

## **Ecological assessment on water quality and fisheries at confluence of Ayeyawady and Chindwin River**

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### **Abstract**

Water quality analysis of three locations; Ayeyawady River, Chindwin River, as well as confluence of Ayeyawady and Chindwin River were observed from December 2018 to August 2019. Physico-chemical parameters of water in three locations were tested seasonally (February, May, August-2019) such as pH, colour, turbidity, conductivity, calcium, hardness total, magnesium, chloride, total alkalinity, iron total, manganese and sulphate. In the present work, chemical effluents from gold mines are currently flowing into Chindwin River directly. Thus, Chindwin river is mostly poor water sanitation for fisheries resources and all aquatic life as well as unhealthy for people concerning drinking purposes. The water from that Chindwin River effects on the confluence of Ayeyawady River and Chindwin River as well as Ayeyawady River. If it can control that effluents from gold mines from Chindwin river, water bodies of Confluence and Ayeyawady river water are suitable not only survival of fish fauna and all aquatic forms but also drinking water standards for people and all living things. Water qualities were analyzed at three locations; in doing so, all results are chemically potable by comparing with World Health Organization (WHO) standard. The water result of Ayeyawady River is the better one than confluence of Ayeyawady and Chindwin River as well as Chindwin River. Therefore, the role of stakeholder is very important to sustain the water resources in the riverine ecosystem for sustainable development.

**Key words :** chemical effluents, physico-chemical parameters of water, aquatic life, World Health Organization (WHO) standard

### **Introduction**

Lucy Towers mentioned in 2015 water quality is the most important factor affecting fish health and performance in aquaculture production systems. Fish live and are totally dependent on the water they live in for all their needs. In this study, fish survival depends on the quality of water. Water quality effects on mortality as well as survival of fish and aquatic life. Water quality is various ingredients in water. If the quality of water is better situation, fish and other aquatic animals can survive more in it.

In 1994, Nelson stated about fishes are cold-blooded, therefore their metabolism depend on water quality and the temperature of the environment. Therefore, in this work, the populations of fish are totally depending on the water quality, water sanitation and the temperature of water because they are cold-blooded animals.

Fish perform all their bodily functions in water. They are totally dependent upon water to respiration, feed and grow, excrete wastes, preserve a salt balance, and reproduce; understanding the physical-chemical parameters is critical to quality aquaculture (Sargaonkar and Deshpande, 2003). In this study, water quality that is completely influenced fisheries resources that are directly related with socioeconomic situations in the study area. This is very important issues not only for fish and aquatic life but also health of human beings regarding sustainable development goals (SDGs).

In 2010, Patra and Datta described the physical, chemical and biological characteristics of the river water are gradually changing and producing the harmful effect on aquatic biota thereby also harming human beings. In this present work, water sources of streams, lakes, rivers are polluting by humans' activities such as battery shock fishing, using

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chemicals, and weak environmental awareness. Various characteristics and courses of river route are changing along the river. These changes impact on all aquatic organisms especially fisheries resources and human beings. River banks in the study area gradually collapse because of erosion according to speed water current. Therefore, some local indigenous people are moving from one place to another in the vicinity of study area. And, water resources are getting polluted by human's actions especially in the upstream of Chindwin River where small-scale gold mines are located. This River is joining with Ayeyawady River in the study area, therefore, the impacts of water resources from the Chindwin River are conveying into Ayeyawady River by mixing two water bodies and fisheries resources. Therefore, physical, chemical, and biological resources are linking each other.

Hafiza Hira Iqbal *et al.*, said in 2017, the toxic metal contamination of freshwater ecosystems is a serious worldwide environmental problem. Degrading water quality, particularly in developing countries, poses deleterious effects on aquatic life and threats to human health. Large amounts of contaminants comprising toxic metals, pathogens, persistent organic pollutants, and pharmaceutical drugs are being discharged at high volumes into urban river systems. In this study, water quality that affects not only on aquatic life but also local community's health. Rivers, streams, lakes and ponds in the upstream of Chindwin River that are released effluents from small scales gold mines and wastes by human's action, especially water bodies are mixing in the study area, the confluence of two rivers.

For the human and industrial growth, water is considered to be the main requirement. Increase in population and industrialization, the demand of the freshwater increases in the last decades. This demand fulfilled by the rivers which provide the water for human life and agriculture purposes. Due to the waste discharged from the human and industrial activities, the quality of river water has deteriorated which affects human as well as aquatic life. According to WHO, CPCB, BIS, ICMR, the water quality of about 70% river water was contaminated due to pollutants in India and some of the river water was too poor for human consumption (Ramakrishnaiah *et al.*, 2009; Jindal and Sharma, 2010). In this study, fish and all aquatic life that live in water are facing various threats as challenges because the quality of water. The wastes discharged by human and small scales gold mine zones that are flowing into the water bodies. Therefore, riverine water resources are directly related with human actions, which impact on fisheries resources. In the previous time, the populations of fisheries resource are very high with good condition of water sanitation because there were almost no environmental impacts on water bodies as well as fisheries resources in the riverine ecosystem in the study area.

