journal is very interesting to me, because this journal mission matches my background. For that I plan to contribute to this journal.

Please provide information, is this journal still active in 2018? Thank you

reply

**K Karthick J** 2 years ago

Please check for the scopus status at scopus website and proceed for the publication. Because in scopus site, the scopus period seems to be end up by 2018. After publishing if its not scopus indexed, then your research paper will not be recognized



**Elena Corera** 3 years ago

SCImago Team

Dear Eddiwan,

articles published in 2018 are not over yet (we are in September). 2018 indicators will not be available until June 2019. We cannot see what will happen in the future with this journal. SCImago receives the data from Scopus / Elsevier annually and does not have the authority to include, exclude or modify the data provided by Scopus.

Best Regards,  
SCImago Team

**A Abhieshek Sharma** 3 years ago

Good morning sir,  
I am interested in research in water pollution , so please join me sir.  
Thank you sir.

reply



**Elena Corera** 3 years ago

SCImago Team

Dear Abhieshek Sharma,

thank you very much for your comment. If you need bibliographic information or full text, we suggest you do a Scopus research or contact your librarian.

Best Regards,  
SCImago Team

#### Leave a comment

Name

Email

(will not be published)



I'm not a robot  
reCAPTCHA  
Privacy - Terms

The users of Scimago Journal & Country Rank have the possibility to dialogue through comments linked to a specific journal. The purpose is to have a forum in which general doubts about the processes of publication in the journal, experiences and other issues derived from the publication of papers are resolved. For topics on particular articles, maintain the dialogue through the usual channels with your editor.

Developed by:



Powered by:



Follow us on @ScimagoJR

Scimago Lab, Copyright 2007-2020. Data Source: Scopus®

EST MODUS IN REBUS  
Horacio (Bates) J. J. 1992



## Pollution Research Editorial Advisory Board

### Chief Editor

**Dr. R.K.Trivedy, Pune, India**  
 Email Id- [rktrivedy@gmail.com](mailto:rktrivedy@gmail.com)  
 Tel: 91-20-46745115  
 Mobile No.-9975703363

### EDITORIAL ADVISORY BOARD

1. Dr. Marck Bricka, Professor, Mississippi State University, U.S.A	<a href="mailto:bricka@che.msstate.edu">bricka@che.msstate.edu</a>
2. Dr. I.C. Onyema, Professor, Deptt. of Marine Sciences, University of Lagos, Akoka, Lagos, Nigeria	<a href="mailto:ionyema@unilag.edu.ng">ionyema@unilag.edu.ng</a>
3. Dr. Michael Green, Prof. Emeritus, Civil and Environment Engg. Technion, I.I.T., Haifa 32000, Israel	<a href="mailto:agmgreen@technion.ac.il">agmgreen@technion.ac.il</a>
4. Dr. L.O. Chukwu, Professor, Department of Marine Sciences, University of Lagos, Nigeria	<a href="mailto:obinnalocunilag@yahoo.com">obinnalocunilag@yahoo.com</a>
5. Dr. Prof. N.C. Gupta, Professor, Deptt. of Environmental Science and Technology, GGIP Univ., New Delhi	<a href="mailto:ncgupta@jpu.ac.in">ncgupta@jpu.ac.in</a>
6. Dr. S.I. Kolesnikov, Professor, Academy of Biology and Biotech. D.I. Ivanovsky, Southern Federal Univ. Russia	<a href="mailto:kolesnikov@srfedu.ru">kolesnikov@srfedu.ru</a>
7. Dr. Prof. J. Narayan, Professor and Head, Department of Environmental Science, Kuvempu University, Karnataka, India	<a href="mailto:narayana@kuvempu.ac.in">narayana@kuvempu.ac.in</a>
8. Dr. Neeka Jacob, Head, Research and Development at Petroleum Technology, PTDF, Abuja, Nigeria	<a href="mailto:neekajacob@uph.ng">neekajacob@uph.ng</a>
9. Dr. A.H. Subraty, Prof. and Dean, University of Mauritius, Mauritius	<a href="mailto:deanfmhs@uom.ac.mu">deanfmhs@uom.ac.mu</a>
10. Dr. K. Mathew, Director National Small Wind Turbine Test Centre, Murdoch University, Australia	<a href="mailto:kuruwilla@murdoch.edu.au">kuruwilla@murdoch.edu.au</a>
11. Dr. T. Bahorun, Professor, Department of Biosciences, Mauritius University, Mauritius	<a href="mailto:tbahorun(.@.)uom.ac.mu">tbahorun(.@.)uom.ac.mu</a>
12. Dr. C.K.Kale, Dean, Krishna Institute of Allied Sci., K.I.M.S., Deemed to be Univ., Karad, M.S., India	<a href="mailto:deankibb@kimskarad.in">deankibb@kimskarad.in</a>
13. Dr. Prof. Azni Idris, Deputy Vice Chancellor (Res. & Innovation), Universiti Putra Malaysia, Malaysia	<a href="mailto:azni@upm.edu.my">azni@upm.edu.my</a>
14. Dr. Prof. D.J. Lee, Professor, Department of Chemical Engineering, National Taiwan University, Taiwan	<a href="mailto:dilee@ntu.edu.tw">dilee@ntu.edu.tw</a>
15. Dr. Margaret Greenway, Professor Griffith University, Australia	<a href="mailto:m.greenway@griffith.edu.au">m.greenway@griffith.edu.au</a>
16. Dr. Prof. Ir. Diana Arfiati, Professor, School of Fisheries and marine Sciences, University of Brawijaya, Indonesia	<a href="mailto:d-arfiati@ub.ac.id">d-arfiati@ub.ac.id</a>
17. Dr. A. Giacometti, Professor, Department of Environmental Science, University of Venice, Venice, Italy	<a href="mailto:giacomet@unive.it">giacomet@unive.it</a>
18. Dr. Prof. A.K. Dikshit, Professor, Centre for Environmental Science, I.I.T., Mumbai, India	<a href="mailto:dikshit@iitb.ac.in">dikshit@iitb.ac.in</a>
19. Dr. Prof. Ajit Pratap Singh, Professor and Dean, Birla Institute of Technology, Pilani, Rajasthan, India	<a href="mailto:aps@pilani.bits-pilani.ac.in">aps@pilani.bits-pilani.ac.in</a>
20. Dr. Prof. S.A. Abbasi, Professor, Deptt. of Environmental Science, Pondicherry University, Puducherry, India	<a href="mailto:abbasi.cpee@gmail.com">abbasi.cpee@gmail.com</a>

