# Climate and Disaster Risk can NG Assessment (CDRA)

Municipal Government of Casiguran, Aurora, Philippines

July 2018

This Climate and Disaster Risk Assessment (CDRA) report (preliminary results) was prepared in partnership with the University of the Philippines Los Banos – Interdisciplinary Study Center for Integrated Natural Resources and Environment Management (UPLB, IDSC-INREM), with financial support from the provincial government of Aurora and the Asia-Pacific Network for Global Change Research (APN).









## **Table of Contents**

I. Introduction	1
Legal Basis for the CDRA of Casiguran, Aurora	
Historical Origins of Casiguran	2
Geographic Information	
Demographic Trends	4
Population Density by Barangay	5
Indigenous Cultural Communities	6
Language	7
Religious Denominations	7
Income & Economic Base	7
Land and Forest Resources	7
Agriculture and Land Utilization by Barangay	9
Support Services	9
Development Vision, Mission, & Goals	
II. Climate Change Projections & Hazard Information	13
Seasonal Minimum Temperatures	
Seasonal Maximum Temperatures	15
Seasonal Rainfall	15
Hot Days	16
Dry Days	16
Extreme Daily Rainfall Events	17
Sea Level Rise	
Hazard Inventory	17
Flood Susceptibility	17
Rain-Induced Landslide	19
Storm Surge	
Ground Rupture	21
Liquefaction	22
Earthquake-Induced Landslide	23
Tsunami	25
Records of Disasters	

Hazard Susceptibility	
III. Impact Chain Analysis	
IV. Hazard Exposure Database	
Population Exposure Database	
Natural Resources Exposure Database	
Critical Facilities Exposure Database	
Urban Use Exposure Database	
Lifeline Utility Exposure Database	71
V CLIMATE CHANCE VIII NEDABII ITV ASSESSMENT	78
Climate Change Volkerability Assessment of Develotion	70
Climate Change vulnerability Assessment of Population	
Future Temperature Trends and Population	
Future Rainfall Trends and Population	
Future Number of Hot Days and Population	
Future Number of Dry Days Population	
Future Number of Extreme Rainfall Events and Population	
Future Sea Level Changes and Population	
Future Typhoons/Supertyphoons and Population	
Climate Change Vulnerability Assessment of Natural Resources	
Future Temperature Trends and Natural Resources	
Future Rainfall Trends and Natural Resources	
Future Number of Hot Days and Natural Resources	
Future Number of Dry Days and Natural Resources	
Future Number of Extreme Rainfall Events and Natural Resources	
Future Sea Level Changes and Natural Resources	
Future Typhoon/ Supertyphoons and Natural Resources	93
Climate Change Vulnerability Assessment of Critical Facilities	
Future Temperature Trends and Critical Facilities	94
Future Rainfall Trends and Natural Resources and Critical Facilities	
Future Number of Hot Days and Critical Facilities	
Future Number of Dry Days and Critical Facilities	
Future Number of Extreme Rainfall Events and Critical Facilities	
Future Sea Level Changes and Natural Resources	
Future Typhoons/Supertyphoons and Natural Resources	
Climate Change Vulnerability Assessment of Urban Use	102

Future Temperature Trends and Urban Use	
Future Rainfall Trends and Natural Resources and Urban Use	
Future Number of Hot Days and Urban Use	
Future Number of Dry Days and Urban Use	105
Future Number of Extreme Rainfall Events and Urban Use	
Future Sea Level Changes and Urban Use	107
Future Typhoons/Supertyphoons and Urban Use	108
Climate Change Vulnerability Assessment of Lifeline Utilities	109
Future Temperature Trends and Lifeline Utilities	109
Future Rainfall Trends and Natural Resources and Lifeline Utilities	110
Future Number of Hot Days and Lifeline Utilities	111
Future Number of Dry Days and Lifeline Utilities	112
Future Number of Extreme Rainfall Events and Lifeline Utilities	114
Future Sea Level Changes and Lifeline Utilities	115
Future Typhoons/Supertyphoons and Lifeline Utilities	116
Overall Climate Change Vulnerability Assessment of Urban Use	117
VI. Disaster Risk Assessment	129
Disaster Risk Assessment of Population	131
Floods and Population	131
Rain-induced Landslides and Population	133
Storm Surges and Population	135
Droughts and Population	137
Sea Level Rise and Population	139
Earthquake-induced Landslides and Population	141
Liquefaction/Sinkholes and Population	143
Ground Shaking and Population	145
Ground Rupture and Population	147
Tsunamis and Population	149
Volcanic Eruptions and Population	151
Disaster Risk Assessment of Natural Resources	152
Floods and Natural Resources	152
Rain-induced Landslides and Natural Resources	154
Storm Surges and Natural Resources	156
Droughts and Natural Resources	158
Sea Level Rise and Natural Resources	160
Earthquake-induced Landslides and Natural Resources	

Liquefaction/Sinkholes and Natural Resource	ces164
Ground Shaking and Natural Resources	
Ground Rupture and Natural Resources	
Tsunamis and Natural Resources	
Volcanic Eruptions and Natural Resources	
Disaster Risk Assessment of Critical Point Faci	lities173
Floods and Critical Point Facilities	
Rain-induced Landslides and Critical Point F	acilities177
Storm Surges and Critical Point Facilities	
Droughts and Critical Point Facilities	
Sea Level Rise and Critical Point Facilities	
Earthquake-induced Landslides and Critical	Point Facilities193
Liquefaction/Sinkholes and Critical Point Fa	cilities197
Ground Shaking and Critical Point Facilities.	
Ground Rupture and Critical Point Facilities	
Tsunamis and Critical Point Facilities	
Volcanic Eruptions and Critical Point Faciliti	es213
Disaster Risk Assessment of Urban Use Areas	
Floods and Urban Use Areas	
Rain-induced Landslides and Urban Use Are	as216
Storm Surges and Urban Use Areas	
Droughts and Urban Use Areas	
Sea Level Rise and Urban Use Areas	
Earthquake-induced Landslides and Urban I	Jse Areas224
Liquefaction/Sinkholes and Urban Use Area	s226
Ground Shaking and Urban Use Areas	
Ground Rupture and Urban Use Areas	
Tsunamis and Urban Use Areas	
Volcanic Eruptions and Urban Use Areas	
Disaster Risk Assessment of Lifeline Utilities	
Floods and Lifeline Utilities	
Rain-induced Landslides and Lifeline Utilitie	es237
Storm Surges and Lifeline Utilities	
Droughts and Lifeline Utilities	
Sea Level Rise and Lifeline Utilities	
Earthquake-induced Landslides and Lifeline	Utilities245

Liquefaction/Sinkholes and Lifeline Utilities	.247
Ground Shaking and Lifeline Utilities	.249
Ground Rupture and Lifeline Utilities	.251
Tsunamis and Lifeline Utilities	.253
Volcanic Eruptions and Lifeline Utilities	.255
Overall Disaster Risk Assessment of Urban Use	.256
VII. Summary & Conclusions	279
VIII. References	

# **List of Tables**

Table 1. Slope categories in the landscape of Casiguran.

Table 2. Elevation Characteristics of Casiguran.

Table 3. Population Growth in Casiguran, 1960-2016.

Table 4. Household Composition, Casiguran, Aurora.

Table 5. Population Density, Casiguran, Aurora.

Table 6. Indigenous Peoples Population, Casiguran, Aurora.

Table 7. Population by Mother Tongue, Casiguran, Aurora, as of 2016.

Table 8. Land Area by Barangay, Casiguran, Aurora.

Table 9. Land Use Descriptions in Casiguran, Aurora.

Table 10. Annual fish catch per barangay

Table 11. Projected change in minimum seasonal temperature in Casiguran, Aurora during 2011-2014.

Table 12. Seasonal Maximum Temperatures

Table 13. Projected change in seasonal rainfall (%) in 2036-2065 and 2100 and

observed baseline (1971-2000) in Casiguran, Aurora.

Table 14. Projected change in the frequency extreme events under medium-range emission scenarios in 2020 and 2050 and observed baseline (1971-2000).

Table 15. Barangays potentially exposed to high susceptibility in flooding.

Table 16. Barangays Highly Susceptible to Rain-induced Landslides.

Table 17. Barangays susceptible to inundation of more than 1 to 4 m storm surge.

Table 18. Barangays Susceptible to Earthquake Induced- Landslide.

Table 19. Previous disaster occurrences in Casiguran.

Table 20. Previous disaster occurrences in Casiguran and its financial costs.

Table 21. Hazard Susceptibility Inventory (as of 2017).

Table 22. Climate Change impacts to Different Systems of Interest in Casiguran

Table 23. Exposed Population Variables in Casiguran, Aurora.

Table 24. Total Number of Individuals Exposed to Flooding

Table 25. Exposure Indicators of Natural Resources.

Table 26. Exposure Indicators of Critical Facilities.

Table 27. Exposure Indicators of Urban Use.

Table 28. Exposure Indicators of Lifeline Utility.

Table 29. CCVA on Future Temperature Trends and Population Table 30. CCVA on Future Rainfall Trends and Population Table 31. CCVA of Future Number of Hot Days and Population Table 32. CCVA on Future Number of Dry Days and Population Table 33. CCVA on Future Number of Extreme Rainfall Events and Population Table 34. CCVA on Future Sea Level Changes and Population Table 35. CCVA on Future Typhoons/Super typhoons and Population Table 36. CCVA on Future Temperature Trends and Natural Resources Table 37. CCVA on Future Rainfall Trends and Natural Resources Table 38. CCVA on Future Number of Hot Days and Natural Resources Table 39. CCVA on Future Number of Dry Days and Natural Resources Table 40. CCVA on Future Number of Extreme Rainfall Events and Natural Resources Table 41. CCVA on Future Sea Level Changes and Natural Resources Table 42. CCVA on Future Typhoons/Super typhoons and Natural Resources Table 43. CCVA on Future Temperature Trends and Critical Facilities Table 44. CCVA on Future Rainfall Trends and Critical Facilities Table 45. CCVA on Future Number of Hot Days and Critical Facilities Table 46. CCVA on Future Number of Dry Days and Critical Facilities Table 47. CCVA on Future Number of Extreme Rainfall Events and Critical Facilities Table 48. CCVA on Future Sea Level Changes and Critical Facilities Table 49. CCVA on Future Typhoons/Super typhoons and Critical Facilities Table 50. CCVA on Future Temperature Trends and Urban Use Table 51. CCVA on Future Rainfall Trends and Urban Use Table 52. CCVA on Future Number of Hot Days and Urban Use Table 53. CCVA on Future Number of Dry Days and Urban Use Table 54. CCVA on Future Number of Extreme Rainfall Events and Urban Use Table 55. CCVA on Future Sea Level Changes and Urban Use Table 56. CCVA on Future Typhoons/Super typhoons and Urban Use Table 57. CCVA on Future Temperature Trends and Lifeline Utilities Table 58. CCVA on Future Rainfall Trends and Lifeline Utilities Table 59. CCVA on Future Number of Hot Days and Lifeline Utilities Table 60. CCVA on Future Number of Dry Days and Lifeline Utilities

Table 61. CCVA on Future Number of Extreme Rainfall Events and Lifeline Utilities

Table 62. CCVA on Future Sea Level Changes and Lifeline Utilities

Table 63. CCVA on Future Typhoons/Super typhoons and Lifeline Utilities

Table 64. CCVA on Overall Climate Change Vulnerability Assessment

Table 65. Description of Severity of Risk per System of Interest.

Table 66. Variables for Determining Overall Severity of Consequence per System of Interest.

Table 67. Disaster Risk Assessment of Floods and Population

Table 68. Disaster Risk Assessment of Rain-induced Landslides and Population

Table 69. Disaster Risk Assessment of Storm Surges and Population

Table 70. Disaster Risk Assessment of Drought and Population

Table 71. Disaster Risk Assessment of Sea Level Rise and Population

Table 72. Disaster Risk Assessment of Earthquake-induced Landslides and Population

- Table 73. Disaster Risk Assessment of Liquefaction/Sinkholes and Population
- Table 74. Disaster Risk Assessment of Ground Shaking and Population

Table 75. Disaster Risk Assessment of Ground Rupture and Population

Table 76. Disaster Risk Assessment of Tsunamis and Population

Table 77. Disaster Risk Assessment of Volcanic Eruptions and Population

Table 78. Disaster Risk Assessment of Floods and Natural Resources

Table 79. Disaster Risk Assessment of Rain-induced Landslides and Natural Resources

Table 80. Disaster Risk Assessment of Storm Surges and Natural Resources

Table 81. Disaster Risk Assessment of Droughts and Natural Resources

Table 82. Disaster Risk Assessment of Sea Level Rise and Natural Resources

 Table 83. Disaster Risk Assessment of Earthquake-induced Landslides and Natural

 Resources

Table 84. Disaster Risk Assessment of Liquefaction/Sinkholes and Natural Resources

Table 85. Disaster Risk Assessment of Ground Shaking and Natural Resources

Table 86. Disaster Risk Assessment of Ground Rupture and Natural Resources

Table 87. Disaster Risk Assessment of Tsunamis and Natural Resources

Table 88. Disaster Risk Assessment of Volcanic Eruptions and Natural Resources

Table 89. Disaster Risk Assessment of Floods and Critical Point Facilities

Table 90. Disaster Risk Assessment of Rain-induced Landslides and Critical Point Facilities

 Table 91. Disaster Risk Assessment of Storm Surges and Critical Point Facilities

Table 92. Disaster Risk Assessment of Droughts and Critical Point Facilities

Table 93. Disaster Risk Assessment of Sea Level Rise and Critical Point Facilities

Table 94. Disaster Risk Assessment of Earthquake-induced Landslides and Critical Point Facilities

Table 95. Disaster Risk Assessment of Liquefaction/Sinkholes and Critical Point Facilities

Table 96. Disaster Risk Assessment of Ground Shaking and Critical Point Facilities

Table 97. Disaster Risk Assessment of Ground Rupture and Critical Point Facilities

Table 98. Disaster Risk Assessment of Tsunamis and Critical Point Facilities

Table 99. Disaster Risk Assessment of Volcanic Eruptions and Critical Point Facilities

Table 100. Disaster Risk Assessment of Floods and Urban Use Areas

Table 101. Disaster Risk Assessment of Rain-induced Landslides and Urban Use Areas

Table 102. Disaster Risk Assessment of Storm Surges and Urban Use Areas

Table 103. Disaster Risk Assessment of Droughts and Urban Use Areas

Table 104. Disaster Risk Assessment of Sea Level Rise and Urban Use Areas

Table 105. Disaster Risk Assessment of Earthquake-induced Landslides and Urban Use Areas

Table 106. Disaster Risk Assessment of Liquefaction/Sinkholes and Urban Use Areas

Table 107. Disaster Risk Assessment of Ground Shaking and Urban Use Areas

Table 108. Disaster Risk Assessment of Ground Rupture and Urban Use Areas

Table 109. Disaster Risk Assessment of Tsunamis and Urban Use Areas

Table 110. Disaster Risk Assessment of Volcanic Eruptions and Urban Use Areas

Table 111. Disaster Risk Assessment of Floods and Lifeline Utilities

Table 112. Disaster Risk Assessment of Rain-induced Landslides and Lifeline Utilities

Table 113. Disaster Risk Assessment of Storm Surges and Lifeline Utilities

Table 114. Disaster Risk Assessment of Droughts and Lifeline Utilities

Table 115. Disaster Risk Assessment of Sea Level Rise and Lifeline Utilities

Table 116. Disaster Risk Assessment of Earthquake-induced Landslides and Lifeline Utilities

Table 117. Disaster Risk Assessment of Liquefaction/Sinkholes and Lifeline Utilities

Table 118. Disaster Risk Assessment of Ground Shaking and Lifeline Utilities

Table 119. Disaster Risk Assessment of Ground Rupture and Lifeline Utilities

Table 120. Disaster Risk Assessment of Tsunamis and Lifeline Utilities

Table 121. Disaster Risk Assessment of Volcanic Eruptions and Lifeline Utilities

Table 122.Disaster Risk Assessment Summary, Casiguran, Aurora Table 123. Climate Change Vulnerability and Disaster Risk Assessment Summary Matrix, Casiguran, Aurora

## **List of Figures**

- Fig. 1. CDRA Workshop, November 7, 2017.
- Fig. 2. Climate and Disaster Risk Assessment Process.
- Fig. 3. Casiguran, Aurora, Philippines.
- Fig. 4. Landslide and Flood Hazard Map of Casiguran, Aurora.
- Fig. 5. Rain-induced Landslide Hazard Map.
- Fig. 6. Storm Surge Hazard Map.
- Fig. 7. Ground Rupture Hazard Map.
- Fig. 8. Liquefaction Map of Casiguran.
- Fig. 9. Earthquake-Induced Landslide Hazard Map.
- Fig. 10. Tsunamis Hazard Map of Casiguran.
- Fig. 11. Impacts Chain Diagram of Extreme Daily Rainfall, Casiguran, Aurora
- Fig. 12. Impacts Chain Diagram of Future Typhoon/Supertyphoons Occurences,
- Casiguran, Aurora.
- Fig. 13. Impacts Chain Diagram of Future Sea Level Changes, Casiguran, Aurora.
- Fig. 14. Impacts Chain Diagram of Future Number of Hot/Dry Days, Casiguran, Aurora
- Fig. 15. Impacts Chain Diagram of Drought Casiguran, Aurora.
- Fig.16.Households Exposed to Flood Hazard
- Fig.17.Households Exposed to Rain- induced Landslide Hazard
- Fig.18.Households Exposed to Storm Surge Hazard
- Fig.19.Households Exposed to Drought Hazard
- Fig.20.Households Exposed to Sea Level Rise Hazard
- Fig.21.Households Exposed to Earthquake-induced Landslide Hazard
- Fig.22.Households Exposed to Liquefaction Hazard
- Fig.23.Households Exposed to Ground Shaking Hazard
- Fig.24.Households Exposed to Ground Rupture Hazard
- Fig.25.Households Exposed to Tsunami Hazard
- Fig.26.Natural Resources Exposed to Flood Hazard
- Fig.27. Natural Resources Exposed to Rain-Induced Landslide Hazard

Fig.28. Natural Resources Exposed to Storm Surge Hazard Fig.29. Natural Resources Exposed to Drought Hazard Fig.30. Natural Resources Exposed to Sea Level Rise Hazard Fig.31. Natural Resources Exposed to Earthquake-Induced Landslide Hazard Fig.32. Natural Resources Exposed to Liquefaction Hazard Fig.33. Natural Resources Exposed to Ground Shaking Hazard Fig.34. Natural Resources Exposed to Ground Rupture Hazard Fig.35. Natural Resources Exposed to Tsunami Hazard Fig.36.Critical facilities Exposed to Flood Hazard Fig.37.Educational Facilities Exposed to Flood Hazard Fig.38.Health Facilities Exposed to Flood Hazard Fig.39.Critical Facilities Exposed to Rain-induced Landslide Hazard Fig.40.Educational Facilities Exposed to Rain-induced Landslide Hazard Fig.41.Health Facilities Exposed to Rain-induced Landslide Hazard Fig.42.Critical Facilities Exposed to Storm Surge Hazard Fig.43.Educational Facilities Exposed to Storm Surge Hazard Fig.44.Health Facilities Exposed to Storm Surge Hazard Fig.45.Critical Facilities Exposed to Drought Hazard Fig.46.Educational Facilities Exposed to Drought Hazard Fig.47.Health Facilities Exposed to Drought Hazard Fig.48.Critical Facilities Exposed to Sea Level Rise Hazard Fig.49.Educational Facilities Exposed to Sea Level Rise Hazard Fig.50.Health Facilities Exposed to Sea Level Rise Hazard Fig.51.Critical Facilities Exposed to Earthquake-induced Landslide Hazard Fig.52.Educational Facilities Exposed to Earthquake-induced Landslide Hazard Fig.53.Health Facilities Exposed to Earthquake-induced Landslide Hazard Fig.54.Critical Facilities Exposed to Liquefaction Hazard Fig.55.Educational Facilities Exposed to Liquefaction Hazard Fig.56.Health Facilities Exposed to Liquefaction Hazard Fig.57.Critical Facilities Exposed to Ground Shaking Hazard

Fig.58.Educational Facilities Exposed to Ground Shaking Hazard Fig.59.Health Facilities Exposed to Ground Shaking Hazard Fig.60.Critical Facilities Exposed to Ground Rupture Hazard Fig.61.Educational Facilities Exposed to Ground Rupture Hazard Fig.62.Health Facilities Exposed to Ground Rupture Hazard Fig.63.Critical Facilities Exposed to Tsunami Hazard Fig.64.Educational Facilities Exposed to Tsunami Hazard Fig.65.Health Facilities Exposed to Tsunami Hazard Fig.66.Land Use Exposed to Flood Hazard Fig.67.Land Use Exposed to Rain-Induced Landslide Hazard Fig.68.Land Use Exposed to Storm Surge Hazard Fig.69.Land Use Exposed to Drought Hazard Fig.70.Land Use Exposed to Sea Level Rise Hazard Fig.71.Land Use Exposed to Earthquake-Induced Landslide Hazard Fig.72.Land Use Exposed to Liquefaction Hazard Fig.73.Land Use Exposed to Ground Shaking Hazard Fig.74.Land Use Exposed to Ground Rupture Hazard Fig.75.Land Use Exposed to Tsunami Hazard Fig.76.Lifeline Facilities Exposed to Flood Hazard Fig.77.Lifeline Facilities Exposed to Rain-induced Landslide Hazard Fig.78.Lifeline Facilities Exposed to Storm Surge Hazard Fig.79.Lifeline Facilities Exposed to Drought Hazard Fig.80.Lifeline Facilities Exposed to Sea Level Rise Hazard Fig.81.Lifeline Facilities Exposed to Earthquake-induced Landslide Hazard Fig.82.Lifeline Facilities Exposed to Liquefaction Hazard Fig.83.Lifeline Facilities Exposed to Ground Shaking Hazard Fig.84.Lifeline Facilities Exposed to Ground Rupture Hazard Fig.85.Lifeline Facilities Exposed to Tsunami Hazard Fig.86.Households Vulnerable to Flood Hazard Fig.87.Households Risk to Flood Hazard

Fig.88.Households Vulnerable to Rain-induced Landslide Hazard Fig.89.Households Risk to Rain-induced Landslide Hazard Fig.90.Households Vulnerable to Storm Surges Hazard Fig.91.Households Risk to Storm Surges Hazard Fig.92.Households Vulnerable to Drought Hazard Fig.93.Households Risk to Drought Hazard Fig.94.Households Vulnerable to Sea Level Rise Hazard Fig.95.Households Risk to Sea Level Rise Hazard Fig.96.Households Vulnerable to Earthquake-induced Landslide Hazard Fig.97.Households Vulnerable to Earthquake-induced Landslide Hazard Fig.98.Households Vulnerable to Liquefaction Hazard Fig.99.Households Risk to Liquefaction Hazard Fig.100.Households Vulnerable to Ground Shaking Hazard Fig.101.Households Risk to Ground Shaking Hazard Fig. 102. Households Vulnerable to Ground Rupture Hazard Fig. 103. Households Risk to Ground Rupture Hazard Fig. 104. Households Vulnerable to Tsunami Hazard Fig.105.Households Risk to Tsunami Landslide Hazard Fig.106.Natural Resources Vulnerable to Flood Hazard Fig. 107.Natural Resources Risk to Flood Hazard Fig. 108. Natural Resources Vulnerable to Rain-induced Landslides Hazard Fig.109.Natural Resources Risk to Rain-induced Landslides Hazard Fig.110.Natural Resources Vulnerable to Storm Surges Hazard Fig.111.Natural Resources Risk to Storm Surges Hazard Fig.112.Natural Resources Vulnerable to Drought Hazard Fig.113.Natural Resources Risk to Drought Hazard Fig.114.Natural Resources Vulnerable to Sea Level Rise Hazard Fig. 115.Natural Resources Risk to Sea Level Rise Hazard Fig. 116.Natural Resources Vulnerable to Earthquake-induced Hazard

Fig. 117.Natural Resources Risk to Earthquake-induced Hazard Fig. 118.Natural Resources Vulnerable to Liquefaction/Sinkhole Hazard Fig. 119.Natural Resources Risk to Liquefaction/Sinkhole Hazard Fig.120.Natural Resources Vulnerable to Ground Shaking Hazard Fig. 121.Natural Resources Risk to Ground Shaking Hazard Fig.122.Natural Resources Vulnerable to Ground Rupture Hazard Fig.123.Natural Resources Risk to Ground Rupture Hazard Fig.124.Natural Resources Vulnerable to Tsunami Hazard Fig.125.Natural Resources Risk to Tsunami Hazard Fig.126.Critical Facilities Vulnerable to Flood Hazard Fig.127.Educational Facilities Vulnerable to Flood Hazard Fig.128.Health Facilities Vulnerable to Flood Hazard Fig.129.Critical Facilities Risk to Flood Hazard Fig.130.Educational Facilities Risk to Flood Hazard Fig.131.Health Facilities Risk to Flood Hazard Fig.132.Critical Facilities Vulnerable to Rain-induced Landslide Hazard Fig.133.Educational Facilities Vulnerable to Rain-induced Landslide Hazard Fig.134.Health Facilities Vulnerable to Rain-induced Landslide Hazard Fig.135.Critical Facilities Risk to Rain-induced Landslide Hazard Fig.136.Educational Facilities Risk to Rain-induced Landslide Hazard Fig.137.Health Facilities Risk to Rain-induced Landslide Hazard Fig.138.Critical Facilities Vulnerable to Storm Surge Hazard Fig.139.Educational Facilities Vulnerable to Storm Surge Hazard Fig.140.Health Facilities Vulnerable to Storm Surge Hazard Fig.141.Critical Facilities Risk to Storm Surge Hazard Fig.142.Educationa Facilities Risk to Storm Surge Hazard Fig.143.Health Facilities Risk to Storm Surge Hazard Fig.144.Critical Facilities Vulnerable to Drought Hazard Fig.145.Educational Facilities Vulnerable to Drought Hazard Fig.146.Health Facilities Vulnerable to Drought Hazard Fig.147.Critical Facilities Risk to Drought Hazard

Fig.148.Educational Facilities Risk to Drought Hazard Fig.149.Health Facilities Risk to Drought Hazard Fig.150.Critical Facilities Vulnerable to Sea Level Rise Hazard Fig.151.Educational Facilities Vulnerable to Sea Level Rise Hazard Fig.152.Health Facilities Vulnerable to Sea Level Rise Hazard Fig.153.Critical Facilities Risk to Sea Level Rise Hazard Fig.154.Educational Facilities Risk to Sea Level Rise Hazard Fig.155.Health Facilities Risk to Sea Level Rise Hazard Fig.156.Critical Facilities Vulnerable to Earthquake-induced Landslide Hazard Fig.157.Educational Facilities Vulnerable to Earthquake-induced Landslide Hazard Fig.158.Health Facilities Vulnerable to Earthquake-induced Landslide Hazard Fig.159.Critical Facilities Risk to Earthquake-induced Landslide Hazard Fig.160.Educational Facilities Risk to Earthquake-induced Landslide Hazard Fig.161.Health Facilities Risk to Earthquake-induced Landslide Hazard Fig.162.Critical Facilities Vulnerable to Liquefaction Hazard Fig.163.Educational Facilities Vulnerable to Liquefaction Hazard Fig.164.Health Facilities Vulnerable to Liquefaction Hazard Fig.165.Critical Facilities Risk to Liquefaction Hazard Fig.166.Educational Facilities Risk to Liquefaction Hazard Fig.167.Health Facilities Risk to Liquefaction Hazard Fig. 168. Critical Facilities Vulnerable to Ground Shaking Hazard Fig.169.Educational Facilities Vulnerable to Ground Shaking Hazard Fig.170.Health Facilities Vulnerable to Ground Shaking Hazard Fig.171.Critical Facilities Risk to Ground Shaking Hazard Fig.172.Educational Facilities Risk to Ground Shaking Hazard Fig.173.Health Facilities Risk to Ground Shaking Hazard Fig.174.Critical Facilities Vulnerable to Ground Rupture Hazard Fig.175.Educational Facilities Vulnerable to Ground Rupture Hazard Fig.176.Health Facilities Vulnerable to Ground Rupture Hazard Fig.177.Critical Facilities Risk to Ground Rupture Hazard Fig.178.Educational Facilities Risk to Ground Rupture Hazard Fig.179.Health Facilities Risk to Ground Rupture Hazard

Fig.180.Critical Facilities Vulnerable to Tsunami Hazard Fig.181.Educational Facilities Vulnerable to Tsunami Hazard Fig.182.Health Facilities Vulnerable to Tsunami Hazard Fig.183.Critical Facilities Risk to Tsunami Hazard Fig.184.Educational Facilities Risk to Tsunami Hazard Fig.185.Health Facilities Risk to Tsunami Hazard Fig.186.Land Use Vulnerable to Flood Hazard Fig.187.Land Use Risk to Flood Hazard Fig. 188.Land Use Vulnerable to Rain-induced Landslides Hazard Fig.189.Land Use Risk to Rain-induced Landslides Hazard Fig.190.Land Use Vulnerable to Storm Surge Hazard Fig.191.Land Use Risk to Storm Surge Hazard Fig.192.Land Use Vulnerable to Drought Hazard Fig.193.Land Use Risk to Drought Hazard Fig.194.Land Use Vulnerable to Sea Level Rise Hazard Fig.195.Land Use Risk to Sea Level Rise Hazard Fig.196.Land Use Vulnerable to Earthquake-induced Landslides Hazard Fig.197.Land Use Risk to Earthquake-induced Landslides Hazard Fig.198.Land Use Vulnerable to Liquefaction/Sinkholes Hazard Fig.199.Land Use Risk to Liquefaction/Sinkholes Hazard Fig.200.Land Use Vulnerable to Ground Shaking Hazard Fig.201.Land Use Risk to Ground Shaking Hazard Fig.202.Land Use Vulnerable to Ground Rupture Hazard Fig.203.Land Use Risk to Ground Rupture Hazard Fig.204.Land Use Vulnerable to Tsunami Hazard Fig.205.Land Use Risk to Tsunami Hazard Fig.206.Lifeline Facilities Vulnerable to Flood Hazard Fig.207.Lifeline Facilities Risk to Flood Hazard Fig.208.Lifeline Facilities Vulnerable to Rain-induced Landslide Hazard Fig.209.Lifeline Facilities Risk to Rain-induced Landslide Hazard

Fig.210.Lifeline Facilities Vulnerable to Storm Surge Hazard Fig.211.Lifeline Facilities Risk to Storm Surge Hazard Fig.212.Lifeline Facilities Vulnerable to Drought Hazard Fig.213.Lifeline Facilities Risk to Drought Hazard Fig.214.Lifeline Facilities Vulnerable to Sea Level Rise Hazard Fig.215.Lifeline Facilities Risk to Sea Level Rise Hazard Fig.216.Lifeline Facilities Vulnerable to Earthquake-induced Landslide Hazard Fig.217.Lifeline Facilities Risk to Earthquake-induced Landslide Hazard Fig.218.Lifeline Facilities Vulnerable to Liquefaction Hazard Fig.219.Lifeline Facilities Risk to Liquefaction Hazard Fig.220.Lifeline Facilities Vulnerable to Ground Shaking Hazard Fig.221.Lifeline Facilities Risk to Ground Shaking Hazard Fig.222.Lifeline Facilities Vulnerable to Ground Rupture Hazard Fig.223.Lifeline Facilities Risk to Ground Rupture Hazard Fig.224.Lifeline Facilities Vulnerable to Tsunami Hazard Fig.225.Lifeline Facilities Risk to Tsunami Hazard

# **I. INTRODUCTION**

## Legal Basis for the CDRA of Casiguran, Aurora

The climate and disaster risk assessment (CDRA) is defined by the Housing and Land Use Regulatory Board (HLURB) as the "process of studying risks and vulnerabilities of exposed elements namely, the people, urban areas, agriculture, forestry and fishery production areas, critical point facilities, and lifeline infrastructure associated with natural hazards and climate change. It seeks to establish risk and vulnerable areas by analysing the hazard, exposure, vulnerability/sensitivity and adaptive capacities of the various exposed elements." HLURB adds that a major function of CDRA is to identify priority decision areas that need to be addressed using climate change adaptation and mitigation measures, as well as spatial policy interventions.

This document serves as an essential tool in mainstreaming climate change and disaster risk into the Comprehensive Development Plan (CDP) and the Comprehensive Land Use Plan (CLUP) of Casiguran, Aurora. It follows the supplemental guidelines on mainstreaming climate and disaster risks in land use and development plans (Fig. 2). The goals for incorporating CDRA in CLUPs and CDPs are to:

- Enhance understanding of climate change vulnerabilities and disaster risks affecting the locality
- Prioritize decision areas based on risk and vulnerability assessment
- Determine policy interventions/options with emphasis on risk management options
- Adjust land demand to account for backlogs due to risks and vulnerabilities
- Analyze land supply and suitability based on climate change and possible impacts on the severity and frequency of natural hazards.



Fig. 1. CDRA Workshop, November 7, 2017.



Fig. 2. Climate and Disaster Risk Assessment Process.

## **Historical Origins of Casiguran**

Casiguran was founded in June 13, 1609 when a group of Franciscan friars headed by Fr. Blas Palomino established a mission to the Agta, whom the Spaniards called *Cimarrones*. In 1658, the Franciscans abandoned the mission and the Augustinian Recollect Fathers took over until 1703. After 1703, the Franciscan friars returned. Notable among the missionaries in the area were Fray Pedro de la Concepcion and Fray Joseph Fonte. The name of the town is based from the word *kasiguruhan* meaning "safety" or "assurance".

In 1798, a Muslim fleet of some twenty-five boats harassed the town of Casiguran, Palanan, Isabela, and Baler, taking 450 captives. Because of this incident, the natives of Casiguran built a watchtower at Sitio Dipalale, overlooking the bay. If Moro vintas would enter Casiguran Sound thereon, guards at the watchtower created smoke signals as a sign of incoming intruders. Church bells immediately rang, warning people to take cover at Ermita Hill. A stockpile of logs and stones were also readied at the summit in case raiders attempted to come up.

In 1818, Casiguran was designated as a component of Nueva Ecija. By 1856, Casiguran, Baler, and Palanan were organized into a separate military district, "El Distrito del Principe", governed by a comandante politico-militar, under Nueva Ecija. In June 12, 1902, Casiguran was annexed into the province of Tayabas. The passage of Republic Act 648 on June 14, 1951, recognized Casiguran as a component of the newly created province of Aurora.

#### **CLIMATE AND DISASTER RISK ASSESSMENT**

## **Geographic Information**

Casiguran is located at 122<sup>o</sup> 07' 29" longitude and 16<sup>o</sup> 16' 36" latitude in the northern part of Aurora province (Fig. 3). It is two kilometres away from the nearest shoreline, and approximately 120 km away from Baler, Aurora's capital town. Casiguran has an elevation of about 61 masl (or 200 feet above sea level), bounded on the north by the municipality of Dilasag; on the east by the Pacific Ocean; on the south by the town of Dinalungan; and on the west by Quirino Province. In general, Casiguran landscapes are characterized by about 24% steep slopes (30% to 50% slope), 22% of undulating to rolling slopes (8% to 18%), and 22% very steep areas (slopes of more than 50%). Flat areas (0-3 slope percent) which are generally used for agriculture and settlements consist of 7,517.07 hectares or 10.5 % (Table 1).



Fig. 3. Casiguran, Aurora, Philippines.

SLOPE CATEGORIES				
Slope Class	Description	Area (Has.)	Percent to Total	
0-3	Level to nearly level	7,517.05	10.51	
3-8	Gently sloping to undulating	746.74	1.04	
8-18	Undulating to rolling	15,846	22.15	
18-30	Rolling to moderately steep	14,198.49	19.85	
30-50	Steep	17,393	24.31	
>50	Very steep	15,840.87	22.14	
TOTAL 71,543 100%				

## Table 1. Slope categories in the landscape of Casiguran.

Source: Local Government Unit, 2016

The plain valley landscape of Casiguran was formed by the accumulation of eroded and transported recent alluvial sediments consisting of sub-angular to rounded gravel, pebbles and boulders as well as sand, silt and clay. Casiguran also has the most extensive tidal flats compared to other land areas occupying the eastern foot of the Sierra Madre Mountains lying form North to South. These tidal flats were formed through volcanic uplift and subsequent tensional forces and compression, the surface configuration of which have been carried by erosion, landslides, rock fall fault, folding, soil creeping and deepening of water channels.

The elevation of Casiguran ranges from 2 to 1,670 meters above sea level with the highest peak located on its mid-western portion which is near its boundary with Quirino Province. Most of the area (31.08%) has an elevation of less than 100 meters, while areas located at 300-500 meters cover the least at 12.48% of the total area.

Range of Elevation	Description	Area (has.)	Percent to Total
Α	< 100 m	22,235.73	31.08
В	100-300 m	10,670.62	14.91
С	300-500 m	8,925.71	12.48
D	500-1000 m	17,021.74	23.79
E	>1000 m	12,689.20	17.74
	Total	71,543	100%

Table 2. Elevation Characteristics of Casiguran.

Source: Local Government Unit, 2016

## **Demographic Trends**

In 1960, the recorded population of Casiguran was 6,900. This was almost doubled in 1970 when the population was recorded at 12,128, an increase of about 76% at a growth rate of 0.8% annually. In the 1980 census, the municipality has a total population of 13,925, while the latest 2015 census tallied a population of 24,313. The latest Community-Based Monitoring System (CMBS) in 2016 recorded 27,577.

Year	Population	Per annum growth rate
1903	2,067	_
1918	2,567	+1.45%
1939	6,393	+4.44%
1948	5,643	-1.38%
1960	6,900	+1.69%
1970	12,128	+5.79%
1975	11,670	-0.77%
1980	13,925	+3.60%
1990	18,388	+2.82%
1995	19,578	+1.18%
2000	21,459	+1.99%
2007	22,403	+0.60%
2010	23,865	+2.33%

 Table 3. Population Growth in Casiguran, 1960-2016.

Year	Population	Per annum growth rate
2015	24,313	+0.35%
2016	27,577	—

Source: Local Government Unit, 2016 CBMS Census

Casiguran had a total household population 6,185, based from the 2016 CBMS. For urban areas, Barangay 03 has the least number of households with 64 numbers of households while Barangay 01 has the highest number of households with 192. For rural barangays, Barangay Esperanza has the least number of households (110) while Barangay Bianoan has the highest number of households with 904.

NO.	Barangays	Population	Male	Female	No. of	No. of	Average
					Households	Families	Household
1	01	1,285	854	431	192	302	3.2
2	02	1,000	448	552	168	203	4.4
3	03	257	123	134	64	80	5.0
4	04	244	124	120	68	98	4.0
5	05	406	200	206	107	108	6.0
6	06	208	102	106	78	81	5.0
7	07	343	165	178	79	94	5.0
8	08	710	395	315	157	214	5.0
9	Bianoan	3,960	2,080	1,880	904	1,010	5.0
10	Calabgan	717	367	350	125	163	4.0
11	Calangcuasan	1 171	606	565	305	375	4.0
12	Calantas	2, 056	1,073	983	478	528	4.5
13	Cozo	1,803	802	1,001	410	444	5.0
14	Culat	1,247	654	593	287	331	4.0
15	Dibacong	2,231	1,091	1,140	551	559	4.7
16	Dibet	1,096	552	544	221	249	5.5
17	Ditinagyan	663	336	327	131	167	4.0
18	Esperanza	582	292	290	146	158	5.1
19	Esteves	1,801	947	854	412	442	6.0
20	Lual	1,836	916	920	381	475	4.0
21	Marikit	775	402	373	170	188	4.0
22	San Ildefonso	1,202	625	577	311	318	5.0
23	Tabas	1,051	551	500	224	243	6.0
24	Tinib	933	489	444	216	254	5.0
	TOTAL	27, 577	14,194	13,383	6,185	7,084	5.0

Table 4. Household Composition, Casiguran, Aurora.

Source: Local Government Unit, 2016 CBMS Census

#### **Population Density by Barangay**

Given that Casiguran has total land area of 71,543 hectares distributed in 24 barangays, population density is at 0.385 per hectare as of 2016. However, if the net or effective density of the municipality is calculated using the total alienable and disposable area and the total population, the municipality's density is placed at 0.83 per hectare.

BARANGAY	Population	Area	Population
	-	(hectare)	Density
			(person/ha)
01	1,285	8.59	149.59
02	900	11.47	78.47
03	257	1.47	174.83
04	244	3.13	77.96
05	406	4.93	82.35
06	208	5.48	37.96
07	343	5.92	57.94
08	710	12.23	58.05
Bianoan	3,960	2.02	1960.40
Calabgan	717	5417.73	0.13
Calangcuasan	1 171	319.46	3.67
Calantas	2,056	1079.78	1.90
Cozo	1,803	8382.09	0.22
Culat	1,447	3842.15	0.38
Dibacong	2,231	5284.74	0.42
Dibet	1,096	7016.46	0.16
Ditinagyan	663	9825.08	0.07
Esperanza	582	453.89	1.28
Esteves	1,801	784.89	2.29
Lual	1,836	332.46	5.52
Marikit	775	329.57	2.35
San Ildefonso	1,202	5319.44	0.23
Tabas	1,051	15598.38	0.07
Tinib	933	7412.52	0.13
Total	27,577	71543.88	0.39

Table 5. Population Density, Casiguran, Aurora.

Source: Local Government Unit, 2016 CBMS Census

## **Indigenous Cultural Communities**

According to the National Commission on Indigenous people (NCIP), there are at present 728 indigenous people inhabiting within the municipality of Casiguran. Of this total, 663 and 65 are Dumagats/Agta and Igorots, respectively, with household numbers of 138 and 14, respectively. Barangay Calantas and Culat are the non-Christian reservation areas for Agta in Casiguran.

	Indigenous		Number of
Location	Communities	Population	Households
Brgy. 08:	Agta	11	1
Poblacion			
Calabgan	Agta	103	49
	Kanakanaey	61	10
	Ibaloi	12	2
Cozo: Dipontian,	Agta	172	39
Dumagipo	Agta	103	28

 Table 6. Indigenous Peoples Population, Casiguran, Aurora.

#### **CLIMATE AND DISASTER RISK ASSESSMENT**

	Indigenous		Number of
Location	Communities	Population	Households
Culat: Sitio Paraiso	Agta	45	9
Dibacong: Sitio			13
Gumaninang	Agta	39	6
Esperanza	Agta	16	9
San Ildefonso	Agta	254	77
Tinib: Sitio Mainit	Agta	31	6

Source: Local Government Unit, 2016 CBMS Census

In January to May 1998, the NCIP prepared ancestral domain claims by the IPs in Dinalungan, Casiguran and Dilasag (DICADI). The area claimed by the IPs is estimated to cover 91,872 ha. Or 72% of the total land area of DICADI.

#### Language

Casiguran has a dialect called *Kasiguranin*, derived from the mixture of Ilocano, Visayan, Bicol, Pampango, Gadang, Itawis, Ibanag and many others. Aside from Tagalog which is commonly used, there is also a large number who speaks Ilocano, Bicolano and Visayan dialects. There are about 5 dialects being spoken, Kasiguranin, Tagalog, Bikol, Ilokano and Agta.

Mother Tongue	Population (%)
Tagalog	30.01
Casiguranin	45.50
Ilokano	6.91
Bicolano	10.02
Agta	2
Others	5.56
Total	100%

 Table 7. Population by Mother Tongue, Casiguran, Aurora, as of 2016.

Source: Local Government Unit, 2016 CBMS Census

## **Religious Denominations**

About thirty (30) years ago these were only two major religious sects in the municipality, the Roman Catholic and the Seventh Day Adventist. At present, there are, Iglesia Ni Cristo, Saksi ni Jehovah, Protestant, Born Again, Baptist and others.

## **Income & Economic Base**

## Land and Forest Resources

Casiguran is classified into two (2) major land classifications: "forestland", and "alienable and disposable land." About 85% of the municipality's land areas are classified forestlands and 15% alienable and disposable lands.

## CLIMATE AND DISASTER RISK ASSESSMENT

NO.	BARANGAY	AREA	%
		(HAS.)	
1	Barangay 01	8.9	0.01
2	Barangay 02	11.47	0.02
3	Barangay 03	1.41	0.002
4	Barangay 04	3.13	0.004
5	Barangay 05	4.93	0.007
6	Barangay 06	5.48	0.008
7	Barangay 07	5.92	0.003
8	Barangay 08	12.23	0.02
9	Barangay Bianoan	120.20	0.17
10	Barangay Calabgan	5,417.73	7.57
11	Barangay Calangcuasan	319.46	0.45
12	Barangay Calantas	1,079.78	1.51
13	Barangay Cozo	8,352.09	11.67
14	Barangay Culat	3,842.15	5.37
15	Barangay Dibacong	5,284.74	7.39
16	Barangay Dibet	7,016.46	9.81
17	Barangay Ditinagyan	9,825.08	13.73
18	Barangay Esperanza	453.89	0.63
19	Barangay Esteves	784.89	1.10
20	Barangay Lual	332.46	0.47
21	Barangay Marikit	329.57	0.46
22	Barangay San Ildefonso	5,319.44	7.44
23	Barangay Tabas	15,598.38	21.80
24	Barangay Tinib	7,412.50	10.36
	TOTAL	71,543.00	100.00%

#### Table 8. Land Area by Barangay, Casiguran, Aurora.

Source: MPDC

# Table 9. Land Use Descriptions in Casiguran, Aurora.

Land Uses	<u>Area (ha.)</u>					
Forest Zone	49,124					
Eco-zone	12,496					
Agriculture	7,184					
Settlements	158					
Other uses	2,581					
Total	71,543					
Existing Urban Land Uses						
Land Uses	<u>Area (ha.)</u>					
Agriculture	2.11					
Commercial	1.70					
Institutional	10.23					
Residential	18.30					
Industrial	0.19					
Open Space	0.26					
Roads	11.15					
Vacant Lands	9.22					
Total	53.16					
Source: MPDC						

## Agriculture and Land Utilization by Barangay

Agricultural lands occupy around 7,184 hectares or 10% of the municipality total land area. Agricultural lands are normally planted coconut and/or rice. Other crops planted in the municipality are root crops, banana, citrus and vegetables. Though not significant in terms of land area, fishponds can also be found in the municipality.

Riceland in particular are found in flat and rolling areas. These areas are found in Barangay Esteves, Calantas, Esperanza, Calangcuasan and Culat. As for coconuts, these are usually found in Barangay San Ildefenso, Cozo, Calantas, Esperanza, Calabgan, Esteves, Culat and Dibacong. Barangay San Ildefonso has the widest area, around 1,000 hectares, planted with coconut, followed by Barangay Cozo with 275 hectares. The Poblacion has a relatively smaller area utilized for agriculture, with barangay 1 and 2 planted with rice and coconut.

## **Support Services**

## Financing

The municipality has limited financial institutions especially those that are particularly engaged in financing agriculture production. Existing credit cooperatives in the municipality are the Pangkasama Multi-Purpose Cooperative, Inc. and the Casiguran Multi-Purpose Cooperative, Inc. that offer credit to local farmer. Another financial institution that extends loans for agricultural purposes is the Rural Bank, PR Bank and Aurora Bank of Casiguran. Additionally, the Office of the Provincial Agriculturist is sourcing certified seeds from PhilRice to distribute to farmers.

#### Agricultural Technology

Agencies that extend technical assistance to local farmers/cooperative are the Department of Agriculture/Department of Agrarian Reform (DA/DAR) and Philippine Coconut Authority (PhilCoA). Technology transfer is done through constant trainings, exposure to actual application of agricultural technology through field visits, and farmer classes.

#### Post-Harvest Infrastructure

The National Food Authority and the Aurora Integrated Area Development (Phase 1) worked in partnership to construct grain warehouses with an aggregate capacity of 20,000 sacks. Barangays 1, 4, Dibet, Marikit and San Ildefonso have one warehouse each. Barangays 6 have 4 have warehouses, Barangays 8 and Calangcuasan each have 3 warehouses.

Common agriculture support facilities are hand tractors and threshers, while postharvest facilities are rice mills, haulers, and solar dryers. Due to inadequacy of agriculture facilities, local farmers resort to other means of satisfying their needs and demands in relation to processing, maintaining and preserving agriculture products.

#### Irrigation System

Given the lush forest cover, water abounds in the municipality. There are several existing communal irrigation systems (CIS) in the municipality servicing around 2,030 hectares. Five of this existing CIS were made operational through the support of the National Irrigation Administration. The other CIS were established through private support.

#### **CARP** Areas

Comprehensive Agrarian Reform Programs (CARP) areas in the municipality are distributed in 12 barangays. Brgy. Esteves (64.6774 hectares) and Tabas (58.761 hectares) have the largest agricultural lands distributed to farmers under (CARP) starting in 1991.

#### Poultry and Livestock, Fishing and Aquatic Resources

In terms of livestock preferences, hog raising is the most preferred, followed by chicken raising and goat raising.

Casiguran Bay and Casiguran Sound are the two major fishing grounds in the municipality. Casiguran Bay is 7.7 kilometers long and 5.9 kilometers wide. Casiguran Sound is 20 kilometers long and 11 kilometers wide. Another fishing ground is Casapsapan Bay which Casiguran shares with the Municipality of Dilasag. There are 241 motorized fishing vessels/crafts and about 115 non-motorized. Fish are normally caught using hook and line and gillnet. The common species caught are snappers, crevalle, big-eyed scads, and groupers. The estimated daily catch is 650 kilograms.

Information gathered from the Office of the Municipal Agriculturist indicates that around 14.8 hectares are utilized for inland fishponds. These are located in areas with brackish water. Only about 0.85 hectares of fishponds are within fresh waters.

In 2007, brackish water and freshwater fishpond had a combined produce of 24,000 and 19.50 metric tons of *bangus*, respectively. The fish catch of the municipality are marketed at the municipal public market while others are brought to the Province of Quirino and Isabela. Esteves has the highest volume of catch among the different barangays.

i able 10. Annual ISII Catch per barangay							
Barangay	Volume of Catch per kg						
Lual	2,770						
Marikit	930						
Calangcuasan	1,480						
Dibacong	4,400						
Esteves	6,200						
Dibet	1,050						
Calabgan	1,170						
Ditinagyan	1,780						
Cozo	2,230						
San Ildefonso	5,200						
Culat	820						
Total	28,030						

Table 10. Annual fish catch per barangay

Source: MAO 2017

#### **Commerce and Industry**

Commercial establishments in the municipality are generally within the category of neighbourhood scale operations where they can serve or provide the basic commodity needs to at least 100 families. These commercial establishments include variety stores, bakeries, hardware appliance store, school supplies and furniture. There is a concentration of these establishments and services in the Poblacion.

Sites frequented by residents include Casapsapan Beach in Brgy. Culat and Motiong Beach, which both have white sand beaches. Agoho (*Casuarina equisetifolia* 

Linn.) trees line up the shores of Motiong Beach. Other sites worth visiting in the municipality are Mainit Spring in Brgy. Tinib, and Ditinagyan Falls in Brgy. Ditinagyan.

#### Forest-Based Economic Activities

Aurora Province is rich in forest resources. The forest covers in Casiguran are categorized as mossy forest, sub-marginal, residual, and mangrove. The production forest in the municipality includes the mineral lands and areas that are logged through a Timber Licensing Agreement (TLA).

The production forest encompasses around six barangays (Calabgan, Dibacong, Dibet, Ditinagyan, Tinib and Tabas). There are 6,938 hectares under the Verdant Agro-Forest Development Corporation Integrated Forest Management Agreement (VAFDC-IFMA), while the Industries Development Corporation (IDC) IFMA area has 9,466 hectares.

#### **Development Vision, Mission, & Goals**

The municipal government of Casiguran aims to promote the general welfare of its constituents by:

- Harnessing its human resources through promotion of high standards of education and continuing professional development.
- Upholding the right and dignity of marginalized sector through quality health and social services;
- Adopting modern packages of agricultural technology for food security;
- Creating an economic environment that promotes equal opportunities to investors and other stakeholders.
- Preserving and enriching the socio-cultural heritage akin to Casiguranins;
- Upholding the right of the people to a balanced ecology through protection and conservation of rich natural resources;
- Adopting measures to maintain peace and order to ensure public safety and security;
- Adopting time-honored principles, values and innovative systems in local governance; and
- Establishing and strengthening linkages with other government organizations, non-government organizations and other sectors of the society.

