Institute for Advanced Science,
Social and Sustainable Future
MORALITY BEFORE KNOWLEDGE

COVID-19 contact tracing apps in the Netherlands and Indonesia and its privacy concerns: A comparative review

FITRISIA RAHMA[1]*, RALDI HENDRO KOESTOER[1]

[1] *School of Environmental Science, Universitas Indonesia; Central Jakarta, Jakarta, 10430, Indonesia*
*Correspondence: fitrisia.rahma@gmail.com

ABSTRACT

Background: In this COVID-19 pandemic, all affected countries are making efforts to end the pandemic quickly. One of the efforts made is contact tracing. At first, contact tracing is done by officers interviewing confirmed patients and then filling in the results of the interview on an epidemiological manually in investigation form. Then, the government developed a contact tracing application to optimize this activity. However, the use of the application raises the issue of user concern over the privacy of personal data entered into the application. This article compares the use of the app and user concerns about its privacy in the Netherlands and Indonesia. **Methods:** We use the comparative literature review method with inclusion criteria only including studies that provide information about the use of PeduliLindungi application in Indonesia and CoronaMelder in the Netherlands, especially those that discuss privacy policy concerns in their use. **Finding:** Both Netherlands and Indonesia have high population densities which is a risk factor for the easy spread of COVID-19. The governments of both countries have developed contact tracing applications to enhance their efforts in handling COVID-19. People using this application are concerned about the privacy policy of personal data entered into the application. However, it doesn't reduce the number of application users because the use of these applications is required by the government. **Conclusion:** The importance of contact tracing activities in disaster management is of concern to the government so that these activities run optimally. The contact tracing application developed can be easily used but has a privacy policy issue that can be re-evaluated so that security can be increased in maintaining the privacy of users' data.

KEYWORDS: CoronaMelder; COVID-19; PeduliLindungi; privacy policy.

1. Introduction

The Coronavirus Disease (COVID-19) pandemic that is currently happening around the world has been going on for approximately two years. All affected countries are making efforts to deal with COVID-19 so that the pandemic ends quickly. Governments in many countries enact regulations governing human behavior to minimize the spread of COVID-19. These regulations include washing hands, wearing masks, maintaining distance, staying away from crowds, and reducing mobility. In addition, the government is actively carrying out testing activities for testing for COVID-19, tracing close contacts, and carrying out treatment and care for sufferers of COVID-19 as an effort to minimize the transmission of COVID-19. In carrying out these close contact-tracing efforts, governments in several countries use contact-tracing applications to facilitate tracing activities. As was done by the Belgian and Dutch governments, the contact tracing applications that are already in use in these two countries are the Coronalert application in Belgium and the CoronaMelder

application in the Netherlands (van Brakel et al., 2022). Meanwhile, Germany uses the Corona-Warn-App contact tracing application (Horstmann et al., 2021). Scientists in Germany estimate that the pandemic can be ended if 60% of the population uses the app, but the numbers needed are even lower to help slow the pandemic (Horstmann et al., 2021).

To assist contact tracing activities in Indonesia, the government uses the PeduliLindungi application. This contact tracing activity is carried out in an integrated manner, starting from the laboratory that enters each personal data and the results of the swab antigen and COVID-19 PCR tests into the AllRecord website from the Ministry of Health, to connecting the PeduliLindungi application with the website. When PeduliLindungi users download the application, the system will ask for the user's approval to activate location data. With the location conditions being activated, the user's location will be periodically identified and the apps will provide information regarding crowds and the spreading zone of COVID-19. Despite the functionality of the apps that can help with contact tracing, there is concern in the community about personal data leaks. A study in Germany stated that most respondents said there was no reason not to use the application, but some respondents expressed privacy concerns and doubted the effectiveness and technical problems of the application (Horstmann et al., 2021). Meanwhile in Belgium and the Netherlands, this privacy issue is one of the reasons why people are reluctant to use contact tracing applications (van Brakel et al., 2022). The same thing also happened in Indonesia. Chairman of the Research Institute for Indonesian Cyber Communication and Information System Security Research Center (CISSReC), Pratama Persadha, admitted that the potential for data leakage is always there when it comes to integrating the PeduliLindungi application with several other digital platforms. This is because the platform is not very strong and leaked data is very likely to be misused and harm the owner (Cahyaningrum, 2021).

