# Community Services In Indonesia Regarding Waste Handling And Management: Mapping And Bibliometric Analysis

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***Abstract***.
*Indonesia is a country with large area of land and sea, and therefore possesses vast amount of natural resources. However, the use of natural resources without proper handling or management of the waste causes a serious problem in Indonesia. Besides the lack of waste management facilities, local communities also exhibit insufficient awareness and knowledge in waste management. From the point of view of universities and higher education institutions, this issue might be resulted from few community development or community service, as well as lack of knowledge dissemination. In order to equalize the knowledge of the local communities with that of people of the large cities, then Indonesian universities perform community service (a part of the university tridarmas). With the intention to obtain effective and efficient community service, in this manuscript we describe mapping of publication of community service in the Scopus (a trusted database of international publication) in the field of waste management. From 2410 data from Scopus, they are sorted to obtain 38 publications related to the community service and community development for the waste management. The locations of the community services are mapped, as distributed in islands of Sumatera, Java, Bali, Kalimantan, Sulawesi, and Papua. From the mapping, it can be observed that most of the published community service activities are concentrated in Java, Bali, and some at Sulawesi. It is therefore imperative to have future explorations at Kalimantan, Sumatera, and Papua. The published community services in Scopus commonly discuss about the developments of (1) recycling or upcycling, (2) socioeconomic evaluation, (3) performance evaluation, and (4) ecological evaluation of the waste management. Besides the mapping, bibliometric analysis is also performed where it is shown that the community service related to the waste management in Indonesia is highly tied with the sustainable development, rural areas, waste or wastewater treatment, sanitation, etc. where all these issues are important and urgent to obtain economic equality (especially for people of Kalimantan, Sumatera, and Papua) to achieve Gold Indonesia 2045.*

***Keywords:*** *Community service, waste management, Scopus, bibliometric analysis*

## I. INTRODUCTION

Indonesia is a country with large area of land and sea, and therefore possesses vast amount of natural resources. However, the use of natural resources without proper handling or management of the waste causes a serious problem in Indonesia. Besides the lack of waste management facilities, local communities also exhibit insufficient awareness and knowledge in waste management. From the point of view of universities and higher education institutions, this issue might be resulted from few community development or community service, as well as lack of knowledge dissemination. In

order to equalize the knowledge of the local communities with that of people of the large cities, then Indonesian universities perform community service (a part of the university tridarmas). With the intention of obtain effective and efficient community service, in this manuscript we describe mapping of publication of community service in the Scopus (a trusted database of international publication) in the field of waste management. To the best of our knowledge, there is no mapping of publications of community service related to the waste management in Indonesia, indexed in Scopus database, as well as analysis of community service gap to support better community service in the future. Therefore, this paper will contribute significantly for the community service in Indonesia, especially in the field of waste handling and waste management.

## II. METHODS

The mapping of community service in this study was conducted by accessing the Scopus database (https://scopus.com). Scopus was selected because it indexes peer-reviewed journal and conference papers. On the otherhand, Google Scholar was not selected because it is too wide since it indexes non peer-reviewed paper, while Web of Science only indexes journal publications (no conference paper). From the Scopus page, a search was conducted by entering keywords of “community service”, “Indonesia”, “waste”, and limited to the affiliation country= Indonesia, with the Boolean search form of ( TITLE-ABS KEY ( community AND service ) ) AND ( ( indonesia ) ) AND ( waste ) AND ( LIMIT-TO ( AFFILCOUNTRY , "Indonesia" ) ).From the search result using “community service” keyword in Scopus, 309115 articles were shown. When limited to keyword “Indonesia”, and affiliation country= Indonesia, the number of articles were filtered to 6334, and 2410 articles, respectively. Finally, the Scopus search is sorted again with the keyword “waste” to obtain 138 titles. The 138 titles were further selected by deep reading of the abstract, down to final 38 articles related to the community service and waste in Indonesia. Moreover, the final articles were tabulated and mapped. The keywords of the selected 38 articles were also further analyzed by using VOSViewer software are a form of visualization of the interlinkage of the keywords of the aforementioned articles related to the community service and waste management in Indonesia.