Usman Atique and Kwang-Guk An stated in 2019, water quality is assumed as the mainstay of public interest for monitoring disease and the state of healthiness in humans and aquatic organisms. Freshwater quality is reportedly deteriorating because of rapid industrialization, expanding populations, and globally increasing pressure reinforced by poor management that ultimately has led to severe environmental degradation. In this study, the quality of water deterioration is necessary to focus on as well as fisheries richness and their relationship. Therefore, water quality is good and sustain for survival of fish and all aquatic life as well as for usage of human and their socioeconomic situation.

The water quality parameters like temperature hardness, pH, dissolved gases, salinity etc, must be watched regularly, individually or synergistically to keep the aquatic habitat favorable for existence of fish (Mondal *et al.*, 2010). In this research work, all physico-chemical indicators are analyzed for water quality testing is very important to live fish and other aquatic organisms. Water quality parameters are temperature, pH, dissolved gases, colour, turbidity, conductivity, total hardness and nutrients etc are analyzed for fisheries

resource that is related with socioeconomic situation of rural community in the vicinity of the study area.

Physico-chemical parameters were very essential and important to test the water before it is used for drinking, domestic, agricultural or industrial purpose (Patil *et al.*, 2012). In fact, in this research works, physico-chemical parameters testing for different purposes make healthy society not only human, animals, and plants but also aquatic life especially fisheries resources that are living in water. It sustains development of social and economy of rural community.

Today they form an important element in the economy of many nations (Nelson, 2006). In the study area, fishery resources create many opportunities for career of people that makes acquire many profits for people in every region because they are important food source in daily life. That provides social and economy of human to develop and sustain. Therefore, fisheries resources, water quality that live in and socio-economic development of local indigenous groups are required to observe as well as monitor to be sustainable state of ecosystem regarding SDGS.

### **Aims and objectives**

The present study was conducted with the following objectives;

- to observe fisheries resources and their populations in nature
- to analyze water quality and sources of impacts on water bodies
- to emphasize socio-economic situation in the study area regarding SDGs (Sustainable Development Goals)
- to inform the result of research works to all stakeholders with capacity engagement

### **Materials and Methods**

#### **Study area**

This study was conducted at the confluence of Ayeyawady River and Chindwin River (hereafter study area). The study sites are situated in the vicinity of four villages of Darkyun village and Tazaung village, Natnyun village, and Aung Pan Chaung village. Darkyun village and Tazaung village are situated in Myingyan Township, Mandalay Region and Natnyun village and Aung Pan Chaung village are situated in Yaesagyo Township, Magway Region. Confluence of Ayeyarwady and Chindwin River are situated at latitude 21° 28'40.46" N and longitude 95° 17' 13.79" E.

#### **Study period**

From December 2018 to August 2019

#### **Water Analysis**

Water samples were collected seasonally (February, May, August) from the study area with plastic bottle. These samples were taken from the depth of 1 feet to 2 feet and it was covered with black plastic bag to protect the direct sunlight and sent to laboratory of Water and Sanitation Department, Mandalay City Development Committee (MCDC) within

24 hours to analyze the parameters of pH(scale), color(units), turbidity(N.T.U), conductivity (micromhos/cm), calcium, hardness total( $\text{CaCO}_3$ ), magnesium, chloride, total alkalinity, iron total, manganese and sulphate. These all criteria are analyzed by comparing with W.H.O standard as desirable as well as imperative value. The results are coincided with W.H.O standard; therefore, all results are chemically potable.



Figure (1).The location of confluence of Ayeyarwady and Chindwin River from google earth



Figure (2).Taking water sample from three locations; confluence, Ayeyawady and Chindwin River.

## Results

### Physico-chemical Parameters

The physico-chemical parameters of water resources of the study area are vital important for fisheries, water resources, as well as socioeconomic situations of rural community. This result of physicochemical parameters of Ayeyawady River and Chindwin River are highlighting for healthy aquatic ecosystems of the study area.

In this study, water quality result is for three seasons (February, May, August) and the average data of physical and chemical parameters of water from (1) Confluence of Ayeyawady River and Chindwin River, (2) Ayeyawady River, and (3) Chindwin River were shown in (Table 1, 2, 3).

