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Research Article

Weather Conditions in Relation to Crimes Committed in Pagadian City

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ABSTRACT

This study aimed to determine the relationship between weather conditions as to wet and dry as recorded in the Department of Science and Technology (DOST) – Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) Weather Forecast Station and the crimes committed in Pagadian City in calendar years 2014-2018. Weather conditions as to wet and dry were correlated to crimes against person and property that was committed in Pagadain City. It employed a quantitative descriptive correlational method of research using the data of crime occurrences recorded in the Philippine National Police Pagadian City Station and the rainfall data from Department of Science and Technology (DOST) – Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) Weather Forecast Station in the city statistically treated using frequency count, mean, paired sample t-test, and chi-square test. Findings of the study revealed that physical injuries were profiled the highest in crimes against persons, followed by murder, homicide, and rape. At the same time, theft cases were dominantly registered for crimes against properties, followed by robbery, carnapping, and cattle rustling. The average distribution of murder, homicide, and physical injuries during the wet season outnumbered the cases during the dry season, except for rape cases that were higher during the dry season. Likewise, robbery, theft, carnapping, and cattle rustling were higher during the wet season than the dry season. The average distribution differences of crimes committed between the wet and the dry seasons tested at a 0.05 level of significance were not significant. The relationship between crimes against persons and the weather conditions was not significant. The relationship between crimes against properties and the weather conditions was also not significant. Moreover, crimes against persons and properties in the city do not depend on weather conditions. Murder, homicide, physical injuries, rape, robbery, theft, carnapping, cattle rustling, and the like could happen in the city regardless of whether it is wet or dry weather conditions, and there is a need to implement the crime prevention programs designed by the researcher.

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Keywords: *crimes committed, crime prevention programs, weather conditions*

Introduction

Crime is everywhere. It exists in all levels of society (UN-habitat, 2010). Over the past few decades, there has been a growing worldwide interest in examining the relationship between weather and various types of crime. Other people also relate the existence of crimes on the weather condition of a certain place. They focus on the behavioral aspect of the person depending on weather condition. Weather condition influences people indirectly in many ways; periods, days, months, seasons, and years, have all pointed to a temperature and aggression relationship. Considerably, more acts of aggression occur when the temperature is uncomfortably hot; even when socio-economic status is taken into account. People react violently and their reaction may be due to the weather conditions that they are experiencing (Baas, 2017).

During dry weather condition, it is possible that more people are away from home to enjoy the outdoors. This would invite more empty homes to strike, decreasing the risk of being caught and potentially increasing the expected reward from successfully committing a robbery. It was also discovered that during dry weather condition, criminal activities like rape and criminal conspiracy usually occurred (Gamble & Hess, 2012). However, wet weather conditions could also affect people's movement patterns, as rain may make individuals reluctant to leave their home which supposedly makes people lazy. If fewer people leave their houses, it is harder to commit crimes like robbery without getting caught. Alternatively, rain could also wash away evidence left by criminals, decreasing the risk of being caught. The utility gained from committing a crime could also be altered by precipitation levels, as committing a crime in wet weather might be less pleasurable (Prudkov & Rodina, 2019).

Pagadian City is known as the Little Hong Kong of the South for its mountainous terrain. According to Cadion (2014) Chief of Police Supt. Glenn Dulawan said, "crime volume for the period of January 1 to November 30, 2014 registered to 2,274 which is higher than 2013 with a total of 1,338 crime incidents or an increase by 936 crime incidents or 41.16 percent of crime volume. He further said that Pagadian City has the average monthly crime rate (AMCR) of 90.91 in 2014 compared to 60.37 in 2013 which registered at 63.37 crime incidents per 100,00 population or an increase of 30.54 crime incident or 34 percent". As of 2018, the total crime volume was 439; the index crime was 297 and the non-index crime was 142 (PNP PRO9 ZDS PRO, Pagadian City Police Station, Crime Volume for 2018). The city experiences a high volume of rainfall or rainy season last consecutive years 2016 and 2017 and they also experienced a long period of dry season last 2014 (Data on total rainfall, PAGASA).

With these, the researcher impelled to conduct investigation to determine if there is a relationship between crimes committed and the weather conditions in Pagadian City. The researcher believed that the role of physical environment and weather conditions that foster social interactions are likely to increase crime occurrences. Furthermore, the researcher believed that weather may affect on the way people behave in society. The researcher ventured on knowing whether there is an increase on crime commission in relation to weather conditions in Pagadian City.

Methods

The researchers used data mining techniques to examine weather conditions recorded in the Department of Science and Technology (DOST) – Philippine Atmospheric, Geophysical, and Astronomical Services Administration (PAGASA) Weather Forecast in Pagadian City on wet and dry days, as well as reported crimes for the previous five years at the police station. Because the researchers employed secondary data, no research instrument was used to obtain the results.

