Aiming High

Monograph No. 13
Issue #02, December 2019

Kadunung

A Research Monograph of the Office of Research

Editorial Office:
The Research Office
Divine Word College of Legazpi
Legazpi City
Tel. No.: (052) 480-1239 loc. 25
Telefax: (052) 480-2148
E-mail: dwclresearchoffice@gmail.com

Cover and book design by:
Alicia S. Mapa
Ma. Cristita T. Nuñez

Aiming High

Kadunung

Monograph No. 13, Issue #02
December 2019

DIVINE WORD COLLEGE OF LEGAZPI
Research Office
Legazpi City

AIMING HIGH

Divine Word College of Legazpi
Legazpi City
Tel. No. (052) 480-1239

Monograph No. 13

Publisher
Rev. Fr. Nielo M. Cantilado, S.V.D.

Editor-in-Chief
Pedro B. Bernaldez, D.P.S., D.B.A., Ph.D.

External Editor
Edith Rebecca S. Regino, Ph.D.

Managing Editor
Alicia S. Mapa

Technical/Production Design
Ma. Cristita T. Nuñez

This monograph is published monthly. The works published in this monograph are the sole responsibility of the authors. Publication does not mean endorsement by the Office of Research itself.

Kadunung, a very clever person or a wizard. In a Bikol epic called Ibalong, Kadunung epitomizes the brilliant mind searching for greater ideas, skills, and knowledge, inculcating them while on a research journey...

INTRODUCTION

Knowledge is enriched by research. Administrators can share insight through research on issues and concerns in school administration and instruction. Tracer studies are able to show results of curriculum implementation, too. This issue of KADUNUNG showcases a government official's research activity formatted by the research staff.

KADUNUNG will be further published featuring research articles written by administrators of DWCL, written alone or in collaboration with other institutional researchers. KADUNUNG indicates knowledge and intelligence, which are the main focus of research in scientific development.

Pedro B. Bernaldez, D.P.S., D.B.A., Ph.D.
Research Director

VULNERABILITY ASSESSMENT OF LEGAZPI CITY ON URBAN SPECIFIC FIRE HAZARDS

Aramis A. Balde
BFP RHO V, Legazpi City

Transformed to IMRAD by:
Alicia S. Mapa
Divine Word College of Legazpi

Abstract

Unwanted fires are the least predictable common physical phenomenon that has the potential to get out of control and cause property damage or personal injury, and even death. A fire in two-minute time turns life threatening, and entailing a sustained and destructive progression five-minute after a structure engulfed in flames. The incidents may even worsen should the standard seven-minute response time of firefighters on fire call suffers delays due to the presence of 'fire hazards' that require immediate abatement. To address these hazards, a pre-fire plan is required not only to identify vulnerable or fire-prone areas but also to recommend appropriate form of defense, with corresponding fire response strategies.

The Fire Code of the Philippines (P. D. 1185) amended by Republic Act 9514, does not provide criteria for area vulnerability. Rule 7 of the code, entitled 'Suppression Control of Hazardous Fire Areas' only outlines factors to determine hazards and recommend necessary safeguards to prevent the occurrence of fires and to control its spread specific on the type of construction materials used, the combustibility of contents, the type of occupancy, load capacity, height from the ground level, longest travel to exit, and safety and warning systems installed (Morgan, J. et al, 2008). Similarly, the National Building Code, PD 1096 does not provide criteria for area vulnerability but only defines what a fire zone is, providing restrictions on construction and land use, but not necessarily enumerating fire-prone conditions of an area. Cognizant of these limitations the researcher attempted to contribute to the knowledge

in the subject of vulnerability and urban specific hazards and generate guidance for mitigation, craft an integrated pre-fire plan to propose solutions, measures and control of factors, and finally to identify vulnerable urban areas in the city of Legazpi and their respective area specific fire hazards.

Specifically, the study attempted to answer the following sub-problems: 1. What is the profile of the most Fire Vulnerable Barangays in Legazpi City in terms of: (A) Physical Vulnerability; a.1 Location condition; a.2 Design of structures; a.3 Proximity or nearness of structures; a.4 Narrowness of roads and, a.5 Water sources and hydrants: (B.) Social Vulnerability; b.1 Population Density; b.2 Disregard for fire wise management; b.3 Lack of public information and awareness and b.4 Limited recognition of risks and preparedness measures.: (C.) Economic Related-activity Vulnerability; c.1 Source of livelihood?,: (2) What are the risk reduction capabilities of these barangays?: (3) What fire plan may be proposed to address these vulnerabilities, which will incorporate both prevention (fire safety and reaction education) and suppression?

From the findings of the study, conclusions were deduced to address vulnerability on location conditions, social vulnerability, and economic-related activity vulnerability for the three barangays. Likewise, an integrated fire plan was proposed to help transform the residents as well as the whole Legazpi community into force-multipliers, enhancing their respective responses on fire safety and prevention, in reference to Section 14 of Republic Act (RA) 9514 or the New Fire Code of the Philippines 2008 and the Building code.

In view of the conclusions made, the following recommendations are advanced: (1) Hazard mapping criterion of Bureau of Fire Protection (BFP) Legazpi/Legazpi City Fire Station (LCFS) should not only consider fire prone indicators but must include most importantly the dimension of vulnerability of an area specifically on its Physical, Social and Economic related activities, which is greatly contributory to the risks of fire; (2) The BFP Legazpi/LCFS should sustain its Barangay Ugnayan program on a year-round basis, concentrating on their pre-identified fire prone areas and ensure that every Barangay has its respective organized Barangay Volunteer Fire Brigades as their first-line-of-defense; has proper zoning and install horizontal dry pipes strategically extending

from the street to the interior and most vulnerable area of the Barangay. Most importantly the LCFS transforms every person in the community as force-multipliers and to actually have confidence in them as partners in fire safety and prevention; (3) The Barangay Councils should work together with the BFP Legazpi/LCFS to propose measure to the City Mayor and the City council to prioritize fire mitigating measures to include equipage and the provisions of Telephone/VHF Radio sets for immediate notification of the BFP; installation of fire hydrants; constructions of Barangay roads and training funds and institutionalization of Barangay Volunteer Fire Brigades liken to the Public Safety Officers; (4) The Office of the Legazpi City Mayor through its Sanggunian should pass an ordinance compelling all Barangays to adopt the proposed integrated fire plan to establish fire mitigating measures not limited to: organization of a permanent Barangay Volunteer Fire Brigades, fire truck accessibility roads compliant to the DPWH standard (entrance and interior), construction of fire walls on need basis, installation of fire hydrants, and other physical features as maybe deemed necessary; (5) The respective Barangays should adopt or sustain a livelihood program as well as advocate family planning program to ensure that residents achieve limitless ability to manage vulnerability, enhance resilience and make safety a main concern; (6) The BFP Regional Office should strictly implement, monitor and extend technical and financial support to the Barangay Ugnayan programs of the field units, particularly the Legazpi City Fire Station.

Keywords: *assessment, fire hazards, urban, vulnerability*

Fires can start in a number of ways: some natural, some accidental and some intentional. The threat of fire is felt greater in urban areas where structural fires frequently occur, primarily in homes where houses are part of the fuel which initiates and propagates the fire. A single fire incident can transform a highly urbanized area into ashes if the vicinity is not immediately defended. In the United States, the U.S Fire Administration (FEMA) Statistics shows that the urban structural fire problem represented approximately 84 percent of all fire deaths and 79 percent of the injuries to civilians in 2007.

Nationwide, a similar situation had been experienced.

Residential fires topped the list of fire incidents among property fires from 2005 to 2008 of 18,077 fires or 49.8 % of 36,319 total fire incidents and a total estimated damages or economic loss of P 11,181,619,598.93 billion (Stinus-Remonde M., 2009). In the Bicol Region, from 2005 to 2008, a total of 519 residential fires were recorded representing 61 % of the total 851 fire incidents with a total economic loss of P 329, 208, 704.60. (Senate Press Release, 2009).

Legazpi City, the capital of Albay, is composed of seventy (70) Barangays, 58 of which are urban and 12 are rural. The City has the strategic advantage of being a commercial, institutional, and transportation hub and is the gateway between the two island provinces of Catanduanes and Masbate. Legazpi City is the top tourist destination in Bicol as it lies just 15 kilometers southeast of Mayon Volcano, and is a convenient jump-off point to other tourist destinations in the region, accommodating Airbus A320, Boeing 737-400, and Boeing 72 (Crowley, M., 2008). Considering the importance of Legazpi City for its economic complexes, major planning is required for its defense. The seat of business, commercial and educational establishments, Legazpi attracts an influx of transient workers as well as students and caters to their sleeping and living accommodations, adding to the city's fire safety situation concern. Legazpi City's progress requires the protective mission of the Bureau of Fire Protection to prevent fire incident opportunities and hazard increase. According to Fire Statistics Report Legazpi has a total of 37 residential fires or 18.78 % of the 197 total fire incidents that occurred in the province from 2005-2008. In 2005, there were nine, representing 22.5 % of the 40 fire incidents. In 2006, there were 13 or 17.81% of the total 73 fire incidents. In 2007, Legazpi City has nine fires representing 16.7 % of the total 54 fire incidents and in 2008; there were 6 or 22.22 % of the total 27 fire incidents. The combined estimated total fire damages to property or total economic loss from 2006-2008 for Legazpi alone is P 52,976,611.60 (Crowley, M., 2008).

The standard seven-minute response time of firefighters on fire call suffers delays due to the presence of 'fire hazards' that require immediate abatement. A commonly encountered fire hazards that slows firefighting operations are: (1) no established fire lane, (2) narrow Barangay roads for accessibility of fire trucks, (3) distances of houses to each one, (4) absence of hydrants, and (5) weak cooperation of the

community on fire safety practices. To address these hazards, a pre-fire plan is required not only to identify vulnerable or fire-prone areas but also to recommend appropriate form of defense, with corresponding fire response strategies.

Statement of the Problem

This study was conducted to identify fire prone areas and evaluate the risks and vulnerabilities based on the number of incidents and fire-hazards encountered by the fire responding units during actual firefighting operations and as per the existing fire prone selection standards of the Bureau of Fire Protection. Specifically, the study attempted to answer the following sub-problems:

1. What is the profile of the most Fire Vulnerable Barangays in Legazpi City in terms of:

a. Physical Vulnerability
- a.1 Location condition
- a.2 Design of structures
- a.3 Proximity or nearness of structures
- a.4 Narrowness of roads
- a.5 Water sources and hydrants

b. Social Vulnerability
- b.1 Population Density
- b.2 Disregard for fire wise management
- b.3 Lack of public information and awareness
- b.5 Limited recognition of risks and preparedness measures

c. Economic Related-activity Vulnerability
- c.1 Source of livelihood?

2. What are the risk reduction capabilities of these barangays?

3. What fire plan may be proposed to address these vulnerabilities, which will incorporate both prevention (fire safety and reaction education) and suppression?

Theoretical Framework

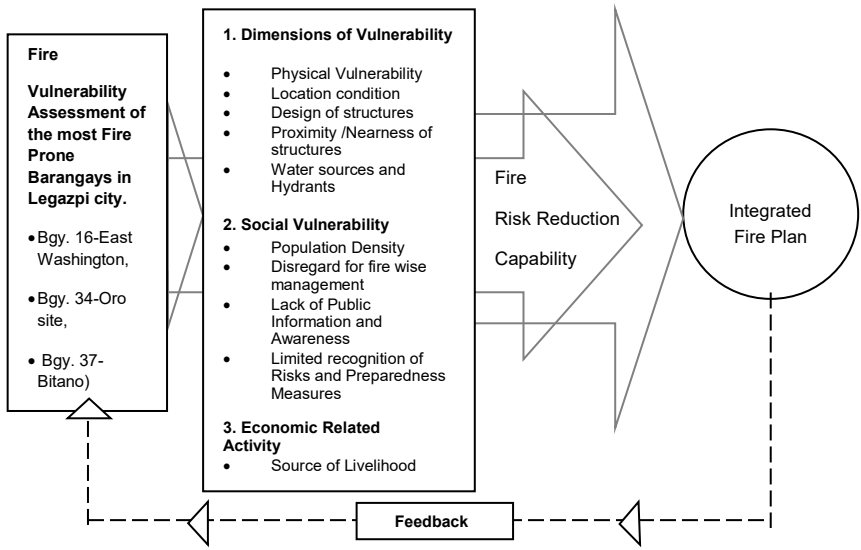
Henry Fayol's rationale of an organization as a working unit, a 'system' of relationship for the attainment of its specific objectives; perceived here of Legazpi City community as one organization working together. It is viewed as a General Systems Theory where the parts are interconnected and continuously interact. A change in the part of the system will affect other parts of the system. Specifically the formula that Hazard equals Risk + Vulnerability (H = R + V), translated as, if there is no vulnerability there will be no risk.

This is also true of Robert Deinhardt technical rationality that the end result of which is that citizens input based on social values is replaced by bureaucratic decisions based on technical goals. This study is also based on the theory of administration.

According to Leonard D. White, "the art of administration is the direction, coordination and control of many persons to achieve some purposes or objectives." This is true in the BFP's aspiration for a coordinated effort of the community and the BFP in the implementation of the fire prevention program with the cooperation of the community. It is shown in this study that in order to determine susceptibility of an area to fires, vulnerability assessment should be conducted to identify the Hazards and Risk in terms of Physical/Geographical Vulnerability, Social Vulnerability and Economic Related Vulnerability.

Conceptual Framework

The conceptual framework of the study totally revolves around vulnerability assessment of Legazpi City on urban specific hazards. The paradigm illustrates the conceptual framework of the study and how vulnerability assessment can aid in the effective management of fire hazards in the City of Legazpi. Having identified all factors in the Barangay relating to vulnerability and capability, it now begs for an integrated fire plan, inclusive of an action as well as a communication plan to guide the safety inspectors and educators of the BFP on their advocacy to prevent fire and a communication plan comprehensive enough to exact maximum cooperation of the community from the barangays, LGU and the media.



Conceptual Framework

Methods

The qualitative-quantitative research design was used in this study. Direct observation technique was employed using an observation checklist. In the analysis and interpretation of data, contrast and comparison were used to demonstrate the expertise of a firefighter, as a fire prevention specialist.

The frequencies of identified risks in the Barangays were the basis for the discussions, to include the number of fire occurrences from 1996-2008. The Observation method was used for it investigated vulnerabilities in the natural setting in which they were found. The identification of vulnerabilities made use of the researchers' training as a firefighter; therefore, data were taken from a firefighter's perspective. In order to eliminate bias and ensure authenticity, the data gathered was verified by the Legazpi City Socio-Economic and Physical Profile Facts and Figures, Volume 1, of the City Planning and Development Office-Research Development and Statistical Division.