Table (1). Physico-chemical parameters examination of water quality representative of cold season (February-2019)

Parameters	Confluence	Ayeyawady River	Chindwin River	W.H.O standard	
				Desirable	Imperative
<u>Physical Examination</u>					
pH	6.8 mol/l	6.8 mol/l	6.8 mol/l	7-8.5 mol/l	6.5-9.2 mol/l
Colour	>50	>50	>50	5	50
Turbidity	43.1 NTU	24.1 NTU	126 NTU	5 NTU	25 NTU
Conductivity	185.6 mmho/cm	173 mmho/cm	228 mmho/cm		
<u>Chemical Analysis</u>					
Calcium	24 mg/l	19 mg/l	24 mg/l	75 mg/l	200 mg/l
Hardness Total	88 ppm	80 ppm	100 ppm	100 ppm	500 ppm
Magnesium	5 mg/l	8 mg/l	10 mg/l	30 mg/l	150 mg/l
Chloride	8 mg/l	8 mg/l	10 mg/l	200 mg/l	600 mg/l
Total Alkalinity	88 mEq/l	80 mEq/l	120 mEq/l	200 mEq/l	500 mEq/l
Iron Total	>0.2 mg/l	>0.2 mg/l	>0.2 mg/l	0.1 mg/l	1.0 mg/l
Manganese	0.03 mg/l	0.03 mg/l	0.03 mg/l	0.05 mg/l	0.5 mg/l
Sulphate	<200 mg/l	<200 mg/l	<200 mg/l	200 mg/l	400 mg/l

Table (2). Physico-chemical parameters examination of water quality representative of hot season (May-2019)

Parameters	Confluence	Ayeyawady River	Chindwin River	W.H.O standard	
				Desirable	Imperative
<u>Physical Examination</u>					
pH	6.8 mol/l	6.8 mol/l	6.9 mol/l	7-8.5 mol/l	6.5-9.2 mol/l
Colour	>50	>50	>50	5	50
Turbidity	92.9 NTU	66 NTU	9.89 NTU	5 NTU	25 NTU
Conductivity	108.1 mmho/cm	101.7 mmho/cm	217 mmho/cm		
<u>Chemical Analysis</u>					
Calcium	11 mg/l	11 mg/l	19 mg/l	75 mg/l	200 mg/l
Hardness Total	56 ppm	52 ppm	100 ppm	100 ppm	500 ppm
Magnesium	6 mg/l	5 mg/l	12 mg/l	30 mg/l	150 mg/l
Chloride	10 mg/l	10 mg/l	8 mg/l	200 mg/l	600 mg/l
Total Alkalinity	56 mEq/l	52 mEq/l	100 mEq/l	200 mEq/l	500 mEq/l
Iron Total	>0.2 mg/l	>0.2 mg/l	>0.2 mg/l	0.1 mg/l	1.0 mg/l
Manganese	0.03 mg/l	0.03 mg/l	0.03 mg/l	0.05 mg/l	0.5 mg/l
Sulphate	<200 mg/l	<200 mg/l	<200 mg/l	200 mg/l	400 mg/l

Table (3). Physico-chemical parameters examination of water quality representative of rainy season (August-2019)

Parameters	Confluence	Ayeyawady River	Chindwin River	W.H.O standard	
				Desirable	Imperative
<u>Physical Examination</u>					
pH	6.8 mol/l	6.8 mol/l	6.8 mol/l	7-8.5 mol/l	6.5-9.2 mol/l
Colour	>50	>50	>50	5	50
Turbidity	61.2 NTU	33.6 NTU	105 NTU	5 NTU	25 NTU
Conductivity	74.7 mmho/cm	84.2 mmho/cm	70.2 mmho/cm		
<u>Chemical Analysis</u>					
Calcium	8 mg/l	11 mg/l	8 mg/l	75 mg/l	200 mg/l
Hardness Total	48 ppm	48 ppm	40 ppm	100 ppm	500 ppm
Magnesium	6 mg/l	5 mg/l	5 mg/l	30 mg/l	150 mg/l
Chloride	5 mg/l	5 mg/l	5 mg/l	200 mg/l	600 mg/l
Total Alkalinity	48 mEq/l	48 mEq/l	40 mEq/l	200 mEq/l	500 mEq/l
Iron Tatal	>0.2 mg/l	>0.2 mg/l	>0.2 mg/l	0.1 mg/l	1.0 mg/l
Manganese	0.03 mg/l	0.03mg/l	0.03 mg/l	0.05 mg/l	0.5 mg/l
Sulphate	<200 mg/l	<200 mg/l	<200 mg/l	200 mg/l	400 mg/l

### Physical Parameters

#### 1. pH

pH is measured mathematically by, the negative logarithm of hydrogen ions concentration. The pH of natural water is greatly influenced by the concentration of carbon dioxide which is an acidic gas (Boyd, 1979). The pH value is equal to for all sites in both cold and rainy season but Chindwin River is higher than two others during hot season.

