

## ANALYSIS OF THE DISTRIBUTION OF MERCURY POLLUTION (HG) IN RIVER WATER IN PASIE RAJA DISTRICT, SOUTH ACEH REGENCY

Darmawan<sup>1</sup>, Susy Sriwahyuni<sup>2</sup>

<sup>1,2</sup>Faculty of Public Health, Universitas Teuku Umar, Aceh, Indonesia

E-mail: <sup>1</sup>[darmawan@utu.ac.id](mailto:darmawan@utu.ac.id), <sup>2</sup>[susyriwahyuni@utu.ac.id](mailto:susyriwahyuni@utu.ac.id)

### Abstract

*The method used by the Pasie Raja community in processing gold is using the amalgamation, which uses chemicals as chemicals to extract the seeds.waste mercury produced is channeled into the river near the mining site in the Sungai Pasie Raja sub-district. The purpose of this study was to analyze the distribution of mercury (Hg) in river water in Pasie Raja District, South Aceh Regency. The method used in this research is a qualitative method with a descriptive method. The results of this study indicate that the highest mercury levels in the river water of Pasie Raja District, South Aceh Regency, are found in the lower reaches of the river, reaching a value of 0.02145 mg/l and the lowest is in the middle, which is <0.0005 mg/l. The conclusion of this study is that river water in Pasie Raja District, South Aceh Regency has been polluted by mercury because the mercury levels in the river water have exceeded the normal threshold for quality standards according to the Ministerial Republic of Indonesia Number 57 of 2016 which is 0.001. It is recommended to the local government to provide direction and understanding to local gold miners about the dangers of using mercury and the negative impact on society, if used sustainably to local gold miners.*

**Keywords:** *Quality Standards, Mercury, Rivers, Gold Mines.*

### 1. INTRODUCTION

Indonesia is one of the countries that has abundant natural products, one of which is rich in mineral products, especially Indonesian gold which is abundant where in 2019 gold produced by Indonesia was 108 977.00 kg /year BPS Indonesia. 2022).abundance of gold sources causes the emergence of an unlicensed gold mining industry, which is often referred to as PETI (Unlicensed Gold Mining) (Yulis, 2018). The development of gold mining conditions without permits has caused problems for the environment where people use a simple method called amalgamation where people use mercury as an ingredient for extraction goldThis is explained by Veiga et al., 2009 in Salatin, Febrian M. Etc. 2015 which states that at this research location the community uses the amalgamation in gold mining, the amalgamation method is a gold extraction method by mixing gold ore with mercury (Salatutin, Febrian M. et al. 2015).

Mercury (Hg) is a source of environmental pollution which is very dangerous for health and the environment because mercury has toxic, persistent, bioaccumulating properties which are very dangerous for human health and other creatures (UUD RI No. 11 of 2017). Environmental pollution by mercury that has occurred in Indonesia is the case of mercury pollution in Buyat Bay and Manado Bay, North Sulawesi, Kapuas River and Kahayan River in Kalimantan (Asiah Nur, et al. 2015).

Quality Standards Mercury Regulation Ministerial Republic of Indonesia No. 32 of 2017 that the threshold value for mercury in water is 0.001 mg/l. Based on research conducted by Yulis, Putri Ade Rahma. 2018 shows that mercury taken at 3 locations exceed the quality standard threshold where the mercury in the Kuantan river water reaches 13.6 ppb or 0.0136 ppm.details of the mercury obtained are at location 1 with the lowest pH value of 6.46, the average heavy metal mercury (Hg) content is up to 13 ppb, while at location 2 and location 3, the pH is slightly higher,

**ANALYSIS OF THE DISTRIBUTION OF MERCURY POLLUTION (HG) IN RIVER WATER IN PASIE RAJA DISTRICT, SOUTH ACEH REGENCY**

Darmawan, Susy Sriwahyuni | DOI: <https://doi.org/10.54443/morfai.v2i1.195>

namely, 6,50 obtained heavy metal levels of mercury 1- 2 pp. The impact that can be caused if exposed to mercury is to increase fetal abnormalities and infant mortality, can cause brain damage, nerve, cerebral palsy, and mental retardation (Putranto Thomas Triadi. 2011).