The vision of the municipality is as follows: **"A model community based tourism destination in the region with a vibrant economy supporting empowered, safe and secured Casiguranin who are sustainably utilizing resources and developing, well-planned resilient communities under a competent transparent and participative leadership".** By 2023, the Municipality of Casiguran envisions a premier municipality prioritizing the following areas for short and medium-term programs and policies:

- Continuing education,
- Becoming a business-friendly municipality,
- Low cost decent housing,
- Medical/health care and emergency services,
- Quality infrastructure,
- Crisis management,
- Healthy and sustainable environment,
- Public safety and police assistance,

- Public utilities and consumer protection,
- Good governance
- Agriculture Productivity
- Opportunities for Livelihood,

Subsequently, the municipality's mission; **"pursue vigorous efforts towards a safe, productive and a healthy community"**, aims to rely on the municipality's strategic resources such as tourism, trade and commerce, education services, and infrastructure systems for its incomes.

## **II. CLIMATE CHANGE PROJECTIONS & HAZARD INFORMATION**

Atmospheric, Geophysical and The Philippine Astronomical Services Administration (PAGASA), the University of the Philippines National Institute of Geological Sciences (UP NIGS), the Department of Agriculture (DA) through the Philippine Rice Research Institute (PhilRice), the National Economic and Development Authority (NEDA), the Food and Nutrition Research Institute (FNRI), and the Community Based Monitoring System (CBMS) forged a joint project with the Food and Agriculture Organization's (FAO) Analysis and Mapping of Impacts under Climate Change for Adaptation and Food Security (AMICAF), and the University of Cantabria in Spain, to create the latest climate change projections for the Philippines as of 2014. Results from the project were compiled and processed by PAGASA, together with Japanese scientist consultants, to create projected climate scenarios from 2011 to 2040 (PAGASA 2014).

Three global circulation models (GCMs) were used for the 2014 climate change projections. These are the Bergen Climate Model Version 2 (BCM2), Centre National de Recherches Météorologique (CNRM) Climate Model Version 3 (CNCM3), and Max Planck Institute ECHAM Version 5 (MPEH5). The Bergen Climate Model, developed by Furevik et al. (2003) of the Bjerknes Centre for Climate Research in Bergen, Norway, uses a coupled atmosphere-ocean-sea-ice general circulation model. The second model, CNCM3, is an ocean-atmosphere model initially developed at the Centre of Basic and Applied Research Specialized in Modelling and Numerical Simulation (CERFACS) in Toulouse, France, and later on, regularly updated at the Center National Weather Research (CNRM). CNCM3 was developed by Salas-Melia et al. (2005) from CNRM. Finally, MPEH5 was developed by Roeckner et al. (2003) of the Max Planck Institute for Meteorology in Germany, which is also used by various papers on climate change research.

Each of the three GCMs has its strengths and weaknesses and has been determined by PAGASA to collectively assess projected climatic conditions in the Philippines. Overall, the trend analysis made by PAGASA showed that the observed mean temperature in the Philippines has increased by 0.64 °C during the last 60 years (1951-2010). Daytime maximum temperatures have increased by 0.36 °C, while minimum temperatures increased by 1 °C during the last 60 years (PAGASA 2014).

For the projections, guidelines from the Housing and Land Use Regulatory Board (HLURB) for crafting local government unit (LGU) climate and disaster risks assessments (CDRA), suggest the use of the A1B storyline of the Intergovernmental Panel on Climate Change (IPCC). This indicates "a future world of very rapid economic growth, with the global population peaking in mid-century and declining thereafter and there is rapid introduction of new and more efficient technologies with energy generation balanced across all sources" (PAGASA, 2011). This CDRA likewise utilizes this medium-range scenario for determining future climate scenarios and for planning necessary adaptation strategies.

## **Seasonal Minimum Temperatures**

Seasonal minimum temperatures for December, January and February will increase by 2011-2040. Based from three GCMs, minimum temperatures will increase around 0.6 to 1.4 degrees Celsius. For March, April and May, temperature will also

increase by 2011-2040. Based from three GCMs, minimum temperatures will increase 0.4 to 1.1 degrees Celsius. June, July and August temperatures will increase by 2011-2040. Based from three GCMs, minimum temperatures will increase 0.2 to 0.7 degrees Celsius. Finally, temperatures for September, October and November will increase by 2011-2040. Based from three GCMs, minimum temperatures will increase 0.7 to 0.9 degrees Celsius (Table 11).

						Specific Change Expected by 2011-2040 (2014 PAGASA Projection)									
IVIIN	(1971_2000)				%	% BCM2 %		%	CNCM3		%	MPEH5			
		(1)	/1-2000/			change	Pro	ojection	change	Pro	ojection	change	Pro	Projection	
19.6	°C during DJF (BCM2 baseline)	19.7	°C during DJF (CNCM3 baseline)	19.6	°C during DJF (MPEH5 baseline)	5.0%	20.6	°C during DJF (BCM2 baseline)	7.0%	21.1	°C during DJF (CNCM3 baseline)	3.0%	20.2	°C during DJF (MPEH5 baseline)	
21.3	°C during MAM (BCM2 baseline)	21.5	°C during MAM (CNCM3 baseline)	21.4	°C during MAM (MPEH5 baseline)	2.0%	21.8	°C during MAM (BCM2 baseline)	4.0%	22.3	°C during MAM (CNCM3 baseline)	5.0%	22.5	°C during MAM (MPEH5 baseline)	
22.4	°C during JJA (BCM2 baseline)	22.4	°C during JJA (CNCM3 baseline)	22.4	°C during JJA (MPEH5 baseline)	2.0%	22.8	°C during JJA (BCM2 baseline)	1.0%	22.7	°C during JJA (CNCM3 baseline)	3.0%	23.1	°C during JJA (MPEH5 baseline)	
21.7	°C during SON (BCM2 baseline)	21.8	°C during SON (CNCM3 baseline)	21.8	°C during SON (MPEH5 baseline)	3.0%	22.4	°C during SON (BCM2 baseline)	4.0%	22.7	°C during SON (CNCM3 baseline)	3.0%	22.4	°C during SON (MPEH5 baseline)	

Table 1. Projected change in minimum seasonal temperature in Casiguran,Aurora during 2011-2014.

Source: PAGASA (2014)

#### **Seasonal Maximum Temperatures**

Seasonal maximum temperatures for December, January and February will increase by 2011-2040. Based from three GCMs, maximum temperatures will increase around 0.6 to 1.1 degrees Celsius. For March, April and May, maximum temperatures will also increase by 0.9 to 1.2 degrees Celsius. June, July and August maximum temperatures will increase by 0.3 to 0.9 degrees Celsius. Finally, temperatures for September, October and November will increase by 0.6 to 1.8 degrees Celsius (Table 12).

Maximum Tomporature Observed Paseline				Specific Change Expected by 2011-2040 (2014 PAGASA Projection)										
					%	% BCM2		%	CNCM3		%	MPEH5		
(19/1-2000)			change	change Projection		change	Pr	ojection	change	Projection				
	°C during		°C during		°C during			°C during			°C during			°C during
	DJF		DJF		DJF	1.0%		DJF	8.0%		DJF	2.0%		DJF
	(BCM2		(CNCM3		(MPEH5	4.070		(BCM2	0.070		(CNCM3	2.070		(MPEH5
28.5	baseline)	28.4	baseline)	28.5	baseline)		29.6	baseline)		30.7	baseline)		29.1	baseline)
	°C during		°C during		°C during			°C during			°C during			°C during
	MAM		MAM		MAM	2.0%		MAM	2.00/		MAM	4.0%		MAM
	(BCM2		(CNCM3		(MPEH5	5.0%		(BCM2	5.0%		(CNCM3	4.0%		(MPEH5
30.4	baseline)	30.7	baseline)	30.7	baseline)		31.3	baseline)		31.6	baseline)		31.9	baseline)
	°C during		°C during		°C during			°C during			°C during			°C during
	JJA		JJA		JJA	1 00/		JJA	0.0%		JJA	2.00/		JJA
	(BCM2		(CNCM3		(MPEH5	1.0%		(BCM2	0.0%		(CNCM3	3.0%		(MPEH5
30.6	baseline)	30.7	baseline)	30.5	baseline)		30.9	baseline)		30.7	baseline)		31.4	baseline)
	°C during		°C during		°C during			°C during			°C during			°C during
	SON		SON		SON	4.0%		SON	6.0%		SON	2.0%		SON
	(BCM2		(CNCM3		(MPEH5	4.0%		(BCM2	0.0%		(CNCM3	2.0%		(MPEH5
29.7	baseline)	29.9	baseline)	30.0	baseline)		30.9	baseline)		31.6	baseline)		30.6	baseline)

## **Table 2. Seasonal Maximum Temperatures**

Source: PAGASA (2014)

## **Seasonal Rainfall**

The projected rainfall change in 2036-2065 indicates a decrease during the southwest monsoon season (June, July and August) and the transition from northeast to southwest monsoon seasons (September, October and November). During the northeast monsoon season (December, January and February), the amount of rainfall will increase by 8.5% and increase by 6.8% during the dry season (March, April and May). The projected rainfall change in 2070-2099 shows a decrease of 14.5% during southwest monsoon. In general, there is a slight increase of rainfall during the northeast monsoon season, but will decrease during the southwest monsoon season, and during the transition from northeast to southwest monsoon seasons (Table 13).

Rainfall Observed Baseline (1971-2000)					Specific Change Expected by 2011-2040 (2014 PAGASA Projection)									
					% BCM2 change Projection ch		% change	CNCM3 Projection		% change	MPEH5 Projection			
238	mm during DJF (BCM2 baseline)	285.5	mm during DJF (CNCM3 baseline)	243.3	mm during DJF (MPEH5 baseline)	26.1%	300.6	mm during DJF (BCM2)	18.1%	337.2	mm during DJF (CNCM3)	21.1%	294.6	mm during DJF (MPEH5)
178	mm during MAM (BCM2 baseline)	178.5	mm during MAM (CNCM3 baseline)	154.7	mm during MAM (MPEH5 baseline)	13.6%	202.7	mm during MAM (BCM2)	17.0%	208.8	mm during MAM (CNCM3)	37.5%	212.7	mm during MAM (MPEH5)
321	mm during JJA (BCM2 baseline)	347.4	mm during JJA (CNCM3 baseline)	321.3	mm during JJA (MPEH5 baseline)	-0.8%	318.6	mm during JJA (BCM2)	25.2%	434.9	mm during JJA (CNCM3)	13.1%	363.4	mm during JJA (MPEH5)
306	mm during SON (BCM2 baseline)	317.3	mm during SON (CNCM3 baseline)	339.9	mm during SON (MPEH5 baseline)	17.1%	358.1	mm during SON (BCM2)	10.0%	349.0	mm during SON (CNCM3)	5.9%	360.0	mm during SON (MPEH5)

Table 3. Projected o	change in sea	isonal rainfall	(%) in	2036-2065	and 2100 and
observed baseline	(1971-2000)	in Casiguran, A	Aurora		

Source: PAGASA (2014)

## **Hot Days**

While the previous three climatic projections were based from PAGASA's 2014 projections, projections for hot days, dry days, and extreme rainfall events were not included in the 2014 publication. Data used for hot days, dry days, and extreme rainfall were therefore based from PAGASA's 2011 projections. Using the 2011 data, temperature increase is seen to contribute to the number of days with temperature higher than 35°C. There will be an increase of 422 days of hot days in 2006-2035, indicating 27.3 hot days per year, as compared to 397 hot days in 1971-2000 (or 13.23 hot days per year). It will further increase to 2008 hot days in 2036-2065, or 66.93 hot days per year (Table 14).

## Dry Days

Based from PAGASA's 2011 projections, there will be an increase of dry days in 2006-2035, indicating 205.87 days with <2.5 mm of rain per year. This means that most of the year from 2006-2035, there will be more days with less rainfall. Dry days will very slightly decrease in 2036-2065 (about a day less compared to 2006-2035) to 205.37 dry days per year (Table 14).
No. o	f Days w/ >3	5°C	No. of Days	w/ <2.5 mm	of rain per year
1971-2000 (baseline)	2006-2035	2036-2065	1971-2000 (baseline)	2006-2035	2036-2065
397	819	2008	1,295	205.87	205.37
Source, DA	CACA 2011				

Table 4. Projected change in the frequency extreme events under medium-range emission scenarios in 2020 and 2050 and observed baseline (1971-2000).

Source: PAGASA, 2011

### **Extreme Daily Rainfall Events**

Using PAGASA's 2011 data, extreme daily rainfall events, or days with more than 200 mm of rain, will increase in 2006-2035 and 2036-2050 by 1.43 days per year, from the 0.4 day/year of wet days during 1971-2000. During the baseline of 1971-2000, 12 days were observed to have rainfall more than 200 mm. It is projected that from 2006-2035, and 2035-2065, each time period is projected to have 43 days of extreme daily rainfall events.

### Sea Level Rise

Based from Kahana et al. (2016), sea levels in the Philippines are seen to increase by 0.48-0.69 meters by the end of 2100. Positive sea level rise will occur for the Philippines for Representative Concentration Pathway (RCP) 4.5 for 2080-2100 based from 5th IPCC Assessment Report (AR5).

An RCP, in this case, RCP 4.5, is one of many models or pathways of how greenhouse gas emissions (under specific greenhouse gas emission rates) affect global climatic conditions. For a more comprehensive discussion of RCPs and its various implications to global climatic conditions, including projected sea levels, see van Vuuren et al. (2011).

## **Hazard Inventory**

Natural hazards in Casiguran are flooding, rain-induced landslides, storm surges, ground shaking, ground ruptures, liquefaction, earthquake-induced landslides and tsunami. Detailed information of hazards were taken from the community risk assessment, participatory capacity, vulnerability assessment, geo-hazard assessment and hazard maps from Mines and Geosciences Bureau (MGB), PAG-ASA, and DOST Project NOAH (Nationwide Operation of Assessments and Hazards).

## **Flood Susceptibility**

The topography of Casiguran is characterized by the rugged terrain of the Sierra Madre mountain range running the entire length of the municipality. The lowland areas, which are characterized by alluvial plains, are found along the coast of the Casiguran Bay (Fig. 4).



Fig. 1. Flood Hazard Map of Casiguran, Aurora.

On the eastern coast, the Cape of San Ildefonso shields the settlement areas of the municipality from the onslaught of the passing typhoons. A number of barangays, however, are still susceptible to flooding, as shown in the following table.

Barangay	Purok/Sitios/Areas highly susceptible to flooding
Barangay 01	areas along AMRO River
Barangay 04	areas along AMRO River
Barangay 06	areas along AMRO River
Barangay 08	areas along AMRO River
Calantas	Purok 2 and New Public Market
Culat	Capongsohan 1 and 2 and Lalau
Esperanza	Dipagbato, Lada, and Bal-ong
Lual	areas along AMRO River
Marikit	Cabugao and Centro
Tabas	Proper and Bukton

Table 5. Barangays	potentially ex	posed to high	susceptibility	v in flooding.
rubic of burunguys	potentially ex	posed to man	Susceptionit	, in noouing.

#### **Rain-Induced Landslide**

Topography is a critical factor in determining areas prone to rain-induced landslides. The susceptibility map (Fig. 5) prepared by the MGB reflects four (3) susceptibility levels:

- High- presence of active/ recent landslides; large tension cracks that would affect the community; areas with drainage that are prone to landslide damming; steep slopes (21-55 % gradient)
- Moderate- areas with inactive and old landslide; small tension cracks are located away from the community; moderately steep slopes (15-30%); small, shallow landslides (less than 1.0-meter vertical displacement)
- Low- gently sloping to sloping; absence of tension cracks; flat terrain (5-15%)

In general, areas highly susceptible to rain-induced landslide include mountainous portions of the municipality with slope categories within the 30 - 50% and greater than 50% range.

Although it can be noted that the areas highly susceptible to landslides are relatively less populated and less developed, landslide occurrences can still pose threats once it reaches the foot slopes of mountains where settlements are located. Landslides also have the potential of destroying roads and bridges, isolating several upland communities.

Another landslide susceptibility level worth noting are the possible accumulation zones which are described as areas to be likely affected by transported landslide materials. These areas are the potential build up zones of land masses and slab of rocks that when disturbed can cause damage to nearby lowland communities. In Casiguran, the possible accumulation zones identified by the MGB are those located along the foot slopes, in between high and moderate landslide susceptibility zones.

Barangay	Purok/Sitios/Areas highly susceptible to rain- induced landslide
Bianoan	Purok 4, 5 and 6
Calabgan	Northwestern Part (Mountainous Area)
Calantas	Sitio Mucdol
Cozo	Busok-busok, Kinabunglan, Dinipan and Agues
Culat	Sitio Malandeg to Sitio Paraiso and Sitio Buked
Dibacong	Purok 6 and 7 and the Northern Mountainous Part
Dibet	Sitio Pulang Lupa Upper and Along National Road
Ditinagyan	Northwestern MountainousPart
San Ildefonso	Purok 1, 2, 3, 4, 5, 6 and 7

Table 0. Dalangays memy susceptible to Nam-muuleu Lanushues.
--



Fig. 2. Rain-induced Landslide Hazard Map.

#### **Storm Surge**

Storm Surge hazard map for the municipality of Casiguran reveals that the town especially the (8) barangays along Casiguran Bay, (3) barangays along Casiguran Sound, one barangay facing Casapsapan Bay, and two barangays facing the Philippine Sea are most vulnerable to this hazard and with these the built-up areas and settlements commonly found near the shore (Table 17 and Fig. 6).

Barangay	Purok/Sitios/Areas susceptible to Inundation of more than 1 to 4m surge
Calabgan	Purok 5
Calangcuasan	So. Dangkalan 1
Cozo	So. Dungon, Busok-busok, Site, Kinabunglan, Kataguman, Gabgab, Dinipan
	and Dumaguipo
Culat	So. Paraiso along Casapsapan Area
Dibacong	Purok 1, 2, 4, 5, 6 and 7
Dibet	So. Centro, Kasanglayan, Pajo and School Zone
Ditinagyan	So. Labasan
Esteves	So. Buaya, Centro, Landing Block 2 and Motiong
Lual	Purok 1
San Ildefonso	Purok 1,2,4,5,6 and 7
Tinib	Purok 1

Table 7. Baran	gays susceptible to inundation of more than 1 to 4 m storm surge
Davangau	Durch Sition (Aroon suggestible to Inundation of more than 1 to Am surge



Fig. 3. Storm Surge Hazard Map.

#### **Ground Rupture**

The Casiguran Fault has been identified as the most active zone in the Northern Philippines. On August 2, 1968, a severe and destructive earthquake from the Casiguran Fault killed 270 persons and injured 261. Due to the proximity of the municipality to the fault, all barangays are prone to ground-shaking events arising from tectonic plate movements. A total of 14 barangays are particularly transected by the Casiguran Fault, namely: Poblacion 2, Poblacion 8, Bianoan, Calabgan, Calangcuasan, Calantas, Cozo, Culat, Dibacong, Dibet, Ditinagyan, Esperanza, Lual, and Tinib (Fig. 7).



Fig. 4. Ground Rupture Hazard Map.

#### Liquefaction

In general, the whole municipality is highly susceptible to liquefaction (Fig. 8). Soil characteristics in the municipality are contributory to this liquefaction susceptibility. Lowland soils of Casiguran are considered young and formed of fluvio-marine sediments and alluvial materials. These are sub-categorized into coastal and alluvial landscapes. Coastal landscapes are composed of active tidal flats (natural mangroves and nipa) and beach ridges and depressions. On the other hand, alluvial landscape is composed of swamps of mixed tree and grass type marshes, river terraces, broad alluvial plains and colluvial fans.

Broad alluvial plains are generally poorly drained, which are presently planted with rice and coconuts. Most settlements are found in these areas. These areas have soils with fine loamy to clayey textures, no apparent erosion and with slight to moderate flooding. Colluvial plains are "moderately" to "well-drained" areas, consisting of soils that are fine loamy, and shallow to very deep. Some of these areas have no apparent erosion while others have slight to moderate erosion, particularly along rivers and creeks.



Fig. 5. Liquefaction Map of Casiguran.

#### Earthquake-Induced Landslide

There are 11 barangays susceptible to earthquake-induced landslides. The specific areas within the barangays highly susceptible to such landslides are shown in the following table and figure.

Barangay	Purok
Bianoan	Purok 4,5 and 6
Calabgan	Mountainous Area
Calantas	So. Mucdol
Cozo	So. Dungon, Busok-busok, Site, Agues, Kinabunglan, Kataguman, Gabgab,
	Dinipan and Dumaguipo
Culat	So. Buked, Malandeg, Diaga and Paraiso
Dibacong	Purok 6, 7 and mountainous part
Dibet	So. Pulang Lupa, Pajo and mountainous part
Ditinagyan	Mountainous part
San Ildefonso	Purok 1 to 7
Tabas	Mountainous Part
Tinib	So. Pugo, Mainit and Mountainous Part

<b>Fable 8. Barangays</b>	Susceptible to	Earthouake	Induced-	Landslide.
abie of barangays	bubeeptible to	Duringuane	maacca	Lanaonaci



Fig. 6. Earthquake-Induced Landslide Hazard Map.

### Tsunami

There are 19 barangays highly susceptible to tsunami (Fig. 10). These are the eight barangays of the Poblacion, Calabgan, Calantas, Calangcuasan, Culat, Dibacong, Dibet, Esperanza, Esteves, Lual, Marikit, and Tabas.



Fig. 7. Tsunami Hazard Map of Casiguran.

### **Records of Disasters**

Two destructive earthquakes recorded in the Philippines occurred in the province of Aurora. At 4:19 AM on August 02, 1968 an earthquake with an intensity of VIII in the Rossi-Forel Intensity Scale affected Casiguran. Two hundred seventy (270) persons were killed and 261 were injured as a result of the earthquake. Another destructive earthquake occurred on April 7, 1970 with a magnitude 7.0, damaging the road from Baler to Bongabon. The main road from San Luis to Baler had cracks about 0.5 meter wide and 0.5 meter deep. A tsunami was recorded at 1:34 pm on the same date.

Other disaster occurrences are listed in the following tables.

Hazard Events and	Date of Hazardous Event	Affected Number of Barangay Casualties		Number of Affected Persons		Number of Damaged Houses			
Descripti on		S	Dea d	Injure d	Missi ng	Person s	Famili es	Totall v	Partial lv
Typhoo								y	<u> </u>
n	Monday, August	24							
Labuyo	12, 2013	barangays	1	0	0	0	7752	804	1269
	Wednesday,								
Landslid	December 11,	San							
е	2013	Ildefonso	4	0	0	5	1	1	0
Typhoo	Thursday, October	24							
n Lando	08, 2015	barangays	2	280	0	-	6579	1009	3946
Typhoo	Monday, October	24							
n Karen	16, 2017	barangays	0	0	0	-	512	0	58
Typhoo	Thursday, October	24							
n Lawin	19, 2017	barangays	0	0	0	0	1732	-	81

 Table 9. Previous disaster occurrences in Casiguran.

Tuble 10, 1 revious disuster occurrences in cusigurun and its infunctur costs.
--

und Description	rdous Event	arangays			Cost of Damaged Properties (in PhP)		
Hazard Events a	Date of Haza	Affected <b>F</b>	Infrastructure	Agriculture	Private/Comm ercial Properties	Other Classification (Please snecifv)	Total
Typhoon Labuyo	Monday, August 12, 2013	24 barangays	₱ 101,928,100.00	₱ 64,592,944.00	₱ 482,225,971.00	₱7,110,000.00	₱ 655,857,015.00
Landslide	Wednesday, December 11, 2013	San Ildefonso	ı	ı	ı	1	I

and Description	rdous Event	arangays	Cost of Damaged Properties (in PhP)								
Hazard Events a	Date of Haza	Affected B	Infrastructure	Agriculture	Private/Comm ercial Properties	Other Classification (Please specify)	Total				
Typhoon Lando	Thursday, October 08, 2015	24 barangays	₱ 30,686,000.00	₱ 65,704,425.00	₱ 89,460,000.00		₱ 185,850,425.00				
Typhoon Karen	Monday, October 16, 2017	24 barangays		₱ 66,805,281.25			₱ 66,805,281.25				
Typhoon Lawin	Thursday, October 19, 2017	24 barangays		₱ 66,805,281.25			₱ 66,805,281.25				

### **Hazard Susceptibility**

The hazard susceptibility inventory matrix shows a summary of barangays having been affected by several hazard categories based on the hazard maps developed by concerned agencies. Barangay Cozo, Culat, Dibacong, Dibet, and Tinib are considered to be highly susceptible (90.91 %) to various hazards (n=11). The most common hazard, as identified by local government unit personnel, are droughts (seen to impact all 24 barangays), liquefaction or sinkholes (seen to impact 23 barangays), and ground shaking (seen to impact all barangays). The least common hazard is volcanic eruption, as no barangays are considered to be affected by such hazard. Additionally, a matrix is presented below for different hazards and their % coverage, and hazard susceptibility.

	Barangay	Flood	Rain- Induced Landslide	Storm Surge	Drou ght	Sea Level Rise	Earthquak e-induced landslide	Liquefac tion / Sinkhole	Grou nd shaki ng	Ground Rupture	Tsuna mi	Volca nic Erupt ion	Haz ard Cou nt	Hazard Suscepti bility % of Baranga V
1	Barangay 1 (Pob.)	1	not susceptibl e	not susceptibl e	1	1	not susceptibl e	1	1	not susceptibl e	1		6	54.55%
2	Barangay 2 (Pob.)	1	1	not susceptibl e	1	1	1	1	1	1	1		9	81.82%
3	Barangay 3 (Pob.)	1	1	not susceptibl e	1	1	1	1	1	not susceptibl e	1		8	72.73%
4	Barangay 4 (Pob.)	1	not susceptibl e	not susceptibl e	1	1	not susceptibl e	1	1	not susceptibl e	1		6	54.55%
5	Barangay 5 (Pob.)	1	1	not susceptibl e	1	1	1	1	1	not susceptibl e	1		8	72.73%
6	Barangay 6 (Pob.)	1	not susceptibl e	not susceptibl e	1	1	not susceptibl e	1	1	not susceptibl e	1		6	54.55%
7	Barangay 7 (Pob.)	1	not susceptibl e	not susceptibl e	1	1	not susceptibl e	1	1	not susceptibl e	1		6	54.55%
8	Barangay 8 (Pob.)	1	not susceptibl e	not susceptibl e	1	1	not susceptibl e	1	1	1	1		7	63.64%
9	Bianuan	1	not susceptibl e	not susceptibl e	1	1	not susceptibl e	1	1	1	1		7	63.64%
10	Calabgan	1	1	1	1	1	1	1	1	1	1		10	90.91%
11	Calangcuasan	1	not susceptibl e	1	1	1	not susceptibl e	1	1	1	1		8	72.73%
12	Calantas	1	1	susceptibl e	1	1	1	1	1	1	1		9	81.82%
13	Cozo	1	1	1	1	1	1	1	1	not susceptibl e	1		9	81.82%
14	Culat	1	1	1	1	1	1	1	1	1	1		10	90.91%
15	Dibacong	1	1	1	1	1	1	1	1	1	1		10	90.91%
16	Dibet	1	1	1	1	1	1	1	1	1	1		10	90.91%
17	Ditinagyan	1	1	not susceptibl	1	1	1	1	1	not susceptibl	1		10 8	90.91% 72.73%
18	Esperanza	1	not susceptibl	е 1	1	1	not susceptibl	1	1	e not susceptibl	1		7	63.64%
20	Lual	1	not susceptibl e	1	1	1	not susceptibl e	1	1	not susceptibl e	1		7	63.64%
21	Marikit	1	not susceptibl e	1	1	1	not susceptibl e	1	1	1	1		8	72.73%
22	San Ildefonso	1	1	1	1	1	1	1	1	not susceptibl e	1		9	81.82%
23	Tabas	1	1	not susceptibl e	1	1	1	1	1	1	1		9	81.82%
24	Tinib	1	1	1	1	1	1	1	1	1	1		10	90.91%
Bara	angays Covered			40						4.0				
	by Hazard	24	14	12	24	24	14	24	24	13	24	0		
% Co in	verage of Hazard Municipality	100.0 0%	58.33%	50.00%	100.0 0%	100.0 0%	58.33%	100.00	100.0 0%	54.17%	100.0 0%	0.00		

# Table 11. Hazard Susceptibility Inventory (as of 2017).

# **III. IMPACT CHAIN ANALYSIS**

"Impacts" is used to refer to the effects on natural and human systems of physical events, of disasters, and of climate change – IPCC. HLURB describes these impacts chains as follows: "Impact chains provide the most important chains of cause and effect leading to the potential impacts relevant in the planning area. This can help identify the key development areas/sectors where climate change and disasters will likely impact and guide the detailed study of establishing the level of risks and vulnerabilities of the area".

In the municipality of Casiguran, the major areas affected due to extreme rainfall brought by climate change are agriculture, population, human health and infrastructures. Extreme rainfall triggers flash flood directly damaged the crops, livestock and fisheries. A secondary impact in this area includes loss or decrease of agricultural yields and productions, insufficient food supplies and increase of demands and prices of the prime commodities. While under the areas of population, the major concern is the human displacement with secondary impacts such as increase poverty level and high cost of living, increase demands of employment and livelihood. The following effects when the government and tourism related infrastructures were damaged are interruption in the delivery of basic social services, interruption of human mobility, and the decrease of tourist arrival and income. Effects such as the increase in water-bourne related diseases brought about by flooding may increase the morbidity and mortality rate of the municipality.

Climate Variable	Describe Impacts to Population	Describe Impacts to Natural Resource-Based Production Areas	Describe Impacts to Critical Point Facilities	Describe Impacts to Urban Use Areas	Describe Impacts to Lifeline Utilities
Future Temperature Trends	increase the level of stress, upper respiratory infections, dehydration, human displace, infectious diseases, skin infection, poverty and malnutrition, heat stroke, hypertension	-decrease in crop production due to low crop absorption of nutrients -altered ecosystem due to migration of important species -decrease in fish population due to coral bleaching caused by increase in temparature -decrease in poultry and livestock population due to heat stress -decrease in inland fishery production due to drying of ponds	disruption of governmen t services, water supply shortage	reduced availability of potable water supply to sustain urban use areas	increased electric consumption , water shortage and revenue lost
Future Rainfall Trends	increase level of diarrhea, parasitism, dengue fever,skin infection, measles, influenza,malnutrition,pneum onia, suspension of classes, leptospirosis	decreased in crop production due to submersion and siltation -destruction of upland farm due to heavy/continous rainfall	disruption of governmen t services, delayed governmen t constructio n projects,	reduced availability of potable water supply to sustain urban use areas	unpassable road due to flood, damaged roads and bridges, contaminati on of water supply

#### Table 1. Climate Change impacts to Different Systems of Interest in Casiguran

			inaccesibili ty and flooding		
Future Number of Hot days	heat stroke, hypertension, dehydration, malnutition, pneumonia, skin infection, acute conjunctivitis, respiratory infections, acute gastroenteritis	-decreased in crop production due to low crop absorption of nutrients -altered ecosystem due to migration of important species -forest and grass fire	disruption of governmen t services	increased temperatur es in urban area, increased energy consumptio n for cooling	water shortage, rotating brownout, increased electric consumption
Future Number of Dry days	skin infection, respiratory tract infection, hypertension,malnutrition, diarrhea and parasitism	decreased in crop production area heat stress on inland fishes	disruption of governmen t services	increased temperatur es in urban area, increased energy consumptio n for cooling	water shortage, rotating brownout, increased electric consumption
Future Extreme Rainfall Events	increased incidencs of diarrhea, parasitism, dengue fever, skin infection, malnutrition, pneumonia,	decreased in crop production due to submersion and siltation -destruction of upland farm due to heavy/continous rainfall	class suspension , disruption of governmen t services due to frequent flooding	flooded urban areas, disrupted economic activities	flooded, damaged and unpassable roads and bridges, contaminate d water supply
Future Sea Level Changes	displacement of habitation area, migration	decrease in production due to intrusion of saline water to agricultural area	relocation of facilities	relocation of existing urban areas along coastal part	relocation of roads and electric post
Future Typhoon/Su pertyphoon Occurrences	diseases outbreak, death, migration, mental health problem	low production and destruction of agricultural products	damaged all governmen t facilities	damage to properties disruption of economic activities	damaged electric post, cell site towers, water pipelines, roads and bridges



Fig. 1. Impacts Chain Diagram of Extreme Daily Rainfall in Casiguran, Aurora.



Fig. 12. Impacts Chain Diagram of Future Typhoons/ Supertyphoons Occurences in Casiguran, Aurora



Fig. 13. Impacts Chain Diagram of Future Sea Level Changes in Casiguran, Aurora



Fig. 14. Impacts Chain Diagram of Future Number of Hot/Dry days in Casiguran, Aurora



Fig. 15. Impacts Chain Diagram of Drought in Casiguran, Aurora

### **IV. Hazard Exposure Database**

The Exposure Database provides baseline information pertaining to the systems of interests in Casiguran, Aurora. Systems of interests, as defined by the HLURB (2015). are Population, Natural Resources, Critical Facilities, Urban Use Areas, and Lifeline Utilities. "Population" refers to elements of the human population residing in the area, including assets, demographic characteristics, and related activities which may affect a population's adaptive capacity. "Natural Resources" refer to areas used for agricultural, fisheries, and other land- or water-based production. In this CDRA for example, croplands, livestock production areas, fishery areas, forests, and other natural resources unique to the locality are referred to as "natural resources". "Critical Facilities" are physical infrastructures crucial for deliviering various socio-economic activities in the locality, except those directly related to transportation, communications, water, and electricity. Critical facilities include schools, health centers, gymnasiums, and other public and government infrastructures. "Urban Use Areas" are land use areas in the area, as well as the related activities characterizing each land use area, including variables affecting its adaptive capacities. Finally, "Lifeline Utilities" are infrastructures related to transportation, communications, and the delivery of water and electricity.

#### **Population Exposure Database**

In determining the sensitivity of exposed population characteristics in Casigran, the distribution of settlements in Casiguran were mapped (Fig. 12). Additionally, data regarding households living in dwelling units with walls made from light to salvageable materials, information about the number of elderly, young dependents or children 0-12 years old, and persons with disabilities (PWDs).



**Fig.16.Households Exposed to Flood Hazard** 



Fig.17.Households Exposed to Rain- induced Landslide Hazard



Fig.18.Households Exposed to Storm Surge Hazard



Fig.19.Households Exposed to Drought Hazard



Fig.20.Households Exposed to Sea Level Rise Hazard



Fig.21.Households Exposed to Earthquake-induced Landslide Hazard





### Fig.22.Households Exposed to Liquefaction Hazard

Fig.23.Households Exposed to Ground Shaking Hazard



Fig.24.Households Exposed to Ground Rupture Hazard



Fig.25.Households Exposed to Tsunami Hazard

In terms of population living in dwelling units with walls made from light to salvageable materials, barangay calangcuasan, calantas, esperanza ,san ildefonso ,tabas and tinib has the least number of households, with 1% (.calangcuasan has16 population Bianuan and Marikit has the highest prevalence of households living in dwelling units made of light and salvageable materials with 2%.

For the number of elderly per barangay, barangay Esteves has 44 elderly or 2% of its 1,890 population. The highest percentage of elderly population is Barangay 6, having 15% (31) of its 299 population as elderly. Elderly in barangay 5 also has a 17% elderly population (80/113 population).

Barangay Bianuan has the least number of young dependents in its population at 12% or 480/3960. For the barangay with the highest number of children 0-12 years old is Esperanza at 44% or 228/523.

PWDs are least in Esperanza with less than 1% of the total population (2/523). The barangay with the most percentage of PWDs is barangay 7 at 5% or 14/309.

А	В	с	D	E	F	G	н	I	J	к	L	м	N	0	Р	Q
	EXPOS	URE INDIC	ATORS		SENSITIVITY INDICATORS											
BARANGAY	Resident ial Area (ha)	Popul ation	Populati on Density in Resident ial Areas (person/ ha)	# of Info rma I Sett Iers	% of Info rma I Sett Iers	# of Popul ation Living in Dwell ing Units with Walls Made from Light to Salva geabl e Mater ials	% of Popul ation Living in Dwell ing Units with Walls from Light to Salva geabl e Matee fast	# of Eld Y (60 yrs old ab v e)	% of Eld y (60 yea s old a b v e)	# of Young Depe ndent s (Child ren, 0-12 years old)	% of Young Depe ndent s (Child ren, 0-12 years old)	# of P W Ds	% of Perso ns with Disab ilities	# of Hous ehold S Living Belo w the Pover ty Thres hold	# of Malno urishe d Individ uals	% of Malno urishe d Individ uals
Barangay 1 (Pob.)	8.90	1285	144.382 0225	8.00	1%	1	0%	83	6%	131	10%	4	0%	77	1	0%
Barangay 2 (Pob.)	11.47	1000	87.1839 5815	18.0 0	2%	0	0%	63	6%	101	10%	5	1%	87	3	0%
Barangay 3 (Pob.)	1.41	257	182.269 5035	0.00	0%	1	0%	31	12 %	32	12%	0	0%	37	0	0%
Barangay 4 (Pob.)	3.13	244	77.9552 7157	0.00	0%	0	0%	22	9%	43	18%	0	0%	50	0	0%
Barangay 5 (Pob.)	4.93	406	82.3529 4118	0.00	0%	2	0%	51	13 %	42	10%	0	0%	61	0	0%
Barangay 6 (Pob.)	5.48	208	37.9562 0438	0.00	0%	0	0%	31	15 %	9	4%	0	0%	60	0	0%
Barangay 7 (Pob.)	5.92	343	57.9391 8919	6.00	2%	0	0%	29	8%	61	18%	7	2%	73	1	0%
Barangay 8 (Pob.)	12.30	710	57.7235 7724	3.00	0%	0	0%	47	7%	72	10%	4	1%	84	0	0%
Bianuan	120.02	3960	32.9945 0092	69.0 0	2%	67	2%	33 2	8%	674	17%	70	2%	745	1	0%

#### Table 1. Exposed Population Variables in Casiguran, Aurora.

Calabgan	5,417.73	717	0.13234 3251	1.00	0%	1	0%	43	6%	80	11%	1	0%	121	0	0%
Calangcua san	319.46	1171	3.66556 0634	1.00	0%	16	1%	10 9	9%	151	13%	9	1%	104	0	0%
Calantas	1,079.78	2056	1.90409 1574	2.00	0%	11	1%	13 7	7%	215	10%	19	1%	204	0	0%
Cozo	8,352.09	1803	0.21587 4111	7.00	0%	7	0%	10 5	6%	316	18%	36	2%	174	0	0%
Culat	3,842.15	1247	0.32455 7865	1.00	0%	0	0%	44	4%	188	15%	5	0%	105	0	0%
Dibacong	5,284.74	2231	0.42215 8895	11.0 0	0%	5	0%	14 9	7%	405	18%	15	1%	417	0	0%
Dibet	7,016.46	1096	0.15620 4126	6.00	1%	0	0%	80	7%	188	17%	8	1%	193	0	0%
Ditinagyan	9,825.08	663	0.06748 0367	0.00	0%	1	0%	50	8%	85	13%	6	1%	121	0	0%
Esperanza	453.89	582	1.28224 9003	2.00	0%	6	1%	38	7%	114	20%	4	1%	78	0	0%
Esteves	784.89	1801	2.29458 9051	10.0 0	1%	5	0%	96	5%	253	14%	4	0%	221	0	0%
Lual	332.46	1836	5.52246 8868	0.00	0%	5	0%	15 0	8%	313	17%	11	1%	140	3	0%
Marikit	329.57	775	2.35154 8988	0.00	0%	15	2%	33	4%	125	16%	1	0%	88	0	0%
San Ildefonso	5,319.44	1202	0.22596 3635	8.00	1%	13	1%	69	6%	159	13%	8	1%	149	0	0%
Tabas	15,598.3 8	1051	0.06737 8792	2.00	0%	11	1%	57	5%	165	16%	7	1%	134	5	0%
Tinib	7,412.50	933	0.12586 8465	0.00	0%	6	1%	69	7%	121	13%	5	1%	75	0	0%

In terms of the percentage of the population exposed to flooding, almost everyone is susceptible, although the degree of susceptibility differs for each barangay. As shown in Table 24, most residents in the Poblacion, barangays 1-8, have a low susceptibility to flooding. Barangay 8, however, is moderately to highly susceptible. Barangay Calantas is moderately susceptible, while barangays Culat, Lual and Tabas are highly susceptible. All the rest of the barangays have low susceptibility to flooding.

Barangay		Number of Individuals						
	Purok/Sitio/Block	Low	Moderate	High				
		Susceptible	Susceptible	Susceptible				
Poblacion 01	Purok 1			194				
	Purok 2			50				
	Purok 3	157						
	Purok 6	135						
Poblacion 02	Purok 1	104						
	Purok 2	114						
	Purok 3	55						
	Purok 4	94						
Poblacion 04	Block 1			78				
	Block 2		21					
	Block 3	41						
	Block 4	38						
	Block 6	39						
Poblacion 05	Zamora	71						
	Calderon	96						
Poblacion 06	Gomez	51						
	Osmena	47						
	Gala	62						

 Table 2. Total Number of Individuals Exposed to Flooding

Barangay		Number of Individuals							
	Purok/Sitio/Block	Low	Moderate	High					
		Susceptible	Susceptible	Susceptible					
	Mercado		40						
	Pescador		45						
	Salamera			54					
Poblacion 07	Proper	40							
	Site	17							
Poblacion 08	Purok 5		115						
	Purok 6		76						
	Purok 7			134					
Bianoan	Purok 1	34							
	Purok 2	15							
	Purok 3	77							
	Purok 4	95							
	Purok 6	223							
	Purok 7	762							
Calabgan	Purok 5	45							
Calangcuasan	Pandan	169							
	Bulo	40							
	Centro	51							
	Kabinoran	46							
	Karerayan	83							
	Dangkalan 1	51							
Calantas	Mucdol	510							
	Purok 1			202					
	Purok 2		303						
	Purok 3		245						
	Purok 4-A		221						
	Purok 4-B		249						
	Purok 5			165					
Cozo	Busok-busok	7							
	Site	113							
	Agues	7							
	Kinabunglan	50							
	Kataguman	18							
	Dinipan	40							
	Dumaguipo	49							
Culat	Capongsoan 1			64					
	Capongsoan 2			225					
	Lalau			431					
Dibacong	Purok 1	12							
	Purok 7	73							
Dibet	Pajo	110							
	Demades	10							
	Centro	91							
	School Zone	7							

Barangay		Number of In	Number of Individuals							
	Purok/Sitio/Block	Low	Moderate	High						
		Susceptible	Susceptible	Susceptible						
	Pulang Lupa Lower	216								
Esperanza	Lada			81						
	Dipagbato			20						
	Brgy. Site		258							
	Bal-ong			35						
Lual	Purok 1		35							
	Purok 2		65							
	Purok 3			37						
	Purok 4			353						
	Purok 5			42						
	Purok 6			143						
	Purok 7			245						
Marikit	Centro			73						
	Phase 1	64								
	Catuban	160								
	Phase 2	141								
	Phase 3	76								
	Cabugao			14						
San Ildefonso	Purok 1	28								
	Purok 6	16								
	Purok 7	8								
Tabas	Proper			56						
	Bucton			182						
Tinib	Pugo	76								

Source: Climate and Disaster Risk Assessment (CDRA) 2017

## Natural Resources Exposure Database Table 3. Exposure Indicators of Natural Resources.

			EXPOSU		s	
BARANGAY	Number of Crop-based Farming Dependent Households	Number of Fishing- Dependent Households	Number of Livestock & Poultry- Dependent Households	Total Area Allocation for Agriculture (ha)	Total Area Allocation for Aquaculture (ha)	Dominant/Major Crop(s)/Variety(ies) of Produce
Barangay 1 (Pob.)	17	5	1	0	0	
Barangay 2 (Pob.)	28	0	0	0	0	
Barangay 3 (Pob.)	1	1	0	0	0	
Barangay 4 (Pob.)	0	0	0	0	0	
Barangay 5 (Pob.)	4	0	0	0	0	
Barangay 6 (Pob.)	0	0	0	0	0	
Barangay 7 (Pob.)	5	1	0	0	0	
Barangay 8 (Pob.)	5	0	0	0	0	

Bianuan	257	9	45	0	1	
Calabgan	42	7	0	60.49	0	rice
Calangcuasan	28	23	1	82.52	1.2	rice
Calantas	135	5	6	577.2	0.13	rice
Cozo	97	70	11	75.38	0.05	rice
Culat	38	13	3	176.39	0.55	rice
Dibacong	73	35	118	204.19	1.26	rice/corn
Dibet	43	5	103	243.75	0.46	rice
Ditinagyan	51	14	3	90.11	0	rice
Esperanza	63	1	5	294.36	0	rice
Esteves	41	32	30	357.83	0.33	rice
Lual	53	22	8	128.28	0	rice
Marikit	12	19	25	46.63	0.53	rice
San Ildefonso	15	38	21	6.05	0	rice
Tabas	28	1	52	282.42	0	rice/corn
Tinib	43	3	3	245.48	5.5	rice

Source: Climate and Disaster Risk Assessment (CDRA) 2017

Barangay Calantas has the most number of household relying on crop-based agriculture with 208 households, while barangay San Ildefonso has the least number with 13 households. Barangays on the Poblacion, on the other hand, do not rely much on agriculture. There are no natural-resource based livelihoods practiced in barangays 1-8. The largest area allotted for agriculture is in Calantas with 577.07 ha., while the least is San Ildefonso with 6.05 ha. The major crop being grown in Casiguran is rice.

Fishing-dependent households are majorly located in Cozo with 110 households, while the least is Marikit with 5 households. Barangay Tinib has the largest body of water dedicated to aquaculture with 5.5 ha., while the least is barangay Cozo with .05 ha. Other details of natural resources exposed to hazards are shown in the following table.



Fig.26. Natural Resources Exposed to Flood Hazard



Fig.27. Natural Resources Exposed to Rain-Induced Landslide Hazard



Fig.28. Natural Resources Exposed to Storm Surge Hazard



Fig.29. Natural Resources Exposed to Drought Hazard



Fig.30. Natural Resources Exposed to Sea Level Rise Hazard



Fig.31. Natural Resources Exposed to Earthquake-Induced Landslide Hazard



Fig.32. Natural Resources Exposed to Liquefaction Hazard



Fig.33. Natural Resources Exposed to Ground Shaking Hazard



Fig.34. Natural Resources Exposed to Ground Rupture Hazard



Fig.35. Natural Resources Exposed to Tsunami Hazard

### **Critical Facilities Exposure Database**

				EXPOSU	RE INDICA	TORS			
、	# of Presch ool Campu ses	# of Element ary School Campus es	# of High School Campu ses	# of College/Voca tional School Campuses	# of Hospit als	# of RHUs/ BHS	# of Baran gay Hall	# of Gymnasi ums	# of other Governm ent- owned or occupied Structure S
Barangay 1 (Pob.)	1	0	0	0	0	0	1	0	3
Barangay 2	1	0	0	0	0	0	1	0	0
Barangay 3	0	0	0	0	0	1	1	0	0
Barangay 4	0	0	0	0	0	1	1	0	1
Barangay 5	1	0	0	0	0	0	1	0	0
Barangay 6	1	1	1	1	0	0	1	0	0
Barangay 7	0	2	0	0	0	0	1	0	3
Barangay 8	1	1	0	0	0	0	1	0	0
Bianuan	4	1	0	0	0	1	1	0	4
Calabgan	2	1	0	0	0	1	1	0	3
Calangcuasa n	2	1	1	0	0	1	1	0	6
Calantas	2	1	0	0	0	2	1	0	6
Cozo	3	4	1	0	0	1	1	0	2
Culat	2	1	0	0	0	1	1	0	0
Dibacong	3	1	1	0	0	1	1	0	6
Dibet	3	1	0	0	0	1	1	0	2
Ditinagyan	1	0	0	0	0	1	1	0	0
Esperanza	2	1	0	0	0	1	1	0	1
Esteves	3	1	1	1	0	1	1	0	1
Lual	1	0	1	0	0	1	1	0	2
Marikit	2	0	0	0	1	1	1	0	1
San Ildefonso	2	1	0	0	0	1	1	0	2
Tabas	2	1	0	0	0	0	1	0	0
Tinib	1	0	0	0	0	1	1	0	1

### Table 26. Exposure Indicators of Critical Facilities.

In terms of critical facilities there is one hospital located at Barangay Marikit, 18 RHU, 24 Barangay Halls, 44 government owned or occupied structures, 19 elementary, 6 high school, 40 pre school and 2 college campuses that are exposed to different hazards.



Fig.36.Critical Facilities Exposed to Flood Hazard



Fig.37.Educational Facilities Exposed to Flood Hazard



Fig.38.Health Facilities Exposed to Flood Hazard



Fig.39.Critical Facilities Exposed to Rain-induced Landslide Hazard



Fig.40.Educational Facilities Exposed to Rain-induced Landslide Hazard



Fig.41.Health Facilities Exposed to Rain-induced Landslide Hazard


Fig.42.Critical Facilities Exposed to Storm Surge Hazard



Fig.43.Educational Facilities Exposed to Storm Surge Hazard



Fig.44.Health Facilities Exposed to Storm Surge Hazard



Fig.45.Critical Facilities Exposed to Drought Hazard



**Fig.46.Educational Facilities Exposed to Drought Hazard** 



Fig.47.Health Facilities Exposed to Drought Hazard



Fig.48.Critical Facilities Exposed to Sea Level Rise Hazard



Fig.49.Educational Facilities Exposed to Sea Level Rise Hazard



Fig.50.Health Facilities Exposed to Sea Level Rise Hazard



Fig.51.Critical Facilities Exposed to Earthquake-induced Landslide Hazard



Fig.52.Educational Facilities Exposed to Earthquake-induced Landslide Hazard



Fig.53.Health Facilities Exposed to Earthquake-induced Landslide Hazard



Fig.54.Critical Facilities Exposed to Liquefaction Hazard



Fig.55.Educational Facilities Exposed to Liquefaction Hazard



Fig.56.Health Facilities Exposed to Liquefaction Hazard



Fig.57.Critical Facilities Exposed to Ground Shaking Hazard



Fig.58.Educational Facilities Exposed to Ground Shaking Hazard



Fig.59.Health Facilities Exposed to Ground Shaking Hazard



Fig.60.Critical Facilities Exposed to Ground Rupture Hazard



Fig.61.Educational Facilities Exposed to Ground Rupture Hazard



Fig.62.Health Facilities Exposed to Ground Rupture Hazard



Fig.63.Critical Facilities Exposed to Tsunami Hazard



Fig.64.Educational Facilities Exposed to Tsunami Hazard



Fig.65.Health Facilities Exposed to Tsunami Hazard

# Urban Use Exposure Database

			EX	POSURE INDICAT	ORS		
BARANGAY	Total Land Area (ha)	Descriptio n of Landuse Types	# of Landus e Types	Landuse Type with Largest/Majo r Area Occupied	Total Occupied Area of Major Land Use (ha)	Landuse Type with Least/Mino r Area Occupied	Total Occupie d Area of Minor Landuse Type (ha)
Barangay 1 (Pob.)	8.90	Residential	3	Residential	8.90	Institutional	0.08
Barangay 2 (Pob.)	11.47	Residential	3	Residential	11.47	Institutional	0.08
Barangay 3 (Pob.)	1.41	Residential	3	Residential	1.41	Institutional	0.005
Barangay 4 (Pob.)	3.13	Residential	3	Residential	3.13	Institutional	0.19
Barangay 5 (Pob.)	4.93	Residential	3	Residential	4.93	Institutional	0.04
Barangay 6 (Pob.)	5.48	Residential	3	Residential	5.48	Commercial	0.45
Barangay 7 (Pob.)	5.92	Residential	3	Residential	5.92	Institutional	0.40
Barangay 8 (Pob.)	12.30	Residential	3	Residential	12.30	Institutional	0.38
Bianuan	120.02	Residential	3	Residential	120.02	Institutional	3.05
Calabgan	5,417.73	Agricultural	4	Agricultural	5,417.73	Institutional	0.68
Calangcuasan	319.46	Agricultural	4	Agricultural	319.46	Institutional	2.67
Calantas	1,079.78	Agricultural	4	Agricultural	1,079.78	Institutional	0.08
Cozo	8,352.09	Agricultural	4	Agricultural	8,352.09	Institutional	0.45
Culat	3,842.15	Agricultural	4	Agricultural	3,842.15	Institutional	0.45
Dibacong	5,284.74	Agricultural	4	Agricultural	5,284.74	Institutional	0.81
Dibet	7,016.46	Agricultural	4	Agricultural	7,016.46	Institutional	0.56
Ditinagyan	9,825.08	Agricultural	4	Agricultural	9,825.08	Institutional	0.21
Esperanza	453.89	Agricultural	4	Agricultural	453.89	Institutional	0.67
Esteves	784.89	Agricultural	4	Agricultural	784.89	Commercial	0.29
Lual	332.46	Agricultural	4	Agricultural	332.46	Recreationa I Park	0.60
Marikit	329.57	Agricultural	4	Agricultural	329.57	Institutional	1.36

# Table 27. Exposure Indicators of Urban Use.

San Ildefonso	5,319.44	Agricultural	4	Agricultural	5,319.44	Institutional	0.57
Tabas	15,598.3 8	Agricultural	4	Agricultural	15,598.3 8	Park	0.12
Tinib	7,412.50	Agricultural	4	Agricultural	7,412.50	Institutional	0.09

In terms of urban use attributes, Tabas has the greatest number of total land area with 15, 598.38 ha with agriculture as a largest/major occupied and park as a least/minor area. While Poblacion 3 has the least total land area with 1.41 ha. Barangays on población on the other hand are mostly residential land use type and low lying area which are vulnerable to hazard.