The researchers began by writing to the Officer in Charge of the Department of Science and Technology (DOST) – Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) Weather Forecast

Station in Pagadian City, requesting records of the number of dry or wet days in a month for the previous five years. Similarly, the researchers wrote a letter to the Chief of Police of Pagadian City Police Station, requesting records of reported crimes in the city from 2014 to 2018. The researchers scheduled themselves to be aided during data collecting once authorization was obtained. Different date calendars were created, and the researchers strictly adhered to these schedules in order to collect the data required for the study.

After gathering all of the necessary information, the researchers meticulously examine each record, cross-referencing recorded crimes with days in the city that are classified as wet or dry to see if the crimes committed are related to the meteorological conditions. To arrive at this conclusion, the researchers depend solely on the documents available from the two offices.

Furthermore, no respondents were involved in achieving the desired outcome. The only people engaged were the two offices' record officers, who helped the researchers obtain the records they required to finish the study.

Results and Discussion

Table 1. Frequency of Crime Occurrences for Five (5) Years Period (2014-2018)

	Types of Crime	Years					Total	Ave. Dist
		2014	2015	2016	2017	2018		
Crimes against Person	Murder	61	58	55	63	61	**298**	**60**
	Homicide	4	14	28	5	4	**55**	**11**
	Physical Injuries	82	184	108	197	82	**653**	**131**
	Rape	4	13	9	5	4	**35**	**7**
	Total	**151**	**269**	**200**	**270**	**151**	**1041**	**208**
Crimes against Property	Robbery	58	170	88	117	58	**491**	**98**
	Theft	78	98	141	102	78	**497**	**99**
	Carnapping	9	20	26	6	9	**70**	**14**
	Cattle Rustling	1	4	7	0	1	**13**	**3**
	Total	**146**	**292**	**262**	**225**	**146**	**1071**	**214**

Table 1 reveals that physical injuries were the most committed under the category of crimes against persons. The proportion accounted as the highest on the average distribution (63%). It means that physical injuries are highly profiled in the city of Pagadian. It was also documented that most of the crimes happened on the road. The city is not a good site because it is situated on a steeply rolling terrain, prone to road traffic accidents. The present finding supports the study of Gosalia et al (2019), which revealed that physical injuries were the most prominent public health problem where the road was the most commonplace of injury occurrence.

It can be seen further in the table that murder is the second most registered crime against persons. It accounted for about 29 percent of the average distribution. Pagadian City is the second-largest city in the Zamboanga Peninsula (Philippine Statistics Authority, 2016). Being the largest city in terms of population, the crime rate is expected to be higher. According to Glaeser and Sacerdote (2019), crime rates are much higher in big cities than in small or rural areas.

In a similar vein, homicide cases were also prevalent in Pagadian City. The proportion registered to about five percent of the total average distribution for the five years considered in the study. Petherick and Petherick (2019) stressed that homicide and murder are complex events determined by various factors. Accordingly, these can be victim-related, offender-related, situation-related, or environmental. A homicide involves killing one person

by another, while a murder consists of killing another with intent. However, whatever the intent to kill, homicide is still a crime and punishable by law in the Philippines.

Moreover, rape cases in Pagadian City registered approximately three percent of the average distribution of crimes in the area. The commission of the cases showed a decreasing trend after its highest record in 2015. It means that rape cases in the city are not serious. However, the current finding contradicts Ordinario's (2020) report, in which 30.6 percent increase in rape cases in 2019 over the same cases in 2018 in the whole country.

On the other hand, robbery and theft were major crimes against properties committed in the city of Pagadian. Robbery accounted for about 46 percent, while theft was 46.26 percent of the average distribution of crimes against properties. Robbery cases were highest in 2015, while theft cases were highest in 2016. The table revealed further robbery and theft as severe since both accounted for about 50 percent of the crimes against properties in the city. It can be construed that properties in Pagadian are least secured or have inadequate security measures. Badiora et al (2017) averred that burglars target homes that have little or no security. They also enter homes that appear unoccupied. These places are chosen because there is little chance of apprehension.

Similarly, carnapping also occurred in the city. The cases tabled for about seven percent of the average distribution of crimes against properties. Carnapping is the taking, with intent to gain, of a motor vehicle belonging to another without the latter's consent, or by means of violence against or intimidation of persons, or by using force upon things (RA, 10883). Abad (2019) disclosed that vehicle theft such as carnapping (taking one's vehicle without the presence of the owner or driver) is becoming rampant nowadays. From parking lots to the streets or highways, it can happen anywhere, to even the driveway. It can happen whether driving a new car or a second-hand car. The crime may even endanger the vehicle's driver and passengers.

