GENDER ANALYSES ON THE RELATIONSHIP BETWEEN HOUSEHOLD INCOME CATEGORIES AND WATER SYSTEM AMONG THE VULNERABLE RESPONDENT IN FISHERIES COMMUNITY

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Abstract

This paper aims to explore the types of vulnerability through the Sustainable Livelihood Approach (SLA), identify the relationship between types of vulnerability and sex of the respondents, and measure the relationship between household income categories and types of the water system by sex disaggregation. Two data sets were used in this study (brackish water community and freshwater community) which covered the backgrounds of the vulnerable respondents and household income from the respective questionnaires. The respondents in both datasets are vulnerable respondents selected through multi-stage random sampling with the help of government agencies and community leaders in the sampled villages in Padang Terap, Kedah; Hulu Perak, Perak; Pulau Langkawi, Kedah; and Kota Setar, Kedah (Northern Peninsular Malaysia). A total of 415 vulnerable respondents were reported in this paper. Three hypotheses were tested. Seven vulnerability types obtained through SLA that the respondents are poor marginalised, and vulnerable – handicapped, single parents, the elderly, child labour, living alone, caretaker, and suffering serious diseases. The Ho_1 had been rejected because there is a significant (p<0.05) relationship between types of vulnerability and sex of the respondents. The Ho2 and Ho3 were also rejected because there is a significant (p<0.05) relationship between household income levels and types of water systems among male and female respondents, respectively. The vulnerable women are mainly single mothers and older people, and the vulnerable men are mainly handicapped individuals. The vulnerable men and women in the brackish water community are poorer than the vulnerable men and women, respectively, in the freshwater community.

Keywords: Gender; Poverty; Elderly; Fisheries; Household income

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Introduction

The Fisheries and Aquaculture Economic Sector (FAES) is essential for many countries because FAES contributes to healthy protein for national food security (FAO, 2018). The FAES may help a nation to achieve Sustainable Development Goal (SDG) 2 (United Nations, 2015) to free the community from hunger (FAO, 2018), especially for poor and the vulnerable community members; for instance, the handicapped or single mothers with many dependents, older people, and child labourers (Shahar, Vanoh, Ludin, Singh, & Hamid, 2019; Ismail, Masud, & Zainalaludin, 2015). The vulnerable community members may earn income in less masculine FAES activities, or at least they will get FAES products (food) as 'payment' for their work. This may help them avoid hunger because everybody in the community is essential.

The FAES is a masculine sector, which means the work risk is high (Stergiou-Kita, Mansfield, Bezo, Colantonio, Garritano, Lafrance, & Theberge, 2015). The FAES is categorised as a masculine economic sector because the fishermen may face a high work risk of fatal accidents or accidents that may cause them to be permanently disabled. Their wives are usually full-time housewives and depend totally on their husbands for a living (Wahab, Ghani, & Yusof; 2018). The sudden death of the fishermen might leave behind poor single mothers unless the late husband secured social security for their wives and their families, which is a rare case among rural folk (Bertolini, 2019) due to poverty and low awareness because of low academic background (Zainalaludin, 2012). Roslina (2018) stated that the members in brackish water communities might earn a higher income than those in the freshwater communities because of the higher work risk in brackish water than in freshwater FAES (Danielsson, Kuyateh, & Ravikumar, 2010). Consequently, the vulnerable groups in brackish water may suffer a higher incidence of poverty than the vulnerable groups in the freshwater communities. Therefore, this study aims to answer three research questions as follows: -

i) What were the types of vulnerabilities by sex-disaggregated as according to the Sustainable Livelihood Approach (SLA)?
ii) Was there any relationship between the types of vulnerability and the sex of the respondents?
iii) Was there any relationship between household income categories, types of water systems, and sex of the respondents?

Objectives

RO_1 - to explore the types of vulnerability by sex disaggregation through SLA.
RO_2 - to identify the relationship between types of vulnerability and sex of the respondents.
RO_3 - to measure the relationship between household income categories, types of the water system, and the sex of the respondents.

Literature Review

In Malaysia, the Department of Fisheries defines three types of water system in FAES, namely, brackish water, freshwater, and marine water system (Department of Fisheries - DOF, 2019), and all the activities involved in these three types of water systems are masculine (Satapornvanit, 2018). However, Taylor, Welcomme, Bartley, Goddard, and Leonard (2016) state that the freshwater system's FAES activities are less masculine than in the brackish water system. Henceforth, the fisheries communities in the brackish water system will be called the brackish water community. The fisheries communities in the freshwater system will be called the freshwater community in this paper.

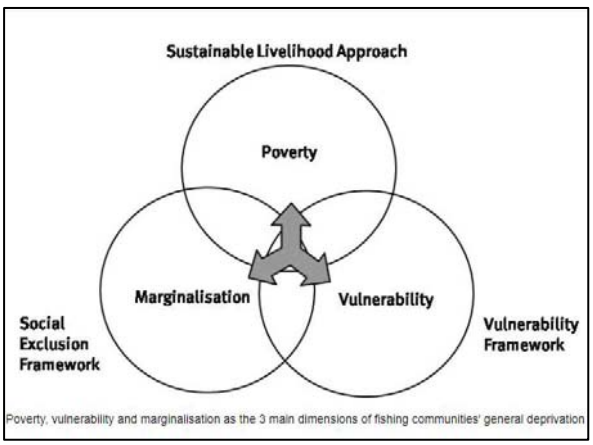
Generally, single mothers in fisheries communities are the poorest because they mainly depend on their husbands for a living (Islam, 2008). They have to earn for the family without their husbands, as they cannot do many things in masculine FAES. The masculinity of FAES not just marginalised the single mother, but also the handicapped, older women, and the individuals who suffer serious disease in any community because they usually have no financial security to face any loss of income (Masud & Zainalaludin, 2018).

