## Scopus

#### **Documents**

Periaiah, N.a, Islam, R.b, Abdullah, M.F.c

**Environmental Impact Assessment For Malyasian Bauxite Mining Industry** 

(2021) International Journal of the Analytic Hierarchy Process, 13 (1), pp. 2-26.

DOI: 10.13033/ijahp.v13i1.851

- <sup>a</sup> Graduate School of Management, International Islamic University Malaysia, Jalan Gombak, Kuala Laumpur 53100, Malaysia
- <sup>b</sup> Department of Business Administration, International Islamic University Malaysia, Jalan Gombak, Kuala Laumpur 53100, Malavsia
- <sup>c</sup> Department of Urban and Regional Planning, International Islamic University Malaysia, Jalan Gombak, Kuala Laumpur 53100, Malaysia

#### **Abstract**

The mining industry plays an important role in the economic development of Malaysia. However, uncontrolled mining activities have caused serious environmental impacts. Recently, bauxite mining in Kuantan, in the state of Pahang, stained fifteen kilometers of Pahang's coastline with red arsenic particles and heavy metal pollution washed from open-pit bauxite mines into the nearby sea. This has caused potentially catastrophic damages to the ecosystem off the coast of Pahang. This triggered the Government of Malaysia to issue a temporary ban on bauxite mining while the state government engaged in expensive clean-up. Mining activities require an Environmental Impact Assessment (EIA). Environmental decisions are complex and multidisciplinary including knowledge bases which incorporate natural, physical, and social sciences, politics, and ethics. This research proposes a decision support framework that uses the Analytic Network Process (ANP) to help decision makers in EIA pertaining to the bauxite mining industry. © 2021, International Journal of the Analytic Hierarchy Process. All Rights Reserved.

## **Author Keywords**

Analytic Network Process; Bauxite mining; decision making; Environmental Impact Assessment; environmental pollution

- Abba, A. H., Noor, Z. Z., Yusuf, R. O., Din, M. F. M. D., Hassan, M. A. A. Assessing environmental impacts of municipal solid waste of Johor by analytical hierarchy process (2013) Resources, Conservation and Recycling, 73, pp. 188-196.
  - (April)
- Abdullah, N. H., Mohamed, N., Sulaiman, L. H., Zakaria, T. A., Rahim, D. A. Potential health impacts of bauxite mining in Kuantan (2016) Malays Journal of Medical Science, 23 (3), pp. 1-8.
- Aminu, M., Matori, A. N., Yusof, K. W., Malakahmad, A., Zainol, R. B. Analytic network process (ANP)-based spatial decision support system (SDSS) for sustainable tourism planning in Cameron Highlands, Malaysia (2017) Arab Journal of Geoscience, 10 (286), pp. 1-20.
- Asadabadi, M. R., Chang, E., Saberi, M. Are MCDM methods useful? A critical review of Analytic Hierarchy Process (AHP) and Analytic Network Process (ANP) (2019) Cogent Engineering, 6 (1), pp. 1-11.

1 of 6 8/4/2021, 12:10 PM

- Ataei, M., Asr, E. T., Khalokakaie, R., Ghanbari, K., Mohammadi, M. R. T.
   Semi-quantitative environmental impact assessment and sustainability level determination of coal mining using a mathematical model

   (2016) Journal of Mining & Environment, 7 (2), pp. 185-193.
- Beltran, P. A., Melon, M. G., Valera, J. M.
  How to assess stakeholders' influence in project management?
  (2017) A proposal based on the Analytic Network Process International Journal of Project Management, 35 (3), pp. 451-462.
- Bond, A., Morrison, A. S.
   Environmental impact assessment and the quest for sustainable mining (Vol. Part 2) (2018) Food and Energy Security, 6 (2), pp. 61-77.
   New York: Routledge. Carvalho, F. P. (2017). Mining industry and sustainable development: time for change
- (2016) Bauxite in Malaysia: Will the ban bring relief? by Clean Malaysia Organization (CMO), CMO. Retrieved on: December 11, 2020, from
- Daim, N.
   6-month trial period for new Bauxite mining SOP (2019) New Straits Times,
   Retrieved on: January 17, 2021, from
- Dell'Anna, F., Bottero, M., Becchio, C., Corgnati, S.P., Mondini, G.
   Designing a decision support system to evaluate the environmental and extraeconomic performances of a nearly zero-energy building
   (2020) Smart and Sustainable Built Environment, 9 (4), pp. 413-442.
- (2016) EIA Order 2015 by Department of Environment (DOE) Malaysia, DOE. Retrieved on: August 26, 2020, from
- (2017) Department of Statistics Malaysia (DOSM), DOSM. Retrieved on: April 5, 2020, from
- Faradiella, M. K., Rahman, M. S. A., Madzin, Z., Jusop, S., Yusuff, F. M., Ariffin, M. The occurrence and potential ecological risk assessment of bauxite mine-impacted water and sediments in Kuantan, Pahang, Malaysia (2016) *Environmental Science Pollution Research*, 24 (1), pp. 1-16.
- Garcia, L. C., Ribeiro, D. B., Roque, F. D. O., Quintero, J. M. O.
   Brazil's worst mining disaster: corporations must be compelled to pay the actual environmental costs
   (2016) Ecological Applications, 27 (1), pp. 5-9.
- Hadiwijaya, N. A., Hamdani, H., Syafrianto, A., Tanjung, Z.
   The decision model for selection of tourism site using analytic network process method
   (2018) International Journal of Intelligent Systems and Applications, 9, pp. 23-31.
   (September)
- Hamida, A., Alsudairi, A., Alshaibani, K., Alshamrani, O.
   Environmental impacts cost assessment model of residential building using an artificial neural network