This article compares the use of the app and user concerns about its use in the Netherlands and Indonesia. The author chose the Netherlands as a comparison with Indonesia because the author saw the similarity of problems that occurred in the Netherlands and Indonesia, namely concerns about leakage of personal data privacy when using a contact tracing application provided by the government. In addition, references to privacy concerns in the use of close contact applications in the Netherlands are easy to find. The author discusses concerns about the privacy policy for using this contact tracing application because it is by the conditions at the time this writing was written.

2. Methods

In writing this article, the author uses the comparative review method. As an inclusion criterion, the authors only include studies that provide information about the use of the PeduliLindungi application in Indonesia and CoronaMelder in the Netherlands, especially those that discuss privacy policy concerns in their use. A literature review on a specific topic was excluded from this article. We include studies from all disciplines, from medical and health sciences to information systems, law, and computer science.

In identifying the literature, the authors started a literature search using the keywords "PeduliLindungi", "CoronaMelder", "privacy policy", and "COVID-19. For each manuscript, the initial relevance is determined based on the title. From the title, if the content appears to discuss the use of the PeduliLindungi and CoronaMelder applications, the author will continue to download the full references, including author, year, title, and abstract, for further evaluation. After that, the authors compared concerns regarding privacy policies in using the contact tracing application in the two countries.

The author searched Google Scholar and the University of Indonesia's e-library for reliable references. As technological advances change the method of archiving and retrieving information, we limit publication dates to 2021 to 2022 (articles published within the last two years), so that authors can build this review on the most recent relevant

literature on the COVID-19 pandemic that has occurred since 2020 taking into account the retrieval and synthesis of information in the digital age. In addition, the author also takes references from guidelines for handling COVID-19 in Indonesia and the Netherlands.

3. Results and Discussion

According to the United Nations International Strategy for Disaster Reduction (UNISDR), the definition of disaster is a serious disruption of the functioning of a community or society involving widespread human, material, economic, or environmental losses and impacts, which exceed the ability of the affected community or society to cope using its resources alone (UNISDR, 2009). Meanwhile, the Regulation of the Minister of Health of the Republic of Indonesia number 75 of 2019 defines a disaster as an event or series of events that threatens and disrupts people's lives and livelihoods, both by natural factors and/or non-natural factors as well as human factors resulting in human casualties, environmental damage, loss of property, and psychological impact (*Kementerian Kesehatan*, 2019). For disaster management to be carried out effectively, disaster management is required that be carried out comprehensively and continuously and aims to reduce the adverse effects of disasters on human life, assets, and the environment. Coppola suggests that comprehensive disaster management is based on four distinct components, namely: mitigation, preparedness, response, and recovery (Coppola, 2011).

Public health is defined as the science and art of maintaining, protecting, and improving public health through community efforts in providing health services and preventing and eradicating disease. Public health includes all activities, both directly and indirectly, to prevent disease (preventive), improve health (promotive), therapy (curative), as well as recovery (rehabilitative). One of the main pillars of public health science that plays a main role in pandemics that newly arise in epidemiology (Surahman & Supardi, 2016). From each phase of disaster management, the role of public health is required in preparing for and responding to emergencies. One of the important public health roles in each phase is the implementation of epidemiology in disaster conditions, which is known as disaster epidemiology. Disaster epidemiology can provide information that can be used by policymakers, planners, incident commanders, decision-makers, and members of the community affected (Malilay et al., 2014). One of the activities carried out in disaster epidemiology is surveillance activities. Public health surveillance is the systematic activity of collecting, analyzing, and interpreting data, tightly integrated with the timely dissemination of this data to those responsible for preventing and controlling disease and injury (Nsubuga et al., 2006). One of the surveillance activities during the COVID-19 Pandemic was carried out on confirmed cases, namely contact tracing activities (Sugihantono et al., 2020). At the start of the pandemic, contact tracing activities were carried out by contact tracing officers by filling out an Epidemiological Investigation form through interviews, both in person and using communication tools. While traditional contact tracing has been successfully done, public health staff has been judged to be multi-tasking, slow, and have a greater chance of making a mistake not all people remember their contacts (Bi et al., 2020). In addition, a limited number of officers will experience difficulties if the number of cases increases significantly. There will be the possibility of missing cases, namely cases where contact tracing is not carried out as a result of officers being overwhelmed in conducting searches on a large number of cases. This initiated the creation of a contact tracing application in several countries including the Netherlands and Indonesia. Some of the benefits that contact tracing apps can provide include: being independent of the user's memory (reminding the user with whom they have been in contact); allowing contacts the user doesn't know to be notified; speeding up and improving the search process; and facilitate further follow-up of the contacts by public health authorities (Ivers & Weitzner, 2020).

