

THE COLLABORATION LEVEL AMONG UNIVERSITY – INDUSTRY – POLICY (U-I-P) ENTITIES ON ENVIRONMENTAL MATTERS IN SARAWAK; MALAYSIA: STATUS AND BARRIERS

Agriculture Sciences

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ABSTRACT

University – Industry – Policy (U-I-P) entities collaboration is viewed to tackle environmental issues. Collaboration, which involves different entities pushes the entities to move towards shared objectives. However, although the significance of U-I-P entities collaboration was known, there are still limited information on the practice of collaboration specifically on environmental matters in Sarawak. Thus, the study seeks to examine the level of linkages among U-I-P entities on environmental matters in Sarawak through structured questionnaires from a total number of 199 respondents. Findings indicated that the current level of collaboration among U-I-P entities on environmental matters in Sarawak is at an infant stage and still relatively poor. The low level is due to the barriers of collaboration such as private knowledge from entities and cost of collaboration. It is suggested that more efforts to increase awareness on collaboration be disseminated in order to tackle and manage environmental matter.

KEYWORDS

University – Industry – Policy, Sarawak, Environmental Matters, Collaboration.

INTRODUCTION

Throughout the past decades, environmental matters have sparked interest and concern among different groups of policy makers, universities, entrepreneurs or industries (Sato, 2017). This is due to the rise in environmental issues that we faced. The major cause of environmental issues that are faced in the world is the result of increased human population, and also the impacts from human activities (Larrson, 2009). Growth in human population, leads to the rise of demand of goods and services that cost energy and raw materials that may impact the environment (Gerland et al, 2014). From late 1960s, Malaysia is very active in the pursuit of rapid industrialization. This rapid industrial activities and urbanization has causes pollution problems by industrial waste water, and also contribute to other types of pollution such as air pollution coming from smoke by vehicles, industrial burning process or domestic burning and noise pollution from machines or quarries (Mokthsim and Salleh, 2016). During the 1970s, most of the environmental pollution was pollution from point source such as emissions from industrial plants or spillage of chemicals. However, during 1980s, environmental pollution becoming to move towards a non- point source, where emissions from numerous small activities came into focus and causes damage (Larrson, 2009).

In Sarawak, its environmental situation surfaces due to the rapid development of the state's activities. Many has argued on the effects of the Pan Borneo Highway and also the construction of hydroelectric dams in Sarawak (Moses, 2009). Although the development may benefit to Sarawak, the activities also has caused several damages such as the disruption of biodiversity and the displacement of thousands of indigenous people. Besides that, air pollution and wastewater pollution are also one of the frequent environmental issues that have hit Sarawak. An example of the environmental threat was the occurrence of haze In 1997, the Malaysian government had declared a state of emergency in Sarawak when the Air Pollution Index (API) reading in Kuching, Sarawak hit 658 (Swinbanks, 1997) and later in 2019, the API in Sri Aman, Sarawak recorded a reading of 367 which is hazardous to human health. As a consequence, the government of Malaysia started to increase awareness on the environment and implement several guidelines to monitor and improve the air quality (Yusof et al, 2016).

Therefore, it can be accepted that clean environmental conditions are the crucial necessity that are needed for the betterment of life. In case of environmental crisis, prompt action must be taken to mitigate its negative consequences. However, the environment is not the responsibility of only one side of entity, but it is a shared responsibility in an integrated manner of university – industry – policy (U-I-P) entities collaboration. The approach of U-I-P has emerged as a trend and started to be recognized by most countries, governments and organizations and was suggested as the ways to tackle environmental issues. The approach itself has been implemented in many countries

including Malaysia. As the approach of collaboration are growing in recognition various factors of why collaboration is important has been studied. One of the reasons are there are many potentials of collaboration which includes higher productivity. According to Beaver (2001), organizations that collaborate with each other tend to have higher productivity than those who does not collaborate with each other. This is supported by Rigby and Edler (2005) who mentioned that the organization that collaborate with each other has higher quality of result than the organization that does not care to collaborate with each other. This is logical as when practicing collaboration there are more than one organization or entities that work together by putting in their mind and efforts into solving a certain issues. Other advantages of collaboration identified are access to skilled manpower. Through collaboration, manpower could be fully utilized by both organizations (Katz and Martin, 1997; Melin, 2000). With all these advantages of collaboration, many organizations seek to encourage collaboration by means of establishing research centers or contributing funding for collaborative engagement to improve many raising issues such as environmental issues (Sonnenwald, 2007). Therefore, with all the potentials and factors of collaboration, it is important to investigate on the level of collaboration. In order to reap the benefit of collaboration, it is significant to investigate the practice in depth.