2 of 6 8/4/2021, 12:10 PM

(2020) Engineering, Construction and Architectural Management, ahead-of-print No

Harun, N., Samat, N.

# GIS-based multicriteria evaluation approach in planning tourism development sites in environmentally sensitive areas

(2016) SHS Web of Conferences, 23, pp. 1-16.

(02001), https://doi.org/10.1051/shsconf/20162302001, Huang, I. B., Keisler, J., & Linkov, I. (2011). Multi-criteria decision analysis in environmental sciences: Ten years of applications and trends. Science of the Total Environment, 409(1), 3578–3594

- Jain, R. K., Cui, Z. C., Domen, J. K.
   (2016) Environmental impact of mining and mineral processing,
   Oxford, UK Butterworth-Heinemann
- Jamal, A., Yadav, H. L., Pandey, S. S.
   Heavy metals from acid mine drainage in coal mines-a case study
   (2015) European Journal of Advances in Engineering and Technology, 2 (8), pp. 16-20.
- (2018) Malaysian Minerals Production for 2016 by Minerals and Geoscience Department (JMG) Malaysia,
  JMG. Retrieved on: October 22, 2019, from https://doi.org/10.7186/bgsm51200501
- Kadoic, N., Divjak, B., Redep, N. B.
   Integrating the DEMATEL with the analytic network process for effective decision-making
   (2019) Central European Journal of Operations Research, 27 (3), pp. 653-678.
- Kaya, T., Kahraman, C.
   An integrated fuzzy AHP-ELECTRE methodology for environmental impact assessment
   (2011) Expert Systems with Applications, 38 (7), pp. 8553-8562.
- Kheybari, S., Rezaie, F. M., Farazmand, H.
   Analytic network process: An overview of applications
   (2020) Applied Mathematics and Computation, 367, p. 124780.
   (February)
- Lee, K. Y., Ho, L. Y., Tan, K. H., Tham, Y. Y., Ling, S. P., Qureshi, A. M., Nordin, R. Environmental and occupational health impact of bauxite mining in Malaysia: a review
   (2017) International Medical Journal Malaysia, 16 (2), pp. 137-150.
- Leena, S., Thomas, E., Elena, K., Korchak, E., Vigdis, N., Gregory, A. P. Social impacts of the "glocal" mining business: case studies from Northern Europe (2017) *Mineral Economics*, 30 (1), pp. 31-39.
- Leonard, L.
   Examining environmental impact assessments and participation: the case of mining development in Dullstroom, Mpumalanga, South Africa
   (2017) Journal of Environmental Assessment Policy and Management, 19 (1), p. 1.
   1750002, (-25)

3 of 6 8/4/2021, 12:10 PM

• Liu, K. F. R., Lai, J.-H.

# Decision-support for environmental impact assessment: A hybrid approach using fuzzy logic and fuzzy analytic network process

(2009) Expert Systems with Applications, 36 (3), pp. 5119-5136.

Lodhia, S. K.

(2018) Mining and sustainable development,

(Ed) New York: Routledge

Louw, L.

(2018) Addressing critical water and waste issues in Environmental Impact Assessment (EIA): the case of coal mining in South Africa,

(Masters in Environmental Management). North-West University, Potchefstroom Campus. (22142762)

• Mahmud, A. R.