## III. RESULT AND DISCUSSION

In general, the result of the mapping of the community service activity related to the waste handling and management in Indonesia that have been published and scientifically disseminated in Scopus are shown in Table 1. The table is classified with the location (and its related province and major island in Indonesia), along with the activity of the community service, and the type of the community service, such as (1) recycling or upcycling, (2) socioeconomic evaluation, (3) performance evaluation, and (4) ecological evaluation.It can be seen from Table 1 that the community service related to the waste handling and waste management in Indonesia are spread from west

(North Sumatera) to eastern part of Indonesia (Merauke). There are around 42% of the activities in Table 1 that are of socioeconomic evaluations, 31% of recycling or upcycling, 21% of performance evaluation of waste handling and management, and less than 6% are of ecological evaluation. Based on this finding, we can conclude that there is a community service gap in terms of the activities, where more attention have be given in the near future for the community service activities related to the recycle or upcycle, and performance evaluation of waste handling and management.

**Table 1.** Mapping of community service in the field of waste management in Indonesia (based on Scopus database)

| No. | Island | Province | Location | Community service activity | Type(s) of community service | Ref. |
|---|---|---|---|---|---|---|
| 1. | Sumatera | North Sumatera | Bagan Deli | Development of coastal waste bank | -Recycling or upcycling<br>- Socioeconomic evaluation | [1] |
| 2. | Sumatera | Riau | Meranti Pandak, Pekanbaru | Environmental aspects for the relocation or restructuring slum area in Meranti Pandak village, Pekanbaru | Socioeconomic evaluation | [2] |
| 3. | Sumatera | Jambi | Tanjung Jabung Barat Regency, Jambi | Development of black soldier fly maggot for organic waste management | -Recycling or upcycling<br>-Biological conversion | [3] |
| 4. | Sumatera | West Sumatera | Surau Gadang, Padang City | Evaluation of performance and cost of a community-based solid waste plant | Performance evaluation | [4] |
| 5. | Java | DKI Jakarta | Ciliwung | Analysis of pollutant load due to greywater from riverbanks settlement | Performance evaluation | [5] |
| 6. | Java | Banten | Kebonsari Urban Village, Citangkil Sub-District, Cilegon City | Performance evaluation of solid waste management by the local population | Performance evaluation | [6] |

| No. | Island | Province | Location | Community service activity | Type(s) of community service | Ref. |
|---|---|---|---|---|---|---|
| 7. | Java | West Java | -Bekasi<br>-Bandung<br>-Banjar<br>-<br>Tasikmalaya | Evaluation of waste bank for socioeconomic empowerment | Socioeconomic evaluation | [7] |
| 8. | Java | West Java | Cimahi | Risk assessment of exposure and impact of absence and presence of domestic wastewater in several villages | Performance evaluation | [8] |
| 9. | Java | West Java | Citarum | Evaluation of community satisfaction level to the drainage channel in riverbanks | Socioeconomic evaluation | [9] |
| 10. | Java | West Java | Girimekar Village, outskirt Bandung | Development of a village through workshop, mural, environmental conservation and waste management | Socioeconomic evaluation | [10] |
| 11. | Java | West Java | Bekasi | Exploration of waste utilities development for the concept of smart city | -<br>Socioeconomic evaluation<br>-Performance evaluation | [11] |
| 12. | Java | West Java | Citarum river | Design of close loop faecal management as an integrated community sanitation | Performance evaluation | [12] |
| 13. | Java | Central Java | Kampung Malon, Gunungpati, Semarang | -Development of natural biodegradable pigments from various plants for local batik industry<br>-Recycling organic waste as compost | -Development of green alternatives<br>-Recycling or upcycling | [13] |

| No. | Island | Province | Location | Community service activity | Type(s) of community service | Ref. |
|---|---|---|---|---|---|---|
| 14. | Java | Central Java | Tanjung Mas, Semarang | Evaluation of the determinants that influence the 3R (reduce, reuse, recycle) program | Socioeconomic evaluation | [14] |
| 15. | Java | Central Java | Surakarta | Sustainable development of a large centralized sanitation infrastructure in Surakarta | - Socioeconomic evaluation -Performance evaluation | [15] |
| 16. | Java | DI Yogyakarta | Sukunan | Development of framework of community-based solid waste management that empower local community for waste separation (organic and non-organic) and recycling | Recycling or upcycling | [16] |
| 17. | Java | DI Yogyakarta | Piyungan landfill, Yogyakarta | Implementation of wastepreneurship concept, especially for energy business via incineration of the landfill wastes | -Recycling or upcycling -Waste to energy conversion | [17] |
| 18. | Java | DI Yogyakarta | Yogyakarta | -Development of Community-based sanitation program (“Sanimas”) -Evaluation of factors that will maintain the sustainability of “Sanimas” | Socioeconomic evaluation | [18] |
| 19. | Java | DI Yogyakarta | Yogyakarta | Performance evaluation of material recovery facilities (MRF) that serve 800 households/MRF | Performance evaluation | [19] |

