Gender differentials on disaster resilience in small island communities in Western Visayas, Philippines

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INTRODUCTION

Small Island

- Land mass or territories surrounded by a large body of water
- Land area less 10,000 km^2
- Approximately 500,000 or fewer human residents

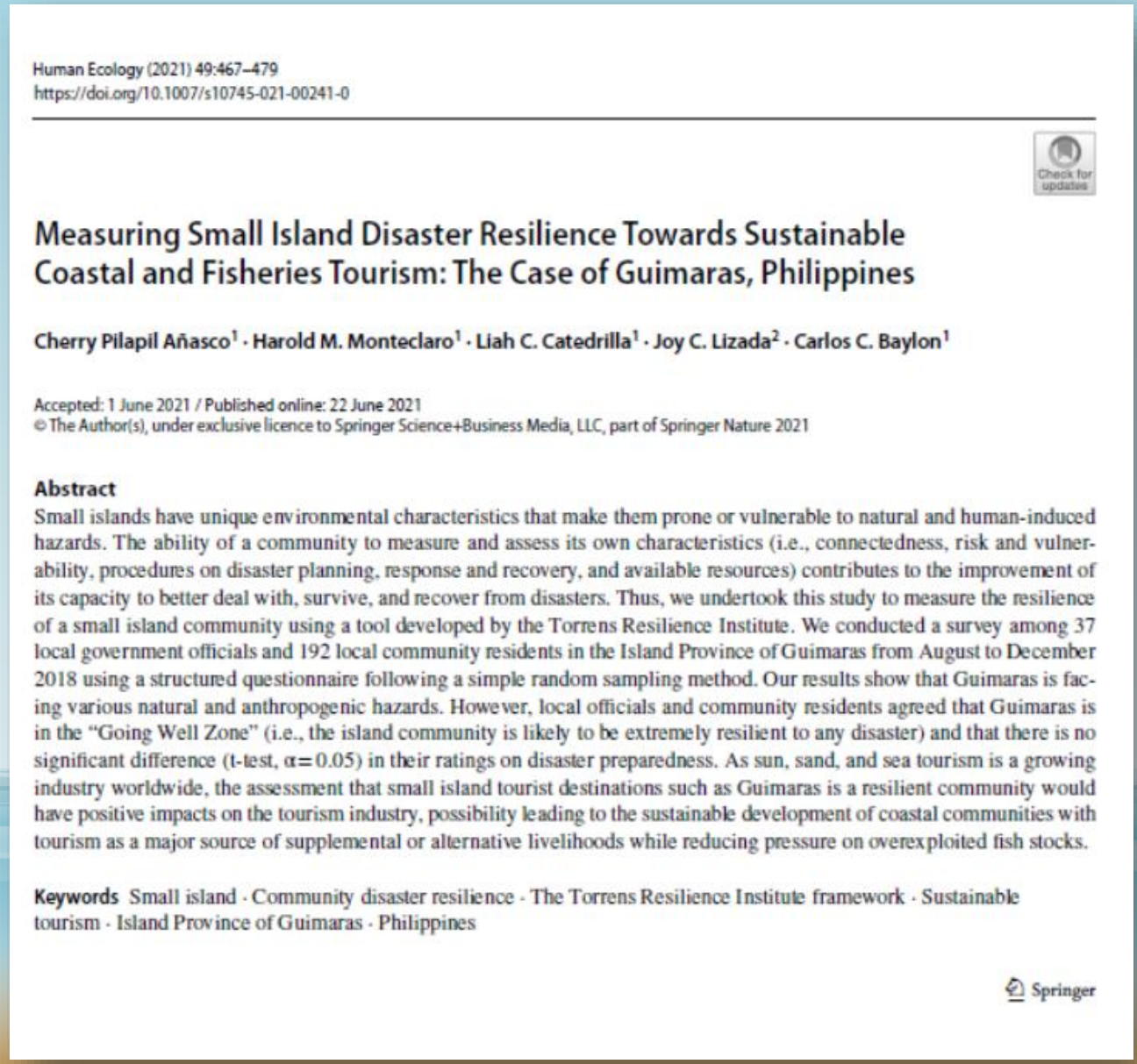
(Sharpley, 2012; Hess, 1990; Beller et al., 1990)

Characteristics of Small Island

- High biodiversity
- Limited natural resources for its human inhabitants
- Prone to natural and anthropogenic hazards
- Inevitable disaster occur
  - ➔ Damage of natural resources
  - ➔ Livelihood dependent on natural resources affected

Sex-disaggregated data in measuring disaster resilience

- Little is known on gender differentials particularly on the ability of women and men to measure and assess their degree of resilience
- Previous work on resilience measurement in small islands did not consider sex-disaggregated data (Pilapil Añasco *et al.*, 2021)



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Measuring Small Island Disaster Resilience Towards Sustainable Coastal and Fisheries Tourism: The Case of Guimaras, Philippines

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Abstract
Small islands have unique environmental characteristics that make them prone or vulnerable to natural and human-induced hazards. The ability of a community to measure and assess its own characteristics (i.e., connectedness, risk and vulnerability, procedures on disaster planning, response and recovery, and available resources) contributes to the improvement of its capacity to better deal with, survive, and recover from disasters. Thus, we undertook this study to measure the resilience of a small island community using a tool developed by the Torrens Resilience Institute. We conducted a survey among 37 local government officials and 192 local community residents in the Island Province of Guimaras from August to December 2018 using a structured questionnaire following a simple random sampling method. Our results show that Guimaras is facing various natural and anthropogenic hazards. However, local officials and community residents agreed that Guimaras is in the "Going Well Zone" (i.e., the island community is likely to be extremely resilient to any disaster) and that there is no significant difference (t-test, $\alpha = 0.05$) in their ratings on disaster preparedness. As sun, sand, and sea tourism is a growing industry worldwide, the assessment that small island tourist destinations such as Guimaras is a resilient community would have positive impacts on the tourism industry, possibility leading to the sustainable development of coastal communities with tourism as a major source of supplemental or alternative livelihoods while reducing pressure on overexploited fish stocks.

Keywords Small island · Community disaster resilience · The Torrens Resilience Institute framework · Sustainable tourism · Island Province of Guimaras · Philippines

Research Questions

Do men and women in small islands have the same level of hazard awareness, resilience and disaster preparedness?