The Netherlands is a country with an area of 41,540 km^2, mostly located on the European continent consists of a population of 17,441,500 people with a population density

of 518 people per km² (World Bank, 2021a; 2021b, 2021c). In contrast to Indonesia, the small area of the Netherlands resulted in a higher population density for the Netherlands compared to Indonesia. Figure 1 shows a comparison of the regions of the Netherlands and Indonesia on a world map. According to the World Bank, the Netherlands is one of the 30 most densely populated countries (World Bank, 2021c). With the transmission of COVID-19 through splashes of small liquid particles that come out of the mouth or nose of an infected person (WHO, 2022), a dense population is a risk factor that facilitates the spread of COVID-19. The difficulty of keeping their distance due to the dense population, especially teenagers who come into contact with each other in public places, including their schools, plays an important role in the spread of COVID-19 (Vos et al., 2021). This is a concern for the Dutch government to suppress the spread of COVID-19. The European Center for Disease Prevention and Control has also recommended using digital tools, such as mobile tracking apps, to enhance and optimize traditional contact tracing (Bente et al., 2021). Therefore, a development team was created supported by an advisory committee and four task forces to be assigned to the development and testing of CoronaMelder. The app design follows a privacy-by-design approach to minimize privacy breaches. The application was tested with various end users in field tests, think-hard usability tests, practical tests, and ethical tests during the development. Additionally, the digital security of the app is tested using penetration testing and data privacy impact assessments. The findings from these tests led to an ongoing evaluation of the development and implementation of CoronaMelder. The CoronaMelder app is an app that has been developed to help fight the spread of the coronavirus. The app tracks when users are near each other for a longer period and notifies other app users.

Fig. 1. Comparison of the regions of the Netherlands and Indonesia on the world map
(World Map, 2019)

As we have seen, the disruptive nature of technology has given rise to different opinions about monitoring the use of technology and user privacy. However, tracking and tracing systems using digital equipment raise more than just privacy concerns. It is the appropriateness of sharing data with third parties to support public health which is contextually dependent that raises the heated debate (Vitak & Zimmer, 2020). In this regard, COVID-19 tracking application technology in the Netherlands is seen as government coercion in surveillance as the government engages with private companies or a collective responsibility to provide a unified response to the pandemic, regardless of privacy risks

(van Brakel et al., 2022). A study shows that it seems that important parts of the app are not understood by respondents, such as the notification system, sharing of authorization keys through public health authorities, or how the app secures privacy. Many doubts and concerns were expressed regarding the privacy, usability, and consequences of CoronaMelder (Bente et al., 2021).

Indonesia is an archipelagic country with an Indonesian land area of 1.9 million km^2 and a population of Indonesia according to the Central Statistics Agency (BPS) in September 2020 the total population of Indonesia was 270.20 million people (BPS, 2021). From these data, Indonesia's population density is 141 people per km^2 whose distribution can be seen in Figure 2. Together with the Netherlands, Indonesia is included in the 100 countries with the densest population according to the World Bank (World Bank, 2021c). This fairly dense population can be one of the reasons for the increasing number of confirmed cases of COVID-19. Based on these problems, the Ministry of State-Owned Enterprises the Ministry of Communication and Information of the Republic of Indonesia, and PT Telkom Indonesia initiated the creation of an application that can assist the contact tracing process, namely PeduliLindungi. PeduliLindungi is an application developed by third parties to help relevant government agencies in tracking activity to end the spread of Coronavirus Disease (COVID-19). This application uses community participation to share location data while traveling so that contact history tracing with people who suffer from COVID-19 can be carried out. The application users will be notified if they are in a crowd or a red zone, an area or sub-district where a person positively infected with COVID-19 has been recorded or a patient is under surveillance. In its use, PeduliLindungi is integrated with the AllRecord web from the Ministry of Health of the Republic of Indonesia (Kemenkes RI) which contains the results of the COVID-19 rapid test antigen and Polymerase Chain Reaction (PCR) tests from all officially registered laboratories. The results from this website then provide information to PeduliLindungi regarding patient data tested for antigen and PCR along with the results of the examination. Patient data that is shared from the web to the application is personal data, including name, National Identity Number, date of birth, address, and telephone number. In addition to the COVID-19 examination data, the application is also integrated with the Pcare Vaccine website owned by the Health Social Security Administration Agency (BPJS). This website contains COVID-19 vaccine data such as vaccine tickets and vaccine certificates as well as personal data from vaccine targets which is also shared with the PeduliLindungi application.
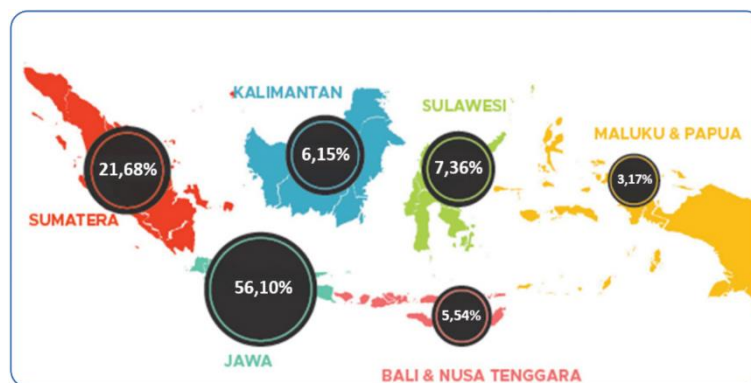