Absolute poverty was used to measure the Malaysian Poverty Line Income (PLI). A monthly household income was used as an economic indicator to measure poverty (Economic Planning Unit - EPU, 2018). In the Ninth Malaysia Plan (2006-2010), the Malaysian government established three PLIs to measure the poverty in Peninsular Malaysia, Sabah, and Sarawak. These PLIs are based on the gross monthly household income for basic needs consumption, including food and non-food categories. In a poor household, the gross household income equals or below the PLI (Terano, Mohamed, & Jusri, 2015).

Based on the gross household income and basic amenities survey report 2016 by EPU (2018), the PLI was revised in Malaysian Ringgit (RM) from RM950 per month in 2014 to RM980 per month in 2016. Meanwhile, for the hard-core poor households, the PLI was revised from RM600 per month in 2014 to RM619 per month in 2016 (EPU, 2018). Therefore, this study used PLI=RM980 as a cut-off point between poor and non-poor household income categories.

The fisheries communities usually associate with rural areas, which are always associated with poverty (Bertolini, 2019), especially in the fisheries communities in Malaysia. The poverty risk is very high among the vulnerable community members because they have less ability to earn an income (Backiny-Yetna, Batana, Nokho, Guene & Bougna Lonla, 2016). According to SLA, the vulnerable individual also refers to the poor and marginalised (Allison, Horemans, & Bene, 2006). Thus, the vulnerability type refers to the risk of being poor (Baiyegunhi & Fraser, 2011) because

of physical or psychological vulnerability as well as having poor social health (Havrilla, 2017), and at risk of not being capable of doing something (O'Donnell, Weitz, & Freedman, 2011), especially working and earning money as a non-vulnerable individual can do (McCarthy, Canziani, Leary, Dokken, & White, 2001).



Source: Allison, E. H., & Horemans, B. (2006)

Figure 1: Sustainable Livelihood Approach

Moreover, in masculine FAES, vulnerability is also associated with women and femininity (William, 2012). Poverty and vulnerability are prevalent issues in rural and fisheries communities (Department of Statistic Malaysia - DOSM, 2017). Poverty, vulnerability, and gender are the triangulated factors in this study. In contrast, sex is the biological aspect of being male or female (Pryzgoda & Chrisler, 2000). Gender is the social construct of what men and women should do, dress, and behave (Macolo, 2019). According to Snow (2008), men and women may suffer different vulnerability types. The women may face more difficulties working outside the house. Thus, they have greater vulnerability and poverty risk than men (Stamarski & Son Hing, 2015). They often represent the older single mothers living alone, especially in rural areas (Kapur 2019). There is significant gender inequality between men and women in rural areas due to poor access to the resources and decision-making opportunities among rural women, especially in income-generating activities (Barkat & Suhraward, 2019), which makes them poorer than men (Zain *et al*., 2018).

Methodology

This paper uses two sets of data from two studies with a similar methodology and background – quantitative research data through survey data collection method in 2017 – 2018 in the fisheries community. The first data set represented respondents from brackish water communities, and the second data set represented respondents

from freshwater communities. The Part A of the questionnaire in both data sets consist of the backgrounds of the respondents, namely sex (male & female), age, location (Kuala Kedah & Langkawi Island), marital status (single, married, divorced & widow), academic backgrounds (no schooling, primary school, secondary school & tertiary level), and seven vulnerable types which were handicapped, single parents, older person, caretakers, serious disease, living alone and child labour vulnerable type. Part B in both data sets consist of information on the vulnerable respondents' household income. This paper uses both Part A and Part B data from both data sets.

According to FAO (2018), 59.6 million people were engaged in the FAES primary sectors in 2016, comprising 19.3 million in aquaculture and 40.3 million in capture fisheries globally. An estimated 146,744 Malaysians are involved in FAES (DOF, 2019). Assuming an average of four to six per household (Zainudin, Zein, Idris, & Luqman, 2019), the fisheries community population can be estimated at around 900,000 members. From this population, 10 per cent (90,000 members) were assumed in this study as the vulnerable community members (Osman, Bakri, Bachok, Ibrahim, & Mohamed, 2015). They are poor and always marginalised in the community. However, through appropriate programmes, they may serve back to the national economy to eradicate poverty to at least 50 per cent of the vulnerable population (Monchuk, 2013).

According to Krejcie and Morgan, for *N*=90,000, the *n*=382. Two hundred respondents from Data 01 and 200 respondents from Data 02 were sampled with 50 males and 50 females in each sampled district - Kuala Kedah, Kuah/Ayer Hangat, Pedu/Tekai, and Lenggong (Table 1).

Table 1: Number of Questionnaire Distribution in Each Sub-district (*n*=400)

Water System	Sub-district	Sample (*n*=400)		Questionnaire Distribution (*n*=600)	
		Male	Female	Male	Female
Data-01 (brackish water)	Kuala Kedah	50	50	70	80
	Kuah/Ayer Hangat	50	50	70	80
Data-02 (freshwater)	Pedu/Tekai	50	50	70	80
	Lenggong	50	50	70	80
Total		**200**	**200**	**280**	**320**

Note: Oversample in this study to overcome the risk of rejection to participate in the studies, error, or damage of the questionnaire form Two null hypotheses were tested in this paper as follows: -

Ho1: No significant relationship between types of vulnerability and sex of the respondents.
Ho2: No significant relationship between household income categories and FAES water systems among vulnerable male respondents.
Ho3: No significant relationship between household income categories and FAES water systems among vulnerable female respondents.