(2016) Guideline on Environmental Impact Assessment in Malaysia, Kuala Lumpur: Department of Environment (DOE), Malaysia

- (2019) Kuantan MP wants ministry to disclose SOP on Bauxite mining, Malaysiakini. Malaysiakini. Retrieved On: January 2020, from
- (2017) Malaysian Chamber of Mines (MCOM),
   MCOM. Retrieved on: April 5, 2018 from
- Povera, A.

## Bauxite SOP finalised, enforcement starts today

(2019) New Straits Times,

Retrieved on: January 17, 2020, from

Rohan, J. L., Samant, J. S.

## Studies on the impact of bauxite mining activities on environment in Kolhapur district

(2012) Paper presented at the Proceeding of International Conference SWRDM-2012, Department of Environmental Science, Shivaji University, Kolhapur

Saaty, T. L.

(2005) Theory and applications of the analytic network process: decision making with benefits, opportunities, costs, and risks,

Pittsburgh: RWS Publications

Saffari, A., Ataei, M., Sereshki, F., Naderi, M.
 Environmental impact assessment (EIA) by using the Fuzzy Delphi Folchi (FDF) method (case study: Shahrood cement plant, Iran)

(2019) Environment, Development and Sustainability, 21 (2), pp. 817-860.

- Samah, M. A. A., Manaf, L. A., Zukki, N. I. M.
   Application of AHP model for evaluation of solid waste treatment technology (2010) International Journal of Engineering Techsci, 1 (1), pp. 35-40.
- Sarupria, M., Manjare, S. D., Girap, M.
   Environmental impact assessment studies for mining area in Goa, India, using the new approach

(2019) Environmental Monitoring and Assessment, 191 (1), pp. 1-17.

4 of 6 8/4/2021, 12:10 PM

- Skuta, R., Kucerova, R., Pavelek, Z., Dirner, V.
   Assessment of mining activities with respect to the environmental protection (2017) Acta Montanistica Slovaca, 22 (1), pp. 79-93.
- Solbar, L., Keskitalo, E. C. H.
   A role for authority supervision in impact assessment? Examples from Finnish EIA reviews

(2017) Arctic Review on Law and Politics, 8 (1), pp. 52-72.

Spiegel, S. J.

EIAs, power and political ecology: Situating resource struggles and the technopolitics of small-scale mining

(2017) *Geoforum*, 87, pp. 95-107. (December)

• Thorpe, C.

Lateritic plateaus in the Northern Western Ghats, India; a review of bauxite mining restoration practices

(2015) Journal of the Ecological Society, pp. 25-44.

Special Section: Rocky Plateaus

• Tian, W., Bai, J., Sun, H., Zhao, Y.

Application of the analytic hierarchy process to a sustainability assessment of coastal beach exploitation: a case study of the wind power projects on the coastal beaches of Yancheng, China

(2013) Journal of Environmental Management, 115 (1), pp. 251-256.

- (2017) Mining sector could see silver lining ahead, TMR. The Malaysian Reserve (TMR). Retrieved on: January 17, 2020, from
- Toth, W., Vacik, H.

A comprehensive uncertainty analysis of the analytic hierarchy process methodology applied in the context of environmental decision making (2018) *Journal of Multi-Criteria Decision Analysis*, 25 (6), pp. 142-161.

• (2016) World alumina refinery and bauxite mine production and bauxite reserves by United States Geological Survey (USGS),

USGS. Retrieved on: April 5, 2018, from

Venkateswarlu, K., Nirola, R., Kuppusamy, S., Thavamani, P., Naidu, R., Megharaj, M.
 Abandoned metalliferous mines: ecological impacts and potential approaches for reclamation

(2016) Reviews in Environmental Science and Bio Technology, 15 (2), pp. 327-354.

Younes, M. K., Basri, N. E. A., Nopiah, Z. M., Basri, H., Abushammala, M. F. M.
 Use of a combination of MRSS-ANP for making an innovative landfill siting decision model

(2015) *Mathematical Problems in Engineering*, 501, p. 381926. (Online)

## **Correspondence Address**

Periaiah N.; Graduate School of Management, Malaysia; email: nagen@envichem.com.my

Publisher: Creative Decisions Foundation

ISSN: 19366744

**Language of Original Document:** English **Abbreviated Source Title:** Int. J. Analytic Hierarchy Process 2-s2.0-85107855225

**Document Type:** Article Publication Stage: Final

Source: Scopus

## **ELSEVIER**

Copyright © 2021 Elsevier B.V. All rights reserved. Scopus® is a registered trademark of Elsevier B.V.

**RELX** Group™

6 of 6 8/4/2021, 12:10 PM