Fig. 2. Distribution of Indonesian population by region
(BPS, 2021)

As happened in the Netherlands, privacy concerns regarding the use of the contact tracing application are also a problem in Indonesia. Even though the public's acceptance of the application is good because of the ease of use of the application, there is still concern in the community that data leakage will occur which is very detrimental (Cahyaningrum, 2021; Kurniawati et al., 2020). This is supported by the statement by the Head of CISSReC which states that the potential for leaks will always exist regarding the use of applications that are

integrated with third parties (Cahyaningrum, 2021). Other articles also encourage us to be able to inform society when we see danger and to make more conscious choices when we face dilemmas such as between privacy and health (Rowe, 2020).

The governments in the Netherlands and Indonesia both have obstacles in suppressing the spread of COVID-19. By using traditional contact tracing techniques, deficiencies in these techniques become obstacles in carrying out contact tracing. Coupled with the high population density in each country, it is feared that there will be cases where contact tracing is accidentally not carried out when the number of cases is high due to the limited number of officers. To optimize contact tracing activities, each country has created a contact tracing application that is useful for tracing contact history with sufferers of COVID-19 tracking when users are near each other for a longer period, and notifying other application users if found. contact with confirmed cases. However, technological sophistication does not necessarily guarantee the privacy of its users. This is a problem in the Netherlands and Indonesia. Although it appears that contact tracing applications made in the two countries are technically easy to use, people are still concerned about the privacy of personal data entered into the application. Siffels noted that when privacy is "protected", the ethical duties of this application will be completed. This concern is consistent with the fact that privacy is conceptualized as an individual good that can be protected by anonymization (Siffels, 2021). However, privacy concerns have not resulted in fewer app users. This is because the use of the contact tracing application is required by the governments in both countries (van Brakel et al., 2022; Kurniawati et al., 2020). Another article stated that, despite doubts about privacy, there is a potential benefit that affects key clinical and epidemiological outcomes in the use of the COVID-19 contact tracing application. High-quality empirical evidence, either from experimental or methodological observational studies, is needed to be able to draw stronger conclusions about the effectiveness of contact tracing apps for COVID-19 (Jenniskens et al., 2021).

4. Conclusions

In disaster management, the most important thing is disaster management so that the response activities run in a comprehensive and organized manner. One of the important activities in the disaster management phase is surveillance activities. Surveillance is important because the results can inform decision-making for authorities. One of the surveillance activities in handling COVID-19 is contact tracing. Contact tracing activities before the application were carried out traditionally by officers conducting interviews with confirmed patients and then filling in the results of the interview into the PE form. The drawbacks of the traditional method are that it is labor-intensive, slow, and error-prone because people don't remember all of their contacts.

The Netherlands and Indonesia are among the countries that are concerned about the problems mentioned above. This is partly because the two countries have high population densities, making it easier for the transmission of COVID-19 which will lead to an increase in the number of confirmed cases of COVID-19. To avoid this, the Dutch and Indonesian governments collaborated across sectors to create a contact application that aims to make it easier to track and store data. The CoronaMelder application in the Netherlands and PeduliLindungi in Indonesia are used on their respective cellphones and share their location automatically when used. These two applications will notify the user if they are in a crowd or in a red zone, such as an area or sub-district where it has been recorded that there are people who are infected with COVID-19 or there are patients with COVID-19 symptoms who are under surveillance in the area.