Moreover, cattle rustling occurred in Pagadian City. The incidence recorded about 1.5 percent of the average distribution of crimes against properties. However, the city's law-enforcement agency revealed it as a resurgence of thievery in 2016, thereby directly prejudicing the livelihood of the agricultural workers and adversely affecting food production programs for self-sufficiency in rice, corn, and other staple crops as well as in fresh meat. Hence, cattle rustling compromised the people's lives in the agricultural sector.

Presidential Decree Number 533 in 1974 contemplated those large cattle are indispensable to the people's livelihood and economic growth, particularly the agricultural workers. Such large cattle are the work animals among farmers and the source of fresh meat and dairy products for the people and provide the raw material for the tanning and canning industries.

Table 2. Frequency of Crimes Committed during Wet and Dry Weather Conditions within Five (5) Year Period (2014-2018)

Types of Crime		*Wet Season*					Total	Ave. Dist
		Years						
		2014	2015	2016	2017	2018		
Crimes against Persons	Murder	26	29	33	47	21	156	31
	Homicide	3	4	24	2	2	35	7
	Phvsical Iniuries	27	80	55	154	36	352	70
	Raoe	1	5	3	3	-	12	2
	Total	57	118	115	206	59	555	111
Crimes against Properties	Robberv	22	85	59	83	18	267	53
	Theft	37	43	97	80	40	297	59
	Carnapping	5	14	23	3	3	48	10

Types of Crime		Wet Season					Total	Ave. Dist
		Years						
		2014	2015	2016	2017	2018		
	Cattle Rustling	-	3	5	-	1	9	2
	Total	64	145	184	166	62	621	124

Types of Crime		Drv Season					*Total*	*Ave. Dist*
		Years						
		2014	2015	2016	2017	2018		
Crimes against Persons	Murder	35	29	22	16	40	*142*	*28*
	Homicide	1	10	4	3	2	*20*	*4*
	Phvsical Iniuries	55	104	53	43	46	*301*	*60*
	Raoe	3	8	6	2	4	*23*	5
	Total	*94*	*151*	*85*	*64*	*92*	*486*	*97*
Crimes against Properties	Robberv	36	85	29	34	40	*224*	*45*
	Theft	41	55	44	22	38	*200*	*40*
	Camaooiniz	4	6	3	3	6	*22*	*4*
	CattleRustliniz	1	1	2	-	-	*4*	*1*
	Total	*82*	*147*	*78*	*59*	*84*	*450*	*90*

Presented in Table 2 are the crime occurrences during wet and dry seasons in Pagadian City from 2014 to 2018. With the exception of the event of rape cases in the area, the average distribution of murder, homicide, and physical injuries during the wet season outnumbered during the dry season. A similar scenario was seen for robbery, theft, carnapping, and cattle rustling, which were higher during the wet season than the dry season. It means that crimes against persons and crimes against properties generally occurred in greater volume during the wet season than the dry weather condition. However, the findings showed that crimes incident in Pagadian City were prevalent regardless of the weather conditions.

However, the present findings contradicted the research of Drexel University (2017). A study analyzing crime data in Philadelphia for ten years found that violent crime rates and disorderly conduct were higher when the weather was warmer and more pleasant, even rising sharply during warmer-than-typical winter days. Similarly, Breetzke (2018) revealed that violent and property crimes were higher on hot days than cold days. Violent crimes increased by 50% on hot days compared to freezing days, while property crimes increased by 12% on hot days. He concluded that as the temperature goes up, so too does crime.

On the other hand, Breetzke (2018) further disclosed that sexual crimes were higher by 41% on hot days and decreased on high-rainfall days. This finding is corroborated by the present study, in which the result divulged that rape cases in Pagadian City were higher during the dry season than the wet weather condition.

Table 3 Test of the Difference of Crimes Committed between Wet and Dry Seasons

Types of Crime		**Weather Condition**	**Mean**	**Mean Diff.**	**t-value**	**p-value**	**Remarks**
Crimes against Persons	Murder	Wet	31	3	0.32	0.761	Not Significant
		Dry	28				
	Homicide	Wet	7	3	0.67	0.537	Not Significant
		Dry	4				

Types of Crime		Weather Condition	Mean	Mean Diff.	t-value	p-value	Remarks
Crimes against properties	Physical Injury	Wet	70	10	0.40	0.712	Not Significant
		Dry	60				
	Rape	Wet	2	3	2.56	0.063	Not Significant
		Dry	5				
	Robbery	Wet	53	8	0.64	0.557	Not Significant
		Dry	45				
	Theft	Wet	59	19	1.30	0.264	Not Significant
		Dry	40				
	Carnap-ping	Wet	10	6	1.26	0.275	Not Significant
		Dry	4				
	Cattle Rustling	Wet	2	1	1.41	0.230	Not Significant

Table 3 discloses the test of the difference of crimes committed between wet and dry seasons. The table reveals that the mean differences were registered in all types of offenses documented, with theft being the highest and physical injuries as the next lower than theft. However, the mean differences of crimes committed between the wet and the dry seasons tested at a 0.05 level of significance divulged not significant. It means that, though there were variations in the count of crimes against persons and properties during the wet and dry seasons, the variations were not significant. It implies that the frequency of crimes during the wet season is most likely when crimes occur during the dry weather condition.