During the site visit, a guide was provided by the Punong

Barangay, through the Brgy. Secretary to ensure that identified risks are true and all measurements taken of the roads and alleys were factual. All observations, seen fire safety deficiencies / fire risks, were validated by the respective Punong Barangay or their Barangay Secretaries on their correctness.

Sources of Data

The main sources of data were the Fire Incidents Report records and Fire Statistics record from the Regional Intelligence and Investigation Section and from the record of the Fire Investigation Reports and Fire Statistics Report covering the period 1996–2008 of the Legazpi City Fire Station. Fire incident frequency were obtained, revealing that Barangay 16-East Washington Drive, Barangay 34-Oro site and Barangay 37-Bitano topped the list of having the most number of fire occurrences out of the thirteen fire prone urban Barangays.

Procedure of Investigation

Before the study was conducted, an approval to perform the study was secured. Informed consent was obtained from all the respective Barangays and they were informed that the purpose of the study was to learn more about the existing hazards or existing fire risks in each Barangay and why these were not given attention by the respective Barangay councils and to know what the measures undertaken are or efforts done/attempts/initiatives to address these inadequacies either by correction or removal. A letter of permission to conduct the study was prepared by the researcher, and endorsed by the Dean of the Graduate School, before proceeding to the actual site observation. The conduct of observation was done through site visitation of the Barangays, taking pictures for additional documentations and securing a copy of the Barangay profile from the Office of the Punong Barangay.

Data Gathering Instrument

A fire hazard checklist was developed by the researcher to record the existing fire risk conditions of each Barangays. Using the checklist, the researcher marked ‘check’ on the seen risks and marked

'x' if there was no observable fire risks conditions. The active-observation technique which is the exchange of information between the researcher and the guide, made the researcher part of the respondents. The BFP records on file, Barangay profile and the observation checklist was sufficient in scope to generate the data needed.

Documentary Analysis. The records on file at the Investigation and Intelligence Section of the Operation Division of the BFP Regional Office was consulted and reviewed as the prime source of data; specifically Fire Statistics and Fire Investigation Report to determine the causes, origin and nature of fire incidents; and criteria selection for hazardous and vulnerable areas. Likewise, the Barangay Profile requested from the respective Barangays to aid in the assessment.

Observation. The checklist was presented to the respective Barangay Secretaries before the actual conduct of rounds. The ocular inspection was done four times in each Barangay on different dates and months. A Barangay tanod was assigned as security throughout the duration. Site visitation was conducted to identify and assess outright Barangay conditions and assist vulnerability assessment as a valuable first step in discovering safety inadequacies on fire. Site visitation documentation is composed of a checklist and pictures of the existing hazardous conditions and the data gathered substantiate a comparative analysis and determine respective Barangays improvement on their capabilities.

Statistical Treatment

Direct counting and the number of incidents made use of the frequency to quantify the number of identified risks in each Barangays, as well as the number of fire incidents occurrences as per the data on record. This was used to present the number of risks or inherent disadvantages on fire safety as required by the study. All information and data generated were tabulated, interpreted and analyzed using contrast and comparison method.

Quantification of Variables

The dependent and independent variables of the study were

quantified as follows:

A. Very High Vulnerability (VHV) - 3
High Vulnerability (HV) - 2
Low Vulnerability (LV) - 1

B. Very High Vulnerability (VHV) - 5 - 6
High Vulnerability (HV) - 3 - 4
Low Vulnerability (LV) - 1 - 2

Data Analysis

The data on the Vulnerability Assessment of Legazpi City on Urban Specific Fire Hazards was gathered. Included are discussions on the vulnerabilities, inadequacies and risk reduction capabilities, specific mitigating measures and abatement of existing potential fire starters to totally address urban specific fire hazards. All data are presented in tabular form to support the analyses supported by a scoring system. Implications of the findings were substantially discussed following the interpretation of data.

Results and Discussion

This chapter presents the findings, analysis and interpretation of the data gathered on the Vulnerability Assessment of Legazpi City on Urban Specific Fire Hazards. Included herein are discussions on the vulnerabilities, inadequacies and risk reduction capabilities, specific mitigating measures and abatement of existing potential fire starters to totally address urban specific fire hazards. All data are presented in tabular form to support the analyses supported by a scoring system. Lastly, an integrated fire plan for urban in Legazpi City was presented.

Profile of the most Fire Vulnerable Barangays in Legazpi City

The profile of the most fire vulnerable Barangays in Legazpi, namely Barangay 16-East Washington, Barangay 34-Oro site and Barangay 37-Bitano, were discussed using three of the five dimensions of vulnerability namely: physical, social and economic related activity. Physical vulnerability refers to threat by location, design of structures, proximity of structures, narrow roads and water sources and hydrants.

Social vulnerability includes population density, disregard for fire wise management, lack of public awareness, and limited recognition of risks and preparedness measures and absence of volunteer fire brigades. Economic vulnerability refers to economic related activity as referred, herein, as the source of livelihood that poses fire threat to each of the respective Barangays.

Physical Vulnerability. Area threat makes people or places vulnerable to extreme man- made and natural events that varies by locality. Location condition, design of structures, proximity or nearness of structures, narrowness of roads, water source and hydrants are physical features that should be in the standard manner made available to prevent fire from occurring in the first place.

Location condition**.** Fire threat at location is a nightmare to its directly affected community and if left unchecked, destructions may extend to its adjacent community on all sides. Most fires start with the contents of a structure and if not quickly extinguished, spread further into the building, through the walls, common roof and or attic spaces, and even from one structure to an adjacent building. In the Chemistry of Fire, oxygen, heat and fuel are the elements to start a fire represented by a triangle to show connectivity that once these elements are complete and in the correct quantity they generate the inevitable reaction-fire. In a residential fire, the house itself is the fuel, the heat may come from an electrical spark, lighted matchstick, candle, discarded cigarette or even open flames when cooking; and the oxygen is supplied by the very air we breathe.

Table 1

Location condition	Bgy. 16	Bgy. 34	Bgy. 37
Presence of Illegal Settlers	✓	✓	✓
Not within radius of a nearby Fire Station	×	×	×
Presence of Vegetation	✓	✓	✓
No. of Observed Indicators	**2**	**2**	**2**
Level of Vulnerability	**HV**	**HV**	**HV**

Physical Vulnerability in terms of Location Condition ^{VHV} Very High Vulnerability ^{HV} High Vulnerability ^{LV} Low Vulnerability

In terms of location vulnerability, Table 1 showed that Bgy. 16-East Washington, Bgy, 34-Oro Site and Bgy. 37-Bitano shared a common rating of High Vulnerability. There were illegal settlers in these three Barangays which was one common indicator of a fire prone area due to the usual non-observance of safety construction as provided for in the National Building Code and the New Fire Code of 2008. Further, they also shared the risks of having untrimmed vegetation which were potential fire starters.

The important thing to remember about environmental threats (bush/wild fire) is that although they can be extremely severe, they are usually avoidable with a cautious attitude. Sadly, even when people there saw the oddity in the situation, the consequences were not imagined (Steelyman, n.d.)

Regular fire safety and prevention awareness seminars supported with information campaigns through the Tri-media is not enough to convince the public of the real and imagined dangers of fire. The conduct of a fire drill with the residents as actual victims completes their education and ensures proper reaction in any event of a fire anytime of the day.

One fire incident in urban Legazpi associated with threat at location is the Barangay Sabang and Barangay Pigcale fire. Both barangays are highly congested, inaccessible by fire trucks, with no water hydrants and are both coastal Barangays. Sabang and Pigcale were stricken by fire twice in a span of four years, first in 1996 and in 2000. The open sea fronting these Barangays provided a generous supply of winds which fanned a small fire into a raging wild fire eventually accelerating fire spread, causing destruction in its wake. According to fire investigators, it does not matter where the fire started whether it was in Bgy. Pigcale or Bgy. Sabang, for the resulting destruction would have been the same due to geographical disadvantage; situated along the coastlines, and with the majority of homes made of light materials, therefore easily ignitable. Any fire can easily get out of control in any same situation, having an abundance of fuel to burn. To prevent occurrence and recurrence of this incident in any of the Barangays in urban Legazpi, Barangay captains and their councils need

to plan for fire both for its use and its risk, in harmony with the doctrines of Disaster Management dictating that self-reliance shall be developed by promoting and encouraging the spirits of self-help and mutual assistance among the local officials and their constituents (P.D 1566, Section 1). According to Sen. Loren Legarda (2010), we must, therefore, first strengthen governance in the urban centers. As a national agency, the Bureau of Fire Protection (BFP) is vital in the operation of all LGUs by ensuring safety of its economic assets, side- by-side with the Local Building Officials and their Building code; having lawful provisions on safety not limited to identification of fire zones, land use, mechanical and electrical operations.

Fire may not be a regular feature within any specific part of the barangay, but it is important to be prepared and an active fire management is required for the right use and timing of fire. The fire code ascertains "allowed–burning" on special cases with proper permits and observance of pre-cautionary measures. BFP Legazpi City Fire Statistics covering the period 1996 to 2008, disclosed that Bgy 37-Bitano is the no.1 fire prone Barangay in Legazpi having 19 fire incidents, the highest number of incidence in a span of twelve years, followed by Bgy 16-Washington Drive with 11 incidents and Bgy. 34-Oro site with nine incidents, making them the three most fire prone Barangays in urban Legazpi, as shown in Table 2.

Table 2
Urban Legazpi's Leading Fire Prone Bgys., 1996-2008

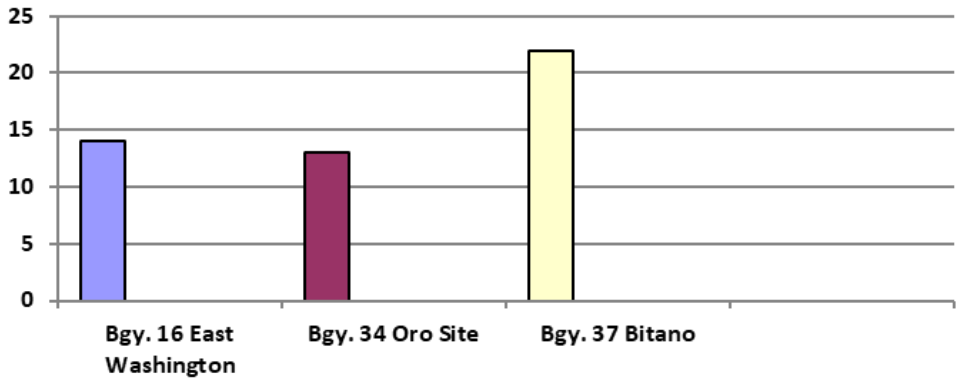
Name of Barangay	Number of Fire Incidence
Barangay 37 – Bitano	19
Barangay 16 – Washington	11
Barangay 34 – Oro Site	9

Fire spread happens either thru high heat transfer by exposure (radiation) or heat transfer through heated smoke (convection) and or by direct contact (conduction) as the three (3) most common forms of heat transfer. By these principles all fires from either Barangays have the probability to spread to other nearby Barangays. Fire brands commonly known as *'manok-manok'* are most dangerous during windy days. All these forms of fire spread were present in the Sabang-Pigcale fire and to

be expected in every fire incident particularly if it occurs in highly congested urban areas. Bgy. 37–Bitano adjacent Barangays frequency of fire occurrence is 22; while Bgy. 16–Washington adjacent barangays frequency of fire occurrence is 14, and Bgy. 34 adjacent barangays frequency of fire occurrence is 13, as shown Table 3 and Graph 1.

Table 3
Adjacent Barangays Fire History, 1996-2008

Bgy 16 – Washington		**Bgy 34– Oro site**		**Bgy 37 – Bitano**	
Adjacent Bgys	**No. of Fires**	**Adjacent Bgys**	**No. of Fires**	**Adjacent Bgys**	**No. of Fires**
Cruzada	7	PNR Peñaranda	4	PNR Peñaranda	4
Ilawod	5	Dinagaan	0	Capantawan	3
Rizal St., Ilawod	2	San Roque	1	Oro site	8
Bagumbayan	0	Bitano	8	Cruzada	7
Total	**14**	**Total**	**13**	**Total**	**22**



Another location threat was the fire histories of the direct adjacent barangays. As shown in Table 3, Bgy. 16-Washington had four adjacent barangays with a total of 14 fire incidences; Bgy. 34-Oro site also had four adjacent barangays had 13 fire incidences, while Bgy. 37–

Bitano had four adjacent barangays, with the largest number of fire incidents of 22.

The graph showed that in terms of fire frequency Bgy. 37-Bitano was more vulnerable than Bgy. 16–Washington and Bgy. 34-Oro Site. Barangays with frequent fire occurrences are definitely fire prone areas and ought to be labeled as fire zones. The Building code provides in section 2.01.02. Designation of Fire Zones, that (a) The Secretary shall classify each type of fire zone in accordance to use, occupancy, type of construction, and resistance to fire subject to the provisions of this Code. (b) Based on the classification of fire zones, City Counsels or Municipal Boards, by resolution, shall divide cities and municipalities into fire zones. Such division shall be in accordance with the local physical and spatial framework plans or the recommendation of the local city or municipal development body (The National Building Code: P.D. NO. 1096).

If this provision will be implemented fire spread can be controlled or else neither Legazpi City Fire Headquarter nor its two sub-stations can adequately protect the growing number of structures in urban Legazpi City. Meanwhile, a critical key to solving the present inadequacy is that the City Government of Legazpi, subdivision owners, establishment owners and even residents should take steps on their own to protect their property.

Design of Structures**.** It is important to remember that the construction materials used in homes is part of a system, and we should understand performance implications associated with changes in materials and design. Neglect of safety and poor planning results to fire threat. In firefighting, one of the most significant skills a fire ground commander should possess is one that they can obtain before ever showing up on the scene of a fire. Knowledge of how a building is constructed will offer tactical clues regarding: rate of fire spread, void spaces for hidden fires, weak areas that can be subjected to rapid deterioration secondary to fire, how specific structures may collapse

should an advanced fire weakens the structural support system of a given building. Knowing the types of building construction classification is paramount to projecting the future evolution of fire within a structure (Lee, M., 2009).