The literature for RO-1 under SLA on the vulnerability types used the domains in Figure 01 – poverty, marginalisation and vulnerability. Someone is considered vulnerable in this paper when he/she is poor and/or marginalised in the community. A Chi-square test was used to measure the relationship between the categorical data for RO-2 and RO-3, respectively. The Malaysia PLI 2016 = RM980 was used to divide the household income into two categories – non-poor (household income > RM980) and poor (household income RM980 and below). Two water systems were used in the analyses – freshwater and brackish water system. The relationship between the seven types of vulnerability as obtained in RO-1 and the sex of the respondents (male/female) was measured through the Chi-square test. The relationship between two household income categories (poor and non-poor), two water systems (brackish water and fresh water) and the sex of the respondents was measured through the Chi-square test.

Findings and Discussion

This paper reports N=415 data of vulnerable respondents consisting of *n*=215 vulnerable respondents from the brackish water community and *n*=200 vulnerable respondents from the freshwater community. Table 2 shows that the majority (58.14%) of vulnerable male respondents were from the freshwater community, and the remaining 41.86 per cent were from the brackish water community. Among vulnerable female respondents, the majority (58.84%) of them were from the brackish water community, and the balance of 41.15 per cent are from the freshwater community. Under single parents' vulnerable type, a high percentage of single mothers and not married women (64.61%) obtained in this study than only 35.39 per cent of married women. On the other hand, among vulnerable male respondents, a high majority (79.07%) of them married in this study (Table 2). In this paper, the proportion of single mothers is higher because older women are more likely to live independently after being widowed, separated from their husbands, or divorced. A similar conclusion was also reached by McWilliam *et al*. (2021) and Zainalaludin *et al*. (2017), who found many single women in fishing communities.

The majority (63.37%) of vulnerable male respondents had low academic backgrounds (no schooling or primary school), and this was not much different with vulnerable female respondents (66.67%, *n*=162) (Table 2). These findings are corroborated by Zainalaludin (2012), who found that rural communities usually have

low academic backgrounds and fisheries communities are located in rural areas. Therefore, the low academic background in a rural community may lead to poverty (Cahaya, 2015; Calson & Buttram, 2004).

The mean age of vulnerable male respondents was 61.19 years old (SD=13.88) in 2019 for both studies (Table 2). In 2020, vulnerable male respondents from brackish water data mean aged=63.99 years old (SD=15.45) and vulnerable male respondents from freshwater data mean aged= 60.89-year-old (SD=12.55). Both mean ages in the year 2020 referred to old age (United Nations, 2008). The vulnerable respondents in the brackish water community were, on average, slightly older than vulnerable respondents in freshwater communities. In 2020, females were found to be older than vulnerable male respondents in fisheries communities, which could be due to the fact that the life expectancy of females in Malaysia is higher than that of males (DOSM, 2019; Tey & Hamid, 2013).

Table 2: Socioeconomic Background of the Respondent

Variable	Category	Male (*n*=172)		Female (*n*=243)	
		n	%	*n*	%
Water System	**brackish water community** Kuala Kedah Kuah/Ayer Hangat	72	41.86	143	58.85
	freshwater community Pedu/Tekai Lenggong	100	58.14	100	41.15
Academic Background	No schooling/ Primary school	109	63.37	162	66.67
	Secondary/Tertiary	63	36.63	81	33.33
Marital Status	Single	36	20.93	157	64.61
	Married	136	79.07	86	35.39
House Ownership	Yes	140	81.40	169	69.55
	No	32	18.60	74	30.45
Age (Years Old)	Mean SD	61.19 13.88		61.56 15.02	
Household Income (RM)	Mean SD	RM1481.28 RM1584.29		RM960.74 RM911.28	

Note: water system=FAES Water System; brackish water community=Brackish water system; freshwater community=Fresh water system

A high majority (81.40%) of vulnerable male respondents had house ownership, and only 18.60 per cent of them did not have house ownership (Table 2). This is because the vulnerable male respondents with house ownership are usually heads of households. Whereas vulnerable female respondents, the majority (69.55%) had house ownership, and only 30.45 per cent of them did not have house ownership.

However, the percentage of vulnerable female respondents with house ownership was much lower than that of vulnerable male respondents. This may be due to women are on average poorer than men, especially in rural areas (McWilliam *et al*., 2021; Zain *et al.*, 2018; DOSM, 2017; HLPE, 2014, Zainalaludin, 2010) because they are mainly rural housewives who have no income, which means they cannot buy a house.

The mean household income of vulnerable female respondents = RM960.86 (SD=RM911.28), which was lower than the mean household income of vulnerable male respondents = RM1481.28 (SD=RM1584.29) (Table 2). These findings are supported by many studies that conclude rural women are poorer than rural men (McWilliam *et al*., 2021; Zain *et al*., 2018; DOSM, 2017; HLPE, 2014, Zainalaludin, 2010). In fisheries communities, the gender income gap may be due to the masculinity of FAES activities (Satapornvanit, 2018, Cliffe & Akinrotimi, 2013), where women are at a disadvantage in earning an income, especially the vulnerable women (Ogunlela, & Mukhtar, 2009; William, 2008). Moreover, in Malaysia, poor households in farming communities are significant (Khor, Yusof, Tee, Kandiah, Huang, Khor, & Huang, 1999).

RO-1: Type of Vulnerability from Sustainable Livelihood Approach

This sub-topic discusses the RO-1: to explore the types of vulnerability through SLA by Allison, Horemans and Bene (2006), which is limited to three dimensions – poverty, marginalisation, and vulnerability. The vulnerability types deduced from the SLA are handicapped single parent, older person, caretakers, severe disease, living alone, and child labour.

i) Handicapped Vulnerability Type

The handicapped vulnerability type refers to individuals who suffer physical or mental disability but can still work at a very minimum capacity (WHO, 1980). According to National Wellness Institute (1976), there are eight handicapped vulnerability types, which are blind, deaf, mute, less than two hands, less than two legs, less than 20 fingers or no hand, or no leg paralysed. This paper focuses on handicapped individuals with the minimum capability to work and earn an income in fisheries communities. According to the United Nations (2018), the handicapped vulnerability type has been included as a target in the 2030 Agenda for Sustainable Development (Blind, 2019) concerning poverty eradication (SGD1) and achieving zero hunger (SDG2).

