

**ICH 2019****International Conference on Humanities****COMMUNITY AWARENESS AND INVOLVEMENT IN RIVER  
CONSERVATION IN PASIR MAS, KELANTAN**

See Too Kay Leng (a)\*, Chan Ngai Weng (b), Narimah Samat (c)

\*Corresponding author

(a) School of Humanities, Universiti Sains Malaysia, Penang, Malaysia, [kayleng@student.usm.my](mailto:kayleng@student.usm.my)

(b) School of Humanities, Universiti Sains Malaysia, Penang, Malaysia, [nwchan@usm.my](mailto:nwchan@usm.my)

(c) School of Humanities, Universiti Sains Malaysia, Penang, Malaysia, [narimah@usm.my](mailto:narimah@usm.my)

***Abstract***

River water resources are very important for human society to sustain life, as a source of food and for income generation, main source of freshwater supply to the communities, hydro-electric power and many more. Unfortunately, many rivers in Kelantan State in Malaysia are badly polluted, bringing severe negative impacts to habitat and human society. The aims of this paper are to identify the river water pollutants' sources, to identify the level of awareness among communities regarding river pollution problems and to explore the community's role and engagement in river water quality conservation. This study uses a mixed method combining quantitative and qualitative methods. For data collection, this study used questionnaires to study selected communities in Pasir Mas, Kelantan and also qualitative interview sessions with relevant stakeholders. From the field survey, it was found that household wastewater disposal, solid waste dumping and river bank erosion were the main sources of pollution in the Kelantan River. Results show that about half the respondents do not know that river water pollution affects the costing in water treatment and gave rise to problems in the water supply. This study recommends public education and awareness campaigns to enhance community awareness, and to involve communities in monitoring and reporting all the activities that occur nearby the river in order to control polluting activities. The model of community-based management of water resources is proposed as a viable model to conserve river water quality towards the sustainability of water resources in the future.

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## 1. Introduction

Natural resources are vital for humans to sustain life and also to maintain ecosystem balance. Malaysia is a blessed country that has an abundance of rainfall and water resources. It has been estimated that each Malaysian enjoys a per capita freshwater of more than 5,000 m<sup>3</sup> per person per year (World Wildlife Fund, 2019). According to Chan et al. (2018), freshwater resources is more than enough as there is more than 5000m<sup>3</sup> per person per year. Yet, lack of freshwater still occurs in some of the areas in Malaysia. This happens not because of having too little water to satisfy human needs but is due to the unsustainable management of water resources that brings lots of negative impacts to human and nature (Chan et al., 2018).

According to Mohd Ehwan Toriman (2016), 80% of freshwater from water bodies is used for industrial and domestic use. Accessing freshwater is also important for industries in the cooling down of the machines and producing their products. Besides, freshwater is also important in other sectors such as agriculture, fisheries, aquaculture, etc. Other than that, domestic freshwater demand is high for washing, cooking, gardening, flushing, and so on. Hence, freshwater is very important to everyone either for the individual or the industry as water is needed daily to sustain people and industry. The contamination issue of river water resource is one of the factors leading to the freshwater shortage and causes lots of negative consequences to society, economy and environment. Besides, urbanisation and population increase have led to stress on surface water from industrial, agricultural and domestic sources (Daniel, 2017; Kanu & Achi, 2011). Consequently, water bodies such as rivers that are receiving treatment or non-treated wastewater from domestic or industry have become highly contaminated (Daniel, 2017; Ogbeibu & Ezeunara, 2002). Consumers of polluted river water will suffer illnesses such as gastrointestinal, respiratory, dermatologic or throat diseases depending on the concentration of pathogens and duration of exposure (Nzeadibe, 2009; Obeta & Ochege, 2014).