The risk assessment ability of the fire ground commander to size -up a situation just by his imagination and familiarity of the place during his ocular survey of the community should be adopted by the residents. Particularly with informal settlements , commonly known as squatters identified by makeshift houses made of non-fire resistive light materials are likely fire fuel, made extra dangerous by the manner they are constructed. It is ordinary to see one house attached to another, literally supporting each other's walls, even sharing a roof, thus poses a high potentiality to fire.

Rule II of BP 220 defines what a FIREBLOCK is any wall which separates two abutting living units so as to resist the spread of fire. Such wall shall be of masonry construction e.g., cement hollow blocks, bricks, reinforced concrete, etc. at least four inch thick, and shall extend throughout the whole length of the living units and from the lowest portion of the wall adjoining the living units up to the point just below the roof covering of purlins. FIRE-RESISTIVE: Fire resistive time period is the length of time a material can RATING withstand being burned which may be one-hour, 2-hours, 3-hours, 4-hours, etc. FIRE WALL: A fire block with extends vertically from the lowest portion of the wall which adjoins the two living units up to a minimum height of 0.30 meter above the highest portion of the roof attached to it; the fire wall shall also extend horizontally up to a minimum distance of 0.30 meter beyond the outermost edge of the abutting living units (Batas Pambansa Blg 220). Though intended for subdivision and other housing projects, the suggested standards are applicable to all type of residential areas and can keep safe the community from fire. The hazardous conditions of subject Barangays are shown in Table 4.

Table 4
Physical Vulnerability in terms of Design of Structures

Design of structures	Bgy. 16	Bgy. 34	Bgy. 37
Faulty design of structure	✓	✓	✓
Light materials (non-fire resistive)	✓	✓	✓
Absence of fire walls	✓	✓	✓
Absence of fire blocks	✓	✓	✓
Absence of required ventilation	✓	✓	✓
Unsafe construction practice	✓	✓	✓
No. of Observed Indicators	**6**	**6**	**6**
Level of Vulnerability	**VHV**	**VHV**	**VHV**

VHV Very High Vulnerability HV High Vulnerability LV Low Vulnerability

By studying the data, one notices that in terms of design of structures according to the given indicators, all three barangays had Very High Vulnerability levels. As shown, there were extensive violations on fire safety provisions of the fire code and national building code, particularly on fire block requirements.

The Building Code specified standards on the kind of dwellings, in SECTION 1.01.04: *Application*-The traditional type of family dwellings are those that are constructed of native materials such as bamboo, nipa, logs, or lumber, wherein the distance between vertical supports or suportales does not exceed 3.00 meters (10 feet); and if masonry walls or socalos are used, such shall not be more than 1.00 meter (3 feet, 3 inches) from the ground: Provided, however, that such traditional indigenous family dwelling will not constitute a danger to life or limb of its occupants or of the public; will not be fire hazard or an eyesore to the community; and does not contravene any fire zoning regulation of the city or municipality in which it is located (The National Building Code: P.D. NO. 1096).

Further, SECTION 1.01.05, *Building Use Affecting Public Health and Safety,* states that (a) Any building or structure, or any

ancillary or accessory facility thereto, and any alteration or addition to any building or structure already existing, shall conform in all respects to the principles of safe construction, shall be suited to the purpose for which the building is designed, and shall, in no case contribute to making the community in which it is located at eyesore, a slum, or a blighted area (PD 1096). Fires in squatters' area are devastating. One horrific example is the Caloocan City fire Incident where hundreds of squatters lost their homes to a huge fire that raged through their settlement for nearly nine hours from Saturday evening to Sunday morning, fire authorities said. Almost 500 shanties were gutted and more than 1,000 families were displaced after the blaze struck the Philippine National Railways compound on Samson Road, officials said. Damage to property reached at least P5 million but investigators later said this was only a conservative estimate, and that the actual losses could run to much more. Although there were reports of minor injuries, no one was seriously hurt. The fire started at about 6:25 p.m. The arson investigators said the fire could have been sparked by a burning electrical wire that came in contact with the rubber hose of a liquefied petroleum gas tank. Reaching the general alarm, or the highest level in the hierarchy of emergencies, the fire spread quickly through the colony of shanties made of mostly light and combustible materials like wood, the investigators said. The fire was put out at about 3 a.m. The displaced families took shelter on the sidewalks and vacant lots as they waited for city officials to set up temporary evacuation centers for them. Such is the devastation of a fire incident in a highly volatile housing environment circumstantially due to poor design and make of houses (Yap, DJ., 2010). Poor unkempt electrical wirings in houses have the tendency to spark. In Bgy. 16-Washington, one particular post alongside the railway track is a regular fire sparker every time the power fluctuates and or resumes after a power interruption, according to its residents.

Also in that same barangays are halfway-gasoline stations. These are stores that sell gasoline in bottles of which improper storage is a big threat to the community. In one slightest mistake, a spillage or a drop of a cigarette can start a big fire.

Remonde of Manila Times says that "Fires in urban areas quickly become big and all people can do is to grab as much of their

belongings as they can carry and then save themselves. In other words, since fires are usually caused by human error or pure carelessness and considering the consequences of fire and how difficult it is to put out, strengthening of fire prevention awareness is a good investment for country and community. This is not so much about the monetary value of what is lost because the loss is not borne by society in general, but by the fire victims (Remonde, n.d.).

Surviving a fire is extremely difficult for nothing is spared. All the years of hard work turns to ashes in just hours-a nightmare. There is truth in the saying that *'mabuti pang manakawan, wag lang masunugan.'*

There are squatters in Bgy 37-Bitano located in purok IV, V and VI ; while Bgy 16 railway squatters are in Purok III, IV and VI, whose houses are made of light material and, therefore, susceptible to fire. Squatters are of Bgy. 34-Oro site are Purok 1 and 3. The poor are subjected to different forms of risks, most of which threaten their livelihood and their own existence. Risks are important determinants of vulnerability due to their effect on households' livelihood. The fact that the majority of the squatters are poor, a fire incident is one of the greatest risks that continue to impact negatively on their welfare due to the substantial losses of income, consumption and wealth when the shocks occur. It is clear that the extent to which these shock affect households' welfare depend on their risk reduction strategies, as well as coping strategies. While Bgy. 16-Washington and Bgy. 37-Bitano have identified puroks which are considered 'high-risk residential areas' typically that of a squatters' area; according to the 1996-2008 fire statistics, there has been no report of fire incidence in any of Bgy.34-Oro Site residential areas. Fire incidents occur in Brgy–Oro site's commercial district along "Magallanes Street", in downtown Legazpi. Community involvement is vital in dealing with these risks.

Proximity or Nearness of Structures. Where fire protection is inadequate, lives as well as property assets can be devastated. A natural first step in the fire protection of buildings and their occupants is to prevent fires from starting. Building codes and zoning ordinances regulate the combustibility of the materials with which buildings may be built in different areas of a city, as well as the conditions under which

flammable and explosive substances may be stored in or near buildings. Non-usage of fire walls and the proximity or nearness of structures to each one and or the non-observance of set-backs may contribute to fire spread in case of fires thus are violations of building design.

Stated in the purpose of the National Building code is that the act incorporates the "policy of the State to safeguard life, health, property, and public welfare, consistent with the principles of environmental, management and control. In terms of Space and Size, the code provides for maximum requirements for ones-and-two story structures. A dwelling should generally occupy not more than 90 percent of a corner lot and 80 percent of an inside lot and shall be at least two meters (six feet, inches) from the property line (The National Building Code: P.D. NO. 1096). Shown in the Table 5 are the Barangay conditions in terms of proximity.

Table 5
Physical Vulnerability by Proximity or nearness of structures

Proximity or nearness of structures	**Bgy. 16**	**Bgy. 34**	**Bgy. 37**
Non-observance of setbacks	✓	✓	✓
Lack of fire resistive materials	✓	✓	✓
Absence of adequate light and ventilation	✓	✓	✓
No safe egress / exits	✓	✓	✓
Sign of damage/dilapidation	✓	✓	✓
Not sufficient stability	✓	✓	✓
No. of Observed Indicators	**6**	**6**	**6**
Level of Vulnerability	**VHV**	**VHV**	**VHV**

VHV Very High Vulnerability HV High Vulnerability LV Low Vulnerability

The data revealed that in terms of Proximity of structures according to the given indicators in the above table, all three Barangays had Very High Vulnerability ratings. As shown, extensive violations on fire safety provisions of the fire code and national building code

were tolerated by the residents themselves, due to apathy or lack of concern.

An example of the dangers of non-observance of setbacks is the Bacolod fire incident - a fire swept through a residential building as people slept in a slum community in the central Philippines on Monday, killing 16 residents including women and children. The fire started after midnight Monday and rapidly spread because of strong winds, gutting the wooden two-story apartment building and more than 60 nearby shanties in Bacolod City. Fire Marshal Pamela Candido said; Division 6 features fire protection, section 10.2.6.1 construction and compartmentation; A. Buildings or structures occupied or used in accordance with the individual occupancy Division (Divisions 8 through 17 of this Chapter) shall meet the minimum construction requirements of those of Division B (www. Firefightingnews, 2009).

Appropriate provisions of PD 1096 and its IRR (National Building Code) shall be used to determine the requirements for the construction classification, C. Where the building or facility includes additions or connected structures of different construction types, the rating and classification of the structure shall be as follows: 1.) Two-hour (2-hr) fire resistance rating or greater, if vertically-aligned fire barrier wall exists between the portions of the building, and 2.) the least fire-resistive type of construction of the connected portions, if no such separation is provided. Fire-Resistive Standards refers to:

(a) *General.* Materials and systems of fire-resistive purposes shall be classified according to their fire-resistive ratings as determined by internationally accepted testing methods, subject to the provisions of this Section.

(b) *One-Hour Fire-Resistive Time Period Rating, (1)* The following walls and partitions shall have a one-hour fire-resistive rating: Solid masonry, 10 centimeters (4 inches) thick; hollow unit masonry, 15 centimeters (6 inches) thick; solid concrete, 10 centimeters (4 inches) thick; stud walls covered on each side with 1.9 centimeters (3/4 inch) lath and plaster, 1.6 centimeters (5/8 inch) of vermiculite gypsum board, or 2.5 centimeters (1 inch) of gypsum board; and 5 centimeters (2 inches) nominal thickness tongue and groove wood, or two layers of 1.9

centimeters (3/4 inch) tongue and groove wood separated by sheet metal or asbestos paper and treated on each side with a fire-retardant coating having a flame-spread rating of 50 or less. Square-edged boards may be used is the layers are laid at right angles with each other; *(2)* The following floors shall have a one-hour fire-resistive rating: masonry or concrete, 10 centimeters (4 inches) thick; wood joists having two layers of flooring above and a plaster or gypsum board ceiling, 1.9 centimeters (3/4 inch) in thickness-the two layers of flooring shall be separated by sheet metal or asbestos building paper; 6.3 centimeters (2-1/2 inches) net thickness tongue and grooved wood floors covered with 1.9 centimeters (3/4 inch) wood flooring laid at right angles thereto. The supporting beams for such floors shall be not less than 15 centimeters (6 inches) in minimum dimension. *(3)* The following protections for metal structural members shall have a one-hour fire-resistive rating: 2.5 centimeters (1 inch) of concrete; 3.8 centimeters (1-1/2 inches) of masonry; and metal lath and 2.5 centimeters (1 inch) of plaster. *(4)* The following shall also have a one-hour fire-resistive rating; wood columns, 20 centimeters (eight inches) or more in least dimension; and wood beams, 15 centimeters (six inches) or more in least dimension.

(c) *Two-Hour Fire-Resistive Time Period Rating* (1) The following partitions, walls, and floors shall have a two-hour fire-resistive rating: solid masonry, 15 centimeters (6 inches) thick; hollow unit masonry, 20 centimeters (eight inches) thick; and solid concrete, 127 centimeters (5 inches) thick. (2) The following protections for metal structural members shall have a two-hour fire-resistive rating. 3.8 centimeters (1-1/2 inches) of concrete; five centimeters (two inches) of masonry; and two layers of metal lath and plaster with 1.9 centimeters (3/4 inch) air space between and having a total thickness of 6.3 centimeters (2-1/2 inches).

(d) *Three-Hour Fire-Resistive Time Period Rating* (1) The following partitions, walls, and floors shall have a three-hour fire-resistive rating: solid masonry, 17.8 centimeters (7 inches) thick; hollow unit masonry, 25.4 centimeters (10 inches) thick; and solid concrete, 15 centimeters (6 inches) thick. (2) The following protection for metal structural members shall have a three-hour fire resistive rating: centimeters (two inches) of concrete; 7.6 centimeters (three inches) of masonry.

(e) *Four-Hour Fire-Resistive Time Period Rating* (1) The following partitions, walls, and floors shall have a four-hour fire resistive rating: solid masonry walls, 20 centimeters (eight inches) thick; hollow unit masonry, 30 centimeters (12 inches) thick; and solid concrete, 17.8 centimeters (seven inches) thick. (f) *Steel Joists*. Steel joist floors shall have from one to four-hour fire-resistive rating based on internationally accepted standards of engineering. (g) *Flame-Proof Materials.* Materials required to be flame-proofed shall be treated with a flame-retardant having flame-spread rating of 50 less as determined by the "Tunnel Test" (The National Building Code: P.D. NO. 1096).

Moreover, every building shall be designed, constructed and equipped to provide adequate light and ventilation. In SECTION 1.01.08: *Dangerous and Ruinous Buildings or Structures* (a) *General.* The provisions of this Code shall apply to all dangerous buildings, as herein defined, which are now in existence or which may hereafter be constructed, as well as to ruinous buildings as defined in Article 482 of the Civil Code of the Philippines. (b) *Dangerous Buildings Defined.* Dangerous buildings are those which are structurally unsafe or not provided with safe egress, or which constitute a fire hazard, or are otherwise dangerous to human life, or which in relation to existing use constitute a hazard to safety or health or public welfare, by reason of inadequate maintenance, dilapidation, obsolescence, fire hazard, or abandonment; or which otherwise contribute to the pollution of the site or the community to an intolerable degree.