Poverty incidence among handicapped individuals has been recognised in many past studies (Ficarra, Ficarra, Mendoza & Ficarra, 2018, Turmusami, 2003). Individuals who suffer from the handicapped vulnerability type are likely to live in poverty

because they can only work at minimum capacity (WHO, 1980). They do not have many alternatives to earn an income and have less power to influence employers to accept them as workers (Ficarra *et al*., 2018), especially in the masculine economic sector.

In FAES, many men may suffer from the handicapped vulnerability type due to the accidents they are involved in while fishing since FAES activities involves high work risk (Zainalaludin et al., 2017). On the other hand, women in FAES may suffer from the handicapped vulnerability type due to disease, such as chronic diabetes (Kalra, Jena & Yeravdekar, 2018), and not necessarily due to their involvement in FAES, because women are involved in less masculine activities in FAES, such as the activities after the harvest and the processed food industry (Rohe, Schluter & Ferse, 2018).

ii) Single Parents Vulnerability Type

The single parent vulnerability type refers to single fathers and single mothers in the community. According to Lu, Walker, Richard, and Younis (2020), globally, there are more single mothers than single fathers under the single parent vulnerability type in any economic sector due to the spouse's death or divorce. Many studies focus on single mothers due to the death of their spouses (Zainalaludin *et al*., 2017), divorce or separation (Rahman, Abdullah, Darus, & Mansor, 2017) and being abandoned by their spouse (Endut, Azmawati, & Hashim, 2015). Globally, single mother issues are a major public concern (Lu *et al.,* 2020). There is a high percentage of single mothers, especially in fisheries communities, due to the high death risk among the fishermen husbands (Janetius & Christopher, 2019). They may experience a reduction in the household income after the death of their spouse or divorce and are usually more vulnerable to poverty (Klesen *et al*., 2011), especially in rural areas (Mulia, 2017), than single fathers (Stack & Meredith, 2018).

There might be two reasons for high poverty incidence among single mothers, especially in rural areas. First, the late husband did not prepare for her financial security in older age or when the husband passed away (Zarina & Anton, 2012) because the men in rural areas are also poor with low academic backgrounds (Zainalaludin, 2012). Thus, they may have less knowledge concerning the importance of financial security for their wife and family members to survive after they pass away. In fisheries communities, women are usually housewives with no income and are fully dependent on their husbands for a living (Rusmana, Anna, Nurruhwati, & Nurhayati, 2019). The second reason is that divorced women usually do not receive enough alimony from their ex-husbands (Flecther *et al.,* 2005).

On average, women live longer than men (United Nations, 2019). As a result, many older poor single mothers will be in rural areas (Adisa, 2019). In addition, according to

Stutzer and Frey (2006), in many cultures, it is easier for single fathers to re-marry compared to single mothers, which is one of the reasons why there are more single mothers than single fathers in any community.

iii) Older Person Vulnerability Type

The older person vulnerability type refers to individuals aged 60 years old and above (United Nations, 2008). The percentage of older persons globally is rising (Tuohy & Cooney, 2019). This might be due to the increment in life expectancy among males and females. For example, in Malaysia, the life expectancy for women is 77 years old and 72 years old for men (DOSM, 2019). According to Mohamad Ibrahim, Shair and Yusof (2020), Malaysia will become an ageing country by 2030 when 7% reach 65 years and above.

Older people are more vulnerable to poverty than younger adults, especially those who lose their income due to retirement (Masud & Zainalaludin, 2018a). Older persons are also vulnerable to diseases (Shahar *et al*., 2019; Paim, 2017) and malnutrition (WHO, 2007). According to Tomioka, Kurumatani and Hosoi (2016), the three most prevalent diseases among older people are hypertension, ophthalmologic disease, and musculoskeletal disorders. Among older people, suffering a disease may incur living costs and make them vulnerable to poverty if they have no financial security for old age (Joyce, Keeler, Shang, & Goldman, 2005). From the gender perspective, older women are poorer than older men (Ismail *et al.,* 2015).

Past literature determined that older women living in poverty have no income, are involved in household chores, are uneducated, and have low-wage or unpaid work (Ismail et al., 2015). Many studies found that older women are prone to poverty (OECD, 2019), especially among heads of households (Masud, Hamid, & Haron, 2015). The population of older people consists of many older women compared to older men (United Nations, 2017). This may be due to women living longer than men (Tuohy & Cooney, 2019). According to the United Nations (2002), as cited in Knodel and Ofstedal (2003), only 40 per cent of older men are above 80 years. According to Hamid (2015) and the WHO (2007), globally, the population of older women is significant, and their number is expected to grow to one billion by 2050 from 336 million in 2000. This shows that older women outnumber older men globally, particularly in the masculine economic sectors where men face a high risk of fatal accidents while working.

iv) Serious Disease Vulnerability Type

The serious disease vulnerability type refers to individuals who suffer any disease that may reduce their ability to work and earn an income, such as cancer, hypertension, stroke, heart disease, diabetes, arthritis, asthma, or kidney disease

(Christian & Alisha, 2017). Poverty may cause people to be vulnerable to serious disease (Mudege & Ezeh, 2009), which may be because they cannot afford to get medical services, eat good food, or manage the stress of poverty (Hartline-Grafton & Dean, 2017). Simultaneously, suffering disease may also cause poverty due to high medical and service costs, and long-term stress may affect work performance (Braveman & Gottlieb, 2014). Furthermore, someone might be fired due to low work performance (Wagenaar, Kompier, Houtman, van den Bossche, & Taris, 2015).