Research Objectives

General

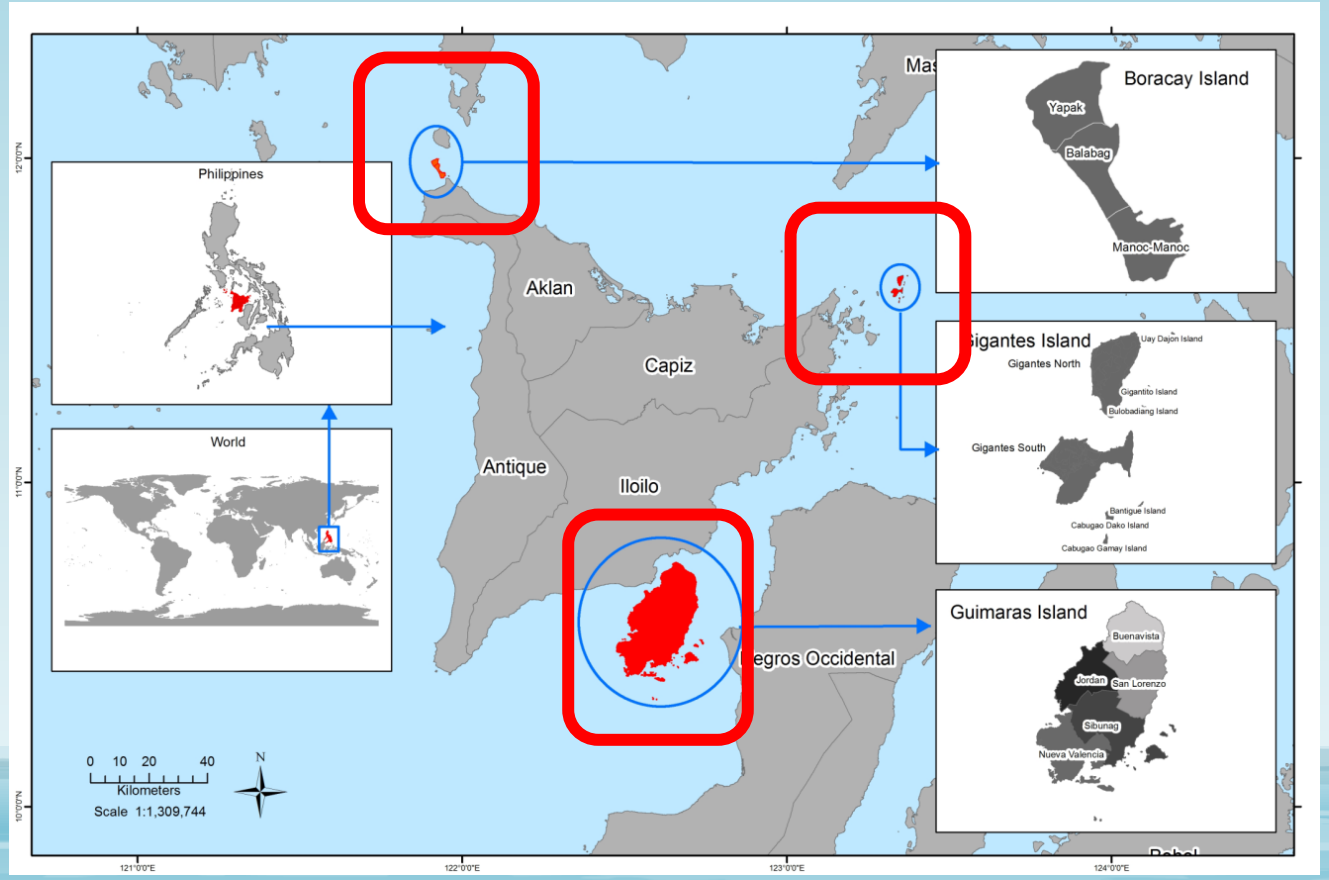
To measure the perceived disaster resilience of men and women in small island communities taking small islands in Western Visayas as case studies.

Specific

1) To determine the hazards and level of hazard awareness based on the perceptions of men and women in small islands and test their significant differences;
2) To measure the perceived level of resilience among men and women in small islands and test their significant differences; and
3) To compare the perceptions of the level of disaster preparedness among men and women in small islands and test their significant differences.

METHODOLOGY

Study Sites



Map showing location of the study areas with inset maps of Boracay, Gigantes and Guimaras Islands

Study sites profile

Information	Study Site		
	Boracay	Gigantes	Guimaras
Scale	Part of a Municipality	Part of a Municipality	Province
Municipality (Province)	Malay (Aklan)	Carles (Iloilo)	Jordan, Buenavista, San Lorenzo, Nueva Valencia, Sibunag
Land Area	10.32 km²	10.77 km²	604.57 km²
Population (PSA, 2015)	32,267	13,846	174,613
Population Density	3,127/km²	655/km²	290/km²
Total Barangays	3	4	98
Coastal Barangays	3	4	54
Number of fishers	309	2,035	10,111
Number of Tourism-related Establishments	1,407	34	223

Information Sources: PSA, 2015; Malay CLUP, 2013-2022; Carles CLUP, 2013-2022; Guimaras PCLUP, 2005-2035; Municipal/Provincial Tourism Officers; Municipal Agriculture Officers

The study framework: Torrens Resilience Institute

- Designed to determine the level of resilience of a community to adverse situations in terms of:
  1) **connectedness** of the people in a community
  2) level of **risk and vulnerability** of a community
  3) **procedures** that support community disaster planning, response, and recovery
  4) emergency planning, response, and recovery **resources** that are available

Variables

Dependent

- Level of hazard awareness
- Level of resilience
- Level of preparedness

Measurements: Ordinal

- 5-point Likert scale

Independent (Nominal)