| No. | Island | Province | Location | Community service activity | Type(s) of community service | Ref. |
|---|---|---|---|---|---|---|
| 20. | Java | DI Yogyakarta | Yogyakarta | Performance evaluation of formal and informal sector (waste bank) of waste management system | Performance evaluation | [20] |
| 21. | Java | East Java | Ngawi | Evaluation of community behavior, regulation, and reliable waste infrastructure to improve the quality of life | Socioeconomic evaluation | [21] |
| 22. | Java | East Java | Randegan, Mojokerto city | Evaluation of willingness of community of 3R (reduce, reuse, recycle) program | Socioeconomic evaluation | [22] |
| 23. | Java | East Java | Malang | Performance evaluation of 89 anaerobic baffled reactors as part of “Sanimas” (community-based sanitation) program | Performance evaluation | [23] |
| 24. | Java | East Java | Surabaya | Evaluation of aspects that influence the stool waste management | Socioeconomic evaluation | [24] |
| 25. | Bali | Bali | Klungkung District, Bali | Listrik Kerakyatan Initiative (Society Electricity Initiative) from gasification of localized municipal waste | -Recycling or upcycling<br>-Waste to energy conversion | [25] |

| No. | Island | Province | Location | Community service activity | Type(s) of community service | Ref. |
|---|---|---|---|---|---|---|
| 26. | Bali | Bali | Bali | Treatment of laundry wastewater by using vertical sub-surface flow constructed wetland system, with volcanic rocks and Canna sp. plants as nature-based filters | Performance evaluation | [26] |
| 27. | Bali | Bali | South Denpasar | Evaluation of media booklet to the behavior change of waste management in elementary school students | Socioeconomic evaluation | [27] |
| 28. | East Nusa Tenggara | East Nusa Tenggara | Alak and Kelapa Lima Sub-Districts, Kupang | Analysis of spatial distribution of informal waste collection | Ecological evaluation | [28] |
| 29. | Kalimantan | East Kalimantan | Samarinda | Performance analysis of hauled container truck system for final disposal facility in Samarinda | Performance evaluation | [29] |
| 30. | Kalimantan | East Kalimantan | Samarinda | Design of e-business for small and medium furniture enterprises by taking account commodity and waste utilization aspects | Performance evaluation | [30] |

| No. | Island | Province | Location | Community service activity | Type(s) of community service | Ref. |
|---|---|---|---|---|---|---|
| 31. | Sulawesi | North Sulawesi | Dayow village, Pinolosian Timur subdistrict, Bolaang Mongondow Selatan regency | Increasing community knowledge by technology transfer of:<br>-Reproduction of goat<br>-Processing the livestock waste into solid and liquid fertilizer | -Recycling or upcycling<br>-Biological conversion | [31] |
| 32. | Sulawesi | North Sulawesi | Manado | Socio-juridical analysis of environmental regulations or policies in Manado | Socioeconomic evaluation | [32] |
| 33. | Sulawesi | Central Sulawesi | Palu | Composition analysis of organic and inorganic waste and the impacts of coastal city | Performance evaluation | [33] |
| 34. | Sulawesi | Central Sulawesi | Palu | Evaluation of the relationship between reducing waste and participation level of heterogeneous community | Socioeconomic evaluation | [34] |
| 35. | Sulawesi | South Sulawesi | Makassar | BHC Project (Building Healthy Cities) and evaluation of its wastewater management | Socioeconomic evaluation | [35] |
| 36. | Sulawesi | Southeast Sulawesi | Kendari | Evaluation of empowerment of coastal communities | Socioeconomic evaluation | [36] |
| 37. | Sulawesi | Southern Sulawesi | Remote islands in two archipelagos of Southern Sulawesi | Evaluation of plastic pollution in remote Indonesian coastal communities | Ecological evaluation | [37] |

| No. | Island | Province | Location | Community service activity | Type(s) of community service | Ref. |
|---|---|---|---|---|---|---|
| 38. | Papua | Papua | Eligobel, Merauke | Utilization of agricultural wastes for sustainable livestock development | -Recycling or upcycling<br>-Biological conversion | [38] |

When the result in Table 1 is mapped and depicted in Figure 1, the location of the community service activies are not quite distributed evenly. The community service activities are heavily conducted at Java and Bali islands, with some at Sulawesi island. The community service related to waste handling and management are not well carried out at Sumatera, Kalimantan, and Papua islands. The number of activities in Table 1 is further analyzed based on the locations, and shown in Table 2. It is shown that the activities recorded in Scopus are of more than 50% in Java island alone. The detailed plot of the community services in Java can be seen in Figure 2.