Any building or structure which has any or all of the conditions or defects hereinafter described, or conditions or defects similar thereto, shall be deemed to be dangerous building: Provided, that such conditions or defect exists to the extent that the life, health, property, or safety of the public or its occupant are endangered:

(1) Whenever any door, aisle, passageway, stairway, or other means of exits is not of sufficient width or size, or is not so arranged as to provide safe and adequate means of exit in case of fire or panic;

(2) Whenever the stress in any materials member or portion thereof, due to all dead and live loads is more than one and one-half times the working stresses or stresses allowed in this Code for new building of similar structure, purpose, or location: *Provided*, That in determining working stress, the working stress method of analysis shall

be used, and in the case of engineering *"overstress"*, the ultimate strength method;

(3) Whenever any portion thereof has been damaged by fire, earthquake, wind, flood, or by any other cause, to such an extent that the structural strength or the stability thereof is materially less than it was before such catastrophe and is less than the minimum requirements of this Code for new buildings of similar structures, purpose, or location;

(4) Whenever any portion or member or appurtenance thereof is likely to fall, or to become detached or dislodged, or to collapse and thereby injure persons or damage property;

(5) Whenever any portion or member or any appurtenance or ornamentation of the exterior thereof is not of such sufficient strength or stability, or is not so anchored, attached, or fastened - place so as to be capable of resisting a wind pressure of one-half of that specified in this Code for new buildings of similar structure; purpose, or location without exceeding the working stresses permitted for such buildings;

(6) Whenever any portion thereon has wracked, warped, buckled, or settled to such an extent that walls or other structural portions have materially less resistance to winds or earthquake than is required in the case similar new construction;

(7) Whenever the building or structure, or any portion thereof, because of: (i) dilapidation, deterioration, or delay; (ii) faulty construction; (iii) the removal, movement, or instability of any portion of the ground necessary for the purpose of supporting such building; (iv) the deterioration, decay, or inadequacy of its foundation; or (v) any other cause, is likely to partially or completely collapse;

(8) Whenever, for any reason, the building or structure, or any portion thereof, is manifestly unsafe for the purpose for which it is being used;

(9) Whenever the exterior walls or other vertical structural members list, lean, or buckle to such an extent that the structure falls within the condition described in the preceding subparagraph (2), above, or whenever any portion thereof suffers a material reduction of the fire and weather resistance qualities of characteristics required by this Code for newly constructed buildings of like area, height, and occupancy in the same location;

(10) Whenever a building or structure, used or intended to be used for dwelling purposes, because of inadequate maintenance,

dilapidation, decay, damage, faulty construction or arrangement, inadequate light, air, or sanitation facilities, or otherwise, is found to be unsanitary, unfit for human habitation, or in such a condition that is likely to cause sickness or disease;

(11) Whenever any building or structure, because of obsolescence, dilapidated, condition, deterioration, damage, inadequate exists, lack of sufficient fire-resistive construction, or other cause, is found to be a fire hazard;

(12) Whenever any portion of a building or structure remains on a site after demolition or destruction of the building or structure is abandoned for a period in excess of six months, so as to constitute a nuisance or hazard to the public;

(13) Whenever any building or structure is in such a condition as to constitute a public nuisance defined in Article 694 and 695 of the Civil Code of the Philippines (PD 1096).

Same goes for row houses. Fire-resistant walls must be provided between dwellings. Fire-resistant walls are required on the exteriors of many buildings. The type of materials allowed in these walls and the permissible extent and treatment of windows and doors are governed by the proximity of each wall to the walls of neighboring buildings.

If two buildings are within a certain minimum distance, each must have a parapet, a fire-resistant wall that projects a distance above the roof in order to prevent fire from leaping from one roof to the next. The fire-resistive qualities of roof materials are important in urban areas to prevent easy ignition of a roof by burning fragments thrown by a fire in an adjacent building. Wired glass, which holds together against flame for a considerable period of time, is usually required in windows that face a nearby structure (Paradela “Tuts” I., 2009). The table of fire hazard attributes shows that bgy. 16-washington, 34-oro site and 37-bitano have houses with no fire walls, and are constructed narrowly close to one another.

Narrowness of Roads. Road density is one consideration during actual fire response. The usual 6 meter Rizal (Street) roads between Legazpi to Daraga are too narrow to allow fire engines access. The road is not wide enough, and during rush hours would be easily blocked by cars and people trying to catch a ride home; and in case of a fire call

there are no places for fire engines to turn around. Road density is the average number of vehicles that occupy one mile or one kilometer of road space, expressed in vehicles per mile or per kilometer. As per the National Statistical coordination Board (NSCB) Report for 2009, there were 196,277 registered vehicles for Legazpi City. Logically, Narrow streets slow traffic and reduce vehicular crashes, increasing neighborhood safety, but categorically, in terms emergency response narrow roads causes delays. As shown in Table 6, narrow roads are present in all three Barangays.

Table 6
Physical Vulnerability in terms of Narrowness of Roads

Narrowness of Roads	Bgy. 16	Bgy. 34	Bgy. 37
No maneuverability of Fire Trucks	✓	x	✓
No evacuation lane for residents	✓	✓	✓
No fire lane for responding fire trucks	✓	✓	✓
No. of Observed Indicators	**3**	**2**	**3**
Level of Vulnerability	**VHV**	**HV**	**VHV**

VHV Very High Vulnerability HV High Vulnerability LV Low Vulnerability

As revealed in the table, in terms of Narrowness of Roads, Bgy. 16-East Washington and Bgy. 37-Bitano had a Very High Vulnerability, while Bgy. 34-Oro site has a High Vulnerability. Maneuvering fire apparatus to the scene of an incident is one of the most dangerous under-takings of the entire operation. Safe arrival at an incident is the first benchmark of a successful operation. We cannot accomplish our mission if we cannot get there (Tomas, H.A., n.d.)

The daily midday traffic along Rizal Street fronting St. Agnes Academy, around 11:30 to 12:30 will stall responding firefighters for five minutes or more to get through. The whole 5-minute waiting time is injurious for fire can engulf and raze to ground a small structure in 7 - minute time.

Worst fire incident in Bangladesh, Dhaka, in less than 48 hours time from the Begunbari building collapse that claimed more than 24 lives, yet another tragedy of far greater magnitude struck the capital city Thursday night. More than 116, mostly women and children, were charred to death and 200 others received severe burn injuries in the country's worst ever fire incident involving eight residential buildings and more than 20 shops at the densely populated Nawab Katra and Nimtali of the old part of the city. The origin of the fire remains a mystery. Some residents of the locality claimed the fire had originated from the power transformer explosion while others said it started from a place storing chemicals.

The source of the fire matters little now since the disaster has completely devastated many families, in terms of life and property. Locals have alleged that the firefighters arrived at the scene far too late, an allegation very common in case of fire incidents. But the fire officials said the approach road was so narrow that it took a lot of time to bring the vehicles to the place of occurrence and engage them in bringing the fire under control. There is truth in the statement of the firefighters since most roads and alleys in the old part of the Dhaka are very narrow and found to be not wide enough for the movement of even manually driven vehicles (The Financial Express, 2010).

Similarly, barangays' interior roads are not designed for big vehicle passage and surely pose delay in responders arriving at the fire scene. Marit Stinus Remonde of Manila Times, wrote on fire prevention awareness: such awareness is not fully instilled in us and this can have disastrous outcome especially in highly congested urban areas, where houses are built of light, highly flammable materials, and fire trucks cannot enter the narrow roads.

In Cebu City, March 03, 2007 80 families lost homes in blaze a day after sirens blared to signify the start of Fire Prevention Month. Forty structures were razed while four persons were injured in Barangay Tinago, Cebu City at dawn. The narrow roads leading to Sitio Potat made it hard for firefighters to immediately get to the area while the winds fanned the flames, which spread to the neighboring homes. Around 80 families were displaced and are temporarily housed at the Barangay hall, multi-purpose building and day care center. Vice Mayor

Michael Rama said the Tinago fire showed the needed to provide better access to interior portions of Barangays. He said fire trucks had a hard time getting to the area because of the narrow roads. It is the usual problem of narrow access roads, he said (Abellana, M.A., n.d.). In the Butuan City fire incident - Local firefighters blamed narrow roads in failing to immediately put out a fire that engulfed a residential area and razed a nearby commercial warehouse in this city that left some 500 families homeless. It took firefighters from Butuan City's Bureau of Fire Protection three hours to put the fire under control. By that time, some 300 houses in Puroks 7, 8, 9 and 12 and a soft drink warehouse in Brgy. Limaha had already been destroyed. The fire of still undetermined origin started 10 a.m. and was put under control at 1p.m. No casualties were reported during the incident. SFO4 Mario Palarca, City Arson Investigator, said narrow roads leading to Brgy. Limaha made it hard for firefighters to immediately get to the area while winds fanned the flames (Pataleon, A., 2008).

As shown in Table 7, if a fire occurs in the interior areas of Bgy. 16-Washington, Bgy. 34–Oro Site and Bgy. 37-Bitano, each area can be torched in a matter of minutes, considering the narrow interior roads that can hamper firefighters in reaching fires quickly.

Table 7
Barangay Road Accessibility

Type of Road	Bgy. 16 (Washington)	Bgy. 34 (Oro site)	Bgy. 37 (Bitano)	DPWH Standard
Main	3.50m	6.59m	4.00m	
Secondary	2.40m	4.00m	3.00m	4.00 m
Interior	1.35m	1.53m	1.35m	

The standard Barangay road width is 4.00 m. according to the Department of Public Works and Highways (DPWH) and National Statistical Coordination Board (NSCB). During the site visit of the researcher, measurement disclosed that Bgy. 16-Washington had a main road measurement of 3.50 m; Bgy. 34–Oro site had 6.59m; while Bgy. 37 had more or less 4.00m. Interior roads of Bgy. 16 had 1.35m; Bgy 34 had 1.53m and Bgy. 37 had 1.37m. With these sub-sized roads and

with homes intermingling, evacuation would be difficult. Bgy. 37–Bitano had access roads wide enough for fire trucks, but had narrow interior roads too.

Even if approach roads were wide enough for entry, there was no room for maneuverability which was detrimental to firefighters and got in the way of firefighting operations.

Water Sources and Hydrants. In order to mount a proper defense against fire, there must be a ready supply of water. It must be of adequate volume and located close to the area one wishes to protect. Access must be somewhat free of barriers to allow the pump to be quickly put into place at the water's edge. Even if water supply is within a quarter of a mile, it is still a valuable fire protection asset. Water Supply Conditions must be relatively clean, easily accessible, minimal water elevation difference , obstacle-free path from source to area to protect, water depth of 1 foot or more, suitable area for pump close to water source, storage area nearby for pump, hose, fuel, etc. Firefighters may utilize different elements to fight a raging wildfire. Obviously, however, firefighters prefer to use water. The more water at their disposal, the more effectively they may suppress any flare-up threatening the Barangays. Rivers, ponds, and even backyard pools are possible sources of alternative water for firefighting. Rivers in particular, when available in an area are good water sources and can often be used as a reliable source for water, often with very little work.

By studying the data, one can verify that in terms of Water sources and Hydrants according to the given indicators, Bgy. 16-East Washington had a High Vulnerability, while Bgy. 37-Bitano and Bgy. 34-Oro site had Very High Vulnerability, owing much to the fact that even if there is a nearby river like Sagumayon river of Bgy. 16, still there is no established road for accessibility.

Table 8
Physical Vulnerability in terms of Water sources and Hydrants

Water Sources and Hydrants	Bgy. 16	Bgy. 34	Bgy. 37
No deep flowing rivers	x	✓	✓
No deep flowing canals	✓	x	✓
No deep flowing ponds	x	✓	✓
No Accessibility	x	✓	✓
No swimming pools	✓	✓	✓
No Hydrants	✓	✓	✓
No. of Observed Indicators	**3**	**5**	**6**
Level of Vulnerability	**HV**	**VHV**	**VHV**

VHV Very High Vulnerability HV High Vulnerability LV Low Vulnerability

Some factors to consider when determining whether a river is an adequate source of water include the flowing capacity and accessibility. Many rivers look as if they would provide an ample water supply but only an inspection by local Firefighters can confirm it. To evaluate a river's flowing capacity, it is important that you do this during the lowest flow; typically during the most active part of the local fire season, summer time. Accessibility is also another issue to consider. For a river to be considered a good water source, it needs to be accessible. Some features that will make your river more accessible include having an all-weather road that approaches the river stream, or having a flat surface that is capable of supporting a fire engine within 20 feet of the stream with no more than a four to eight foot drop in elevation.

Ponds, although not found locally in great abundance as streams, can still be a great source of water. Determining the reliability of a pond as a water source depends on the volume, deposits in the water, and its accessibility. The carrying capacity of a pond is an extremely important

factor when deciding if it is a viable source of water. In particular, the minimum level of water held in a pond is the ultimate deciding factor. The minimal level of water in the pond should be determined during the warmest part of the year. Many rural homes have water tanks set up as their primary water source. Homeowners should inform their local fire department of the water tank's location and inform them about the amount of water the tanks can hold. Swimming pools are becoming an increasingly common source, in rare instances. If one is planning on building a swimming pool, some structural considerations include accessibility and structural soundness. Accessibility is the biggest problem as many pools are located inside hotels and behind residences. A pool that can easily be approached with a fire engine or portable pump will prove to be the most effective. Structural soundness is also a factor when deciding if a pool is a viable water source. Many pools are constructed from lightly built cement and rock. This light cement and rock may not be structurally sound enough to support the type of equipment used in an emergency situation. Check with a local engineer to determine the potential for structural failure during an emergency situation (www.kansasforezt.org/fire/protecthomewater.shtml, n.d.)

As a rule of thumb, fire engines / trucks carry water in tanks since speed is an essence in putting out a fire. It's quicker to use water from the truck, than to hook up to a hydrant. NFPA (National Fire Protection Association) requires that a pumper had a minimum of 300 gallon water tank on a pumper. Note that a pumper also has a minimum pump size of 750 gpm. The smallest pump will empty the smallest tank in less than 30 seconds, therefore, firefighter, have to conserve water or hook up to an external source of water, usually a hydrant (NFPA 1901).

Standard practice involving hydrant placement is to install hydrants every 500 ft. Based on NFPA Table of Distance-for practical application, this standard is a guideline and minor deviations in this spacing may be appropriate. When determining locations to place fire hydrants, consideration should be given to accessibility, obstructions, proximity to structures protected, driveway entrances and other circumstances where adjustments to a specific hydrant's location would be warranted (www.firehydrant.org/info/design01.html).

In Division 7: Urban and Rural Pre-fire Planning, Section 10.5.7.1 entitled HYDRANT of RA 9514 or the New Fire Code of the

Philippines, specifies that (1) Project developers or Owners of housing projects shall provide a hydrant system and develop the source of water used for the purpose of providing adequate water supply for fire suppression use on both economic and socialized housing in connection with this code; (2) Local Government Units (LGUs) in coordination with the BFP shall provide each community with fire hydrants and cisterns or elevated tanks that will suffice the requirement pertaining to provision of water for firefighting operation. (3) All reservoir or water tanks must provide twenty (20%) percent fire reserves over and above the Average Daily Demand Supply (ADDS); (4) In communities where no Public Water Supply is available a water well or any other devices with water impounding capability that shall be provided.