21. Dr. Prof. A.R. Ghosh, Professor, Department of Environmental Science, Burdwan University, Burdwan, India	<a href="mailto:apurbaghosh2010@gmail.com">apurbaghosh2010@gmail.com</a>
22. Dr. Prof. Deenbandhu Sahoo, Professor, Department of Botany, University of Delhi, India	<a href="mailto:dbsahoo@hotmail.com">dbsahoo@hotmail.com</a>
23. Dr. Prof. D.P. Singh, Professor, Dept. of Environmental Sciences, Dr. B.B.A. University, Lucknow, India	<a href="mailto:dpsingh_lko@yahoo.com">dpsingh_lko@yahoo.com</a>
24. Dr. Prof. Toan Vu, Duc, Professor, Thuyli University, Hanoi, Vietnam	<a href="mailto:toanvd@wru.vn">toanvd@wru.vn</a>
25. Dr. Suresha, Huta, Senior Environmental Consultant, Environmental Company, Saudi Arabia	<a href="mailto:vaishnavisureshg@yahoo.com">vaishnavisureshg@yahoo.com</a>
26. Dr. Duangrat Inthorn, Professor, Department of Environmental Health, Mahidol University, Bangkok, Thailand	<a href="mailto:phdit@mahidol.ac.th">phdit@mahidol.ac.th</a>
27. Dr. Prof. V. Arutchelvan, Professor, Dept. of Civil Engineering, Annamalai University, Annamalainagar, India	<a href="mailto:arul.au@gmail.com">arul.au@gmail.com</a>
28. Dr. Prof. T.N. Singh, Professor (Presently Vice-Chancellor, Kashi Vidyapeeth Univ., Varanasi) Department of Geology, I.I.T, Mumbai, India	<a href="mailto:vc@mgkvp@ac.in">vc@mgkvp@ac.in</a>
29. Dr. Vijaya Ilango, Associate Professor Department of Chemistry, Birla Institute of Technology and Science, UAE	<a href="mailto:vilango@dubai.bits-pilani.ac.in">vilango@dubai.bits-pilani.ac.in</a>
30. Dr. Prof. R.M. Naraynan., Professor and head Dept. of Civil Engineering, Dr. M.G.R. Deemed to be Univ., Chennai, India	<a href="mailto:narayanan.rm@drmgrdu.ac.in">narayanan.rm@drmgrdu.ac.in</a>
31. Dr. Kudrat-E-Khuda (Babu), Assoc. Prof. & Head, Dept. of Law, Daffodil Intern. Univ., Bangladesh	<a href="mailto:kekbabu@gmail.com">kekbabu@gmail.com</a>
32. Dr. V.N. Janakirajan, Assoc. Prof., Department of Biochemistry, Govt. Medical College, Erode, India	<a href="mailto:vjnigeetha@gmail.com">vjnigeetha@gmail.com</a>