#### 2. Color

The colour of an object is defined by the wavelengths of visible light that the object reflects (Anita Bhatnagar and Pooja Devi, 2013). The colour of water is greater than 50 for all sites during three seasons.

#### 3. Turbidity

Ability of water to transmit the light that restricts light penetration and limit photosynthesis is termed as turbidity and is the resultant effect of several factors such as suspended clay particles, dispersion of plankton organisms, particulate organic matters and also the pigments caused by the decomposition of organic matter (Anita Bhatnagar and Pooja Devi, 2013). The turbidity of water is the highest in Chindwin River and the lowest in Ayeyawady River during cold season. The Confluence have highest turbid and Chindwin river have lowest turbid during summer. In the rainy season, Chindwin river has the highest turbid and Ayeyawady river has the lowest turbid.

#### 4. Conductivity

Conductivity is an index of the total ionic content of water, and therefore indicates freshness or otherwise of the water (Ogbeibu and Victor, 1995). The conductivity of water is equal to in Confluence and Chindwin River and lower in Ayeyawady River during cold

season. In hot season, Chindwin River is the highest conductivity and Ayeyawady River is the lowest. Ayeyawady River is the highest conductivity and the lowest in Chindwin River during rainy season.

## **Chemical Parameters**

### **5. Calcium**

Calcium is generally present in soil as carbonate and most important environmental, divalent salt in fish culture water. Fish can absorb calcium either from the water or from food (Anita Bhatnagar and Pooja Devi, 2013). The value of calcium is equal to in Confluence and Chindwin River and lower in Ayeyawady River during cold season. Chindwin River has the highest calcium, on the other hand, Confluence as well as Ayeyawady River is equal to in hot season. In the rainy season, the calcium of Ayeyawady River is higher than two others and the two others are equal to in the rainy season.

### **6. Hardness, Total**

Hardness is the measure of alkaline earth elements such as calcium and magnesium in an aquatic body along with other ions such as aluminum, iron, manganese, strontium, zinc, and hydrogen ions. Calcium and magnesium are essential to fish for metabolic reactions such as bone and scale formation (Anita Bhatnagar and Pooja Devi, 2013). The hardness total value of water is the highest in Chindwin River and the lowest in Ayeyawady River during winter and summer. Confluence and Ayeyawady is equal to and higher than Chindwin River in the rainy season.

### **7. Magnesium**

The magnesium of water is the highest in Chindwin River and the lowest in Confluence during cold season. In hot season, Chindwin River is also the highest and the lowest in Ayeyawady River. The magnesium of Confluence is the highest and the two others are equal to during the rainy season.

### **8. Chloride**

Chlorine (Cl<sup>-</sup>) is a gas which is added in water as a disinfectant to control harmful bacteria and Chloride is the same element found in the form of a salt, both have dramatically different chemical properties. Chloride is a common component of most waters and is useful to fish in maintaining their osmotic balance (Anita Bhatnagar and Pooja Devi, 2013). The value of Chloride is the highest in Chindwin River and the two others are equal to in cold season. Confluence and Ayeyawady River is equal to and higher than Chindwin River in hot season. In the rainy season, Chloride in the water resources in three places is equal to all sites.

### **9. Total Alkalinity**

Alkalinity is the water's ability to resist changes in pH and is a measure of the total concentration of bases in pond water including carbonates, bicarbonates, hydroxides, phosphates and borates, dissolved calcium, magnesium, and other compounds in the water (Anita Bhatnagar and Pooja Devi, 2013). The value of total alkalinity is highest in Chindwin River and the lowest in Ayeyawady River during cold and hot season. During the rainy season, Confluence and Ayeyawady River is equal and higher than Chindwin River.

### **10. Iron total**

The iron total of water is equal to in all sites during three seasons.

### 11. Manganese

The manganese value of water is equal to in all sites during three seasons.