The national water quality parameters can be used as a parameter to check the water quality of the rivers. The National Water Quality Index Classification for Malaysia uses the six parameters of ammoniacal nitrogen (NH<sub>3</sub>-N), biochemical oxygen demand (BOD), chemical oxygen demand (COD), dissolved oxygen, pH and total suspended solid (TSS) (Department of Environment, 2019). High levels of pollutants in river water cause an increase in those parameters and hence make such water unsuitable for drinking, irrigation and aquatic life (Emongor et al., 2005). The other indicators to identify contamination of river water is through human sense detection such as smell, river water's color and water temperature (Coyle et al., 1994). Most people can easily notice the occurrence of water pollution by sense detection compared to water quality tests that require the usage of some specific equipment for measurement. The DOE has classified the water classes into five, Class I is considered very clean water while Class V is very polluted water (Department of Environment, 2019). Only Class I and Class II water are recommended for drinking after treatment.

In short, to address river water pollution, the starting point is in getting community involvement as they are living nearest to the river and they can detect river water pollution sooner compared to others. Conservation, both for the environment and rivers, is a state of harmony between humans and nature (Adams, 2009). There are many ways to conserve river water quality but there are gaps to achieve the best result. Community-based conservation to conserve and maintain river water quality through reducing

pollution is an effective and economical solution compared to expensive river cleaning using machines. Community-based conservation includes a range of activities that directly or indirectly lead to better river water quality.

## 2. Problem Statement

There are several factors that can cause river water pollution, but the major cause is due to unscrupulous human activities towards the river that can threaten human well-being and the environment as well. For example, Qin said, urbanisation significantly contributes to the increase in water pollution problems, especially in the form of sedimentation, solid waste, rubbish, and organic pollution (Qin et al., 2014). The same issues occur in the study area of Pasir Mas where a huge population living near the river causes river water quality degradation. For example, improper wastewater system of the households will make river water quality become worst due to no treatment or filter of the wastewater before they are discharged into the water bodies (World Wildlife Fund, 2019).

Household sewage contamination contain organic pollutants, which means those harmful bacteria or viruses that may cause and led to diseases and living things in the river to be extinct. Water-borne diseases such as cholera, hepatitis A, and typhoid that may harm human health can happen when the river water is polluted by sewage disposal.

According to Chan (2002), Malaysia has found that rivers are important to society and nature as big cities have been established along major rivers. Although rivers are rich natural ecosystems that are teeming with life, and provide water supply, irrigation, means of transportation, food and power, the rivers have been neglected and polluted. Some reasons given by Chan (2005) include low government priority, public apathy, negligence, poor management and pollution from agriculture and the industry. River pollution represents a very serious obstacle to achieve sustainable development of water resources. This problem has identified the wastewater company Indah Water Konsortium as one of the main polluters of rivers in Malaysia, as well as polluters from the agricultural sector, industrial polluters, and the domestik sector (Chan, 2012). While many international multi-national companies with huge industries have adopted ISO 14001, and procatise coporate social responsibility (CSR), the bulk of small and medium scale (SME) industries in Malaysia are not regulated and consequently do not practise CSR or environmental conservation programmes (Fawzi Halila, 2007). Along major rivers in Malaysia there are thousands of squatter colonies that remain as major polluting source as well.

In addition, nonpoint sources are also a serious threat as they are extremely difficult to monitor and manage. Public apathy is another river water pollution factor. This is because garbage is routinely dumped into rivers (Water Pollution Organisation, 2019). It is true that the general public is now more educated than the previous generations of Malaysians, but general public apathy continue to be a huge unsolved problem as fines are insignificant and not severe to deter garbage dumping into the rivers by the public. All these reasons have led to the current poor quality state of rivers in the country. In 2019 alone, the cases of severe river pollution in the Kim Kim River in the industrial area of Pasir Gudang in Johor, which led to thousands being hospitalised are proofs of the poor enforcement in management of the rivers (Mohd Sabran Md Sani, 2019). In another serious incident, the diesel pollution of Sungai Selangor forced the shutdown

of four water treatment plants in the state in July 2019, leaving more than one million people in Selangor and Kuala Lumpur without piped water (Amirudin Shari, 27 September 2019).