# POLLUTION RESEARCH

VOL. 39 (4) : 2020

## CONTENTS

- 825–829 Water Pollution in Bangladesh, Its Causes and Impacts: An Analysis Based on Existing Regulatory and Institutional Framework  
—*Kudrat-E-Khuda (Babu)*
- 830–838 Assessment of the Physico chemical and Biological Quality of the Ourika Catchment  
—*Yassine Schahrakane, Hanane Idali, Naaima Benjeloun, Abdelatife Khatabi, Wahbi Abderrazik and Ouadia Tazi*
- 839–841 Effect of Region in Broiler Meat Pollution by Heavy Metal in Kirkuk Governorate, Iraq  
—*Adnan Shakor Ahamed Al-Perkhdro, Thikra Ahmed Hassan and Ammar Qahtan Shanoon*
- 842–855 Spatial and Seasonal Variations of the Particulate Matters (PM<sub>10</sub>) at Selected Sites in the State of Kuwait Air within the Period 2010–2014  
—*Eman Ahmed Kalander and Sura Al-Harashsheh*
- 856–863 Analysis of the Hydraulic Characteristics of Al Mahawil Stream Using Hecras: A Field Study  
—*Atheer Zaki Mohsin AlQaisi and Rusul Ihsan Abdulridha*
- 864–871 Developing an Enterprise Risk's Early Warning System for Manufacturing Industry in Lesotho Using RDI  
—*Bernard Moeketsi Hlalele and Reitumetse Pearl Motati*
- 872–878 Evaluation of Physicochemical and Bacteriological Parameters of Effluents in Taza Hospital-Morocco-Application of Principal Component Analysis (PCA)  
—*I. Touzani, M. Machkor, O. Boudouch, I. El Machrafi, R. Flouchi and K. Fikri-Benbrahim*
- 879–885 Pesticide Exposure of Rice Farmers and Herbicide Residue in Paddy Field, Suphan Buri, Thailand  
—*K. Suwannahong, A. Sridon, T. Pitaksilp, W. Pongstaporn and Y. Sudjaroen*
- 886–891 Geochemical Speciation of Vanadium and Nickel from Selected Mangrove Areas Along the West Coast of Peninsular Malaysia  
—*Jafaru Malam Ahmed, Ahmad Ismail and Syaizwan Zahmir Zulkifli*
- 892–900 Chemical Modification of Castor Oil as Adsorbent Material for Oil Content Removal from Oilfield Produced Water  
—*Ali A. Hassan, Raid T. Hadi, Adil H. Rashid and Ahmed Samir Naje*
- 901–910 Use of Epipellic Algae as A Bioindicator to Determine Water Quality of Al-Diwanyia River, Diwanyia (Iraq)  
—*Fikrat M. Hassan, Bassam M. Al-Yaseen and Azal Abbas*
- 911–916 Air Pollution of Carbon Monoxide: A Case Study on City Traffic Jam  
—*Devi Angeliana Kusumaningtiar, Gisely Vionalita and Septian Ardiansyah*
- 917–924 Decontamination of Leachates Using *Moringa oleifera* and *Hibiscus rosa-Sinensis* as Coagulants Aids  
—*Agbor R.B., Edu N.E. and Odok E.N*
- 925–934 The Possibility of Heavy Metal Accumulation in To Lich River Water, Irrigation Water, Cultivation Land and Vegetable Products in Bang B Hamlet, Thanh Tri District, Ha Noi, Viet Nam  
—*Pham Thi To Oanh and Vu Duc Toan*
- 935–939 Performance Evaluation of (n-Butanol with Tri-Sodium Phosphate) for Regeneration of (10W-40) Spent Oil Lubricant  
—*Mudhaffar Yacoub Hussein, Zuhair Kudhair Abbas, Quraish Abbas Kadhum and Ahmed Samir Naje*
- 940–945 Impact of Lockdown Due to Covid-19 on Aqi in 3 Major Hotspots of Delhi : A Before and After Study  
—*Prateek Malhotra, Ruby Chauhan, Paridhi Gupta and Prakamya Arorat*