The privacy policy is a problem that occurs when using the application. Even though it is technically easy to use the application, people still doubt that the personal data they enter into the application will be kept private. However, this does not reduce the use of the application because the governments in the Netherlands and Indonesia both require the use

of the application. Even though the public is required to use it so that application usage remains high, application developers are expected to evaluate and ensure that the user's data entered into the application is truly protected.

Acknowledgement

Author Contribution
The authors contributed to writing this article.

Funding

Ethical Review Board Statement
Not applicable.

Informed Consent Statement
Not applicable.

Data Availability Statement
Not applicable.

Conflicts of Interest
The authors declare no conflict of interest.

Open Access

Reference
Badan Pusat Statistik. (2021). *BPS: 270,20 juta Penduduk Indonesia Hasil SP2020*. Retrieved from https://www.bps.go.id/id/news/2021/01/21/405/bps--270-20-juta-penduduk-indonesia-hasil-sp2020.html.

Bente, B.E., van't Klooster, J.W.J.R., Schreijer, M.A., Berkemeier, L., van Gend, J.E., Slijkhuis, P.J.H., Kelders, S.M., van Gemert-Pijnen, J.E.W.C. (2021). The Dutch COVID-19 Contact

Tracing App (the CoronaMelder): Usability Study. *JMIR Form Res*, 5(3), https://pubmed.ncbi.nlm.nih.gov/33724198/.

Bi, Q., Wu, Y., Mei, S., Ye, C., Zou, X., Zhang, Z., Liu, X., Wei, L., Truelove, S.A., Zhang, T., Gao, W., Cheng, C., Tang, X., Wu, X., Wu, Y., Sun, B., Huang, S., Sun, Y., Zhang, J., Ma, T., Lessler, J., Feng, T. (2020). Epidemiology and transmission of COVID-19 in 391 cases and 1286 of their close contacts in Shenzhen, China: a retrospective cohort study. *Lancet Infect Dis*, 20(8), 911-919. https://pubmed.ncbi.nlm.nih.gov/32353347/.

Cahyaningrum, D. (2021). Urgensi Perlindungan Data Pribadi dalam Aplikasi Peduli Lindungi. *Pusat Analisis Keparlemenan, Badan Keahlian DPR RI*, V. https://pusaka.dpr.go.id/produk/isu-sepekan/page/10.

Coppola, D.P. *Introduction to International Disaster Management*. Elsevier.

Horstmann, K.T., Buecker, S., Krasko, J., Kritzler, S., & Terwiel, S. (2021). Who does or does not use the 'Corona-Warn-App' and why? *European Journal of Public Health*, 31(1), 49-51. https://doi.org/10.1093/eurpub/ckaa239.

Ivers, L.C. & Weitzner, D.J. (2020). Can digital contact tracing make up for lost time? *Lancet Public Health*, 5(8), e417-e418. https://doi.org/10.1016/S2468-2667(20)30160-2.

Jenniskens, .K., Bootsma, M.C.J., Damen, J.A.A.G., Oerbekke, M.S., Vernooij, R.W.M., Spijker, R., Moons, K.G.M., Kretzschmar, M.E.E., & Hooft, L. (2021). Effectiveness of contact tracing apps for SARS-CoV-2: a rapid systematic review. *BMJ Open*, 11(7):e050519. https://pubmed.ncbi.nlm.nih.gov/34253676/.

Kementerian Kesehatan RI. (2019). *Peraturan Menteri Kesehatan Republik Indonesia Nomor 75 Tahun 2019 Tentang Penanggulangan Krisis Kesehatan*. http://hukor.kemkes.go.id/uploads/produk_hukum/PMK_No__75_Th_2019_ttg_Penaggulangan_Krisis_Kesehatan.pdf.

Kurniawati, Khadapi, M., Riana, D., Arfian, A., Rahmawati, E., & Heriyanto. (2020). Public Acceptance of Pedulilindungi Application in the Acceleration of Corona Virus (Covid-19) Handling. *Journal of Physics: Conference Series*, 1641. https://iopscience.iop.org/article/10.1088/1742-6596/1641/1/012026.