Fig.66.Land Use Exposed to Flood Hazard



Fig.67.Land Use Exposed to Rain-Induced Landslide Hazard



Fig.68.Land Use Exposed to Storm Surge Hazard



Fig.69.Land Use Exposed to Drought Hazard



Fig.70.Land Use Exposed to Sea Level Rise Hazard



Fig.71.Land Use Exposed to Earthquake-Induced Landslide Hazard



Fig.72.Land Use Exposed to Liquefaction Hazard



Fig.73.Land Use Exposed to Ground Shaking Hazard



Fig.74.Land Use Exposed to Ground Rupture Hazard



Fig.75.Land Use Exposed to Tsunami Hazard

# Lifeline Utility Exposure Database

	EXPOSURE INDICATORS										
BARANGAY	Road Length (km)	# of bridge s	Name of Largest Bridge in Baranga Y	Name of Lightest Capacity Bridge in Barangay	Water Utility Provider(s )	Electric Utility Provider(s )	Telecommunication s Network Coverage Available (Globe/TM and or Smart/Sun/TnT)				
Barangay 1 (Pob.)	2.017	1	Foot Bridge		Casiguan Water System	Aurelco	Globe and Smart				
Barangay 2 (Pob.)	0.932	0			Casiguan Water System	Aurelco	Globe and Smart				
Barangay 3 (Pob.)	0.916	0			Casiguan Water System	Aurelco	Globe and Smart				
Barangay 4 (Pob.)	0.725	0			Casiguan Water System	Aurelco	Globe and Smart				
Barangay 5 (Pob.)	0.74	0			Casiguan Water System	Aurelco	Globe and Smart				
Barangay 6 (Pob.)	1.298	0			Casiguan Water System	Aurelco	Globe and Smart				
Barangay 7 (Pob.)	0.921	0			Casiguan Water System	Aurelco	Globe and Smart				
Barangay 8 (Pob.)	2.102	0			Casiguan Water System	Aurelco	Globe and Smart				
Bianuan	9.702	1	Bianoan Bridge			Aurelco	Globe and Smart				
Calabgan	5.567	1	Calabgan Bridge			Aurelco	Globe and Smart				
Calangcuasan	6.152	1	Minanga Bridge			Aurelco	Globe and Smart				
Calantas	22.419 2	0				Aurelco	Globe and Smart				
Cozo	30.648	0				Aurelco	Globe and Smart				
Culat	22.11	1	Culat Bridge			Aurelco	Globe and Smart				
Dibacong	8.086	2	Montay Bridge	Gumaninan g Bridge		Aurelco	Globe and Smart				
Dibet	14.011	4	Dibet Bridge C	Dibet Brige D		Aurelco	Globe and Smart				
Ditinagyan	8.721	0				Aurelco	Globe and Smart				
Esperanza	13.834	3	Dimasingan Bridge	Esperanza Bridge		Aurelco	Globe and Smart				
Esteves	11.7	0				Aurelco	Globe and Smart				
Lual	11.072	1	Mabuntot Bridge			Aurelco	Globe and Smart				

# Table 28. Exposure Indicators of Lifeline Utility.

Marikit	8.795	2	Casiguran Bridge	Hanging Bridge	Aurelco	Globe and Smart
San Ildefonso	23.15	0				Globe and Smart
Tabas	6.136	1	Tabas Calanta s Bridge		Aurelco	Globe and Smart
Tinib	16.439	3	Disugon Bridge	Dyos Bridge	Aurelco	Globe and Smart

In terms of lifeline utilities attributes cozo has the longest road length with 30.648 km. Most of the roads in Poblacion are susceptible to flooding. Mabuntot bridge in brgy Lual is made of wood which make it vulnerable to hazards. There are 21 total number of bridges exposed to flooding.



Fig.76.Lifeline Facilities Exposed to Flood Hazard



Fig.77.Lifeline Facilities Exposed to Rain-induced Landslide Hazard



Fig.78.Lifeline Facilities Exposed to Storm Surge Hazard



Fig.79.Lifeline Facilities Exposed to Drought Hazard



Fig.80.Lifeline Facilities Exposed to Sea Level Rise Hazard



Fig.81.Lifeline Facilities Exposed to Earthquake-induced Landslide Hazard



Fig.82.Lifeline Facilities Exposed to Liquefaction Hazard



Fig.83.Lifeline Facilities Exposed to Ground Shaking Hazard



Fig.84.Lifeline Facilities Exposed to Ground Rupture Hazard



Fig.85.Lifeline Facilities Exposed to Tsunami Hazard

# V. CLIMATE CHANGE VULNERABILITY ASSESSMENT

The Climate Change Vulnerability Assessment (CCVA) involves the determination of the degree of impact of a particular climate change variable using three broad scales: "low", "medium" and "high". A "low" category has a score of 1, a "moderate" is scored 2, and a "high" degree of impact is 3. Next, the adaptive capacity is determined, again using the aforementioned scales. For adaptive capacity, a "low" is scored 3, a "moderate" as 2, and a "high" as 1. To obtain the climate change vulnerability score, the degree of impact score is multiplied with the adaptive capacity score. The resulting quotient is finally categorized into the following rubric: scores ranging 1-3 is a "low" climate change vulnerability, and scores ranging 7-9 is a "high" climate change vulnerability.

The CCVA of each system of interest (Population, Natural Resources, Critical Facilities, Urban Use, and Lifeline Utilities) will be determined per climate change variable, namely; (1) future temperature trends, (2) future rainfall trends, (3) future number of hot days, (4) future number of dry days, (5) future number of extreme rainfall events, (6) future sea level changes, and (7) future typhoons/super typhoons. The CCVA for each climate change variable will then be averaged to determine the overall CCVA of a particular barangay.

#### **Climate Change Vulnerability Assessment of Population**

#### Future Temperature Trends and Population

	Future Temperature Trends										
		DEGRI	EE OF IMPA	ACT			ADAPT	IVE CAPA	CITY		
BARANGAY	To all barang ay reside nts	To Inform al Settler s	To houses made of light materi als	To elderl y and young childr en	To PW Ds	of all barang ay reside nts	of Inform al Settler s	of house s made with of light materi al	of elderl y and young childr en	of PW Ds	
Barangay 1							-	_	_		
(Pob.)	High	High	High	High	High	Low	Low	Low	Low	Low	
Barangay 2 (Pob.)	High	High	High	High	High	Low	Low	Low	Low	Low	
Barangay 3 (Pob.)	High	High	High	High	High	Low	Low	Low	Low	Low	
Barangay 4 (Pob.)	High	High	High	High	High	Low	Low	Low	Low	Low	
Barangay 5 (Pob.)	High	High	High	High	High	Low	Low	Low	Low	Low	
Barangay 6 (Pob.)	High	High	High	High	High	Low	Low	Low	Low	Low	
Barangay 7 (Pob.)	High	High	High	High	High	Low	Low	Low	Low	Low	
Barangay 8 (Pob.)	High	High	High	High	High	Low	Low	Low	Low	Low	
Bianuan	High	High	High	High	High	Low	Low	Low	Low	Low	
Calabgan	High	High	High	High	High	Low	Low	Low	Low	Low	
Calangcuasan	High	High	High	High	High	Low	Low	Low	Low	Low	

**Table 29. CCVA on Future Temperature Trends and Population** 

Calantas	High	High	High	High	High	Low	Low	Low	Low	Low
Cozo	High	High	High	High	High	Low	Low	Low	Low	Low
Culat	High	High	High	High	High	Low	Low	Low	Low	Low
Dibacong	High	High	High	High	High	Low	Low	Low	Low	Low
Dibet	High	High	High	High	High	Low	Low	Low	Low	Low
Ditinagyan	High	High	High	High	High	Low	Low	Low	Low	Low
Esperanza	High	High	High	High	High	Low	Low	Low	Low	Low
Esteves	High	High	High	High	High	Low	Low	Low	Low	Low
Lual	High	High	High	High	High	Low	Low	Low	Low	Low
Marikit	High	High	High	High	High	Low	Low	Low	Low	Low
San Ildefonso	High	High	High	High	High	Low	Low	Low	Low	Low
Tabas	High	High	High	High	High	Low	Low	Low	Low	Low
Tinib	High	High	High	High	High	Low	Low	Low	Low	Low

The degree of impact to all barangays in Casiguran is "high" to future temperature trends and with a "low" adaptive capacity.

### Future Rainfall Trends and Population

# Table 30. CCVA on Future Rainfall Trends and Population

				Fu	iture Raii	nfall Tren	ds			
		DEGF	REE OF IM	РАСТ			ADAP	TIVE CAP	ACITY	
``	To all baran gay reside nts	To Infor mal Settle rs	To houses made of light materi als	To elderl y and young childr en	To PWDs	of all baran gay reside nts	of Infor mal Settle rs	of houses made of light materi als	of elderl y and young childr en	of PWDs
Barangay 1						Moder	Moder	Moder	Moder	Moder
(Pob.)	High	High	High	High	High	ate	ate	ate	ate	ate
Barangay 2						Moder	Moder	Moder	Moder	Moder
(Pob.)	High	High	High	High	High	ate	ate	ate	ate	ate
Barangay 3						Moder	Moder	Moder	Moder	Moder
(Pob.)	High	High	High	High	High	ate	ate	ate	ate	ate
Barangay 4						Moder	Moder	Moder	Moder	Moder
(Pob.)	High	High	High	High	High	ate	ate	ate	ate	ate
Barangay 5						Moder	Moder	Moder	Moder	Moder
(Pob.)	High	High	High	High	High	ate	ate	ate	ate	ate
Barangay 6						Moder	Moder	Moder	Moder	Moder
(Pob.)	High	High	High	High	High	ate	ate	ate	ate	ate
Barangay 7						Moder	Moder	Moder	Moder	Moder
(Pob.)	High	High	High	High	High	ate	ate	ate	ate	ate
Barangay 8						Moder	Moder	Moder	Moder	Moder
(Pob.)	High	High	High	High	High	ate	ate	ate	ate	ate
Bianuan	Moder	Moder	Moder	Moder	Moder	Moder	Moder	Moder	Moder	Moder
Dialituali	ate	ate	ate	ate	ate	ate	ate	ate	ate	ate
Calabgan						Moder	Moder	Moder	Moder	Moder
Calabgali	Low	Low	Low	Low	Low	ate	ate	ate	ate	ate
Calangcuasa	Moder	Moder	Moder	Moder	Moder	Moder	Moder	Moder	Moder	Moder
n	ate	ate	ate	ate	ate	ate	ate	ate	ate	ate
Calantas						Moder	Moder	Moder	Moder	Moder
Galdillas	High	High	High	High	High	ate	ate	ate	ate	ate

Cozo						Moder	Moder	Moder	Moder	Moder
6626	Low	Low	Low	Low	Low	ate	ate	ate	ate	ate
Culat						Moder	Moder	Moder	Moder	Moder
Guiat	High	High	High	High	High	ate	ate	ate	ate	ate
Dibacong	Moder									
Dibacolig	ate									
Dihat						Moder	Moder	Moder	Moder	Moder
Dibet	Low	Low	Low	Low	Low	ate	ate	ate	ate	ate
Ditinggroup						Moder	Moder	Moder	Moder	Moder
Ditinagyan	Low	Low	Low	Low	Low	ate	ate	ate	ate	ate
Echonongo						Moder	Moder	Moder	Moder	Moder
Esperanza	High	High	High	High	High	ate	ate	ate	ate	ate
E-to						Moder	Moder	Moder	Moder	Moder
Esteves	High	High	High	High	High	ate	ate	ate	ate	ate
Lual						Moder	Moder	Moder	Moder	Moder
Luai	High	High	High	High	High	ate	ate	ate	ate	ate
Monibit						Moder	Moder	Moder	Moder	Moder
магікі	High	High	High	High	High	ate	ate	ate	ate	ate
San						Moder	Moder	Moder	Moder	Moder
Ildefonso	Low	Low	Low	Low	Low	ate	ate	ate	ate	ate
Tabaa						Moder	Moder	Moder	Moder	Moder
Tabas	High	High	High	High	High	ate	ate	ate	ate	ate
Tinih						Moder	Moder	Moder	Moder	Moder
TIUD	Low	Low	Low	Low	Low	ate	ate	ate	ate	ate

In terms of degree of impact in Casiguran, there are 15 barangays which are high vulnerable, 3 barangays which are moderately vulnerable and 6 barangays which are low vulnerable to future rainfall trends, and a generally "moderate" adaptive capacity.

#### Future Number of Hot Days and Population

			Future	e Numbo	er of Hot D	ays	
	DEGRI	EE OF IMPA			ADAPT	IVE CAPA	
-	 -	То	То		6 11	c	of

		DECE									
		DEGRI	EE OF IMPA	ACT			ADAPT	IVE CAPAO	TTY		
、	To all barang ay reside nts	To Inform al Settler s	To houses made of light materi als	To elderl y and young childr en	To PW Ds	of all barang ay reside nts	of Inform al Settler s	of houses made of light materi als	of elderl y and young childr en	of PW Ds	
Barangay 1							Ŧ			Ŧ	
(Pob.)	High	High	High	High	High	LOW	LOW	Low	LOW	LOW	
Barangay 2 (Pob.)	High	High	High	High	High	Low	Low	Low	Low	Low	
Barangay 3 (Pob.)	High	High	High	High	High	Low	Low	Low	Low	Low	
Barangay 4 (Pob.)	High	High	High	High	High	Low	Low	Low	Low	Low	
Barangay 5 (Pob.)	High	High	High	High	High	Low	Low	Low	Low	Low	
Barangay 6 (Pob.)	High	High	High	High	High	Low	Low	Low	Low	Low	
Barangay 7 (Pob.)	High	High	High	High	High	Low	Low	Low	Low	Low	
Barangay 8 (Pob.)	High	High	High	High	High	Low	Low	Low	Low	Low	
Bianuan	High	High	High	High	High	Low	Low	Low	Low	Low	
Calabgan	High	High	High	High	High	Low	Low	Low	Low	Low	

Calangcuasan	High	High	High	High	High	Low	Low	Low	Low	Low
Calantas	High	High	High	High	High	Low	Low	Low	Low	Low
Cozo	High	High	High	High	High	Low	Low	Low	Low	Low
Culat	High	High	High	High	High	Low	Low	Low	Low	Low
Dibacong	High	High	High	High	High	Low	Low	Low	Low	Low
Dibet	High	High	High	High	High	Low	Low	Low	Low	Low
Ditinagyan	High	High	High	High	High	Low	Low	Low	Low	Low
Esperanza	High	High	High	High	High	Low	Low	Low	Low	Low
Esteves	High	High	High	High	High	Low	Low	Low	Low	Low
Lual	High	High	High	High	High	Low	Low	Low	Low	Low
Marikit	High	High	High	High	High	Low	Low	Low	Low	Low
San Ildefonso	High	High	High	High	High	Low	Low	Low	Low	Low
Tabas	High	High	High	High	High	Low	Low	Low	Low	Low
Tinib	High	High	High	High	High	Low	Low	Low	Low	Low

The degree of impact to all barangays in Casiguran is "high" to future Number of Hot Days and with a "low" adaptive capacity.

# **Future Number of Dry Days Population**

# Table 32. CCVA on Future Number of Dry Days and Population

		Future Number of Dry Days										
		DEGRI	EE OF IMP	ACT			ADAP	TIVE CAPA	ACITY			
、	To all barang ay reside nts	To Infor mal Settler s	To houses made of light materi als	To elderl y and young childr en	To PW Ds	of all barang ay reside nts	of Infor mal Settler s	of houses made of light materi als	of elderl y and young childr en	of PWDs		
Barangay 1						Modera	Moder	Modera	Moder	Moder		
(Pob.)	High	High	High	High	High	te	ate	te	ate	ate		
Barangay 2						Modera	Moder	Modera	Moder	Moder		
(Pob.)	High	High	High	High	High	te	ate	te	ate	ate		
Barangay 3						Modera	Moder	Modera	Moder	Moder		
(Pob.)	High	High	High	High	High	te	ate	te	ate	ate		
Barangay 4						Modera	Moder	Modera	Moder	Moder		
(Pob.)	High	High	High	High	High	te	ate	te	ate	ate		
Barangay 5						Modera	Moder	Modera	Moder	Moder		
(Pob.)	High	High	High	High	High	te	ate	te	ate	ate		
Barangay 6						Modera	Moder	Modera	Moder	Moder		
(Pob.)	High	High	High	High	High	te	ate	te	ate	ate		
Barangay 7						Modera	Moder	Modera	Moder	Moder		
(Pob.)	High	High	High	High	High	te	ate	te	ate	ate		
Barangay 8						Modera	Moder	Modera	Moder	Moder		
(Pob.)	High	High	High	High	High	te	ate	te	ate	ate		
Dianuan						Modera	Moder	Modera	Moder	Moder		
Dialiuali	High	High	High	High	High	te	ate	te	ate	ate		
Calabran						Modera	Moder	Modera	Moder	Moder		
Calabgan	High	High	High	High	High	te	ate	te	ate	ate		
Colongquagan						Modera	Moder	Modera	Moder	Moder		
Calaligeuasali	High	High	High	High	High	te	ate	te	ate	ate		
Calantas						Modera	Moder	Modera	Moder	Moder		
Galdillas	High	High	High	High	High	te	ate	te	ate	ate		

C070						Modera	Moder	Modera	Moder	Moder
020	High	High	High	High	High	te	ate	te	ate	ate
Culat						Modera	Moder	Modera	Moder	Moder
Culat	High	High	High	High	High	te	ate	te	ate	ate
Dibacong						Modera	Moder	Modera	Moder	Moder
Dibacolig	High	High	High	High	High	te	ate	te	ate	ate
Dihat						Modera	Moder	Modera	Moder	Moder
Dibet	High	High	High	High	High	te	ate	te	ate	ate
Ditinggroup						Modera	Moder	Modera	Moder	Moder
Ditillagyali	High	High	High	High	High	te	ate	te	ate	ate
Economongo						Modera	Moder	Modera	Moder	Moder
Esperanza	High	High	High	High	High	te	ate	te	ate	ate
Fatawaa						Modera	Moder	Modera	Moder	Moder
Esteves	High	High	High	High	High	te	ate	te	ate	ate
Lual						Modera	Moder	Modera	Moder	Moder
Luai	High	High	High	High	High	te	ate	te	ate	ate
Manilait						Modera	Moder	Modera	Moder	Moder
Marikit	High	High	High	High	High	te	ate	te	ate	ate
Can Ildafanaa						Modera	Moder	Modera	Moder	Moder
San Ildelonso	High	High	High	High	High	te	ate	te	ate	ate
Tabaa						Modera	Moder	Modera	Moder	Moder
Tabas	High	High	High	High	High	te	ate	te	ate	ate
Tinik						Modera	Moder	Modera	Moder	Moder
TINID	High	High	High	High	High	te	ate	te	ate	ate

The degree of impact to all barangays in Casiguran is "high" to future Number of Dry Days and with a "moderate" adaptive capacity.

## Future Number of Extreme Rainfall Events and Population

		Future Number of Extreme Rainfall Events												
		DEGRI	EE OF IMPA	АСТ			ADAPT	IVE CAPA	CITY					
、	To all barang ay reside nts	To Inform al Settler s	To houses made of light materi als	To elderl y and young childr en	To PW Ds	of all barang ay reside nts	of Inform al Settler s	of house s made of light materi al	of elderl y and young childr en	of PW Ds				
Barangay 1 (Pob.)	High	High	High	High	High	Low	Low	Low	Low	Low				
Barangay 2 (Pob.)	High	High	High	High	High	Low	Low	Low	Low	Low				
Barangay 3 (Pob.)	High	High	High	High	High	Low	Low	Low	Low	Low				
Barangay 4 (Pob.)	High	High	High	High	High	Low	Low	Low	Low	Low				
Barangay 5 (Pob.)	High	High	High	High	High	Low	Low	Low	Low	Low				
Barangay 6 (Pob.)	High	High	High	High	High	Low	Low	Low	Low	Low				
Barangay 7 (Pob.)	High	High	High	High	High	Low	Low	Low	Low	Low				
Barangay 8 (Pob.)	High	High	High	High	High	Low	Low	Low	Low	Low				
Bianuan	High	High	High	High	High	Low	Low	Low	Low	Low				
Calabgan	High	High	High	High	High	Low	Low	Low	Low	Low				

### Table 33. CCVA on Future Number of Extreme Rainfall Events and Population

Calangcuasan	High	High	High	High	High	Low	Low	Low	Low	Low
Calantas	High	High	High	High	High	Low	Low	Low	Low	Low
Cozo	High	High	High	High	High	Low	Low	Low	Low	Low
Culat	High	High	High	High	High	Low	Low	Low	Low	Low
Dibacong	High	High	High	High	High	Low	Low	Low	Low	Low
Dibet	High	High	High	High	High	Low	Low	Low	Low	Low
Ditinagyan	High	High	High	High	High	Low	Low	Low	Low	Low
Esperanza	High	High	High	High	High	Low	Low	Low	Low	Low
Esteves	High	High	High	High	High	Low	Low	Low	Low	Low
Lual	High	High	High	High	High	Low	Low	Low	Low	Low
Marikit	High	High	High	High	High	Low	Low	Low	Low	Low
San Ildefonso	High	High	High	High	High	Low	Low	Low	Low	Low
Tabas	High	High	High	High	High	Low	Low	Low	Low	Low
Tinib	High	High	High	High	High	Low	Low	Low	Low	Low

The degree of impact to all barangays in Casiguran is "high" to future Number of Extreme Rainfall Events and with a "low" adaptive capacity.

## Future Sea Level Changes and Population

# Table 34. CCVA on Future Sea Level Changes and Population

				Futu	re Sea Le	vel Change	es			
		DEGI	REE OF IMI	PACT			ADAPT	IVE CAPA	CITY	
、	To all barang ay reside nts	To Infor mal Settler s	To houses made of light materi als	To elderl y and young childr en	To PWDs	of all barang ay reside nts	of Infor mal Settler s	of houses made of light materi als	of elderl y and young childr en	of PW Ds
Barangay 1 (Pob.)	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Barangay 2 (Pob.)	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Barangay 3 (Pob.)	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Barangay 4 (Pob.)	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Barangay 5 (Pob.)	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Barangay 6 (Pob.)	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Barangay 7 (Pob.)	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Barangay 8 (Pob.)	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Bianuan	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Calabgan	Modera te	Moder ate	Modera te	Moder ate	Moder ate	Low	Low	Low	Low	Low
Calangcuasan	Modera te	Moder ate	Modera te	Moder ate	Moder ate	Low	Low	Low	Low	Low
Calantas	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low

Cozo	Modera te	Moder ate	Modera te	Moder ate	Moder ate	Low	Low	Low	Low	Low
Culat	Modera te	Moder ate	Modera te	Moder ate	Moder ate	Low	Low	Low	Low	Low
Dibacong	Modera te	Moder ate	Modera te	Moder ate	Moder ate	Low	Low	Low	Low	Low
Dibet	Modera te	Moder ate	Modera te	Moder ate	Moder ate	Low	Low	Low	Low	Low
Ditinagyan	Modera te	Moder ate	Modera te	Moder ate	Moder ate	Low	Low	Low	Low	Low
Esperanza	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Esteves	Modera te	Moder ate	Modera te	Moder ate	Moder ate	Low	Low	Low	Low	Low
Lual	Modera te	Moder ate	Modera te	Moder ate	Moder ate	Low	Low	Low	Low	Low
Marikit	Modera te	Moder ate	Modera te	Moder ate	Moder ate	Low	Low	Low	Low	Low
San Ildefonso	Modera te	Moder ate	Modera te	Moder ate	Moder ate	Low	Low	Low	Low	Low
Tabas	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Tinib	Modera te	Moder ate	Modera te	Moder ate	Moder ate	Low	Low	Low	Low	Low

The degree of impact to 12 barangays in Casiguran is "moderate" and "low" to another 12 barangays to future Sea Level Changes and with a generally "low" adaptive capacity.

#### Future Typhoons/Super typhoons and Population

		Future Typhoons/Super typhoons											
		DEGRI	EE OF IMP.	ACT			ADAP	TIVE CAPA	ACITY				
、	To all barang ay reside nts	To Infor mal Settler s	To houses made of light materi als	To elderl y and young childr en	To PW Ds	of all barang ay reside nts	of Infor mal Settler s	of houses made of light materi als	of elderl y and young childr en	of PWDs			
Barangay 1 (Pob.)	High	High	High	High	High	Modera te	Moder ate	Modera te	Moder ate	Moder ate			
Barangay 2 (Pob.)	High	High	High	High High M	Modera te	Moder ate	Modera te	Moder ate	Moder ate				
Barangay 3 (Pob.)	High	High	High	High	High	Modera te	Moder ate	Modera te	Moder ate	Moder ate			
Barangay 4 (Pob.)	High	High	High	High	High	Modera te	Moder ate	Modera te	Moder ate	Moder ate			
Barangay 5 (Pob.)	High	High	High	High     High     High     Mo       High     High     High     Mo	Modera te	Moder ate	Modera te	Moder ate	Moder ate				
Barangay 6 (Pob.)	High	High	High	High	High	Modera te	Moder ate	Modera te	Moder ate	Moder ate			
Barangay 7 (Pob.)	High	High	High	High	High	Modera te	Moder ate	Modera te	Moder ate	Moder ate			
Barangay 8 (Pob.)	High	High	High	High	High	Modera te	Moder ate	Modera te	Moder ate	Moder ate			
Bianuan	High	High	High	High	High	Modera te	Moder ate	Modera te	Moder ate	Moder ate			
Calabgan	High	High	High	High High		Modera te	Moder ate	Modera te	Moder ate	Moder ate			
Calangcuasan	High	High	High	High	High	Modera te	Moder ate	Modera te	Moder ate	Moder ate			

Table 35. CCVA on Future Typhoons/Super typhoons and Population

Calantas	High	High	High	High	High	Modera	Moder	Modera	Moder	Moder
						Modera	Moder	Modera	Moder	Moder
Cozo	High	High	High	High	High	te	ate	te	ate	ate
						Modera	Moder	Modera	Moder	Moder
Culat	High	High	High	High	High	te	ate	te	ate	ate
D'1		TT: 1	TT: 1		TT: 1	Modera	Moder	Modera	Moder	Moder
Dibacong	High	High	High	High	High	te	ate	te	ate	ate
Dilent	High	High	Uiah	Uich	III ala	Modera	Moder	Modera	Moder	Moder
Dibet	High	High	High	High	High	te	ate	te	ate	ate
Ditinggrap	High	High	High	Uigh	Uigh	Modera	Moder	Modera	Moder	Moder
Ditillagyall	mgn	mgn	mgn	mgn	mgn	te	ate	te	ate	ate
Fenoranza	High	High	High	High	High	Modera	Moder	Modera	Moder	Moder
Esperanza	Ingn	Ingn	Ingn	mgn	mgn	te	ate	te	ate	ate
Fetovos	High	High	High	High	High	Modera	Moder	Modera	Moder	Moder
Esteves	Ingn	Ingn	Ingn	mgn	mgn	te	ate	te	ate	ate
Lual	High	High	High	High	High	Modera	Moder	Modera	Moder	Moder
Luai	mgn	mgn	mgn	mgn	mgn	te	ate	te	ate	ate
Marikit	High	High	High	High	High	Modera	Moder	Modera	Moder	Moder
Marikit	mgn	mgn	mgn	mgn	mgn	te	ate	te	ate	ate
San Ildefonso	High	High	High	High	High	Modera	Moder	Modera	Moder	Moder
San nacionso	mgn	mgn	mgn	mgn	mgn	te	ate	te	ate	ate
Tabas	High	High	High	High	High	Modera	Moder	Modera	Moder	Moder
1 1 1 1 2 3	111611	111611	111511	111511	111611	te	ate	te	ate	ate
Tinih	High	High	High	High	High	Modera	Moder	Modera	Moder	Moder
11110	111611	111511	111611	111511	111611	te	ate	te	ate	ate

The degree of impact to all barangays in Casiguran is "high" to Future Typhoons/Super typhoons and with a generally "moderate" adaptive capacity.

# **Climate Change Vulnerability Assessment of Natural Resources**

## **Future Temperature Trends and Natural Resources**

			•	Futur	e Tempe	rature	Trends			
		DE	GREE OF IMPA	ACT			ADA	APTIVE CAPA	CITY	
	To crop - base d far min g area s	To aquacu lture- based farmin g areas	To livestock/ poultry areas	To major crop produ ction	To irriga tion syste ms	of crop - base d far min g area s	of aquacu lture- based farmin g areas	of livestock/ poultry areas	of major crop produ ction	of irriga tion syste ms
Barangay 1 (Pob.)										
Barangay 2 (Pob.)										
Barangay 3 (Pob.)										
Barangay 4 (Pob.)										
Barangay 5 (Pob.)										
Barangay 6 (Pob.)										

Barangay 7 (Pob.)										
Barangay 8 (Pob.)										
Bianuan	High		High			Low		Low		
Calabgan	High		High	High	High	Low		Low	Low	Low
Calangcua san	High	High	High	High	High	Low	Low	Low	Low	Low
Calantas	High		High	High	High	Low		Low	Low	Low
Cozo	High		High	High	High	Low		Low	Low	Low
Culat	High		High	High	High	Low		Low	Low	Low
Dibacong	High	High	High	High	High	Low	Low	Low	Low	Low
Dibet	High		High	High	High	Low		Low	Low	Low
Ditinagya n	High		High	High	High	Low		Low	Low	Low
Esperanza	High		High	High	High	Low		Low	Low	Low
Esteves	High		High	High	High	Low		Low	Low	Low
Lual	High	High	High	High	High	Low	High	Low	Low	Low
Marikit	High	Low	High	High	High	Low	High	Low	Low	Low
San Ildefonso	High		High	High	High	Low		Low	Low	Low
Tabas	High		High	High	High	Low		Low	Low	Low
Tinib	High		High	High	High	Low		Low	Low	Low

Barangays on población has no farming areas. There are 16 barangays where crop-based farming and livestock or poultry areas has "high" degree of impact, 15 barangays where major crop production and irrigation system has "high" degree of impact, 3 barangays where aquaculture-based farming areas has "high" degree of impact to future temperature trends. Only barangay Marikit has a low degree of impact in aquaculture to future temperature trends.

Barangay Marikit and Lual has a "high" adaptive capacity in aquaculture-based farming areas. 15 barangays has a "low" adaptive capacity in major crop production and irrigation system and 16 barangays with "low" adaptive capacity in major crop-based farming areas and livestock or poultry areas to future temperature trends.

#### **Future Rainfall Trends and Natural Resources**

Table 37.	<b>CCVA on</b>	Future	Rainfall	Trends	and	I N	latur	al	Resource	S

	Future Rainfall Trends											
		DEGREE OF IMPACT					ADAPTIVE CAPACITY					
	To crop - base d farm ing area s	To aquacu lture- based farmin g areas	To livestock/ poultry areas	To major crop produ ction	To irrig ation syste ms	of crop - base d farm ing area s	of aquacu lture- based farmin g areas	of livestock/ poultry areas	of major crop produ ction	of irrig ation syste ms		
Barangay 1 (Pob.)												

Barangay										
2 (100.) Barangay										
3 (Pob.)										
Barangay										
4 (Pob)										
Barangay										
5 (Pob)										
Barangay										
6 (Pob.)										
Barangay										
7 (Pob.)										
Barangay										
8 (Pob.)										
6 (Pob.) Barangay 7 (Pob.) Barangay 8 (Pob.) Bianuan Calabgan Calangcua san Calantas Cozo Culat Dibacong	Mode					Mode		Moderate		
Bianuan	rate		Moderate			rate				
Calabasa	Mode			Moder	Mode	Mode		Moderate	Moder	Mode
Calabgan	rate		Moderate	ate	rate	rate			ate	rate
Calangcua	Mode	Modera		Moder	Mode	Mode	Modera	Moderate	Moder	Mode
san	rate	te	Moderate	ate	rate	rate	te		ate	rate
Calantas	Mode			Moder	Mode	Mode		Moderate	Moder	Mode
	rate		Moderate	ate	rate	rate			ate	rate
Cozo	Mode			Moder	Mode	Mode		Moderate	Moder	Mode
	rate		Moderate	ate	rate	rate			ate	rate
Culat	Mode			Moder	Mode	Mode		Moderate	Moder	Mode
Culat	rate		Moderate	ate	rate	rate			ate	rate
Dibacong	Mode	Modera		Moder	Mode	Mode	Modera	Moderate	Moder	Mode
Dibacong	rate	te	Moderate	ate	rate	rate	te		ate	rate
Dibet	Mode			Moder	Mode	Mode		Moderate	Moder	Mode
	rate		Moderate	ate	rate	rate			ate	rate
Ditinagya n	Mode			Moder	Mode	Mode		Moderate	Moder	Mode
	rate		Moderate	ate	rate	rate			ate	rate
Esperanza	Mode			Moder	Mode	Mode		Moderate	Moder	Mode
	rate		Moderate	ate	rate	rate			ate	rate
Esteves	Mode			Moder	Mode	Mode		Moderate	Moder	Mode
	rate		Moderate	ate	rate	rate			ate	rate
Lual	Mode	Modera	Madamata	Moder	Mode	Mode	Modera	Moderate	Moder	Mode
	rate	te	Moderate	ate	rate	rate	te		ate	rate
Marikit	Mode	Modera		Moder	Mode	Mode	Modera	Moderate	Moder	Mode
C	rate	te	Moderate	ate	rate	rate	te		ate	rate
San	Mode		Moderate	Moder	Mode	Mode		Moderate	Moder	Mode
nueronso	Mode		Mouerate	Moder	Mode	Mode			Moder	Mode
Tabas	rate		Moderate	ato	rato	rato		Moderate	ato	rato
	Mode		Mouerate	Modor	Mode	Mode			Modor	Mode
Tinib	rato		Moderate	ato	rato	rato		Moderate	ato	rato
	Ialt	1	moutrate	alt	Idle	Idlt	1		alt	Idle

Barangays on población has no farming areas. There are 16 barangays where crop-based farming and livestock or poultry areas has "moderate" degree of impact, 15 barangays where major crop production and irrigation system has "moderate" degree of impact, 4 barangays where aquaculture-based farming areas has "moderate" degree of impact to future rainfall trends.

There are 4 barangays that has a "moderate" adaptive capacity in aquaculturebased farming areas. 15 barangays have a "moderate" adaptive capacity in major crop production and irrigation system and 16 barangays with "moderate" adaptive capacity in major crop-based farming areas and livestock or poultry areas to future rainfall trends.
# Future Number of Hot Days and Natural Resources Table 38. CCVA on Future Number of Hot Days and Natural Resources

				Futur	e Numbe	er of Ho	t Days					
		DEC	GREE OF IMPA	АСТ			ADA	PTIVE CAPACITY				
	To crop - base d farm ing area s	To aquacu lture- based farmin g areas	To livestock/ poultry areas	To major crop produ ction	To irriga tion syste ms	of crop - base d far min g area s	of aquacu Iture- based farmin g areas	of livestock/ poultry areas	of major crop produ ction	of irriga tion syste ms		
Barangay 1 (Pob.)												
Barangay 2 (Pob.)												
Barangay 3 (Pob.)												
Barangay 4 (Pob.)												
Barangay 5 (Pob.)												
Barangay 6 (Pob.)												
Barangay 7 (Pob.)												
Barangay 8 (Pob.)												
Bianuan	Mode rate		Moderate			Low		Low				
Calabgan	Mode rate		Moderate	Moder ate	Mode rate	Low		Low	Low	Low		
Calangcua san	Mode rate	Modera te	Moderate	Moder ate	Mode rate	Low	Low	Low	Low	Low		
Calantas	Mode rate		Moderate	Moder ate	Mode rate	Low		Low	Low	Low		
Cozo	Mode rate		Moderate	Moder ate	Mode rate	Low		Low	Low	Low		
Culat	Mode rate		Moderate	Moder ate	Mode rate	Low		Low	Low	Low		
Dibacong	Mode rate	Modera te	Moderate	Moder ate	Mode rate	Low	Low	Low	Low	Low		
Dibet	Mode rate		Moderate	Moder ate	Mode rate	Low		Low	Low	Low		
Ditinagya n	Mode rate		Moderate	Moder ate	Mode rate	Low		Low	Low	Low		
Esperanza	Mode rate		Moderate	Moder ate	Mode rate	Low		Low	Low	Low		
Esteves	Mode rate		Moderate	Moder ate	Mode rate	Low		Low	Low	Low		
Lual	Mode rate	Modera te	Moderate	Moder ate	Mode rate	Low	Low	Low	Low	Low		
Marikit	Mode rate	Modera te	Moderate	Moder ate	Mode rate	Low	Low	Low	Low	Low		
San Ildefonso	Mode rate		Moderate	Moder ate	Mode rate	Low		Low	Low	Low		
Tabas	Mode rate		Moderate	Moder ate	Mode rate	Low		Low	Low	Low		
Tinib	Mode rate		Moderate	Moder ate	Mode rate	Low		Low	Low	Low		

Barangays on población has no farming areas. There are 16 barangays where crop-based farming and livestock or poultry areas has "moderate" degree of impact, 15 barangays where major crop production and irrigation system has "moderate" degree of impact, 4 barangays where aquaculture-based farming areas has "moderate" degree of impact to future Number of Hot Days.

There are 4 barangays that has a "low" adaptive capacity in aquaculture-based farming areas. 15 barangays have a "low" adaptive capacity in major crop production and irrigation system and 16 barangays with "low" adaptive capacity in major crop-based farming areas and livestock or poultry areas to future Number of Hot Days.

#### **Future Number of Dry Days and Natural Resources**

		DE	GREE OF IMP	Futu ACT	re Numb	er of Dry	y Days ADA	TIVE CAPACITY				
	To crop - base d far min g area s	To aquacu lture- based farmin g areas	To livestock/ poultry areas	To major crop produ ction	To irriga tion syste ms	of crop - base d farm ing area s	of aquacu lture- based farmin g areas	of livestock/ poultry areas	of major crop produ ction	of irriga tion syste ms		
Barangay 1 (Pob.)												
Barangay 2 (Pob.)												
Barangay 3 (Pob.)												
Barangay												
Barangay												
Barangay												
6 (Pob.) Barangay												
7 (Pob.) Barangay												
8 (Pob.) Bianuan						Mode		Modorato				
Dianuan	High		High			rate Mode		Moderate	Moder	Mode		
Calabgan	High		High	High	High	rate		Moderate	ate	rate		
Calangcua san	High	Modera te	High	High	High	Mode rate	Modera te	Moderate	Moder ate	Mode rate		
Calantas	High		High	High	High	Mode rate		Moderate	Moder ate	Mode rate		
Cozo	High		High	High	High	Mode rate		Moderate	Moder	Mode rate		
Culat	High		High	High	High	Mode		Moderate	Moder	Mode		
Dibacong	High	Uiah	Iliah	Iliah	Iliah	Mode	Modera	Moderate	Moder	Mode		
Dihot	High	High	нıgh	нıgn	High	rate Mode	te	Moderate	ate Moder	rate Mode		
Dibet	High		High	High	High	rate Mode		Moderate	ate Moder	rate Mode		
n	High		High	High	High	rate		Moderate	ate	rate		

#### Table 39. CCVA on Future Number of Dry Days and Natural Resources

Esperanza	High		High	High	High	Mode rate		Moderate	Moder ate	Mode rate
Esteves						Mode		Moderate	Moder	Mode
	High		High	High	High	rate			ate	rate
Lual						Mode	Modera	Moderate	Moder	Mode
Luai	High	High	High	High	High	rate	te	Moderate	ate	rate
Marikit						Mode	Modera	Modorato	Moder	Mode
Marikit	High	High	High	High	High	rate	te	Moderate	ate	rate
San						Mode		Modorato	Moder	Mode
Ildefonso	High		High	High	High	rate		Moderate	ate	rate
Tabaa						Mode		Madavata	Moder	Mode
Tabas	High		High	High	High	rate		Moderate	ate	rate
Tinih						Mode		Madarata	Moder	Mode
11110	High		High	High	High	rate		mouerate	ate	rate

Barangays on población has no farming areas. There are 16 barangays where crop-based farming and livestock or poultry areas has "high" degree of impact, 15 barangays where major crop production and irrigation system has "high" degree of impact. In aquaculture-based farming areas, barangays Lual, Marikit and Dibacong has "high" while barangay Calangcuasan has "moderate" degree of impact to Future Number of Dry Days.

There are 4 barangays that has a "moderate" adaptive capacity in aquaculturebased farming areas. 15 barangays have a "moderate" adaptive capacity in major crop production and irrigation system and 16 barangays with "moderate" adaptive capacity in major crop-based farming areas and livestock or poultry areas to Future Number of Dry Days.

#### Future Number of Extreme Rainfall Events and Natural Resources`

			Fut	ure Numl	per of Ex	treme R	ainfall Eve	ents		
		DE	GREE OF IMPA	АСТ			ADA	<b>APTIVE CAPA</b>	CITY	
	To crop - base d far min g area s	To aquacu lture- based farmin g areas	To livestock/ poultry areas	To major crop produ ction	To irriga tion syste ms	of crop - base d far min g area s	of aquacu lture- based farmin g areas	of livestock/ poultry areas	of major crop produ ction	of irriga tion syste ms
Barangay 1 (Pob.)										
Barangay 2 (Pob.)										
Barangay 3 (Pob.)										
Barangay 4 (Pob.)										
Barangay 5 (Pob.)										
Barangay 6 (Pob.)										
Barangay 7 (Pob.)										

Table 40. CCVA on Future Number of Extreme Rainfall Events and Natural Resources

Barangay 8 (Pob.)										
Bianuan	High		High			Low		Low		
Calabgan	High		High	High	High	Low		Low	Low	Low
Calangcua san	High	High	High	High	High	Low	Low	Low	Low	Low
Calantas	High		High	High	High	Low		Low	Low	Low
Cozo	High		High	High	High	Low		Low	Low	Low
Culat	High		High	High	High	Low		Low	Low	Low
Dibacong	High	High	High	High	High	Low	Low	Low	Low	Low
Dibet	High		High	High	High	Low		Low	Low	Low
Ditinagya n	High		High	High	High	Low		Low	Low	Low
Esperanza	High		High	High	High	Low		Low	Low	Low
Esteves	High		High	High	High	Low		Low	Low	Low
Lual	High	High	High	High	High	Low	Low	Low	Low	Low
Marikit	High	High	High	High	High	Low	Low	Low	Low	Low
San Ildefonso	High		High	High	High	Low		Low	Low	Low
Tabas	High		High	High	High	Low		Low	Low	Low
Tinib	High		High	High	High	Low		Low	Low	Low

Barangays on población has no farming areas. There are 16 barangays where crop-based farming and livestock or poultry areas has "high" degree of impact, 15 barangays where major crop production and irrigation system has "high" degree of impact, 4 barangays where aquaculture-based farming areas has "high" degree of impact to Future Number of Extreme Rainfall Events.

There are 4 barangays that has a "low" adaptive capacity in aquaculture-based farming areas. 15 barangays have a "low" adaptive capacity in major crop production and irrigation system and 16 barangays with "low" adaptive capacity in major crop-based farming areas and livestock or poultry areas to Future Number of Extreme Rainfall Events.

### Future Sea Level Changes and Natural Resources

				Futu	re Sea Le	evel Cha	anges			
		DEC	GREE OF IMPA	АСТ			ADA	PTIVE CAPA	CITY	
	To crop - base d farm ing area s	To aquacu lture- based farmin g areas	To livestock/ poultry areas	To major crop produ ction	To irriga tion syste ms	of crop - base d far min g area s	of aquacu lture- based farmin g areas	of livestock/ poultry areas	of major crop produ ction	of irriga tion syste ms
Barangay 1 (Pob.)										

### Table 41. CCVA on Future Sea Level Changes and Natural Resources

	-			-	-		-	-	-	
Barangay										
2 (POD.)										
Barangay										
S (POD.)										
Barangay										
4 (POD.)										
5 (Pob.)										
Barangay										
6 (Pob)										
Barangay										
7 (Pob)										
Barangay										
8 (Pob.)										
	Mode									
Bianuan	rate		Moderate			Low		Low		
<u></u>	Mode			Moder	Mode					
Calabgan	rate		Moderate	ate	rate	Low		Low	Low	Low
Calangcua	Mode	Modera		Moder	Mode					
san	rate	te	Moderate	ate	rate	Low	Low	Low	Low	Low
Calantaa	Mode			Moder	Mode					
Calantas	rate		Moderate	ate	rate	Low		Low	Low	Low
Cozo	Mode			Moder	Mode					
COZO	rate		Moderate	ate	rate	Low		Low	Low	Low
Culat	Mode			Moder	Mode					
Gulat	rate		Moderate	ate	rate	Low		Low	Low	Low
Dibacong	Mode	Modera		Moder	Mode					
Dibacong	rate	te	Moderate	ate	rate	Low	Low	Low	Low	Low
Dihet	Mode			Moder	Mode					
Dibet	rate		Moderate	ate	rate	Low		Low	Low	Low
Ditinagya	Mode			Moder	Mode	_			_	_
n	rate		Moderate	ate	rate	Low		Low	Low	Low
Esperanza	Mode			Moder	Mode				_	
1	rate		Moderate	ate	rate	Low		Low	Low	Low
Esteves	Mode		Madamata	Moder	Mode	T		T	T	T
	rate	NC 1	Moderate	ate	rate	LOW		LOW	LOW	LOW
Lual	Mode	Modera	Madamata	Moder	Mode	Low	Loui	Loui	Low	Lour
	Tate	Madama	Moderate	Madam	Made	LOW	LOW	LOW	LOW	LOW
Marikit	Mode	Modera	Modorato	Moder	Mode	Low	Low	Low	Low	Low
San	Mode	le	mouerate	Modor	Mode	LUW	LUW	LUW	LOW	LUW
Ildefonso	rate		Moderate	ate	rate	Low		Low	Low	Low
nucronso	Mode		moderate	Moder	Mode	LUW			LUW	LUW
Tabas	rate		Moderate	ate	rate	Low		Low	Low	Low
	Mode		moderate	Moder	Mode	1011			LOW	LOW
Tinib	rate		Moderate	ate	rate	Low		Low	Low	Low

Barangays on población has no farming areas. There are 16 barangays where crop-based farming and livestock or poultry areas has "moderate" degree of impact, 15 barangays where major crop production and irrigation system has "moderate" degree of impact, 4 barangays where aquaculture-based farming areas has "moderate" degree of impact to Future Number of Extreme Rainfall Events.

There are 4 barangays that has a "low" adaptive capacity in aquaculture-based farming areas. 15 barangays have a "low" adaptive capacity in major crop production and irrigation system and 16 barangays with "low" adaptive capacity in major crop-based farming areas and livestock or poultry areas to Future Number of Extreme Rainfall Events.

# Future Typhoons/Super typhoons and Natural Resources

				Future T	yphoons	s/Super	typhoons						
		DE	GREE OF IMPA	АСТ			ADA	ADAPTIVE CAPACITY					
BARANG AY	To crop - base d far min g area s	To aquacu lture- based farmin g areas	To livestock/ poultry areas	To major crop produ ction	To irriga tion syste ms	of crop - base d far min g area s	of aquacu Iture- based farmin g areas	of livestock/ poultry areas	of major crop produ ction	of irriga tion syste ms			
Barangay 1 (Pob.)													
Barangay 2 (Pob.)													
Barangay 3 (Pob.)													
Barangay 4 (Pob.)													
Barangay 5 (Pob.)													
Barangay 6 (Pob.)													
Barangay 7 (Pob.)													
Barangay 8 (Pob.)													
Bianuan	High		High			Low		Low					
Calabgan	High		High	High	High	Low		Low	Low	Low			
Calangcua san	High	High	High	High	High	Low	Low	Low	Low	Low			
Calantas	High		High	High	High	Low		Low	Low	Low			
Cozo	High		High	High	High	Low		Low	Low	Low			
Culat	High		High	High	High	Low		Low	Low	Low			
Dibacong	High	High	High	High	High	Low	Low	Low	Low	Low			
Dibet	High		High	High	High	Low		Low	Low	Low			
Ditinagya n	High		High	High	High	Low		Low	Low	Low			
Esperanza	High		High	High	High	Low		Low	Low	Low			
Esteves	High		High	High	High	Low		Low	Low	Low			
Lual	High	High	High	High	High	Low	Low	Low	Low	Low			
Marikit	High	High	High	High	High	Low	Low	Low	Low	Low			
San Ildefonso	High		High	High	High	Low		Low	Low	Low			
Tabas	High		High	High	High	Low		Low	Low	Low			
Tinib	High		High	High	High	Low		Low	Low	Low			

## Table 42. CCVA on Future Typhoons/Super typhoons and Natural Resources

Barangays on población has no farming areas. There are 16 barangays where crop-based farming and livestock or poultry areas has "high" degree of impact, 15

barangays where major crop production and irrigation system has "high" degree of impact, 4 barangays where aquaculture-based farming areas has "high" degree of impact to Future Number of Extreme Rainfall Events.

There are 4 barangays that has a "low" adaptive capacity in aquaculture-based farming areas. 15 barangays have a "low" adaptive capacity in major crop production and irrigation system and 16 barangays with "low" adaptive capacity in major crop-based farming areas and livestock or poultry areas to Future Number of Extreme Rainfall Events.