### 12. Sulphate

The value of sulphate of water is equal to in all sites during three seasons

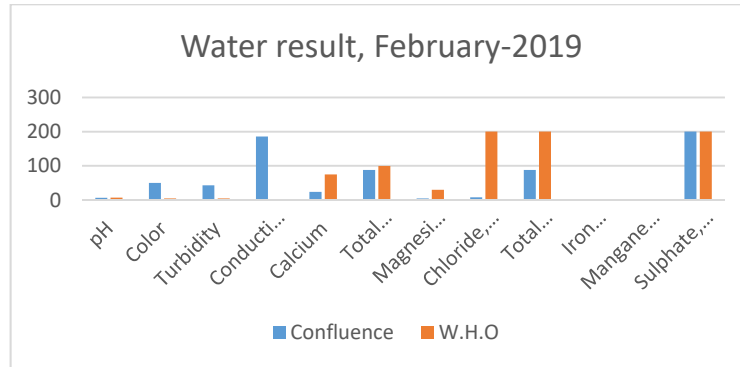


Figure (3). Water result of confluence of Ayeyawady and Chindwin River (February-2019)

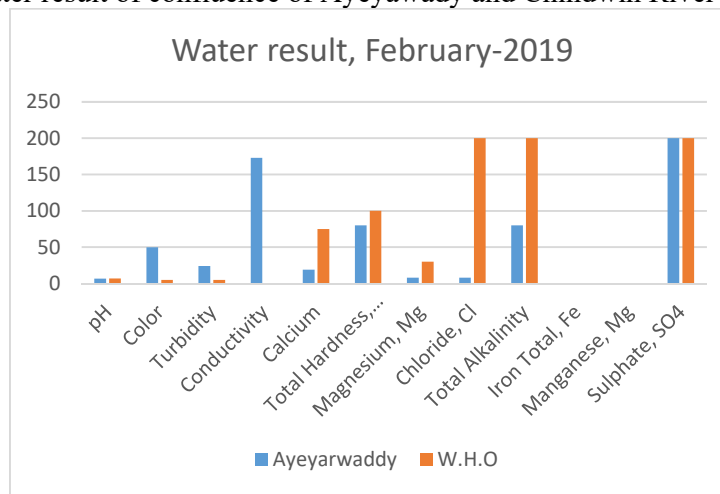


Figure (4). Water result of Ayeyawady River (February-2019)

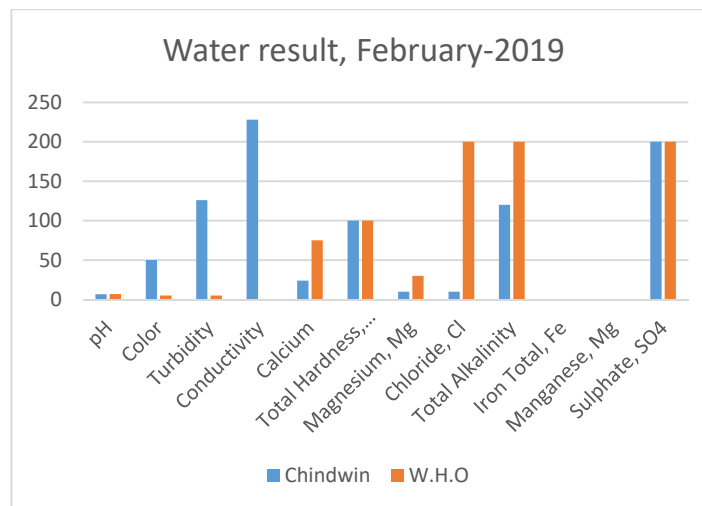


Figure (5). Water result of Chindwin River (February-2019)



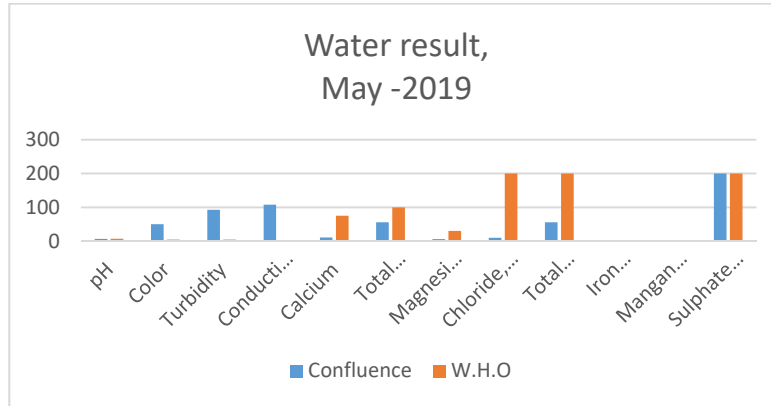


Figure (6). Water result of Confluence of Ayeyawady and Chindwin River (May-2019)