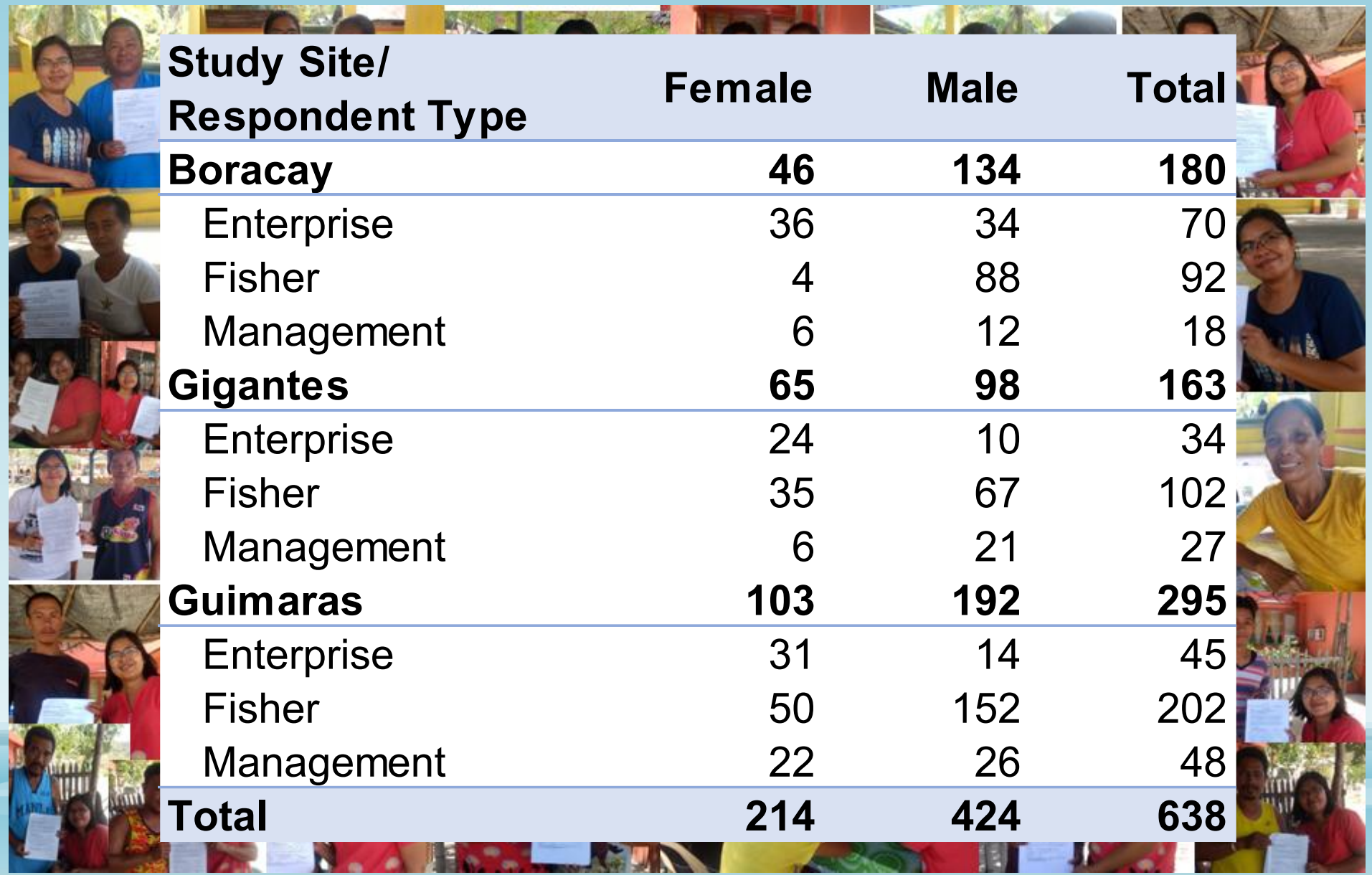
- Local stakeholders
  - ✓Female
  - ✓Male
- Level rated
  - ✓Self
  - ✓Community
  - ✓Barangay council
  - ✓Local government units

Semi-structured questionnaire
- ✓ KIIs
- ✓ Pilot tested

Delphi Survey
n = 638
- 214 Female
- 424 Male

Data management
- MS Excel
- SPSS 27.0

Statistical analysis
- Descriptive
- Inferential



Study Site/ Respondent Type	Female	Male	Total
Boracay	**46**	**134**	**180**
Enterprise	36	34	70
Fisher	4	88	92
Management	6	12	18
Gigantes	**65**	**98**	**163**
Enterprise	24	10	34
Fisher	35	67	102
Management	6	21	27
Guimaras	**103**	**192**	**295**
Enterprise	31	14	45
Fisher	50	152	202
Management	22	26	48
Total	**214**	**424**	**638**

Some female and male survey respondents

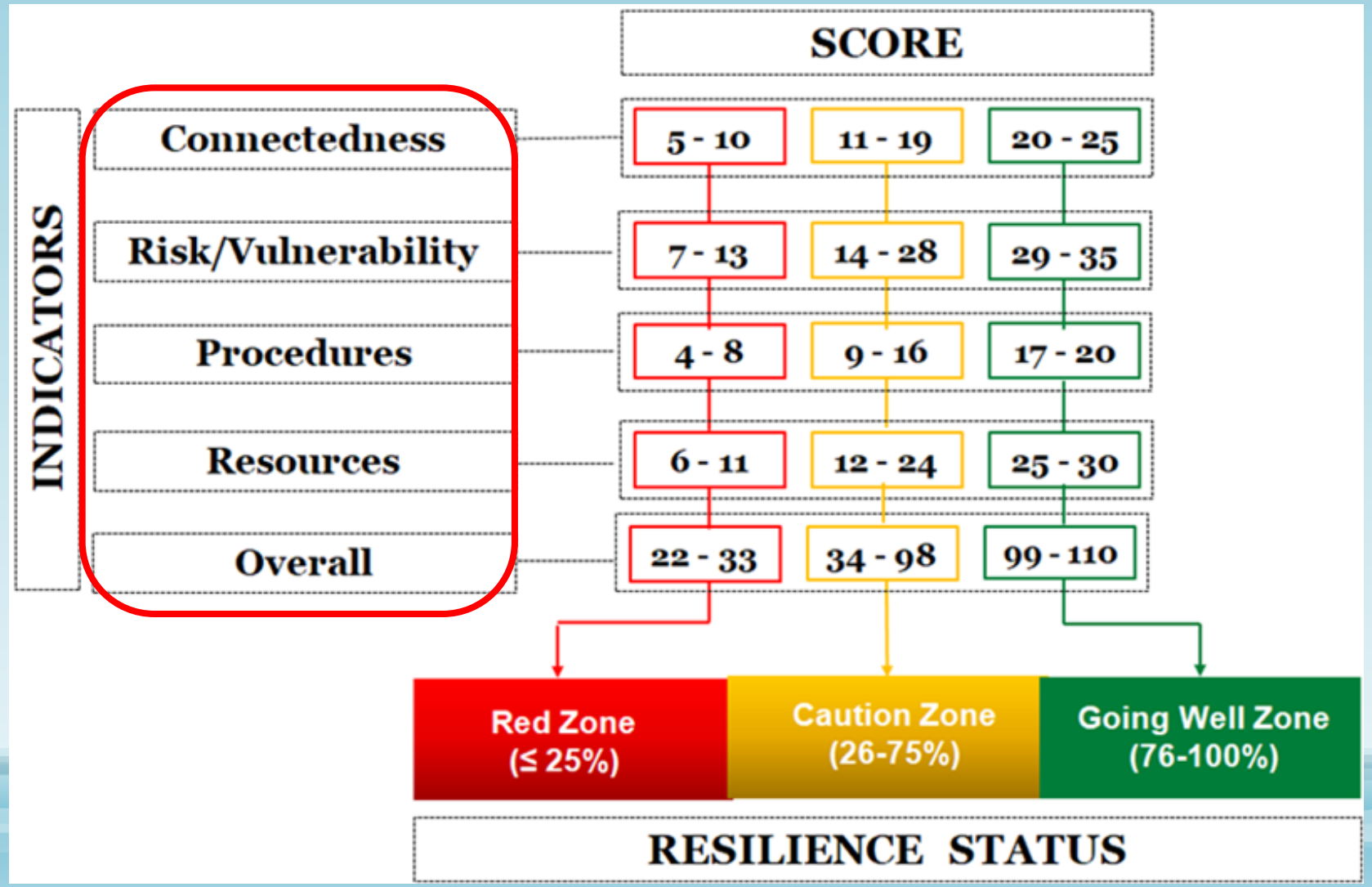
Hazard Awareness

1. Disturbances: Knowledge of hazards in the island	SA	A	N	D	SD
1. I am well aware of the hazards present in the island	5	4	3	2	1