According to Ezeh, Chepngeno Kasiira, and Woubalem (2006), almost one-quarter of men suffer from respiratory disease. Women tend to be more prone to serious disease due to poverty (WHO, 2007), such as having no money to pay hospital bills and transportation fees to access the health care services, which may cause them to delay their treatment (Wondawek & Ali, 2019). Poor people only depend on their bodies to work and earn an income, and if they suffer a severe disease, they may not be able to work, which may increase their poverty risk (Mynarska, Riederer, Jaschinski, Krivanek, Neyer, & Oláh, 2015). Besides that, poor people suffer inequality in healthcare services, which might be due to not being able to afford to pay for healthcare (Gwatkin, 2000). In addition, the children from poor households who suffer serious diseases may be prevented from working at a productive age because they did not receive early treatment due to their household financial problems (WHO, 2003).

According to WHO (2007), males and females may suffer different diseases because of their biological differences and gender roles and power (Klein & Huber, 2010). Women are prone to diseases that may cause death and disability, such as diabetes and hypertension (Gaziano, Bitton, Anand, Abrahams-Gessel, & Murphy, 2010), while men are prone to heart and respiratory diseases (Gao, Chen, Sun, & Deng, 2019). Women are also vulnerable to stress, which, in the long term, may cause disease (Salleh, 2008). Furthermore, women do less exercise or physical activities (Ali & Isa, 1995), and women always have unequal household food distribution (Ihab, Rohana, Manan, Suriati, Zalilah, & Rusli, 2013). Rural women always face a problem getting family permission to go to health care facilities and worry about the lack of female doctors (Kumar, 2018), making women more prone to diseases (Chiang *et al.,* 2013).

According to Tong, Low, and Ng (2011), Malaysia shows a similar trend for men dying at a higher rate in most disease categories than their women counterparts. Many studies state that the higher death rate among Malaysian men may be due to their poor health knowledge (Ng, Teo, Ang, Kok, Ashraf, Leong, & Hor, 2020) and poor lifestyles, such as taking illegal or unprofitable risks like smoking (Farhud, 2015), consuming alcohol and drugs, gambling, low physical activities, inadequate diet, obesity, and being involved in free sex (Thein *et al.,* 2017).

v) Living Alone Vulnerability Type

The living alone vulnerability type refers to poor individuals who stay alone and usually without family members (De Vaus & Qu, 2015). The individuals living alone are usually associated with poverty (Piekut, 2020), as well as individuals with social problems, such as drug addicts (Brandova & Kajanova, 2015), not married (Ho, 2015), older person (McCann, Donnelly, & O'Reilly, 2011), live in rural areas (Marsitah & Zalina, 2000), and is common among older women (Young Bum & Lee, 2019).

In Malaysia, many individuals living alone are Indian single mothers (Yeung & Cheung, 2015). Women's living alone vulnerability type is usually poor, unmarried, older persons (Hamid, 2015), and single mothers (Yahaya, Abdullah, Momtaz, & Hamid, 2010). They usually earn little pay for a living (Shahar et al., 2019). Many studies found that the living alone vulnerability type among women may be due to women's longer life expectancy than men. Thus, older women are more likely to live alone than older men in their old age (DOSM, 2019). They may be single mothers without children or not married women.

vi) Caretaker Vulnerability Type

The caretaker vulnerability type refers to individuals taking care of the old, bedridden, children, or developmentally disabled family members (Sullivan & Miller, 2015). They are strongly associated with women (Ruiz & Nicolas, 2018) because caretaking of family members is considered the women's gender role (Hirschman, 2017; Sullivan & Miller, 2015). The National Partnership for Women and Families (2018) found many women are associated with the 'sandwich generation', especially in rural areas. Thus, adult women have to take care of the vulnerable members of the household. This job is unpaid, and usually, they are wives or adult daughters in a household (Sharma *et al.*, 2016).

According to WHO (2007), the responsibilities of caretakers may prevent them from working and earning an income because they are working 24 hours a day and seven days per week. They have no income, some of them are not married and have no social security for their older age. They are highly prone to poverty because they have a lower income than men who can work outside the home (Ghazali, Abdullah, Abd Aziz, Mohd Amin, Jusoh, Mansor, & Mohd Shafie, 2015. They can only work from home as, for example, as babysitters, in order to earn some money (Poduval & Poduval, 2009).

vii) Child Labour Vulnerability Type

The child labour vulnerability type refers to a child under the age of 18 and working in FAES to earn an income for a living (ILO, 2014). Poverty is the main reason for the incidence of child labour (Sasmal & Guillen, 2015). Sasmal *et al*. (2015) also highlighted that parent from poor households force their children to work and that, usually, they are unskilled workers and earn a lower income than adults. The incidence of child labour is twice as likely to happen if their parents also experienced child labour during their childhood (Wahba, 2000). According to Tabassum and Baig (2002), Murray, Alias and Quinn (2009), as well as Bonnet (1993), the children were forced to work in order to earn some extra money for daily life.

There is a significant percentage of child labour in the agriculture economic sector in which the involvement of girls is almost half the involvement of boys (ILO, 2014). However, from the gender perspective, girl labourers face the double burden of assisting their mothers in doing household chores and the work of a child labourer (Putnick & Bornstein, 2016). Therefore, fewer girls are child labourers.

RO-2: Relationship between the Vulnerability Types and Sex of the Respondent

This subtopic reports findings on RO_2 - to identify the relationship between the types of vulnerability and sex of the respondents. This provides baseline data regarding the vulnerability types suffered by men and women, respectively. One null hypothesis was tested (Ho1: No significant relationship between types of vulnerability and sex of the vulnerable respondents). The Chi-square test shows a significant (p<0.05) relationship between types of vulnerability and sex of the vulnerable respondents. Table 3 shows 826 multiple responses from n=415 vulnerable respondents on six vulnerability types. Table 3 shows that a high percentage (31.7%) of vulnerable respondents in this study suffer from a severe disease vulnerability type, followed by older person (30.6%), single parent (19%), caretakers (9.1%), handicapped (6.5%), and living alone vulnerability type (3.1%).