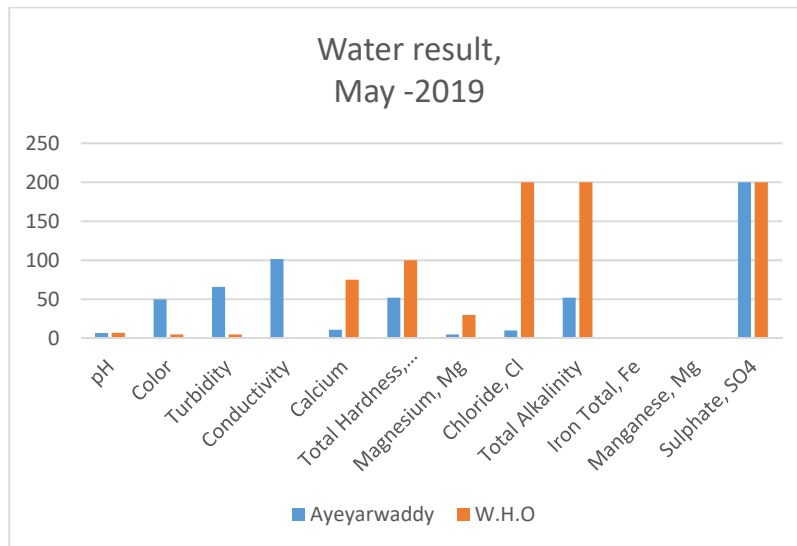


Figure (7). Water result of Ayeyawady River (May-2019)

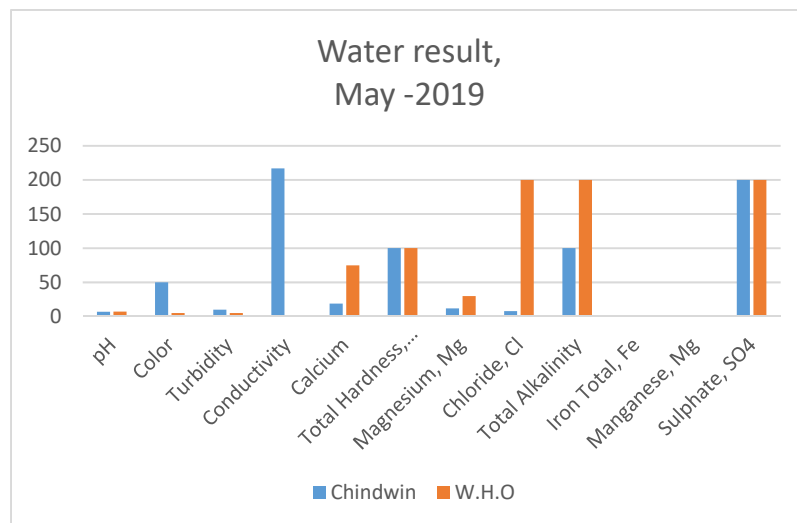


Figure (8). Water result of Chindwin River (May -2019)

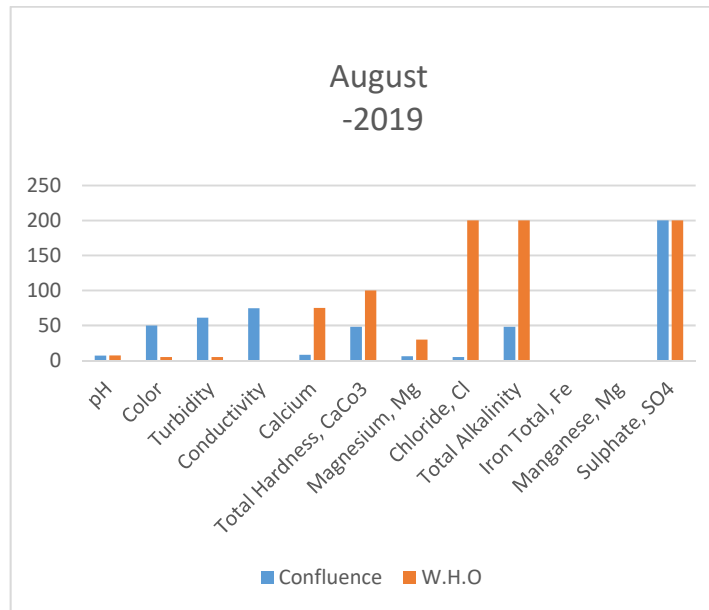


Figure (9). Water result of Confluence of Ayeyawady and Chindwin River (August-2019)

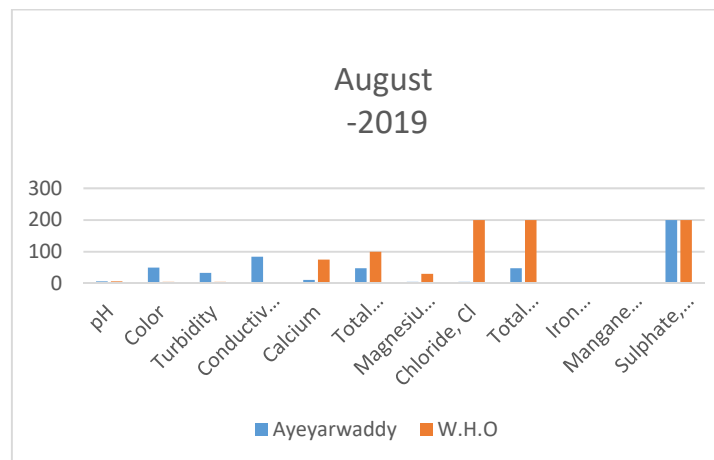


Figure (10). Water result of Ayeyawady River (August-2019)