1.1. These hazards are: (please check as many hazard as you are aware of)

Island Hazard	Present in the Island (✓)		Island Hazard	Present in the Island (✓)	
	Personally identified	Feed by Interviewer		Personally identified	Feed by Interviewer
Amihan			Overbearing heat		
Big waves			Pollution		
Blast fishing			Red tide		
Drought			Rising sea levels slowly eating up the islands' coastline		
Earthquake					
Erosion			Sedimentation		
Fault lines			Storm surge		
Flash floods			Too much rain		
Flood			Tsunami		
Habagat			Typhoons		
Landslide			Others:_____		
Oil spill			_____		

Level of Resilience



TRI resilience evaluation framework

Level of Resilience: Connectedness

	SA	A	N	D	SD
2. Connectedness: How connected are the members of your community?					
2.1. More than 80% of the population in the island is engaged with organizations (e.g., fishers' organization, clubs, service groups, sports teams, churches, etc.).	5	4	3	2	1
2.2. Members of the community in the island have access to wide range of damage-resistant communication methods to gather and share information during times of emergency (e.g. radio, cellphone)	5	4	3	2	1
2.3. The level of communication between local governing body and population is active (i.e. community informs government on what is needed)	5	4	3	2	1
2.4. Regular planning and activities with other towns/region are participated in members of the community	5	4	3	2	1
2.5. Support for and active involvement in cultural/cross-cultural events is evident in the island to increase degree of connectedness across community groups (e.g. sub-cultures/age groups/ new residents not in your community when last disaster happened)	5	4	3	2	1

Level of Resilience: Risk and Vulnerability

	SA	A	N	D	SD
3. Risk/Vulnerability: What is the level of risk and vulnerability in your community?					
3.1. Known risks of all identified hazards in the island are mapped indicating low probability/high impact events.	5	4	3	2	1
3.2. The permanent resident population forms >80% of the daytime (worker) population	5	4	3	2	1
3.3. The rate of the resident population change in the last 5 years is less than 5%.	5	4	3	2	1
3.4. More than 80% of the population has the capacity to independently move to safety (e.g., non- institutionalized, mobile with own vehicle, adult)	5	4	3	2	1
3.5. Less than 5% of the resident population prefers communication in a language other than the local language/dialect.	5	4	3	2	1
3.6. The transient population (e.g., tourists, transient workers) has been included in planning for response and recovery.	5	4	3	2	1
3.7. The risk that the island could be isolated during an emergency event is low (e.g. transport of people or of goods and services is readily available).	5	4	3	2	1

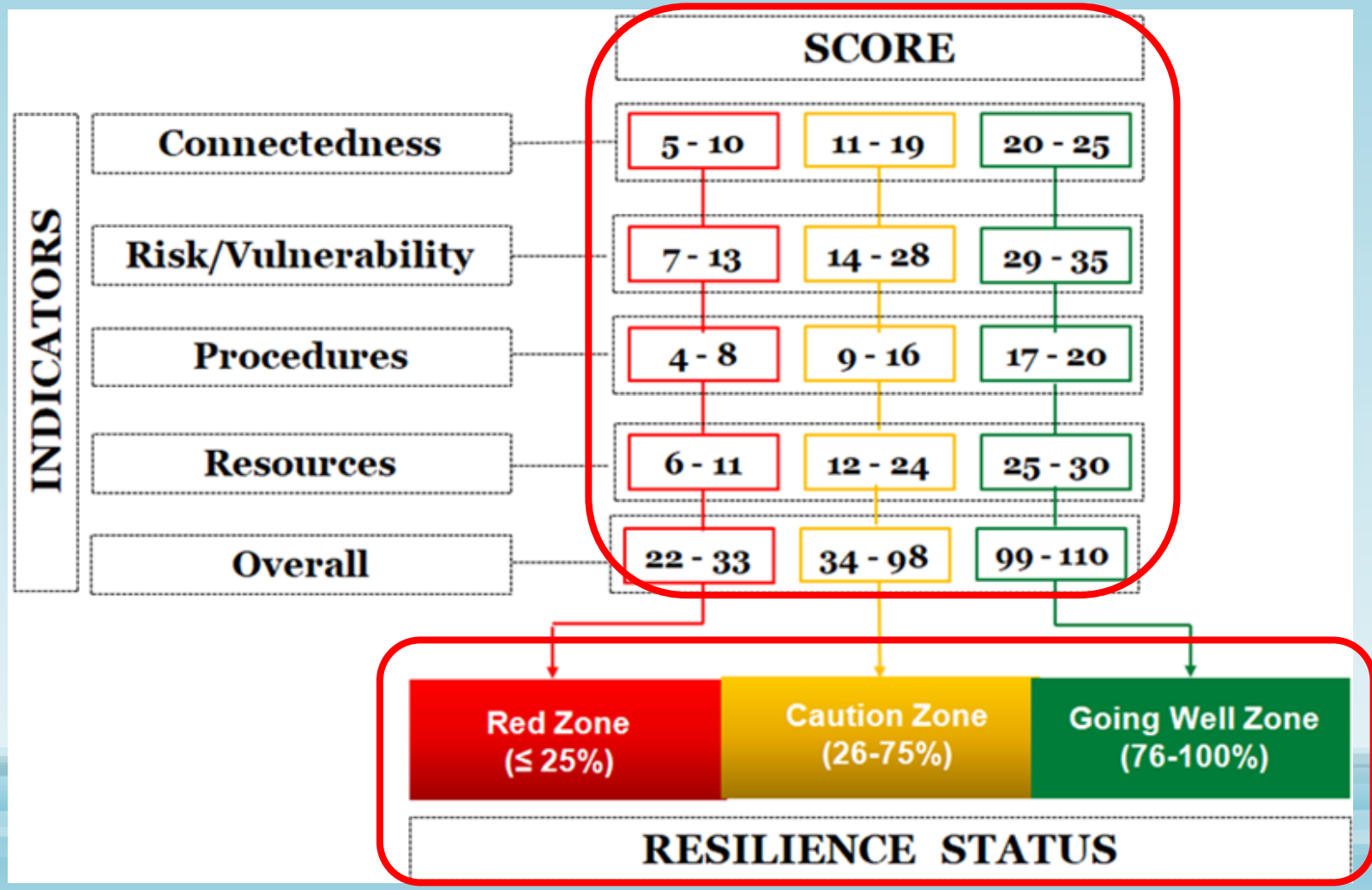
Level of Resilience: Procedure

	SA	A	N	D	SD
4. Procedures: What procedures support community disaster planning, response and recovery?					
4.1. Households within the community actively engaged in planning for disaster response and recovery	5	4	3	2	1
4.2. Planned activities reach the entire community about all-hazards resilience	5	4	3	2	1
4.3. Community members are required for disaster readiness (informed public, communication plans, regular drills or exercises, etc.)	5	4	3	2	1
4.4. Post-event action plan based on responses includes all community stakeholders (government/businesses/ NGO's)	5	4	3	2	1