The linkages among university – industry – policy (U-I-P) entities has begun in the recent years as to answer the government's vision which is to encourage working in an integrated manner of collaboration. The effort of collaboration is viewed to be the tools for success especially when used in dealing environmental matters (Gajda, 2004). Institutional linkages are important in managing environmental matters. There are growing amount of evidences that depicts the engagement of one entity with another entity in addressing environmental problems in Malaysia or internationally (Bodin, 2017). The government itself has implemented several policies that are in favor to collaboration in addressing environmental matters. However, while there is government focus in collaborative work on environmental matters, it is still reported that there are little collaboration relationship established with no clear overview on the exact level of collaboration (Rasiah and Govindaraju, 2019). There are lack assessment and very limited information known on the status of the linkage structures between U-I-P entities in Malaysia, particularly in Sarawak. Generally, this paper is to explore on the status level of linkages on managing environmental matters in Sarawak, Malaysia as to provide a clear overview state of the level of collaboration among University-Industry-Policy entities. Therefore, the specific objectives of the study are:

- i. To examine the level of linkages and status of collaboration on environmental matters among universities, industries and policy entities.
- ii. To investigate the barriers that hinder the linkage structures among these entities towards tackling environmental matters.

Study Methods

The study employs a mixed method to access the U-I-P entities linkages in Sarawak particularly on matters that are related to the environment. The data collection for the study was collected by a face to face interview from 199 respondents and entities in four main divisions of Sarawak that are in Kuching, Sibü, Bintulu and Miri.

Target respondents

The target respondents for this study are selectively selected from three different entities of university, industry and policy makers in Sarawak. Respondents from these entities are selected based on their knowledge or experience on the subject study.

Study areas

The study areas for the study of U-I-P entities linkage structure on environmental matters is located in Sarawak, the largest state in East Malaysia which is located near the Northwest Borneo Island. There are 12 divisions in Sarawak which are Kuching, Samarahan, Sibü, Mukah, Bintulu, Miri, Betong, Kapit, Limbang, Sarikei, Serian and Sri Aman. However, in the study, data collection are only collected from only four main divisions of Sarawak that are Kuching, Sibü, Bintulu and Miri as shown in Figure 1 below.



Figure 1: Study Location In Sarawak

Sample size

Sample size is a statistical method that was used to study the whole population of the subject study without actually involving the whole population. The formula to calculate sample size was taken from Krejcie and Morgan (1970). Below is the formula to determine sample size:

$$S = \frac{(x^2)(N)(1-P)}{((d^2)(N-1) + (x^2P(1-P)))}$$

where,

s = sample size needed;

N = Population size;

P = population proportion (assumed to be 0.50);

d = degree of accuracy (0.05); and

x^2 = table value of chi square for 1 degree of freedom at desired confidence level is 3.841

In Sarawak, up to year 2019, identified are 400 industries that are selected according to the significance to the study. Therefore, the calculation for the sample size can be obtained by using the formula as follow:

$$S = \frac{(x^2)(N)(1-P)}{((d^2)(N-1) + (x^2P(1-P)))}$$

$$s = \frac{(3.841)(400)(0.25)}{(0.0025)(399) + (0.96)}$$

$$s = 196.1; s \approx 196$$

Data analysis

Data analysis in the study was analysed using a SPSS computer software. Type of analysis used is descriptive analysis, where the raw data was transformed into a new summary of format that is easier to interpret and chi square test is used to find the differences between groups.

RESULTS AND DISCUSSION

Collaboration Status in Sarawak

In Sarawak, the U-I-P collaboration has started to emerge in the recent years. Many has realized the importance of collaboration as a way to tackle issues especially environmental issues. However, from the findings many has perceived that Sarawak is still lacking in U-I-P collaboration especially in environmental matters. This is observed from the data findings as shown in Figure 2.

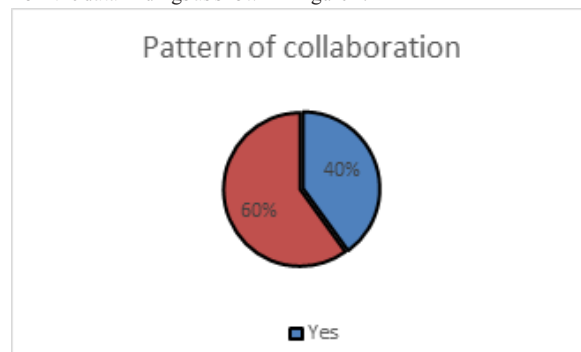


Figure 2: Pattern Of Collaboration In Sarawak (yes/no)

From the pie chart in Figure 2, it can be observed that only 40% mentioned that there is collaboration on environmental matters among U-I-P in Sarawak while the remaining 60% strongly agree that there are no familiar collaboration work. There are few arguments to support the result. Firstly, collaboration work especially on environmental issues is not a priority for the entities. Industry entities are more focused on production and profit gaining while universities are chasing publications and commercialization of research products while earning profit (Etzkowitz, 2014).