**Fig 1.** Geographical distribution of community service in the field of waste management in Indonesia (based on Scopus database)

**Table 2.** Percentage of the community services activities related to waste handling and management in Indonesia based on island location

| Island | Number of community services activities related to waste handling and management in Indonesia | Percentage |
|---|---|---|
| Bali | 3 | 7.9% |
| East Nusa Tenggara | 1 | 2.6% |
| Java | 20 | 52.6% |
| Kalimantan | 2 | 5.3% |
| Papua | 1 | 2.6% |
| Sulawesi | 7 | 18.4% |
| Sumatera | 4 | 10.5% |


**Fig 2.** Detailed distribution of community service in the field of waste management (based on Scopus database) in Java island

Based on Table 2 and Figure 1, it can be concluded also that there is another community service gap of uneven distribution of community services located heavily in Java and Bali islands (combined percentage of around 60%). Therefore, it is crucial for academia and industry to perform community services for the economic equalization applied in Sumatera, Kalimantan, and Papua (less than 20% in total). A healthy percentage of community service activities related to waste handling and management is shown at Sulawesi (around 20%).

However, the number of community services in terms of waste handling and management is highly recommended to be increased to support the even distribution of waste management in order to obtain healthier society and indirectly influence the economic growth.The keywords of the selected 38 articles were further analyzed and visualized in Figure 3. The keywords are classified to 4 (four) distinct clusters, namely (1, red) water and wastewater, (2, blue) community, (3, green) Indonesia and sustainable development, and (4, yellow) sanitation and population. Based on the visualization in Figure 3, it is clearly demonstrated that the community services in waste management is highly related with sustainable development, water or wastewater treatment, rural areas, sanitation, and even for the employment and economics as well.

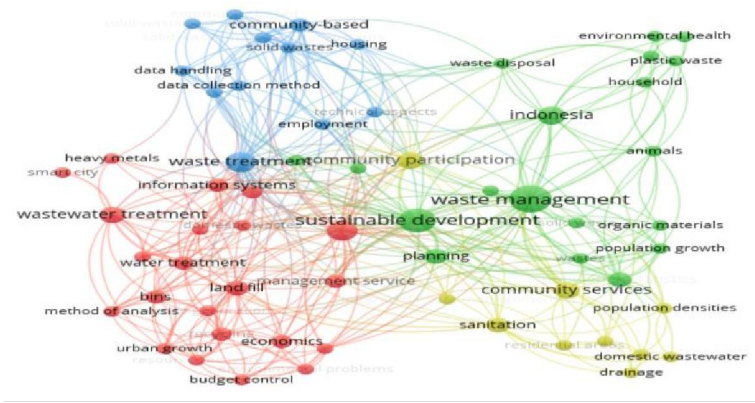


**Fig 3.** Interlinkage between keywords of the publications in Scopus database related to the community service and waste management through bibliometric analysis.

## IV. CONCLUSION

This paper illustrates the mapping of the Scopus database related to the community service in Indonesia in the field of waste handling and waste management. There are 38 selected publications of community service in Indonesia in the field of waste handling and waste management from western to eastern part of Indonesia. From the mapping, there are 2 (two) community service gaps identified, namely:

- Location: Uneven distribution of community service location, around 60% in Java and Bali islands.
- Type of activities: There are about 60% activities in the field of socioeconomic evaluation, whereas the activities directly related to the waste management (recycling or upcycling, and performance evaluation) are less than 40%.

It is highly hoped that in the future, these community service gaps can be further reducted in order to achieve even distribution of community service activities and economic equalization in every part of Indonesia. Furthermore, bibliometric visualization from the publication data of community services of waste management in Indonesia depicted the importance of waste handling and waste management for the sustainable development for better Indonesia in the future.

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