Level of Resilience: Resources

	SA	A	N	D	SD
5. Resources: What emergency planning, response and recovery resources are available in your community?					
5.1. Infrastructure emergency system (e.g., water supply, sewerage, power system) is integrated into an all hazards protection plan	5	4	3	2	1
5.2. More than 81% of population with skills useful in emergency response/ recovery (e.g., first aid, safe food handling) can be mobilized if needed.	5	4	3	2	1
5.3. Most schools (public/private schools, all levels including early child care) actively participate in emergency preparedness education at community	5	4	3	2	1
5.4. Public health/medical systemic plan to support response and recovery is in place in the island	5	4	3	2	1
5.5 Well-known, sufficient sites (e.g. evacuation or recovery centers such as schools and gymnasiums) with water/ food/ information resources are widely advertised and included in all planning	5	4	3	2	1
5.6. Most households have over 5 days supply of food/water/fuel	5	4	3	2	1

Level of Resilience



TRI resilience evaluation framework

Disaster Preparedness

6. Preparedness. Please rate (from 1 = not at all prepared to 5 = very prepared) the extent to which you perceive each of the following is prepared to deal with disaster in the island

	Very prepared				Not at all prepared
6.1. Yourself	5	4	3	2	1
6.2. Your community	5	4	3	2	1
6.3. Your Barangay council (including Civil Defense/ Emergency Management)	5	4	3	2	1
6.4. Local government unit	5	4	3	2	1

Statistical Analysis

Descriptive Statistics

- Count
- Mean: $\bar{x}$
- Standard deviation: s
- Proportion: p
- Frequency distribution

Inferential

- Hazard Awareness: *Mann Whitney U test*
- Resilience: *t*-test
- Preparedness: *Mann Whitney U test*
  (Female vs. Male)
  : Kruskal-Wallis (Different local stakeholders rated)
- $\alpha = 0.05$

RESULTS AND DISCUSSION

Boracay

Rank	Hazard	Female(n_F =40
1	Typhoons	54.3
2	*Amihan* (Northeast Monsoon)	50.0
3	Pollution	52.1
4	Big Waves	41.3
5	*Habagat* (Southwest monsoon)	63.0

13	Oil spill	17.39	32.84	26.89
14	Storm surge	21.74	28.36	26.67
15	Illegal fishing (e.g., blast fishing)	10.87	26.87	22.78
16	Drought	8.70	26.87	22.22
17	Flash flood	13.04	25.37	22.22
18	Land slide	15.22	23.13	21.11
19	Fault lines	13.04	22.39	20.00
20	Red tide	13.04	20.90	18.89
21	Lightning		17.16	12.78
22	*Buhawi/lpo-ipo* (Tornado)		14.93	11.11
23	Sedimentation	10.87	11.19	11.11
24	Fire/Burning	2.17	2.99	2.78
25	Carrying capacity excess	2.17		0.56
26	Open drainage/excavation	2.17		0.56
27	Sinkhole	2.17		0.56
28	Strong current		0.75	0.56
29	Terrorism		0.75	0.56
30	Volcanic eruption	2.17		0.56
31	Wind storm		0.75	0.56

Guimaras

Rank	Hazard	Female(n_F =103)	Male(n_M = 192)	Total (n_{Gu} = 295)
1	Typhoons	75.73	84.38	81.36
2	Oil spill	66.02	81.25	75.93
3	Rising sea levels slowly altering the islands' coastline	56.31	67.19	63.39
4	Earthquake	60.19	58.33	58.98
5	Overbearing heat	49.51	51.56	50.85

14	Drought	50.77	50.00	50.31
15	Too much rain	64.62	40.82	50.31
16	Flood	43.08	48.98	46.63
17	*Buhawi/lpo-ipo* (Tornado)	33.85	50.00	43.56
18	Sedimentation	38.46	41.84	40.49
19	Lightning	32.31	37.76	35.58
20	Tsunami	30.77	38.78	35.58
21	Fault lines	35.38	15.31	23.31
22	Land slide	24.62	21.43	22.70
23	Flash flood	23.08	12.24	16.56
24	*Kanaway* (Northwest wind)	7.69	4.08	5.52
25	*Pugada* (Squall)		2.04	1.23
26	*Away sa kapistahan* (Riot in festivals)		1.02	0.61
27	*Halakay* (Shifting monsoon wind)		1.02	0.61
28	*Walo-walo* (Southwesterley wind)		1.02	0.61

13	Land slide	33.98	31.77	32.54
14	Illegal fishing (e.g. blast fishing)	28.16	34.38	32.20
15	Flood	35.92	25.00	28.81
16	Pollution	28.16	26.56	27.12
17	Sedimentation	23.30	29.17	27.12
18	Tsunami	28.16	20.83	23.39
19	Too much rain	30.10	18.75	22.71
20	Storm surge	21.36	14.58	16.95
21	Fault lines	22.33	13.02	16.27
22	Flash flood	13.59	13.02	13.22
23	Red tide	17.48	10.42	12.88
24	Tidal wave	8.74	5.21	6.44
25	Fire/Burning		2.60	1.69
26	Rock slide	0.97	2.08	1.69
27	Strong Wind	0.97	1.56	1.36
28	Terrorism		2.08	1.36
29	Drugs		1.04	0.68
30	El Nino	1.94		0.68
31	Fallen trees	0.97	0.52	0.68
32	Jelly fish, sea snake attack, sea urchin stepping	0.97	0.52	0.68
33	*Pugada* (Squall)		1.04	0.68
34	Sinkhole		1.04	0.68
35	Vehicular accident		1.04	0.68
36	Disease outbreak		0.52	0.34
37	Hail stone Rain	0.97		0.34
38	*Kanaway* (Northwest wind)		0.52	0.34
39	*Salatan* (Easterly wind)		0.52	0.34
40	Volcanic eruption		0.52	0.34