For Legazpi City Fire Station, in the absence of a hydrant there are four identified possible sources of water that can be utilized for firefighting during fire emergencies. These are: (1) Legazpi Oil Company at Brgy. Arimbay; (2) Petron Depot at Lakandula Drive; (3) Free Flowing Water at Brgy. Bogtong; and (4) Legazpi City Water District blow-offs located at Peñaranda Street (Ladd, H. F.,1992).

In the observation checklist, the absence of hydrants is common to all three barangays; Brgy 34–Oro Site has a deep flowing river running along its main road near the Brgy. Hall and ideal as an alternative water source; Brgy 16–Washington has the Sagumayon River but with no access road; while Brgy. 37–Bitano has its river heavily polluted with bush growth, dirty and shallow.

Social Vulnerability. Social vulnerability is partially the product of social inequalities or social factors that influence or shape the susceptibility to harm and that also govern the ability to respond. It also includes place inequalities such as the level of urbanization, growth rates, and density of population, the urban poor; and the security risks posed by the type of economic activity, specific on the nature of employment or source of income.

Population Density. Increasing growth of urban populations, increasing urban centers, increasing housing areas all pose an immediate and direct threat to the community. Overpopulation is a term that refers to a condition by which the population density enlarges to a limit that provokes the environmental deterioration. The impact of human

populations on the environment has been severe particularly on urban areas; pollution is a problem that is increasing gradually because we are using more cars. Emerging countries industrialization is not paying attention to environmental issues because of the feeding demands of their ever-growing populations (David S Caldewell, D.S., n.d.). One of the oldest hypotheses in the social sciences is that population density plays a vital role in explaining human behavior.

Basic theory holds that as population density increases, stress on the human animal will also increase. Manifestations of this include increased levels of social disorder compared to less dense areas (Armstrong, M.J., n.d.). Crimes are manifestations of these to include the intentional and juvenile setting of fires, for reason of revenge or simply just for the fun of it when under the influence of liquor. Pre-occupation and stress can also result to accidental and intentional fires. If proven in court, intentional burning is a crime of Arson. There are fires caused by pure negligence or accidental in nature, thus, people are responsible for igniting fires. As shown in Table 9, due to pre-occupation and stress caused by over population, common potential fire starters are neglected and are considered negligible.

Table 9
Social Vulnerabilities in terms of Population Density

Population Density	**Bgy. 16**	**Bgy. 34**	**Bgy. 37**
Un-swept roads/lawns	✓	✓	✓
No garbage collection/disposal System	x	x	✓
Tree branches touching electrical wir-ings	✓	✓	x
Untrimmed grass on vacant lots	✓	✓	✓
Unfenced vacant lots and structures	✓	✓	✓
High frequency of fire incidents	✓	✓	✓
No. of Observed Indicators	**5**	**5**	**5**
Level of Vulnerability	**VHV**	**VHV**	**VHV**

VHV Very High Vulnerability HV High Vulnerability LV Low Vulnerability

It was observed that in terms of Population Density according to the given indicators in Table 9, that all three Barangays, namely Brgy. 16-East Washington and Brgy. 37-Bitano and Brgy, 34-Oro site had a Very High Vulnerability levels.

When individuals act recklessly it is likely that accidents and injuries will result. Some of the common negligent actions which can easily result in tragic large scale fires include the following: Faulty electrical wiring, usually resulting from electrician error or manufacturing error on the part of the wire developers or design team for the product and; improper oversight in the kitchen. While it is understood many fires can mistakenly occur in a professional kitchen, they can easily get out of control without proper and immediate action. When these situation hazards are present, there is a dramatically increased fire risk. Innocent victims may suffer physically, emotionally, mentally, and financially from the incident (Armstrong, M.J., n.d.). Poverty or unemployment can very well encourage crimes, a result of frustrations. When once a fire victim, the person has a hard time to move on and finds himself more stressed than ever, with a deep sense of hopelessness requiring stress debriefing is a must to help them externalize and believe in a sense of normalcy liken to victims of natural disasters.

To develop effective conservation and fire management strategies to deal with altered fire management, it is necessary to understand the causes underlying altered fire behavior and their human relationships. In addition to population density (which simply quantifies the number of people in an area), we expected the spatial pattern of human development (indicated by housing density) to be an important influence on fire because we assumed that anthropogenic ignitions are most likely to occur where human presence is greatest. We also expected that the relationships between human activities and fire would be both positive and negative because humans ignite fires (www.firewise.org/resources/index.htm, 2009).

As shown in Table 10, the socio-economic book of the city planning and development office listed Brgy. 37-Bitano as the highest populated barangay with 7,780; while Brgy. 16 had 5,947 and Brgy. 34

had only 2,802. Brgy 34 was more densely populated, followed by Brgy. 16 with 145 people per square kilometer, and Brgy. 37 with 102 people per square kilometer.

Table 10
Barangay Population Density

Bgy. 16 - Washington			Bgy. 34 - Oro Site			Bgy. 37- Bitano		
Pop	**Land Area**	**Density Count**	**Pop**	**Land Area**	**Density Count**	**Pop**	**Land Area**	**Density Count**
5,947	0.409 Sq.km (40.90 has)	145	2,802	0.07 Sq.km (7.00 has)	400	7,780	0.761 Sq.km (76.10 has)	102

More people mean more houses and more houses means there is fuel continuity in case of fire.

Disregard for Fire Wise Management. With the need for housing for the growing population in urban areas, like Legazpi City, new subdivisions are now commonly located in upland areas near vegetation. Because of their location, these structures are now considered in wild land environments and are extremely vulnerable to fire should a bushfire/wildfire occur in the surrounding area.

Senator Legarda in her statement on Good Governance to Reduce Risks from Disasters, says “we must, therefore, strengthen governance in urban centers, which means enforcing strictly building codes and zoning policies and therefore not placing people, houses, and industries in high risk areas; to include of course wild land environments for new subdivision locations”. Fire is not the only threat in upland areas but also landslides during rainy season. Further, she asserted that the lack of political will, poor understanding of risks disregard for prevention and mitigation, lack of preparedness for response, our failure to take action, and our apathy and complacency transforms natural hazards to a disaster.

The popular hobby of planting trees in every space available near houses to shield homes from heat becomes common even in flat land Barangays. Found in swampy areas in Brgy. 34-Oro Site and Brgy. 37-Bitano are growth of Nipa that fans fresh air as a welcome respite from the warm climate during summer months, but may also be a fire threat.

Warm and drier conditions are expected to increase the frequency, duration and intensity of fires, with the imminent threat of drought due to El Niño. Bush fire or grass fires may be caused by human activity either accidental or intentional (arson); lightning strikes in open fields can ignite fires. Fire may also occur in these nipa areas and may affect homes. To be protected, there is a need to establish a defensible space. For example, if your property is on flat land surrounded by grassland, your survivable space distance will extend out at least 30 feet from the sides of the house. As shown in Table 11, there was non-observance of fire management in all three subject Barangays.

By looking at the data, one can see that in terms of Disregard for Fire Wise Management according to the given indicators, all three Barangays, namely Brgy. 16-East Washington and Brgy. 37-Bitano and Brgy, 34-Oro site had a Very High Vulnerability level.

Table 11
Social Vulnerability in terms of Disregard for Fire Wise Management

Indicators	Bgy. 16	Bgy. 34	Bgy. 37
No defensible space	✓	✓	✓
Absence of fire safety posters	✓	✓	✓
Unclipped electrical wirings on posts	✓	✓	✓
Dangerous heights and distance of structures to electrical wirings/posts	✓	✓	✓
Tree branches touching electrical posts	✓	✓	✓
No Barangay zoning	x	x	x
No. of Observed Indicators	**5**	**5**	**5**
Level of Vulnerability	**VHV**	**VHV**	**VHV**

VHV Very High Vulnerability HV High Vulnerability LV Low Vulnerability

If one's house sits on a 25 percent slope and the adjacent vegetation is dense or has tall brushes, he will need to reduce hazardous fuels out to at least 200 feet of his home. Trees here are considered part of the structure, the fewer the better, and are at least 10 feet from the structure. Keep plantings within three to five feet of the walls to a minimum, especially if structure sides are flammable. Decorative gravel, flagstone or concrete decking is recommended in this area. Dry grass next to flammable structural components can easily ignite and carry fire that may cause a home ignition. Succulent plants and other low growing, fire resistant plants and groundcover are acceptable. Do not stack firewood or store other combustibles in this zone. Remove branches overhanging or touching the roof to a distance of a least 10 feet (pubs1.cals.arizona.edu/sales/find.cfm, n.d.).

Fire wise principles established that people live on a fire planet. Fire is, and always has been, as much an element of nature as weather, soils, minerals, plants, animals, and water. Indeed, some natural landscapes depend on occasional fire to maintain a healthy existence. Fire, in its place, can replenish soil nutrients, remove dead and dying vegetation, and create the conditions for healthy re-growth. Some plants even require fire for seed propagation. Fire can be destructive as well, particularly where property and life are concerned, and in the past 100 years we have tended to see it only in this role as a foe. We have developed the equipment, techniques, and tactics to be highly successful in doing battle with fires.

Still, as regular as the seasons, fires continue to occur. Although we have achieved remarkable success in keeping most fires small, some will always escape our best efforts. In the absence of any change in our development, building and landscaping practices, these escaped fires will continually lead to devastating losses of lives, homes, and other properties. As the population grows and the communities expand, this situation may only grow worse. But people have a choice. They can continue to accept serious losses, or adapt to living in these fire environments. Reducing these losses is possible. There is no need for lives or homes to be lost. People can live with fire while protecting lives, homes, and natural areas by creating fire wise communities (nz/swatty/ emergency/fire/fire, n.d.)

On how to prevent fires and be fire wise, part and parcel of any

fire safety education training is a simple evaluation test that can save lives: 18 Questions that Could Save Your Life and Your Property. When frying/deep frying, do you always stay by the stove and keep a pot lid or oven tray handy? Are matches, cigarette lighters and candles kept safe when there are children around? i.e., out of sight and well above their reach? Do you stub butts out in a suitable ashtray and empty it regularly? Do you always keep lighted candles and oil burners well away from anything that will burn easily? Do you regularly clear away household rubbish and keep it away from the house? Are heaters kept at least one meter away from curtains, furniture and bedding? Do you avoid overloading and use circuit breakers? Do you do a 'night-check'? Is there a working smoke alarm in the hallway, every sleeping area and on every level of your home? Do you test your smoke alarms regularly? Do you replace smoke alarm batteries annually or when the unit starts "cheeping"? Has your household discussed a fire escape plan with at least two ways out of every room and a safe meeting place? Are the keys kept in the deadlocks on your doors and windows when you are at home? Does everyone know what to say if they call 820-9160, the LCFS Hot line? Do you have a fire extinguisher in your home and do you keep the garden hose connected? Michael Crowley, a fire safety engineer article on home fires says that the fire safety and prevention aspect of community public safety should be given equal attention to create mind set for commitment and cooperation of everyone, for fire safety is everyone's concern.

Increasing numbers of fires dramatically illustrate the need for understanding and cooperation between the residents who are most impacted by these fires and the local BFP or the Legazpi City Fire Station which is responsible for preventing and suppressing them. The necessity to prevent fires falls not only on the shoulders of the BFP mandated to protect the community from destructive fires, but also on the individual whose properties and lives are endangered through disregard of defensive parameters and other safe practices. Commonly observed were unclipped electrical wirings, electrical wirings touching roofs, trees touching electrical wirings.

As observed, loose/unclipped electrical wirings on posts and relays are common to all three Barangays. While the Bgys. 16 and 37 are residential areas; Brgy. 34 is a business center under threat by the

dangerous height of structure from electrical wirings or posts. In a tree 10 meters away from the Barangay Hall, electrical wirings were complete entangled with the leaves and branches; one electrical post in Brgy. 37-Bitano an old streamer was draped over the wires, and along the Bitano-Barriada road, particularly fronting Legazpi City Water District Office; several trees were directly along electrical posts thus wires, branches and leaves were dangerously entwined. Disheveled wires can also be seen in Bgy. 34 and Bgy. 16.

Lack of Public Information and Awareness. The sure strategy to convert the community as forced multiplier of safety against fires is to educate them on the practice of fire safety and prevention, explaining its importance. The major causes of home fires are misplaced smoking materials (e.g. smoking in bed), heating equipment (cooking, ironing, etc), arson, and children playing with matches or lighters. The BFP has a year-round fire safety program, but the problem in general is lack of awareness related to fire safety and the importance of making this a part of the residents' everyday lives.

Thousands of fire incidents happen every year, especially in the workplace. Lives, money and businesses are lost; with lack of knowledge about preventive measures, it is the same thing as letting a thief inside. People always assume it cannot happen to them, but there's a saying that it is better to be safe than sorry. Why risk everything when you can prevent it to happen. The way that humans perceive and interact with their environments largely determines how well they will perform in preventing and responding to fires. Helping people perform better in their efforts to prevent and respond to fires is the most cost effective, but least appreciated and understood approach to fire safety (Bengriston, n.d.). Ostonal in his study recommends that the BFP may maintain linkages with volunteer fire brigades and other stakeholders in public safety as possible. Further he encouraged the participation of the public in fire prevention (Ostonal, V.O., 2008).

Table 12 below shows indicators relating to lack of public information and awareness of safety programs. As revealed by the data, in terms of Lack of Public Information and Awareness, all three barangays had a Very High level of Vulnerability. Not one of the barangays had a posting of the emergency telephone numbers of any fire

station. They had police emergency numbers, but coursing a fire call through the police is in fact an additional delay in response.

Table 12
Social Vulnerability in terms of Lack of Public Information and Awareness

Indicator	Bgy. 16	Bgy. 34	Bgy. 37
No regular fire safety training	✓	✓	✓
No regular fire drills	✓	✓	✓
No established linkage with local BFP	✓	✓	✓
No household escape plans	✓	✓	✓
No postings of emergency numbers	✓	✓	✓
No fire safety campaign initiative	✓	✓	✓
No. of Observed Indicators	**6**	**6**	**6**
Level of Vulnerability	**VHV**	**VHV**	**VHV**

VHV Very High Vulnerability HV High Vulnerability LV Low Vulnerability

There few important safety and prevention tips everyone needs to know: Proper training. Before we can use an extinguisher, we must have a proper training on how to distinguish and operate a fire extinguisher. First aid training is also a must. Proper storage-some chemicals are flammable, we must place it in a proper storage away from areas vulnerable to fire. Proper garbage disposal-we never thought garbage can start a fire, but yes it can. We should be very cautious in throwing anything in our garbage can, such as used batteries or cigarettes, because it can start a fire. Garbage must be cleaned and disposed regularly and properly. Malfunctioned electrical wiring-Instead of buying a substandard wiring; we must buy those that are highly recommended. We always think of buying the things that could save us money.