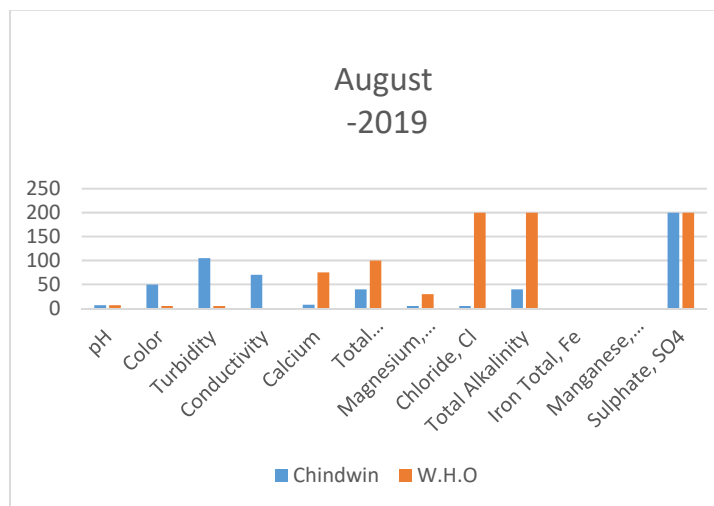


Figure (11). Water result of Chindwin River (August-2019)

### Discussion

The present work was conducted from December 2018 to August 2019. This study was conducted in the vicinity of confluence of Ayeyawady River and Chindwin River. The study sites are situated in the vicinity of four villages, namely; Darkyun village, Tazaung village, Natnyun village, and Aung Pan Chaung village. Darkyun village and Tazaung village are situated in Myingyan Township, Mandalay Region and Natnyun village and Aung Pan Chaung village are situated in Yaesagyo Township, Magway Region. The confluence of Ayeyawady and Chindwin River is situated at latitude 21° 28' 40.46" N and longitude 95° 17' 13.79" E.

According to WHO standard, pH = 7 to 8.5 is the desirable range and 6.5 to 9.2 is the imperative range for drinking water. During study period, pH value measured = 6.8 for all sites in cold, hot and rainy seasons but 6.9 for Chindwin River in hot season. So, it is assumed that the value of pH is suitable to drink for human seasonally. Wurts and Durborow, 1992; Bhatnagar *et al.*, 2004 stated that the desirable range of pH between 6.5 and 9 for fish species. According to these researchers, this value of pH is suitable to survive for fish fauna.

The colour 5 is the desirable range and 50 is the imperative range regarding WHO standard. In this study, the colour of water measured >50 for all sites in cold, hot and rainy seasons. Bhatnagar *et al.* 2004 mentioned that light green color is good for fish species.

The turbidity of water 5 NTU is the desirable range and 25 NTU is the imperative range for drinking water according to WHO standard. In this study, turbidity of water measured 43.1 NTU for Confluence, 24.1 NTU for Ayeyawady River, 126 NTU for Chindwin River in cold season, 92.9 NTU for Confluence, 66 NTU for Ayeyawady River, 9.89 NTU for Chindwin River in hot season and 61.2 NTU for Confluence, 33.6 NTU for Ayeyawady River, 105 NTU for Chindwin River in rainy season. Therefore, the amount of turbidity is unsuitable to drink in Confluence and Chindwin River during cold season. It is challenges to drink in Confluence, Ayeyawady River in hot season as well as all three sites in rainy season. Bhatnagar *et al.* described in 2004 that turbidity range from 30 to 80 cm is good for fish health.

During the present study, the value of conductivity measured 185.6 mmho/cm for Confluence, 173 mmho/cm for Ayeyawady River, 228 mmho/cm for Chindwin River in cold season, 108.1 mmho/cm for Confluence, 101.7 mmho/cm for Ayeyawady River, 217 mmho/cm for Chindwin River in hot season and 74.7 mmho/cm for Confluence, 84.2 mmho/cm for Ayeyawady River, 70.2 mmho/cm for Chindwin River in rainy season. Stone and Thomforde in 2004 recommended the desirable range 100 to 2,000 mSiemens/cm of conductivity is suitable for fish species.