Besides that, the university staffs are too keen on focusing on publications, research and achieving their KPI's while neglecting the practise of addressing the real issues through collaboration. Based on the surveyed findings, the level of collaboration in Sarawak is not encouraging due to the lack of commitment to collaborate especially among the industries as most industries nowadays are too focused only on profit gain without developing a sense of priority towards environmental concern. Therefore, as collaboration progressed, priority settings must be developed and implemented accordingly among collaborating entities. In Malaysia, the universities have since been gotten priority in terms of collaboration with industry and government after the growth of science and technology in the country is not moving (Wong and Goh, 2010).

The Level of Collaboration in Sarawak

The data findings were then further divided to show the level of linkages in four major cities in Sarawak which are in Kuching, Sibü, Bintulu and Miri. The level of collaboration linkages were summed up as in Table 1 to show the level of linkages in study areas.

Table 1 The Level Of Collaboration Linkages Among Study Areas.

Study areas	Level of linkages				
	Infant	Semi Building	Building	Semi Mature	Mature
Kuching	21.0%	29.0%	32.6%	54.0%	36.0%
Sibü	29.5%	24.0%	18.6%	8.0%	14.0%
Bintulu	15.8%	38.0%	30.2%	23.0%	29.0%
Miri	33.7%	9.0%	18.6%	15.0%	21.0%

The level of collaboration was accessed by dividing the level into five scales of rating namely infant, semi building, building, semi mature and mature. For infant, there are a total number of 95 (47.7%) respondents out of 199 respondents who stated that the level of current collaboration in Sarawak is still in infant stages. The highest number of respondents that falls under the category is from Miri (33.7%), followed by Sibü (29.5%), Kuching (21.0%) and Bintulu (15.8%). Miri rated the highest rating of infant as collaboration based on environmental matters is because it is not a priority there. Bintulu revealed the highest semi building stage with 38.0%, followed by second highest 29.0% from Kuching, 24.0% from Sibü and 9.0% from Miri. Bintulu, is known as a developing town in Sarawak, and recognized for its oil and gas activity. Therefore, the town is moving towards a more encouraging status in terms of collaboration. On the

other hand, Kuching held the highest vote as 32.6% of total respondents agreeing that the level of collaboration is at building stage. The second highest vote for building came from Bintulu (30.2%) followed by Sibü (18.6%) and Miri (18.6%).

As for semi mature, most votes came from Kuching (54.0%), followed by Bintulu (23.0%), Miri (15.0%) and Sibü (8.0%). Kuching is the capital city of Sarawak and also known as an administrative division. Thus, the division is expected to have a more encouraging collaboration especially on those related to environmental matters. For the level of collaboration at mature stage, Kuching is perceived of having excellent collaboration level among other divisions with highest votes of 36.0%, followed by Bintulu (29.0%), Miri (21.0%) and Sibü (14.0%).

The findings revealed that Kuching displayed a better collaboration level among U-I-P on the environmental matters. Kuching has a more encouraging state of collaboration than the others as Kuching is the capital city in Sarawak, thus more of the collaboration work are focused in the head offices of Kuching. As said by one of the Sarawak's Minister Dato Sri Michael Manyin in a conference held in Kuching, he mentioned that the government is encouraging of the collaboration and coordinate all the research projects that have been conducted all this while other than being ended up in theory but no commercial values. This is evident that there are a lot of researches being done on environmental matters but most of them are just research that end up in a paper but not being implemented. Therefore, collaboration is the perfect tools for this, as collaboration among many entities has always be the solid pillar for environmental management (Sulaiman and Wei Chan, 2019).

Barriers of Collaboration

This section contributes to explore out the barriers that challenge collaboration and list down all the constraining factors of collaboration that hinders the development of collaboration relationship. In this section, all the barriers perceived in the study of the assessment of collaboration linkages among U-I-P entities on environmental matters in Sarawak are listed as in Table 2 and Figure 3.