This is very understandable. However, we should not take the risk when it comes to things like this because if fire occurs due to faulty wirings then you will lose everything and all you could do is regret. Fire exit-every workplace must have a fire exit that every employee

should know. Fire alarm and fire hose must be properly installed. Fire department's telephone numbers must always be posted near the telephone to easily contact them while the fire is just starting.

This will help them respond on time before the fire gets bigger. Inspection of wirings on regular basis is also important. By doing this we would be able to identify which wirings could possibly cause fire in the future. Conduct safety measures-discuss to everyone important safety measures that should be done when a particular situation arises. This is to prevent possible injuries or death. Putting of signboards can also be done, like the signs that indicate escape routes and exits. There should be a smoke detector in every workplace. Make sure that batteries are change every six months. Install one battery operated and one powered by electricity so that when the battery operated fails to work properly, there wouldn't be a problem since there is installed one powered by electricity, or vice versa. Test each installed smoke detector every month.

Remember smoke detectors have saved lives. Rechargeable lights are safer to use than candles during power outages. But if there is none, use a candle with precautions. Candles should not be left unattended and it should be kept away from anything that can easily start a fire such as curtains, papers, gas stoves, among others. Never try to repair any electrical appliance if you do not have the right training, just to save money for the repairs. Let the service technician do the job instead. Always unplug any electrical appliance that is not in use. Not only does it consume electricity, but it can also be a cause of fire. Use extensions temporarily and not permanently. Make sure it is working properly and carries its proper load. Near-miss incidents should always be recounted to the persons involved for them to acquire fire safety awareness and also to prevent those incidents from happening again (http://people and fire.com/index.htm, n.d.).

Increase Fire Safety Awareness in your community. Even if high quality smoke detectors and fire extinguishers are installed in homes, it is an advantage to have a formulated comprehensive escape plan for the whole family. Still this does make the home impervious to fire accidents, especially if there are people around the neighborhood who do not care about fire safety. Every family can still be put in danger of

fire threats and hazards. Increasing fire safety awareness in the community can help lessen the risk. It is important to note that this is not only the job of the Legazpi City Fire Station.

As a resident of the community, everyone must do his/her part in encouraging neighbors to take part in such undertaking. Lead by example. One good way to help encourage neighbors to be concerned with fire safety is to set a good example. If they see that your house is complete with fire safety tools and equipment such as fire blankets (available in National Bookstore Pacific Mall), smoke detectors and fire extinguishers, some of them would probably be motivated or encouraged to do the same and be fire safe. If they see that you practice fire drills regularly in your home, some of them will see the value, and would eventually do the same. If they learn that you educate your children about fire preventive measures, neighbors, friends and relatives would do too. Get in touch with the local government, and request for them to organize a program that pertains to increasing fire safety awareness in your neighborhood.

Bring the matter to their concern by informing them about the lack of awareness among your neighbors when it comes to fire safety. If your local government is efficient, they will immediately respond to your concern. They will start a campaign on fire safety awareness and you can do your share by offering your services as a volunteer, like westerners do. You can help distribute campaign flyers that give information about fire safety. You can design posters or banners for the campaign. Or you can organize programs and classes on fire safety. Whatever kind of service you offer, whether it is big or small, it is already a valuable help to the community.

If establishing an organization is too much work for you, you also have the option to simply organize fire safety symposia and discussions within the neighborhood. Coordinate with reputable fire fighters and fire-fighting experts as speakers or instructors for the symposia or training. Some of the things that a fire safety symposium can teach about include fire preventive measures, proper operation and maintenance of fire-fighting tools, emergency preparedness, health and safety signs, and many others.

Word of mouth is one of the most effective vehicles of influence.

Use this to your advantage by constantly communicating with your neighbors about the significance of fire safety, the many effective ways on how to prevent fire accidents, and the things to do in case of fire. Bring up these topics during casual conversations so it would be easier for you to convince them to be concerned about fire safety. A typical living room fire can threaten the entire house in just a few minutes, producing life-threatening conditions in upstairs bedrooms less than two minutes after the smoke alarm sounds. Your family needs to know how to get out at the first sign of a home fire.

Create your own escape plan grid. Include everyone in the planning process. Draw your plan, marking two ways out of every room. Include windows. Pick a meeting place outside, well away from the building. Tell everyone to meet there after they have escaped. That way you can count heads and tell the fire department if anyone is trapped inside. Do not forget to call the fire department from a safe location. Plans are great, but the only way to know if they work is to practice them. Hold a home fire drill.

Getting out of your own home sounds easy, but your home can look very different if it's full of smoke. Children in particular need to practice. Children practice drills at school every month, but rarely at home. Have someone press the button on the smoke alarm as the signal for the drill to start. Get out quickly but carefully. Everyone should go to the meeting place.

To quote SILG Reyes, Do more than belong, PARTICIPATE. Do more than care HELP; Do more than believe, PRACTICE; and do more than dream, WORK.

According to the table of fire hazard attributes all three (3) Barangays had no fire safety poster or any reminder whatsoever even in their respective Barangay hall, not even the emergency hotline of the nearest fire station can be seen painted on walls in Barangays 34 and 37. Brgy.16 had both the Legazpi City Fire Headquarters telephone number and the PNP hotline written on the whiteboard but is now faded and unreadable.

Limited recognition of risks and preparedness measures. Situation awareness refers to the person's perception of their context, especially as regards how the environment helps or hinders them in their pursuit of goals. An important part of situation awareness concerns a person's ability to project how the environment will change in the future. Table 12 shows data on Limited Recognition of Risks and Preparedness Measures according to the given indicators. All three barangays had a Very High Vulnerability level.

Table 13
Social Vulnerability in terms of Limited Recognition of Risks and Preparedness Measures

Indicator	Bgy. 16	Bgy. 34	Bgy. 37
Lack of situation awareness	✓	✓	✓
Lack of projection for safety	✓	✓	✓
No organized Bgy volunteer fire brigades	✓	✓	✓
No. of Observed Indicators	**3**	**3**	**3**
Level of Vulnerability	**VHV**	**VHV**	**VHV**

[HVH] Very High Vulnerability [HV] High Vulnerability [LV] Low Vulnerability

Lack of awareness makes people commonly underestimate the speed at which a fire can grow, with sometimes deadly consequences. As an example, take the importance of having good situation awareness while trying to escape from a fire in a building with a complex layout. To achieve good "situation awareness," the person needs to perform a two-step process. (1) The person must receive accurate information about the task environment. Task environment means those aspects of the environment that are relevant to life safety goals. For example, the person may see EXIT signs that will help to find a protected way out of the building. But, the person may also need to know that particular stairwell is contaminated by smoke. (2) The person must be able to accurately interpret the information. Accurate interpretation results from either having an appropriate knowledge base, or good human factors design.

For example, a person with a good knowledge base will understand that EXIT signs indicate "protected" ways out of buildings. However, good design can often replace the need for a knowledge base by making the meaning of information obvious. For example, it is technologically feasible to build a device that tells people when they should not enter a stairwell because there is too much smoke. Fire safety engineers have done little to exploit the considerable potential of designing fire safety systems that provide easily understood and accurate information to building occupants. Fire safety experts and the public attribute many fire safety casualties to the mistakes made by building occupants during fires.

However, from the perspective of cognitive ergonomics, these mistakes often result from poor situation awareness. Stated differently, people make mistakes because they have not been provided with good information about the situation with which they are trying to cope. Take, for example, the problem of opening a corridor door when there are dangerous conditions on the other side. This "mistake" has caused many fatalities over the years. Fire safety professionals recommend that people feel the door knob or upper edge of the door, because insulated doors do not transfer much heat and may not feel hot. But this procedure is easily forgotten in an emergency, that is, they can easily lack the appropriate knowledge base. So people will continue to have poor situation awareness (http://people and fire.com/index.htm, n.d.).

With continuous rise in the number of fire incidents, it is enough proof that, indeed, there exists an absence of awareness and participation. People got their focus elsewhere and their very own safety is compromised. According to Melegrito, Agustin, Kabiling and Ramilo, there are three (3) elements that ensure successful prevention; (1) Immediate and genuine concern; (2) competent training and; (3) committed individuals in the immediate area, sensible enough to practice what they have been trained for.

New technology if adopted can also help prevent fire in buildings. Examples are: (1) a simple indicator could change color when exposed to heat; and, (2) a large viewfinder could be used to see conditions in a well-illuminated corridor. With a change of perspective towards improving the situation awareness of building occupants, fire safety design could be inexpensively improved (Olesto, J.O., n.d.).

Before new innovative technology for fire safety could be adopted, there is the question of who will finance its purchase in the first place; when people are limited and devote their time to earning their daily meals , the possibility of technology is very much remote. Even volunteerism is not present anymore. Every waking hour is spent on work.

As for preparedness, there are no organized barangay volunteer fire brigades in all three barangays. Brgy. 16 had their fire drill three years ago but only among the members of the council in the barangay hall, more likened to a table–top exercise. In Brgy. 34, the Secretary Gina Fernandez in an informal interview, disclosed that a barangay kagawad has submitted a proposal to the city government for installation of hydrants, a year ago.

Too dense human communities produce tons of solid wastes (organic and inorganic waste) daily, consume large quantities of energy and emit more pollutants to the environment (Meyers, R., 2008). Garbage/dry leaves littered (not swept) roads/lawns, no garbage disposal system/disposal area, and tree branches touching electrical wirings, untrimmed grass on vacant lots and unfenced abandoned structures are revealing signs of vulnerability. These hazard attributes are not given attention since there is no official recognition of them as equally potential fire starters. According to the table of fire hazard attributes, Bgy. 16, 34 and 37 share these vulnerabilities.

Economic Related Activity. Inherent conditions like unemployment and low-income cause susceptibility of a person, group, society or system to manipulation, persuasion and temptation. The threat or the reality of unemployment and resulting poverty to individuals living in households are either 'great difficulty' or 'difficulty' in making ends meet; thus there is limited ability to manage vulnerability and to enhance resilience. Focus is on daily survival and environment safety becomes their least priority.

Source of livelihood**.** A source of livelihood can become a source of destruction by fire. The Great Fire of London started as a small fire in a bakery in the early morning and as houses back then was made of wood the fire spread rather quickly. The fire started in a bakery in Pudding Lane where an oven had not cooled down properly and overheated setting fire to the house. The fire spread quickly because of

an easterly wind and the summer before had been very dry so the timber was flammable. It started shortly after midnight on Sunday, 2 September to Wednesday, 5 September 1666. It consumed 13,200 houses, 87 parish churches, St. Paul's Cathedral, and most of the buildings of the City authorities. It is estimated that it destroyed the homes of 70,000 of the City's 80,000 inhabitants (http://en.wikipedia., n.d.). Open furnaces; hot ovens are present in Brgy. 16- Washington with three bakeries as well as Brgy. 34–Oro Site, also had three big bakeries. It only takes a single spark or small gas leak to set a restaurant aflame. Fire is a hazard faced by all commercial kitchens. Electricity and gas are the forms of energy used to power a commercial kitchen. Everywhere that energy is found, there is a potential fire hazard. The following list highlights the most common causes of restaurant fires: Open flames. Loose clothing and hair can easily catch fire if they come into contact with open flames; Full grease traps. Full grease traps have pieces of food and maybe even stray paper products inside them and can catch fire when more hot grease is added. Sources of livelihood of the three (3) Barangays are shown in Table 14 below.

By studying the data, one can observe that in terms of Type of Livelihood according to the given indicators, all three barangays, had a Very High Vulnerability levels.

Table 14
Economic Related Activities in terms of Type of Livelihood

Type of Livelihood	Bgy. 16	Bgy. 34	Bgy. 37
Sari-sari Store	✓	✓	✓
Eatery (turo-turo)	✓	✓	✓
Bakery	✓	✓	✓
Electronic Repair shop	✓	✓	✓
Auto- Repair shop	✓	✓	✓
Metal Craft	x	x	✓
No. of Observed Indicators	**5**	**5**	**6**
Level of Vulnerability	**VHV**	**VHV**	**VHV**

[VHV] Very High Vulnerability [HV] High Vulnerability [LV] Low Vulnerability

Small foods stalls (turo-turo) restaurant-like are common to the three respondent barangays. Cooking safety measures is in question. They may be using LPGs (gasul/shellane) but walls are usually made-up of wood or bamboo walling and easily ignitable after a short exposure to heat. Poor housekeeping-fire can quickly spread in dirty and cluttered walkways and storage areas; Faulty or frayed electrical cords-frayed electrical cords or faulty equipment are more likely to spark and cause an electrical fire. Improper storage of flammable materials-flammable materials must be stored away from open flames or heat sources so they do not combust. Short circuit causes fire in an electronic shop in Sharjah's industrial area 6 caused a fire that gutted a number of neighboring buildings (http://gulfnews.com/gntv/news/short-circuit-causes-fire-, 2009). There are a number of electrical/electronic repair shops lining the street in Bgy. 37- Bitano, Repair shops have plywood partitions to separate, each commercial stall from one another. A slight spark or unattended soldering can start a big fire. Farmers in Mid Devon are facing a new threat to their livelihood–Chinese flying lanterns. Spokesman for the NFU, is warning partygoers of the risk the popular flaming party toys, which are often mistaken for UFOs, pose to fields and crops. He says many farmers are becoming increasing worried about the lanterns which can be bought for £12.50 and fly for 20 minutes up to a mile high in the sky. The fads are growing in popularity at weddings, birthdays, anniversaries, and other big events. He believes acres of farmland could go up in smoke, destroying crops or scrubland, because of the small flame which burns inside the lantern to create the glowing effect (http://gulfnews.com/gntv/news/short-circuit-causes-fire, 2009.)

Likened to firecrackers, flying lanterns are dangerous flying objects. When they land on grassy land, they can cause forest fires. If they land in a densely populated barangay, they can raze the whole community to the ground in just hours. The Legazpi Socio-Economic and Physical Profile Facts and Figures, vol. 1 of the City Planning and Development Office Research and Statistical Division disclosed that typically, majority of residents of the respondent Barangays are either employed in private and public offices, while others are engaged in business.