### **Climate Change Vulnerability Assessment of Critical Facilities**

#### **Future Temperature Trends and Critical Facilities**

				Fu	ture Tempe	rature Trer	ıds			
		DEGI	REE OF I	МРАСТ			ADAP	TIVE CA	PACITY	
	To school infrastr uctures	To hosp itals & healt h cent ers	To bara ngay hall	To gymna siums	To other govern ment infrastr uctures	of school infrastr uctures	of hosp itals & healt h cent ers	of bara ngay hall	of gymna siums	of other govern ment infrastr uctures
Barangay 1 (Pob.)			Mode rate		Moderate			Mode rate		Moderate
Barangay 2 (Pob.)			Mode rate					Mode rate		Treating
Barangay 3 (Pob.)		Mode rate	Mode rate				Mode rate	Mode rate		
Barangay 4 (Pob.)		Mode rate	Mode rate		Moderate		Mode rate	Mode rate		Moderate
Barangay 5 (Pob.)			Mode rate					Mode rate		
Barangay 6 (Pob.)	Moderate		Mode rate			Moderate		Mode rate		
Barangay 7 (Pob.)	Moderate		Mode rate		Moderate	Moderate		Mode rate		Moderate
Barangay 8 (Pob.)	Moderate		Mode rate			Moderate		Mode rate		
Bianuan	Moderate	Mode rate	Mode rate		Moderate	Moderate	Mode rate	Mode rate		Moderate
Calabgan	Moderate	Mode rate	Mode rate		Moderate	Moderate	Mode rate	Mode rate		Moderate
Calangcua san	Moderate	Mode rate	Mode rate		Moderate	Moderate	Mode rate	Mode rate		Moderate
Calantas	Moderate	Mode rate	Mode rate		Moderate	Moderate	Mode rate	Mode rate		Moderate
Cozo	Moderate	Mode rate	Mode rate		Moderate	Moderate	Mode rate	Mode rate		Moderate
Culat	Moderate	Mode rate	Mode rate			Moderate	Mode rate	Mode rate		
Dibacong	Moderate	Mode rate	Mode rate		Moderate	Moderate	Mode rate	Mode rate		Moderate
Dibet	Moderate	Mode rate	Mode rate		Moderate	Moderate	Mode rate	Mode rate		Moderate
Ditinagyan		Mode rate	Mode rate		Moderate		Mode rate	Mode rate		Moderate

#### **Table 43. CCVA on Future Temperature Trends and Critical Facilities**

Esperanza	Modorato	Mode	Mode	Modorato	Moderate	Mode	Mode	Modorato
	Moderate	M	M	Moderate	Moderate	M	M	Moderate
Esteves		Mode	Mode			Mode	моде	
Hoteves	Moderate	rate	rate	Moderate	Moderate	rate	rate	Moderate
Lual		Mode	Mode			Mode	Mode	
Luai	Moderate	rate	rate	Moderate	Moderate	rate	rate	Moderate
Manilait		Mode	Mode			Mode	Mode	
Marikit	Moderate	rate	rate	Moderate	Moderate	rate	rate	Moderate
San		Mode	Mode			Mode	Mode	
Ildefonso	Moderate	rate	rate	Moderate	Moderate	rate	rate	Moderate
Tabaa			Mode				Mode	
Tabas	Moderate		rate		Moderate		rate	
Tinih		Mode	Mode			Mode	Mode	
TIIID		rate	rate	Moderate		rate	rate	Moderate

The degree of impact to 67 school infrastructure, 18 health facilities, 24 barangay halls and 44 other government infrastructures are "moderate" to Future Temperature Trends. While the adaptive capacity of all critical facilities is "moderate to Future Temperature Trends.

#### Future Rainfall Trends and Natural Resources and Critical Facilities

					Future Rain	nfall Trends	6			
		DEGI	REE OF I	МРАСТ			ADAP	TIVE CA	PACITY	
	To school infrastr uctures	To hosp itals & healt h cent ers	To bara ngay hall	To gymna siums	To other govern ment infrastr uctures	of school infrastr uctures	of hosp itals & healt h cent ers	of bara ngay hall	of gymna siums	of other govern ment infrastr uctures
Barangay 1 (Pob.)			Mode rate		Moderate			Mode rate		Moderate
Barangay 2 (Pob.)			Mode rate					Mode rate		
Barangay 3 (Pob.)		Mode rate	Mode rate				Mode rate	Mode rate		
Barangay 4 (Pob.)		Mode rate	Mode rate		Moderate		Mode rate	Mode rate		Moderate
Barangay 5 (Pob.)			Mode rate					Mode rate		
Barangay 6 (Pob.)	Moderate		Mode rate			Moderate		Mode rate		
Barangay 7 (Pob.)	Moderate		Mode rate		Moderate	Moderate		Mode rate		Moderate
Barangay 8 (Pob.)	Moderate		Mode rate			Moderate		Mode rate		
Bianuan	Moderate	Mode rate	Mode rate		Moderate	Moderate	Mode rate	Mode rate		Moderate
Calabgan	Moderate	Mode rate	Mode rate		Moderate	Moderate	Mode rate	Mode rate		Moderate
Calangcua san	Moderate	Mode rate	Mode rate		Moderate	Moderate	Mode rate	Mode rate		Moderate
Calantas	Moderate	Mode rate	Mode rate		Moderate	Moderate	Mode rate	Mode rate		Moderate
Cozo	Moderate	Mode rate	Mode rate		Moderate	Moderate	Mode rate	Mode rate		Moderate
Culat	Moderate	Mode rate	Mode rate			Moderate	Mode rate	Mode rate		

#### Table 44. CCVA on Future Rainfall Trends and Critical Facilities

Dibacong		Mode	Mode			Mode	Mode	
Dibacolig	Moderate	rate	rate	Moderate	Moderate	rate	rate	Moderate
Dihot		Mode	Mode			Mode	Mode	
Dibet	Moderate	rate	rate	Moderate	Moderate	rate	rate	Moderate
Ditinagyan		Mode	Mode			Mode	Mode	
Ditillagyali		rate	rate	Moderate		rate	rate	Moderate
Fenoranza		Mode	Mode			Mode	Mode	
Esperanza	Moderate	rate	rate	Moderate	Moderate	rate	rate	Moderate
Estavos		Mode	Mode			Mode	Mode	
Esteves	Moderate	rate	rate	Moderate	Moderate	rate	rate	Moderate
Luci		Mode	Mode			Mode	Mode	
Luai	Moderate	rate	rate	Moderate	Moderate	rate	rate	Moderate
Monilrit		Mode	Mode			Mode	Mode	
Marikit	Moderate	rate	rate	Moderate	Moderate	rate	rate	Moderate
San		Mode	Mode			Mode	Mode	
Ildefonso	Moderate	rate	rate	Moderate	Moderate	rate	rate	Moderate
			Mode				Mode	
Tabas	Moderate		rate		Moderate		rate	
Tinih		Mode	Mode			Mode	Mode	
TIUD		rate	rate	Moderate		rate	rate	Moderate

The degree of impact to 67 school infrastructure, 18 health facilities, 24 barangay halls and 44 other government infrastructures are "moderate" to Future Rainfall Trends. While the adaptive capacity of all critical facilities is "moderate to Future Rainfall Trends.

### Future Number of Hot Days and Critical Facilities

	Future Number of Hot Days											
		DEGI	REE OF I	MPACT			ADAP	TIVE CA	PACITY			
	To school infrastr uctures	To hosp itals & healt h cent ers	To bara ngay hall	To gymna siums	To other govern ment infrastr uctures	of school infrastr uctures	of hosp itals & healt h cent ers	of bara ngay hall	of gymna siums	of other govern ment infrastr uctures		
Barangay 1 (Pob.)			Mode rate		Moderate			Mode rate		Moderate		
Barangay 2 (Pob.)			Mode rate		historiate			Mode rate		110401400		
Barangay 3 (Pob.)		Mode rate	Mode rate				Mode rate	Mode rate				
Barangay 4 (Pob.)		Mode rate	Mode rate		Moderate		Mode rate	Mode rate		Moderate		
Barangay 5 (Pob.)			Mode rate					Mode rate				
Barangay 6 (Pob.)	Moderate		Mode rate			Moderate		Mode rate				
Barangay 7 (Pob.)	Moderate		Mode rate		Moderate	Moderate		Mode rate		Moderate		
Barangay 8 (Pob.)	Moderate		Mode rate			Moderate		Mode rate				
Bianuan	Moderate	Mode rate	Mode rate		Moderate	Moderate	Mode rate	Mode rate		Moderate		
Calabgan	Moderate	Mode rate	Mode rate		Moderate	Moderate	Mode rate	Mode rate		Moderate		
Calangcua san	Moderate	Mode rate	Mode rate		Moderate	Moderate	Mode rate	Mode rate		Moderate		
Calantas	Moderate	Mode rate	Mode rate		Moderate	Moderate	Mode rate	Mode rate		Moderate		

### Table 45. CCVA on Future Number of Hot Days and Critical Facilities

6		Mode	Mode			Mode	Mode	
Lozo	Moderate	rate	rate	Moderate	Moderate	rate	rate	Moderate
Culat		Mode	Mode			Mode	Mode	
Culat	Moderate	rate	rate		Moderate	rate	rate	
Dibacong		Mode	Mode			Mode	Mode	
Dibacolig	Moderate	rate	rate	 Moderate	Moderate	rate	rate	Moderate
Dihot		Mode	Mode			Mode	Mode	
Dibet	Moderate	rate	rate	Moderate	Moderate	rate	rate	Moderate
Ditinagya		Mode	Mode			Mode	Mode	
n		rate	rate	Moderate		rate	rate	Moderate
Esperanz		Mode	Mode			Mode	Mode	
a	Moderate	rate	rate	Moderate	Moderate	rate	rate	Moderate
<b></b>		Mode	Mode			Mode	Mode	
Esteves	Moderate	rate	rate	Moderate	Moderate	rate	rate	Moderate
T 1		Mode	Mode			Mode	Mode	
Lual	Moderate	rate	rate	Moderate	Moderate	rate	rate	Moderate
Monilrit		Mode	Mode			Mode	Mode	
Marikit	Moderate	rate	rate	Moderate	Moderate	rate	rate	Moderate
San		Mode	Mode			Mode	Mode	
Ildefonso	Moderate	rate	rate	Moderate	Moderate	rate	rate	Moderate
			Mode				Mode	
Tabas	Moderate		rate		Moderate		rate	
T::].		Mode	Mode			Mode	Mode	
TINID		rate	rate	Moderate		rate	rate	Moderate

The degree of impact to 67 school infrastructure, 18 health facilities, 24 barangay halls and 44 other government infrastructures are "moderate" to Future Number of Hot Days. While the adaptive capacity of all critical facilities is "moderate" to Future Number of Hot Days.

### Future Number of Dry Days and Critical Facilities

				Fu	iture Numb	er of Dry Da	iys			
		DEGI	REE OF I	MPACT		ADAPTIVE CAPACITY				
	To school infrastr uctures	To hosp itals & healt h cent ers	To bara ngay hall	To gymna siums	To other govern ment infrastr uctures	of school infrastr uctures	of hosp itals & healt h cent ers	of bara ngay hall	of gymna siums	of other govern ment infrastr uctures
Barangay 1 (Pob.)			Mode rate		Moderate			Mode rate		Moderate
Barangay 2 (Pob.)			Mode rate					Mode rate		
Barangay 3 (Pob.)		Mode rate	Mode rate				Mode rate	Mode rate		
Barangay 4 (Pob.)		Mode rate	Mode rate		Moderate		Mode rate	Mode rate		Moderate
Barangay 5 (Pob.)			Mode rate					Mode rate		
Barangay 6 (Pob.)	Moderate		Mode rate			Moderate		Mode rate		
Barangay 7 (Pob.)	Moderate		Mode rate		Moderate	Moderate		Mode rate		Moderate
Barangay 8 (Pob.)	Moderate		Mode rate			Moderate		Mode rate		
Bianuan	Moderate	Mode rate	Mode rate		Moderate	Moderate	Mode rate	Mode rate		Moderate

Table 46. CCVA on Future Number of Dry Days and Critical Facilities

6.1.1	1	Mode	Mode	1			Mode	Mode	
Calabgan	Moderate	rate	rate		Moderate	Moderate	rate	rate	Moderate
Calangcua		Mode	Mode				Mode	Mode	
san	Moderate	rate	rate		Moderate	Moderate	rate	rate	Moderate
Calantaa		Mode	Mode				Mode	Mode	
Calantas	Moderate	rate	rate		Moderate	Moderate	rate	rate	Moderate
Cozo		Mode	Mode				Mode	Mode	
COZO	Moderate	rate	rate		Moderate	Moderate	rate	rate	Moderate
Culat		Mode	Mode				Mode	Mode	
Guiat	Moderate	rate	rate			Moderate	rate	rate	
Dibacong		Mode	Mode				Mode	Mode	
Dibacong	Moderate	rate	rate		Moderate	Moderate	rate	rate	Moderate
Dihet		Mode	Mode				Mode	Mode	
DIDCt	Moderate	rate	rate		Moderate	Moderate	rate	rate	Moderate
Ditinagyan		Mode	Mode				Mode	Mode	
8,		rate	rate		Moderate		rate	rate	Moderate
Esperanza		Mode	Mode				Mode	Mode	
	Moderate	rate	rate	-	Moderate	Moderate	rate	rate	 Moderate
Esteves		Mode	Mode				Mode	Mode	
	Moderate	rate	rate		Moderate	Moderate	rate	rate	Moderate
Lual	N 1 .	Mode	Mode				Mode	Mode	
	Moderate	rate	rate		Moderate	Moderate	rate	rate	Moderate
Marikit	Madameta	Mode	Mode		Madaaata	Madameta	Mode	Mode	Madaaata
6	Moderate	rate	rate	-	Moderate	Moderate	rate	rate	Moderate
San		Mode	Mode				Mode	Mode	
Ildefonso	Moderate	rate	rate		Moderate	Moderate	rate	rate	Moderate
Tabas			Mode					Mode	
14545	Moderate		rate			Moderate		rate	
Tinib		Mode	Mode				Mode	Mode	
15		rate	rate		Moderate		rate	rate	Moderate

The degree of impact to 67 school infrastructure, 18 health facilities, 24 barangay halls and 44 other government infrastructures are "moderate" to Future Number of Dry Days. While the adaptive capacity of all critical facilities is "moderate" to Future Number of Dry Days.

### Future Number of Extreme Rainfall Events and Critical Facilities

		Future Number of Extreme Rainfall Events											
		DEG	REE OF I	MPACT			ADAP	TIVE CA	PACITY				
	To school infrastr uctures	To hosp itals & healt h cent ers	To bara ngay hall	To gymna siums	To other govern ment infrastr uctures	of school infrastr uctures	of hosp itals & healt h cent ers	of bara ngay hall	of gymna siums	of other govern ment infrastr uctures			
Barangay								_		_			
1 (Pob.)			High		High			Low		Low			
Barangay 2 (Pob.)			High					Low					
Barangay 3 (Pob.)		High	High				Low	Low					
Barangay 4 (Pob.)		High	High		High		Low	Low		Low			
Barangay 5 (Pob.)			High					Low					
Barangay 6 (Pob.)	High		High			Low		Low					

#### Table 47. CCVA on Future Number of Extreme Rainfall Events and Critical Facilities

Barangay 7 (Pob.)	High		High	High	Low	]	Low	Low
Barangay 8 (Pob.)	High		High	0	Low		Low	
Bianuan	High	High	High	High	Low	Low	Low	Low
Calabgan	High	High	High	High	Low	Low	Low	Low
Calangcua san	High	High	High	High	Low	Low	Low	Low
Calantas	High	High	High	High	Low	Low	Low	Low
Cozo	High	High	High	High	Low	Low	Low	Low
Culat	High	High	High		Low	Low	Low	Low
Dibacong	High	High	High	High	Low	Low	Low	Low
Dibet	High	High	High	High	Low	Low	Low	Low
Ditinagyan		High	High	High		Low	Low	Low
Esperanza	High	High	High	High	Low	Low	Low	Low
Esteves	High	High	High	High	Low	Low	Low	Low
Lual	High	High	High	High	Low	Low	Low	Low
Marikit	High	High	High	High	Low	Low	Low	Low
San Ildefonso	High	High	High	High	Low	Low	Low	Low
Tabas	High		High		Low		Low	
Tinib		Mode rate	High	High		Low	Low	Low

The degree of impact to 67 school infrastructure, 18 health facilities, 24 barangay halls and 44 other government infrastructures are "moderate" to Future Number of Extreme Rainfall Events. While the adaptive capacity of all critical facilities is "moderate" to Future Number of Extreme Rainfall Events.

### Future Sea Level Changes and Critical Facilities

# Table 48. CCVA on Future Sea Level Changes and Critical Facilities

	Future Sea Level Changes											
		DEGI	REE OF I	MPACT			ADAP	TIVE CA	PACITY			
	To school infrastr uctures	To hosp itals & healt h cent ers	To bara ngay hall	To gymna siums	To other govern ment infrastr uctures	of school infrastr uctures	of hosp itals & healt h cent ers	of bara ngay hall	of gymna siums	of other govern ment infrastr uctures		
Barangay 1 (Pob.)			Low		Low			High		High		
Barangay 2 (Pob.)			Low					High		ŭ		
Barangay 3 (Pob.)		Low	Low				High	High				
Barangay 4 (Pob.)		Low	Low		Low		High	High		High		
Barangay 5 (Pob.)			Low					High				

Barangay 6 (Pob.)	Low		Low		High		High		
Barangay 7 (Pob.)	Low		Low	Low	High		High	High	
Barangay 8 (Pob.)	Low		Low		High		High		
Bianuan	Low	Low	Low	Low	High	High	High	High	
Calabgan	Moderate	Mode rate	Mode rate	Moderate	Low	Low	Low	Low	
Calangcua san	Low	Low	Low	Low	High	High	High	High	
Calantas	Low	Low	Low	Low	High	High	High	High	
Cozo	Moderate	Mode rate	Mode rate	Moderate	Low	Low	Low	Low	
Culat	Low	Low	Low		High	High	High	High	
Dibacong	High	High	High	High	Low	Low	Low	Low	
Dibet	Low	Low	Low	Low	High	High	High	High	
Ditinagyan		Low	Low	Low	High	High	High	High	
Esperanza	Low	Low	Low	Low	High	High	High	High	
Esteves	High	High	High	High	Low	Low	Low	Low	
Lual	High	High	High	High	Low	Low	Low	Low	
Marikit	Low	Low	Low	Low	High	High	High	High	
San Ildefonso	High	High	High	High	Low	Low	Low	Low	
Tabas	Low		Low		High		High		
Tinib		Low	Low	Low		High	High	High	

The degree of impact to all critical facilities in barangays Dibacong, Esteves, Lual and San Ildefonso are "high", while barangays Calabgan and Cozo are "moderate" and the rest of barangays are "low" to Future Sea Level Changes. The adaptive capacity of all critical facilities in barangays Dibacong, Esteves, Lual, San Ildefonso, Calabgan and Cozo are "low" and the rest of barangays are "high" to Future Sea Level Changes.

### Future Typhoons/Super typhoons and Critical Facilities

Table 49. CCVA on Future	Ту	phoons/	′Suj	per t	y	phoons	and	Critical	Facilities
--------------------------	----	---------	------	-------	---	--------	-----	----------	------------

1 abie 49.	CUVA OI	rutu	eryp	1100115/	super ty		nu CH	uital r	aunties	•	
				Futur	e Typhoons	/Supertypl	ioons				
		DEGI	REE OF I	MPACT		ADAPTIVE CAPACITY					
	To school infrastr uctures	To hosp itals & healt h cent ers	To bara ngay hall	To gymna siums	To other govern ment infrastr uctures	of school infrastr uctures	of hosp itals & healt h cent ers	of bara ngay hall	of gymna siums	of other govern ment infrastr uctures	
Barangay 1 (Pob.)			High		High			Mode rate		Moderate	
Barangay 2 (Pob.)			High		8			Mode rate			
Barangay 3 (Pob.)		High	High				Mode rate	Mode rate			
Barangay 4 (Pob.)		High	High		High		Mode rate	Mode rate		Moderate	
									100		

Correspondence       Node       Mode         Barangay       High       High       Mode       Mode         Barangay       High       High       Mode       Mode         Barangay       High       High       Mode       rate       Mode         Barangay       High       High       High       Mode       rate       rate       Mode         Calabgan       High       High       High       High       Mode       Moderate       rate       rate       Moderate       rate       rate       Moderate       Moderate       Mode <td< th=""><th>Barangay 5 (Pob.)</th><th></th><th></th><th>High</th><th></th><th></th><th></th><th></th><th>Mode rate</th><th></th></td<>	Barangay 5 (Pob.)			High					Mode rate	
6 (Pob.)       High       High       Moderate       rate         Barangay       High       High       Moderate       rate       Moderate         7 (Pob.)       High       High       High       Moderate       rate       Moderate         8 (Pob.)       High       High       High       Mode       rate       Mode         Bianuan       High       High       High       Mode       rate       Moderate         Calabgan       High       High       High       Mode       Moderate       rate       Moderate         Calangcua       san       High       High       High       High       Mode       Mode       Moderate         Calantas       High       High       High       High       High       Mode       Mode       Moderate         Cozo       High       High       High       High       High       Mode       Mode       Moderate       rate       Moderate         Dibacong       High       High       High       High       High       High       Moderate       rate       Moderate       Moderate         Dibatong       High       High       High       High       High       Modera	Barangay			8					Mode	
Barangay 7 (Pob.)     High     High     High     Mode High     Mode rate     Mode rate       Barangay 8 (Pob.)     High     High     High     Mode High     Mode rate     Mode rate     Mode rate     Mode rate       Bianuan     High     High     High     High     Mode rate     Mode rate     Mode rate     Mode rate     Mode rate       Calabgan     High     High     High     High     High     Mode High     Mode rate     Mode rate     Mode rate     Mode rate     Mode rate     Mode rate       Calangcua san     High     High     High     High     High     Mode High     Mode High     Mode rate     Mode	6 (Pob.)	High		High			Moderate		rate	
7 (Pob.)       High       High       High       Moderate       rate       Moderate         Barangay 8 (Pob.)       High       High       High       Mode       rate       -         Bianuan       High       High       High       Mode       rate       -       -         Calabgan       High       High       High       High       Mode       Mode       -       -         Calangcua	Barangay								Mode	
Barangay 8 (Pob.)     High     High     High     High     Mode High     Mode Roderate     Mode rate     Mode rate       Bianuan     High     High     High     High     High     Mode     Mode       Calabgan     High     High     High     High     High     Mode     Mode       Calangcua san     High     High     High     High     High     Mode     Mode       Calantas     High     High     High     High     High     High     Mode     Mode       Cozo     High     High     High     High     High     High     Mode     Mode       Dibacong     High     High     High     High     High     High     Migh     Mode     Mode       Dibatong     High     High     High     High     High     Migh     Mode     Mode       Dibatong     High     High     High     High     High     Mode     Mode       Nu     High     High     High     High     High     Mode     Mode       Dibacong     High     High     High     High     High     Mode     Mode       N     High     High     High     High     High	7 (Pob.)	High		High	H	High	Moderate		rate	Moderate
8 (Pob.)       High       High       High       High       High       Mode High       Mode rate       rate       Mode         Bianuan       High       High       High       High       High       Mode       rate       rate       Mode         Calabgan       High       High       High       High       High       Mode       Mode       Mode         Calangcua       High       High       High       High       High       Mode       Mode       Mode         Calantas       High       High       High       High       High       Mode       Mode       Mode         Calantas       High       High       High       High       High       Mode       Mode       Mode       Mode         Cozo       High       High       High       High       High       High       Mode       Mode       Mode       Mode       Moderate       rate       Moderate       rate       Moderate       rate       Moderate       rate       Moderate       rate       Moderate       rate       Moderate       mate       Moderate       mate       Moderate       mate       Moderate       mate       Moderate       mate       Moderate <td< td=""><td>Barangay</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>Mode</td><td></td></td<>	Barangay								Mode	
Bianuan     High     High     High     High     Mode High     Mode rate     Mode rate     Mode rate     Mode rate       Calabgan     High     High     High     High     High     Mode     Mode       Calangcua san     High     High     High     High     Mode     Mode     Mode       Calantas     High     High     High     High     High     Mode     Mode       Cozo     High     High     High     High     High     Mode     Mode       Culat     High     High     High     High     High     Mode     Mode       Dibacong     High     High     High     High     High     Mode     Mode       Dibet     High     High     High     High     Mode     Mode       Dibatong     High     High     High     High     Mode     Mode       Node     Mode     rate     rate     Moderate     Mode       Dibet     High     High     High     High     Mode     rate     Mode       An     High     High     High     High     Mode     rate     Mode       Dibet     High     High     High     High     Mode <td>8 (Pob.)</td> <td>High</td> <td></td> <td>High</td> <td></td> <td></td> <td>Moderate</td> <td></td> <td>rate</td> <td></td>	8 (Pob.)	High		High			Moderate		rate	
Diantulin     High     High     High     High     High     Moderate     rate     rate     rate     rate     rate     Mode       Calabgan     High     High     High     High     High     High     Mode     Mode     Mode       Calangcua     High     High     High     High     High     High     Mode     Mode     Mode       Calantas     High     High     High     High     High     High     Mode     Mode     Mode       Cozo     High     High     High     High     High     High     Mode     Mode     Mode       Culat     High     High     High     High     High     High     Mode     Mode     Mode       Dibacong     High     High     High     High     High     Mode     Mode     Mode       Dibatong     High     High     High     High     High     Mode     Mode     Mode       Dibatong     High     High     High     High     High     High     Mode     Mode       Dibatong     High     High     High     High     High     High     Mode     Mode       Node     Mode     Mode     High	Bianuan							Mode	Mode	
CalabganHighHighHighHighModeModeModeModerateModeModerateModer	Dialituali	High	High	High	I	High	Moderate	rate	rate	Moderate
HighHighHighHighHighModeraterateraterateModerateCalangcua sanHighHighHighHighHighModeModeModerateModeCalantasHighHighHighHighHighModeModeModeModerateModerateCalantasHighHighHighHighHighModeModeModeModerateModerateCozoHighHighHighHighModeModerateraterateModerateCulatHighHighHighHighModerateraterateModerateDibacongHighHighHighHighModerateraterateModerateDibetHighHighHighHighModerateraterateModerateDibetHighHighHighHighModerateraterateModerateDibtaragvaHighHighHighHighModerateraterateModerateaHighHighHighHighModerateraterateModerateLualHighHighHighHighModerateraterateModerateSanHighHighHighHighHighModerateraterateModerateDibacongHighHighHighHighHighModerateraterateModerateDibacon	Calabgan							Mode	Mode	
Calangcua sanHighHighHighHighModeModeModeCalantasHighHighHighHighMighModeModeModeCalantasHighHighHighHighModeraterateModeCozoHighHighHighHighModeModeModeModeCulatHighHighHighHighModeraterateModeDibacongHighHighHighHighModeModeModeModerateDibetHighHighHighHighHighModeraterateModeDibatongHighHighHighHighModeModeModerateModeDibetHighHighHighHighModeraterateModerateDibatHighHighHighHighModerateraterateModerateDibatHighHighHighHighModerateraterateModerateDibatHighHighHighHighModerateraterateModerateDibatHighHighHighHighModerateraterateModerateDibatHighHighHighHighModerateraterateModerateDibatHighHighHighHighModerateraterateModerateDibatHighHighHi	Calabgali	High	High	High	I	High	Moderate	rate	rate	Moderate
sanHighHighHighHighModeraterateraterateModerateCalantasHighHighHighHighHighModeModeModeModerateCozoHighHighHighHighHighModeraterateModeCulatHighHighHighHighModerateraterateModerateDibacongHighHighHighHighModerateraterateModerateDibetHighHighHighHighModerateraterateModerateDibetHighHighHighHighModerateraterateModerateDibarongHighHighHighHighModerateraterateModerateDibetHighHighHighHighModerateraterateModerateDitinagyaHighHighHighHighModerateraterateModerateaHighHighHighHighModerateraterateModerateLualHighHighHighHighHighModerateraterateModerateLualHighHighHighHighHighModerateraterateModerateSanHighHighHighHighHighHighModerateraterateModerateSanHighHighHighHigh <td>Calangcua</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Mode</td> <td>Mode</td> <td></td>	Calangcua							Mode	Mode	
CalantasHighHighHighHighModeModeModeModeCozoHighHighHighHighHighModeModeModeModeCulatHighHighHighHighHighModeModeModeModeDibacongHighHighHighHighHighModeModeModeModeDibacongHighHighHighHighHighModeModeModeModeDibetHighHighHighHighModeModeModeModeModeDibetHighHighHighHighModeModeModeModeModeDibatongHighHighHighHighModeModeModeModeModeDibetHighHighHighHighModeModeModeModeModeModeDitinagyaHighHighHighHighMode	san	High	High	High	I	High	Moderate	rate	rate	Moderate
HighHighHighHighModeraterateraterateModerateCozoHighHighHighHighHighModeModeModeModerateCulatHighHighHighHighModeModeModeModerateModeDibacongHighHighHighHighHighModeModeModeModerateDibacongHighHighHighHighHighModeModeModerateModeDibetHighHighHighHighHighModerateraterateModeDibetHighHighHighHighModerateraterateModerateDibatHighHighHighHighModerateraterateModerateDibetHighHighHighHighModerateraterateModerateDitinagyaHighHighHighHighModerateraterateModerateaHighHighHighHighHighModerateraterateModerateLualHighHighHighHighHighModerateraterateModerateLualHighHighHighHighHighHighModerateraterateModerateSanHighHighHighHighHighHighModerateraterateModerateSanHigh<	Calantas							Mode	Mode	
CozoHighHighHighHighHighModeModeModeCulatHighHighHighHighHighHighModeraterateModeDibacongHighHighHighHighHighHighModeraterateModeDibacongHighHighHighHighHighModeraterateModeDibetHighHighHighHighHighModerateModeDibatHighHighHighHighModerateModeDibatHighHighHighHighModeModeModeDitinagyaHighHighHighHighModeModeModeaHighHighHighHighModeModeModeModerateEstevesHighHighHighHighModeraterateModeModerateLualHighHighHighHighHighModerateraterateModerateMarikitHighHighHighHighHighModerateraterateModerateSanHighHighHighHighHighHighModerateraterateModerateSanHighHighHighHighHighHighHighModerateraterateModerate	Guiuntub	High	High	High	I	High	Moderate	rate	rate	Moderate
LinkHighHighHighHighModeraterateraterateModerateCulatHighHighHighHighHighHighModeModeModeModerateDibacongHighHighHighHighHighHighModerateraterateModerateDibetHighHighHighHighHighModerateraterateModerateDibetHighHighHighHighHighModerateraterateModerateDitinagyaHighHighHighHighModerateraterateModerateaHighHighHighHighModerateraterateModerateEsperanzHighHighHighHighModerateraterateModerateLualHighHighHighHighModerateraterateModerateMarikitHighHighHighHighHighModerateraterateModerateSanHighHighHighHighHighHighHighModerateraterateModerateSanHighHighHighHighHighHighHighModerateraterateModerateSanHighHighHighHighHighHighHighHighModerateraterateModerateSanHighHighHigh <td>Cozo</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Mode</td> <td>Mode</td> <td></td>	Cozo							Mode	Mode	
CulatHighHighHighHighModeModeModeModeDibacongHighHighHighHighHighModeModeModeModeDibacongHighHighHighHighHighModerateraterateModeDibetHighHighHighHighModerateraterateModeDibetHighHighHighHighModeModeModeDitinagyaHighHighHighModeraterateModenHighHighHighModeraterateModeaHighHighHighModeraterateModeaHighHighHighHighModeModeModeLualHighHighHighHighModemodeModeMarikitHighHighHighHighModemodeModeSanHighHighHighHighHighModeModeModeSanHighHighHighHighHighHighModeModeMode	0020	High	High	High	I	High	Moderate	rate	rate	 Moderate
NumHighHighHighHighModerateraterateModerateDibacongHighHighHighHighHighHighModeModeModerateModerateDibetHighHighHighHighHighHighModerateModeModerateModerateDibacongHighHighHighHighHighHighModerateModeModerateModerateDibetHighHighHighHighHighHighModerateModeModerateModerateDitinagyaImage: Comparison of the state of the	Culat							Mode	Mode	
DibacongHighHighHighHighModeModeModeModeDibetHighHighHighHighHighModeModeModeModeDibetHighHighHighHighHighModeModeModeModeDitinagyaImage: Construction of the second		High	High	High			Moderate	rate	rate	Moderate
DibetHighHighHighHighModerateraterateModerateDibetHighHighHighHighHighModeModeModeModerateDitinagyaHighHighHighHighModerateModeModeModerateModerateDitinagyaHighHighHighHighModerateModeModeModerateModerateaHighHighHighHighModerateModeModerateModerateModerateaHighHighHighHighModerateModeModerateModerateModerateEstevesHighHighHighHighModerateModeModerateModerateModerateLualHighHighHighHighHighModerateModeModerateModerateMarikitHighHighHighHighModerateModeModerateModerateSanHighHighHighHighHighModerateModeModeJudefonsoHighHighHighHighHighModerateModeMode	Dibacong							Mode	Mode	
DibetHighHighHighHighHighModeModeModeDitinagya nHighHighHighHighModerateraterateModeDitinagya nHighHighHighHighModeraterateModeEsperanz aHighHighHighHighModeraterateModeEstevesHighHighHighHighModeModeModeLualHighHighHighHighModeraterateModeMarikitHighHighHighHighModeraterateModeSanHighHighHighHighHighModerateModeMaderateHighHighHighHighHighModeModeModeMarikitHighHighHighHighModerateModeModeSanHighHighHighHighHighModeModeMode		High	High	High	I	ligh	Moderate	rate	rate	 Moderate
HighHighHighHighModerateFateFateModerateDitinagya nHighHighHighModerateModeModeModerateResperanz aHighHighHighHighModerateModeModerateModerateEsperanz aHighHighHighHighModerateModeModerateModerateEstevesHighHighHighHighModerateModeModerateModerateLualHighHighHighHighModerateModeModerateModerateMarikitHighHighHighHighModerateTateModerateSan UdefonsoHighHighHighHighModerateModeModeMaderateHighHighHighHighModerateModeModerateMarikitHighHighHighHighModerateModeModeSan UdefonsoHighHighHighHighModerateModeMode	Dibet	TT: 1						Mode	Mode	
Ditinagya nHighHighHighModeModeModeImage: Seperanz aHighHighHighHighModeraterateModeImage: Seperanz aHighHighHighHighModeModeModeModeImage: Seperanz aHighHighHighHighModeModeModeModeImage: Seperanz aHighHighHighHighModeModeModeModeImage: Seperanz aHighHighHighHighModeModeModeModeImage: Seperanz aHighHighHighHighModeModeModeModeImage: Seperanz aHighHighHighHighModeModeModeModeImage: Seperanz San Image: Seperanz HighHighHighHighModeModeModeModeImage: Seperanz Seperanz HighHighHighHighModeModeModeModeSan Image: Seperanz HighHighHighHighHighModeModeModeModeSan Image: Seperanz HighHighHighHighHighModeModeModeModeSan Image: Seperanz HighHighHighHighHighModeModeModeModeSan Image: Seperanz HighHighHighHighHighModeModeModeMode <tr< td=""><td>Divi</td><td>High</td><td>High</td><td>High</td><td>1</td><td>lign</td><td>Moderate</td><td>rate</td><td>rate</td><td>Moderate</td></tr<>	Divi	High	High	High	1	lign	Moderate	rate	rate	Moderate
nHighHighHighModerateFateFateModerateEsperanz aHighHighHighHighModerateModeModeaHighHighHighHighHighModerateraterateModerateEstevesHighHighHighHighHighModerateModeModerateLualHighHighHighHighHighModerateModeModerateMarikitHighHighHighHighModerateModeModerateSanHighHighHighHighModerateTateModeIdefonsoHighHighHighHighModerateModeMode	Ditinagya		III -l.	III -L		11 - L		Mode	Mode	
Esperanz       Mode       Mode       Mode         a       High       High       High       High       Mode       rate       rate       Mode         Esteves       High       High       High       High       High       Mode       Mode       Mode         Lual       High       High       High       High       High       High       Mode       Mode       Mode         Marikit       High       High       High       High       High       Mode       Mode       Mode         San       High       High       High       High       High       High       High       Mode       Mode         San       High       High       High       High       High       High       High       High       High       Mode	n		High	High	1	lign	Moderate	rate	rate	Moderate
a     High     High     High     High     Moderate     Fate     Fate     Fate     Moderate       Esteves     High     High     High     High     Moderate     Mode     Mode     Moderate       Lual     High     High     High     High     High     Moderate     Mode     Moderate       Marikit     High     High     High     High     Moderate     Mode     Moderate       San     High     High     High     High     High     Moderate     Mode	Esperanz	High	High	High		Ti ala		Mode	Mode	
Esteves     High     High     High     High     Mode     Mode       Lual     High     High     High     High     Mode     rate     rate     Mode       Marikit     High     High     High     High     Mode     Mode     Mode       San     High     High     High     High     Mode     Mode     Mode	a	High	High	High	1	aign	Moderate	rate	rate	 Moderate
High     High     High     High     High     Moderate     Fate     Fate     Fate     Moderate       Lual     High     High     High     High     Moderate     Mode     Mode       Marikit     High     High     High     High     Moderate     Mode     Moderate       San     High     High     High     High     Moderate     Fate     Moderate	Esteves	Uich	High	Uigh		lich	Madamata	Mode	Mode	Madamata
Lual     High     High     High     High     Mode     Mode       Marikit     High     High     High     Mode     rate     Mode       San     High     High     High     Mode     Mode     Mode		підп	підп	nigii	1	nigii	Moderate	Mada	Mada	 Moderate
Marikit     High     High     High     High     Moderate     Tate     Tate     Tate     Moderate       San     Idefonso     High     High     High     Migh     Moderate     rate     Moderate	Lual	High	High	High	Т	High	Modorato	rato	rato	Modorato
Marikit     High     High     High     High     Mode     Mode       San     Idefonso     High     High     High     Mode     Mode		nign	nign	riigii	1	ngn	Moderate	Mode	Mode	 Moderate
San High High High High High Moderate rate rate woderate	Marikit	High	High	High	I I I	High	Moderate	rate	rate	Moderate
Ildefonce High High High High Mederate rate rate	San	mgn	mgn	mgn	1	IIgn	Moderate	Modo	Modo	Moderate
MAAPSTA MAAPSTA	Ildefonso	High	High	High	1	High	Moderate	rate	rate	Moderate
Mode Mode	inderoniso		111611	111611			mouchate	Tute	Mode	muutate
Tabas High High Moderate rate	Tabas	High		High			Moderate		rate	
Mode Mode							muurait	Mode	Mode	
Tinib High High High Moderate Moder	Tinib		High	High		High		rate	rate	Moderate

The degree of impact to 67 school infrastructure, 18 health facilities, 24 barangay halls and 44 other government infrastructures are "high" to Future Typhoons/Super typhoons. While the adaptive capacity of all critical facilities is "moderate" to Future Typhoons/Super typhoons.

# Climate Change Vulnerability Assessment of Urban Use Future Temperature Trends and Urban Use Table 50. CCVA on Future Temperature Trends and Urban Use

	Future Temperature Trends           DEGREE OF IMPACT         ADAPTIVE CAPACITY									
		DEGI	REE OF I	MPACT			ADAPT	TIVE CA	PACITY	7
	To reside ntial land use	To comme rcial land use	To touri st sites	To upla nd and slopi ng areas	To shoreline /water bodies	of reside ntial land use	of comme rcial land use	of tou rist site s	of upla nd and slop ing area s	of shoreline /water bodies
Barangay 1	Moder	Modera								
(Pob.)	ate	te				Low	Low			
Barangay 2 (Pob.)	Moder ate	Modera te	Mode rate	Mode rate		Low	Low	Low	Low	
Barangay 3	Moder	Modera		Mode		_				
(Pob.)	ate	te		rate		Low	Low		Low	
Barangay 4	Moder	Modera				Low	Low			
Barangay 5	Moder					LOW	Low			
(Pob.)	ate					Low				
Barangay 6	Moder									
(Pob.)	ate					Low				
Barangay 7 (Pob.)	Moder ate					Low				
Barangay 8	Moder									
(Pob.)	ate					Low				
Bianuan	Moder	Modera				Low	Low			
	Moder	le	Mode	Mode		LUW	LOW			
Calabgan	ate		rate	rate	Moderate	Low		Low	Low	Low
Calangcuas	Moder	Modera	Mode	Mode						
an	ate	te	rate	rate	Moderate	Low	Low	Low	Low	Low
Calantas	Moder	Modera te		Mode		Low	Low		Low	
	Moder		Mode	Mode		LOW	LOW		LOW	
Cozo	ate		rate	rate	Moderate	Low		Low	Low	Low
Culat	Moder		Mode	Mode						
Guilde	ate		rate	rate	Moderate	Low		Low	Low	Low
Dibacong	Moder			Mode	Modorato	Low			Low	Low
	Moder		Mode	Mode	Modelate	LUW			LUW	LOW
Dibet	ate		rate	rate	Moderate	Low		Low	Low	Low
Ditinagyan	Moder		Mode	Mode						
Ditiliagyali	ate		rate	rate	Moderate	Low		Low	Low	Low
Esperanza	Moder ate			Mode rate		Low			Low	
Determo	Moder		Mode	Mode						
Esteves	ate		rate	rate		Low		Low	Low	
Lual	Moder	Modera	Mode	Mode						
	ate	te	rate	rate	Moderate	Low	Low	Low	Low	Low
Marikit	ate	te	rate	rate		Low	Low		Low	
San	Moder	Modera	Mode	Mode						
Ildefonso	ate	te	rate	rate	Moderate	Low	Low	Low	Low	Low
Tabas	Moder		Mode							
	ate Moder	Modera	rate			LOW		LOW		
Tinib	ate	te	rate		Moderate	Low	Low	Low		Low
•										•

The degree of impact to residential, commercial, tourist sites, shoreline or bodies of water and to upland and sloping areas in 24 barangays are "moderate" to Future Temperature Trends with a generally "low" adaptive capacity.

# Future Rainfall Trends and Natural Resources and Urban Use

	Future Rainfall Trends									
		DEG	REE OF I	МРАСТ			ADAPT	TIVE CA	PACITY	,
	To reside ntial land use	To comme rcial land use	To touri st sites	To upla nd and slopi ng areas	To shoreline /water bodies	of reside ntial land use	of comme rcial land use	of tou rist site s	of upla nd and slop ing area s	of shoreline /water bodies
Barangay 1 (Pob.)	Moder ate	Modera te				Low	Low			
Barangay 2 (Pob.)	Moder ate	Modera te	Mode rate	Mode rate		Low	Low	Low	Low	
Barangay 3 (Pob.)	Moder ate	Modera te		Mode rate		Low	Low		Low	
Barangay 4 (Pob.)	Moder ate	Modera te				Low	Low			
Barangay 5 (Pob.)	Moder ate					Low				
Barangay 6 (Pob.)	Moder ate					Low				
Barangay 7 (Pob.)	Moder ate					Low				
Barangay 8 (Pob.)	Moder ate					Low				
Bianuan	Moder ate	Modera te				Low	Low			
Calabgan	Moder ate		Mode rate	Mode rate	Moderate	Low		Low	Low	Low
Calangcuas an	Moder ate	Modera te	Mode rate	Mode rate	Moderate	Low	Low	Low	Low	Low
Calantas	Moder ate	Modera te		Mode rate		Low	Low		Low	
Cozo	Moder ate		Mode rate	Mode rate	Moderate	Low		Low	Low	Low
Culat	Moder ate		Mode rate	Mode rate	Moderate	Low		Low	Low	Low
Dibacong	Moder ate			Mode rate	Moderate	Low			Low	Low
Dibet	Moder ate		Mode rate	Mode rate	Moderate	Low		Low	Low	Low
Ditinagyan	Moder ate		Mode rate	Mode rate	Moderate	Low		Low	Low	Low
Esperanza	Moder ate			Mode rate		Low			Low	
Esteves	Moder ate		Mode rate	Mode rate		Low		Low	Low	
Lual	Moder	Modera te	Mode	Mode	Moderate	Low	Low	Low	Low	Low
Marikit	Moder	Modera te	Mode	Mode		Low	Low	2.511	Low	
					1			1		

### Table 51. CCVA on Future Rainfall Trends and Urban Use

San Ildefonso	Moder ate	Modera te	Mode rate	Mode rate	Moderate	Low	Low	Low	Low	Low
Tabac	Moder		Mode							
Tabas	ate		rate			Low		Low		
Tinih	Moder	Modera	Mode							
11110	ate	te	rate		Moderate	Low	Low	Low		Low

The degree of impact to residential, commercial, tourist sites, shoreline or bodies of water and to upland and sloping areas in 24 barangays are "moderate" to Future Rainfall Trends with a generally "low" adaptive capacity.

# Future Number of Hot Days and Urban Use

Table 52. CCVA	on Future	Number	of Hot Day	s and Urbar	ı Use
I GOLL COLL	onii acai c	Itamoet	of fiot Duy	b und of bui	1000

	Future Number of Hot Days									
		DEGI	REE OF II	MPACT			ADAPT	TIVE CA	PACITY	,
	To reside ntial land use	To comme rcial land use	To touri st sites	To upla nd and slopi ng areas	To shoreline /water bodies	of reside ntial land use	of comme rcial land use	of tou rist site s	of upla nd and slop ing area s	of shoreline /water bodies
Barangay 1 (Pob.)	Moder ate	Modera te				Low	Low			
Barangay 2 (Pob.)	Moder ate	Modera te	Mode rate	Mode rate		Low	Low	Low	Low	
Barangay 3 (Pob.)	Moder ate	Modera te		Mode rate		Low	Low		Low	
Barangay 4 (Pob.)	Moder ate	Modera te				Low	Low			
Barangay 5 (Pob.)	Moder ate					Low				
Barangay 6 (Pob.)	Moder ate					Low				
Barangay 7 (Pob.)	Moder ate					Low				
Barangay 8 (Pob.)	Moder ate					Low				
Bianuan	Moder ate	Modera te				Low	Low			
Calabgan	Moder ate		Mode rate	Mode rate	Moderate	Low		Low	Low	Low
Calangcuas an	Moder ate	Modera te	Mode rate	Mode rate	Moderate	Low	Low	Low	Low	Low
Calantas	Moder ate	Modera te		Mode rate		Low	Low		Low	
Cozo	Moder ate		Mode rate	Mode rate	Moderate	Low		Low	Low	Low
Culat	Moder ate		Mode rate	Mode rate	Moderate	Low		Low	Low	Low
Dibacong	Moder ate			Mode rate	Moderate	Low			Low	Low
Dibet	Moder ate		Mode rate	Mode rate	Moderate	Low		Low	Low	Low
Ditinagyan	Moder ate		Mode rate	Mode rate	Moderate	Low		Low	Low	Low
Esperanza	Moder ate			Mode rate		Low			Low	

Esteves	Moder ate		Mode rate	Mode rate		Low		Low	Low	
Lual	Moder ate	Modera te	Mode rate	Mode rate	Moderate	Low	Low	Low	Low	Low
Marikit	Moder ate	Modera te	Mode rate	Mode rate		Low	Low		Low	
San Ildefonso	Moder ate	Modera te	Mode rate	Mode rate	Moderate	Low	Low	Low	Low	Low
Tabas	Moder ate		Mode rate			Low		Low		
Tinib	Moder ate	Modera te	Mode rate		Moderate	Low	Low	Low		Low

The degree of impact to residential, commercial, tourist sites, shoreline or bodies of water and to upland and sloping areas in 24 barangays are "moderate" to Future Number of Hot Days with a generally "low" adaptive capacity.

# Future Number of Dry Days and Urban Use

	Future Number of Dry Days									
		DEG	REE OF I	МРАСТ			ADAPT	TIVE CA	PACITY	7
	To reside ntial land use	To comme rcial land use	To touri st sites	To upla nd and slopi ng areas	To shoreline /water bodies	of reside ntial land use	of comme rcial land use	of tou rist site s	of upla nd and slop ing area s	of shoreline /water bodies
Barangay 1 (Pob.)	Moder ate	Modera te				Low	Low			
Barangay 2	Moder	Modera	Mode	Mode						
(Pob.)	ate	te	rate	rate		Low	Low	Low	Low	
Barangay 3	Moder	Modera		Mode						
(Pob.)	ate	te		rate		Low	Low		Low	
Barangay 4	Moder	Modera					_			
(Pob.)	ate	te				Low	Low			
Barangay 5	Moder					Low				
(POD.)	ate					LOW			-	
(Poh)	ate					Low				
Barangay 7	Moder					Low				
(Pob.)	ate					Low				
Barangay 8	Moder									
(Pob.)	ate					Low				
Bianuan	Moder	Modera					-			
	ate	te	M.J.	M. J.		Low	Low			
Calabgan	Moder		rate	rate	Moderate	Low		Low	Low	Low
Calangeuas	Moder	Modera	Mode	Mode	Moderate	LUW		LOW	LOW	LOW
an	ate	te	rate	rate	Moderate	Low	Low	Low	Low	Low
	Moder	Modera		Mode						
Calantas	ate	te		rate		Low	Low		Low	
6070	Moder		Mode	Mode						
020	ate		rate	rate	Moderate	Low		Low	Low	Low
Culat	Moder		Mode	Mode						
Salut	ate		rate	rate	Moderate	Low		Low	Low	Low
Dibacong	Moder ate			Mode rate	Moderate	Low			Low	Low
	alt	L		Idle	moutrate	LUW	L		LUW	

### Table 53. CCVA on Future Number of Dry Days and Urban Use

Dibet	Moder		Mode	Mode	Moderate	Low		Low	Low	Low
Ditinagyan	Moder		Mode	Mode	Moderate	LOW		LOW	LOW	LOW
Ditillagyali	ate		rate	rate	Moderate	Low		Low	Low	Low
Feneranza	Moder			Mode						
Loperanza	ate			rate		Low			Low	
Fetovos	Moder		Mode	Mode						
Lateves	ate		rate	rate		Low		Low	Low	
Lual	Moder	Modera	Mode	Mode						
Luai	ate	te	rate	rate	Moderate	Low	Low	Low	Low	Low
Marikit	Moder	Modera	Mode	Mode						
Marikit	ate	te	rate	rate		Low	Low		Low	
San	Moder	Modera	Mode	Mode						
Ildefonso	ate	te	rate	rate	Moderate	Low	Low	Low	Low	Low
Tabac	Moder		Mode							
Tabas	ate		rate			Low		Low		
Tinih	Moder	Modera	Mode							
11110	ate	te	rate		Moderate	Low	Low	Low		Low

The degree of impact to residential, commercial, tourist sites, shoreline or bodies of water and to upland and sloping areas in 24 barangays are "moderate" to Future Number of Dry Days with a generally "low" adaptive capacity.

### Future Number of Extreme Rainfall Events and Urban Use

		Future Number of Extreme Rainfall Events								
		DEGR	EE OF I	МРАСТ			ADAP	<b>FIVE CA</b>	PACITY	
	To reside ntial land use	To comme rcial land use	To tour ist site s	To upla nd and slop ing area s	To shoreline/ water bodies	of reside ntial land use	of comme rcial land use	of tour ist site s	of upla nd and slop ing area s	of shoreline/ water bodies
Barangay 1 (Pob.)	High	High				Low	Low			
Barangay 2 (Pob.)	High	High	High	High		Low	Low	Low	Low	
Barangay 3 (Pob.)	High	High		High		Low	Low		Low	
Barangay 4 (Pob.)	High	High				Low	Low			
Barangay 5 (Pob.)	High					Low				
Barangay 6 (Pob.)	High					Low				
Barangay 7 (Pob.)	High					Low				
Barangay 8 (Pob.)	High					Low				
Bianuan	High	High				Low	Low			
Calabgan	High		High	High	High	Low		Low	Low	Low
Calangcuas an	High	High	High	High	High	Low	Low	Low	Low	Low
Calantas	High	High		High		Low	Low		Low	
Cozo	High		High	High	High	Low		Low	Low	Low

### Table 54. CCVA on Future Number of Extreme Rainfall Events and Urban Use

Culat	High		High	High	High	Low		Low	Low	Low
Dibacong	High			High	High	Low			Low	Low
Dibet	High		High	High	High	Low		Low	Low	Low
Ditinagyan	High		High	High	High	Low		Low	Low	Low
Esperanza	High			High		Low			Low	
Esteves	High		High	High		Low		Low	Low	
Lual	High	High	High	High	High	Low	Low	Low	Low	Low
Marikit	High	High	High	High		Low	Low		Low	
San Ildefonso	High	High	High	High	High	Low	Low	Low	Low	Low
Tabas	High		High			Low		Low		
Tinib	High	High	High		High	Low	Low	Low		Low

The degree of impact to residential, commercial, tourist sites, shoreline or bodies of water and to upland and sloping areas in 24 barangays are "high" to Future Number of Extreme Rainfall Events with a generally "low" adaptive capacity.