The livelihoods of the people of Pasie Raja District, South Aceh Regency are mostly gold miners found in the hills scattered in the Pasie Raja area. The method used by the Pasie Raja community in processing gold is using the amalgamation, which uses chemicals as chemicals to extract gold ore and the mercury produced is flowed into the river near the mining site in the Sungai Pasie Raja sub-district. The purpose of this study was to analyze the distribution of mercury (Hg) in river water in Pasie Raja District, South Aceh Regency.

## 2. IMPLEMENTATION METHOD

The method used in this study is a qualitative method with a descriptive approach. The method used in sampling is river water at 3 location points, namely upstream, downstream, and in the middle. Then it is taken to the laboratory for analysis. The sample in this study was a sample of river water in the Pasie Raja sub-district which was directly affected by PETI activities and continued with analysis in the laboratory to measure the levels of accumulated heavy metal content (Hg) and pH.

## 3. RESULTS AND DISCUSSION

### 3.1 Results

Sampling was carried out at three locations, namely downstream at the end of the waste water disposal channel, middle at the mining waste section and upstream at the end of the mine, then water in the laboratory to be checked for content mercury.

**Table 1** Laboratory Results of River Water Mercury Level

No.	Test Code	Unit	Test Method	Test Results
1	Upstream (L.157)	mg/L	SNI 6989.78-2019	0.00052
2	Middle (L. 158)	mg/L	SNI 6989.78-2019	<0.0005
3	Downstream (L. 159)	mg/l	SNI 6989.78-2019	0.02145

Based on the laboratory results above, content mercury in 3 river locations in the Pasie Raja sub-district exceeds the quality standard threshold in accordance with the Republic of Indonesia Government Regulation No. 32 of 2017. The highest mercury content is at the downstream point, which is 0.02145 mg/L and the lowest is at the middle location, which is < 0.0005 mg/L.

#### 1. Upstream (L. 157)

From the results of laboratory research conducted by the Industrial Research and Development Agency, Research and Industrial Standardization Laboratory, Banda Aceh Industrial Baristand Testing Laboratory (LABBA), that river water in the Upper part with Code (L.157) is positive for mercury ie with a value of 0.00052. This means that the mercury content contained in the Pasie Raja sub-district river exceeds the quality standard threshold according to the Ministerial The Republic of Indonesia Number 57 of 2016 concerning the National Action Plan for Controlling Health Impacts Due to Mercury Exposure in 2016-2020, with the allowable value in the regulation is 0.001.

Based on previous research, it has been shown that mercury levels are measured at four different points. At point 1 the level of mercury reached 0.9676 mg/L then at the second point it reached 0.1357 mg/L, at point 3 it was 0.0646 mg/L and at the farthest point from the PETI activity, mercury was still detected with a concentration of 0, 0282 mg/L. The mercury of four measurement points has exceeded the threshold of the quality standard in accordance with the regulations according to PP No. 82 of 2001. Mercury levels can only be tolerated at 0.001 mg/L (Yulis Putri Ade Rahma & Desti. 2020).

## 2. Middle (L. 158)

From the results of laboratory research conducted by the Industrial Research and Development Agency, Research and Industrial Standardization Center, Banda Aceh Industrial Baristand Testing Laboratory (LABBA), that river water in the middle with Code (L.158) is positive for mercury, with a value of <0 ,0005. This means that the mercury content contained in the Pasie Raja sub-district river exceeds the quality standard threshold according to the Ministerial The Republic of Indonesia Number 57 of 2016 concerning the National Action Plan for Controlling Health Impacts Due to Mercury Exposure in 2016-2020, with the value allowed in the regulation is 0.001.