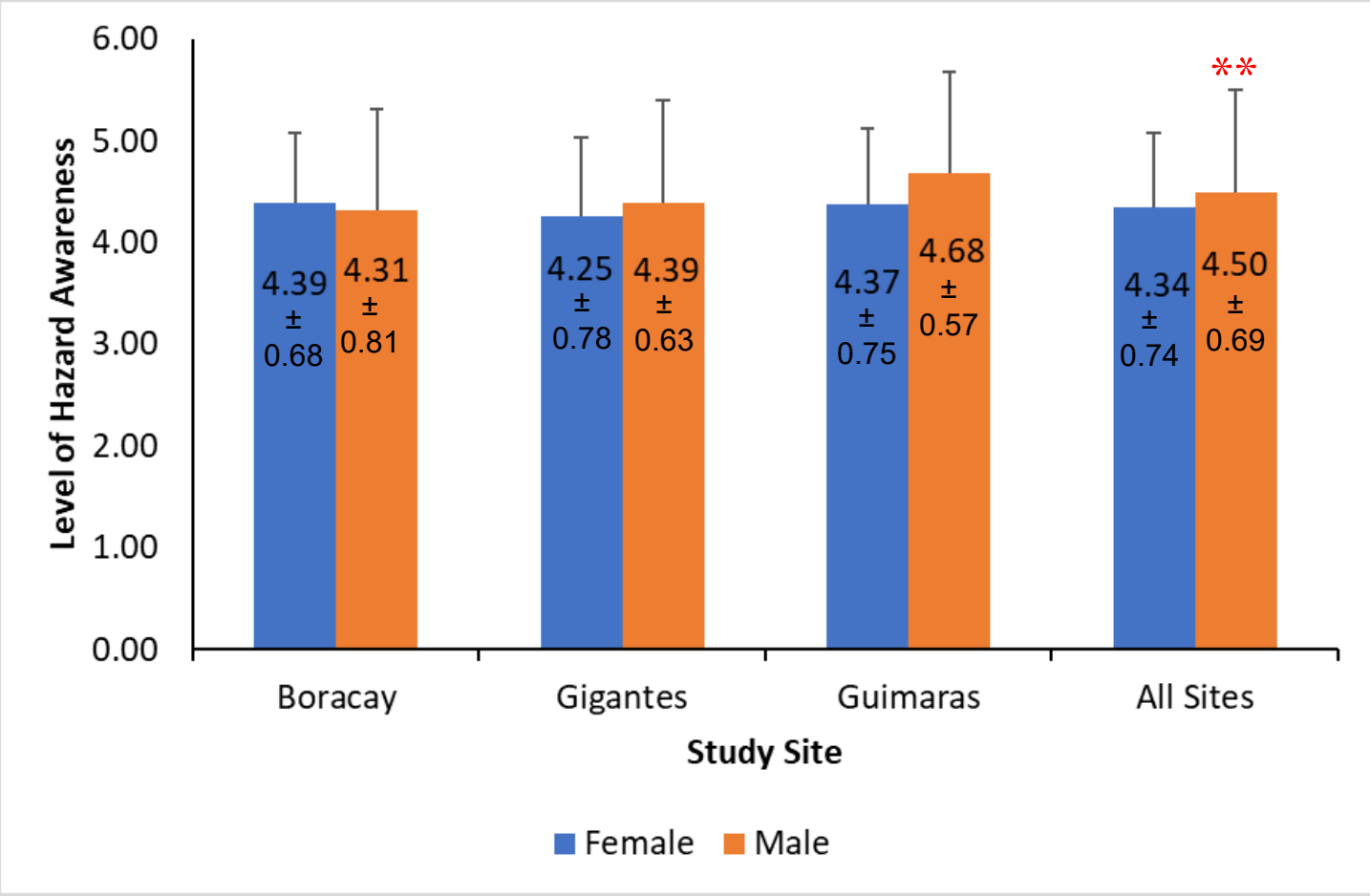
Hazards in the islands based of the proportion of respondents who identified them

Hazards i
of selecte
proportio

Rank	Hazard	Female(n_F =214)	Male(n_M = 424)	Total (n = 638)
1	Typhoons	77.57	83.96	81.82
2	Rising sea levels slowly altering the islands' coastline	58.41	64.62	62.54
3	Big Waves	59.81	59.20	59.40
4	Earthquake	57.48	57.78	57.68
5	Overbearing heat	57.01	57.31	57.21
6	Oil spill	50.00	60.38	56.90
12	Drought			
13	Flood	43.93	33.02	36.68
14	*Buhawi/Ipo-ipo* (Tornado)	25.70	37.26	33.39
15	Storm surge	32.24	32.08	32.13
16	Too much rain	40.19	27.83	31.97
17	Lightning	25.23	34.91	31.66
18	Tsunami	25.70	31.13	29.31
19	Red tide	30.37	28.54	29.15
20	Land slide	27.10	26.65	26.80
21	Sedimentation	25.23	26.42	26.02
22	Fault lines	24.30	16.51	19.12
23	Flash flood	16.36	16.75	16.61
24	Tidal wave	4.21	2.36	2.98
25	Fire/Burning	0.47	2.12	1.57
26	*Kanaway* (Northwest wind)	2.34	1.18	1.57
27	Rock slide	0.47	0.94	0.78
28	Terrorism		1.18	0.78
29	*Pugada* (Squall)		0.94	0.63
30	Strong Wind	0.47	0.71	0.63
31	Sinkhole	0.47	0.47	0.47
32	Drugs		0.47	0.31
33	El Nino	0.93		0.31
34	Fallen trees	0.47	0.24	0.31
35	Jelly fish, sea snake attack, sea urchin stepping	0.47	0.24	0.31
36	Vehicular accident		0.47	0.31
37	Volcanic eruption	0.47	0.24	0.31
38	*Away sa kapistahan* (Riot in festivals)		0.24	0.16
39	Carrying capacity excess	0.47		0.16
40	Disease outbreak		0.24	0.16
41	Hail stone Rain	0.47		0.16
42	*Halakay* (Shifting monsoon wind)		0.24	0.16
43	Open drainage/excavation	0.47		0.16
44	*Salatan* (Easterly wind)		0.24	0.16
45	Strong current		0.24	0.16
46	*Walo-walo* (Southwesterley wind)		0.24	0.16
47	Wind storm		0.24	0.16

- 47 hazards
- Natural, human-induced, combination
- 5 most frequently cited hazards were typhoons, rising sea levels that slowly altered the coastline, big waves, earthquake, and increasing temperatures that led to warm/hot weather
- oil spills (ranked 6th) were increasing in frequency as more passenger, cargo, and tanker vessels regularly ply Guimaras waters (Yap 2020; Burgos 2020; Murga 2019)

Level of Hazard Awareness ($\bar{x} \pm s$)



** Significantly different: Mann-Whitney U-test, $p = 0.006$

- Level of hazard awareness of men and women in small island is high
- There is a significant difference between female and male level of hazard awareness (Mann-Whitney U-test, $p < 0.01$)

Resilience Rating

Indicator	Perfect Score	TRI (2015) Evaluation Score						Study Sites Score		
		Red Zone		Caution Zone		Going Well Zone		Female Rating (%)	Male Rating (%)	Total Rating (%)
		Score Range	Percentage Range	Score Range	Percentage Range	Score Range	Percentage Range			
Connectedness	25	5-10		11-19		20-25		80.96	84.36	83.21
Risk & Vulnerability	35	7-13	25%	14-28	26%	29-35	76%	77.40	78.50	78.13
Procedure	20	4-8	and	9-16	and	17-20	and	81.99	83.47	82.97
Resources	30	6-11	blelow	12-24	75%	25-30	100%	75.47	78.05	77.18
Overall Resilience	110	22-33		34-98		99-110		78.52	80.61	79.91

- Study sites community is in Going Well Zone
  - ✓ the local community was extremely resilient in any disaster

Comparison of Perceived Resilience of Female and Male Small Island Community Members