The present findings refuted the Badiora et al (2017) study results. The research disclosed that Minna City, with a warmer climate, had higher levels and seasonal variations for violent crimes (murder, homicide, rape, assault) and were significant. However, the present results supported the same study findings in Benin City, with colder climates, which had higher levels and seasonal variations for property crimes, but were not significant.

Table 4 Test of Relationship between Crimes against Persons and the Weather Conditions

Variables	X^2-value	p-value @ 0.05	Interpretation
Crimes Against Persons and Weather Conditions	7.649	0.052	Not Significant

The table 4 reveals that the relationship between these variables was not significant [x^2 = 7.649, p = 0.054]. It means that the occurrence of crimes against persons in Pagadian City does not depend on weather conditions. It implies that crimes against persons such as murder, homicide, physical injuries, rape, and the like could happen in the city regardless of whether the season is dry or wet.

The current finding supports Trujillo and Howley's (2019) study, revealing no statistically significant relationship between weather patterns and homicide. Nilsson (2018) corroborated on the study of Trujillo and Howley's (2019) found out that rain or shine, there is always a crime. However, the present finding contrasts with Shen et al (2020) study. The results revealed that significant strong positive relations were observed for temperature-to-minimal violent robbery (MVR) in seasonality. Similarly, significant strong positive relations were also obtained for temperature-to-assault, temperature-to-rape, and relative-humidity-to-MVR.

Table 5 Test of Relationship between Crimes against Properties and the Weather Conditions

Variables	X^2-value	p-value @ 0.05	Interpretation
Crimes Against Properties and Weather Conditions	7.158	0.067	Not Significant

Table 5 discloses that the relationship between these variables was also not significant [x^2 = 7.158, p = 0.067]. It means that the eventuality of crimes against properties in Pagadian City is independent on weather conditions. It implies that crimes against properties such as robbery, theft, carnapping, cattle rustling, and others can occur in the city without reference to the weather conditions as dry or wet.

The current finding refuted the study of Horrocks and Menclova (2021), as cited by Mandal (2020), who revealed that hot and cold temperatures had a significant effect on the number of property crimes recorded. Similarly, Otrachshenko and Tavares (2020) found that extremely hot temperatures significantly increased property crimes, while extremely cold temperatures had no significant effect. However, Blakeslee and Fishman (2018) unveiled that property crimes were unaffected by either hot or cold temperatures, similar to the present study's result.

Conclusion

Based on the findings of the study, crimes against persons and crimes against properties in Pagadian City generally occur in greater volume during the wet season than the dry weather condition. Likewise, crime incidents are prevalent regardless of the weather conditions. However, the variations in the count of crimes against persons and properties during the wet and dry seasons are not significant. Moreover, crimes against persons and properties in the city do not depend on weather conditions. Murder, homicide, physical injuries, rape, robbery, theft, carnapping, cattle rustling, and the like could happen in the city regardless of whether it is wet or dry weather conditions, and there is a need to implement the crime prevention programs designed by the researcher.

Recommendations

1. Situational crime prevention strategies could be strengthened to help reduce the eventualities of crime occurrences like crime against persons and properties, such as but not limited to increased intensive patrol activities specifically in a crime-prone geographical area, formal streets surveillance using electronic alarms, and implement specific actions by strengthening the traffic management to prevent road traffic accident in order to minimize injuries and other consequences.
2. There could be a coalesce operational activities among the police officers, local government unit (LGU), barangay officials, and any non-government organizations (NGO's) to prevent the occurrences of crime during wet weather conditions in which crimes against persons and properties are higher during this season. Furthermore, there is a need to strengthen the operational activities during dry season in which rape cases were also higher during this season.
3. The people in the community should take some precautionary measures all the time in order not to be a victim of any crime like crime against persons and properties even if it is wet or dry weather conditions because crime happens no matter what the weather condition is.
4. Implement the crime prevention programs designed by the researcher underscoring crimes against persons and crimes against properties involving the residents, business sector, the agricultural sector, and the like to be hosted by the city police department, local government units, barangay officials and the non-government organizations.

The results of the current study are essential baseline for further research to better enhance research resources for the city police and other related departments. Thus, a similar study may be conducted in other big cities in the country, considering daily data on crimes

against persons and properties associated with the changing of weather conditions in the country. The research effort will provide the integrity of the present study.

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