In Kelantan State, the lack of awareness among the community towards conservation of river water quality can raise water pollution problems. Motivation or awareness is a basic role to make sure that our environment resources are sustainable for use now and in the future. Unfortunately, communities in many parts of the state appear to be unaware of the water quality issues that may harm their health as well as the problems in water supply and also their costing in water tariffs. Communities who live in the urban or rural areas have the responsibility to protect the river from pollution, but poor awareness, care towards rivers and commitment to volunteer for river conservation work are the obstacles towards community involvement. According to Malaysia's Water, Land and Natural Resources Minister Dr Xavier Jayakumar, river rehabilitation and cleaning initiatives in Malaysia carried out by the government costing billions of ringgit were not effective because the communities do not play their parts, and the lack of awareness and advocacy on environmental conservation were among the biggest challenges the ministry faced in keeping rivers clean and healthy (Hemananthani, 2019). The minister said "a total of 189 rivers in Malaysia were all polluted and their conditions continue to deteriorate over the years as many find rivers to be the most convenient dumping site" (Perimbanayagam, 2018, para.4). In Kelantan, poor community involvement in river conservation has also led to the deterioration of river water quality and the general degradation of rivers in Kelantan State (Ahmad et al., 2009; Tan & Rohasliney, 2013).

### **3. Research Questions**

The main research questions are:

- What kind of pollutant's sources in Kelantan river that contribute to river water pollution?
- How do the pollutant's sources affect the river water quality?
- Does water pollution affect human daily life and environment?
- How far is the local community's awareness to conserve river water quality?
- What should the local community do to address river water pollution in Kelantan river?

### **4. Purpose of the Study**

The aims of this research are:

- To identify the river water pollutant's sources and the consequences
- To identify the level of awareness among communities regarding river water pollution problems
- To suggest community-based management in river water quality conservation

### **5. Research Methods**

This study has used the quantitative and qualitative research methods to achieve all those research objectives.

### **5.1. Sampling Method**

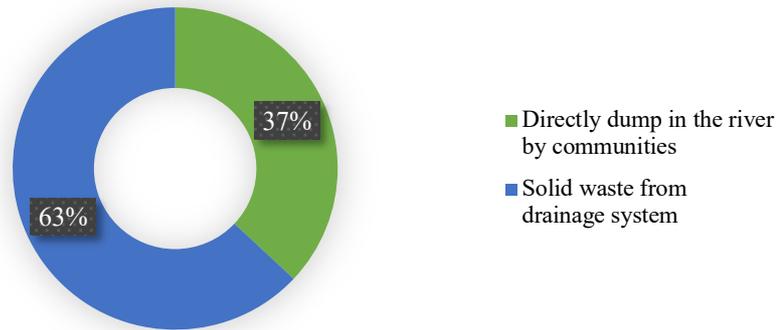
This study has used systematic random sampling for data collection as its quantitative method. The instrument for this sampling is a set of questionnaire form that is distributed to 100 respondents in Pasir Mas who are from various communities, in order to obtain information with regards to river pollutant's sources and their awareness. From these 100 respondents, two major groups have been identified- the urban respondents and rural respondents. The rationale to divide groups of respondents is to determine the differentiation of the pollutant's sources and the difference in the urban and rural respondents' level of awareness. The Statistical Package for the Social Sciences (SPSS) software has been used to compile and analyse the questionnaire's data. The data outputs are shown in graphs, tables and charts in order to make the research findings easily comprehensible.

This research has also used a qualitative method to cover subjective input data that are related to human perspectives and their feelings towards river water pollution in the study area. A total of 5 key respondents have been interviewed to get the research information. The research has used a snowball sampling method to get the descriptive information among the key respondents. Descriptive analysis has been used to analyse the qualitative data and to interpret as a systematic description in the research findings.