- 946–952 Defense Strategy of Mangrove *Avicennia Marina* Facing Heavy Metals (Pb, Cd, and Cu) Pollution at Mangrove Area, Semarang and Jepara Coastal Waters, Central Java Indonesia: A Prospect To Phytoremediation  
—*B. Yulianto, W.A. Wijaya, Sunaryo, O.K. Radjasa and A. Soegianto*
- 953–965 Evaluation of the Impact of Diamond Mining on the Radio-ecological State of the Arctic Zone Ecosystems (Example of Arkhangelsk region, Russia)  
—*Evgeny Yakovlev and Alexander Malov*
- 966–970 The Correlation of Lead (Pb) Content on Leaves of Puring (*Codiaeum Variegatum*) Cultivar Croton to Stomata's Number in Surabaya, Indonesia  
—*Reny Eka Agustin, Hamidah and Thin Soedarti*
- 971–979 Risk Assessment for Pm 10 and Pm 2.5 in Hanoi, Vietnam: An Ecological Study  
—*Do Thi Lan Chi, Vu Duc Toan, Quach Ha Linh, Vu Van Chien and Vu Thu Huyen*
- 980–984 Bioremediation Potency of Probiotics on Cadmium Pollution to Improve Fish Reproductive Health  
—*Alfiah Hayati, Agus Supriyanto, Listijani Suhargo, Suhailah Hayaza and Adamu Ayubu*
- 985–996 A River Water Quality Monitoring, Assessing and Developing a Community Based Eco-Heart Index Tool Kit for Cauvery River  
—*C. Ramprasad, Karthik Sona, Mohammed Afridhi and Ram Kumar*
- 997–1001 Recycling Waste SMS as a Source of Fuel Bioethanol  
—*A.S. Deshmukh*
- 1002–1008 Experimental Investigation on Low Temperature Glow Plasma Based Exhaust Separation and Purification for Static and Dynamic Applications of Internal Combustion Engine  
—*Akhilesh K. Dewangan, Isham Panigrahi, R.K. Paramguru and Prakash Ghose*
- 1009–1016 Synthesis of Polymer Inclusion Membranes Based on PVC Containing Copoly-EDVB 4% as a Carrier for Removal of Phenol Solutions  
—*Candra Saka, Agung Abadi Kiswandonono and Sutopo Hadi*
- 1017–1025 Performance Study on Sewage Treatment Plants in Delhi based on Adopted Advanced Technologies  
—*V. Hima Jwala, P. Brahmaji Rao and S. Agrawal*
- 1026–1033 Study on the Characteristics and Utilization of Nasipadang, General Restaurant and Housing Waste at Pekanbaru, Indonesia  
—*Hasan Basri Jumin, Jamel, Andi A. Syahputra, Ernita, Sulhaswardi and T. Rosmawaty*
- 1034–1037 Biomethanation of High Solid Containing Distillery Spentwash Using Developed Acclimatized Microbial Consortia  
—*Raghunath Vishnu Burase, Sanjay Vasantrao Patil and Rajendra D. Joshi*
- 1038–1041 Biosorption Efficacy of Isolated Bacterial Strain for Nickel Removal from Synthetic Solution  
—*Simmi Goel and Parminder Kaur*
- 1042–1046 Kalidami Retention Ponds Phytoremediation With Nutrient Addition from *Scenedesmus* Sp: A Microlagae  
—*Rheny Ratnawati, Indah Nurhayati, Nareswara Titis and Nur Indradewi Oktavriti*
- 1047–1060 Surface Water Quality Assessment Using Multivariate Statistical Technique and Water Quality Index (WQI) Modelling in the Upper Ganga River, India  
—*Satish Prasad, Ridhi Saluja, Varun Joshi and J.K. Garg*
- 1061–1073 An Analysis to Understand the Air Quality Pattern of North Indian Cities  
—*Era Upadhyay, Jhumoor Biswas, Mugdha Nayak, Saikat Ghosh, P. Chaitanya and Manali Datta*
- 1074–1081 The Utilization of Spoiled Rice as a Local source of Microorganism for Composting and its Effects on Ph, Temperature, Microbes, P, K, C, N, C/N ratio, and Compost  
—*Indasah and Nurina Fitriani*