The value of calcium 75 mg/l is the desirable range and 200 mg/l is the imperative range to drink for human regarding WHO standard. In the present work, the value of calcium measured 24 mg/l for Confluence and Chindwin River, 19 mg/l for Ayeyarwady River in cold season, 11 mg/l for Confluence and Ayeyawady River, 19 mg/l for Chindwin River in hot season and 8 mg/l for Confluence and Chindwin River, 11 mg/l for Ayeyawady River in rainy season. The amount of calcium is suitable to drink for human in all sites seasonally. Wurts and Durborow in 1992 recommended that the desirable range of calcium 25 to 100 mg/l is suitable for fish species.

The value of total hardness 100 ppm is the desirable range and 500 ppm is the imperative range to drink for human according to WHO standard. In this study, total hardness measured 88 ppm for Confluence, 80 ppm for Ayeyawady River, 100 ppm for Chindwin River in cold season, 56 ppm for Confluence, 52 ppm for Ayeyawady River, 100

ppm for Chindwin River in hot season and 48 ppm for Confluence and Ayeyawady River, 40 ppm for Chindwin River in rainy season. The amount of total hardness is suitable to drink for human in Confluence and Ayeyawady River in cold season. In hot season, it is also suitable to drink in Confluence and Ayeyawady River. In rainy season, the total hardness is suitable to drink in all sites as well. Stone and Thomforde in 2004 stated that the desirable range of total hardness 50 to 150 mg/l is suitable for fish species.

The value of magnesium 30 mg/l is the desirable range and 150 mg/l is the imperative range to drink for human with reference of WHO standard. In this study, magnesium measured 5 mg/l for Confluence, 8 mg/l for Ayeyawady River, 10 mg/l for Chindwin River in cold season, 6 mg/l for Confluence, 5 mg/l for Ayeyawady River, 12 mg/l for Chindwin River in hot season and 6 mg/l for Confluence, 5 mg/l for Ayeyawady and Chindwin River in rainy season. The amount of magnesium is suitable to drink for human in all sites seasonally.

The chloride value 200 mg/l is the desirable range and 600 mg/l is the imperative range to drink for human according to WHO standard. During the present study, chloride measured 8 mg/l for Confluence and Ayeyawady River, 10 mg/l for Chindwin River in cold season, 10 mg/l for Confluence and Ayeyawady River, 8 mg/l for Chindwin River in hot season and 5 mg/l for all sites in rainy season. It is suitable to drink in all sites seasonally.

The value of total Alkalinity 200 mEq/l is the desirable range and 500 mEq/l is the imperative range to drink for human in accordance with WHO standard. In this study, total Alkalinity measured 88 mEq/l for Confluence, 80 mEq/l for Ayeyawady River, 120 mEq/l for Chindwin River in cold season, 56 mEq/l for Confluence, 52 mEq/l for Ayeyawady River, 100 mEq/l for Chindwin River in hot season and 48 mEq/l for Confluence and Ayeyawady River, 40 mEq/l for Chindwin River in rainy season. Therefore, the amount of total Alkalinity is suitable to drink for human seasonally. Santhosh and Singh stated in 2007 that the ideal value for fish culture is 50 to 300 mg/l.

The value of iron total 0.1mg/l is the desirable range and 1.0mg/l is the imperative range to drink concerning WHO standard. In the study period, iron total measured > 0.2mg/l for all sites in three seasons. Therefore, it is suitable to drink in all sites seasonally.

The manganese 0.05 mg/l is the desirable range and 0.5 mg/l is the imperative range to drink with respect of WHO standard. In this research work, manganese measured 0.03 mg/l for all sites in three seasons. Therefore, the amount of manganese is suitable to drink for human seasonally.

The sulphate 200 mg/l is the desirable range and 400 mg/l is the imperative range regarding WHO standard. In the present study, the value of sulphate measured <200 mg/l for all sites in three seasons. Therefore, it is suitable to drink seasonally.

Therefore, the results of water quality analysis of three locations of the study area are generally chemically potable.

Hafiza Hira Iqbal *et al.*, 2017 described that Survey and result of study showed that concentrations of pollutants and non-stop fishing activities of commercial fish are the main reasons for the reduction of fish fauna. In this research work, there was also same experienced as above researchers because IUU fishing are somewhere in the study area that make the main reasons for declining of fishes in the study area.

In the present work, chemical effluents from gold mines are currently flowing into Chindwin River directly. Thus, Chindwin river is mostly poor water sanitation for fisheries resources and all aquatic life as well as unhealthy for people concerning drinking purposes.

The water from that Chindwin River affects to the confluence of Ayeyawady River and Chindwin River as well as Ayeyawady River.

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