## **6. Findings**

### **6.1. To identify the river water pollutant's sources and the ways to address them**

According to the results of the field survey at Pasir Mas, there are three main pollutant sources that contribute to the Kelantan river water pollution. Kelantan river is polluted due to household wastewater discharge, solid waste disposal and also river bank erosion. Pasir Mas is a riverside district and there are so many households that have been built along the river in the rural area or town. Most of the households in the rural area have no proper wastewater disposal system. Hence, most of the household's wastewater or sewage will be disposed directly into the river from their house. Budget saving and inconvenience are the reasons for them to not install a proper wastewater disposal system in their house. Research respondents have said that they disposed their household wastewater into the river since many decades ago. However, there is a problem when the river water level rises during the raining day or flood season. Their household wastewater is not able to flow out smoothly due to the high river water level. If this scenario happens continuously and no effective action is taken to resolve it, the consequences will be very harmful to nature and human in the future. According to Abdul Malik (Interview with DID officer, June 2018), the elements present in the household wastewater discharge include oil, gasoline, pet wastes, lawn care chemical, etc. Disposing of the garbage that contains E-Coli and bacteria present in the river can also contribute to water pollution. Other than that, river water may also be polluted by daily activities such as water discharge from washing clothes, car washing or dish washing. All the chemicals that are discharged into the river without treatment may cause a high level of pH, COD and ammonia nitrogen in the water bodies.



**Figure 01.** Factor of solid waste pollution in Kelantan river

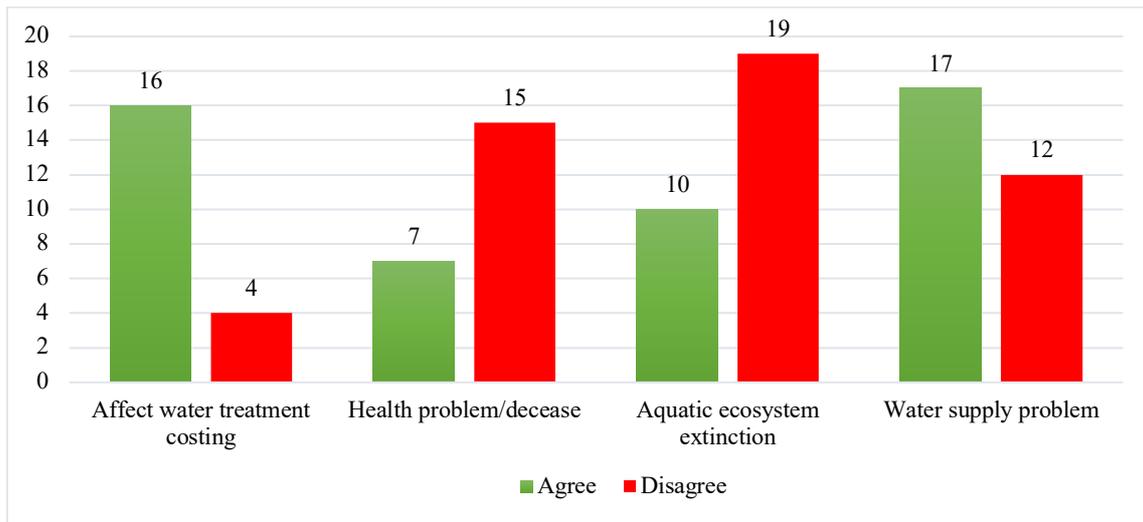
Dumping of solid waste into the drainage systems or river by irresponsible communities is another factor that causes river water pollution in Pasir Mas. As all drains within the drainage system is connected to the Kelantan river, all the pollutants that is dumped into the drains ultimately ends up in the river (Azianti, interview, June 2018). That means everything that is received by the drainage system will end up in the river. According to results from this research shown in figure 01, about 63% of solid waste pollution has been generated by drain garbage. In this study area, we have identified a lot of solid wastes like plastic bottles, single-use plastics, straws and many types of solid garbage in the drainage system, especially in the town area. These solid wastes will affect the river water quality when it flows into the stream because some of those plastic waste is oily or have been filled toxic material that will threaten the river ecosystem as well. The data in figure 01. shows that 37% of the research respondents' opinion on the pollutant sources that cause degradation of the river water quality stem from their negative behaviour- to directly dump their household garbage in the river. They did not feel guilty to dump the solid waste, for example, domestic waste, clothes or electrical waste in the river because they do not know the consequence will threaten the environment or themselves. This action shows that the community lacks awareness regarding the conservation of the river or freshwater in their daily lives.