During the data gathering the Barangay secretary of Bgy. 37–

Bitano shared the information that the existing livelihood or employment in their Barangay are: manpower recruitment cooperative for Domestic helpers and skilled workers abroad, and some get their livelihood from small businesses common to all three fire prone Barangays namely: Eatery ”turo-turo”, Bakery, Junk shops, Electronic Repair shops. In addition, there were the Metal Craft, Welding shop and Auto-repair shops in Bgy. 37–Bitano and Bgy. 34-Oro site.

Synthesis

Risk Reduction Capabilities of Barangays 16-East Washington, 34–Oro site and 37–Bitano

Risk reduction capabilities means a reduction measure addressing all identified and assessed fire hazards, all techniques to manage the fire risk, all strategies on how to put out a fire to reduce the risk of loss by fire (www.eird.org/wikien/index.php/). Risk reductions coordinate efforts to inform the public on all areas of risk reduction including fire prevention, injury prevention, and disaster preparedness. It establishes the relationship between disaster and development. It asserts that disasters can be avoided and the risks of hazards can be reduced by increasing individual’s capability and capacity towards survivability and community’s capacity towards readiness. The goal of which is to build resilient communities.

The risk reduction capabilities of Brgys. 16, 34, and 37 needed to be identified for them to be enhanced or reinforced as necessary. Likewise, fire risk factors in the Barangay needs to be identified for it to be dealt with in the first place. Importantly, identified risk should interact with mitigation to reduce the hazard potential, either moderated or totally abated according to community experience, and their ability to respond to, cope with, recover from, and adapt to hazards. Shown in Table 15 are the existing and non-existing capabilities of the most vulnerable Barangays in Legazpi City.

According to R.A 9514 otherwise known as the New Fire Code of the Philippines, SECTION14.0.0.2 CITIZEN PARTICIPATION, paragraph B. Individual and Group Initiative-All persons are encouraged to inspect their own premises and to abate any fire hazard therein, as well as take the necessary fire safety precautions. They shall strive to

organize themselves into effective fire safety and fire prevention organizations in their community and places of work in order for them to take the necessary contingent actions during fire emergencies and eventually avoid unnecessary loss of life and property

Table 15
Risk Reduction Capability Checklist

CAPABILITY INDICATORS	Bgy. 16	Bgy. 34	Bgy. 37
1. Barangay Map/Zoning	✓	✓	✓
2. Source of Water	x	✓	x
3. Hazard Maps	x	X	x
4. Barangay Emergency Plan	x	X	x
5. Family/ household Exit Plans	x	X	x
6. Communication Equipment (Tel/VHF)	✓	✓	✓
7. Fire Notification System	x	X	x
8. Organized Barangay Volunteer Fire Brigades	x	X	x
9. Regular Fire Safety Training	x	X	x
10. Fire Safety Awareness Projects	x	X	x
11. Standby Fire Brigades (24HR duty)	x	X	x
12. Periodic Electrical Inspection	x	X	x
13. Community Housekeeping	✓	✓	✓
14. Barangay Disaster Operation Center	x	X	x

The data revealed that out of the 14 indicators or must-haves of a Barangay, only three items were present. By the mere observation and logic, risk reduction capability of the three most vulnerable Barangays is poor, considering: 1-5 Poor, 5-9 Satisfactory; 10-14 Very Satisfactory.

Barangay Map/Zoning. A Barangay zoning map is very much important feature to demarcate illegal settlers' areas from those of

homeowners. The zoning will guarantee 'blockade' by remote location as an initial defense against spread of fire. A properly zoned Barangay will assure fire fighters of safe passage for response. It will also pinpoint locations of available source of water and safe areas for evacuation of residents. Similarly a zoning map will guide the LGU and other concerned agency like the DPWH to consider erecting a fire block of pure concrete around these areas to contain the spread of fire in case of any untoward incident compliant to the "fire-zones" provision of the building code. Barangays 16, 34 and 37 has zoning maps but does not contain fire safety features as previously mentioned.

Source of Water. In the absence of the most needed Hydrant, an alternative source of water is most important for the resident to be able to perform initial firefighting prior to the arrival of the firefighters. A person with a background on firefighting is aware that the best time to stop a fire from spreading is to suppress it while it is still a small fire. And considering the traffic situation in Legazpi city, response surely is delayed. To fight a fire at the Barangay level without the availability of fire hoses and hydrants, a common house water pail/bucket is an effective tool to douse out the fire. By the 'bucket-relay' method, the resident's line up, extending from the source of water and hand-over hand pass the bucket of water until it reaches the person nearest the fire, who will be responsible for throwing the water unto the fire. This is done continuously until either the water runs out, the firefighter has arrived or the fire is already extinguished. This method is best taught to all the residents of the three most vulnerable Barangays in Legazpi city.

Hazard Maps. Identified prone areas to fire, low-lying areas prone to floods and typhoons should be recorded on a hazard map to be used as guide of the Barangay authorities, i.e., Punong Barangay and council to watch out for and plan for contingency measures, to include safe evacuation areas, and safe evacuation passage. Barangays 16, 34 and 37 do not have hazard maps of their respective areas.

Barangay Emergency Plan. An emergency plan first and foremost considers the common emergencies and addresses them by being prepared, i.e. ready provisions to be used during short and long-term evacuations to include medical supplies. It is a complete guide to address both man-made and natural calamities and similar emergencies.

The plan is also inclusive of the hazard map and the zoning map, where areas of safe refuge and evacuation routes were pre-identified. Most importantly, focal persons should be designated and listed in the plan for easy reference. As far as the observation/ immersion was concerned, there was no indication that Barangays 16, 34 and 37 had emergency plans.

Family/Household Exit Plan. A family exit plan is a fail-safe strategy to ensure that every member of the household is able to evacuate in case of fire incidents. Particularly, with the houses made of light materials and no exit passages between houses and puroks, an exit plan to train each household member will make sure that lives will be spared from any destructive fire. The efficiency of every Barangay Emergency Plan starts when all the residents are safe and out and moving, rather than trapped in their own homes. Barangays 16, 34 and 37 and all Barangays for that matter should practice having their respective family exit plans.

Communication Equipment (Tel/VHF). A telephone is most effective to notify any fire station in cases of fires. The key to a telephone being an effective communication tool is to have listing of emergency numbers closed by. A call by telephone can direct the responding firefighters to the exact area of the incident, thus eliminating unnecessary delays. Likewise, an effective caller can be relied on to provide other information relative to the fire that will aid in the mental assessment of the responding fire ground commander, based on his familiarity of the area.

Fire Notification System. Considering the expanse of Barangays 16, 34 and 37, in cases of fires there was no alarming system to inform and even warn all residents of the emergency situation. A simple alarm system should be installed in every Barangays. It can either be a bell (hollow metal pipe), trumpet (budyong), whistle, or any other sounding mechanism that would be loud enough to be heard by the farthest house in the Barangay. An alarm sound may alert the residents of a fire or any emergency, or signaling help or assistance.

Organized Barangay Volunteer fire Brigades. When a fire incident occurs, the chance of having a firefighter near is very much

remote, unless before the fire was lighted the firefighters presence was requested beforehand, like for example during allowed burning. Considering the distance of the nearest fire station in a an average of one kilometer of Barangays 16, 34 and 37 and the travel time involved, there is need to have trained members of the Barangay to act as first-line-of-defense , to ensure that the fire is controlled , confined at its earliest stage prior to the arrival of the firefighters. A volunteer fire brigade is composed mostly of the Barangay tanods and the kagawads or any resident volunteer who is committed to making themselves available in cases of emergency and performs duty 24 hours a day. There are no organized VFBs in any of the three top most vulnerable Barangays.

Fire Safety Awareness Projects. A regular seminar "Ugnayan Sa Barangay "with the BFP, will inform and train residents on fire safety and prevention. Particularly for highly congested areas in the Barangays, constant reminder of kitchen safety is very much important to remind them that even simple lighted cigarette stub can burn a whole Barangay down in minutes. Fire safety and prevention in the homes to include hanging or posting of fire safety tips in conspicuous places in the Barangay is much needed to make residents aware and committed.

Standby Fire Brigades (24HR duty). Fire is like a thief in the night, it can happen anytime, any minute. We use fire to cook our food, fire is present when we used lighters or matchsticks to light cigarettes, fire is an everyday hazard; that there should be a 24-hour look outs for fire incidents. Like to Public Safety Officers (PSO), a regular volunteer fire brigade should be employed by the Barangay with regular monthly salary and rice allowance. These standby fire brigades will be responsible for monitoring safety of the Barangay in aid to the fire safety and awareness program of the BFP.

Periodic Electrical Inspection. In order to prevent electrical fires there must be a regular checkup of all household connections. To do these, the Barangay electricians should be committed to inspect and correct if necessary all electrical connections within the Barangay to prevent accidental electrocution or overloads and short circuits by the rampant practice of illegal connections and undersized wires in most homes. A monitoring report shall be submitted to the BFP for reference purposes. Periodic inspection will also remind small businesses present

in the Barangay to observe electrical safety. The Barangays should give regular remuneration to these Barangay electricians.

Community Housekeeping. Since, almost anything can be burned; everything then is a potential fire starter, starting with things or materials that are not given importance like trash or garbage. Housekeeping refers to the removal of dry leaves, dry woods, and tall grasses, to include proper garbage collection and disposal system, upkeep of electrical wirings on posts. Housekeeping can also mean the cutting of tree branches particularly those near electrical posts and wirings, removal of past-events streamers made of cloth or any material to eliminate any potentiality of fire. These also include the cutting/ trimming of grasses on vacant lots and fencing of abandoned structures. In Bgy 37–Bitano a rolled up streamer can be seen wrapped on the electrical wires where it was originally tied and hanged.

Barangay Disaster Operation Center. To place all these capabilities in one place and ensure their use and application, a Barangay disaster operation center should be installed in every Barangay. The function of which is to be responsible for the coordination with the authorities for training and planning of safety requirements of the Barangay. The Barangay zoning map, the hazard map and emergency plans should be kept in this disaster operation center for activation in case of a fire incident, or any other related emergencies. Likewise, a Barangay disaster operation center is required under the new disaster law.

Proposed Fire Plan to Address Vulnerabilities

From fuels reduction to fire code fees, education and prevention to evacuation, citizens must have the information and resources to be active participants in reducing their risk to fire. For many years, there has been a reliance on local government, fire service, and many other types of organizations to aid the Barangay when emergency strikes. This urban integrated fire plan encourages the Barangay residents themselves to take an active role in identifying needs, developing strategies and implementing solutions to address fire risk by assisting with the development of a Barangay Emergency Plan and participating in fire prevention activities.

Mission and Purpose:

To enhance awareness of residents/homeowners on the fire vulnerability problem and encourage them to act through active participation on fire prevention initiatives of the Barangay, in coordination with the local Bureau of Fire Protection office.

Objectives

To reduce the risk of fire to life and property in Urban Legazpi City by coordinating public agencies, community organizations, private landowners, and the public to increase their awareness of and responsibility for fire issues. This plan contains the goals, objectives and actions as well as the strategies for monitoring and implementation, that includes:

- Protection against potential losses to life, property and natural resources from accidental fires
- Build and maintain active participation from all concerned sectors;
- Realistic expectations for reducing fire risk;
- Identify and prioritize actions for fire protection;
- Access and utilize 20% LGU funding for community fire protection LGU share from the fire code fees collection as per RA 9514;
- Identify incentives for fire protection and community participation;
- Institutionalize fire-related programs and sustain community efforts for fire protection

The plan is divided into four (4) areas: Identified fire risks, Strategies, Funding Requirements and Involved/Office/Agency.

1. Identified Risk refers to the Physical, Social and Economic Related vulnerability indicators;
2. Strategies are the required actions to address the identified vulnerabilities that include relocation, corrective constructions, and review of zoning laws and ordinances and mobilization of the Barangay residents themselves as first-line-of-defense.
3. Funding requirements shall make the strategies operational and

shall ensure the sound implementation of the plan.

Involved Office/Agency/Persons refer to:

- The City Government of Legazpi
- City Engineering office
- Department of Environmental and Natural Resources;
- Tri-Media
- City and Provincial Sanggunian
- Local electric cooperative
- Barangay Residents

Consistent with the fire protection doctrine of the BFP, simplified by the 3E's, Enforcement, Education and Engineering. Enforcement refers to safety provisions of the RA 9514 or the New Fire Code of the Philippines of 2008, through building inspection, collection of fire code fees and other related activities. Education refers to seminars and training of the community on fire safety and prevention, to include Organization of Volunteer Fire Brigades and Engineering, which refers to the installation of fire protection systems, specifically the Automatic Fire Sprinkler Systems, Fire Alarms, Smoke Detectors and the installation of Fire Hydrants. The urban integrated fire plan is committed to supporting the Barangay communities in their fire protection efforts, both short and long-term. The plan will continue to serve as guide in maintaining Barangay risk assessment and emergency management coordination.

INTEGRATED FIRE PLAN FOR URBAN LEGAZPI CITY

Identified Risks/ Hazards	Strategies	Funding Requirement	Involved/Office/Agency
PHYSICAL VULNERABILITIES			
Presence of illegal settlers	Relocation, review of zoning laws and ordinances	P 1 MILLION	LGU, City Engineering , Media, DPWH, PNP, BFP, DILG
Not within radius of a fire station	Organize VFBs/ Safety Education		BFP, DILG, LGU, Media
Presence of vegetation	Pruning of trees, trimming of grasses/ safety education	P 5,000.00	DENR, LGU, City Engineering, ALECO, Bgy Residents, Media
Faulty design of structure	Corrective construction	P 30- 100,000.00	City Engineering, DPWH, Media
Light materials	Fire Safety Education	P 25,000.00	BFP, DILG, LGU, Media
Absence of fire walls	Corrective construction	P 30- 100,000.00	City Engineering
Absence of fire blocks	Corrective construction	P 30-100,000.00	City Engineering
Absence of required ventilation	Corrective construction	P 30-100,000.00	City Engineering
Unsafe construction practice	Corrective construction	P 30-100,000.00	City Engineering
Non-observance of setbacks	Corrective construction	P 30-100,000.00	City Engineering
Lack of fire resistive materials	Fire Safety Education	P 25,000.00	LGU, City Engineering , DPWH,PNP,BFP, DILG,
Absence of adequate light and ventilation	Corrective construction	P 30-100,000.00	City Engineering
No sign of safe egress/ exits	Corrective construction	P 30-100,000.00	City Engineering
Sign of damage/ dilapidation	Corrective construction	P 30-100,000.00	City Engineering
Maneuverability of fire trucks	Road widening	P 30-100,000.00	City Engineering
Evacuation lane for residents	Barangay zoning	P 30-100,000.00	City Engineering
Fire lane for responding fire trucks	Establish center lane of main roads	P 30-100,000.00	City Engineering
No deep flowing rivers	Install hydrants	P 900,000 – 2,250,000	LGU, City Engineering , DPWH,PNP,BFP, DILG
No deep flowing canals	Install hydrants	P 900,000 – 2,250,000	LGU, City Engineering , DPWH,PNP,BFP, DILG
No deep flowing ponds	Install hydrants	P 900,000 – 2,250,000	LGU, City Engineering , DPWH,PNP,BFP, DILG
No accessibility to source of water	Install hydrants	P 900,000 – 2,250,000	LGU, City Engineering , DPWH,PNP,BFP, DILG
No swimming pools	Install hydrants	P 900,000 – 2,250,000	LGU, City Engineering , DPWH,PNP,BFP, DILG
No hydrants	Install hydrants	P 900,000 – 2,250,000	LGU, City Engineering , DPWH,PNP,BFP, DILG

Integrated Fire Plan continued...