Resilience Indicator/ Repondent Type[a]	Descriptive Statistics $\bar{x}$	s	Levene's Test F	p-value	t-test for equality of means[b] t	df	p-value
Overall Resilience							
Female	78.52	11.48	8.58	0.004	2.078	455.494	0.038*
Male	80.61	12.64					
Connectedness							
Female	80.96	12.67	0.526	0.469	-3.139	619	0.002**
Male	84.36	12.81					
Risk/Vulnerability							
Female	77.40	13.18	4.626	0.032	-0.963	440.537	0.336
Male	78.50	13.97					
Procedures							
Female	81.99	14.51	7.410	0.007	-1.157	461.509	0.248
Male	83.47	16.22					
Resources							
Female	75.47	15.32	1.768	0.184	-1.942	619	0.053
Male	78.05	15.80					

[a] - Female: 209, Male: 412
** - Significantly different at $\alpha = 0.05$*
*** - Significantly different at $\alpha = 0.01$*

- Overall, the level of resilience of men is significantly higher than the women ($p < 0.05$)
- Level of resilience of women is not significantly different than men in all resilience indicators except **Connectedness** ($p < 0.01$)
  - ✓ Both group agree on their **vulnerability** in the island towards any disaster

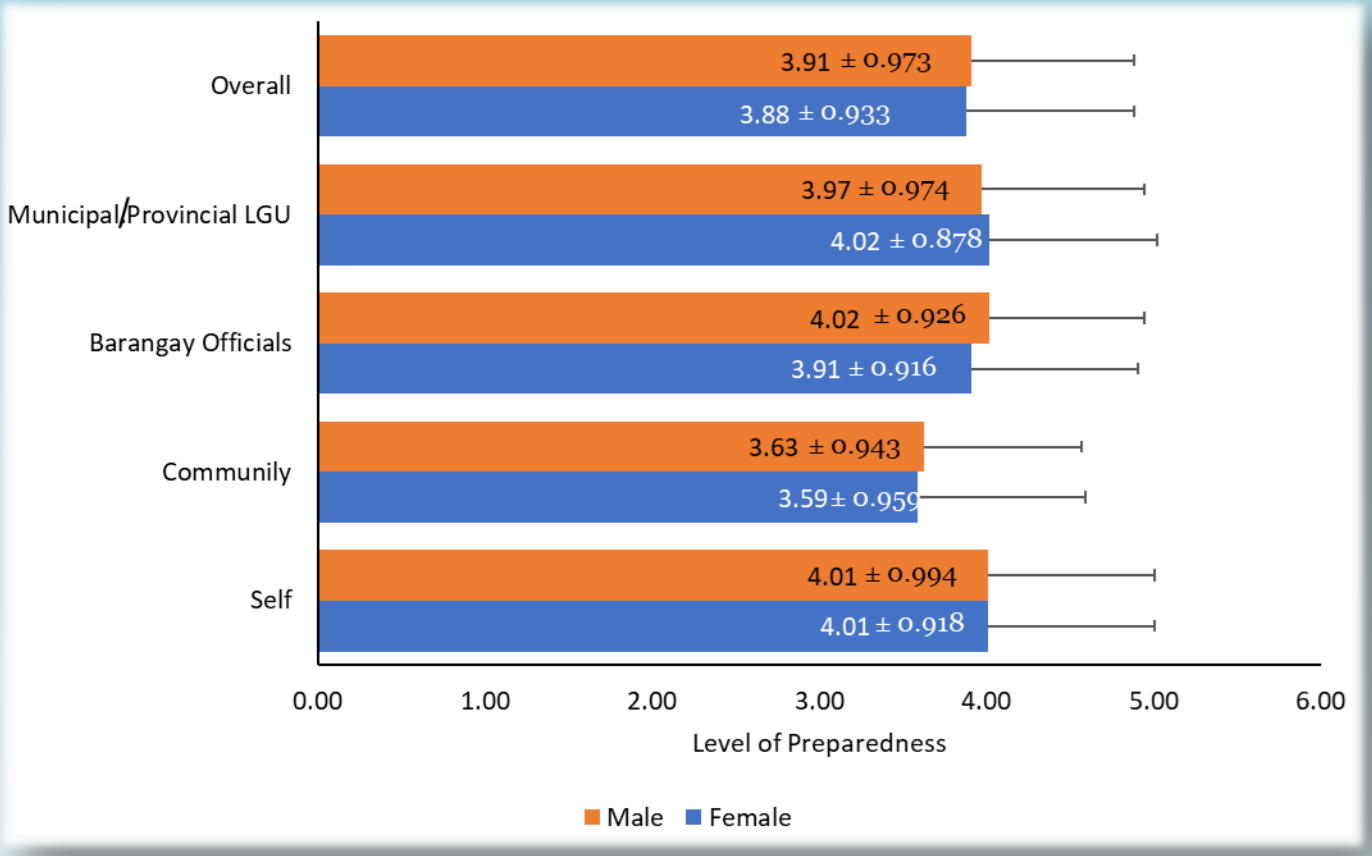
✓ **Procedures** that support community disaster planning, response, and recovery

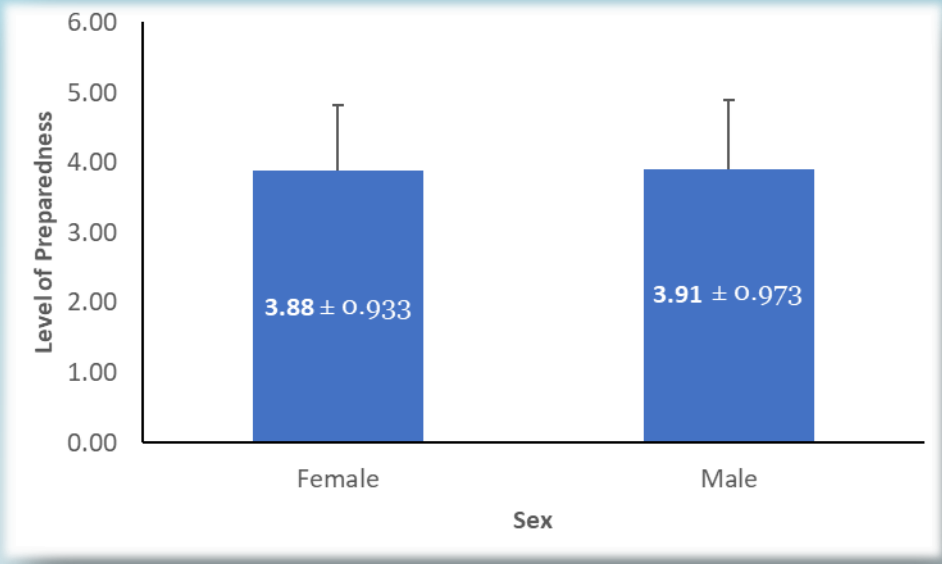
✓ Emergency planning, response, and recovery **resources** that are available