The other source that causes river water pollution is bank erosion. Unstable river bank may cause freshwater pollution as there will be fine sediments (Baharudin Yaakob, interview, June 2018). Sediment particles remain suspended in a river for some time, causing cloudy, turbid water and depriving aquatic plants of the light they need for growth. For this study, bank erosion happens due to riverside development. Developing activities destabilised the river slopes and can trigger a landslide which will send mud and trees tumbling into the stream. For example, when a developer reclaims a riverside bank for development, the result of this action is that the river wall will become unstable due to the change in the stream morphology. A destabilised stream bank can easily be eroded and collapsed into the river bringing soil and sediments as pollutants.

## **6.2. To identify the level of awareness among communities regarding river pollutions problems**

River water pollution probably occurs because of a community's attitude and the lack of motivation in protecting the river water quality. Therefore, this study has done a survey about the community's

awareness of the river water quality. 50% (red bar in the graph) of the respondents have responded that they do not know that their bad behavior e.g. dumping solid waste or discharging their household wastewater into the river or drain system may cause river water pollution. Next, the community in this study area also gives their response that the river will not be polluted just because a few people throw their wastes in the river. However, another 50% (green bar in the graph) of the respondents understands, and agrees with the value of freshwater and are therefore involved in the river water conservation practice.



**Figure 02.** Implication of river water pollution

The figure 02 shows 50% (green bar in the graph) from those 100 respondents who have agreed that river water pollution may cause a lot of implications including high costing in water treatment, health problem, aquatic ecosystem extinction, and water supply problem. Most of the people (17%) agreed that river water pollution can become trouble in the water supply system for domestic or industrial consumption. This is because polluted water especially classified in class V is not safe to be used for drinking or direct skin contact. Even though the Kelantan river in Pasir Mas area is still safe to be used but there is still no improvement in conserving river water, for sure water quality will decrease and affect the water supply one day. Correspondingly, 16% have agreed that high costing is required in polluted river water treatment as the company has to process the polluted water so that it is free from chemical and biological pollution. This advance treatment must use high technologies to process it so that freshwater can be supplied and be of safe use by the community. 10% of research respondents have agreed that the aquatic ecosystem may extinct if the river water is polluted, and 7% of the respondents have pointed that the implication of river water pollution may affect human health or disease may occur.

**Table 01.** Communities practice to conserve river water quality

Community role to conserve river water quality	Respondents (%)
Did not dump or throw solid waste in the drain or river	12
Did not discharge household wastewater to the river	15
Educate surround people to conserve river water quality	60
Report irresponsible activity that may cause river water pollution to authority	13

Table 01 shows 60% of the people will teach or educate surround people to conserve water river quality. The reasons they choose to conserve water quality through education because human attitude or behavior can be change by enhancing motivation and knowledge input. Once they understand the cause-effect of river water pollution, for sure they will not do something that can pollute the river water and by then river water quality can improve. 15% of respondents practice not to discharge any wastewater from their household to maintain good water quality. This practice can be done by installing a proper domestic wastewater system for every house. Mostly, this systematic wastewater disposal system had installed in the residential area but not for own build house in the rural area especially for those who live nearby the river. To make sure good river water quality can truly retain, this problem must be encounter as soon as possible. 12% of peoples react they will not dump solid waste or garbage in the drain system or river. At the same time, 13% of respondents said they will report to authority such as Department of Environmental (DOE) or Department of Integrated and Drainage (DID) when they caught or notice someone pollute the river by pollutant's sources.