The distribution of vulnerable respondents under the older person and suffering serious disease vulnerability type were almost equal. Since, on average, the vulnerable respondents in this study were older people, it can be concluded that older people are prone to diseases (Backers, Lasch, & Reimann, 2008). Table 3 shows that a high majority (87.8%, n=137) of vulnerable female respondents were single mothers and that only 12.2 per cent (n=19) of vulnerable male respondents were single fathers. Both single mothers and single fathers are under the single parent vulnerability type.

Table 3: Distribution of Respondents by Vulnerability Type and Sex Disaggregated (N=415)

Vulnerability Type	Male		Female		Total	
	n	%	*n*	%	*n*	%
Handicapped	27	50.0	27	50.0	54	6.5
Single parents	19	12.2	137	87.8	156	19.0
Older person	104	41.1	149	58.9	253	30.6
Caretaker	34	45.3	41	54.7	75	9.1
Living alone	6	23.08	20	76.92	26	3.1
Serious disease	115	43.89	147	56.11	262	31.7
	305	36.6	521	63.4	826	100

Note: Multiple responses n=826; p<0.05

More single mothers than single fathers were reported in this study, which may be due to men in FAES being involved in high-risk work involving fatal accidents, and leaving behind single mothers (Zainalaludin *et al*., 2017). The single mothers in this first category are called widows, and they have proper documents as single mothers. In addition, widows also result from women living longer than men because about half of the older women in Malaysia are widows (United Nations, 2019).

Besides widows, the second and third categories of single mothers have divorced wives with proper documents and separated without legal divorce documents, respectively (Mulia, 2017). They choose to live separately, either in the same or a different household. In the same household means they decided to live in the same household for the sake of their children and feel ashamed to divorce properly (Brinig & Allen, 2000). However, they manage money separately as if there were two households (Plauche, 2014), and, usually, the wives are the ones who feed the children (Marsh & Wood, 2019).

The fourth category of single mothers has abandoned wives, which may be due to their spouses being bedridden or not wanting to be responsible for the households (Endut *et al*., 2015). For example, drug addicts or husbands who are paralysed. The single mothers in this category are legal wives who have to feed the children and husbands themselves. Single mothers without proper legal documents usually miss out on any help.

Table 3 shows that a majority (56.11%, n=147) of vulnerable female respondents suffer the serious disease vulnerability type than their male counterparts at only 43.89 per cent (n=115). However, many women suffer serious diseases, which may be due to the lack of physical activities and increasing energy density (Ali & Isa, 1995), which, in the long term, makes them vulnerable to disease.

In rural areas, there is the common phenomenon of malnutrition among poor households due to the unequal distribution of food (in favour of men) in a household because of the size (Ihab *et al*., 2013). In addition, females in poor households always consume less than their male family members. Thus, they do not have enough to satisfy their nutritional needs, and they may be vulnerable to diseases (Vlassoff, 2007; Ransom & Elder, 2003; Ali & Isa, 1995).

Rural women may be vulnerable to diseases due to structural, financial, and personal/cultural obstacles (Chiang *et al*., 2013). One example of a structural obstacle in rural areas is the distance and transportation services to health facilities, preventing a rural woman from seeing a doctor (Syed, Gerber, & Sharp, 2013). An example of a financial obstacle is the challenge of paying the health care facilities (Chiang *et al.,* 2013). Finally, an example of a personal/cultural obstacle is that women constantly face a significant problem in getting permission from the family to go to health care facilities and are also worried about the lack of a female doctor (Kumar, 2018; Chiang, 2013).

The majority (58.9%, *n*=149) of vulnerable female respondents were older persons in this study, which is higher than the older vulnerable male respondents at only 41.1 per cent (*n*=104). There are many older women compared to older men in fisheries communities, which may be due to the life expectancy of women in Malaysia being longer than men (DOSM, 2019; Peng & Hamid, 2013). Thus, most older women are widowed (Mulia, 2017).

According to Siar and Kusakabe (2020), older women increase relative to other age groups when women live longer than men. As a result, they may expose to discrimination, abuse, poverty, and social isolation in the fishing community. Therefore, the older person in the fishing community faces problems related to ageing, such as access to health services and other age care services in the fishing community (UNFPA, 2019). This could be because members of the fishing community are always associated with poverty (Solaymani & Kari, 2014; Bene 2003). In addition, as the population of the fishing community grows older, the women spend more time helping their elderly (Soejima & Frangoudes, 2019).

The majority (54.7%; *n*=41) of vulnerable female respondents ‘suffer’ caretaker vulnerability type, while only 45.3 per cent (*n*=34) of the vulnerable male respondents are the caretakers. Caretaking older children, bedridden, or family members who suffer epilepsy are mainly women’s gender roles in a household (Hirschman, 2017; Sullivan & Miller, 2015; Maybud & Gender, 2015; Abdullah *et al.,* 2008). Thus, more women than men are caretakers in this paper. In fisheries communities, women involved in fishing activities are also the primary household earners responsible for childcare, feeding and financial security (William, 2010). According to Kalikoski and Vasconcellos (2012), the traditional gender role cannot be underestimated because

this role places a tremendous burden on women, not only because they play a small role in fishing activities, but also as mothers and providers of the fisheries households, especially for poor and female-headed households.