### Future Sea Level Changes and Urban Use

				F	uture Sea Le	vel Chang	es			
		DEGI	REE OF I	МРАСТ			ADAPT	TIVE CA	PACITY	
	To reside ntial land use	To comme rcial land use	To touri st sites	To upla nd and slopi ng areas	To shoreline /water bodies	of reside ntial land use	of comme rcial land use	of tou rist site s	of upla nd and slop ing area s	of shoreline /water bodies
Barangay 1 (Pob.)	Low	Low				Low	Low			
Barangay 2 (Pob.)	Low	Low	Low	Low		Low	Low	Low	Low	
Barangay 3 (Pob.)	Low	Low		Low		Low	Low		Low	
Barangay 4 (Pob.)	Low	Low				Low	Low			
Barangay 5 (Pob.)	Low					Low				
Barangay 6 (Pob.)	Low					Low				
Barangay 7 (Pob.)	Low					Low				
Barangay 8 (Pob.)	Low					Low				
Bianuan	Low	Low				Low	Low			
Calabgan	Moder ate		Mode rate	Mode rate	Moderate	Low		Low	Low	Low
Calangcuas an	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Calantas	Low	Low		Low		Low	Low		Low	
Cozo	Moder ate		Mode rate	Mode rate	Moderate	Low		Low	Low	Low

## Table 55. CCVA on Future Sea Level Changes and Urban Use

Culat	Low		Low	Low	Low	Low		Low	Low	Low
Dibacong	High			High	High	Low			Low	Low
Dibet	Low		Low	Low	Low	Low		Low	Low	Low
Ditinagyan	Low		Low	Low	Low	Low		Low	Low	Low
Esperanza	Low			Low		Low			Low	
Esteves	High		High	Low		Low		Low	Low	
Lual	High	High	High	Low	High	Low	Low	Low	Low	Low
Marikit	Low	Low		Low	<u> </u>	Low	Low		Low	
San Ildefonso	High	High	High	Low	High	Low	Low	Low	Low	Low
Tabas	Low		Low		<u> </u>	Low		Low		
Tinib	Low	Low	Low		Low	Low	Low	Low		Low

The degree of impact to residential is "high" in barangays San Ildefonso, Lual, Esteves and Dibacong while "moderate" in barangays Calabgan and Cozo and "low" in the remaining 18 barangays, to commercial is "high" in barangays Lual and San Ildefonso and "low" in 9 barangays, to tourist sites is "high" in Esteves, Lual and San Ildefonso while "moderate" in Cozo and Calabgan and "low" in 7 barangays, to shoreline or bodies of water is "high" in Dibacong while "moderate" in Calabgan and Cozo and "low" in 12 barangays, and to upland and sloping areas is "high" in Dibacong, Lual and San Ildefonso while "moderate" in Calabgan and Cozo and "low" in 5 barangays to Future Sea Level Changes with a generally "low" adaptive capacity.

#### Future Typhoons/Super typhoons and Urban Use

		Future Typhoons/Super typhoons										
		DEGR	EE OF I	MPACT			ADAP	<b>FIVE CA</b>	PACITY			
	To reside ntial land use	To comme rcial land use	To tour ist site s	To upla nd and slop ing area s	To shoreline/ water bodies	of reside ntial land use	of comme rcial land use	of tour ist site s	of upla nd and slop ing area s	of shoreline/ water bodies		
Barangay 1 (Pob.)	High	High				Low	Low					
Barangay 2 (Pob.)	High	High	High	High		Low	Low	Low	Low			
Barangay 3 (Pob.)	High	High		High		Low	Low		Low			
Barangay 4 (Pob.)	High	High				Low	Low					
Barangay 5 (Pob.)	High					Low						
Barangay 6 (Pob.)	High					Low						
Barangay 7 (Pob.)	High					Low						
Barangay 8 (Pob.)	High					Low						

#### Table 56. CCVA on Future Typhoons/Super typhoons and Urban Use

Bianuan	High	High				Low	Low	]		
Calabgan	High		High	High	High	Low		Low	Low	Low
Calangcuas an	High	High	High	High	High	Low	Low	Low	Low	Low
Calantas	High	High		High		Low	Low		Low	
Cozo	High		High	High	High	Low		Low	Low	Low
Culat	High		High	High	High	Low		Low	Low	Low
Dibacong	High			High	High	Low			Low	Low
Dibet	High		High	High	High	Low		Low	Low	Low
Ditinagyan	High		High	High	High	Low		Low	Low	Low
Esperanza	High			High		Low			Low	
Esteves	High		High	High		Low		Low	Low	
Lual	High	High	High	High	High	Low	Low	Low	Low	Low
Marikit	High	High	High	High		Low	Low		Low	
San Ildefonso	High	High	High	High	High	Low	Low	Low	Low	Low
Tabas	High		High			Low		Low		
Tinib	High	High	High		High	Low	Low	Low		Low

The degree of impact to residential, commercial, tourist sites, shoreline or bodies of water and to upland and sloping areas in 24 barangays are "high" to Future Typhoons/Super typhoons with a generally "low" adaptive capacity.

# **Climate Change Vulnerability Assessment of Lifeline Utilities**

#### **Future Temperature Trends and Lifeline Utilities**

## Table 57. CCVA on Future Temperature Trends and Lifeline Utilities

		Future Temperature Trends										
		D	EGREE OF IMPA	АСТ			А	DAPTIVE CAPA	CITY			
	To road s	To bridg es	To telecommu nication systems	To wate r utili ties	To power distrib ution system s	of roa ds	of brid ges	of telecommu nication systems	of wate r utili ties	of power distrib ution system S		
Barangay 1	Mode	Mode			Modera							
(Pob.)	rate	rate	Low	High	te	Low	Low	Low	Low	Low		
Barangay 2	Mode				Modera							
(Pob.)	rate		Low	High	te	Low		Low	Low	Low		
Barangay 3	Mode				Modera							
(Pob.)	rate		Low	High	te	Low		Low	Low	Low		
Barangay 4	Mode				Modera							
(Pob.)	rate		Low	High	te	Low		Low	Low	Low		
Barangay 5	Mode				Modera							
(Pob.)	rate		Low	High	te	Low		Low	Low	Low		
Barangay 6	Mode				Modera							
(Pob.)	rate		Low	High	te	Low		Low	Low	Low		
Barangay 7	Mode				Modera							
(Pob.)	rate		Low	High	te	Low		Low	Low	Low		
Barangay 8	Mode				Modera							
(Pob.)	rate		Low	High	te	Low		Low	Low	Low		

Rianuan	Mode	Mode			Modera					
Dianuan	rate	rate	Low	High	te	Low	Low	Low	Low	Low
Calabgan	Mode	Mode			Modera					
Calabgali	rate	rate	Low	High	te	Low	Low	Low	Low	Low
Calangcuas	Mode	Mode			Modera					
an	rate	rate	Low	High	te	Low	Low	Low	Low	Low
Calantas	Mode				Modera					
Calalitas	rate		Low	High	te	Low		Low	Low	Low
Cozo	Mode				Modera					
C020	rate		Low	High	te	Low		Low	Low	Low
Culat	Mode				Modera					
Culat	rate		Low	High	te	Low		Low	Low	Low
Dilessee	Mode	Mode			Modera					
Dibacong	rate	rate	Low	High	te	Low	Low	Low	Low	Low
Dilent	Mode	Mode			Modera					
Dibet	rate	rate	Low	High	te	Low	Low	Low	Low	Low
Divi	Mode				Modera					
Ditinagyan	rate		Low	High	te	Low		Low	Low	Low
P	Mode				Modera					
Esperanza	rate		Low	High	te	Low		Low	Low	Low
	Mode				Modera					
Esteves	rate		Low	High	te	Low		Low	Low	Low
	Mode	Mode			Modera					
Lual	rate	rate	Low	High	te	Low	Low	Low	Low	Low
NG 11.1.	Mode	Mode			Modera					
Marikit	rate	rate	Low	High	te	Low	Low	Low	Low	Low
San	Mode				Modera					
Ildefonso	rate		Low	High	te	Low		Low	Low	Low
m 1	Mode	Mode		Ŭ	Modera					
Tabas	rate	rate	Low	High	te	Low	Low	Low	Low	Low
	Mode	Mode			Modera					
Tinib	rate	rate	Low	High	te	Low	Low	Low	Low	Low

The degree of impact to roads is "moderate", to 21 bridges is "moderate", to communication is "low", to water utilities is "high" and to power distribution systems is "moderate" on Future Temperature Trends and the adaptive capacity is generally low.

### **Future Rainfall Trends and Lifeline Utilities**

Table 58. CCVA on Future Rainfall	l Trends and Lifeline Utilities
-----------------------------------	---------------------------------

				Fu	ture Rainfall Trends					
		D	EGREE OF IMPA	АСТ			A	ADAPTIVE CAPA	ACITY	
	To road s	To bridg es	To telecommu nication systems	To wate r utilit ies	To power distrib ution system s	of roa ds	of brid ges	of telecommu nication systems	of wate r utilit ies	of power distrib ution system S
Barangay 1	Mode	Mode			Modera					
(Pob.)	rate	rate	Low	High	te	Low	Low	Low	Low	Low
Barangay 2	Mode				Modera					
(Pob.)	rate		Low	High	te	Low		Low	Low	Low
Barangay 3	Mode				Modera					
(Pob.)	rate		Low	High	te	Low		Low	Low	Low
Barangay 4	Mode				Modera					
(Pob.)	rate		Low	High	te	Low		Low	Low	Low
Barangay 5	Mode				Modera					
(Pob.)	rate		Low	High	te	Low		Low	Low	Low
Barangay 6	Mode				Modera					
(Pob.)	rate		Low	High	te	Low		Low	Low	Low

Barangay 7	Mode				Modera					
(Pob.)	rate		Low	High	te	Low		Low	Low	Low
Barangay 8	Mode				Modera					
(Pob.)	rate		Low	High	te	Low		Low	Low	Low
Bianuan	Mode	Mode			Modera					
Dialituali	rate	rate	Low	High	te	Low	Low	Low	Low	Low
Calabgan	Mode	Mode			Modera					
Calabgali	rate	rate	Low	High	te	Low	Low	Low	Low	Low
Calangcuas	Mode	Mode			Modera					
an	rate	rate	Low	High	te	Low	Low	Low	Low	Low
Calantas	Mode				Modera					
Calalitas	rate		Low	High	te	Low		Low	Low	Low
6070	Mode				Modera					
C020	rate		Low	High	te	Low		Low	Low	Low
Culat	Mode				Modera					
Culat	rate		Low	High	te	Low		Low	Low	Low
Dibacong	Mode	Mode			Modera					
Dibacolig	rate	rate	Low	High	te	Low	Low	Low	Low	Low
Dihot	Mode	Mode			Modera					
Dibet	rate	rate	Low	High	te	Low	Low	Low	Low	Low
Ditinaguan	Mode				Modera					
Ditillagyall	rate		Low	High	te	Low		Low	Low	Low
Echorango	Mode				Modera					
Esperanza	rate		Low	High	te	Low		Low	Low	Low
Estaves	Mode				Modera					
Esteves	rate		Low	High	te	Low		Low	Low	Low
Lual	Mode	Mode			Modera					
Luai	rate	rate	Low	High	te	Low	Low	Low	Low	Low
Manilait	Mode	Mode			Modera					
Marikit	rate	rate	Low	High	te	Low	Low	Low	Low	Low
San	Mode				Modera					
Ildefonso	rate		Low	High	te	Low		Low	Low	Low
Tabas	Mode	Mode			Modera					
Tabas	rate	rate	Low	High	te	Low	Low	Low	Low	Low
Tinih	Mode	Mode			Modera					
11110	rate	rate	Low	High	te	Low	Low	Low	Low	Low

The degree of impact to roads is "moderate", to 21 bridges is "moderate", to communication is "low", to water utilities is "high" and to power distribution systems is "moderate" on Future Rainfall Trends and the adaptive capacity is generally low.

### Future Number of Hot Days and Lifeline Utilities

		Future Number of Hot Days									
		D	EGREE OF IMPA	АСТ		ADAPTIVE CAPACITY					
	To road s	To bridg es	To telecommu nication systems	To wate r utilit ies	To power distrib ution system s	of roa ds	of brid ges	of telecommu nication systems	of wate r utilit ies	of power distrib ution system S	
Barangay 1	Mode	Mode			Modera						
(Pob.)	rate	rate	Low	High	te	Low	Low	Low	Low	Low	
Barangay 2	Mode				Modera						
(Pob.)	rate		Low	High	te	Low		Low	Low	Low	
Barangay 3	Mode				Modera						
(Pob.)	rate		Low	High	te	Low		Low	Low	Low	

## Table 59. CCVA on Future Number of Hot Days and Lifeline Utilities

Barangay 4	Mode				Modera					
(Pob.)	rate		Low	High	te	Low		Low	Low	Low
Barangay 5	Mode				Modera					
(Pob.)	rate		Low	High	te	Low		Low	Low	Low
Barangay 6	Mode				Modera					
(Pob.)	rate		Low	High	te	Low		Low	Low	Low
Barangay 7	Mode				Modera					
(Pob.)	rate		Low	High	te	Low		Low	Low	Low
Barangay 8	Mode				Modera					
(Pob.)	rate		Low	High	te	Low		Low	Low	Low
Rianuan	Mode	Mode			Modera					
Dialituali	rate	rate	Low	High	te	Low	Low	Low	Low	Low
Calabgan	Mode	Mode			Modera					
Calabgali	rate	rate	Low	High	te	Low	Low	Low	Low	Low
Calangcuas	Mode	Mode			Modera					
an	rate	rate	Low	High	te	Low	Low	Low	Low	Low
Calantas	Mode				Modera					
Calalitas	rate		Low	High	te	Low		Low	Low	Low
6070	Mode				Modera					
020	rate		Low	High	te	Low		Low	Low	Low
Culat	Mode				Modera					
Gulat	rate		Low	High	te	Low		Low	Low	Low
Dibacong	Mode	Mode			Modera					
Dibacolig	rate	rate	Low	High	te	Low	Low	Low	Low	Low
Dihet	Mode	Mode			Modera					
Dibet	rate	rate	Low	High	te	Low	Low	Low	Low	Low
Ditinagyan	Mode				Modera					
Ditillagyali	rate		Low	High	te	Low		Low	Low	Low
Feneranza	Mode				Modera					
Loperanza	rate		Low	High	te	Low		Low	Low	Low
Fsteves	Mode				Modera					
Lateves	rate		Low	High	te	Low		Low	Low	Low
Lual	Mode	Mode			Modera					
Luai	rate	rate	Low	High	te	Low	Low	Low	Low	Low
Marikit	Mode	Mode			Modera					
Marikit	rate	rate	Low	High	te	Low	Low	Low	Low	Low
San	Mode				Modera					
Ildefonso	rate		Low	High	te	Low		Low	Low	Low
Tabas	Mode	Mode			Modera					
1 abas	rate	rate	Low	High	te	Low	Low	Low	Low	Low
Tinih	Mode	Mode			Modera					
11110	rate	rate	Low	High	te	Low	Low	Low	Low	Low

The degree of impact to roads is "moderate", to 21 bridges is "moderate", to communication is "low", to water utilities is "high" and to power distribution systems is "moderate" on Future Number of Hot Days and the adaptive capacity is generally low.

# Future Number of Dry Days and Lifeline Utilities

# Table 60. CCVA on Future Number of Dry Days and Lifeline Utilities

	Future Number of Dry Days												
		I	DEGREE OF IMPA	СТ				ADAPTIVE CAPA	CITY				
	To roads	To bridge s	To telecommunica tion systems	To water utiliti es	To power distributi on systems	of road s	of bridg es	of telecommunica tion systems	of water utiliti es	of power distributi on systems			
Barangay 1 (Pob.)	Modera te	Modera te	Low	High	Moderate	Low	Low	Low	Low	Low			
Barangay 2 (Pob.)	Modera te		Low	High	Moderate	Low		Low	Low	Low			
Barangay 3 (Pob.)	Modera te		Low	High	Moderate	Low		Low	Low	Low			
Barangay 4 (Pob.)	Modera te		Low	High	Moderate	Low		Low	Low	Low			
Barangay 5 (Pob.)	Modera te		Low	High	Moderate	Low		Low	Low	Low			
Barangay 6 (Pob.)	Modera te		Low	High	Moderate	Low		Low	Low	Low			
Barangay 7 (Pob.)	Modera te		Low	High	Moderate	Low		Low	Low	Low			
Barangay 8 (Pob.)	Modera te		Low	High	Moderate	Low		Low	Low	Low			
Bianuan	Modera te	Modera te	Low	High	Moderate	Low	Low	Low	Low	Low			
Calabgan	Modera te	Modera te	Low	High	Moderate	Low	Low	Low	Low	Low			
Calangcuasan	Modera te	Modera te	Low	High	Moderate	Low	Low	Low	Low	Low			
Calantas	Modera te		Low	High	Moderate	Low		Low	Low	Low			
Cozo	Modera te		Low	High	Moderate	Low		Low	Low	Low			
Culat	Modera te		Low	High	Moderate	Low		Low	Low	Low			
Dibacong	Modera te	Modera te	Low	High	Moderate	Low	Low	Low	Low	Low			
Dibet	Modera te	Modera te	Low	High	Moderate	Low	Low	Low	Low	Low			
Ditinagyan	Modera te		Low	High	Moderate	Low		Low	Low	Low			
Esperanza	Modera te		Low	High	Moderate	Low		Low	Low	Low			
Esteves	Modera te		Low	High	Moderate	Low		Low	Low	Low			
Lual	Modera te	Modera te	Low	High	Moderate	Low	Low	Low	Low	Low			
Marikit	Modera te	Modera te	Low	High	Moderate	Low	Low	Low	Low	Low			
San Ildefonso	Modera te		Low	High	Moderate	Low		Low	Low	Low			
Tabas	Modera te	Modera te	Low	High	Moderate	Low	Low	Low	Low	Low			
Tinib	Modera te	Modera te	Low	High	Moderate	Low	Low	Low	Low	Low			

The degree of impact to roads is "moderate", to 21 bridges is "moderate", to communication is "low", to water utilities is "high" and to power distribution systems is "moderate" on Future Number of Dry Days and the adaptive capacity is generally low.

# Future Number of Extreme Rainfall Events and Lifeline Utilities

#### Table 61. CCVA on Future Number of Extreme Rainfall Events and Lifeline Utilities

	Future Number of Extreme Rainfall Events										
			<b>DEGREE OF IMF</b>	РАСТ			1	ADAPTIVE CAPA	CITY		
	To roa ds	To brid ges	To telecommun ication systems	To wate r utilit ies	To power distrib ution system s	of roa ds	of brid ges	of telecommun ication systems	of wate r utilit ies	of power distrib ution system S	
Barangay 1 (Pob.)	High	High	Moderate	High	High	Low	Low	Low	Low	Low	
Barangay 2 (Pob.)	High		Moderate	High	High	Low		Low	Low	Low	
Barangay 3 (Pob.)	High		Moderate	High	High	Low		Low	Low	Low	
Barangay 4 (Pob.)	High		Moderate	High	High	Low		Low	Low	Low	
Barangay 5 (Pob.)	High		Moderate	High	High	Low		Low	Low	Low	
Barangay 6 (Pob.)	High		Moderate	High	High	Low		Low	Low	Low	
Barangay 7 (Pob.)	High		Moderate	High	High	Low		Low	Low	Low	
Barangay 8 (Pob.)	High		Moderate	High	High	Low		Low	Low	Low	
Bianuan	High	High	Moderate	High	High	Low	Low	Low	Low	Low	
Calabgan	High	High	Moderate	High	High	Low	Low	Low	Low	Low	
Calangcuas an	High	High	Moderate	High	High	Low	Low	Low	Low	Low	
Calantas	High		Moderate	High	High	Low		Low	Low	Low	
Cozo	High		Moderate	High	High	Low		Low	Low	Low	
Culat	High		Moderate	High	High	Low		Low	Low	Low	
Dibacong	High	High	Moderate	High	High	Low	Low	Low	Low	Low	
Dibet	High	High	Moderate	High	High	Low	Low	Low	Low	Low	
Ditinagyan	High		Moderate	High	High	Low		Low	Low	Low	
Esperanza	High		Moderate	High	High	Low		Low	Low	Low	
Esteves	High		Moderate	High	High	Low		Low	Low	Low	
Lual	High	High	Moderate	High	High	Low	Low	Low	Low	Low	
Marikit	High	High	Moderate	High	High	Low	Low	Low	Low	Low	
San Ildefonso	High		Moderate	High	High	Low		Low	Low	Low	
Tabas	High	High	Moderate	High	High	Low	Low	Low	Low	Low	
Tinib	High	High	Moderate	High	High	Low	Low	Low	Low	Low	

The degree of impact to roads is "high", to 21 bridges is "high", to communication is "moderate", to water utilities is "high" and to power distribution systems is "high" on Future Number of Dry Days and the adaptive capacity is generally low.

# Future Sea Level Changes and Lifeline Utilities

	Future Sea Level Changes										
		D	EGREE OF IMPA	АСТ			A	ADAPTIVE CAPA	ACITY		
	To road s	To bridg es	To telecommu nication systems	To wate r utilit ies	To power distrib ution system s	of roa ds	of brid ges	of telecommu nication systems	of wate r utilit ies	of power distrib ution system s	
Barangay 1 (Pob.)	Mode rate	Mode rate	Low	High	Modera te	Low	Low	Low	Low	Low	
Barangay 2 (Pob.)	Mode rate		Low	High	Modera te	Low		Low	Low	Low	
Barangay 3 (Pob.)	Mode rate		Low	High	Modera te	Low		Low	Low	Low	
Barangay 4 (Pob.)	Mode rate		Low	High	Modera te	Low		Low	Low	Low	
Barangay 5 (Pob.)	Mode rate		Low	High	Modera te	Low		Low	Low	Low	
Barangay 6 (Pob.)	Mode rate		Low	High	Modera te	Low		Low	Low	Low	
Barangay 7 (Pob.)	Mode rate		Low	High	Modera te	Low		Low	Low	Low	
Barangay 8 (Pob.)	Mode rate		Low	High	Modera te	Low		Low	Low	Low	
Bianuan	Mode rate	Mode rate	Low	High	Modera te	Low	Low	Low	Low	Low	
Calabgan	Mode rate	Mode rate	Low	High	Modera te	Low	Low	Low	Low	Low	
Calangcuas an	Mode rate	Mode rate	Low	High	Modera te	Low	Low	Low	Low	Low	
Calantas	Mode rate		Low	High	Modera te	Low		Low	Low	Low	
Cozo	Mode rate		Low	High	Modera te	Low		Low	Low	Low	
Culat	Mode rate		Low	High	Modera te	Low		Low	Low	Low	
Dibacong	Mode rate	Mode rate	Low	High	Modera te	Low	Low	Low	Low	Low	
Dibet	Mode rate	Mode rate	Low	High	Modera te	Low	Low	Low	Low	Low	
Ditinagyan	Mode rate		Low	High	Modera te	Low		Low	Low	Low	
Esperanza	Mode rate		Low	High	Modera te	Low		Low	Low	Low	
Esteves	Mode rate		Low	High	Modera te	Low		Low	Low	Low	
Lual	Mode rate	Mode rate	Low	High	Modera te	Low	Low	Low	Low	Low	
Marikit	Mode rate	Mode rate	Low	High	Modera te	Low	Low	Low	Low	Low	

#### Table 62. CCVA on Future Sea Level Changes and Lifeline Utilities

San Ildefonso	Mode rate		Low	High	Modera te	Low		Low	Low	Low
Tabas	Mode rate	Mode rate	Low	High	Modera te	Low	Low	Low	Low	Low
Tinib	Mode rate	Mode rate	Low	High	Modera te	Low	Low	Low	Low	Low

The degree of impact to roads is "moderate", to 21 bridges is "moderate", to communication is "low", to water utilities is "high" and to power distribution systems is "moderate" on Future Number of Dry Days and the adaptive capacity is generally low.

## Future Typhoons/Super typhoons and Lifeline Utilities

Table 63. CCVA on Future	Typhoons	/Super typhoon	s and Lifeline Utilities
--------------------------	----------	----------------	--------------------------

	Future Typhoons/Super typhoons										
			DEGREE OF IMF	РАСТ			I	ADAPTIVE CAPA	CITY		
	To roa ds	To brid ges	To telecommun ication systems	To wate r utilit ies	To power distrib ution system s	of roa ds	of brid ges	of telecommun ication systems	of wate r utilit ies	of power distrib ution system S	
Barangay 1 (Pob.)	High	High	Moderate	High	High	Low	Low	Low	Low	Low	
Barangay 2 (Pob.)	High		Moderate	High	High	Low		Low	Low	Low	
Barangay 3 (Pob.)	High		Moderate	High	High	Low		Low	Low	Low	
Barangay 4 (Pob.)	High		Moderate	High	High	Low		Low	Low	Low	
Barangay 5 (Pob.)	High		Moderate	High	High	Low		Low	Low	Low	
Barangay 6 (Pob.)	High		Moderate	High	High	Low		Low	Low	Low	
Barangay 7 (Pob.)	High		Moderate	High	High	Low		Low	Low	Low	
Barangay 8 (Pob.)	High		Moderate	High	High	Low		Low	Low	Low	
Bianuan	High	High	Moderate	High	High	Low	Low	Low	Low	Low	
Calabgan	High	High	Moderate	High	High	Low	Low	Low	Low	Low	
Calangcuas an	High	High	Moderate	High	High	Low	Low	Low	Low	Low	
Calantas	High		Moderate	High	High	Low		Low	Low	Low	
Cozo	High		Moderate	High	High	Low		Low	Low	Low	
Culat	High		Moderate	High	High	Low		Low	Low	Low	
Dibacong	High	High	Moderate	High	High	Low	Low	Low	Low	Low	
Dibet	High	High	Moderate	High	High	Low	Low	Low	Low	Low	
Ditinagyan	High		Moderate	High	High	Low		Low	Low	Low	
Esperanza	High		Moderate	High	High	Low		Low	Low	Low	
Esteves	High		Moderate	High	High	Low		Low	Low	Low	

Lual	High	High	Moderate	High	High	Low	Low	Low	Low	Low
Marikit	High	High	Moderate	High	High	Low	Low	Low	Low	Low
San Ildefonso	High		Moderate	High	High	Low		Low	Low	Low
Tabas	High	High	Moderate	High	High	Low	Low	Low	Low	Low
Tinib	High	High	Moderate	High	High	Low	Low	Low	Low	Low

The degree of impact to roads is "moderate", to 21 bridges is "moderate", to communication is "low", to water utilities is "high" and to power distribution systems is "moderate" on Future Number of Dry Days and the adaptive capacity is generally low.

# **Overall Climate Change Vulnerability Assessment**

Table 64. CCVA	on Overall Clim	nate Change Vuli	ierability Asses	sment
	on overan enn	late change van	iciusincy hoses	Smene

	Count of CC Descriptive summary of CC vulne						z vulnerabil	ities (5)
Barangays	Overal l CCV Index	CCV Catego ry	ies (Should be 5, review missing data if less than 5)	Populati on	Natural Resourc es	Critical Point Facilitie S	Urban Use	Lifeline Utilities
Barangay 1 (Pob.)	#DIV/ 0!	#DIV/ 0!	4	41.4 % of total househol d are below poverty threshold		Not followin g the zoning ordinan ce, building s are not well planned	non complian ce to policies and program s regardin g land use	lack of comprehens ive developmen t plan
Barangay 2 (Pob.)	#DIV/ 0!	#DIV/ 0!	4	68.5 % of total househol d are below poverty threshold		Not followin g the zoning ordinan ce, building s are not well planned	non complian ce to policies and program s regardin g land use	lack of comprehens ive developmen t plan
Barangay 3 (Pob.)	#DIV/ 0!	#DIV/ 0!	4	74 % of total househol d are below poverty threshold		Not followin g the zoning ordinan ce, building s are not well planned	non complian ce to policies and program s regardin g land use	lack of comprehens ive developmen t plan

Barangay 4 (Pob.)	#DIV/ 0!	#DIV/ 0!	4	84.7 % of total househol d are below poverty threshold	Not followin g the zoning ordinan ce, building s are not well planned	non complian ce to policies and program s regardin g land use	lack of comprehens ive developmen t plan
Barangay 5 (Pob.)	#DIV/ 0!	#DIV/ 0!	4	93.8 % of total househol d are below poverty threshold	Not followin g the zoning ordinan ce, building s are not well planned	non complian ce to policies and program s regardin g land use	lack of comprehens ive developmen t plan
Barangay 6 (Pob.)	#DIV/ 0!	#DIV/ 0!	4	100 % of total househol d are below poverty threshold	Not followin g the zoning ordinan ce, building s are not well planned	non complian ce to policies and program s regardin g land use	lack of comprehens ive developmen t plan
Barangay 7 (Pob.)	#DIV/ 0!	#DIV/ 0!	4	86.9 % of total househol d are below poverty threshold	Not followin g the zoning ordinan ce, building s are not well planned	non complian ce to policies and program s regardin g land use	lack of comprehens ive developmen t plan
Barangay 8 (Pob.)	#DIV/ 0!	#DIV/ 0!	4	72.4 % of total househol d are below poverty threshold	Not followin g the zoning ordinan ce, building s are not well planned	non complian ce to policies and program s regardin g land use	lack of comprehens ive developmen t plan
Bianuan	6.28	High	5	83.9 % of total househol d are below poverty threshold	Not followin g the zoning ordinan ce, building s are not well planned	non complian ce to policies and program s regardin g land use	lack of comprehens ive developmen t plan

Calabgan	6.39	High	5	91 % of total househol d are below poverty threshold	Presence of illegal logging and kaingin	Not followin g the zoning ordinan ce, building s are not well planned	non complian ce to policies and program s regardin g land use	lack of comprehens ive developmen t plan
Calangcuasan	6.16	High	5	45 % of total househol d are below poverty threshold	Cutting of Mangrov es	Not followin g the zoning ordinan ce, building s are not well planned	non complian ce to policies and program s regardin g land use	lack of comprehens ive developmen t plan
Calantas	6.20	High	5	51.9 % of total househol d are below poverty threshold	presence of kaingin and illegal quarryin g	Not followin g the zoning ordinan ce, building s are not well planned	non complian ce to policies and program s regardin g land use	lack of comprehens ive developmen t plan
Cozo	6.44	High	5	49.4 % of total househol d are below poverty threshold	Presence of illegal logging, fishing, quarryin g, kaingin and cutting of mangrov es	Not followin g the zoning ordinan ce, building s are not well planned	non complian ce to policies and program s regardin g land use	lack of comprehens ive developmen t plan
Culat	6.38	High	5	53.3 % of total househol d are below poverty threshold	Presence of illegal logging, fishing and kaingin	Not followin g the zoning ordinan ce, building s are not well planned	non complian ce to policies and program s regardin g land use	lack of comprehens ive developmen t plan

Dibacong	6.61	High	5	90.7 % of total househol d are below poverty threshold	Presence of illegal logging, fishing, quarryin g, kaingin and cutting of mangrov es	Not followin g the zoning ordinan ce, building s are not well planned	non complian ce to policies and program s regardin g land use	lack of comprehens ive developmen t plan
Dibet	6.19	High	5	88.5% of total househol d are below poverty threshold	Presence of illegal logging, fishing, quarryin g, kaingin and cutting of mangrov es	Not followin g the zoning ordinan ce, building s are not well planned	non complian ce to policies and program s regardin g land use	lack of comprehens ive developmen t plan
Ditinagyan	6.18	High	5	97.6 % of total househol d are below poverty threshold	Presence of illegal logging, fishing and kaingin	Not followin g the zoning ordinan ce, building s are not well planned	non complian ce to policies and program s regardin g land use	lack of comprehens ive developmen t plan
Esperanza	6.26	High	5	60.5 % of total househol d are below poverty threshold	Presence of illegal logging, fishing and kaingin	Not followin g the zoning ordinan ce, building s are not well planned	non complian ce to policies and program s regardin g land use	lack of comprehens ive developmen t plan
Esteves	6.67	High	5	70.4 % of total househol d are below poverty threshold	Presence of illegal fishing and cutting of mangrov es	Not followin g the zoning ordinan ce, building s are not well planned	non complian ce to policies and program s regardin g land use	lack of comprehens ive developmen t plan

Lual	6.68	High	5	38.8 % of total househol d are below poverty threshold	Presence of illegal fishing and cutting of mangrov es	Not followin g the zoning ordinan ce, building s are not well planned	non complian ce to policies and program s regardin g land use	lack of comprehens ive developmen t plan
Marikit	6.30	High	5	64.2 % of total househol d are below poverty threshold	Presence of illegal fishing and cutting of mangrov es	Not followin g the zoning ordinan ce, building s are not well planned	non complian ce to policies and program s regardin g land use	lack of comprehens ive developmen t plan
San Ildefonso	6.50	High	5	73.8 % of total househol d are below poverty threshold	Presence of illegal logging, fishing and kaingin	Not followin g the zoning ordinan ce, building s are not well planned	non complian ce to policies and program s regardin g land use	lack of comprehens ive developmen t plan
Tabas	6.26	High	5	74.9 % of total househol d are below poverty threshold	presence of illegal logging, kaingin and quarryin g	Not followin g the zoning ordinan ce, building s are not well planned	non complian ce to policies and program s regardin g land use	lack of comprehens ive developmen t plan
Tinib	6.17	High	5	44.6 % of total househol d are below poverty threshold	presence of illegal logging, kaingin, fishing and cutting of mangrov es	Not followin g the zoning ordinan ce, building s are not well planned	non complian ce to policies and program s regardin g land use	lack of comprehens ive developmen t plan

		Needed Interver	ntions to Address	CC Vulnerabilitie	es
Barangays	Population	Natural Resources	Critical Point Facilities	Urban Use	Lifeline Utilities
Barangay 1 (Pob.)	Sustainable livelihood program Strengthen the entrepreneurshi p of LGU Promotion of tourism industry		strict implementatio n of zoning ordinances and building code	Strict implementatio n of polices, laws and regulation on zoning and building code, relocation of settlement to avoid misused lands, land banking for future development and improvement	improvement, construction, rehabilitation and proper maintenance of roads, bridges buildings, water facilities, electricity, telecommunication s and flood control projects
Barangay 2 (Pob.)	Sustainable livelihood program Strengthen the entrepreneurshi p of LGU Promotion of tourism industry		strict implementatio n of zoning ordinances and building code	Strict implementatio n of polices, laws and regulation on zoning and building code, relocation of settlement to avoid misused lands, land banking for future development and improvement	improvement, construction, rehabilitation and proper maintenance of roads, bridges buildings, water facilities, electricity, telecommunication s and flood control projects
Barangay 3 (Pob.)	Sustainable livelihood program Strengthen the entrepreneurshi p of LGU Promotion of tourism industry		strict implementatio n of zoning ordinances and building code	Strict implementatio n of polices, laws and regulation on zoning and building code, relocation of settlement to avoid misused lands, land banking for future development and improvement	improvement, construction, rehabilitation and proper maintenance of roads, bridges buildings, water facilities, electricity, telecommunication s and flood control projects

Barangay 4 (Pob.)	Sustainable livelihood program Strengthen the entrepreneurshi p of LGU Promotion of tourism industry	strict implementatio n of zoning ordinances and building code	Strict implementatio n of polices, laws and regulation on zoning and building code, relocation of settlement to avoid misused lands, land banking for future development and improvement	improvement, construction, rehabilitation and proper maintenance of roads, bridges buildings, water facilities, electricity, telecommunication s and flood control projects	
Barangay 5 (Pob.)	Sustainable livelihood program Strengthen the entrepreneurshi p of LGU Promotion of tourism industry	strict implementatio n of zoning ordinances and building code	Strict implementatio n of polices, laws and regulation on zoning and building code, relocation of settlement to avoid misused lands, land banking for future development and improvement	improvement, construction, rehabilitation and proper maintenance of roads, bridges buildings, water facilities, electricity, telecommunication s and flood control projects	
Barangay 6 (Pob.)	Sustainable livelihood program Strengthen the entrepreneurshi p of LGU Promotion of tourism industry	strict implementatio n of zoning ordinances and building code	Strict implementatio n of polices, laws and regulation on zoning and building code, relocation of settlement to avoid misused lands, land banking for future development and improvement	improvement, construction, rehabilitation and proper maintenance of roads, bridges buildings, water facilities, electricity, telecommunication s and flood control projects	
Barangay 7 (Pob.)	Sustainable livelihood program Strengthen the entrepreneurshi p of LGU Promotion of tourism industry	strict implementatio n of zoning ordinances and building code	Strict implementatio n of polices, laws and regulation on zoning and building code, relocation of settlement to avoid misused lands, land banking for future development and improvement	improvement, construction, rehabilitation and proper maintenance of roads, bridges buildings, water facilities, electricity, telecommunication s and flood control projects	
Barangay 8 (Pob.)	Sustainable livelihood program Strengthen the entrepreneurshi p of LGU Promotion of tourism industry		strict implementatio n of zoning ordinances and building code	Strict implementatio n of polices, laws and regulation on zoning and building code, relocation of settlement to avoid misused lands, land banking for future development and improvement	improvement, construction, rehabilitation and proper maintenance of roads, bridges buildings, water facilities, electricity, telecommunication s and flood control projects
----------------------	---	---	---	---	--
Bianuan	Sustainable livelihood program Strengthen the entrepreneurshi p of LGU Promotion of tourism industry		strict implementatio n of zoning ordinances and building code	Strict implementatio n of polices, laws and regulation on zoning and building code, relocation of settlement to avoid misused lands, land banking for future development and improvement	improvement, construction, rehabilitation and proper maintenance of roads, bridges buildings, water facilities, electricity, telecommunication s and flood control projects
Calabgan	Sustainable livelihood program Strengthen the entrepreneurshi p of LGU Promotion of tourism industry	Strict implementatio n of enviromental laws, IEC, massive trees and mangroves planting	strict implementatio n of zoning ordinances and building code	Strict implementatio n of polices, laws and regulation on zoning and building code, relocation of settlement to avoid misused lands, land banking for future development and improvement	improvement, construction, rehabilitation and proper maintenance of roads, bridges buildings, water facilities, electricity, telecommunication s and flood control projects
Calangcuasan	Sustainable livelihood program Strengthen the entrepreneurshi p of LGU Promotion of tourism industry	Strict implementatio n of enviromental laws, IEC, massive trees and mangroves planting	strict implementatio n of zoning ordinances and building code	Strict implementatio n of polices, laws and regulation on zoning and building code, relocation of settlement to avoid misused lands, land banking for future development and improvement	improvement, construction, rehabilitation and proper maintenance of roads, bridges buildings, water facilities, electricity, telecommunication s and flood control projects

Calantas	Sustainable livelihood program Strengthen the entrepreneurshi p of LGU Promotion of tourism industry	Strict implementatio n of enviromental laws, IEC, massive tree planting	strict implementatio n of zoning ordinances and building code	Strict implementatio n of polices, laws and regulation on zoning and building code, relocation of settlement to avoid misused lands, land banking for future development and improvement	improvement, construction, rehabilitation and proper maintenance of roads, bridges buildings, water facilities, electricity, telecommunication s and flood control projects
Cozo	Sustainable livelihood program Strengthen the entrepreneurshi p of LGU Promotion of tourism industry	Strict implementatio n of enviromental laws, IEC, massive trees and mangroves planting	strict implementatio n of zoning ordinances and building code	Strict implementatio n of polices, laws and regulation on zoning and building code, relocation of settlement to avoid misused lands, land banking for future development and improvement	improvement, construction, rehabilitation and proper maintenance of roads, bridges buildings, water facilities, electricity, telecommunication s and flood control projects
Culat	Sustainable livelihood program Strengthen the entrepreneurshi p of LGU Promotion of tourism industry	Strict implementatio n of enviromental laws, IEC, massive trees and mangroves planting	strict implementatio n of zoning ordinances and building code	Strict implementatio n of polices, laws and regulation on zoning and building code, relocation of settlement to avoid misused lands, land banking for future development and improvement	improvement, construction, rehabilitation and proper maintenance of roads, bridges buildings, water facilities, electricity, telecommunication s and flood control projects
Dibacong	Sustainable livelihood program Strengthen the entrepreneurshi p of LGU Promotion of tourism industry	Strict implementatio n of enviromental laws, IEC, massive trees and mangroves planting	strict implementatio n of zoning ordinances and building code	Strict implementatio n of polices, laws and regulation on zoning and building code, relocation of settlement to avoid misused lands, land banking for future development and improvement	improvement, construction, rehabilitation and proper maintenance of roads, bridges buildings, water facilities, electricity, telecommunication s and flood control projects

Dibet	Sustainable livelihood program Strengthen the entrepreneurshi p of LGU Promotion of tourism industry	Strict implementatio n of enviromental laws, IEC, massive trees and mangroves planting	strict implementatio n of zoning ordinances and building code	Strict implementatio n of polices, laws and regulation on zoning and building code, relocation of settlement to avoid misused lands, land banking for future development and improvement	improvement, construction, rehabilitation and proper maintenance of roads, bridges buildings, water facilities, electricity, telecommunication s and flood control projects
Ditinagyan	Sustainable livelihood program Strengthen the entrepreneurshi p of LGU Promotion of tourism industry	Strict implementatio n of enviromental laws, IEC, massive trees and mangroves planting	strict implementatio n of zoning ordinances and building code	Strict implementatio n of polices, laws and regulation on zoning and building code, relocation of settlement to avoid misused lands, land banking for future development and improvement	improvement, construction, rehabilitation and proper maintenance of roads, bridges buildings, water facilities, electricity, telecommunication s and flood control projects
Esperanza	Sustainable livelihood program Strengthen the entrepreneurshi p of LGU Promotion of tourism industry	Strict implementatio n of enviromental laws, IEC, massive tree planting	strict implementatio n of zoning ordinances and building code	Strict implementatio n of polices, laws and regulation on zoning and building code, relocation of settlement to avoid misused lands, land banking for future development and improvement	improvement, construction, rehabilitation and proper maintenance of roads, bridges buildings, water facilities, electricity, telecommunication s and flood control projects
Esteves	Sustainable livelihood program Strengthen the entrepreneurshi p of LGU Promotion of tourism industry	Strict implementatio n of enviromental laws, IEC, massive trees and mangroves planting	strict implementatio n of zoning ordinances and building code	Strict implementatio n of polices, laws and regulation on zoning and building code, relocation of settlement to avoid misused lands, land banking for future development and improvement	improvement, construction, rehabilitation and proper maintenance of roads, bridges buildings, water facilities, electricity, telecommunication s and flood control projects

Lual	Sustainable livelihood program Strengthen the entrepreneurshi p of LGU Promotion of tourism industry	Strict implementatio n of enviromental laws, IEC, massive trees and mangroves planting	strict implementatio n of zoning ordinances and building code	Strict implementatio n of polices, laws and regulation on zoning and building code, relocation of settlement to avoid misused lands, land banking for future development and improvement	improvement, construction, rehabilitation and proper maintenance of roads, bridges buildings, water facilities, electricity, telecommunication s and flood control projects
Marikit	Sustainable livelihood program Strengthen the entrepreneurshi p of LGU Promotion of tourism industry	Strict implementatio n of enviromental laws, IEC, massive trees and mangroves planting	strict implementatio n of zoning ordinances and building code	Strict implementatio n of polices, laws and regulation on zoning and building code, relocation of settlement to avoid misused lands, land banking for future development and improvement	improvement, construction, rehabilitation and proper maintenance of roads, bridges buildings, water facilities, electricity, telecommunication s and flood control projects
San Ildefonso	Sustainable livelihood program Strengthen the entrepreneurshi p of LGU Promotion of tourism industry	Strict implementatio n of enviromental laws, IEC, massive trees and mangroves planting	strict implementatio n of zoning ordinances and building code	Strict implementatio n of polices, laws and regulation on zoning and building code, relocation of settlement to avoid misused lands, land banking for future development and improvement	improvement, construction, rehabilitation and proper maintenance of roads, bridges buildings, water facilities, electricity, telecommunication s and flood control projects
Tabas	Sustainable livelihood program Strengthen the entrepreneurshi p of LGU Promotion of tourism industry	Strict implementatio n of enviromental laws, IEC, massive tree planting	strict implementatio n of zoning ordinances and building code	Strict implementatio n of polices, laws and regulation on zoning and building code, relocation of settlement to avoid misused lands, land banking for future development and improvement	improvement, construction, rehabilitation and proper maintenance of roads, bridges buildings, water facilities, electricity, telecommunication s and flood control projects

Tinib	Sustainable livelihood program Strengthen the entrepreneurshi p of LGU Promotion of tourism industry	Strict implementatio n of enviromental laws, IEC, massive trees and mangroves planting	strict implementatio n of zoning ordinances and building code	Strict implementatio n of polices, laws and regulation on zoning and building code, relocation of settlement to avoid misused lands, land banking for future development and improvement	improvement, construction, rehabilitation and proper maintenance of roads, bridges buildings, water facilities, electricity, telecommunication s and flood control projects
-------	---	---	---	---	--

The descriptive summary of climate change vulnerability in terms of population in all barangays has a total percentage of 70.88% of total household are below poverty threshold. Some barangays have a presence of kaingin, fishing, quarrying, illegal logging and cutting of mangroves in natural resources. Mostly, in critical facilities they are not following the zoning ordinance, buildings are not well planned. In urban use noncompliance to policies and programs regarding land use are practiced. Lastly, in lifeline utilities all of the barangays are lacking of comprehensive development plan.

# **VI. DISASTER RISK ASSESSMENT**

The Disaster Risk Assessment (DRA) involves the determination of the likelihood of occurrence of a particular hazard, namely (a) Flood, (b) Rain-induced Landslide, (c) Storm Surge, (d) Drought, (e) Sea Level Rise, (f) Earthquake-induced Landslide, (g) Liquefaction/Sinkhole, (h) Ground Shaking, (i) Ground Rupture, (j) Tsunami, and (k) Volcanic Eruption. The likelihood of occurrence will be quantitatively determined using six scores: (1) Very Rare (>200 years), (2) Rare (101-200 years), (3) Improbable (31-100 years), (4) Occasional Slight Chance (11-30 years), (5) Moderate (4-10 years), and (6) Frequent (1-3 years). To determine the disaster risk for each system of interest in each barangay, the likelihood of occurrence of a risk is multiplied to the severity of its consequence, as further described in detail below:

Severity of	Population	Natural	Critical	Urban Use	Lifeline
Consequenc	Risk	Resources	Point	Risk	Utilities
е	Descriptio	Risk	Facilities	Descriptio	Risk
Score	n	Descriptio	Risk	n	Descriptio
		n	Descriptio		n
			n		
1	<5% of	<5% of	<5% of	<5% of	<5% of
	affected	exposed	critical	urban use	lifeline
	population	natural	point	likely to be	utilities
	needing	resources	facilities	affected	likely to be
	immediate	likely to be	likely to be		affected
	assistance	affected	affected		
2	5-10% of	5-10% of	5-10% of	5-10% of	5-10% of
	affected	exposed	critical	urban use	lifeline
	population	natural	point	likely to be	utilities
	needing	resources	facilities	affected	likely to be
	immediate	likely to be	likely to be		affected
	assistance	affected	affected		
3	10-20% of	10.6-20% of	10.6-20% of	10.6-20% of	10.6-20% of
	affected	exposed	critical	urban use	lifeline
	population	natural	point	likely to be	utilities
	needing	resources	facilities	affected	likely to be
	immediate	likely to be	likely to be		affected
	assistance	affected	affected		
4	>20% of	>20% of	>20% of	>20% of	>20% of
	affected	exposed	critical	urban use	lifeline
	population	natural	point	likely to be	utilities
	needing	resources	facilities	affected	likely to be
	immediate	likely to be	likely to be		affected
	assistance	affected	affected		

#### Table 65. Description of Severity of Risk per System of Interest.

Given that the least possible risk score is "1" and highest is "24", the following rubric is used to categorize risk scores: scores ranging 1-8 are categorized as "low" disaster risk, scores ranging 9-16 are categorized as "medium" disaster risk, and 17-24

scores are "high" disaster risk. Additionally, each system of interest has a particular set of exposure indicators to determine the overall severity of consequence of disaster risk (Table 27) to determine the disaster risk.

	of Interest.						
System of Interest	Variabl	es for deteri	nining overall se	verity of cons	sequence		
Populatio n	Severity of Consequence to barangay residents	Severity of Consequenc e to informal settlers	Severity of Consequence to houses made with light materials	Severity of Consequence to elderly and young people	Severity of Consequence to PWDs		
Natural Resources	Severity of Consequence to crop-based farming areas	Severity of Consequenc e to aquaculture- based farming areas	Severity of Consequence to livestock/poultry areas	Severity of Consequence to production of major crop(s)	Severity of Consequence to irrigation systems		
Critical Point Facilities	Severity of Consequence to school infrastructure s	Severity of Consequenc e to hospitals & health centers	Severity of Consequence to barangay hall	Severity of Consequence to gymnasium(s )	Severity of Consequence to other government infrastructures		
Urban Use	Severity of Consequence to residential land use	Severity of Consequenc e to commercial land use	Severity of Consequence to tourist sites	Severity of Consequence to upland and sloping area(s)	Severity of Consequence to shoreline/wate r bodies		
Lifeline Utilities	Severity of Consequence to roads	Severity of Consequenc e to bridges	Severity of Consequence to telecommunicatio n systems	Severity of Consequence to water supply utilities	Severity of Consequence to power distribution systems		

# Table 66. Variables for Determining Overall Severity of Consequence per Systemof Interest.

The DRA of each system of interest (Population, Natural Resources, Critical Facilities, Urban Use, and Lifeline Utilities) will then be averaged to determine the overall DRA of a particular barangay.

## Disaster Risk Assessment of Population Floods and Population



Fig.86.Households Vulnerable to Flood Hazard



## Fig.87.Households Risk to Flood Hazard Table 67. Disaster Risk Assessment of Floods and Population

			1. I	Flood		
BARANGAY	Likelihood of Occurrenc e	Severity of Consequenc e to barangay residents	Severity of Consequenc e to informal settlers	Severity of Consequenc e to houses made with light materials	Severity of Consequenc e to elderly and young people	Severity of Consequenc e to PWDs
Barangay 1 (Pob.)	6	4	4	4	4	4
Barangay 2 (Pob.)	6	4	4	4	4	4
Barangay 3 (Pob.)	6	4	4	4	4	4
Barangay 4 (Pob.)	6	4	4	4	4	4
Barangay 5 (Pob.)	6	4	4	4	4	4
Barangay 6 (Pob.)	6	4	4	4	4	4
Barangay 7 (Pob.)	6	4	4	4	4	4
Barangay 8 (Pob.)	6	4	4	4	4	4
Bianuan	6	4	4	4	4	4
Calabgan	6	4	4	4	4	4
Calangcuasan	6	4	4	4	4	4
Calantas	6	4	4	4	4	4
Cozo	6	4	4	4	4	4
Culat	6	4	4	4	4	4
Dibacong	6	4	4	4	4	4
Dibet	6	4	4	4	4	4
Ditinagyan	6	4	4	4	4	4
Esperanza	6	4	4	4	4	4
Esteves	6	4	4	4	4	4
Lual	6	4	4	4	4	4
Marikit	6	4	4	4	4	4
San Ildefonso	6	4	4	4	4	4
Tabas	6	4	4	4	4	4
Tinib	6	4	4	4	4	4

In terms of flood hazard all barangays in Casiguran has a "frequent" (1-3 years) likelihood of occurrence and is "very high" in severity of consequences that more than 20 percent of population will be affected and in need of immediate assistance in the occurrence of flood.