### **6.3. Role of the community in river water quality conservation**

Communities living along the river must take the responsibility to monitor and reporting all the river pollution problems as soon as possible to authorities is the way that can reduce pollution problem (Lai et. al., 2017). The vision of small, integrated communities using locally evolved norms and rules to manage resources sustainably and equitably is powerful (Adams, 2009). Communities based conservation intentionally includes a range of activities practice in various concerns of the resources that directly or indirectly lead to conservation (Barrow & Murphree, 2001). As far as they are aware and concerned, natural resources can be conserves or improve through their practice or role. Study findings show that half of Pasir Mas communities was still lack of awareness regards to conserving river water quality and motivation to improve their life's behaviour to reduce river water pollution. Hence, the study suggests the community must address river water pollution through public education and awareness campaigns. This kind of activities may organize by the non-governmental organization (NGO) or local community themselves. They can provide some useful information such as the values of freshwater, the ways to save and prevent water from pollution, the implication of water pollution to nature and human, etc. The organizer can also prepare some games related to conserving river water's topic and get the community to involve as participants so that they can experience and have fun during the campaign.

On the other hand, cleaning up of river by the community can also be an agenda in such conservation campaign (Nur Salina, interview DID officer during field survey, June 2018). This activity not only can reduce solid waste contaminate but it can deduct the river cleaning cost by the local government as well. Level of consciousness towards water quality can be enhancing during river cleaning up programs by the community as they know pollution's consequence may cause inconvenient for the future generation. Nowadays, many parties such as business company, NGO and also environmental activist held a lot of river cleaning up programs that approach the local community to take part. A strong public-private partnership in river conservation practice is a good way to retain water quality. For example, Global Environment Centre (GCE) is an NGO that concerned about river health and they have done many river conservation

activities worldwide. Result of community and their concrete efforts, many polluted rivers have restored to good condition and enjoy the safe use freshwater.

Furthermore, community monitor towards river water quality is a community-based conservation role that must be practice so that we can control water pollution in Pasir Mas. According to DID officer Marziah (interview, July 2018), the communities living along the river has the responsibility to monitor river water condition and any suspicious activity that endanger the river and people. They should take the fast action to report to the authority to catch the irresponsible party causing the threat to the river. Effective cooperation between community and authority is an ideal situation to address water pollution problems. Both parties can work well together by sharing information. Community playing role as “River Watchdog” also can reduce water pollution because of human psychological heuristic factor. The community will feel guilty and afraid to easily to disposing the waste or discharge wastewater in the river due to there are so many peoples monitor their illegal action.

## **7. Conclusion**

Sustainable resource use has become and still remains a polarized issue in Malaysia, especially in Kelantan State. Even though many policies have been formulated and implemented to solve river pollution, the problem remains unsolved largely because most efforts are carried out by the government in a top-down manner without community involvement. The communities who live beside and near to rivers are important agents that can help conserve or pollute a river. When they are better educated and made more aware of the importance of rivers, they will be able to better contribute towards a model of community-run river conservation. A better alternative is for the community to work closely with government and the private sector in an integrated river management model. As there are many factors causing the degradation of river water quality with severe consequences and negative impacts to aquatic life and humans, effective river conservation is necessary. The main contribution of this study is to fill in the problem or gap regarding the community’s role and their awareness in terms of conserve river water quality. However, to reduce the river water pollution is not an easy job if there are no systematic system to deliver or educate the community by the NGO or local government that more experience on river conservation. Hence, everybody has the responsibility to improve community awareness I terms of conserving river. Only when river water pollution is addressed can community and country prosper as water sustainability is an important Sustainable Development Goal (SDG) that needs to be achieved.

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