Disaster Preparedness: A Priori Test

Sex/Level Rated	Descriptive Statistics $\bar{x}$	s	n	Levene's Test F	$df1$	$df2$	p-value
Dependent: Preparedness				3.606	7	2500	0.001
Female							
Self	4.01	0.918	211				
Communily	3.59	0.959	211				
Barangay Officials	3.91	0.916	211				
Municipal.Provincial LGU	4.02	0.878	211				
Total	3.88	0.933	844				
Male							
Self	4.01	0.994	416				
Communily	3.63	0.943	416				
Barangay Officials	4.02	0.926	416				
Municipal.Provincial LGU	3.97	0.974	416				
Total	3.91	0.973	1664				
All Respondents							
Self	4.01	0.968	627				
Communily	3.61	0.948	627				
Barangay Officials	3.98	0.923	627				
Municipal.Provincial LGU	3.99	0.942	627				
Total	3.90	0.959	2508				

Multiple Comparisons of Preparedness Rating according to Sex and Level Rated ($\bar{x} \pm s$)

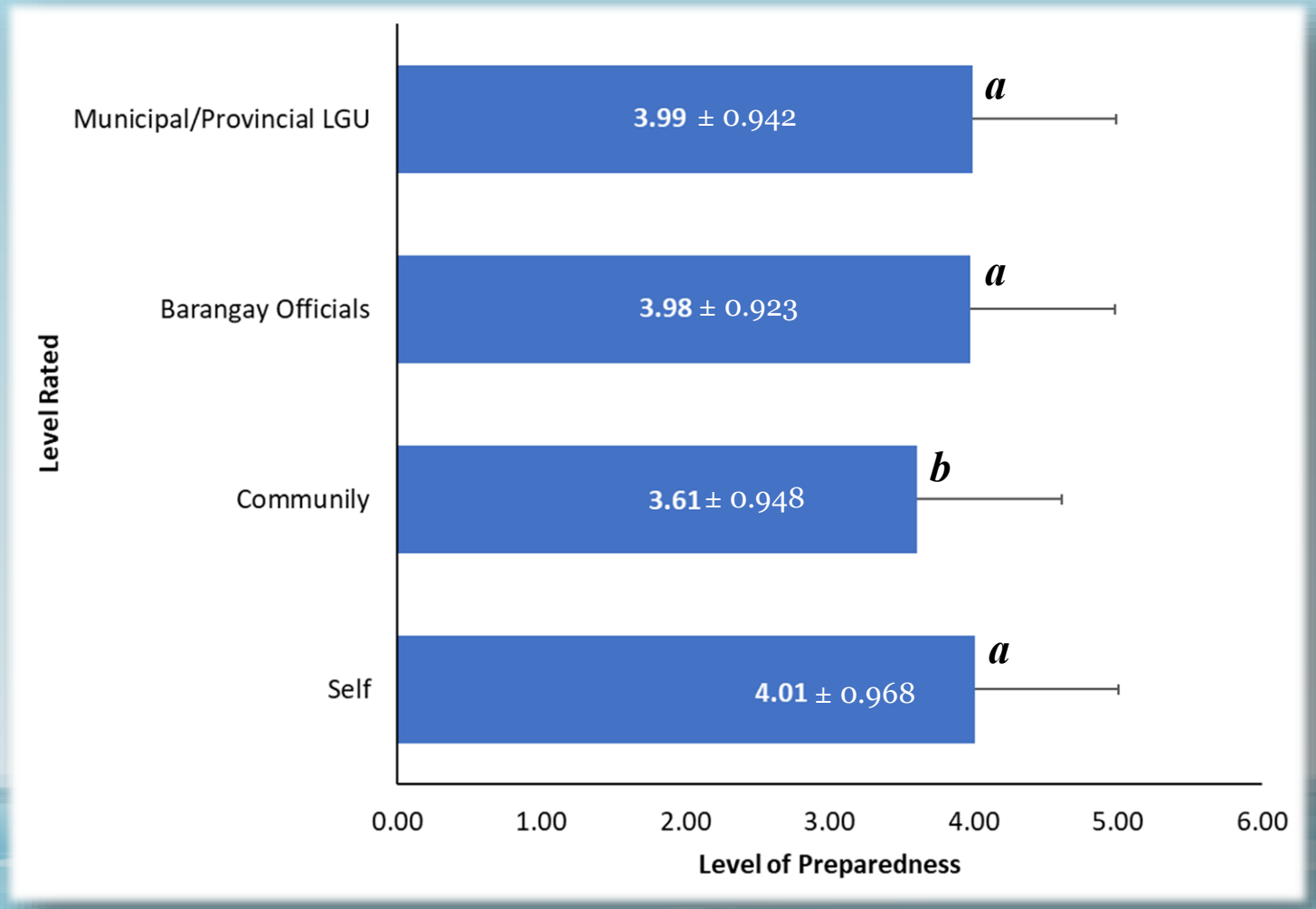




- There is no significant difference between the perceived level of disaster preparedness between female and male members of the small island community (Mann-Whitney U-test)

- Self and overall preparedness ratings have no significant difference
- Preparedness ratings for M/PLGU of female is higher than the male rating
- Preparedness ratings for Barangay Council female is lower than the male rating

Multiple Comparison of Preparedness Rating according to Level Rated ($\bar{x} \pm s$)



a, b – The same affixed letters indicate no significant difference (Kruskal-Wallis Test, $p < 0.01$)

- Community preparedness was significantly lowest among the four levels rated (Bonferroni Correction Multiple Tests, $p < 0.01$)
- Preparedness ratings of Self, Barangay Council and the LGUs were not significantly different
  - ✓ 3 groups were perceived as better prepared for extreme events

DISCUSSION

- As livelihoods in small islands are dependent on the available natural resources, these findings are crucial in making informed and science-based decisions for the sustainable management of coastal and marine resources especially in the face of a global decline in fisheries (Centre for Gender and Disaster 2021; ADB, 2014)
- The perceived level of preparedness of male and female had no significant difference probably because of their long exposure to disasters, local knowledge, traditions, and practices, and collective action and adaptive capacity of local community (Mazurana 2013; Benelli et al 2012; Neumayer and Plümper 2007)
- Given the disadvantaged position in small islands, there is a need to increase women's access to information, resources, and opportunities to increase their resilience thereby enhancing their capacity to cope with and recover from disasters (Moreno-Walton and Koenig 2016; Sohrabizadeh et al 2014; UNDP 2012)

CONCLUSIONS

- Small islands were often confronted with various natural and anthropogenic hazards and the **level of hazard awareness** in the study sites was **high**
- Men and women community members agreed that they faced high risk and vulnerability to hazards and their levels of hazard awareness was high
- Resilience of **the selected small islands** was in the **Going Well Zone**
- Evident that the men and women in these islands were extremely resilient in any disaster and there was a shared responsibility among various DRRM stakeholders
- Level of **disaster preparedness** in the islands was **high** but the significantly lower rating of the female implied that more capability building initiatives were needed for the realistic preparedness of all members of the local community
- While this study is focused on only three small island, the results can guide future research on small island resilience

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