Table 2 Listed barriers in Sarawak

No.	Barriers of collaboration	Total
1A	Acceptance from university/industry	1
2A	Bureaucracy	7
3A	Private knowledge	14
4A	Top management view/support	6
5A	Compliance	1
6A	Cost	19
7A	Differences in culture	3
8A	Experience	2
9A	Expertise	4
10A	Focus on money performance only	8
11A	Funding	10
12A	Hard to collaborate	6
13A	Implementation	5
14A	It is a new approach	1
15A	Knowledge barrier	11
16A	Lack of communication	1
17A	Time	1
18A	University should explore more	1
19A	Unrealistic expectation that it is easy	1
20A	Visible benefit of collaboration	2
21A	Lack of resources	3
22A	Lack of rewards to collaborators	1
23A	Long time frame to start	1
24A	Mindset from industry	3
25A	Neglect environment	4
26A	No barrier	4
27A	Not interested	2
28A	Poor awareness on collaboration	1
29A	Quality of result	1
30A	Recognition	6
31A	Same repetition of subject	2
32A	Size of company	1
33A	Commitment	5
34A	Cooperation	6
35A	Equal partnership	8

36A	Policies	6
37A	Trusted partners	4
38A	No initiatives	9
39A	Willingness to change	1
40A	Lack of help from authority	6

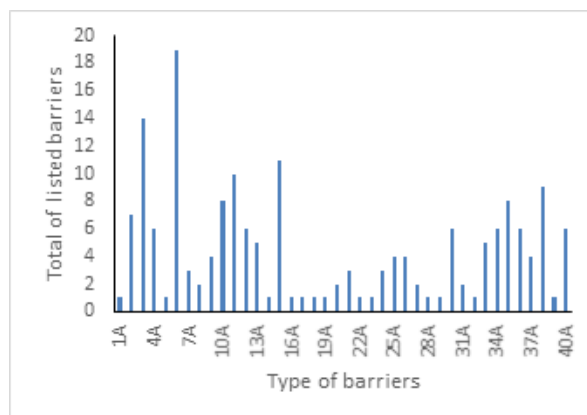


Figure 3: Barriers of U-I-P Entities Collaboration In Sarawak.

The study found that there are a total of 40 barriers identified in Sarawak (Table 2). If these barriers are not identified and addressed intensively by collaborating partners, then the level of collaboration may be weakened and does not gives fruitful results. For these reasons these barriers of mutual challenges of collaboration in Sarawak should be attentively identified and addressed prior to successful collaboration. The main perceived barrier of collaboration among U-I-P entities is cost, private knowledge and knowledge barrier (Figure 3). Cost is an amount of values or money that are required in order to ensure the effectiveness of collaboration. A university research or a collaborative partnership with industries require a certain amount of cost for it to be functioning. It can be in monetary form, effort or materials. As said by Guimon (2013), to achieve the goals of collaboration, it is important to consider whether the cost is achievable or not.

Second highest barriers is private knowledge. Some entities, mostly industries are so secretive and private with their knowledge that they tend to not open up or excited to collaborate with their collaborating partners in fear that the knowledge will be leaked out (Dasgupta and David, 1994). An example, the university plays the roles of economic actor by which some universities are encouraging their researchers to commercialize their knowledge with industry to get research incentives (D'Este and Perkmann, 2011). On the other hand, the industry solve certain issues and develop new creation for competitive advantages (Link and Siegel, 2005). The university are more inclined to share their knowledge but the industries are stern with their knowledge to avoid knowledge leakage (Brown and Duguid, 2000). The process of knowledge creation in the private sector is mainly to create an economic value of the new knowledge as part of a strategic mechanism to gain competitive advantage (Teece, 1986).

Besides that, knowledge barrier is also considered as collaborating constraint among U-I-P entities in Sarawak whereby there is no knowledge on how to start collaboration work or simply does not realized of the importance of partnership for goals especially in tackling environmental issues. Other barriers that are commonly challenging collaboration include bureaucracy, funding and government support. These barriers need to be addressed efficiently in order to ensure the success of collaboration goals.

CONCLUSION

Collaboration is an approach that has been introduced to reduce the gap between entities to progress and also to ensure sustainability. As there are a number of benefits of collaboration, the Malaysian government are implementing policies to encourage collaboration. However, despite there have been many studies of collaboration, little has been published on what exactly is the level of collaboration, specifically dealing with environmental concern in Sarawak and little consideration has been given in examining the level of structural linkages among university, industry and policy entities. This, raises a question of the study that is to look on the level of collaboration in Sarawak on environmental matters. Thus, the paper aimed to access on

the level of structural linkages mainly on environmental matters in Sarawak. The conclusion is, the level of existing collaboration in Sarawak is at an infant stage. Future efforts are needed to increase more collaboration work on environmental matters. On the other hand, the research are subjected to several limitations. The limitation includes are the cooperation from the respondents. This is because, not everyone from the organization or company are willing to cooperate in the survey. Second limitation is the lack of previous research study on the particular topic. Thus, it is vital that more research or study on collaboration are conducted and researched to have a deeper understanding of the concept. Lastly, it is suggested that the government should enforced a strict policies on collaboration and reward those who managed to collaborate and contribute to environmental benefit.