Identified Risks/ Hazards	Strategies	Funding Requirement	Involved/Office/Agency
SOCIAL VULNERABILITIES			
Un-swept roads/ lawns	Mobilize clean-up drives / education of Barangay Residents	P 25,000.0	LGU, City Engineering , DPWH,PNP,BFP, DILG, Barangay Residents
No garbage collection/ disposal	Coordinate with ecological waste management office	P 5,000.00	LGU, City Engineering , DPWH, Barangay Residents
Tree branches touching electrical wirings	Coordinate with City Engineering and ALECO	P 5,000.00	LGU, City Engineering , DPWH, Barangay Residents
Untrimmed grasses on vacant lots and structures	Fire Safety Education	P 25,000.00	BFP, DILG, LGU, Bgy Residents
High frequency of fire incidents	Fire Safety Education	P 25,000.00	BFP, DILG, LGU,
No defensible space	Fire Safety Education	P 25,000.00	BFP, DILG, LGU
Absence of fire safety posters	Fire Safety Education	P 25,000.00	BFP, DILG, LGU
Unclipped electrical wirings on posts	Fire Safety Education	P 25,000.00	BFP, DILG, LGU
Dangerous heights of Buildings to electrical wirings/ posts	Corrective construction	P 100- 2000,000	LGU, City Engineering , DPWH, Bgy Residents
No regular fire safety training	Fire Safety Education	P 25,000.00	BFP, DILG, LGU
No regular fire drills	Fire Safety Education	P 25,000.00	BFP, DILG, LGU
No established linkage with local BFP	Fire Safety Education	P 25,000.00	BFP, DILG, LGU
No household escape plans	Fire Safety Education	P 25,000.00	BFP, DILG, LGU, Bgy Residents
No postings of emergency numbers	Fire Safety Education	P 25,000.00	BFP, DILG, LGU
No fire campaign initiative	Fire Safety Education	P 25,000.00	BFP, DILG, LGU
Lack of situation awareness	Fire Safety Education	P 25,000.00	BFP, DILG, LGU
Lack of projections for safety	Fire Safety Education	P 25,000.00	BFP, DILG, LGU
No organized Bgy. Vol. Fire Brigade	Fire Safety Education	P 25,000.00	BFP, DILG, LGU
ECONOMIC RELATED ACTIVITIES			
Sari-sari stores	Fire Safety Education	P 25,000.00	BFP, DILG, LGU, Bgy Residents
Eatery (turo-turo)	Fire Safety Education	P 25,000.00	BFP, DILG, LGU, Bgy Residents
Bakery	Review of zoning laws and ordinances		LGU, City Engineering , DPWH,PNP,BFP, DILG
Electronic repair shops	Review of zoning laws and ordinances		LGU, City Engineering , DPWH,PNP,BFP, DILG
Auto repair shops	Review of zoning laws and ordinances		LGU, City Engineering , DPWH,PNP,BFP, DILG
Metal crafts	Review of zoning laws and ordinances		LGU, City Engineering , DPWH,PNP,BFP, DILG

Conclusions

Based on the findings of the study, the following conclusions were deduced:

1. In terms of physical vulnerability, there is a need for Barangays 16-East Washington, 34-Oro site and 37-Bitano to take drastic action to address their vulnerabilities on location conditions, design of structures, proximity of structure, narrowness of roads and water sources and hydrants. In terms of social vulnerability, there is also a need for all three Barangays to focus on how to be participative and coordinative with the local fire office, with regard to population density, disregard for fire wise management, lack of public information and awareness and limited recognition of risks and preparedness measures. In terms of economic related activity vulnerability, all three Barangays should coordinate with the LGU, the City Engineering and Zoning Office to address the dangers of fire in relation to source of livelihood.

2. The risk reduction capabilities of the three fire- prone/ vulnerable Barangays are inadequate to provide fire protection, with only three existing capabilities out of the listed fourteen must-haves to ensure total protection from all emergencies, fire and non-fire alike.

3. The integrated fire plan will transform the residents as well as the whole Legazpi community into force-multipliers, enhancing their respective responses on fire safety and prevention, in reference to Section 14 of RA 9514 or the New Fire Code of the Philippines 2008 and the Building code.

Recommendations

In view of the findings and conclusions made, the following recommendations are advanced:

1. Hazard mapping criterion of BFP Legazpi/LCFS should not only consider fire prone indicators but must include most importantly the dimension of vulnerability of an area specifically on its Physical, Social and Economic related activities , which is greatly contributory to the risks of fire.

2. The BFP Legazpi/LCFS should sustain its Barangay Ugnayan

program on a year-round basis, concentrating on their pre-identified fire prone areas and ensure that every Barangay has their respective organized Barangay Volunteer Fire Brigades as their first-line-of-defense; have proper zoning and install horizontal dry pipes strategically extending from the street to the interior and most vulnerable area of the Barangay. Most importantly the LCFS transforms every person in the community as force-multipliers and to actually have confidence in them as partners in fire safety and prevention.

3. The Barangay Councils should work together with the BFP Legazpi/LCFS to proposed measures to the City Mayor and the City council to prioritize fire mitigating measures to include equipage and the provisions of Telephone/VHF Radio sets for immediate notification of the BFP; installation of fire hydrants; constructions of Barangay roads and training funds and institutionalization of Barangay Volunteer Fire Brigades likened to the Public Safety Officers.

4. The Office of the Legazpi City Mayor through its Sanggunian should pass an ordinance compelling all Barangays to adopt the proposed integrated fire plan to establish fire mitigating measures not limited to: organization of a permanent Barangay Volunteer Fire Brigades, fire truck accessibility roads compliant to the DPWH standard (entrance and interior), construction of fire walls on need basis, installation of fire hydrants, and other physical features as maybe deemed necessary.

5. The respective Barangays should adopt or sustain a livelihood program as well as advocate family planning program to ensure that residents achieve limitless ability to manage vulnerability, enhance resilience and make safety a main concern.

6. The BFP Regional Office should strictly implement monitor and extend technical and financial support to the Barangay Ugnayan programs of the field units, particularly the Legazpi City Fire Station.

References

Anne A. Jambora, On Fiery Alert in this Season of Fires, PDI, Sunday Life Style, Sunday March 13, 2005

Armstrong, M.J., Urban Mitigation : Increasing Human Security through Re-Assessing the Steps Toward Livable Commu nities.

Associated Press: "16 Killed in Philippine Slum Fire, Including Kids". Retrieved from http:// www. Firefighting news.com/ Article, November 2, 2009.

Batas Pambansa Blg 220: An Act Authorizing the Human Settle ments to Establish and Promulgate Different Levels of Standards and Technical Requirements for Economic and Socialized Housing Projects in Urban and Rural Areas from those provided in PD 987,PD 1216, PD 1096 and PD 1185.

Bengriston,"Increase Fire Safety Awareness in You". Retrieved from http://www.flickr.com/photos/gazeronly

Caldewell, D.S , "How Negligence Causes Fires". Retrieved from, http://EzineArticles.Com

Coleman R. J., Coleman J.A.,Granito. Managing Fire Services, 2nd Edition, 1988 on Women in Firefighting.

Crowley, M.A., P.E., FSFPE, "Impact of Fires on the Built Envi ronment", Fire Protection Engineering Magazine Fall 2008 Issue, p. 38

Philippine Daily Inquirer, 02/07/2010

Doctrines of Disaster Management, The Philippine Disaster Sys tem, P.D 1566, Sec. 1.

Editorial, The Protector, 4th Quarter Issue 2003.

Editorial, The Scenarist, Official Publication of BFP Region 3, March 2004 Issue

Fire Safety–How to be Firewise Homepages. Paradise. Retrieved form net nz/swatty/emergency/fire/fire

Fire Code of the Philippines (P. D. 1185)

Fire Hydrant.Org. Retrieved from http://www.firehydrant.org/info/ design01.html

Fire Safety Engineering Design, published by E & FN Spon, an imprint of Chapman & Hall, 2-6 Boundary Row, Lon don, SE18HN, UK, p.16

Firewise Communities, "Introduction to Firewise Principles". Fall/ Winter 2009 Newsletter. www.firewise.org/ resources/index.htm

F/Sr Supt Pandaog, A.A., DSC, "Message" Fire Prevention Month Celebration, The Protector , Official Publication of BFP Region XI, 1st Quarter 2000 Issue.

Gen. Rosales, M., Chairman Public Relations Organization of the Philippines (PROP), "Message" LUZCOMNET, May 30, 2003, Hyatt Regency Hotel.

Gulf News, Short Circuit Causes Fire. Published 22:18 October 12, 2009. Retreived from http://gulfnews.com/gntv/ news/short-circuit-causes-fire-1.513913.

HFA-Pedia International Strategy for Disaster Reduction, http:// www.eird.org/wikien/index.php/

Human Behaviors and Fire Safety. http://people and fire.com/ index.ht

Invictus "Tuts" Paradela, Building Code: Rules to Build Safe Structures. Cebu Daily News. First Posted 12:59:00 01/15/2008 Filed Under: Real State Laws.

Melegrito, J., Agustin, E., Kabiling C., Ramilo F., Public Safety and Ecological Preservation, Public Safety Dimensions and Concerns

J. O. Alesto, "How Essential is Fire Safety Awareness". http:// EzineArticles.com

Kansas Forest Service: "Protect Your Home/ Available Water Sources", retrieved from http://www.kansasforezt.org/ fire/ protecthomewater.shtml.

Ladd, H.F., Urban Studies: Population Growth , Density and Costs of Providing Services, Vol.29, No. 2, 1992, pp. 273- 295.

Lawrence, J., Queens University, Belfast Design Against Fire an introduction to Fire Safety Engineering Design, published by E & FN Spon, an imprint of Chapman & Hall, 2-6 Boundary Row, London, SE18HN, UK, p.16

Living with Wild Fire. Retrieved from, http:// pubs1.cals.arizona.edu/sales/ find.cfm.

Loren Legarda, "Engineering Resilience: Confronting Risks Be yond Adaptation" Senate Press Release, March 15, 2010.

Marit Stinus-Remonde, Mission Impossible, Opinion, the Manila Times Tuesday, August 18, 2009.

Md. Sayeedul I Islam, Debasis Roy Raza, Md. Saiful Islam, Bangladesh University of Engineering & Technology (BUET)

Meyers, R., "Living with Fire: Sustaining Ecosystems and Live lihoods through Integrated Fire Management", 2008.

Mia E. Abellana with Martel, Rene, Cuizon, Aledel Gonzales, "Eighty 80 Families Lose Homes In Blaze", The Philip pine Star

Michael Lee, "Fire Ground Tactics: Pre-Fire Planning", Street smart, Fire Rescue 1, February 18, 2009.

Morgan J. Hurley, P.E Technical Director, Fire Protection Engi neering in Japan, Society of Fire Protection Engineer Magazine,

Editorial, issue no. 39, 2008
NFPA 1901: Requirements for Fire Apparatus
Ostonal, V.O.,"The Resource Capability of the Firefighting Units of the Bureau of Fire Protection in the Province of Al bay", Unpublished Thesis, MPA, March 2008
Pantaleon A., GMA News: "Fire Leaves 500 Butuan City Resi dents Homeless"; April, 10, 2008.
P.D 1096 National Building Code
Quismundo T., Fire Kids Now Back in School, PDI Metro, Janu ary 14, 2004
Remonde, M., "Fires In Urban Areas". The Manila Times Inter net Edition/Opinion.
Reyes, A.T., "Message upon Assumption as SILG" Restoring Our Sense of Community under the Rule of Law, BFP Annual Report, 2004
Salazar, T., Philippine Daily Inquirer: 8,823 Property Fires Rec orded in 2006, First Posted March 2, 2007
Schmidt, D.L., Planning for Disasters, Fire Protection Engineer ing magazine, p. 26, issue no. 39, 2008
Senate Press Release, June 23, 2009, "Loren Stresses Good Gov ernance to Reduce Risks from Disasters"
Steelyman, Health, Environmental and Human Threats, retrieved from http://Steelyman.com/index.HTM
The Financial Express: Death In Worst Fire Incident, Editorial, vol.18 no. 185 REGD NO. DA 1589 / Dhaka, Saturday June 5, 2010
The Philippine Disaster System: Doctrines of Disaster Manage ment, P.D 1566, Section 1.
The National Building Code: P.D. NO. 1096, February 1977. Adopting a National Building Code of the Philippines (NBCP) revising R.A. no. 6541
Thomas, Aurn Hammer, The Hazard Involved when Operating Apparatus in the Interface: Off the Beaten Track
UK News: "Flying Threat to Farmers Crops", July 17, 2009, re trieved from http://www.middevonstar.co.uk/ news/4497447.
Wikipedia: Great fire of London. http://en.wikipedia.
Yap, DJ., "Fire Razes Squatters Shanties in Caloocan, Hundreds Homeless, P5M Lost".

MONOGRAPHS:

SEAS	**— *Ningas***
GSBM	**— *Saliksik***
SOECS	**— *Mukna***
SBMA	**— *Panganganinag***
SHOM	**— *Namit***
SON	**— *Lampara***
RESEARCH OFFICE	**— *Kadunung***
SHS	**— *Tinta***
JHS	**— *Liyab***
GS	**— *Banhi***

DIVINE WORD COLLEGE OF LEGAZPI
Research Office
Legazpi City 4500 Philippines