#### **Rain-induced Landslides and Population**

Fig.88.Households Vulnerable to Rain-induced Landslide Hazard



## Fig.89.Households Risk to Rain-induced Landslide Hazard Table 68. Disaster Risk Assessment of Rain-induced Landslides and Population

			2. Rain-Indu	ced Landslide		
BARANGAY	Likelihood of Occurrenc e	Severity of Consequenc e to barangay residents	Severity of Consequenc e to informal settlers	Severity of Consequenc e to houses made with light materials	Severity of Consequenc e to elderly and young people	Severity of Consequenc e to PWDs
Barangay 1 (Pob.)						
Barangay 2 (Pob.)	6	2				
Barangay 3 (Pob.)	6	2				
Barangay 4 (Pob.)						
Barangay 5 (Pob.)	6	2	2	2	2	2
Barangay 6 (Pob.)						
Barangay 7 (Pob.)						
Barangay 8 (Pob.)						
Bianuan						
Calabgan	6	1	1	1	1	1
Calangcuasan						
Calantas	6	2	2	2	2	2
Cozo	6	4	4	4	4	4
Culat	6	2	2	2	2	2
Dibacong	6	2	2	2	2	2
Dibet	6	2	2	2	2	2
Ditinagyan	6	1	1	1	1	1
Esperanza	6	1	1	1	1	1
Esteves						
Lual						
Marikit						
San Ildefonso	6	4	4	4	4	4
Tabas	6	1	1	1	1	1
Tinib	6	1	1	1	1	1

In terms of rain induced landslide hazard, 3 barangays in población where the Ermita hill is located and 11 barangays that has mountainous area has a "frequent" (1-3 years) likelihood of occurrence. Barangay 5 in población has a moderate or 5.1% to 10% of population will be affected and in need of immediate assistance while the two remaining barangays in poblacion has a moderate severity of consequence to barangay residents. The remaining barangays – Cozo and San Ildefonso - "very high", Calantas, Culat, Dibacong and Dibet – "moderate" and Calabgan, Ditinagyan, Esperanza, Tabas and Tinib – "low" in severity of consequences.



#### **Storm Surges and Population**

Fig.90.Households Vulnerable to Storm Surges Hazard



## **Fig.91.Households Risk to Storm Surges Hazard** Table 69. **Disaster Risk Assessment of Storm Surges and Population**

	3. Storm Surge					
BARANGAY	Likelihood of Occurrenc e	Severity of Consequenc e to barangay residents	Severity of Consequenc e to informal settlers	Severity of Consequenc e to houses made with light materials	Severity of Consequenc e to elderly and young people	Severity of Consequenc e to PWDs
Barangay 1 (Pob.)						
Barangay 2 (Pob.)						
Barangay 3 (Pob.)						
Barangay 4 (Pob.)						
Barangay 5 (Pob.)						
Barangay 6 (Pob.)						
Barangay 7 (Pob.)						
Barangay 8 (Pob.)						
Bianuan						
Calabgan	5	3	3	3	3	3
Calangcuasan	5	3	3	3	3	3
Calantas						
Cozo	5	4	4	4	4	4
Culat	5	2	2	2	2	2
Dibacong	5	4	4	4	4	4
Dibet	5	4	4	4	4	4
Ditinagyan	5	4	4	4	4	4
Esperanza						
Esteves	5	4	4	4	4	4
Lual	5	2	2	2	2	2
Marikit	5	2	2	2	2	2
San Ildefonso	5	4	4	4	4	4
Tabas						
Tinib	5	2	2	2	2	2

In terms of Storm Surge there are 12 barangays who has "moderate" likelihood of occurrence (4-10 years) but the severity of consequences differs in all sector of population. "Very High" in barangays Cozo, Dibacong, Dibet, Ditinagyan, Esteves and San Ildefonso. "High" in Calabgan and Calangcuasan. "Moderate" in Culat, Marikit, Lual and Tinib.





Fig.92.Households Vulnerable to Drought Hazard



#### Fig.93.Households Risk to Drought Hazard Table 70. Disaster Risk Assessment of Drought and Population

			4. Di	rought		
BARANGAY	Likelihood of Occurrenc e	Severity of Consequenc e to barangay residents	Severity of Consequenc e to informal settlers	Severity of Consequenc e to houses made with light materials	Severity of Consequenc e to elderly and young people	Severity of Consequenc e to PWDs
Barangay 1		4	4	4	4	4
(POD.)	6	4	4	4	4	4
(Pob.)	6	4	4	4	4	4
Barangay 3 (Pob.)	6	4	4	4	4	4
Barangay 4 (Pob.)	6	4	4	4	4	4
Barangay 5 (Pob.)	6	4	4	4	4	4
Barangay 6 (Pob.)	6	4	4	4	4	4
Barangay 7 (Pob.)	6	4	4	4	4	4
Barangay 8						
(Pob.)	6	4	4	4	4	4
Blanuan	6	4	4	4	4	4
Calangeussan	6	4	4	4	4	4
Calantas	6	4	4	4	4	4
Cozo	6	4	4	4	4	4
Culat	6	4	4	4	4	4
Dibacong	6	4	4	4	4	4
Dibet	6	4	4	4	4	4
Ditinagyan	6	4	4	4	4	4
Esperanza	6	4	4	4	4	4
Esteves	6	4	4	4	4	4
Lual	6	4	4	4	4	4
Marikit	6	4	4	4	4	4
San Ildefonso	6	4	4	4	4	4
Tabas	6	4	4	4	4	4
Tinib	6	4	4	4	4	4

In terms of drought hazard all barangays in Casiguran has a "frequent" (1-3 years) likelihood of occurrence and is "very high" in severity of consequences that more than 20 percent of population will be affected and in need of immediate assistance in the occurrence of drought.



## Sea Level Rise and Population

Fig.94.Households Vulnerable to Sea Level Rise Hazard



Fig.95.Households Risk to Sea Level Rise Hazard Table 71. Disaster Risk Assessment of Sea Level Rise and Population

			5. Sea L	evel Rise		
BARANGAY	Likelihood of Occurrenc e	Severity of Consequenc e to barangay residents	Severity of Consequenc e to informal settlers	Severity of Consequenc e to houses made with light materials	Severity of Consequenc e to elderly and young people	Severity of Consequenc e to PWDs
Barangay 1						
(Pob.)	3	1	1	1	1	1
Barangay 2 (Pob.)	3	1	1	1	1	1
Barangay 3						_
(Pob.)	3	1	1	1	1	1
Barangay 4 (Pob.)	3	1	1	1	1	1
Barangay 5 (Pob.)	3	1	1	1	1	1
Barangay 6 (Pob.)	3	1	1	1	1	1
Barangay 7 (Pob.)	3	1	1	1	1	1
Barangay 8 (Pob.)	3	1	1	1	1	1
Bianuan	3	1	1	1	1	1
Calabgan	3	2	2	2	2	2
Calangcuasan	3	2	2	2	2	2
Calantas	3	1	1	1	1	1
Cozo	3	3	3	3	3	3

Culat	3	2	2	2	2	2
Dibacong	3	4	4	4	4	4
Dibet	3	3	3	3	3	3
Ditinagyan	3	2	2	2	2	2
Esperanza	3	1	1	1	1	1
Esteves	3	4	4	4	4	4
Lual	3	2	2	2	2	2
Marikit	3	2	2	2	2	2
San Ildefonso	3	4	4	4	4	4
Tabas	3	1	1	1	1	1
Tinib	3	2	2	2	2	2

In terms of sea level rise all barangays in Casiguran has a "improbable" (31-100 years) likelihood of occurrence and 12 barangays including población and the non coastal areas has a "low" severity of consequences, "very high" severity of consequences is in barangays Dibacong, Esteves and San Ildefonso, "high" and "moderate" in barangays Calabgan, Calangcuasan, Culat, Ditinagyan, Lual, Marikit and Tinib.

#### Earthquake-induced Landslides and Population



Fig.96.Households Vulnerable to Earthquake-induced Landslide Hazard



Fig.97.Households Vulnerable to Earthquake-induced Landslide Hazard Table 72. Disaster Risk Assessment of Earthquake-induced Landslides and Population

	6. Earthquake-induced landslide						
BARANGAY	Likelihood of Occurrenc e	Severity of Consequenc e to barangay residents	Severity of Consequenc e to informal settlers	Severity of Consequenc e to houses made with light materials	Severity of Consequenc e to elderly and young people	Severity of Consequenc e to PWDs	
Barangay 1 (Pob.)							
Barangay 2 (Pob.)	6	1	1	1	1	1	
Barangay 3 (Pob.)	6	1	1	1	1	1	
Barangay 4 (Pob.)							
Barangay 5 (Pob.)	6	1	1	1	1	1	
Barangay 6 (Pob.)							
Barangay 7 (Pob.)							
Barangay 8 (Pob.)							
Bianuan							
Calabgan	6	1	1	1	1	1	
Calangcuasan							

Calantas	6	2	2	2	2	2
Cozo	6	4	4	4	4	4
Culat	6	2	2	2	2	2
Dibacong	6	2	2	2	2	2
Dibet	6	2	2	2	2	2
Ditinagyan	6	2	2	2	2	2
Esperanza	6	2	2	2	2	2
Esteves						
Lual						
Marikit						
San Ildefonso	6	4	4	4	4	4
Tabas	6	2	2	2	2	2
Tinib	6	2	2	2	2	2

In terms of earthquake induce landslide, there are 11 barangays mountainous and 3 barangays in población near the Ermita hill who have a frequent (1-3 years) likelihood of occurrence of landslides. In the severity of consequences Cozo and San Ildefonso are "very high", Calantas, Culat, Dibacong, Dibet, Ditinagyan, Esperanza, Tabas and Tinib are "moderate" and Calabgan, Poblacion 2,3 and 5 are "low".

## Liquefaction/Sinkholes and Population



Fig.98.Households Vulnerable to Liquefaction Hazard



Fig.99.Households Risk to Liquefaction Hazard Table 73. Disaster Risk Assessment of Liquefaction/Sinkholes and Population

	7. Liquefaction / Sinkhole					
BARANGAY	Likelihood of Occurrenc e	Severity of Consequenc e to barangay residents	Severity of Consequenc e to informal settlers	Severity of Consequenc e to houses made with light materials	Severity of Consequenc e to elderly and young people	Severity of Consequenc e to PWDs
Barangay 1						
(Pob.)	3	4	4	4	4	4
Barangay 2 (Pob.)	3	4	4	4	4	4
Barangay 3 (Pob.)	3	4	4	4	4	4
Barangay 4 (Pob.)	3	4	4	4	4	4
Barangay 5 (Pob.)	3	4	4	4	4	4
Barangay 6 (Pob.)	3	4	4	4	4	4
Barangay 7 (Pob.)	3	4	4	4	4	4
Barangay 8 (Pob.)	3	4	4	4	4	4
Bianuan	2	2	2	2	2	2
Calabgan	1	2	2	2	2	2
Calangcuasan	3	4	4	4	4	4
Calantas	3	4	4	4	4	4

Cozo	1	2	2	2	2	2
Culat	3	4	4	4	4	4
Dibacong	3	4	4	4	4	4
Dibet	1	4	4	4	4	4
Ditinagyan	2	2	2	2	2	2
Esperanza	3	4	4	4	4	4
Esteves	3	4	4	4	4	4
Lual	3	4	4	4	4	4
Marikit	3	4	4	4	4	4
San Ildefonso	1	1	1	1	1	1
Tabas	3	4	4	4	4	4
Tinib	3	3	3	3	3	3

In terms of liquefaction/sinkholes, 18 barangays of Casiguran have an "improbable" (31-100 years) likelihood of occurrence and 18 barangays have a "very high" severity of consequences, 4 barangays are "moderate", Tinib is "high and San Ildefeonso is "low".

#### **Ground Shaking and Population**



Fig.100.Households Vulnerable to Ground Shaking Hazard



Fig.101.Households Risk to Ground Shaking Hazard Table 74. Disaster Risk Assessment of Ground Shaking and Population

			8. Ground shaking			
BARANGAY	Likelihood of Occurrenc e	Severity of Consequenc e to barangay residents	Severity of Consequenc e to informal settlers	Severity of Consequenc e to houses made with light materials	Severity of Consequenc e to elderly and young people	Severity of Consequenc e to PWDs
Barangay 1		4	4		4	
(Pob.)	4	4	4	4	4	4
Barangay 2 (Pob.)	4	4	4	4	4	4
Barangay 3 (Pob.)	4	4	4	4	4	4
Barangay 4 (Pob.)	4	4	4	4	4	4
Barangay 5 (Pob.)	4	4	4	4	4	4
Barangay 6 (Pob.)	4	4	4	4	4	4
Barangay 7 (Pob.)	4	4	4	4	4	4
Barangay 8 (Pob.)	4	4	4	4	4	4
Bianuan	4	4	4	4	4	4
Calabgan	4	4	4	4	4	4
Calangcuasan	4	4	4	4	4	4
Calantas	4	4	4	4	4	4

Cozo	4	4	4	4	4	4
Culat	4	4	4	4	4	4
Dibacong	4	4	4	4	4	4
Dibet	4	4	4	4	4	4
Ditinagyan	4	4	4	4	4	4
Esperanza	4	4	4	4	4	4
Esteves	4	4	4	4	4	4
Lual	4	4	4	4	4	4
Marikit	4	4	4	4	4	4
San Ildefonso	4	4	4	4	4	4
Tabas	4	4	4	4	4	4
Tinib	4	4	4	4	4	4

In terms of ground shaking, all barangays in Casiguran has an "occasional slight chance" (11-30 years) likelihood of occurrence and is "very high" in severity of consequences that more than 20 percent of population will be affected and in need of immediate assistance in the occurrence of ground shaking.

#### **Ground Rupture and Population**



147 | Page



## Fig.102.Households Vulnerable to Ground Rupture Hazard

Fig.103.Households Risk to Ground Rupture Hazard Table 75. Disaster Risk Assessment of Ground Rupture and Population

	9. Ground Rupture						
BARANGAY	Likelihood of Occurrenc e	Severity of Consequenc e to barangay residents	Severity of Consequenc e to informal settlers	Severity of Consequenc e to houses made with light materials	Severity of Consequenc e to elderly and young people	Severity of Consequenc e to PWDs	
Barangay 1 (Pob.)							
Barangay 2 (Pob.)	4	1	1	1	1	1	
Barangay 3 (Pob.)							
Barangay 4 (Pob.)							
Barangay 5 (Pob.)							
Barangay 6 (Pob.)							
Barangay 7 (Pob.)							
Barangay 8 (Pob.)	4	1	1	1	1	1	
Bianuan	4	1	1	1	1	1	
Calabgan	4	1	1	1	1	1	
Calangcuasan							

Calantas	4	1	1	1	1	1
Cozo						
Culat	4	1	1	1	1	1
Dibacong	4	1	1	1	1	1
Dibet	4	1	1	1	1	1
Ditinagyan	4	1	1	1	1	1
Esperanza						
Esteves						
Lual						
Marikit						
San Ildefonso						
Tabas	4	1	1	1	1	1
Tinib	4	1	1	1	1	1

In terms of ground rupture, 11 barangays in Casiguran are bisected by the Casiguran Fault and has a "occasional slight chance" (11-30 years) likelihood of occurrence and has a "low" severity of consequences.

#### **Tsunamis and Population**



149 | Page



#### Fig.104.Households Vulnerable to Tsunami Hazard

Fig.105.Households Risk to Tsunami Landslide Hazard	
Table 76. Disaster Risk Assessment of Tsunamis and Populatio	n

	10. Tsunami							
BARANGAY	Likelihood of Occurrenc e	Severity of Consequenc e to barangay residents	Severity of Consequenc e to informal settlers	Severity of Consequenc e to houses made with light materials	Severity of Consequenc e to elderly and young people	Severity of Consequenc e to PWDs		
Barangay 1 (Pob.)	3	4	4	4	4	4		
Barangay 2 (Pob.)	3	4	4	4	4	4		
Barangay 3 (Pob.)	3	4	4	4	4	4		
Barangay 4 (Pob.)	3	4	4	4	4	4		
Barangay 5 (Pob.)	3	4	4	4	4	4		
Barangay 6 (Pob.)	3	4	4	4	4	4		
Barangay 7 (Pob.)	3	4	4	4	4	4		
Barangay 8 (Pob.)	3	4	4	4	4	4		
Bianuan	3	1	1	1	1	1		
Calabgan	3	4	4	4	4	4		
Calangcuasan	3	4	4	4	4	4		

Calantas	3	4	4	4	4	4
Cozo	3	1	1	1	1	1
Culat	3	4	4	4	4	4
Dibacong	3	4	4	4	4	4
Dibet	3	4	4	4	4	4
Ditinagyan	3	4	4	4	4	4
Esperanza	3	4	4	4	4	4
Esteves	3	4	4	4	4	4
Lual	3	4	4	4	4	4
Marikit	3	4	4	4	4	4
San Ildefonso	3	1	1	1	1	1
Tabas	3	4	4	4	4	4
Tinib	3	4	4	4	4	4

In terms of tsunamis, all barangays in Casiguran has a "improbable" (31-100 years) likelihood of occurrence and 23 barangays are "very high" in severity of consequences that more than 20 percent of population will be affected and in need of immediate assistance while Cozo, San Ildefonso and Bianuan are "low".

## **Volcanic Eruptions and Population**

Table 77. Disaster Risk Assessment of Volcanic Erup	ptions and Population
---	-----------------------

	11. Volcanic Eruption					
BARANGAY	Likelihood of Occurrenc e	Severity of Consequenc e to barangay residents	Severity of Consequenc e to informal settlers	Severity of Consequenc e to houses made with light materials	Severity of Consequenc e to elderly and young people	Severity of Consequenc e to PWDs
Barangay 1 (Pob.)						
Barangay 2 (Pob.)						
Barangay 3 (Pob.)						
Barangay 4 (Pob.)						
Barangay 5 (Pob.)						
Barangay 6 (Pob.)						
Barangay 7 (Pob.)						
Barangay 8 (Pob.)						
Bianuan						
Calabgan						

Calangcuasan			
Calantas			
Cozo			
Culat			
Dibacong			
Dibet			
Ditinagyan			
Esperanza			
Esteves			
Lual			
Marikit			
San Ildefonso			
Tabas			
Tinib			

Disasters arising from volcanic eruptions in Casiguran are highly unlikely because of the absence of volcano in the municipality or neighboring town.

## Disaster Risk Assessment of Natural Resources Floods and Natural Resources



Fig.106.Natural Resources Vulnerable to Flood Hazard



#### Fig.107.Natural Resources Risk to Flood Hazard Table 78. Disaster Risk Assessment of Floods and Natural Resources

	1. Flood						
BARANGAY	Likelihoo d of Occurrenc e	Severity of Consequenc e to crop- based farming areas	Severity of Consequenc e to aquacultur e-based farming areas	Severity of Consequence to livestock/poult ry areas	Severity of Consequenc e to production of major crop(s)	Severity of Consequenc e to irrigation systems	
Barangay 1 (Pob.)							
Barangay 2 (Pob.)							
Barangay 3 (Pob.)							
Barangay 4 (Pob.)							
Barangay 5 (Pob.)							
Barangay 6 (Pob.)							
Barangay 7 (Pob.)							
Barangay 8 (Pob.)							
Bianuan							
Calabgan	6	4	4	4	4	4	
Calangcuasan	6	4	4	4	4	4	
Calantas	6	4	4	4	4	4	
Cozo	6	4	4	4	4	4	
Culat	6	4	4	4	4	4	
Dibacong	6	4	4	4	4	4	
Dibet	6	4	4	4	4	4	
Ditinagyan	6	4	4	4	4	4	
Esperanza	6	4	4	4	4	4	
Esteves	6	4	4	4	4	4	
Lual	6	4	4	4	4	4	
Marikit	6	4	4	4	4	4	
San Ildefonso	6	4	4	4	4	4	
Tabas	6	4	4	4	4	4	
Tinib	6	4	4	4	4	4	

In terms of flood hazard,15 barangays in Casiguran has a "frequent" (1-3 years) likelihood of occurrence and is "very high" in severity of consequences that more than 20 percent of exposed natural resources will be affected in the occurrence of flood. The 8 barangays of población and barangay Bianuan will not be affected due to the absence of natural resources because it is an urban community.



#### **Rain-induced Landslides and Natural Resources**

Fig.108.Natural Resources Vulnerable to Rain-induced Landslides Hazard



# Fig.109.Natural Resources Risk to Rain-induced Landslides Hazard

		2. Rain-Induced Landslide					
BARANGAY	Likelihoo d of Occurrenc e	Severity of Consequenc e to crop- based farming areas	Severity of Consequenc e to aquacultur e-based farming areas	Severity of Consequence to livestock/poult ry areas	Severity of Consequenc e to production of major crop(s)	Severity of Consequenc e to irrigation systems	
Barangay 1 (Pob.)							
Barangay 2 (Pob.)							
Barangay 3 (Pob.)							
Barangay 4 (Pob.)							
Barangay 5 (Pob.)							
Barangay 6 (Pob.)							
Barangay 7 (Pob.)							
Barangay 8 (Pob.)							
Bianuan							
Calabgan	6	4	4	4	4	4	
Calangcuasan							
Calantas	6	4	4	4	4	4	
Cozo	6	4	4	4	4	4	
Culat	6	4	4	4	4	4	
Dibacong	6	4	4	4	4	4	
Dibet	6	4	4	4	4	4	
Ditinagyan	6	4	4	4	4	4	
Esperanza	6	4	4	4	4	4	
Esteves							
Lual							
Marikit							
San Ildefonso	6	4	4	4	4	4	
Tabas	6	4	4	4	4	4	
Tinib	6	4	4	4	4	4	

Fable 79. Disaster Risk Assessment of Rain-induced Landslides and Natural
Resources

In terms of rain-induced landslide, 11 barangays in Casiguran has a "frequent" (1-3 years) likelihood of occurrence and is "very high" in severity of consequences that more than 20 percent of exposed natural resources will be affected in the occurrence of flood. The 8 barangays of población and barangay Bianuan, Calangcuasan, Esteves, Lual and Marikit will not be affected because there are no mountainous areas.



#### **Storm Surges and Natural Resources**

Fig.110.Natural Resources Vulnerable to Storm Surges Hazard



# Fig.111.Natural Resources Risk to Storm Surges Hazard

	3. Storm Surge					
BARANGAY	Likelihoo d of Occurrenc e	Severity of Consequenc e to crop- based farming areas	Severity of Consequenc e to aquacultur e-based farming areas	Severity of Consequence to livestock/poult ry areas	Severity of Consequenc e to production of major crop(s)	Severity of Consequenc e to irrigation systems
Barangay 1 (Pob.)						
Barangay 2 (Pob.)						
Barangay 3 (Pob.)						
Barangay 4 (Pob.)						
Barangay 5 (Pob.)						
Barangay 6 (Pob.)						
Barangay 7 (Pob.)						
Barangay 8 (Pob.)						
Bianuan						
Calabgan	5	4	4	4	4	4
Calangcuasan	5	4	4	4	4	4
Calantas						
Cozo	5	4	4	4	4	4
Culat	5	4	4	4	4	4
Dibacong	5	4	4	4	4	4
Dibet	5	4	4	4	4	4
Ditinagyan	5	4	4	4	4	4
Esperanza						
Esteves	5	4	4	4	4	4
Lual	5	4	4	4	4	4
Marikit	5	4	4	4	4	4
San Ildefonso	5	4	4	4	4	4
Tabas						
Tinib	5	4	4	4	4	4

In terms of storm surges, 12 barangays in Casiguran has a "moderate" (4-10 years) likelihood of occurrence and is "very high" in severity of consequences that more than 20 percent of exposed natural resources will be affected in the occurrence of flood.



#### **Droughts and Natural Resources**

Fig.112.Natural Resources Vulnerable to Drought Hazard


## Fig.113.Natural Resources Risk to Drought Hazard

	4. Drought						
BARANGAY	Likelihoo d of Occurrenc e	Severity of Consequenc e to crop- based farming areas	Severity of Consequenc e to aquacultur e-based farming areas	Severity of Consequence to livestock/poult ry areas	Severity of Consequenc e to production of major crop(s)	Severity of Consequenc e to irrigation systems	
Barangay 1 (Pob.)							
Barangay 2 (Pob.)							
Barangay 3 (Pob.)							
Barangay 4 (Pob.)							
Barangay 5 (Pob.)							
Barangay 6 (Pob.)							
Barangay 7 (Pob.)							
Barangay 8 (Pob.)							
Bianuan							
Calabgan	6	4	4	4	4	4	
Calangcuasan	6	4	4	4	4	4	
Calantas	6	4	4	4	4	4	
Cozo	6	4	4	4	4	4	
Culat	6	4	4	4	4	4	
Dibacong	6	4	4	4	4	4	
Dibet	6	4	4	4	4	4	
Ditinagyan	6	4	4	4	4	4	
Esperanza	6	4	4	4	4	4	
Esteves	6	4	4	4	4	4	
Lual	6	4	4	4	4	4	
Marikit	6	4	4	4	4	4	
San Ildefonso	6	4	4	4	4	4	
Tabas	6	4	4	4	4	4	
Tinib	6	4	4	4	4	4	

Table 81. Disaster Risk Assessment o	of Droughts and Natural Resour	rces
--------------------------------------	--------------------------------	------

In terms of droughts, 15 barangays in Casiguran has a "frequent" (1-3 years) likelihood of occurrence and is "very high" in severity of consequences that more than 20 percent of exposed natural resources will be affected in the occurrence of drought. The 8 barangays of población and barangay Bianuan will not be affected due to the absence of natural resources because it is an urban community.



### Sea Level Rise and Natural Resources

Fig.114.Natural Resources Vulnerable to Sea Level Rise Hazard



## Fig.115.Natural Resources Risk to Sea Level Rise Hazard

	5. Sea Level Rise							
BARANGAY	Likelihoo d of Occurrenc e	Severity of Consequenc e to crop- based farming areas	Severity of Consequenc e to aquacultur e-based farming areas	Severity of Consequence to livestock/poult ry areas	Severity of Consequenc e to production of major crop(s)	Severity of Consequenc e to irrigation systems		
Barangay 1								
(Pob.)								
Barangay 2 (Pob.)								
Barangay 3 (Pob.)								
Barangay 4 (Pob.)								
Barangay 5 (Pob.)								
Barangay 6 (Pob.)								
Barangay 7 (Pob.)								
Barangay 8 (Pob.)								
Bianuan								
Calabgan	3	1	1	1	1	1		
Calangcuasan	3	1	1	1	1	1		
Calantas	3	1	1	1	1	1		
Cozo	3	1	1	1	1	1		
Culat	3	1	1	1	1	1		
Dibacong	3	1	1	1	1	1		
Dibet	3	1	1	1	1	1		
Ditinagyan	3	1	1	1	1	1		
Esperanza								
Esteves	3	1	1	1	1	1		
Lual	3	1	1	1	1	1		
Marikit	3	1	1	1	1	1		
San Ildefonso	3	1	1	1	1	1		
Tabas								
Tinib	3	1	1	1	1	1		

Table 82. Disastei	r Risk Assessment	of Sea Level Ri	ise and Natural	Resources
--------------------	-------------------	-----------------	-----------------	-----------

In terms of sea level rise, 13 barangays in Casiguran has an "improbable" (31-100 years) likelihood of occurrence with a "low" severity of consequences, because it is a coastal barangays.



#### Earthquake-induced Landslides and Natural Resources

Fig.116.Natural Resources Vulnerable to Earthquake-induced Hazard



## Fig.117.Natural Resources Risk to Earthquake-induced Hazard

	6. Earthquake-induced landslide					
BARANGAY	Likelihoo d of Occurrenc e	Severity of Consequenc e to crop- based farming areas	Severity of Consequenc e to aquacultur e-based farming areas	Severity of Consequence to livestock/poult ry areas	Severity of Consequenc e to production of major crop(s)	Severity of Consequenc e to irrigation systems
Barangay 1						
(Pob.)						
Barangay 2 (Pob.)						
Barangay 3						
(Pob.)						
Barangay 4						
(Pob.)						
Barangay 5						
(POD.) Barangay 6						
(Pob.)						
Barangay 7 (Pob.)						
Barangay 8 (Pob.)						
Bianuan						
Calabgan	6	4	4	4	4	4
Calangcuasan						
Calantas	6	4	4	4	4	4
Cozo	6	4	4	4	4	4
Culat	6	4	4	4	4	4
Dibacong	6	4	4	4	4	4
Dibet	6	4	4	4	4	4
Ditinagyan	6	4	4	4	4	4
Esperanza	6	4	4	4	4	4
Esteves						
Lual						
Marikit						
San Ildefonso	6	4	4	4	4	4
Tabas	6	4	4	4	4	4
Tinib	6	4	4	4	4	4

Fable 83. Disaster Risk Assessment of Earthquake-induced Landslides and Natura	1
Resources	

In terms of earthquake-induced landslide, 11 barangays in Casiguran has a "frequent" (1-3 years) likelihood of occurrence and is "very high" in severity of consequences that more than 20 percent of exposed natural resources will be affected in the occurrence of flood. The 8 barangays of población and barangay Bianuan, Calangcuasan, Esteves, Lual and Marikit will not be affected because there are no mountainous areas.



#### Liquefaction/Sinkholes and Natural Resources

Fig.118.Natural Resources Vulnerable to Liquefaction/Sinkhole Hazard



# Fig.119.Natural Resources Risk to Liquefaction/Sinkhole Hazard

			7. Liquefa	ction / Sinkhole		
BARANGAY	Likelihoo d of Occurrenc e	Severity of Consequenc e to crop- based farming areas	Severity of Consequenc e to aquacultur e-based farming areas	Severity of Consequence to livestock/poult ry areas	Severity of Consequenc e to production of major crop(s)	Severity of Consequenc e to irrigation systems
Barangay 1 (Pob.)						
Barangay 2 (Pob.)						
Barangay 3 (Pob.)						
Barangay 4 (Pob.)						
Barangay 5 (Pob.)						
Barangay 6 (Pob.)						
Barangay 7 (Pob.)						
Barangay 8 (Pob.)						
Bianuan						
Calabgan	1	4	4	4	4	4
Calangcuasan	3	4	4	4	4	4
Calantas	3	4	4	4	4	4
Cozo	1	4	4	4	4	4
Culat	3	4	4	4	4	4
Dibacong	3	4	4	4	4	4
Dibet	1	4	4	4	4	4
Ditinagyan	2	4	4	4	4	4
Esperanza	3	4	4	4	4	4
Esteves	3	4	4	4	4	4
Lual	3	4	4	4	4	4
Marikit	3	4	4	4	4	4
San Ildefonso	1	4	4	4	4	4
Tabas	3	4	4	4	4	4
Tinib	3	4	4	4	4	4

Table 84. Disaster Risk Assessment of Liquefaction/Sinkholes and NaturalResources

In terms of liquefaction/sinkhole, 15 barangays will be affected, 10 barangays are "improbable" (31-100 years), Ditinagyan is "rare" (101-200 years) and Calabgan, Cozo, Dibet and San Ildefonso are "very rare" (20 above years) to likelihood of occurrence and all sectors of natural based resources have a "very high" severity of consequences.

### **Ground Shaking and Natural Resources**



Fig.120.Natural Resources Vulnerable to Ground Shaking Hazard



## Fig.121.Natural Resources Risk to Ground Shaking Hazard

	8. Ground shaking							
BARANGAY	Likelihoo d of Occurrenc e	Severity of Consequenc e to crop- based farming areas	Severity of Consequenc e to aquacultur e-based farming areas	Severity of Consequence to livestock/poult ry areas	Severity of Consequenc e to production of major crop(s)	Severity of Consequenc e to irrigation systems		
Barangay 1								
(POD.) Barangay 2								
(Pob.)								
Barangay 3 (Pob.)								
Barangay 4 (Pob.)								
Barangay 5 (Pob.)								
Barangay 6 (Pob.)								
Barangay 7 (Pob.)								
Barangay 8 (Pob.)								
Bianuan								
Calabgan	4	4	4	4	4	4		
Calangcuasan	4	4	4	4	4	4		
Calantas	4	4	4	4	4	4		
Cozo	4	4	4	4	4	4		
Culat	4	4	4	4	4	4		
Dibacong	4	4	4	4	4	4		
Dibet	4	4	4	4	4	4		
Ditinagyan	4	4	4	4	4	4		
Esperanza	4	4	4	4	4	4		
Lual	4	4	4	4	4	4		
Marikit	4	4	4	4	4	4		
San Ildefonso	4		4	4	4	4		
Tabas	4	4	4	4	4	4		
Tinib	4	4	4	4	4	4		

Table 03, Disaster Mish Assessment of around shaking and Natural Resources
--

In terms of ground shaking, 15 barangays in Casiguran has a "occasional slight chance" (11-30 years) likelihood of occurrence and is "very high" in severity of consequences that more than 20 percent of natural resources will be affected.





Fig.122.Natural Resources Vulnerable to Ground Rupture Hazard



## Fig.123.Natural Resources Risk to Ground Rupture Hazard

	9. Ground Rupture							
BARANGAY	Likelihoo d of Occurrenc e	Severity of Consequenc e to crop- based farming areas	Severity of Consequenc e to aquacultur e-based farming areas	Severity of Consequence to livestock/poult ry areas	Severity of Consequenc e to production of major crop(s)	Severity of Consequenc e to irrigation systems		
Barangay 1								
(Pob.) Parangay 2								
(Pob.)								
Barangay 3								
(Pob.)								
Barangay 4								
(Pob.) Barangay 5								
(Pob.)								
Barangay 6								
Barangay 7 (Pob.)								
Barangay 8 (Pob.)								
Bianuan								
Calabgan	4	4	4	4	4	4		
Calangcuasan	4	4	4	4	4	4		
Calantas	4	4	4	4	4	4		
Cozo	4	4	4	4	4	4		
Culat	4	4	4	4	4	4		
Dibacong	4	4	4	4	4	4		
Dibet	4	4	4	4	4	4		
Ditinagyan	4	4	4	4	4	4		
Esperanza	4	4	4	4	4	4		
Esteves	4	4	4	4	4	4		
Lual	4	4	4	4	4	4		
Marikit	4	4	4	4	4	4		
San Ildefonso	4	4	4	4	4	4		
Tabas	4	4	4	4	4	4		
Tinib	4	4	4	4	4	4		

Table 86.	<b>Disaster Risk</b>	Assessment of	<b>Ground Ru</b>	ipture and I	Natural	Resources
-----------	----------------------	---------------	------------------	--------------	---------	-----------

In terms of ground rupture, 15 barangays in Casiguran has a "occasional slight chance" (11-30 years) likelihood of occurrence and is "very high" in severity of consequences that more than 20 percent of natural resources will be affected.



#### **Tsunamis and Natural Resources**

Fig.124.Natural Resources Vulnerable to Tsunami Hazard



## Fig.125.Natural Resources Risk to Tsunami Hazard

	10. Tsunami						
BARANGAY	Likelihoo d of Occurrenc e	Severity of Consequenc e to crop- based farming areas	Severity of Consequenc e to aquacultur e-based farming areas	Severity of Consequence to livestock/poult ry areas	Severity of Consequenc e to production of major crop(s)	Severity of Consequenc e to irrigation systems	
Barangay 1 (Pob.)							
Barangay 2 (Pob.)							
Barangay 3 (Pob.)							
Barangay 4 (Pob.)							
Barangay 5 (Pob.)							
Barangay 6 (Pob.)							
Barangay 7 (Pob.)							
Barangay 8 (Pob.)							
Bianuan							
Calabgan	3	4	4	4	4	4	
Calangcuasan	3	4	4	4	4	4	
Calantas	3	4	4	4	4	4	
Cozo	3	1	1	1	1	1	
Culat	3	4	4	4	4	4	
Dibacong	3	4	4	4	4	4	
Dibet	3	4	4	4	4	4	
Ditinagyan	3	4	4	4	4	4	
Esperanza	3	4	4	4	4	4	
Esteves	3	4	4	4	4	4	
Lual	3	4	4	4	4	4	
Marikit	3	4	4	4	4	4	
San Ildefonso	3	1	1	1	1	1	
Tinib	3	4	4	4	4	4	

Table 87. Disaster Risk Assessment of	<b>Tsunamis and Natural Resources</b>
---------------------------------------	---------------------------------------

In terms of tsunamis, 15 barangays in Casiguran has "improbable" (31-100 years) likelihood of occurrence and is "very high" in severity of consequences that more than 20 percent of natural resources will be affected.

## **Volcanic Eruptions and Natural Resources**

Table 88. Disaster Risk Assessment of Volcanic Eruptions and Natural Resource
---

	11. Volcanic Eruption					
BARANGAY	Likelihoo d of Occurrenc e	Severity of Consequenc e to crop- based farming areas	Severity of Consequenc e to aquacultur e-based farming areas	Severity of Consequence to livestock/poult ry areas	Severity of Consequenc e to production of major crop(s)	Severity of Consequenc e to irrigation systems
Barangay 1						
(Pob.)						
Barangay 2 (Pob.)						
Barangay 3						
(Pob.)						
Barangay 4 (Pob.)						
Barangay 5 (Pob.)						
Barangay 6 (Pob.)						
Barangay 7 (Pob.)						
Barangay 8 (Pob.)						
Bianuan						
Calabgan						
Calangcuasan						
Calantas						
Cozo						
Culat						
Dibacong						
Dibet						
Ditinagyan						
Esperanza						
Esteves						
Lual						
Marikit						
San Ildefonso						
Tabas						
Tinib						

Disasters arising from volcanic eruptions in Casiguran are highly unlikely because of the absence of volcano in the municipality or neighboring town.

### Disaster Risk Assessment of Critical Point Facilities Floods and Critical Point Facilities



Fig.126.Critical Facilities Vulnerable to Flood Hazard



Fig.127.Educational Facilities Vulnerable to Flood Hazard



Fig.128.Health Facilities Vulnerable to Flood Hazard



Fig.129.Critical Facilities Risk to Flood Hazard



Fig.130.Educational Facilities Risk to Flood Hazard



Fig.131.Health Facilities Risk to Flood Hazard

			1.	Flood		
BARANGAY	Likelihood of Occurrence	Severity of Consequence to school infrastructures	Severity of Consequence to hospitals & health centers	Severity of Consequence to barangay hall	Severity of Consequence to gymnasium(s)	Severity of Consequence to other government infrastructures
Barangay 1 (Pob.)	6			4		4
Barangay 2 (Pob.)	6			4		
Barangay 3 (Pob.)	6		4	1		
Barangay 4 (Pob.)	6		4	4		4
Barangay 5 (Pob.)	6			4		
Barangay 6 (Pob.)	6	4		4		
Barangay 7 (Pob.)	6	4		4		4
Barangay 8 (Pob.)	6	4		4		
Bianuan	6	4	1	1		1
Calabgan	6	4	1	1		1
Calangcuasan	6	2	1	4		4
Calantas	6	4	1	4		4
Cozo	6		1	1		1
Culat	6		4	4		
Dibacong	6	1	1	1		1
Dibet	6	1	1	1		1
Ditinagyan	6		1	1		1
Esperanza	6	4	4	4		4
Esteves	6	2	1	1		1
Lual	6	4	4	4		4
Marikit	6	4	4	4		4
San Ildefonso	6	1	1	1		1

able 89. Disaster Risk Assessment of Floods and Critical Point Facilitie
--

CLIMATE AND DISASTER RISK ASSESSMENT	
--------------------------------------	--

Tabas	6	1		4	
Tinib	6		1	1	1

In terms of flood, there were "frequent" (1-3 years) likelihood of occurrence in all barangays. In school infrastructure there were 9 barangays with "very high", 2 barangays with "moderate" and 4 barangays with "low" severity of consequence. In hospitals and health centers there were 6 barangays with "very high" and 11 barangays with "low" severity of consequence. In barangay hall there were 14 barangays with "very high" and 10 barangays with "low" severity of consequence. There is no severity of consequence to gymnasium in all barangay. In other government infrastructures there were 8 barangays with "very high" and 9 barangays with "low" severity of consequence.



#### **Rain-induced Landslides and Critical Point Facilities**



Fig.132.Critical Facilities Vulnerable to Rain-induced Landslide Hazard

Fig.133.Educational Facilities Vulnerable to Rain-induced Landslide Hazard





### Fig.134.Health Facilities Vulnerable to Rain-induced Landslide Hazard

Fig.135.Critical Facilities Risk to Rain-induced Landslide Hazard





### Fig.136.Educational Facilities Risk to Rain-induced Landslide Hazard

Fig.137.Health Facilities Risk to Rain-induced Landslide Hazard

Fable 90. Disaster Risk Assessment of Rain-induced Landslides and Critical Point	
Facilities	

			2. Rain-Ind	uced Landslide		
BARANGAY	Likelihood of Occurrence	Severity of Consequence to school infrastructures	Severity of Consequence to hospitals & health centers	Severity of Consequence to barangay hall	Severity of Consequence to gymnasium(s)	Severity of Consequence to other government infrastructures
Barangay 1 (Pob.)						
Barangay 2 (Pob.)	4					
Barangay 3 (Pob.)	4			4		
Barangay 4 (Pob.)						
Barangay 5 (Pob.)	4					
Barangay 6 (Pob.)						
Barangay 7 (Pob.)						
Barangay 8 (Pob.)						
Bianuan						
Calabgan	4					
Calangcuasan						
Calantas	4					4
Cozo	4	4	4			4
Culat	4					
Dibacong	4					
Dibet	4					4
Ditinagyan	4					
Esperanza	4					

### CLIMATE AND DISASTER RISK ASSESSMENT

Esteves					
Lual					
Marikit					
San Ildefonso	4	4	4	4	4
Tabas	4				
Tinib	4				

In terms of rain-induced landslide, there were 14 barangays with "occasional slight chance" (11-30 years) likelihood of occurrence. In school infrastructure there were 2 barangays with "very high" severity of consequence. In hospitals and health centers there were 2 barangays with "very high" severity of consequence. In barangay hall there were 2 barangays with "very high" severity of consequence. There were no severity of consequence to gymnasium in all barangay. In other government infrastructures there were 4 barangays with "very high" severity of consequence.



### **Storm Surges and Critical Point Facilities**

Fig.138.Critical Facilities Vulnerable to Storm Surge Hazard



Fig.139.Educational Facilities Vulnerable to Storm Surge Hazard



Fig.140.Health Facilities Vulnerable to Storm Surge Hazard





Fig.141.Critical Facilities Risk to Storm Surge Hazard

Fig.142.Educationa Facilities Risk to Storm Surge Hazard



### Fig.143.Health Facilities Risk to Storm Surge Hazard

		3. Storm Surge					
BARANGAY	Likelihood of Occurrence	Severity of Consequence to school infrastructures	Severity of Consequence to hospitals & health centers	Severity of Consequence to barangay hall	Severity of Consequence to gymnasium(s)	Severity of Consequence to other government infrastructures	
Barangay 1 (Pob.)							
Barangay 2 (Pob.)							
Barangay 3 (Pob.)							
Barangay 4 (Pob.)							
Barangay 5 (Pob.)							
Barangay 6 (Pob.)							
Barangay 7 (Pob.)							
Barangay 8 (Pob.)							
Bianuan							
Calabgan	5						
Calangcuasan	5						
Calantas							
Cozo	5	4	4	4		4	
Culat	5						
Dibacong	5	4	4	4		4	
Dibet	5	4	4	4		4	
Ditinagyan	5		4	4		4	
Esperanza							
Esteves	5	4	4	4		4	
Lual	5	4	4	4		4	
Marikit	5						
San Ildefonso	5	4					
Tabas							
Tinib	5						

#### Table 91. Disaster Risk Assessment of Storm Surges and Critical Point Facilities

In terms of storm surge, there were 12 barangays with "moderate" (4-10 years) likelihood of occurrence. In school infrastructure there were 6 barangays with "very high" severity of consequence. In hospitals and health centers there were 6 barangays with "very high" severity of consequence. In barangay hall there were 6 barangays with "very high" severity of consequence. There were no severity of consequence to gymnasium in all barangay. In other government infrastructures there were 6 barangays with "very high" severity of consequence.





Fig.144.Critical Facilities Vulnerable to Drought Hazard



Fig.145.Educational Facilities Vulnerable to Drought Hazard



Fig.146.Health Facilities Vulnerable to Drought Hazard



Fig.147.Critical Facilities Risk to Drought Hazard



Fig.148.Educational Facilities Risk to Drought Hazard



Fig.149.Health Facilities Risk to Drought Hazard

		4. Drought					
BARANGAY	Likelihood of Occurrence	Severity of Consequence to school infrastructures	Severity of Consequence to hospitals & health centers	Severity of Consequence to barangay hall	Severity of Consequence to gymnasium(s)	Severity of Consequence to other government infrastructures	
Barangay 1 (Pob.)	6			1		1	
Barangay 2 (Pob.)	6			1			
Barangay 3 (Pob.)	6		1	1			
Barangay 4 (Pob.)	6		1	1		1	
Barangay 5 (Pob.)	6			1			
Barangay 6 (Pob.)	6	1		1			
Barangay 7 (Pob.)	6	1		1		1	
Barangay 8 (Pob.)	6	1		1			
Bianuan	6	1	1	1		1	
Calabgan	6	1	1	1		1	
Calangcuasan	6	1	1	1		1	
Calantas	6	1	1	1		1	
Cozo	6	1	1	1		1	
Culat	6	1	1	1			
Dibacong	6	1	1	1		1	
Dibet	6	1	1	1		1	
Ditinagyan	6		1	1		1	
Esperanza	6	1	1	1		1	
Esteves	6	1	1	1		1	
Lual	6	1	1	1		1	
Marikit	6	1	1	1		1	
San Ildefonso	6	1	1	1		1	

Fable 92. Disaster	<sup>•</sup> Risk Assessment	of Droughts and	<b>Critical Point Facilities</b>

	CLIN	MATE AND D	ISASTER RIS	K ASSESSM	ENT	
Tabas	6	1		1		

Tinib 6 1 1 1 1	Tabas	6	1		1	
	Tinib	6	1	1	1	1

In terms of drought, there were "frequent" (1-3 years) likelihood of occurrence in all barangays. In school infrastructure there were 18 barangays with "low" severity of consequence. In hospitals and health centers there were 17 barangays with "low" severity of consequence. In barangay hall there is "low" severity of consequence in all barangay. There were no severity of consequence to gymnasium in all barangay. In other government infrastructures there were 17 barangays with "low" severity of consequence.

## Sea Level Rise and Critical Point Facilities



Fig.150.Critical Facilities Vulnerable to Sea Level Rise Hazard



Fig.151.Educational Facilities Vulnerable to Sea Level Rise Hazard



Fig.152.Health Facilities Vulnerable to Sea Level Rise Hazard



Fig.153.Critical Facilities Risk to Sea Level Rise Hazard



Fig.154.Educational Facilities Risk to Sea Level Rise Hazard



Fig.155.Health Facilities Risk to Sea Level Rise Hazard

	5. Sea Level Rise					
BARANGAY	Likelihood of Occurrence	Severity of Consequence to school infrastructures	Severity of Consequence to hospitals & health centers	Severity of Consequence to barangay hall	Severity of Consequence to gymnasium(s)	Severity of Consequence to other government infrastructures
Barangay 1 (Pob.)	3					
Barangay 2 (Pob.)	3					
Barangay 3 (Pob.)	3					
Barangay 4 (Pob.)	3					
Barangay 5 (Pob.)	3					
Barangay 6 (Pob.)	3					
Barangay 7 (Pob.)	3					
Barangay 8 (Pob.)	3					
Bianuan	3					
Calabgan	3					
Calangcuasan	3					
Calantas	3					
Cozo	3		1	1		1
Culat	3					
Dibacong	3	1	1	1		1
Dibet	3	1	1	1		1
Ditinagyan	3					
Esperanza	3					
Esteves	3	1	1	1		1
Lual	3	1	1	1		1
Marikit	3					
San Ildefonso	3	1	1	1		1

l able 93. Disaster Risk Assessment of Sea Level Rise and Critical Point Faciliti
---

CLIM	IATE AND DISA	STER RISK AS	SSESSME	NT	

Tinib 3	Tabas	3			
	Tinib	3			

In terms of sea level rise, there were "improbable" (31-100 years) likelihood of occurrence in all barangays. In school infrastructure there were 5 barangays with "low" severity of consequence. In hospitals and health centers there were 6 barangays with "low" severity of consequence. In barangay hall there were 6 barangays with "low" severity of consequence. There is no severity of consequence to gymnasium in all barangay. In other government infrastructures there were 6 barangays with "low" severity of consequence.

## Earthquake-induced Landslides and Critical Point Facilities



Fig.156.Critical Facilities Vulnerable to Earthquake-induced Landslide Hazard


Fig.157.Educational Facilities Vulnerable to Earthquake-induced Landslide Hazard



Fig.158.Health Facilities Vulnerable to Earthquake-induced Landslide Hazard



Fig.159.Critical Facilities Risk to Earthquake-induced Landslide Hazard



Fig.160.Educational Facilities Risk to Earthquake-induced Landslide Hazard



Fig.161.Health Facilities Risk to Earthquake-induced Landslide Hazard

Table 94	. Disaster	Risk	Assessment	of Earthqu	ake-indu	ced Land	slides and	Critical
Point Fa	cilities							

	6. Earthquake-induced landslide							
BARANGAY	Likelihood of Occurrence	Severity of Consequence to school infrastructures	Severity of Consequence to hospitals & health centers	Severity of Consequence to barangay hall	Severity of Consequence to gymnasium(s)	Severity of Consequence to other government infrastructures		
Barangay 1 (Pob.)								
Barangay 2 (Pob.)	6							
Barangay 3 (Pob.)	6			4				
Barangay 4 (Pob.)								
Barangay 5 (Pob.)	6							
Barangay 6 (Pob.)								
Barangay 7 (Pob.)								
Barangay 8 (Pob.)								
Bianuan								
Calabgan	6							
Calangcuasan								
Calantas	6					4		
Соzo	6	4	4			4		
Culat	6							
Dibacong	6							
Dibet	6					4		
Ditinagyan	6							
Esperanza	6							
Esteves								

Lual					
Marikit					
San Ildefonso	6	4	4	4	4
Tabas	6				
Tinib	6				

In terms of earthquake-induced landslide, there were 14 barangays with "frequent" (1-3 years) likelihood of occurrence. In school infrastructure there were 2 barangays with "very high" severity of consequence. In hospitals and health centers there were 2 barangays with "very high" severity of consequence. In barangay hall there were 2 barangays with "very high" severity of consequence. There is no severity of consequence to gymnasium in all barangay. In other government infrastructures there were 4 barangays with "very high" severity of consequence.

## Liquefaction/Sinkholes and Critical Point Facilities



Fig.162.Critical Facilities Vulnerable to Liquefaction Hazard



Fig.163.Educational Facilities Vulnerable to Liquefaction Hazard



Fig.164.Health Facilities Vulnerable to Liquefaction Hazard



Fig.165.Critical Facilities Risk to Liquefaction Hazard



Fig.166.Educational Facilities Risk to Liquefaction Hazard



Fig.167.Health Facilities Risk to Liquefaction Hazard

			7. Liquefac	tion / Sinkhole		
BARANGAY	Likelihood of Occurrence	Severity of Consequence to school infrastructures	Severity of Consequence to hospitals & health centers	Severity of Consequence to barangay hall	Severity of Consequence to gymnasium(s)	Severity of Consequence to other government infrastructures
Barangay 1 (Pob.)	3			1		1
Barangay 2 (Pob.)	3			1		
Barangay 3 (Pob.)	3		1	1		
Barangay 4 (Pob.)	3		1	1		1
Barangay 5 (Pob.)	3			1		
Barangay 6 (Pob.)	3	1		1		
Barangay 7 (Pob.)	3	1		1		1
Barangay 8 (Pob.)	3	1		1		
Bianuan	2	1	1	1		1
Calabgan	1	1	1	1		1
Calangcuasan	3	1	1	1		1
Calantas	3	1	1	1		1
Соzo	1	1	1	1		1
Culat	3	1	1	1		
Dibacong	3	1	1	1		1
Dibet	1	1	1	1		1
Ditinagyan	2		1	1		1
Esperanza	3	1	1	1		1
Esteves	3	1	1	1		1
Lual	3	1	1	1		1
Marikit	3	1	1	1		1
San Ildefonso	1	1	1	1		1
Tabas	3	1		1		
Tinib	3		1	1		1

Table 95. Disaster Risk Assessment of Liquefaction/Sinkholes and Critical Point Facilities

In terms of drought, there were 18 barangay with "improbable" (31-100 years), 2 barangays with "rare" (101-200) and 4barangay with "very rare" (>200) likelihood of occurrence in all barangays. In school infrastructure there were 17 barangays with "low" severity of consequence. In hospitals and health centers there were 17 barangays with "low" severity of consequence. In barangay hall there is "low" severity of consequence in all barangay. There is no severity of consequence to gymnasium in all barangay. In other government infrastructures there were 17 barangays with "low" severity of consequence.