Malilay, J., Heumann, M., Perrotta, D., Wolkin, A.F., Schnall, A.H., Podgornik, M.N., Cruz, M.A., Horney, J.A., Zane, D., Roisman, R., Greenspan, J.R., Thoroughman, D., Anderson, H.A., Wells, E.V., Simms, E.F. (2014). The role of applied epidemiology methods in the disaster management cycle. *Am J Public Health*, 104(11), 2092-2102. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4202981/.

Nsubuga, P., White, M.E., Thacker, S.B., Anderson, M.A., Blount, S.B., Broome, C.V., Chiller, T.M., Espitia, V., Imtiaz, R., Sosin, D., Stroup, D. F., Tauxe, R. V., Vijayaraghavan, M., & Trostle, M. (2006). Public Health Surveillance: A Tool for Targeting and Monitoring Intervention. In D.T. Jamison, J.G. Breman, A.R. Measham, G. Alleyne, M. Claeson, D.B. Evans, P. Jha, A. Mills, & P. Musgrove (Eds.), *Disease Control Priorities in Developing Countries* (pp. 997-1015). The International Bank for Reconstruction and Development/The World Bank.

Rowe, F. (2020). Contact tracing apps and values dilemmas: A privacy paradox in a neo-liberal world. *International Journal of Information Management,* 55. https://doi.org/10.1016/j.ijinfomgt.2020.102178.

Siffels, L.E. (2021). Beyond privacy vs. health: a justification analysis of the contact-tracing apps debate in the Netherlands. *Ethics Inf Technol*, 23(1), 99-103. https://doi.org/10.1007/s10676-020-09555-x.

Sugihantono, A., Burhan, E., Susanto, D.A., et al. (2020). *Pedoman Pencegahan Dan Pengendalian Coronavirus Disease (COVID-19)*. Kementerian Kesehatan.

Surahman & Supardi, S. (2016). *Ilmu Kesehatan Masyarakat PKM*. Kementerian Kesehatan RI.

UNISDR. (2009). *2009 UNISDR terminology on disaster risk reduction*. UNISDR.

van Brakel, R., Kudina, O., Fonio C., & Boersma, K. (2022). Bridging values: Finding a balance between privacy and control. The case of Corona apps in Belgium and the Netherlands. *Journal of Contingencies and Crisis Management*, 30(1), 50-58. https://doi.org/10.1111/1468-5973.12395.

Vitak, J. & Zimmer, M. (2020). More Than Just Privacy: Using Contextual Integrity to Evaluate the Long-Term Risks from COVID-19 Surveillance Technologies. *Social Media and Society*, 6(3). https://journals.sagepub.com/doi/epub/10.1177/2056305120948250.

Vos, E.R.A., van Boven, M., den Hartog, G., Backer, J.A., Klinkenberg, D., van Hagen, C.C.E., Boshuizen, H., van Binnendijk, R.S., Mollema, L., van der Klis, F.R.M., de Melker, H.E. (2021). Associations Between Measures of Social Distancing and Severe Acute Respiratory Syndrome Coronavirus 2 Seropositivity: A Nationwide Population-based Study in the Netherlands. *Clin Infect Dis*, 73(12), 2318-2321. https://pubmed.ncbi.nlm.nih.gov/33772265/.

WHO. (2021). *Coronavirus disease (COVID-19)*. Retrieved from https://www.who.int/health-topics/coronavirus#tab=tab_1.

World Bank. (2021a). *Surface area (sq. km) - Netherlands*. Retrieved from https://data.worldbank.org/indicator/AG.SRF.TOTL.K2?locations=NL.

World Bank. (2021b). *Population, total - Netherlands*. Retrieved from https://data.worldbank.org/indicator/SP.POP.TOTL?end=2020&locations=NL&start=2013.

World Bank. (2021c). *Population density (people per sq. km of land area) - Netherlands*. Retrieved from https://data.worldbank.org/indicator/EN.POP.DNST?end=2020&locations=NL&start=2018.

World Map. (2019). Retrieved from https://www.mapsofworld.com/.

Biographies of Authors

FITRISIA RAHMA, School of Environmental Science, Universitas Indonesia.
- Email: fitrisia.rahma@gmail.com
- ORCID: -
- Web of Science ResearcherID: -
- Scopus Author ID: -
- Homepage: -

RALDI HENDRO KOESTOER, School of Environmental Science, Universitas Indonesia.
- Email: ralkoest@gmail.com
- ORCID: https://orcid.org/0000-0003-1701-0419
- Web of Science ResearcherID: -
- Scopus Author ID: 57418579200
- Homepage: -