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REFERENCES

1. Beaver, D. (2001). Reflections on scientific collaborations (and its study): Past, present and future. *Scientometrics*, Vol 52, No. 3, PP 365 - 377.
2. Bodin, O. (2017). Collaborative environmental governance: Achieving collective action in social ecological systems. *Science*, 357, 659.
3. Brown, J.S., and Duguid, P. (2000). The social life of information. *Harvard Business School Press*.
4. Dasgupta, P., and David, P. (1994). Towards a new economics of science. *Research Policy* 23, 487 - 522.
5. D' Este, P., and Perkmann, M. (2011). Why do academics engage with industry? The entrepreneurial university and individual motivations. *Journal of Technology Transfer*.
6. Etzkowitz, H. (2014). The entrepreneurial university wave: From ivory tower to global economic engine. *Industry and Higher Education*, 28 (4), 223 - 232.
7. Gajda, R. (2004). Utilizing collaboration theory to evaluate strategic alliances. *American Journal of Evaluation* 25, 1, 65 - 77.
8. Gerland, P., Raftery, A. E., Ševčíková, H., Li, N., Gu, D., Spoorenberg, T., and Wilmoth, J. (2014). World population stabilization unlikely this century. *Science*. <http://doi.org/10.1126/science.1257469>.
9. Guimon, J. (2013). Promoting university - industry collaboration in developing countries. World Bank. Retrieved from
10. [http://innovationpolicyplatform.org/sites/default/files/rdf_imported_documents/Promoting University Industry Collaboration In Developing Countries.pdf](http://innovationpolicyplatform.org/sites/default/files/rdf_imported_documents/Promoting%20University%20Industry%20Collaboration%20In%20Developing%20Countries.pdf).
11. Katz, J. S., and Martin, B. R. (1997). What is research collaboration? *Research Policy*
12. Krejcie, R. V., and Morgan, D. W. (1970). Determining sample size for research activities. Educational and physiological measurement.
13. Larsson, M-L. (2009). Legal definition of the environment and of environmental damage. Stockholm institute of Scandinavian law.
14. Link, A. N., and Siegel, D. S. (2005). "Generating science-based growth: An econometric analysis of the impact of organizational incentives on university-industry technology transfer", *European Journal of Finance*, vol. 11, no. 3.
15. Melin, G. (2000). Pragmatism and self - organization research collaboration on the individual level *Research Policy*, 29 (1), 31 - 40
16. Mokhtsim, N and Salleh, K.O (2016). An appraisal of environmental management strategies in Malaysia's towards achieving sustainable development goals. *International Journal of Applied Environment Science*.
17. Moses, K. (2009). Power, profit and pollution: dams and the uncertain future of Sarawak. MongaBay, New York.
18. Rasiah, R., and Govindaraju, C. (2009). University - Industry R&D collaboration in the automotive, biotechnology and electronics firms in Malaysia. *Seoul Journal of Economics*.
19. Rigby, J., and Edler, J. (2005). Peering inside research networks: Some observations on the effects of intensity of collaboration on the variability of research quality. *Research Policy* 34(6), 784 - 794.
20. Sato, S. (2017). Climate change, the built environment and triple - helix innovation. *Elsevier*.
21. Sulaiman, N., and Chan, S. W. (2019). Multi agency collaboration in flood disaster management in Sarawak Malaysia. *International Journal of Innovative Technology and Exploring Engineering*.
22. Swinbanks, D. (1997). Forest fires cause pollution crisis in Asia. *Nature*.
23. Sonnenwald, D. H. (2007). Scientific collaboration. *Information Science and Technology*, 41, 643 - 681.
24. Teece, D. (1986). Profiting from technological innovation: implications for integration collaboration, licensing and public policy. *Research Policy* 15, 285 - 305.
25. Wong, C. Y., and Goh, K. L. (2010). Modeling the behaviour of science and technology: self propagating growth in the diffusion process. *Scientometrics*.
26. Yusof, N.S., Zawawi, E. M. A., and Ismail, Z. (2016). Disaster waste management in Malaysia: Significant Issues, Policies and Strategies. *MATEC Web of Conference* 66, 005