#### **Ground Shaking and Critical Point Facilities**

Fig.168.Critical Facilities Vulnerable to Ground Shaking Hazard



Fig.169.Educational Facilities Vulnerable to Ground Shaking Hazard



Fig.170.Health Facilities Vulnerable to Ground Shaking Hazard





Fig.171.Critical Facilities Risk to Ground Shaking Hazard

Fig.172.Educational Facilities Risk to Ground Shaking Hazard



Fig.173.Health Facilities Risk to Ground Shaking Hazard

			8. Grou	nd shaking		
BARANGAY	Likelihood of Occurrence	Severity of Consequence to school infrastructures	Severity of Consequence to hospitals & health centers	Severity of Consequence to barangay hall	Severity of Consequence to gymnasium(s)	Severity of Consequence to other government infrastructures
Barangay 1 (Pob.)	4			4		4
Barangay 2 (Pob.)	4			4		
Barangay 3 (Pob.)	4		4	4		
Barangay 4 (Pob.)	4		4	4		4
Barangay 5 (Pob.)	4			4		
Barangay 6 (Pob.)	4	4		4		
Barangay 7 (Pob.)	4	4		4		4
Barangay 8 (Pob.)	4	4		4		
Bianuan	4	4	4	4		4
Calabgan	4	4	4	4		4
Calangcuasan	4	4	4	4		4
Calantas	4	4	4	4		4
Cozo	4	4	4	4		4
Culat	4	4	4	4		
Dibacong	4	4	4	4		4
Dibet	4	4	4	4		4
Ditinagyan	4		4	4		4
Esperanza	4	4	4	4		4
Esteves	4	4	4	4		4
Lual	4	4	4	4		4
Marikit	4	4	4	4		4
San Ildefonso	4	4	4	4		4

Table 96. Disaster	Risk A	ssessment o	of Ground	d Shaking ar	nd Critical I	Point Facilities
I abic 70. Disaster	INDIX IX		or ur ound	a shaning ai	ia criticari	onit i acmitico

CLIMATE AND DISASTER RISK ASSESSMENT

Tabas	4	4		4	
Tinib	4		4	4	4

In terms of ground shaking, there is "occasional slight chance" (11-30 years) likelihood of occurrence in all barangays. In school infrastructure there were 17 barangays with "very high" severity of consequence. In hospitals and health centers there were 17 barangays with "very high" severity of consequence. In barangay hall there is "very high" severity of consequence. There is no severity of consequence to gymnasium in all barangay. In other government infrastructures there were 17 barangays with "very high" severity of consequence.

## **Ground Rupture and Critical Point Facilities**





## Fig.174.Critical Facilities Vulnerable to Ground Rupture Hazard

Fig.175.Educational Facilities Vulnerable to Ground Rupture Hazard



Fig.176.Health Facilities Vulnerable to Ground Rupture Hazard



Fig.177.Critical Facilities Risk to Ground Rupture Hazard



Fig.178.Educational Facilities Risk to Ground Rupture Hazard



Fig.179.Health Facilities Risk to Ground Rupture Hazard

			9. Grou	nd Rupture		
BARANGAY	Likelihood of Occurrence	Severity of Consequence to school infrastructures	Severity of Consequence to hospitals & health centers	Severity of Consequence to barangay hall	Severity of Consequence to gymnasium(s)	Severity of Consequence to other government infrastructures
Barangay 1 (Pob.)						
Barangay 2 (Pob.)	3			4		
Barangay 3 (Pob.)						
Barangay 4 (Pob.)						
Barangay 5 (Pob.)						
Barangay 6 (Pob.)						
Barangay 7 (Pob.)						
Barangay 8 (Pob.)	3	4		4		
Bianuan	3	4	4	4		4
Calabgan	3	4	4	4		4
Calangcuasan	3					
Calantas	3	4	4	4		4
Соzо						
Culat	3	4	4	4		
Dibacong	3	4	4	4		4
Dibet	3	4	4	4		4
Ditinagyan	3		4	4		4
Esperanza						
Esteves						
Lual						
Marikit	3	4	4	4		4
San Ildefonso						
Tabas	3	4		4		
Tinib	3		4	4		4

#### Table 97. Disaster Risk Assessment of Ground Rupture and Critical Point Facilities

In terms of ground rupture landslide, there were 14 barangays with "improbable" (31-100 years) likelihood of occurrence. In school infrastructure there were 9 barangays with "very high" severity of consequence. In hospitals and health centers there were 9 barangays with "very high" severity of consequence. In barangay hall there were 12 barangays with "very high" severity of consequence. There is no severity of consequence to gymnasium in all barangay. In other government infrastructures there were 8 barangays with "very high" severity of consequence.



#### **Tsunamis and Critical Point Facilities**

Fig.180.Critical Facilities Vulnerable to Tsunami Hazard



Fig.181.Educational Facilities Vulnerable to Tsunami Hazard



Fig.182.Health Facilities Vulnerable to Tsunami Hazard



Fig.183.Critical Facilities Risk to Tsunami Hazard



Fig.184.Educational Facilities Risk to Tsunami Hazard



Fig.185.Health Facilities Risk to Tsunami Hazard

			10.	Tsunami		
BARANGAY	Likelihood of Occurrence	Severity of Consequence to school infrastructures	Severity of Consequence to hospitals & health centers	Severity of Consequence to barangay hall	Severity of Consequence to gymnasium(s)	Severity of Consequence to other government infrastructures
Barangay 1 (Pob.)	1			4		4
Barangay 2 (Pob.)	1			4		
Barangay 3 (Pob.)	1		4	4		
Barangay 4 (Pob.)	1		4	4		4
Barangay 5 (Pob.)	1			4		
Barangay 6 (Pob.)	1	4		4		
Barangay 7 (Pob.)	1	4		4		4
Barangay 8 (Pob.)	1	4		4		
Bianuan	1	4	4	4		4
Calabgan	1	4	4	4		4
Calangcuasan	1	4	4	4		4
Calantas	1	4	4	4		4
Cozo	1	4	4	4		4
Culat	1	4	4	4		
Dibacong	1	4	4	4		4
Dibet	1	4	4	4		4
Ditinagyan	1		4	4		4
Esperanza	1	4	4	4		4
Esteves	1	4	4	4		4
Lual	1	4	4	4		4

 Table 98. Disaster Risk Assessment of Tsunamis and Critical Point Facilities

Marikit	1	4	4	4	4
San Ildefonso	1	4	4	4	4
Tabas	1	4		4	
Tinib	1		4	4	4

In terms of tsunami, there is "very rare" (>200 years) likelihood of occurrence in all barangays. In school infrastructure there were 17 barangays with "very high" severity of consequence. In hospitals and health centers there were 18 barangays with "very high" severity of consequence. In barangay hall there is "very high" severity of consequence in all barangays. There is no severity of consequence to gymnasium in all barangay. In other government infrastructures there were 17 barangays with "very high" severity of consequence.

## **Volcanic Eruptions and Critical Point Facilities**

Table 99. Disast	ter Risk Assessment	of Volcanic Eruption	is and Critical Point	t
Facilities				

	11. Volcanic Eruption							
BARANGAY	Likelihoo d of Occurrenc e	Severity of Consequence to school infrastructur es	Severity of Consequen ce to hospitals & health centers	Severity of Consequen ce to barangay hall	Severity of Consequenc e to gymnasium( s)	Severity of Consequence to other government infrastructur es		
Barangay 1 (Pob.)								
Barangay 2 (Pob.)								
Barangay 3 (Pob.)								
Barangay 4 (Pob.)								
Barangay 5 (Pob.)								
Barangay 6 (Pob.)								
Barangay 7 (Pob.)								
Barangay 8 (Pob.)								
Bianuan								

Calabgan			
Calangcuasan			
Calantas			
Cozo			
Culat			
Dibacong			
Dibet			
Ditinagyan			
Esperanza			
Esteves			
Lual			
Marikit			
San Ildefonso			
Tabas			
Tinib			

Disasters arising from volcanic eruptions in Casiguran are highly unlikely because of the absence of volcano in the municipality or neighboring town.

## Disaster Risk Assessment of Urban Use Areas Floods and Urban Use Areas



Fig.186.Land Use Vulnerable to Flood Hazard



Fig.187.Land Use Risk to Flood Hazard Table 100. Disaster Risk Assessment of Floods and Urban Use Areas

		1. Flood							
BARANGAY	Likelihood of Occurrence	Severity of Consequence to residential land use	Severity of Consequence to commercial land use	Severity of Consequence to tourist sites	Severity of Consequence to upland and sloping area(s)	Severity of Consequence to shoreline/water bodies			
Barangay 1 (Pob.)	6	4	4			4			
Barangay 2 (Pob.)	6	4	4						
Barangay 3 (Pob.)	6	4	4						
Barangay 4 (Pob.)	6	4	4			4			
Barangay 5 (Pob.)	6	4	4						
Barangay 6 (Pob.)	6	4	4			4			
Barangay 7 (Pob.)	6	4	4						
Barangay 8 (Pob.)	6	4	4			4			
Bianuan	6	4	4			4			
Calabgan	6	4	4	4		4			
Calangcuasan	6	4	4	4		4			
Calantas	6	4	4			4			
Соzо	6	4	4	4		4			
Culat	6	4	4	4		4			
Dibacong	6	4	4	4		4			
Dibet	6	4	4	4		4			
Ditinagyan	6	4	4	4		4			
Esperanza	6	4	4			4			
Esteves	6	4	4	4		4			
Lual	6	4	4	4		4			
Marikit	6	4	4	4		4			
San Ildefonso	6	4	4	4		4			
Tabas	6	4	4			4			

CLIMATE AND DISASTER RISK ASSESSMENT									
Tinib	6	4	4	4		4			

In terms of flood, there is "frequent" (1-3 years) likelihood of occurrence in all barangays. In residential land use there is "very high" severity of consequence in all barangays. In commercial land use there is "very high" severity of consequence in all barangay. In tourist sites there were 12 barangay with "very high" severity of consequence. There is no severity of consequence to upland and sloping areas in all barangay. In other government infrastructures there were 20 barangays with "very high" severity of consequence.



## Rain-induced Landslides and Urban Use Areas

Fig.188.Land Use Vulnerable to Rain-induced Landslides Hazard



Fig.189.Land Use Risk to Rain-induced Landslides Hazard Table 101. Disaster Risk Assessment of Rain-induced Landslides and Urban Use Areas

			2. Rain-In	duced Landslide		
BARANGAY	Likelihood of Occurrence	Severity of Consequence to residential land use	Severity of Consequence to commercial land use	Severity of Consequence to tourist sites	Severity of Consequence to upland and sloping area(s)	Severity of Consequence to shoreline/water bodies
Barangay 1 (Pob.)						
Barangay 2 (Pob.)	6	4	4			
Barangay 3 (Pob.)	6	4	4	4	4	
Barangay 4 (Pob.)						
Barangay 5 (Pob.)	6	4	4			
Barangay 6 (Pob.)						
Barangay 7 (Pob.)						
Barangay 8 (Pob.)						
Bianuan						
Calabgan	6	4	4	4	4	4
Calangcuasan						
Calantas	6	4	4		4	4
Cozo	6	4	4	4	4	4
Culat	6	4	4	4	4	4
Dibacong	6	4	4	4	4	4
Dibet	6	4	4	4	4	4
Ditinagyan	6	4	4	4	4	4
Esperanza	6	4	4		4	4
Esteves						
Lual						
Marikit						
San Ildefonso	6	4	4	4	4	4

CLIMATE AND DISASTER RISK ASSESSMENT									
						_			
Tabac	6	1	4		4	1			

labas	6	4	4		4	4	
Tinib	6	4	4	4	4	4	

In terms of rain-induced landslide, there were 14 barangays with "frequent" (1-3 years) likelihood of occurrence. In residential land use there were 14 barangay with "very high" severity of consequence. In commercial land use there were 14 barangays with "very high" severity of consequence. In tourist sites there were 9 barangays with "very high" severity of consequence. In upland and sloping areas there were 12 barangays with "very high" severity of consequence. In other government infrastructures there were 12 barangays with "very high" severity of consequence.

#### LAND USE MAP VULNERABLE TO STORM SURGE HAZARD 121°54'00.000"E 122°12′00.000″E 122°18′00.000″E 122°00'00.000"E 122°06'00.000"F nicipality of Casigu Province of Aurora Region III CRS: WGS84/UTM ZONE 51 N Scale 1: 270,000 LEGEND: Forest Zone Land Lises Agricultural Zone Storm Surge 🔄 Residential Zone 🛛 🔛 Low 🛛 Mariculture Zone 📃 Moderate Poblacion 1-8 Institutional Zone 📕 High Commercial Zone Data Source: MPDO/MDRRMO, CBMS 2017, DOST-NOAH, PHILVOCS This map is prepared for CDRA/LCCAP of Municipa Disaster Risk Reduction Management Office of the Local Government of Casiguran, Aurora. 20 km Note: Administrative Boundaries are approximate

## Storm Surges and Urban Use Areas

Fig.190.Land Use Vulnerable to Storm Surge Hazard



Fig.191.Land Use Risk to Storm Surge Hazard Table 102. Disaster Risk Assessment of Storm Surges and Urban Use Areas

		3. Storm Surge							
BARANGAY	Likelihood of Occurrence	Severity of Consequence to residential land use	Severity of Consequence to commercial land use	Severity of Consequence to tourist sites	Severity of Consequence to upland and sloping area(s)	Severity of Consequence to shoreline/water bodies			
Barangay 1 (Pob.)									
Barangay 2 (Pob.)									
Barangay 3 (Pob.)									
Barangay 4 (Pob.)									
Barangay 5 (Pob.)									
Barangay 6 (Pob.)									
Barangay 7 (Pob.)									
Barangay 8 (Pob.)									
Bianuan									
Calabgan	5	4	4	4		4			
Calangcuasan	5	4	4	4		4			
Calantas									
Cozo	5	4	4	4		4			
Culat	5	4	4	4		4			
Dibacong	5	4	4	4		4			
Dibet	5	4	4	4		4			
Ditinagyan	5	4	4	4		4			
Esperanza									
Esteves	5	4	4	4		4			
Lual	5	4	4	4		4			
Marikit	5	4	4	4		4			
San Ildefonso	5	4	4	4		4			
Tabas									

CLIMATE AND DISASTER RISK ASSESSMENT								
						_		
Tinib	5	4	4	4		4		

In terms of storm surge, there were 12 barangays with "moderate" (4-10 years) likelihood of occurrence. In residential land use there were 12 barangay with "very high" severity of consequence. In commercial land use there were 12 barangays with "very high" severity of consequence. In tourist sites there were 12 barangays with "very high" severity of consequence. There is no severity of consequence in upland and sloping areas. In other government infrastructures there were 12 barangays with "very high" severity of consequence.



# **Droughts and Urban Use Areas**

Fig.192.Land Use Vulnerable to Drought Hazard



Fig.193.Land Use Risk to Drought Hazard

			4.	Drought		
BARANGAY	Likelihood of Occurrence	Severity of Consequence to residential land use	Severity of Consequence to commercial land use	Severity of Consequence to tourist sites	Severity of Consequence to upland and sloping area(s)	Severity of Consequence to shoreline/water bodies
Barangay 1 (Pob.)	6	4	4			4
Barangay 2 (Pob.)	6	4	4			
Barangay 3 (Pob.)	6	4	4	4	4	
Barangay 4 (Pob.)	6	4	4			4
Barangay 5 (Pob.)	6	4	4			
Barangay 6 (Pob.)	6	4	4			4
Barangay 7 (Pob.)	6	4	4			
Barangay 8 (Pob.)	6	4	4			4
Bianuan	6	4	4			4
Calabgan	6	4	4	4	4	4
Calangcuasan	6	4	4	4	4	4
Calantas	6	4	4		4	4
Cozo	6	4	4	4	4	4
Culat	6	4	4	4	4	4
Dibacong	6	4	4	4	4	4
Dibet	6	4	4	4	4	4
Ditinagyan	6	4	4	4	4	4
Esperanza	6	4	4		4	4
Esteves	6	4	4	4		4
Lual	6	4	4	4		4
Marikit	6	4	4	4		4
San Ildefonso	6	4	4	4	4	4

Table 10	3. Disaster	· Risk Assess	ment of Drou	ights and	Urban Use	Areas
	J. Disaster	INDEX TESSESS		ignes and	or ball 03c	meas

CLIMATE AND DISASTER RISK ASSESSMENT								
Tinib	6	4	4	4	4	4		

In terms of drought, there is "frequent" (1-3 years) likelihood of occurrence in all barangays. In residential land use there is "very high" severity of consequence in all barangay. In commercial land use there is "very high" severity of consequence in all barangays. In tourist sites there were 13 barangays with "very high" severity of consequence. In upland and sloping areas there were 13 barangays with "very high" severity of consequence. In other government infrastructures there were 20 barangays with "very high" severity of consequence.

#### LAND USE MAP VULNERABLE TO SEA LEVEL RISE HAZARD 122°12′00.000″E 121°54'00.000"F 122906/00 000//E 122°18'00.000"E 122900/00 000//F unicipality of Casigura **Province of Aurora** Region III CRS: WGS84/UTM ZONE 51 N 1:270.000LEGEND: Forest Zone Land Uses Agricultural Zone Sea Level Rise \_\_\_\_ Residential Zone 🛛 📃 Low 📕 Mariculture Zone 📃 Moderate Poblacion 1-8 Institutional Zone 📕 High Commercial Zone Data Source: MPDO/MDRRMO, CBMS 2017, DOST-NOAH, PHILVOCS This map is prepared for CDRA/LCCAP of Municipa Disaster Risk Reduction lanagement Office of th Local Government Casiguran, Aurora 20 km Note: Administrative Boundaries are approximate

## Sea Level Rise and Urban Use Areas

Fig.194.Land Use Vulnerable to Sea Level Rise Hazard



Fig.195.Land Use Risk to Sea Level Rise Hazard Table 104. Disaster Risk Assessment of Sea Level Rise and Urban Use Areas

	5. Sea Level Rise							
BARANGAY	Likelihood of Occurrence	Severity of Consequence to residential land use	Severity of Consequence to commercial land use	Severity of Consequence to tourist sites	Severity of Consequence to upland and sloping area(s)	Severity of Consequence to shoreline/water bodies		
Barangay 1 (Pob.)								
Barangay 2 (Pob.)								
Barangay 3 (Pob.)								
Barangay 4 (Pob.)								
Barangay 5 (Pob.)								
Barangay 6 (Pob.)								
Barangay 7 (Pob.)								
Barangay 8 (Pob.)								
Bianuan								
Calabgan	3	1	1	1		1		
Calangcuasan	3	1	1	1		1		
Calantas								
Cozo	3	1	1	1		1		
Culat	3	1	1	1		1		
Dibacong	3	1	1	1		1		
Dibet	3	1	1	1		1		
Ditinagyan	3	1	1	1		1		
Esperanza								
Esteves	3	1	1	1		1		
Lual	3	1	1	1		1		
Marikit	3	1	1	1		1		
San Ildefonso	3	1	1	1		1		
Tabas								

CLIMATE AND DISASTER RISK ASSESSMENT									
Tinih	2	1	1	I	1	I	I	1	

In terms of sea level rise, there were 12 barangays with "improbable" (31-100 years) likelihood of occurrence. In residential land use there 12 barangays with "low" severity of consequence. In commercial land use there 12 barangays with "low" consequence. In tourist sites there were 13 barangays with "very high" severity of consequence. There is no severity of consequence in upland and sloping areas. In other government infrastructures there were 12 barangays with "low" severity of consequence.



# Earthquake-induced Landslides and Urban Use Areas

Fig.196.Land Use Vulnerable to Earthquake-induced Landslides Hazard



Fig.197.Land Use Risk to Earthquake-induced Landslides Hazard Table 105. Disaster Risk Assessment of Earthquake-induced Landslides and Urban Use Areas

	6. Earthquake-induced landslide							
BARANGAY	Likelihoo d of Occurrenc e	Severity of Consequenc e to residential land use	Severity of Consequenc e to commercial land use	Severity of Consequenc e to tourist sites	Severity of Consequenc e to upland and sloping area(s)	Severity of Consequence to shoreline/wat er bodies		
Barangay 1 (Pob.)								
Barangay 2 (Pob.)	6	4	4					
Barangay 3 (Pob.)	6	4	4	4	4			
Barangay 4 (Pob.)								
Barangay 5 (Pob.)	6	4	4					
Barangay 6 (Pob.)								
Barangay 7 (Pob.)								
Barangay 8 (Pob.)								
Bianuan								
Calabgan	6	4	4	4	4	4		
Calangcuasan								
Calantas	6	4	4		4	4		
Cozo	6	4	4	4	4	4		
Culat	6	4	4	4	4	4		

Dibacong	6	4	4	4	4	4
Dibet	6	4	4	4	4	4
Ditinagyan	6	4	4	4	4	4
Esperanza	6	4	4		4	4
Esteves						
Lual						
Marikit						
San Ildefonso	6	4	4	4	4	4
Tabas	6	4	4		4	4
Tinib	6	4	4	4	4	4

In terms of earthquake-induced landslide, there were 14 barangays with "frequent" (1-3 years) likelihood of occurrence. In residential land use there is "very high" severity of consequence in all barangay. In commercial land use there were 14 barangays with "very high" severity of consequence. In tourist sites there were 9 barangays with "very high" severity of consequence. In upland and sloping areas there were 9 barangays with "very high" severity of consequence. In other government infrastructures there were 10 barangays with "very high" severity of consequence.



## Liquefaction/Sinkholes and Urban Use Areas

Fig.198.Land Use Vulnerable to Liquefaction/Sinkholes Hazard



Fig.199.Land Use Risk to Liquefaction/Sinkholes Hazard Table 106. Disaster Risk Assessment of Liquefaction/Sinkholes and Urban Use Areas

	7. Liquefaction / Sinkhole										
BARANGAY	Likelihood of Occurrence	Severity of Consequence to residential land use	Severity of Consequence to commercial land use	Severity of Consequence to tourist sites	Severity of Consequence to upland and sloping area(s)	Severity of Consequence to shoreline/water bodies					
Barangay 1 (Pob.)	3	4	4			4					
Barangay 2 (Pob.)	3	4	4								
Barangay 3 (Pob.)	3	4	4	4	4						
Barangay 4 (Pob.)	3	4	4			4					
Barangay 5 (Pob.)	3	4	4								
Barangay 6 (Pob.)	3	4	4			4					
Barangay 7 (Pob.)	3	4	4								
Barangay 8 (Pob.)	3	4	4			4					
Bianuan	2	4	4			4					
Calabgan	1	4	4	4	4	4					
Calangcuasan	3	4	4	4		4					
Calantas	3	4	4		4	4					
Соzо	1	4	4	4	4	4					
Culat	3	4	4	4	4	4					
Dibacong	3	4	4	4	4	4					
Dibet	1	4	4	4	4	4					
Ditinagyan	2	4	4	4	4	4					
Esperanza	3	4	4		4	4					
Esteves	3	4	4	4		4					
Lual	3	4	4	4		4					
Marikit	3	4	4	4		4					
San Ildefonso	1	4	4	4	4	4					
Tabas	3	4	4		4	4					
CLIMATE AND DISASTER RISK ASSESSMENT											
--------------------------------------	---	----------	---	---	---	---	---	--	---	--	--
	2	<b>-</b>	I	4	I	4	I		I		

In terms of drought, there were 19 brangays with "frequent" (1-3 years), 2 barangays with "rare" (101-200) and3 barangays with "very rare" likelihood of occurrence. In residential land use there is "very high" severity of consequence in all barangays. In commercial land use there is "very high" severity of consequence in all barangays. In tourist sites there were 13 barangays with "very high" severity of consequence. In upland and sloping areas there were 12 barangays with "very high" severity of with "very high" severity of consequence. In other government infrastructures there were 20 barangays with "very high" severity of consequence.



### Ground Shaking and Urban Use Areas

Fig.200.Land Use Vulnerable to Ground Shaking Hazard



Fig.201.Land Use Risk to Ground Shaking Hazard Table 107. Disaster Risk Assessment of Ground Shaking and Urban Use Areas

			8. Gro	ound shaking		
BARANGAY	Likelihood of Occurrence	Severity of Consequence to residential land use	Severity of Consequence to commercial land use	Severity of Consequence to tourist sites	Severity of Consequence to upland and sloping area(s)	Severity of Consequence to shoreline/water bodies
Barangay 1 (Pob.)	4	4	4			4
Barangay 2 (Pob.)	4	4	4			
Barangay 3 (Pob.)	4	4	4	4	4	
Barangay 4 (Pob.)	4	4	4			4
Barangay 5 (Pob.)	4	4	4			
Barangay 6 (Pob.)	4	4	4			4
Barangay 7 (Pob.)	4	4	4			
Barangay 8 (Pob.)	4	4	4			4
Bianuan	4	4	4			4
Calabgan	4	4	4	4	4	4
Calangcuasan	4	4	4	4		4
Calantas	4	4	4		4	4
Соzо	4	4	4	4	4	4
Culat	4	4	4	4	4	4
Dibacong	4	4	4	4	4	4
Dibet	4	4	4	4	4	4
Ditinagyan	4	4	4	4	4	4
Esperanza	4	4	4		4	4
Esteves	4	4	4	4		4
Lual	4	4	4	4		4
Marikit	4	4	4	4		4
San Ildefonso	4	4	4	4	4	4
Tabas	4	4	4		4	4

CLIMATE AND DISASTER RISK ASSESSMENT										
			1	1		1				
Tinib	4	4	4		4		4	4		

In terms of ground shaking, there is "occasional slight chance" (11-30 years) likelihood of occurrence in all barangays. In residential land use there is "very high" severity of consequence in all barangays. In commercial land use there is "very high" severity of consequence in all barangays. In tourist sites there were 13 barangays with "very high" severity of consequence. In upland and sloping areas there were 12 barangays with "very high" severity of consequence. In other government infrastructures there were 20 barangays with "very high" severity of consequence.



### **Ground Rupture and Urban Use Areas**

Fig.202.Land Use Vulnerable to Ground Rupture Hazard



Fig.203.Land Use Risk to Ground Rupture Hazard Table 108. Disaster Risk Assessment of Ground Rupture and Urban Use Areas

			9. Gro	und Rupture		
BARANGAY	Likelihood of Occurrence	Severity of Consequence to residential land use	Severity of Consequence to commercial land use	Severity of Consequence to tourist sites	Severity of Consequence to upland and sloping area(s)	Severity of Consequence to shoreline/water bodies
Barangay 1 (Pob.)						
Barangay 2 (Pob.)	3	4	4			
Barangay 3 (Pob.)						
Barangay 4 (Pob.)						
Barangay 5 (Pob.)						
Barangay 6 (Pob.)						
Barangay 7 (Pob.)						
Barangay 8 (Pob.)	3	4	4			4
Bianuan	3	4	4			4
Calabgan	3	4	4	4	4	4
Calangcuasan	3	4	4	4		4
Calantas	3	4	4		4	4
Cozo						
Culat	3	4	4	4	4	4
Dibacong	3	4	4	4	4	4
Dibet	3	4	4	4	4	4
Ditinagyan	3	4	4	4	4	4
Esperanza						
Esteves						
Lual						
Marikit	3	4	4	4		4
San Ildefonso						
Tabas	3	4	4		4	4

CLIMATE AND DISASTER RISK ASSESSMENT										
Tinib	3	4	4		4		4	4		

In terms of drought, there were 13 barangays with "improbable" (31-100 years), likelihood of occurrence. In residential land use there were 13 barangays with "very high" severity of consequence. In commercial land use there were 13 barangays with "very high" severity of consequence. In tourist sites there were 8 barangays with "very high" severity of consequence. In upland and sloping areas there were 8 barangays with "very high" severity of consequence. In other government infrastructures there were 12 barangays with "very high" severity of consequence.



## Tsunamis and Urban Use Areas

Fig.204.Land Use Vulnerable to Tsunami Hazard



Fig.205.Land Use Risk to Tsunami Hazard
Table 109. Disaster Risk Assessment of Tsunamis and Urban Use Areas

	10. Tsunami									
BARANGAY	Likelihoo d of Occurrenc e	Severity of Consequenc e to residential land use	Severity of Consequenc e to commercial land use	Severity of Consequenc e to tourist sites	Severity of Consequenc e to upland and sloping area(s)	Severity of Consequence to shoreline/wat er bodies				
Barangay 1	2	1	1	1	1	1				
(POD.)	3	1	1	1	1	1				
Barangay 2 (Pob.)	3	1	1	1	1	1				
Barangay 3 (Pob.)	3	1	1	1	1	1				
Barangay 4 (Pob.)	3	1	1	1	1	1				
Barangay 5 (Pob.)	3	1	1	1	1	1				
Barangay 6 (Pob.)	3	1	1	1	1	1				
Barangay 7 (Pob.)	3	1	1	1	1	1				
Barangay 8 (Pob.)	3	1	1	1	1	1				
Bianuan	3	1	1	1	1	1				
Calabgan	3	1	1	1	1	1				
Calangcuasan	3	1	1	1	1	1				
Calantas	3	1	1	1	1	1				
Cozo	3	1	1	1	1	1				
Culat	3	1	1	1	1	1				
Dibacong	3	1	1	1	1	1				

Dibet	3	1	1	1	1	1
Ditinagyan	3	1	1	1	1	1
Esperanza	3	1	1	1	1	1
Esteves	3	1	1	1	1	1
Lual	3	1	1	1	1	1
Marikit	3	1	1	1	1	1
San Ildefonso	3	1	1	1	1	1
Tabas	3	1	1	1	1	1
Tinib	3	1	1	1	1	1

In terms of sea level rise, there were "improbable" (31-100 years) likelihood of occurrence in all barangays. In residential land use there is "low" severity of consequence in all barangays. In commercial land use there were "low" severity of consequence in all barangays. In tourist sites there there were "low" severity of consequence in all barangays. In upland and sloping areas there were "low" severity of consequence in all barangay. In other government infrastructures there were "low" severity of consequence in all barangays.

#### **Volcanic Eruptions and Urban Use Areas**

BARANGAY	Likelihood of Occurrence	Severity of Consequence to residential land use	Severity of Consequence to commercial land use	Severity of Consequence to tourist sites	Severity of Consequence to upland and sloping area(s)	Severity of Consequence to shoreline/water bodies
Barangay 1 (Pob.)						
Barangay 2 (Pob.)						
Barangay 3 (Pob.)						
Barangay 4 (Pob.)						
Barangay 5 (Pob.)						
Barangay 6 (Pob.)						
Barangay 7 (Pob.)						
Barangay 8 (Pob.)						
Bianuan						
Calabgan						
Calangcuasan						
Calantas						
Cozo						
Culat						
Dibacong						
Dibet						
Ditinagyan						
Esperanza						
Esteves						
Lual						
Marikit						
San Ildefonso						

#### Table 110. Disaster Risk Assessment of Volcanic Eruptions and Urban Use Areas

CLIMATE	AND DIS	ACTED DICK	ACCECCMENT
CLIMATE	AND DISL	ASTER MOR	ROOFOOMENT

Tabas			
Tinib			

Disasters arising from volcanic eruptions in Casiguran are highly unlikely because of the absence of volcano in the municipality or neighboring town.

### Disaster Risk Assessment of Lifeline Utilities Floods and Lifeline Utilities



Fig.206.Lifeline Facilities Vulnerable to Flood Hazard



Fig.207.Lifeline Facilities Risk to Flood Hazard Table 111. Disaster Risk Assessment of Floods and Lifeline Utilities

	1. FIOOD									
BARANGAY	Likelihood of Occurrenc e	Severity of Consequenc e to roads	Severity of Consequenc e to bridges	Severity of Consequence to telecommunicatio n systems	Severity of Consequenc e to water supply utilities	Severity of Consequenc e to power distribution systems				
Barangay 1 (Pob.)	6	4	4		4	4				
Barangay 2 (Pob.)	6	4			4	4				
Barangay 3 (Pob.)	6	4			4	4				
Barangay 4 (Pob.)	6	4	4		4	4				
Barangay 5 (Pob.)	6	4			4	4				
Barangay 6 (Pob.)	6	4			4	4				
Barangay 7 (Pob.)	6	4			4	4				
Barangay 8 (Pob.)	6	4			4	4				
Bianuan	6	4	4	4	4	4				
Calabgan	6	4	4	4	4	4				
Calangcuasan	6	4			4	4				
Calantas	6	4	4	4	4	4				
Cozo	6	4			4	4				
Culat	6	4	4		4	4				
Dibacong	6	4	4		4	4				

Dibet	6	4	4		4	4
Ditinagyan	6	4			4	4
Esperanza	6	4	4		4	4
Esteves	6	4		4	4	4
Lual	6	4	4		4	4
Marikit	6	4	4		4	4
San Ildefonso	6	4			4	4
Tabas	6	4			4	4
Tinib	6	4	4		4	4

In terms of flood, there were "frequent" (1-3 years) likelihood of occurrence in all barangays. In roads there were "very high" severity of consequence in all barangays. In bridges there were 12 barangays with "very high" severity of consequence in all barangays. In telecommunication systems there were 4 barangays with "very high" severity of consequence. In water supply utilities there were "very high" severity of consequence in all barangays. In power distribution systems there were "very high" severity of consequence in all barangays.

#### **Rain-induced Landslides and Lifeline Utilities**



Fig.208.Lifeline Facilities Vulnerable to Rain-induced Landslide Hazard



Fig.209.Lifeline Facilities Risk to Rain-induced Landslide Hazard Table 112. Disaster Risk Assessment of Rain-induced Landslides and Lifeline Utilities

				2. Rain-Induced Landslide		
BARANGAY	Likelihood of Occurrence	Severity of Consequence to roads	Severity of Consequence to bridges	Severity of Consequence to telecommunication systems	Severity of Consequence to water supply utilities	Severity of Consequence to power distribution systems
Barangay 1 (Pob.)						
Barangay 2 (Pob.)	6	4		4	4	4
Barangay 3 (Pob.)	6	4			4	4
Barangay 4 (Pob.)						
Barangay 5 (Pob.)	6	4			4	4
Barangay 6 (Pob.)						
Barangay 7 (Pob.)						
Barangay 8 (Pob.)						
Bianuan						
Calabgan	6	4			4	4
Calangcuasan						
Calantas	6	4				
Cozo	6	4			4	4
Culat	6	4			4	4
Dibacong	6	4			4	4
Dibet	6	4			4	4
Ditinagyan	6	4			4	4
Esperanza	6	4			4	
Esteves						
Lual						
Marikit						
San Ildefonso	6	4			4	4

CLIMATE AND DISASTER RISK ASSESSMENT											
	I										

In terms of rain-induced landslide, there were 13 barangays with "frequent" (1-3 years) likelihood of occurrence. In roads there were 13 barangays with "very high" severity of consequence. In bridges there were no severity of consequence in all barangays. In telecommunication systems there was 1 barangay with "very high" severity of consequence. In water supply utilities there were 11barangays with "very high" severity of consequence. In power distribution systems there were 10 barangays with "very high" severity of consequence.

### Storm Surges and Lifeline Utilities



Fig.210.Lifeline Facilities Vulnerable to Storm Surge Hazard



Fig.211.Lifeline Facilities Risk to Storm Surge Hazard Table 113. Disaster Risk Assessment of Storm Surges and Lifeline Utilities

			3. 9	Storm Surge		
BARANGAY	Likelihood of Occurrenc e	Severity of Consequenc e to roads	Severity of Consequenc e to bridges	Severity of Consequence to telecommunicatio n systems	Severity of Consequenc e to water supply utilities	Severity of Consequenc e to power distribution systems
Barangay 1 (Pob.)						
Barangay 2 (Pob.)						
Barangay 3 (Pob.)						
Barangay 4 (Pob.)						
Barangay 5 (Pob.)						
Barangay 6 (Pob.)						
Barangay 7 (Pob.)						
Barangay 8 (Pob.)						
Bianuan						
Calabgan	4	4	4	4	4	4
Calangcuasan	4	4			4	4
Calantas						
Cozo	4	4			4	4
Culat	4	4	4		4	4
Dibacong	4	4	4		4	4

Dibet	4	4	4		4	4
Ditinagyan	4	4			4	4
Esperanza						
Esteves	4	4		4	4	4
Lual	4	4			4	4
Marikit	4	4	4		4	4
San Ildefonso	4	4			4	4
Tabas						
Tinib	4	4	4		4	4

In terms of storm surges, there were 12 barangays with "occasional slight chance" (11-30 years) likelihood of occurrence. In roads there were 12 barangays with "very high" severity of consequence. In bridges there were 6 barangays with "very high" severity of consequence in all barangays. In telecommunication systems there were 2 barangays with "very high" severity of consequence. In water supply utilities there were 12 barangays with "very high" severity of consequence. In power distribution systems there were 12 barangays with "very high" severity of consequence. In power distribution systems there were 12 barangays with "very high" severity of consequence.

#### **Droughts and Lifeline Utilities**



Fig.212.Lifeline Facilities Vulnerable to Drought Hazard



Fig.213.Lifeline Facilities Risk to Drought Hazard Table 114. Disaster Risk Assessment of Droughts and Lifeline Utilities

			4	. Drought		
BARANGAY	Likelihood of Occurrenc e	Severity of Consequenc e to roads	Severity of Consequenc e to bridges	Severity of Consequence to telecommunicatio n systems	Severity of Consequenc e to water supply utilities	Severity of Consequenc e to power distribution systems
Barangay 1 (Pob.)	6	4	4		4	4
Barangay 2 (Pob.)	6	4			4	4
Barangay 3 (Pob.)	6	4		4	4	4
Barangay 4 (Pob.)	6	4	4		4	4
Barangay 5 (Pob.)	6	4			4	4
Barangay 6 (Pob.)	6	4			4	4
Barangay 7 (Pob.)	6	4			4	4
Barangay 8 (Pob.)	6	4			4	4
Bianuan	6	4	4	4	4	4
Calabgan	6	4	4	4	4	4
Calangcuasan	6	4			4	4
Calantas	6	4	4	4	4	4
Cozo	6	4			4	4
Culat	6	4	4		4	4
Dibacong	6	4	4		4	4

Dibet	6	4	4		4	4
Ditinagyan	6	4			4	4
Esperanza	6	4	4		4	4
Esteves	6	4		4	4	4
Lual	6	4	4		4	4
Marikit	6	4	4		4	4
San Ildefonso	6	4			4	4
Tabas	6	4			4	4
Tinib	6	4	4		4	4

In terms of drought, there were "frequent" (1-3 years) likelihood of occurrence in all barangays. In roads there were "very high" severity of consequence in all barangays. In bridges there were 12 barangays with "very high" severity of consequence in all barangays. In telecommunication systems there were 5 barangays with "very high" severity of consequence. In water supply utilities there were "very high" severity of consequence in all barangays. In power distribution systems there were "very high" severity of consequence in all barangays. In power distribution systems there were "very high" severity of consequence in all barangays.

#### MAP SHOWING LIFELINE FACILITIES EXPOSED TO SEA LEVEL RISE HAZARD 122°00'00.000"E 122°06'00.000"E 122°12′00.000″E nicipality of Casiau **Province of Aurora** Region III CRS: WGS84/UTM ZONE 51 N Scale 1: 270,000 LEGEND: E Sea Level Rise ---- Roads Facility Bridge ★ Electricity Lines — Waterways Com. Facilities 🛄 Mun. water - Mun. Bdry. Water Facility Philippine Sea Data Source: MPDO/MDRRMO, CBMS 2017, DOST-NOAH, PHILVOCS s sol This map is prepared for CDRA/LCCAP of Municipal Disaster Risk Reduction Management Office of the Local Government of Casiguran, Aurora. 20 km 10 Note: Administrative Boundaries are approximate

### Sea Level Rise and Lifeline Utilities

Fig.214.Lifeline Facilities Vulnerable to Sea Level Rise Hazard



Fig.215.Lifeline Facilities Risk to Sea Level Rise Hazard

	5. Sea Level Rise							
BARANGAY	Likelihood of Occurrenc e	Severity of Consequenc e to roads	Severity of Consequenc e to bridges	Severity of Consequence to telecommunicatio n systems	Severity of Consequenc e to water supply utilities	Severity of Consequenc e to power distribution systems		
Barangay 1 (Pob.)								
Barangay 2 (Pob.)								
Barangay 3 (Pob.)								
Barangay 4 (Pob.)								
Barangay 5 (Pob.)								
Barangay 6 (Pob.)								
Barangay 7 (Pob.)								
Barangay 8 (Pob.)								
Bianuan								
Calabgan	4	4	1		4	4		
Calangcuasan	4	4	1		4	4		
Calantas								
Cozo	4	4			4	4		
Culat	4	4	1		4	4		

Dibacong	4	4	1	4	4
Dibet	4	4	1	4	4
Ditinagyan	4	4		4	4
Esperanza					
Esteves	4	4		4	4
Lual	4	4	1	4	4
Marikit	4	4	1	4	4
San Ildefonso	4	4		4	4
Tabas					
Tinib	4	4	1	4	4

In terms of sea level rise, there were 12 barangays with "occasional slight chance" (11-30 years) likelihood of occurrence. In roads there were 12 barangays with "very high" severity of consequence. In bridges there were 8 barangays with "low" severity of consequence. In telecommunication systems there were no severity of consequence. In water supply utilities there were 12 barangays with "very high" severity of consequence. In power distribution systems there were 12 barangays with "very high" severity of consequence. In power distribution systems there were 12 barangays with "very high" severity of consequence.

#### Earthquake-induced Landslides and Lifeline Utilities



Fig.216.Lifeline Facilities Vulnerable to Earthquake-induced Landslide Hazard



Fig.217.Lifeline Facilities Risk to Earthquake-induced Landslide Hazard Table 116. Disaster Risk Assessment of Earthquake-induced Landslides and Lifeline Utilities

			6. Earthqua	ke-induced landslide		
BARANGAY	Likelihood of Occurrenc e	Severity of Consequenc e to roads	Severity of Consequenc e to bridges	Severity of Consequence to telecommunicatio n systems	Severity of Consequenc e to water supply utilities	Severity of Consequenc e to power distribution systems
Barangay 1 (Pob.)						
Barangay 2 (Pob.)	6	4		4	4	4
Barangay 3 (Pob.)	6	4			4	4
Barangay 4 (Pob.)						
Barangay 5 (Pob.)	6	4			4	4
Barangay 6 (Pob.)						
Barangay 7 (Pob.)						
Barangay 8 (Pob.)						
Bianuan						
Calabgan	6	4			4	4
Calangcuasan						
Calantas	6	4				
Cozo	6	4			4	4
Culat	6	4			4	4

Dibacong	6	4		4	4
Dibet	6	4		4	4
Ditinagyan	6	4		4	4
Esperanza	6	4		4	
Esteves					
Lual					
Marikit					
San Ildefonso	6	4		4	4
Tabas	6	4			
Tinib	6	4		4	

In terms of earthquake-induced landslide, there were 13 barangays with "frequent" (1-3 years) likelihood of occurrence. In roads there were 14 barangays with "very high" severity of consequence. In bridges there were no severity of consequence in all barangays. In telecommunication systems there was 1 barangay with "very high" severity of consequence. In water supply utilities there were 12barangays with "very high" severity of consequence. In power distribution systems there were 10 barangays with "very high" severity of consequence.

#### MAP SHOWING LIFELINE FACILITIES VULNERABLE TO **LIQUEFACTION HAZARD** 121°54'36.000"E 122°00'36.000"E 122°06'36.000" 122°12′36.000″E 122°18′36.000″E nicipality of Casigur **Province of Aurora** Region III CRS: WGS84/UTM ZONE 51 N Scale 1: 270,000 LEGEND: LIQUEFACTION Com. Facilities Low Roads Moderate — Bridae High – Waterways Lifeline Facility 🏋 Electricity Lines 🋄 Mun. water ——— Municipal Bdry. Water Facility Casiguran Data Source: MPDO/MDRRMO, CBMS 2017, DOST-NOAH, PHILVOCS This map is prepared for CDRA/LCCAP of Municipa Disaster Risk Reduction Management Office of the Local Government of Casiguran, Aurora. 10 15 20 km Note: Administrative Boundaries are approximate

### Liquefaction/Sinkholes and Lifeline Utilities

Fig.218.Lifeline Facilities Vulnerable to Liquefaction Hazard



Fig.219.Lifeline Facilities Risk to Liquefaction Hazard Table 117. Disaster Risk Assessment of Liquefaction/Sinkholes and Lifeline Utilities

	7. Liquefaction / Sinkhole									
BARANGAY	Likelihood of Occurrenc e	Severity of Consequenc e to roads	Severity of Consequenc e to bridges	Severity of Consequence to telecommunicatio n systems	Severity of Consequenc e to water supply utilities	Severity of Consequenc e to power distribution systems				
Barangay 1										
(Pob.)	3	4	4		4	4				
Barangay 2 (Pob.)	3	4			4	4				
Barangay 3 (Pob.)	3	4		4	4	4				
Barangay 4 (Pob.)	3	4	4		4	4				
Barangay 5 (Pob.)	3	4			4	4				
Barangay 6 (Pob.)	3	4			4	4				
Barangay 7 (Pob.)	3	4			4	4				
Barangay 8 (Pob.)	3	4			4	4				
Bianuan	2	4	4	4	4	4				
Calabgan	1	4	4	4	4	4				
Calangcuasan	3	4			4	4				
Calantas	3	4	4	4	4	4				
Cozo	1	4			4	4				
Culat	3	4	4		4	4				
Dibacong	3	4	4		4	4				

Dibet	1	4	4		4	4
Ditinagyan	2	4			4	4
Esperanza	3	4			4	4
Esteves	3	4		4	4	4
Lual	3	4	4		4	4
Marikit	3	4	4		4	4
San Ildefonso	1	4			4	4
Tabas	3	4			4	4
Tinib	3	4	4		4	4

In terms of liquefaction/ sinkhole, there were 18 barangays with "improbable" (31-100 years), 2 barangays with "rare" (101-200 years) and 4 barangays with "very rare" (>200 years) likelihood of occurrence. In roads there were "very high" severity of consequence in all barangays. In bridges there were 11 barangays with "very high" severity of consequence. In telecommunication systems there were 5 barangays with "very high" severity of consequence in all barangay. In water supply utilities there were "very high" severity of consequence in all barangay. In power distribution systems there were "very high" severity of consequence in all barangay. In power distribution systems there were "very high" severity of consequence in all barangays.



### **Ground Shaking and Lifeline Utilities**

Fig.220.Lifeline Facilities Vulnerable to Ground Shaking Hazard



Fig.221.Lifeline Facilities Risk to Ground Shaking Hazard Table 118. Disaster Risk Assessment of Ground Shaking and Lifeline Utilities

	8. Ground shaking									
BARANGAY	Likelihood of Occurrenc e	Severity of Consequenc e to roads	Severity of Consequenc e to bridges	Severity of Consequence to telecommunicatio n systems	Severity of Consequenc e to water supply utilities	Severity of Consequenc e to power distribution systems				
Barangay 1 (Pob.)	4	4	4		4	4				
Barangay 2 (Pob.)	4	4			4	4				
Barangay 3 (Pob.)	4	4		4	4	4				
Barangay 4 (Pob.)	4	4	4		4	4				
Barangay 5 (Pob.)	4	4			4	4				
Barangay 6 (Pob.)	4	4			4	4				
Barangay 7 (Pob.)	4	4			4	4				
Barangay 8 (Pob.)	4	4			4	4				
Bianuan	4	4	4	4	4	4				
Calabgan	4	4	4	4	4	4				
Calangcuasan	4	4			4	4				
Calantas	4	4		4	4	4				
Cozo	4	4			4	4				
Culat	4	4	4		4	4				
Dibacong	4	4	4		4	4				

Dibet	4	4	4		4	4
Ditinagyan	4	4			4	4
Esperanza	4	4			4	4
Esteves	4	4		4	4	4
Lual	4	4	4		4	4
Marikit	4	4	4		4	4
San Ildefonso	4	4			4	4
Tabas	4	4			4	4
Tinib	4	4	4		4	4

In terms of ground shaking, there were "occasional slight chance" (11-30 years) likelihood of occurrence in all barangays. In roads there were "very high" severity of consequence in all barangays. In bridges there were 10 barangays with "very high" severity of consequence. In telecommunication systems there were 5 barangays with "very high" severity of consequence. In water supply utilities there were "very high" severity of consequence. In power distribution systems there were "very high" severity of consequence. In power distribution systems there were "very high" severity of consequence.



### **Ground Rupture and Lifeline Utilities**

Fig.222.Lifeline Facilities Vulnerable to Ground Rupture Hazard



Fig.223.Lifeline Facilities Risk to Ground Rupture Hazard Table 119. Disaster Risk Assessment of Ground Rupture and Lifeline Utilities

	9. Ground Rupture										
BARANGAY	Likelihood of Occurrenc e	Severity of Consequenc e to roads	Severity of Consequenc e to bridges	Severity of Consequence to telecommunicatio n systems	Severity of Consequenc e to water supply utilities	Severity of Consequenc e to power distribution systems					
Barangay 1 (Pob.)											
Barangay 2 (Pob.)	3	4			4	4					
Barangay 3 (Pob.)											
Barangay 4 (Pob.)											
Barangay 5 (Pob.)											
Barangay 6 (Pob.)											
Barangay 7 (Pob.)											
Barangay 8 (Pob.)	3	4			4	4					
Bianuan	3	4	4	4	4	4					
Calabgan	3	4	4	4	4	4					
Calangcuasan	3	4			4	4					
Calantas	3	4	4	4	4	4					
Cozo											
Culat	3	4	4		4	4					
Dibacong	3	4	4		4	4					

Dibet	3	4	4	4	4
Ditinagyan	3	4		4	4
Esperanza					
Esteves					
Lual					
Marikit	3	4	4	4	4
San Ildefonso					
Tabas	3	4		4	4
Tinib	3	4	4	4	4

In terms of ground rupture, there were 13 barangays with "improbable" (31-100 years) likelihood of occurrence. In roads there were 13 barangays with "very high" severity of consequence. In bridges there were 8 barangays with "very high" severity of consequence. In telecommunication systems there were 3 barangays with "very high" severity of consequence. In water supply utilities there were 13 barangays with "very high" severity of consequence in all barangay. In power distribution systems there were 13 barangays with "very high" severity of consequence in all barangay.

### **Tsunamis and Lifeline Utilities**



Fig.224.Lifeline Facilities Vulnerable to Tsunami Hazard



Fig.225.Lifeline Facilities Risk to Tsunami Hazard Table 120. Disaster Risk Assessment of Tsunamis and Lifeline Utilities

BARANGAY	Likelihood of Occurrence	Severity of Consequence to roads	Severity of Consequence to bridges	Severity of Consequence to telecommunication systems	Severity of Consequence to water supply utilities	Severity of Consequence to power distribution systems					
Barangay 1 (Pob.)	2	4	4		4	4					
Barangay 2 (Pob.)	2	4			4	4					
Barangay 3 (Pob.)	2	4		4	4	4					
Barangay 4 (Pob.)	2	4	4		4	4					
Barangay 5 (Pob.)	2	4			4	4					
Barangay 6 (Pob.)	2	4			4	4					
Barangay 7 (Pob.)	2	4			4	4					
Barangay 8 (Pob.)	2	4			4	4					
Bianuan	2	4	4	4	4	4					
Calabgan	2	4	4	4	4	4					
Calangcuasan	2	4			4	4					
Calantas	2	4		4	4	4					
Cozo	2	4			4	4					
Culat	2	4	4		4	4					
Dibacong	2	4	4		4	4					
Dibet	2	4	4		4	4					
Ditinagyan	2	4			4	4					
Esperanza	2	4			4	4					
Esteves	2	4		4	4	4					
Lual	2	4	4		4	4					
Marikit	2	4	4		4	4					
San Ildefonso	2	4			4	4					
Tabas	2	4			4	4					

CLIMATE AND DISASTER RISK ASSESSMENT									
Tinih	2	4		I	I	Λ	1		

In terms of tsunami, there were "very rare" (>200 years) likelihood of occurrence. In roads there were "very high" severity of consequence in all barangays. In bridges there were 10 barangays with "very high" severity of consequence. In telecommunication systems there were 5 barangays with "very high" severity of consequence. In water supply utilities there were "very high" severity of consequence in all barangay. In power distribution systems there were "very high" severity of consequence in all barangay.