Table 3 shows the equal distribution among the male and vulnerable female respondents who suffer the handicapped vulnerability type at 50 per cent (*n* male=27; *n* females=27). Regardless of those born handicapped, these distributions may be due to their involvement in masculine FAES activities. For example, they may be involved in accidents while fishing (Zainalaludin *et al.,* 2017) that caused their handicap (Frantzeskou, Kastania, Riza Jensen, & Linos, 2012). Among the vulnerable female respondents, not including those born handicapped, the reasons for being handicapped were serious diseases; for example, chronic diabetes may cause them to lose their leg (Kalra *et al*., 2018; WHO, 2016; Deshpande *et al.,* 2008). Vulnerable female respondents are usually involved in less masculine activities in FAES, such as food processing and marketing fish-based products, which means they are involved in low-risk work in the FAES subsectors (World Fish, 2009), and, thus, suffer more minor accidents that cause them to be handicapped.

The high majority (76.92%; *n*=20) of vulnerable respondents who suffer the stay alone vulnerability type is female as against only 23.08 per cent (*n*=6) of the vulnerable male respondents (Table 3). There are more women than men living alone in fisheries communities. Again, this may be due to women's longer life expectancy than men globally, resulting in a higher risk of women living alone in their older age (United Nations, 2019; DOSM, 2019; Hamid, 2015). They may be widows (Zainalaludin *et al*., 2017) or divorced without children or the children work in urban areas and leave them in villages, or they remain single until older age (De Vaus & Qu, 2015). Moreover, according to McLahanan and Kelly (2006), older women are much more likely to live independently after divorce, separation, or widowhood.

Relationship between household income categories and types of FAES Water system among the respondents by sex disaggregated

This subtopic discusses the findings of RO_3: to measure the relationship between household income categories and types of FAES water system among the respondents by sex-disaggregated. Two null hypotheses were tested to achieve the RO_3, which were $H_0$2 (no relationship between household income categories and types of the community by water system among vulnerable male respondents) and $H_0$3 (no relationship between household income categories and types of the community by water system among vulnerable female respondents).

The $H_0$1 was tested, and there was a significant (p<0.05) relationship obtained through the Chi-square Test between two categories of household income and two types of FAES water systems among vulnerable male respondents. Thus, $H_0$1 was

rejected. From the findings, it can be concluded that there was a relationship between two categories of household income and two types of FAES water systems among vulnerable male respondents. In Table 4, the majority (66%, *n*=54) of vulnerable male respondents in poor household income was from the brackish water community, with only 34 per cent (*n*=28) from the freshwater community.

Table 4: Household Income Level and Type of Water System among Male and Vulnerable female Respondent (N=415)

Community	Male				Female			
	Poor		Low Income		Poor		Low income	
	n	**%**	***n***	**%**	***n***	**%**	***n***	**%**
brackish water	**54**	**66**	18	20	**99**	**66**	44	47
freshwater	**28**	**34**	72	80	**50**	**34**	50	53
Total	82	100	90	100	149	100	94	100

Note: Significant (p<0.05)

The findings for $H_0$1 indicate that the vulnerable male respondents were poorer in the brackish water community than in the freshwater community. Generally, the fishermen are poor (Solaymani & Kari, 2014), especially the brackish water fishermen due to the high work risk (Cliffe & Akirontimi, 2015). For example, the fishermen can only fish in nearby coastal areas without boat engines and catch less fish. Also, fishing gear is usually too expensive (Torell, Bilecki, Owusu, Crawford, Beran, & Kent, 2019; Barange *et al*., 2018) for the poor, vulnerable fishermen to buy.

Fishing along the coastal areas without technology, plus the impact of climate change, means the fishermen in the brackish water community earn tiny, mainly the vulnerable fishermen (Roslina, 2018; Danielsson *et al*., 2010). Whereas, in the freshwater community, the fishermen are usually involved in less risky work, for example, aquaculture farming. This is not the primary source of household income for most freshwater aquaculture operators (Rahman & Haque, 2011). Instead, they usually have a permanent job in the public or private sector, providing their primary income for the household (Roslina, 2018). Similarly, freshwater fishermen in Chandpur reported that 64% of them use agriculture as an alternative source of income (Patwary, 2014). Thus, food security appears to be higher in freshwater communities than in brackish water communities due to the less masculinity of the sector.

The impact of climate change, such as the increment in sea level and unpredicted storms and rainy seasons, present significant hurdles for brackish water fishermen to go out fishing (Hamdan, Othman, & Kari, 2015)). Consequently, they may lose their income (Primavera, 2006). On the other hand, according to Roslina (2018), the fishermen in brackish water communities may earn a higher income than those in

freshwater communities. However, the background of this study is the vulnerable respondents who cannot go far to fish. They mainly work in the FAES subsectors with a small income, and these subsectors usually rely on the fish caught by the able-bodied fishermen.

The mean household income of vulnerable male respondents in the brackish water community= RM936.53 (SD=1521.29), which is only around half of the mean household income of vulnerable male respondents in the freshwater community= RM1873.5 (SD=1518.03). The mean household income among vulnerable female respondents in the brackish water community is below the Malaysian PLI 2016 = RM980 (EPU, 2018). The vulnerable respondents in the brackish water community are poorer than the vulnerable respondents in the freshwater community.

Men in the brackish water community depend solely on fisheries and fish farming for a living (Musa, Fozi, & Mohd, 2020), and, due to the high work risk in the brackish water community, they have to focus full-time. Meanwhile, in the freshwater community, the fishermen are always involved in at least two economic sectors for a living (Roslina, 2018). Therefore, the vulnerable male respondents in the brackish water community are poorer than the vulnerable respondents in the freshwater community even though they are male. Therefore, from the findings in this study for Ho1, it may be concluded that vulnerable men in the brackish water community are poorer than the vulnerable men in the freshwater community.

For Ho2 (no relationship between categories of household income and types of FAES water system community among vulnerable female respondents), there was a significant (p<0.05) relationship through the Chi-square Test between household income categories and the types of water system among vulnerable female respondents. Thus, the Ho2 was rejected. It can be concluded that there is a relationship between the two categories of household income and the two types of water systems among female respondents. Among the poor category household income, there is a higher majority (66%, n=99) of vulnerable female respondents in the brackish water community than in the freshwater community (34 per cent n=50) (Table 4).