- 1082–1088 Evaluation of Photocatalytic Dye Degradation Efficacy of ZnO Nanoparticles Synthesized by Sol-Gel Method at Different Calcination Temperatures  
—*Kavithayeni V., Akash Prabhu S., Prakash V., Rabinder Henry and Jayant Pawar*
- 1089–1092 Biogas Generation from, EC and TDS Reduced, Coir Pith  
—*Priya V. and Sampath Kumar M.C.*
- 1093–1097 Fuel of the Future : Bioethanol from *P. florida* SMS  
—*A. S. Deshmukh*
- 1098–1107 Phytoplankton Nutrient Dynamics of two Lentic Habitats in Eastern India  
—*Partha Talukdar, Amit Swarnakar and Ruma Pal*
- 1108–1111 Microalgae Growth and Nutrient Recovery of *Chlamydomonas Reinhardtii* 11/32c Cultivated Under Laboratory-controlled Condition  
—*Anie Yulistyorini, M.A. Camargo-valero and Agoes Soegianto*
- 1112–1115 Pesticides Residues in Vegetables of Godwar Area (Bali, Falna and Sadri) of Western Rajasthan, India  
—*Sangeeta Parihar, Sarika Nagar and Raina Jadhav*
- 1116–1121 Toxicity of Cd and Cu to Milk Fish (*Chanos chanos*): Considerations of Osmoregulation and Histological Changes in Gills  
—*Diana Hidayati and Agoes Soegianto*
- 1122–1130 Implementation of New Technologies in Solid Waste Management of Patna: An Appraisal of Patna Municipal Corporation  
—*Sneha Swarup, Usha Verma and Ravish Kumar*
- 1131–1136 Assessing the Efficacy of Idol's Immersion Water Pool, a Case of Barharwa Ghat, Patna, India  
—*Bijay Kumar Das, Reena Singh, Ravish Kumar and Anjali Pathak*
- 1137–1139 Selection Methods of Fly Ash and Bottom Ash Utilization from Steam Power Plant 350 – 500 Mw as Building Substitution Material  
—*Titien Setiyo Rini, Yuwono Budi Pratiknyo, Maritha Nilam Kusuma, Wahid Dianbudiyanto and Nurina Fitriani*
- 1140–1147 Comparative Assessment of Phytoaccumulation Potential of Mustard and Wheat Grown in Nickel Contaminated Soil - A Phytoremediation Approach  
—*Hemanta Kumar Patra, Nilima Patnaik, Deepak Kumar Patra, Srinivas Acharya and Chinmay Pradhan*
- 1148–1158 Taxonomic Enumeration of Blue Green Algae of Tea Garden Area of Mangaldoi Sub Division Darrang District Assam, India  
—*Matiur Rahman, Rane Das and G.C. Sarma*
- 1159–1161 Studies on the Ventilatory Function Among the Allied Health Sciences Students of Brainware University, Kolkata, West Bengal  
—*Gopeshwar Mukherjee, Sriparna De and Animesh Dey*
- 1162–1167 Assessment of Cytotoxic Potential of Tartrazine (E102) on Meristematic Cells of *Vicia Faba*  
—*Madhumita Bhattacharjee*
- 1168–1174 Upflow Roughing Filter in Series as Alternative Pretreatment in Water Treatment Plant Siwalanpanji, Sidoarjo, Indonesia  
—*Maritha Nilam Kusuma, Wahyono Hadi, Nur Indradewi Oktavetri, Talent Pramestiyawati, Rachmanu Eko Handriyono and Ro'du Dhuha Afrianisa*
- 1175–1179 Comparative Photocatalytic Degradation of Thiazine Dyes Over Visible Light Active Nickel Bismuth Iodide  
—*Suraj Sharma, Jayanti Samota, Shipra Bhardwaj and Kumud Intodia*