Based on previous research, it is not in line with this study where the results of previous studies showed that the accumulation of heavy metals in the waters of Lake Sipin was taken at four point positions, indicating that the water Hg level was 0.0001-0.0009 ppm and the average 0.0001-0.0010.0008 ppm. This means that the mercury content contained in the water of Lake Sipin is still within the normal threshold or the threshold level of mercury substances allowed in the water.

## 3. Downstream (L. 159)

From the results of laboratory research conducted by the Industrial Research and Development Agency, Research and Industrial Standardization Center, Banda Aceh Industrial Baristand Testing Laboratory (LABBA), it shows that the river water in the Downstream with Code (L.159) is positive for mercury, with a value of 0. ,02145. This means content in the downstream has exceeded the threshold value according to the Ministerial The Republic of Indonesia Number 57 of 2016 concerning the National Action Plan for Controlling Health Impacts Due to Mercury Exposure in 2016-2020, with the value allowed in the regulation is 0.001.

Based on previous research that has been carried out, it is found that from 3 points of sampling , namely points A, B and C, the highest mercury content is at location C, reaching 3.13917 ppm. This means that the amount of mercury contained in River Waipau has exceeded the quality standard threshold for mercury levels that are allowed in the water.

### 3.2 Discussion

The highest level of mercury contained in the river water of Pasie Raja District is at the third point or downstream which reaches 0.02145, which means that the mercury level contained in the Pasie Raja District river has exceeded the normal level of mercury allowed in the water according to the Ministerial The Republic of Indonesia Number 57 of 2016 concerning the National Action Plan for Controlling Health Impacts Due to Mercury Exposure in 2016-2020, with the value allowed in the regulation is 0.001.

The high level of mercury found at the third point or downstream indicates that the river water in Pasie Raja District has been polluted by hazardous mercury , where not only the mercury-

**ANALYSIS OF THE DISTRIBUTION OF MERCURY POLLUTION (HG) IN RIVER WATER IN PASIE RAJA DISTRICT, SOUTH ACEH REGENCY**

Darmawan, Susy Sriwahyuni | DOI: <https://doi.org/10.54443/morfai.v2i1.195>

---

contaminated environment is ultimately dangerous for the biota in the waters but also for humans because of the presence food chain (Mirdat et al., 2013 in Yulis, Putri Ade Rahma & Desti. 2020).

The source of mercury contained in river water in Pasie Raja District is from the Unlicensed Gold Mining (PETI) owned by local residents. Where the method used by the community in processing gold is using the amalgamation or using mercury as an ingredient to extract gold ore then the waste from the mercury is flowed into the river. However, the river water is also used by the residents of the Pasie Raja sub-district to meet their daily needs such as bathing, washing and others. If humans are exposed to mercury in a sustainable manner, it will be harmful to the health of the human body due to its toxic nature. As happened in Japan, known as the tragedy of "Minamata Disease" where people in the region The patient experienced mercury poisoning after consuming fish from the sea around Minamata Bay which contains mercury from plastic industry waste (Hadi, M. Choirul. 2013).

#### **4. CONCLUSION**

Based on the results of research that has been done that mercury from local gold mining has polluted river water in Pasie Raja Subdistrict with the highest mercury content is in the third location point or downstream section which reaches a value of 0.02145 mg/l and the lowest mercury content is in the second or middle location point with a value of <0.0005 mg/l, meaning Mercury levels contained in river water in Pasie Raja District exceed the normal quality standard threshold according to the Ministerial The Republic of Indonesia Number 57 of 2016 concerning the National Action Plan for Controlling Health Impacts Due to Mercury Exposure in 2016-2020, with the value allowed in the regulation is 0.001.

#### **5. ACKNOWLEDGMENTS**

We would like to thank Teuku Umar University and the Faculty of Health for supporting research funding. Also to the entire research team, lecturers, and students who have assisted in this research, both in the preparation of proposals, data collection, data processing, and in the process of scientific publications.

#### **6. AUTHOR'S CONTRIBUTION**

The main researcher is the first researcher who plays a role in preparing ideas, determining research locations, compiling research proposals, determining research budgets as needed, processing data, and making journals. While the second researcher is a member of the researcher who helps all the processes, prepares the necessary equipment.