The findings for $H_0$2 indicate that those vulnerable female respondents were poorer in the brackish water community than in the freshwater community. A similar pattern was obtained among the male and vulnerable female respondents in the brackish water community who were poorer than their counterparts in the freshwater community. Again, this may be due to the high work risk in the brackish water community (Danielsson *et al*., 2010) for women to get involved in FAES activities (WWF, 2012). Therefore, the vulnerable female respondents in the brackish water community are consistently marginalised and usually work in unpaid or low-paid jobs. They may earn less than the vulnerable female respondents in the freshwater

community. Due to the high masculinity of brackish water activities, women often have no power or control over resources and any decision-making in FAES activities (Roy, Hague, Jannat, Ali, & Khan, 2017). According to Lentisco and Lee (2015), women are highly involved, especially in freshwater aquaculture farming (Raney, Anriquez, Croppenstedt, Gerosa, Lowder, Matuschke, & Skoet, 2011), because the activities are less masculine than in brackish water aquaculture farming. Moreover, there is a high involvement of foreign general workers (Deshingkar, 2006). Thus, women in the brackish water community are vulnerable to poverty, particularly the vulnerable women who are handicapped, older, single mothers, caretakers, or suffering various serious diseases.

According to the International Labour Office (2013) and Yahaya (1994), women's involvement in brackish water fisheries is usually not recognised, unlike their involvement in the freshwater community. Nevertheless, most of them are highly dependent on their husbands for a living (Wahab et al., 2018); hence, they may suffer high poverty risk if their husbands pass away. Whereas women in the freshwater community are mainly involved on a part-time basis (Islam & Chuenpagdee, 2013), are involved in the decision-making and have some control over the resources in the FAES activities (Moffitt & Cajas-Cano, 2014). Thus, they have more opportunities to work and earn an income than those in the brackish water community. Consequently, there is less incidence of poverty among women vulnerable respondents in the freshwater community than their counterparts in the brackish water community.

Makhoul (2019) notes that the lack of fishing equipment among women and limited access to FAES contributes to the fact that few women engage in brackish water fisheries. Therefore, they earned income from additional income-generating or subsistence activities such as sewing (Miedema, Hennink, Naved, Talukder, Dore, & Yount, 2021). Women in I-Kiribati support their families with their fishing activities. Therefore, they should be given recognition and support to continue their work to earn income in fisheries (Gotschall, 2021; Fay-Sauni & Sauni, 2005). Currently, the national policy in I-Kiribati has successfully brought the concept of gender equality (SGD5), gender inequality (SDG10) and women empowerment to the forefront of the discussion forum to empower women and improve household food security (Gotschall, 2021). However, in Malaysia, women and vulnerable groups in the fisheries community still need more attention and recognition to empower them to eradicate poverty. Therefore, a gender-sensitive policy is needed in the fishing community to sustain women participation in fisheries. This could be due to the fact that the reasons for the low presence of women in the fishing communities have not been adequately explored.

Conclusion and Recommendation

This paper concludes three significant findings as according to RO respectively as follows:-

i) Seven vulnerability types were obtained from gender analyses on SLA - handicapped, single parents, the elderly, child labour, living alone, caretaker, and suffering serious diseases. Women are mainly single parents and older person, and men are mainly handicapped individuals.

ii) There is a relationship between types of vulnerability and the sex of the vulnerable individual. Among women in fisheries communities, they are mainly single mothers and that the vulnerable men are mainly handicapped individuals. These findings may support the masculinity of FAES activities, which may involve fatal accidents or significant accidents, causing many in the community to be left behind as widows or handicapped men. From the almost equal distribution among older persons and suffering serious disease vulnerability type in almost two-thirds of the multiple responses, it may be concluded that older persons are prone to serious disease in fisheries communities. This may reflect poor healthcare and age care services in fisheries communities.

iii) The vulnerable men and women in the brackish water community are poorer than the vulnerable men and women, respectively, in the freshwater community. This may be due to the masculinity of the brackish water, and, thus, males and females in the brackish water have a high risk of poverty. Freshwater FAES is not the primary source of income for males and females. Thus, they have more opportunities and less risk of poverty than their counterparts in the brackish water community. However, vulnerable males and females are poorer than the non-disabled individuals in the brackish water and freshwater communities even though their involvement in FAES is recognised.

The vulnerable groups should be given special consideration in policies and programmes in the fisheries community to achieve SDG1, SDG2, SDG5 and SDG10. This paper was limited to the fisheries community with at least one of seven vulnerability types. This paper may address the triangular relationship between gender, vulnerability level and poverty in brackish and freshwater communities. It can also help to identify the predictors of the vulnerability of poor households in other sectors of the economy based on gender relationships. In addition, this could help scale up and sustain poverty programmes in rural areas. In addition, a better understanding of vulnerable men and women in fisheries in terms of resources, gender balance and socio-economic distribution are needed to empower them in the fishing community, eradicate poverty and maintain the sustainability of FAES.

Acknowledgement

An appreciation to Fundamental Research Grants Scheme (FRGS/1/2016/SS08/UPM/02/5/05-01-16-1774FR VOT: 5524881) from the Ministry of Higher Education and Grant Putra-IPS from Universiti Putra Malaysia (UPM/700-2/1/GP-IPS/2018/9603700 VOT: 9603700). Thank you to UPM Ethics Committee for approval of questionnaires on 18th December 2017 (JKEUPM-2017-219) and 15th March 2019 (JKEUPM-2018-409). Many thanks to Department of Fisheries Kedah, Perak, Padang Terap, Hulu Perak, Kota Setar, Langkawi Island respectively. Also, to Penghulu and JKKK Kuala Kedah, Kuah/Ayer Hangat, Lenggong, and Pedu/Tekai respectively.

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