- 1180–1187 Treatment of Potable Water Samples Using Eco-Friendly *Phyllanthus emblica* – A Solution for Water Pollution  
—Thamarai Selvi C., Ravichandran S., Boselin Prabhu S.R., Prashanth G.K., Krishnaiah G.M. and Sathyananda H.M.
- 1188–1192 Haematological Profile of Blood in Laying Hens Growth Phase Consuming Aflatoxin Contaminated Ransum  
—E. R. Wilujeng, H. Eliyani, M. Hariadi, B. C. Tehupuring, M.G. A. Yuliani, K. Rachmawati and G. A. Hendarti
- 1193–1195 Correlating Road Traffic Equivalent Noise Levels to Various Physical and Atmospheric Parameters  
—Akanksha Kaushal
- 1196–1202 Studies on Tannase Producing Bacteria from Soil  
—Sumita Hanamant Patil, Bhalerao Kiran, Ghumare Gayatri and Muthal Dakshata
- 1203–1207 Histopathological Feature of Gills of African Catfish (*Clarias Gariepinus*) Exposed to Lead Nitrate  
—Galuh Esti Prabaningsih, Thomas Valentinus Widiyatno, Dewa Ketut Meles, Arimbi, Widjiati and Eka Pramyrtha Hestianah
- 1208–1215 Potential Biosorbent Derived from *Phoenix dactylifera* for the Removal of Heavy Metals from the Aqueous Solution  
—R. Kavitha Saraswathi, Anitha A. and Vinitha U.
- 1216–1220 Study of Subjective Wellbeing of Adult Population in Arsenic Contaminated Rural Areas of West Bengal  
—Pallabi Pattnaik
- 1221–1228 Impact of Bbiopesticide *Beauveria bassiana* (Balsamo) Vuillemin on Behavior of termite *Odontotermes obesus* (R.) Caste  
—Anjana Intodia, Arti Prasad and Bharati Veerwal
- 1229–1233 The Influence of Guava Extract (*Psidium guajava* L.) on Histopathological Feature of White Rat (*Rattus Norvegicus*) exposed Cigarette Smoke  
—Mentari Rachmawati, Ratna Damayanti and Wurlina
- 1234–1241 The Impact of Firework Activity on Air Quality in Visakhapatnam City of Andhra Pradesh, India  
—Kavitha Chandu and Madhavaprasad Dasari
- 1242–1250 Assessment of Microbial Pollution in Drinking Water in and Around Pune City, Maharashtra, India  
—Patwardhan R. B., Abhyankar P. S. and Ambade S. V
- 1251–1255 Effect of Grant Leaf Extract (*Moringa oleifera* Lam) on Histopathological Feature of White Rat (*Rattus Norvegicus*) Testis Exposed Hot Temperature  
—Nur Hidayat, Budi Utomo, Budiarto, Rochman Kurnijasanti, Djoko Legowo and Erma Safitri
- 1256–1261 Decreasing Organic Matter in Waste Water from Sangkuriang Catfish Aquaculture (*Clarias Gariepinus*) Using Attachment Media and Bacterial Consortium  
—Diana Arfiati, Shofiyatul Lailiyah, Karina Farkha Dina, Erlangga Adialam, Alya Rahma Maghfira and Novia Ananda Sari
- 1262–1265 Antibiotic Resistance Profile of *Escherichia Coli* Isolated from Beef Sold at Several Wet Market in Sidoarjo, Indonesia  
—P. B. Pratiwi, S. Hidanah, M. H. Effendi, A. T. S. Estoepangestie, D. Rahardjo and Wiwiek Tyasningsih
- 1266–1272 Assessment of Heavy Metals Concentrations in Migratory Bird Tissue (*Gallinula chloropus*) in Southern Iraq  
—Salwa A. Abdul Jaleel
- 1273–1283 Assessment of Air Pollution Tolerance Index and Evaluation of Air Pollution Anticipated Performance Index of Various Plants and their Application in Planning of Moradabad City, India  
—Anshuman Gupta, Mukesh Kumar, Anju Chauhan, Atul Kumar and Anamika Tripathi

## CONTENTS

V

- 1284–1291 **No-auxiliary Fuel Incinerator Low Emission (Nafile) for Destroying Unusable Plastic In Urban Areas**  
—*Abdu F. Assomadi, Rachmat B. Santoso, Arie D. Syafei, Agus Slamet and Joni Hermana*
- 1292–1296 ***Leucas lavundulifolia* Ameliorates Experimentally Induced Sodium Arsenate Toxicity in Intestinal Epithelial Cells Through Abrogation of Oxidative stress**  
—*S.A. Salmataj and Shobha Kamath*
- 1297–1301 **Freshwater Algal Tolerance to Organic Pollution: A Review**  
—*Najmus Sakib Khan and Naznin Akter Tisha*