#### **REFERENCES**

- Adhan, M., Afriyani, M., & Azhar, M. E. (2021). Factors Affecting Employee Job Satisfaction At The Representative Office Of The Population Agency National Family Planning (Bkkbn). *International Journal Of Economic, Business, Accounting, Agriculture Management and Sharia Administration (IJEAS)*, 1(2), 155-168.
- Asiah Nur, dkk. 2015. Pengaruh Lama Kerja Terhadap Kadar Merkuri (Hg) Dalam Urin Pekerja Tambang Emas (Studi kasus di Desa Pantan Luas Kecamatan Sawang Kabupaten Aceh Selatan). *Jurnal Pendidikan Kimia (JPKim)*, Vol. 7 No. 2, ISSN: 2085-3653 <http://jurnal.unimed.ac.id/2012/index.php/jpk>

- Hadi, M. Choirul. 2013. —Bahaya Merkuri di lingkungan kital. Jurnal skala Husada Vol. 10 No. 2 Tahun 2013: 175-183
- Ilham, R. N., Ervina, N., Julyanthry, J., & Putri, D. E. (2022). Antecedent Nilai Perusahaan Pada Perusahaan yang Konsisten Terdaftar di Jakarta Islamic Index (JII). J-MAS (Jurnal Manajemen dan Sains), 7(1), 363-368.
- Irsan, et. al. 2020. Analisis Kandungan Merkuri (Hg) Pada Pada Ekosistem Sungai Waelata Dan Sungai Anahoni Yang Terdampak Aktifitas Pertambangan Emas Di Pulau Buru, Maluku. Chem. Prog. Vol. 13. No. 1,
- Salatutin, Febrian M. Dkk. 2015. —Analysis Of Mercury (Hg) Distribution In The Waeapo River Irrigation Area, Buru Regency, Maluku Province, Gold Mining Without Permission Result In Botak Mountain Areal. Ind. J. Chem. Res, 2015, 3, 270-276
- Syahrizal dan M. Yusuf Arifin. 2017. —Analisis Kandungan Merkuri (Hg) Pada Air Dan Daging Ikan Patin Siam (Pangasius Hypophthalmus) Di Kja Danau Sipin Jambil. Jurnal Akuakultur Sungai dan Danau Vol. 2 No. 1 ISSN Online 2503-4766, Hal. 9 – 17
- Yulis, Putri Ade Rahma. 2018. —Analisis Kadar Logam Merkuri (Hg) Dan (Ph) Air Sungai Kuantan Terdampak Penambangan Emas Tanpa Izin (PETI)l. Jurnal Pendidikan Kimia Volum 2, Nomor 1
- Yulis Putri Ade Rahma & Desti. 2020. —Penentuan Kadar Logam Berat Air Sungai Singingi Terdampak Penambangan Emas Tanpa Izin (Peti)l. Jurnal Katalisator Vol 5 No. 2, 188-196
- Pamungkas, Helmi Setia Ritma dkk. 2015. —Potential Distribution Pattern Of Artisanal Gold Mining's Mercury Waste In Cisungsang Village, Lebak District, Bantenl. Jumal Ekologi Kesehatan Vol. 14 No 3: 195 — 205
- Peraturan Menteri Kesehatan Republik Indonesia Nomor 57 Tahun 2016 Tentang Rencana Aksi Nasional Pengendalian Dampak Kesehatan Akibatpaparan Merkuri Tahun 2016- 2020
- Undang-Undang Republik Indonesia Nomor 11 Tahun 2017 Tentang Pengesahan Minamata Convention On Me,Rcury (Konvensi Minamata Mengenai Merkuri).



**ANALYSIS OF THE DISTRIBUTION OF MERCURY POLLUTION (HG) IN RIVER WATER IN  
PASIE RAJA DISTRICT, SOUTH ACEH REGENCY**

Darmawan, Susy Sriwahyuni | DOI: <https://doi.org/10.54443/morfai.v2i1.195>

---