### **Volcanic Eruptions and Lifeline Utilities**

	11. Volcanic Eruption									
BARANGAY	Likelihood of Occurrenc e	Severity of Consequenc e to roads	Severity of Consequenc e to bridges	Severity of Consequence to telecommunicatio n systems	Severity of Consequenc e to water supply utilities	Severity of Consequenc e to power distribution systems				
Barangay 1 (Pob.)										
Barangay 2 (Pob.)										
Barangay 3 (Pob.)										
Barangay 4 (Pob.)										
Barangay 5 (Pob.)										
Barangay 6 (Pob.)										
Barangay 7 (Pob.)										
Barangay 8 (Pob.)										
Bianuan										
Calabgan										
Calangcuasan										
Calantas										
Cozo										

Table 121. Disaster Risk Assessment of Volcanic Eruptions and Lifeline Utilities

Culat			
Dibacong			
Dibet			
Ditinagyan			
Esperanza			
Esteves			
Lual			
Marikit			
San Ildefonso			
Tabas			
Tinib			

Disasters arising from volcanic eruptions in Casiguran are highly unlikely because of the absence of volcano in the municipality or neighboring town.

### **Overall Disaster Risk Assessment**

	Overall DRA Index	Overall DR Categor y	Descriptive Summary of Attributes at Risk (5)						
Barangays			Populatio n	Natural Resources	Critical Point Facilities	Urban Use	Lifeline Utilities		
Barangay 1 (Pob.)	#DIV/ 0!	#DIV/0 !	Muti- hazard, most built-up areas are low lying and are easily affected by hazards, affected populatio n included vulnerable sectors of the communit y	Low risk at natural resources because it is an urban area.	can be affected by flooding cause by river overflow	The barangay is located near from the body of water, low lying barangay. No or not enough flood control facilities, Low capacity of owners/barang ay to retrofit or build structure facilities to protect properties & did not applied hazard resistant/climat e proofed standard, and even no	Lifeline utilities are low affected. Can withstand against the impact of all hazards due to its strong foundations and proper maintenanc e.		

### Table 122.Disaster Risk Assessment Summary, Casiguran, Aurora

						properties was insured.	
Barangay 2 (Pob.)	#DIV/ 0!	#DIV/0 !	Muti- hazard, most built-up areas are low lying and are easily affected by hazards, affected populatio n included vulnerable sectors of the communit y	Low risk at natural resources because it is an urban area.	can be affected by flooding cause by river overflow	The barangay is located near from the body of water, low lying barangay. No or not enough flood control facilities, Low capacity of owners/barang ay to retrofit or build structure facilities to protect properties & did not applied hazard resistant/climat e proofed standard, and even no properties was insured.	Lifeline utilities are low affected. Can withstand against the impact of all hazards due to its strong foundations and proper maintenanc e.
Barangay 3 (Pob.)	#DIV/ 0!	#DIV/0 !	Muti- hazard, most built-up areas are low lying and are easily affected by hazards, affected populatio n included vulnerable sectors of the communit y	Low risk at natural resources because it is an urban area.	can be affected by flooding cause by river overflow	The barangay is located near from the body of water, low lying barangay. No or not enough flood control facilities, Low capacity of owners/barang ay to retrofit or build structure facilities to protect properties & did not applied hazard resistant/climat e proofed standard, and even no properties was insured.	Lifeline utilities are low affected. Can withstand against the impact of all hazards due to its strong foundations and proper maintenanc e.

Barangay 4 (Pob.)	#DIV/ 0!	#DIV/0 !	Muti- hazard, most built-up areas are low lying and are easily affected by hazards, affected populatio n included vulnerable sectors of the communit y	Low risk at natural resources because it is an urban area.	can be affected by flooding cause by river overflow	The barangay is located near from the body of water, low lying barangay. No or not enough flood control facilities, Low capacity of owners/barang ay to retrofit or build structure facilities to protect properties & did not applied hazard resistant/climat e proofed standard, and even no properties was insured.	Lifeline utilities are low affected. Can withstand against the impact of all hazards due to its strong foundations and proper maintenanc e.
Barangay 5 (Pob.)	#DIV/ 0!	#DIV/0 !	Muti- hazard, most built-up areas are low lying and are easily affected by hazards, affected populatio n included vulnerable sectors of the communit y	Low risk at natural resources because it is an urban area.	can be affected by flooding cause by river overflow	The barangay is located near from the body of water, low lying barangay. No or not enough flood control facilities, Low capacity of owners/barang ay to retrofit or build structure facilities to protect properties & did not applied hazard resistant/climat e proofed standard, and even no properties was insured.	Lifeline utilities are low affected. Can withstand against the impact of all hazards due to its strong foundations and proper maintenanc e.
Barangay 6 (Pob.)	#DIV/ 0!	#DIV/0 !	Muti- hazard, most built-up areas are low lying and are easily affected by hazards, affected populatio n included vulnerable sectors of the	Low risk at natural resources because it is an urban area.	can be affected by flooding cause by river overflow	The barangay is located near from the body of water, low lying barangay. No or not enough flood control facilities, Low capacity of owners/barang ay to retrofit or build structure facilities to protect properties & did not applied	Lifeline utilities are low affected. Can withstand against the impact of all hazards due to its strong foundations and proper maintenanc e.

			communit y			hazard resistant/climat e proofed standard, and even no properties was insured.	
Barangay 7 (Pob.)	#DIV/ 0!	#DIV/0 !	Muti- hazard, most built-up areas are low lying and are easily affected by hazards, affected populatio n included vulnerable sectors of the communit y	Low risk at natural resources because it is an urban area.	can be affected by flooding cause by river overflow	The barangay is located near from the body of water, low lying barangay. No or not enough flood control facilities, Low capacity of owners/barang ay to retrofit or build structure facilities to protect properties & did not applied hazard resistant/climat e proofed standard, and even no properties was insured.	Lifeline utilities are low affected. Can withstand against the impact of all hazards due to its strong foundations and proper maintenanc e.
Barangay 8 (Pob.)	#DIV/ 0!	#DIV/0 !	Muti- hazard, most built-up areas are low lying and are easily affected by hazards, affected populatio n included vulnerable sectors of the communit y	Low risk at natural resources because it is an urban area.	can be affected by flooding cause by river overflow	The barangay is located near from the body of water, low lying barangay. No or not enough flood control facilities, Low capacity of owners/barang ay to retrofit or build structure facilities to protect properties & did not applied hazard resistant/climat e proofed standard, and even no properties was insured.	Lifeline utilities are low affected. Can withstand against the impact of all hazards due to its strong foundations and proper maintenanc e.

Bianuan	#DIV/ 0!	#DIV/0 !	Muti- hazard, most built-up areas are low lying and are easily affected by hazards, affected populatio n included vulnerable sectors of the communit y	natural resources will be slightly affected; it can withstand the adverse effect of the disaster/ris k due to enhanced agricultural practices by well- adaptive communiti es	can be affected by flooding cause by river overflow	The barangay is located near from the body of water, low lying barangay. No or not enough flood control facilities, Low capacity of owners/barang ay to retrofit or build structure facilities to protect properties & did not applied hazard resistant/climat e proofed standard, and even no properties was insured.	Lifeline utilities are low affected. Can withstand against the impact of all hazards due to its strong foundations and proper maintenanc e.
Calabgan	3.19	Low	Muti- hazard, most built-up areas are low lying and are easily affected by hazards, affected populatio n included vulnerable sectors of the communit y	natural resources will be slightly affected; it can withstand the adverse effect of the disaster/ris k due to enhanced agricultural practices by well- adaptive communiti es	at risk to tsunami and stormsurg e	The barangay is located near from the body of water, low lying barangay. No or not enough flood control facilities, Low capacity of owners/barang ay to retrofit or build structure facilities to protect properties & did not applied hazard resistant/climat e proofed standard, and even no properties was insured.	Lifeline utilities are low affected. Can withstand against the impact of all hazards due to its strong foundations and proper maintenanc e.
Calangcuasan	3.38	Low	Muti- hazard, most built-up areas are low lying and are easily affected by hazards, affected populatio n included vulnerable sectors of the	natural resources will be slightly affected; it can withstand the adverse effect of the disaster/ris k due to enhanced agricultural practices by well- adaptive	can be affected by flooding cause by river overflow	The barangay is located near from the body of water, low lying barangay. No or not enough flood control facilities, Low capacity of owners/barang ay to retrofit or build structure facilities to protect properties & did not applied	Lifeline utilities are low affected. Can withstand against the impact of all hazards due to its strong foundations and proper maintenanc e.

			communit y	communiti es		hazard resistant/climat e proofed standard, and even no properties was insured.	
Calantas	3.33	Low	Muti- hazard, most built-up areas are low lying and are easily affected by hazards, affected populatio n included vulnerable sectors of the communit y	natural resources will be slightly affected; it can withstand the adverse effect of the disaster/ris k due to enhanced agricultural practices by well- adaptive communiti es	can be affected by flooding cause by river overflow	The barangay is located near from the body of water, low lying barangay. No or not enough flood control facilities, Low capacity of owners/barang ay to retrofit or build structure facilities to protect properties & did not applied hazard resistant/climat e proofed standard, and even no properties was insured.	Lifeline utilities are low affected. Can withstand against the impact of all hazards due to its strong foundations and proper maintenanc e.
Cozo	3.40	Low	Muti- hazard, most built-up areas are low lying and are easily affected by hazards, affected populatio n included vulnerable sectors of the communit y	natural resources will be slightly affected; it can withstand the adverse effect of the disaster/ris k due to enhanced agricultural practices by well- adaptive communiti es	at risk to tsunami and storm surge	The barangay is located near from the body of water, low lying barangay. No or not enough flood control facilities, Low capacity of owners/barang ay to retrofit or build structure facilities to protect properties & did not applied hazard resistant/climat e proofed standard, and even no properties was insured.	Lifeline utilities are low affected. Can withstand against the impact of all hazards due to its strong foundations and proper maintenanc e.

Culat	3.42	Low	Muti- hazard, most built-up areas are low lying and are easily affected by hazards, affected populatio n included vulnerable sectors of the communit y	natural resources will be slightly affected; it can withstand the adverse effect of the disaster/ris k due to enhanced agricultural practices by well- adaptive communiti es	can be affected by flooding cause by river overflow	The barangay is located near from the body of water, low lying barangay. No or not enough flood control facilities, Low capacity of owners/barang ay to retrofit or build structure facilities to protect properties & did not applied hazard resistant/climat e proofed standard, and even no properties was insured.	Lifeline utilities are low affected. Can withstand against the impact of all hazards due to its strong foundations and proper maintenanc e.
Dibacong	3.55	Low	Muti- hazard, most built-up areas are low lying and are easily affected by hazards, affected populatio n included vulnerable sectors of the communit y	natural resources will be slightly affected; it can withstand the adverse effect of the disaster/ris k due to enhanced agricultural practices by well- adaptive communiti es	at risk to tsunami and storm surge	The barangay is located near from the body of water, low lying barangay. No or not enough flood control facilities, Low capacity of owners/barang ay to retrofit or build structure facilities to protect properties & did not applied hazard resistant/climat e proofed standard, and even no properties was insured.	Lifeline utilities are low affected. Can withstand against the impact of all hazards due to its strong foundations and proper maintenanc e.
Dibet	3.41	Low	Muti- hazard, most built-up areas are low lying and are easily affected by hazards, affected populatio n included vulnerable sectors of the	natural resources will be slightly affected; it can withstand the adverse effect of the disaster/ris k due to enhanced agricultural practices by well- adaptive	at risk to tsunami and storm surge	The barangay is located near from the body of water, low lying barangay. No or not enough flood control facilities, Low capacity of owners/barang ay to retrofit or build structure facilities to protect properties & did not applied	Lifeline utilities are low affected. Can withstand against the impact of all hazards due to its strong foundations and proper maintenanc e.

			communit y	communiti es		hazard resistant/climat e proofed standard, and even no properties was insured.	
Ditinagyan	3.31	Low	Muti- hazard, most built-up areas are low lying and are easily affected by hazards, affected populatio n included vulnerable sectors of the communit y	natural resources will be slightly affected; it can withstand the adverse effect of the disaster/ris k due to enhanced agricultural practices by well- adaptive communiti es	at risk to tsunami and storm surge	The barangay is located near from the body of water, low lying barangay. No or not enough flood control facilities, Low capacity of owners/barang ay to retrofit or build structure facilities to protect properties & did not applied hazard resistant/climat e proofed standard, and even no properties was insured.	Lifeline utilities are low affected. Can withstand against the impact of all hazards due to its strong foundations and proper maintenanc e.
Esperanza	3.48	Low	Muti- hazard, most built-up areas are low lying and are easily affected by hazards, affected populatio n included vulnerable sectors of the communit y	natural resources will be slightly affected; it can withstand the adverse effect of the disaster/ris k due to enhanced agricultural practices by well- adaptive communiti es	can be affected by flooding cause by river overflow	The barangay is located near from the body of water, low lying barangay. No or not enough flood control facilities, Low capacity of owners/barang ay to retrofit or build structure facilities to protect properties & did not applied hazard resistant/climat e proofed standard, and even no properties was insured	Lifeline utilities are low affected. Can withstand against the impact of all hazards due to its strong foundations and proper maintenanc e.
Esteves	3.47	Low	Muti- hazard, most built-up areas are low lying and are easily affected by hazards, affected populatio n included vulnerable sectors of the communit y	natural resources will be slightly affected; it can withstand the adverse effect of the disaster/ris k due to enhanced agricultural practices by well- adaptive communiti es	at risk to tsunami and storm surge	The barangay is located near from the body of water, low lying barangay. No or not enough flood control facilities, Low capacity of owners/barang ay to retrofit or build structure facilities to protect properties & did not applied hazard resistant/climat e proofed standard, and even no properties was insured.	Lifeline utilities are low affected. Can withstand against the impact of all hazards due to its strong foundations and proper maintenanc e.
---------	------	-----	--	---	---	---	---
Lual	3.31	Low	Muti- hazard, most built-up areas are low lying and are easily affected by hazards, affected populatio n included vulnerable sectors of the communit y	natural resources will be slightly affected; it can withstand the adverse effect of the disaster/ris k due to enhanced agricultural practices by well- adaptive communiti es	can be affected by flooding cause by river overflow	The barangay is located near from the body of water, low lying barangay. No or not enough flood control facilities, Low capacity of owners/barang ay to retrofit or build structure facilities to protect properties & did not applied hazard resistant/climat e proofed standard, and even no properties was insured.	Lifeline utilities are low affected. Can withstand against the impact of all hazards due to its strong foundations and proper maintenanc e.
Marikit	3.31	Low	Muti- hazard, most built-up areas are low lying and are easily affected by hazards, affected populatio n included vulnerable sectors of the	natural resources will be slightly affected; it can withstand the adverse effect of the disaster/ris k due to enhanced agricultural practices by well- adaptive	can be affected by flooding cause by river overflow	The barangay is located near from the body of water, low lying barangay. No or not enough flood control facilities, Low capacity of owners/barang ay to retrofit or build structure facilities to protect properties & did not applied	Lifeline utilities are low affected. Can withstand against the impact of all hazards due to its strong foundations and proper maintenanc e.

			communit y	communiti es		hazard resistant/climat e proofed standard, and even no properties was insured.	
San Ildefonso	3.41	Low	Muti- hazard, most built-up areas are low lying and are easily affected by hazards, affected populatio n included vulnerable sectors of the communit y	natural resources will be slightly affected; it can withstand the adverse effect of the disaster/ris k due to enhanced agricultural practices by well- adaptive communiti es	at risk to landslide, tsunami and storm surge	Large number of families belong to below poverty threshold and has a large number of households living in a makeshift housing. Low capacity of owners/barang ay to retrofit or build structure facilities to protect properties & did not applied hazard resistant/climat e proofed standard and even no properties was insured.	Lifeline utilities are low affected. Can withstand against the impact of all hazards due to its strong foundations and proper maintenanc e.
Tabas	3.46	Low	Muti- hazard, most built-up areas are low lying and are easily affected by hazards, affected populatio n included vulnerable sectors of the communit y	natural resources will be slightly affected; it can withstand the adverse effect of the disaster/ris k due to enhanced agricultural practices by well- adaptive communiti es	can be affected by flooding cause by river overflow	The barangay is located near from the body of water, low lying barangay. No or not enough flood control facilities, Low capacity of owners/barang ay to retrofit or build structure facilities to protect properties & did not applied hazard resistant/climat e proofed standard, and even no	Lifeline utilities are low affected. Can withstand against the impact of all hazards due to its strong foundations and proper maintenanc e.

						properties was insured.	
Tinib	3.35	Low	Muti- hazard, most built-up areas are low lying and are easily affected by hazards, affected populatio n included vulnerable sectors of the communit y	natural resources will be slightly affected; it can withstand the adverse effect of the disaster/ris k due to enhanced agricultural practices by well- adaptive communiti es	at risk to flooding	The barangay is located near from the body of water, low lying barangay. No or not enough flood control facilities, Low capacity of owners/barang ay to retrofit or build structure facilities to protect properties & did not applied hazard resistant/climat e proofed standard, and even no properties was insured	Lifeline utilities are low affected. Can withstand against the impact of all hazards due to its strong foundations and proper maintenanc e.

Barangays			Needed Interventions to Address Disaster Risks (5)					
	Overall DRA Index	DR Categor y	Populatio n	Natural Resources	Critical Point Facilities	Urban Use	Lifeline Utilities	
Barangay 1 (Pob.)	#DIV/0 !	#DIV/0!	Capacitate every resident of the communit y using Informatio n & Educationa I Campaign (IEC), through trainings, seminars, workshops	Enhance policies on environmental protection and strict implementatio n of zoning ordinance including identification and application of appropriate land uses, programs,	Drainage system. Flood control and riverbank protection system. Strengthenin g of Critical Point Facilities (CPF).	Enhance and capacitate barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and	Strengthe n the capacity of any lifeline by retrofittin g to stand alone in multi- hazard using the DRR fund.	

			, drills and simulation s for multi- hazards, and equipping them with skills in disaster resilience materials.	technologies and facilities.		properties of the communit y.	
Barangay 2 (Pob.)	#DIV/0 !	#DIV/0!	Capacitate every resident of the communit y using Informatio n & Educationa I Campaign (IEC), through trainings, seminars, workshops , drills and simulation s for multi- hazards, and equipping them with skills in disaster resilience materials.	Enhance policies on environmental protection and strict implementatio n of zoning ordinance including identification and application of appropriate land uses, programs, technologies and facilities.	Drainage system. Strengthenin g of Critical Point Facilities (CPF).	Enhance and capacitate barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the communit y.	Strengthe n the capacity of any lifeline by retrofittin g to stand alone in multi- hazard using the DRR fund.
Barangay 3 (Pob.)	#DIV/0 !	#DIV/0!	Capacitate every resident of the communit y using Informatio n & Educationa I Campaign (IEC), through trainings, seminars, workshops , drills and simulation s for multi- hazards, and equipping them with skills in disaster	Enhance policies on environmental protection and strict implementatio n of zoning ordinance including identification and application of appropriate land uses, programs, technologies and facilities.	Drainage system. Strengthenin g of Critical Point Facilities (CPF).	Enhance and capacitate barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the communit y.	Strengthe n the capacity of any lifeline by retrofittin g to stand alone in multi- hazard using the DRR fund.

			resilience materials.				
Barangay 4 (Pob.)	#DIV/0 !	#DIV/0!	Capacitate every resident of the communit y using Informatio n & Educationa I Campaign (IEC), through trainings, seminars, workshops , drills and simulation s for multi- hazards, and equipping them with skills in disaster resilience materials.	Enhance policies on environmental protection and strict implementatio n of zoning ordinance including identification and application of appropriate land uses, programs, technologies and facilities.	Drainage system. Flood control and riverbank protection system. Strengthenin g of Critical Point Facilities (CPF).	Enhance and capacitate barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the communit y.	Strengthe n the capacity of any lifeline by retrofittin g to stand alone in multi- hazard using the DRR fund.
Barangay 5 (Pob.)	#DIV/0 !	#DIV/0!	Capacitate every resident of the communit y using Informatio n & Educationa I Campaign (IEC), through trainings, seminars, workshops , drills and simulation s for multi- hazards, and equipping them with	Enhance policies on environmental protection and strict implementatio n of zoning ordinance including identification and application of appropriate land uses, programs, technologies and facilities.	Drainage system. Strengthenin g of Critical Point Facilities (CPF).	Enhance and capacitate barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the communit y.	Strengthe n the capacity of any lifeline by retrofittin g to stand alone in multi- hazard using the DRR fund.

			skills in disaster resilience materials.				
Barangay 6 (Pob.)	#DIV/0 !	#DIV/0!	Capacitate every resident of the communit y using Informatio n & Educationa l Campaign (IEC), through trainings, seminars, workshops , drills and simulation s for multi- hazards, and equipping them with skills in disaster resilience materials.	Enhance policies on environmental protection and strict implementatio n of zoning ordinance including identification and application of appropriate land uses, programs, technologies and facilities.	Drainage system. Flood control and riverbank protection system. Strengthenin g of Critical Point Facilities (CPF).	Enhance and capacitate barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the communit y.	Strengthe n the capacity of any lifeline by retrofittin g to stand alone in multi- hazard using the DRR fund.
Barangay 7 (Pob.)	#DIV/0 !	#DIV/0!	Capacitate every resident of the communit y using Informatio n & Educationa I Campaign (IEC), through trainings, seminars, workshops , drills and simulation s for multi- hazards, and equipping them with	Enhance policies on environmental protection and strict implementatio n of zoning ordinance including identification and application of appropriate land uses, programs, technologies and facilities.	Drainage system. Strengthenin g of Critical Point Facilities (CPF).	Enhance and capacitate barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the communit y.	Strengthe n the capacity of any lifeline by retrofittin g to stand alone in multi- hazard using the DRR fund.

			skills in disaster resilience materials.				
Barangay 8 (Pob.)	#DIV/0 !	#DIV/0!	Capacitate every resident of the communit y using Informatio n & Educationa l Campaign (IEC), through trainings, seminars, workshops , drills and simulation s for multi- hazards, and equipping them with skills in disaster resilience materials.	Enhance policies on environmental protection and strict implementatio n of zoning ordinance including identification and application of appropriate land uses, programs, technologies and facilities.	Drainage system. Flood control and riverbank protection system. Strengthenin g of Critical Point Facilities (CPF).	Enhance and capacitate barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the communit y.	Strengthe n the capacity of any lifeline by retrofittin g to stand alone in multi- hazard using the DRR fund.
Bianuan	#DIV/0 !	#DIV/0!	Capacitate every resident of the communit y using Informatio n & Educationa l Campaign (IEC), through trainings, seminars, workshops , drills and simulation s for multi- hazards, and equipping them with skills in disaster	Enhance policies on environmental protection and strict implementatio n of zoning ordinance including identification and application of appropriate land uses, programs, technologies and facilities.	Drainage system. Flood control and riverbank protection system. Strengthenin g of Critical Point Facilities (CPF).	Enhance and capacitate barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the communit y.	Strengthe n the capacity of any lifeline by retrofittin g to stand alone in multi- hazard using the DRR fund.

			resilience materials.				
Calabgan	3.19	Low	Capacitate every resident of the communit y using Informatio n & Educationa I Campaign (IEC), through trainings, seminars, workshops , drills and simulation s for multi- hazards, and equipping them with skills in disaster resilience materials.	Enhance policies on environmental protection and strict implementatio n of zoning ordinance including identification and application of appropriate land uses, programs, technologies and facilities.	Drainage system. Flood control and riverbank protection system. Strengthenin g of Critical Point Facilities (CPF).	Enhance and capacitate barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the communit y.	Strengthe n the capacity of any lifeline by retrofittin g to stand alone in multi- hazard using the DRR fund.
Calangcuasan	3.38	Low	Capacitate every resident of the communit y using Informatio n & Educationa I Campaign (IEC), through trainings, seminars, workshops , drills and simulation s for multi- hazards, and equipping them with skills in	Enhance policies on environmental protection and strict implementatio n of zoning ordinance including identification and application of appropriate land uses, programs, technologies and facilities.	Drainage system. Flood control and riverbank protection system. Strengthenin g of Critical Point Facilities (CPF).	Enhance and capacitate barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the communit y.	Strengthe n the capacity of any lifeline by retrofittin g to stand alone in multi- hazard using the DRR fund.

			disaster resilience materials.				
Calantas	3.33	Low	Capacitate every resident of the communit y using Informatio n & Educationa l Campaign (IEC), through trainings, seminars, workshops , drills and simulation s for multi- hazards, and equipping them with skills in disaster resilience materials.	Enhance policies on environmental protection and strict implementatio n of zoning ordinance including identification and application of appropriate land uses, programs, technologies and facilities.	Drainage system. Flood control and riverbank protection system. Strengthenin g of Critical Point Facilities (CPF).	Enhance and capacitate barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the communit y.	Strengthe n the capacity of any lifeline by retrofittin g to stand alone in multi- hazard using the DRR fund.
Cozo	3.40	Low	Capacitate every resident of the communit y using Informatio n & Educationa l Campaign (IEC), through trainings, seminars, workshops , drills and simulation s for multi- hazards, and equipping them with skills in disaster	Enhance policies on environmental protection and strict implementatio n of zoning ordinance including identification and application of appropriate land uses, programs, technologies and facilities.	Drainage system. Construction of Seawall. Strengthenin g of Critical Point Facilities (CPF).	Enhance and capacitate barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the communit y.	Strengthe n the capacity of any lifeline by retrofittin g to stand alone in multi- hazard using the DRR fund.

			resilience materials.				
Culat	3.42	Low	Capacitate every resident of the communit y using Informatio n & Educationa l Campaign (IEC), through trainings, seminars, workshops , drills and simulation s for multi- hazards, and equipping them with skills in disaster resilience materials.	Enhance policies on environmental protection and strict implementatio n of zoning ordinance including identification and application of appropriate land uses, programs, technologies and facilities.	Drainage system. Flood control and riverbank protection system. Strengthenin g of Critical Point Facilities (CPF).	Enhance and capacitate barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the communit y.	Strengthe n the capacity of any lifeline by retrofittin g to stand alone in multi- hazard using the DRR fund.
Dibacong	3.55	Low	Capacitate every resident of the communit y using Informatio n & Educationa l Campaign (IEC), through trainings, seminars, workshops , drills and simulation s for multi- hazards, and equipping them with	Enhance policies on environmental protection and strict implementatio n of zoning ordinance including identification and application of appropriate land uses, programs, technologies and facilities.	Drainage system. Construction of Seawall. Strengthenin g of Critical Point Facilities (CPF).	Enhance and capacitate barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the communit y.	Strengthe n the capacity of any lifeline by retrofittin g to stand alone in multi- hazard using the DRR fund.

			skills in disaster resilience materials.				
Dibet	3.41	Low	Capacitate every resident of the communit y using Informatio n & Educationa l Campaign (IEC), through trainings, seminars, workshops , drills and simulation s for multi- hazards, and equipping them with skills in disaster resilience materials.	Enhance policies on environmental protection and strict implementatio n of zoning ordinance including identification and application of appropriate land uses, programs, technologies and facilities.	Drainage system. Flood control and riverbank protection system. Strengthenin g of Critical Point Facilities (CPF).	Enhance and capacitate barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the communit y.	Strengthe n the capacity of any lifeline by retrofittin g to stand alone in multi- hazard using the DRR fund.
Ditinagyan	3.31	Low	Capacitate every resident of the communit y using Informatio n & Educationa l Campaign (IEC), through trainings, seminars, workshops , drills and simulation s for multi- hazards, and equipping them with skills in	Enhance policies on environmental protection and strict implementatio n of zoning ordinance including identification and application of appropriate land uses, programs, technologies and facilities.	Drainage system. Construction of Seawall. Strengthenin g of Critical Point Facilities (CPF).	Enhance and capacitate barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the communit y.	Strengthe n the capacity of any lifeline by retrofittin g to stand alone in multi- hazard using the DRR fund.

			disaster resilience materials.				
Esperanza	3.48	Low	Capacitate every resident of the communit y using Informatio n & Educationa l Campaign (IEC), through trainings, seminars, workshops , drills and simulation s for multi- hazards, and equipping them with skills in disaster resilience materials.	Enhance policies on environmental protection and strict implementatio n of zoning ordinance including identification and application of appropriate land uses, programs, technologies and facilities.	Drainage system. Flood control and riverbank protection system. Strengthenin g of Critical Point Facilities (CPF).	Enhance and capacitate barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the communit y.	Strengthe n the capacity of any lifeline by retrofittin g to stand alone in multi- hazard using the DRR fund.
Esteves	3.47	Low	Capacitate every resident of the communit y using Informatio n & Educationa l Campaign (IEC), through trainings, seminars, workshops , drills and simulation s for multi- hazards, and equipping them with	Enhance policies on environmental protection and strict implementatio n of zoning ordinance including identification and application of appropriate land uses, programs, technologies and facilities.	Drainage system. Construction of Seawall. Strengthenin g of Critical Point Facilities (CPF).	Enhance and capacitate barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the communit y.	Strengthe n the capacity of any lifeline by retrofittin g to stand alone in multi- hazard using the DRR fund.

			skills in disaster resilience materials.				
Lual	3.31	Low	Capacitate every resident of the communit y using Informatio n & Educationa l Campaign (IEC), through trainings, seminars, workshops , drills and simulation s for multi- hazards, and equipping them with skills in disaster resilience materials.	Enhance policies on environmental protection and strict implementatio n of zoning ordinance including identification and application of appropriate land uses, programs, technologies and facilities.	Drainage system. Construction of Seawall. Strengthenin g of Critical Point Facilities (CPF).	Enhance and capacitate barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the communit y.	Strengthe n the capacity of any lifeline by retrofittin g to stand alone in multi- hazard using the DRR fund.
Marikit	3.31	Low	Capacitate every resident of the communit y using Informatio n & Educationa l Campaign (IEC), through trainings, seminars, workshops , drills and simulation s for multi- hazards, and equipping them with skills in disaster	Enhance policies on environmental protection and strict implementatio n of zoning ordinance including identification and application of appropriate land uses, programs, technologies and facilities.	Drainage system. Construction of Seawall. Strengthenin g of Critical Point Facilities (CPF).	Enhance and capacitate barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the communit y.	Strengthe n the capacity of any lifeline by retrofittin g to stand alone in multi- hazard using the DRR fund.

			resilience materials.				
San Ildefonso	3.41	Low	Capacitate every resident of the communit y using Informatio n & Educationa l Campaign (IEC), through trainings, seminars, workshops , drills and simulation s for multi- hazards, and equipping them with skills in disaster resilience materials.	Enhance policies on environmental protection and strict implementatio n of zoning ordinance including identification and application of appropriate land uses, programs, technologies and facilities.	Drainage system. Construction of Seawall. Strengthenin g of Critical Point Facilities (CPF).	Enhance and capacitate barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the communit y.	Strengthe n the capacity of any lifeline by retrofittin g to stand alone in multi- hazard using the DRR fund.
Tabas	3.46	Low	Capacitate every resident of the communit y using Informatio n & Educationa I Campaign (IEC), through trainings, seminars, workshops , drills and simulation s for multi- hazards, and equipping them with	Enhance policies on environmental protection and strict implementatio n of zoning ordinance including identification and application of appropriate land uses, programs, technologies and facilities.	Drainage system. Flood control and riverbank protection system. Strengthenin g of Critical Point Facilities (CPF).	Enhance and capacitate barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the communit y.	Strengthe n the capacity of any lifeline by retrofittin g to stand alone in multi- hazard using the DRR fund.

			skills in disaster resilience materials.				
Tinib	3.35	Low	Capacitate every resident of the communit y using Informatio n & Educationa l Campaign (IEC), through trainings, seminars, workshops , drills and simulation s for multi- hazards, and equipping them with skills in disaster resilience materials.	Enhance policies on environmental protection and strict implementatio n of zoning ordinance including identification and application of appropriate land uses, programs, technologies and facilities.	Drainage system. Flood control and riverbank protection system. Strengthenin g of Critical Point Facilities (CPF).	Enhance and capacitate barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the communit y.	Strengthe n the capacity of any lifeline by retrofittin g to stand alone in multi- hazard using the DRR fund.

The descriptive summary of disaster risk assessment in terms of population, most built-up areas are low lying and are easily affected by hazards, affected population included vulnerable sectors of the community. Natural resources will be slightly affected; it can withstand the adverse effect of the disaster/risk due to enhanced agricultural practices by well-adaptive communities. Critical Point Facilities is at risk to landslide, tsunami and storm surge. In Urban Use low capacity of owners/barangay to retrofit or build structure facilities to protect properties & did not applied hazard resistant/climate proofed standard and even no properties was insured. Lifeline utilities are low affected, can withstand against the impact of all hazards due to its strong foundations and proper maintenance.

The LGU needs to capacitate every resident of the community using Information & Educational Campaign (IEC), through trainings, seminars, workshops, drills and simulations for multi-hazards, and equipped them with skills in disaster resilience materials. In terms of natural resources, it needs to enhance policies on environmental protection and strict implementation of zoning ordinance including identification and application of appropriate land uses, programs, technologies and facilities. Drainage

system, flood control and riverbank protection system and strengthening of Critical Point Facilities (CPF) are needed to mitigate the adverse effect of disaster. The LGU also needs to enhance and capacitate barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the community and strengthen the capacity of all lifeline utilities by retrofitting, to stand alone in multi-hazard.

# **VII. SUMMARY & CONCLUSIONS**

Table 123. Climat	te Change Vulnera	ability and Disaster	<sup>•</sup> Risk Assessment Summary
Matrix, Casiguran	1, Aurora		

	CCV DRA		DRA			
Barangays	Overall Index	Score Description	Overall Index	Score Description	Specific Actions Needed to Address Both CCV and DR	
Barangay 1 (Pob.)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	Capacitate every resident of the community using Information and Educational Campaign (IEC), Through trainings, seminars, workshops,drills and simulations for multi-hazards, and equiping them with skills and disaster resiliency learning materials. Enhanced policies on environmental protection and strict implementation of zoning ordinance including identification and application of appropriate landuses, programs, technologies and facilities. Enhanced the capacity of the barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the community. Initiate possible funding of structural facilities to minimize effect of hazard. Strictly implement building code and landuse/zoning ordinance.	
Barangay 2 (Pob.)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	Capacitate every resident of the community using Information and Educational Campaign (IEC), Through trainings, seminars, workshops,drills and simulations for multi-hazards, and equiping them with skills and disaster resiliency learning materials. Enhanced policies on environmental protection and strict implementation of zoning ordinance including identification and application of appropriate landuses, programs, technologies and facilities. Enhanced the capacity of the barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the community. Initiate possible funding of structural facilities to minimize effect of hazard. Strictly implement building code and landuse/zoning ordinance.	

Barangay 3 (Pob.)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	Capacitate every resident of the community using Information and Educational Campaign (IEC), Through trainings, seminars, workshops,drills and simulations for multi-hazards, and equiping them with skills and disaster resiliency learning materials. Enhanced policies on environmental protection and strict implementation of zoning ordinance including identification and application of appropriate landuses, programs, technologies and facilities. Enhanced the capacity of the barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the community. Initiate possible funding of structural facilities to minimize effect of hazard. Strictly implement building code and landuse/zoning ordinance.
Barangay 4 (Pob.)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	Capacitate every resident of the community using Information and Educational Campaign (IEC), Through trainings, seminars, workshops,drills and simulations for multi-hazards, and equiping them with skills and disaster resiliency learning materials. Enhanced policies on environmental protection and strict implementation of zoning ordinance including identification and application of appropriate landuses, programs, technologies and facilities. Enhanced the capacity of the barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the community. Initiate possible funding of structural facilities to minimize effect of hazard. Strictly implement building code and landuse/zoning ordinance.
Barangay 5 (Pob.)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	Capacitate every resident of the community using Information and Educational Campaign (IEC), Through trainings, seminars, workshops,drills and simulations for multi-hazards, and equiping them with skills and disaster resiliency learning materials. Enhanced policies on environmental protection and strict implementation of zoning ordinance including identification and application of appropriate landuses, programs, technologies and facilities. Enhanced the capacity of the barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the community. Initiate possible funding of structural facilities to minimize effect of hazard Strictly implement

					building code and landuse/zoning ordinance.
Barangay 6 (Pob.)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	Capacitate every resident of the community using Information and Educational Campaign (IEC), Through trainings, seminars, workshops,drills and simulations for multi-hazards, and equiping them with skills and disaster resiliency learning materials. Enhanced policies on environmental protection and strict implementation of zoning ordinance including identification and application of appropriate landuses, programs, technologies and facilities. Enhanced the capacity of the barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the community. Initiate possible funding of structural facilities to minimize effect of hazard. Strictly implement building code and landuse/zoning ordinance.
Barangay 7 (Pob.)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	Capacitate every resident of the community using Information and Educational Campaign (IEC), Through trainings, seminars, workshops,drills and simulations for multi-hazards, and equiping them with skills and disaster resiliency learning materials. Enhanced policies on environmental protection and strict implementation of zoning ordinance including identification and application of appropriate landuses, programs, technologies and facilities. Enhanced the capacity of the barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the community. Initiate possible funding of structural facilities to minimize effect of hazard. Strictly implement building code and landuse/zoning ordinance.
Barangay 8 (Pob.)	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	Capacitate every resident of the community using Information and Educational Campaign (IEC), Through trainings, seminars, workshops,drills and simulations for multi-hazards, and equiping them with skills and disaster resiliency learning materials. Enhanced policies on environmental protection and strict implementation of zoning ordinance including identification and application of appropriate landuses, programs, technologies and facilities. Enhanced the capacity of the barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the community. Initiate possible funding

					of structural facilities to minimize
					effect of hazard. Strictly implement
					ordinance
					Capacitate every resident of the
					community using Information and
					Educational Campaign (IEC), Through
					trainings, seminars, workshops,drills
					and simulations for multi-hazards,
					disaster resiliency learning materials
					Enhanced policies on environmental
					protection and strict implementation
					of zoning ordinance including
Bianuan	6.28	High	#DIV/0!	#DIV/0!	identification and application of
Dianaan	0.20	8			appropriate landuses, programs,
					technologies and facilities. Enhanced
					and its residents on DRR maximize
					the utilization of local fund to protect
					lives and properties of the
					community. Initiate possible funding
					of structural facilities to minimize
					effect of hazard. Strictly implement
					building code and landuse/zoning
					Canacitate every resident of the
					community using Information and
					Educational Campaign (IEC), Through
					trainings, seminars, workshops,drills
					and simulations for multi-hazards,
					and equiping them with skills and
					disaster resiliency learning materials.
					protection and strict implementation
					of zoning ordinance including
Calabaan	( 20	Iliah	2 10	Lovy	identification and application of
Calabgali	0.39	nigii	3.19	LOW	appropriate landuses, programs,
					technologies and facilities. Enhanced
					the capacity of the barangay officials
					the utilization of local fund to protect
					lives and properties of the
					community. Initiate possible funding
					of structural facilities to minimize
					effect of hazard. Strictly implement
					ordinance
					Capacitate every resident of the
					community using Information and
					Educational Campaign (IEC), Through
					trainings, seminars, workshops,drills
					and simulations for multi-hazards,
					disaster resiliency learning materials
					Enhanced policies on environmental
Calangcuasan	6.16	High	3.38	Low	protection and strict implementation
					of zoning ordinance including
					identification and application of
					appropriate landuses, programs,
					the capacity of the barangay officials
					and its residents on DRR, maximize
					the utilization of local fund to protect
					lives and properties of the

					community. Initiate possible funding
					of structural facilities to minimize effect of bazard Strictly implement
					building code and landuse/zoning
					ordinance.
					Capacitate every resident of the
					community using information and Educational Campaign (IEC) Through
					trainings, seminars, workshops,drills
					and simulations for multi-hazards,
					and equiping them with skills and
					disaster resiliency learning materials.
					protection and strict implementation
					of zoning ordinance including
Calantas	6.20	High	3 33	Low	identification and application of
Calantas	0.20	111611	5.55	Low	appropriate landuses, programs,
					technologies and facilities. Enhanced
					and its residents on DRR. maximize
					the utilization of local fund to protect
					lives and properties of the
					community. Initiate possible funding
					effect of hazard Strictly implement
					building code and landuse/zoning
					ordinance.
					Capacitate every resident of the
					community using information and Educational Campaign (IEC). Through
					trainings, seminars, workshops,drills
					and simulations for multi-hazards,
					and equiping them with skills and
					Enhanced policies on environmental
					protection and strict implementation
					of zoning ordinance including
Cozo	6.44	High	3.40	Low	identification and application of
					technologies and facilities. Enhanced
					the capacity of the barangay officials
					and its residents on DRR, maximize
					the utilization of local fund to protect
					lives and properties of the
					of structural facilities to minimize
					effect of hazard. Strictly implement
					building code and landuse/zoning
					ordinance.
					community using Information and
					Educational Campaign (IEC), Through
					trainings, seminars, workshops,drills
					and simulations for multi-hazards,
					and equiping them with skills and disaster resiliency learning materials
Culat	6.20	Link	2.42	Low	Enhanced policies on environmental
Culai	0.38	rign	3.42	LOW	protection and strict implementation
					of zoning ordinance including
					appropriate landuses programs
					technologies and facilities. Enhanced
					the capacity of the barangay officials
					and its residents on DRR, maximize
					the utilization of local fund to protect

					lives and properties of the community. Initiate possible funding of structural facilities to minimize effect of hazard. Strictly implement building code and landuse/zoning ordinance.
Dibacong	6.61	High	3.55	Low	Capacitate every resident of the community using Information and Educational Campaign (IEC), Through trainings, seminars, workshops,drills and simulations for multi-hazards, and equiping them with skills and disaster resiliency learning materials. Enhanced policies on environmental protection and strict implementation of zoning ordinance including identification and application of appropriate landuses, programs, technologies and facilities. Enhanced the capacity of the barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the community. Initiate possible funding of structural facilities to minimize effect of hazard. Strictly implement building code and landuse/zoning ordinance.
Dibet	6.19	High	3.41	Low	Capacitate every resident of the community using Information and Educational Campaign (IEC), Through trainings, seminars, workshops,drills and simulations for multi-hazards, and equiping them with skills and disaster resiliency learning materials. Enhanced policies on environmental protection and strict implementation of zoning ordinance including identification and application of appropriate landuses, programs, technologies and facilities. Enhanced the capacity of the barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the community. Initiate possible funding of structural facilities to minimize effect of hazard. Strictly implement building code and landuse/zoning ordinance.
Ditinagyan	6.18	High	3.31	Low	Capacitate every resident of the community using Information and Educational Campaign (IEC), Through trainings, seminars, workshops,drills and simulations for multi-hazards, and equiping them with skills and disaster resiliency learning materials. Enhanced policies on environmental protection and strict implementation of zoning ordinance including identification and application of appropriate landuses, programs, technologies and facilities. Enhanced the capacity of the barangay officials and its residents on DRR, maximize

					the utilization of local fund to protect lives and properties of the community. Initiate possible funding of structural facilities to minimize effect of hazard. Strictly implement building code and landuse/zoning ordinance.
Esperanza	6.26	High	3.48	Low	Capacitate every resident of the community using Information and Educational Campaign (IEC), Through trainings, seminars, workshops,drills and simulations for multi-hazards, and equiping them with skills and disaster resiliency learning materials. Enhanced policies on environmental protection and strict implementation of zoning ordinance including identification and application of appropriate landuses, programs, technologies and facilities. Enhanced the capacity of the barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the community. Initiate possible funding of structural facilities to minimize effect of hazard. Strictly implement building code and landuse/zoning ordinance.
Esteves	6.67	High	3.47	Low	Capacitate every resident of the community using Information and Educational Campaign (IEC), Through trainings, seminars, workshops,drills and simulations for multi-hazards, and equiping them with skills and disaster resiliency learning materials. Enhanced policies on environmental protection and strict implementation of zoning ordinance including identification and application of appropriate landuses, programs, technologies and facilities. Enhanced the capacity of the barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the community. Initiate possible funding of structural facilities to minimize effect of hazard. Strictly implement building code and landuse/zoning ordinance.
Lual	6.68	High	3.31	Low	Capacitate every resident of the community using Information and Educational Campaign (IEC), Through trainings, seminars, workshops,drills and simulations for multi-hazards, and equiping them with skills and disaster resiliency learning materials. Enhanced policies on environmental protection and strict implementation of zoning ordinance including identification and application of appropriate landuses, programs, technologies and facilities. Enhanced the capacity of the barangay officials

					and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the community. Initiate possible funding of structural facilities to minimize effect of hazard. Strictly implement building code and landuse/zoning ordinance.
Marikit	6.30	High	3.31	Low	Capacitate every resident of the community using Information and Educational Campaign (IEC), Through trainings, seminars, workshops,drills and simulations for multi-hazards, and equiping them with skills and disaster resiliency learning materials. Enhanced policies on environmental protection and strict implementation of zoning ordinance including identification and application of appropriate landuses, programs, technologies and facilities. Enhanced the capacity of the barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the community. Initiate possible funding of structural facilities to minimize effect of hazard. Strictly implement building code and landuse/zoning ordinance.
San Ildefonso	6.50	High	3.41	Low	Capacitate every resident of the community using Information and Educational Campaign (IEC), Through trainings, seminars, workshops,drills and simulations for multi-hazards, and equiping them with skills and disaster resiliency learning materials. Enhanced policies on environmental protection and strict implementation of zoning ordinance including identification and application of appropriate landuses, programs, technologies and facilities. Enhanced the capacity of the barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the community. Initiate possible funding of structural facilities to minimize effect of hazard. Strictly implement building code and landuse/zoning ordinance.
Tabas	6.26	High	3.46	Low	Capacitate every resident of the community using Information and Educational Campaign (IEC), Through trainings, seminars, workshops,drills and simulations for multi-hazards, and equiping them with skills and disaster resiliency learning materials. Enhanced policies on environmental protection and strict implementation of zoning ordinance including identification and application of appropriate landuses, programs, technologies and facilities. Enhanced

					the capacity of the barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the community. Initiate possible funding of structural facilities to minimize effect of hazard. Strictly implement building code and landuse/zoning
Tinib	6.17	High	3.35	Low	Capacitate every resident of the community using Information and Educational Campaign (IEC), Through trainings, seminars, workshops,drills and simulations for multi-hazards, and equiping them with skills and disaster resiliency learning materials. Enhanced policies on environmental protection and strict implementation of zoning ordinance including identification and application of appropriate landuses, programs, technologies and facilities. Enhanced the capacity of the barangay officials and its residents on DRR, maximize the utilization of local fund to protect lives and properties of the community. Initiate possible funding of structural facilities to minimize effect of hazard. Strictly implement building code and landuse/zoning ordinance.

The municipality of Casiguran in the province of Aurora is, undoubtedly, susceptible to various disaster risks as a result of its inherent geological hazards. Furthermore, projected changes in climatic conditions would definitely increase the municipality's susceptibility to disasters. In recognition of these future scenarios, necessary steps to increase climate risk resilience through human security development and capacity building are of utmost importance. A Climate and Disaster Risk Assessment (CDRA) is a starting point for allowing Casiguran to adapt to future climate risks.

All barangays were identified to be not susceptible to volcanic eruptions due to the non-existence of volcanoes in the municipality; however, all barangays are susceptible to at least five natural hazards. Current socio-economic and environmental conditions in Casiguran indicate that numerous Population, Natural Resources, Critical Point Facilities, Urban Use Areas, and Lifeline Utilities are at risk. Demographic trends, income and economic bases, and support services in terms of financial institutions, agricultural technologies, post-harvest infrastructures, irrigation systems, CARP areas, poultry and livestock, fishing and aquatic resources, and forest-based economic activities reveal a need for increasing capacities to cope with projected climatic conditions.

In general, there will be increases in the seasonal minimum and maximum temperatures, seasonal rainfall, as well as the number of hot days, dry days, and extreme daily rainfall events. By the end of 2100, sea levels in the Philippines are expected to rise by about half to almost one meter. Due to the municipality's location along the Pacific Ocean, as well as the presence of upland areas and geological faults, it is highly susceptible

to floods, landslides, storm surges, ground ruptures, liquefaction, earthquake-induced landslides, and tsunamis.

Current initiatives of the local government are commendable. They have identified the need for: providing alternative livelihoods, ensuring the delivery of adequate health services, linking with various funding agencies, maintaining and improving existing irrigation and water system facilities, adopting green technologies, conducting feasibility studies for water supply systems, adopting integrated farming, ensuring access to crop insurance and funding assistance. However, more interventions need to identified, as well as specified for a particular disaster risk since not all risks can be addressed using one strategy. On the other hand, this CDRA points to a comprehensive plan to address its disaster vulnerabilities.

# **VIII. REFERENCES**

- Furevik, T., Bentsen, M., Drange, H., Kindem, I. K. T., Kvamstø, N. G., and Sorteberg, A. (2003). Description and validation of the Bergen Climate Model ARPEGE coupled with MICOM, Clim. Dynam., 21, 27–51.
- HLURB (2015). CLUP Guidebook: Supplemental Guidelines on Mainstreaming Climate Change and Disaster Risks in the Comprehensive Land Use Plan. Housing and Land Use Regulatory Board Climate Change Commission United Nations Development Programme Australian Government.
- Kahana R, Abdon R, Daron J & Scannell, C (2016). Projections of Mean Sea Level Change for the Philippines. Met Office.
- PAGASA. (2011). Climate Change in the Philippines. Philippine Atmospheric, Geophysical and Astronomical Services Administration, Philippines. Retrieved from:

https://pubfiles.pagasa.dost.gov.ph/climps/climateforum/ClimatechangeintheP hilippines.pdf

- PAGASA (2014). Assessments of Climate Change Impacts and Mapping of Vulnerability to Food Insecurity under Climate Change to Strengthen Household Food Security with Livelihoods' Adaptation Approaches (AMICAF): Project Terminal Report. Submitted to Food and Agriculture Organization of the United Nations Country Office in the Philippines. Quezon City: DOST-PAGASA.
- Roeckner, E., Bäuml, G., Bonaventura, L., Brokopf, R., Esch, M., Giorgetta, M., Hagemann, S., Kirchner, I., Kornblueh, L., Manzini, E., Rhodin, A., Schlese, U., Schulzweida, U.,and Tompkins, A. (2003). The atmospheric general circulation model ECHAM 5. PART I: Model description, Max Planck Institute for Meteorology Rep. 349, available at:

http://www.mpimet.mpg.de/fileadmin/publikationen/Reports/max scirep 349. pdf.

- Salas-Mélia, D., F. Chauvin, M. Déqué, H. Douville, J.F. Gueremy, P. Marquet, S. Planton, J.F. Royer and S. Tyteca (2005). Description and validation of the CNRM-CM3 global coupled model. CNRM working note 103.
- van Vuuren DP, Edmonds J, Kainuma MLT, Riahi K, Thomson A, Matsui T, Hurtt G, Lamarque J-F, Meinshausen M, Smith S, Grainer C, Rose S, Hibbard KA, Nakicenovic N, Krey V, Kram T. (2011). Representative concentration pathways: An overview. Climatic Change (2011) 109: 5. doi: <u>10.1007/s10584-011-0152-3</u>