“Flood Risks, Environmental Sanitation and Health Research in Riverine Communities in Iloilo, Philippines” (Project FRESH) ANALYSIS of DATA

Submitted by
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SCOPE OF WORK

An action-oriented research has been design to ascertain flood risks with a focus on environment, sanitation, and health in riverine communities in Iloilo City, Philippines via Project Fresh. The research is aimed to yield both qualitative and quantitative output that will inform risk management interventions for riverine communities that help reduce climatic and non-climatic impact drivers, exposures, and vulnerabilities via household- and community-managed interventions and meso-level policy interventions at the broader LGU level (e.g. barangay or city).

The scope of work is limited to the flood risks and where data is available to environmental health and sanitation. Given the limited time and resources for the conduct of this study, the following were undertaken:

Methodology

Phase 1

Phase 1.1

1. Literature review of existing and relevant reports on flooding in the area where KAISA BESA HOA settlement is located;
2. Preparatory activity using the mentimeter to surface the focus, scope, parameters of the research;
3. Clarifications on the research framework of ARA and TAMPEI (TECHNICAL ASSISTANCE MOVEMENT FOR PEOPLE AND ENVIRONMENT, INC.)
4. FGD to
   4.1 identify the units of analysis for the research
   4.2 Elicit base questions for the research
   4.3 Identify preferred and appropriate tools for analysis
5. Review of initial output and synthesis

Phase 1.2

1. The output was vetted to the trained community researchers for purposes of enhancement;
2. Pre-test

Phase 2 Conduct of the Survey using the KOBO Toolbox

The conduct of the survey was led by KAISA BESA HOA with the guidance from TAMPEI and the assistance of HPFI. A total of 67 respondents representing 67 HHs were engaged in the survey. Of these forty two (42) or 62.20% were females and twenty five (25) of 37.31% were males. 37.31% are private sector employees, 32.84% were self-employed, 4.48 % were government employees, 25.37% were doing housework without compensation, and 2.99% were engaged in housework with compensation.

Phase 3 Conduct of the Focused Group Discussion

Phase 4. Consolidation and Analysis of Data

FRAMEWORK OF ANALYSIS

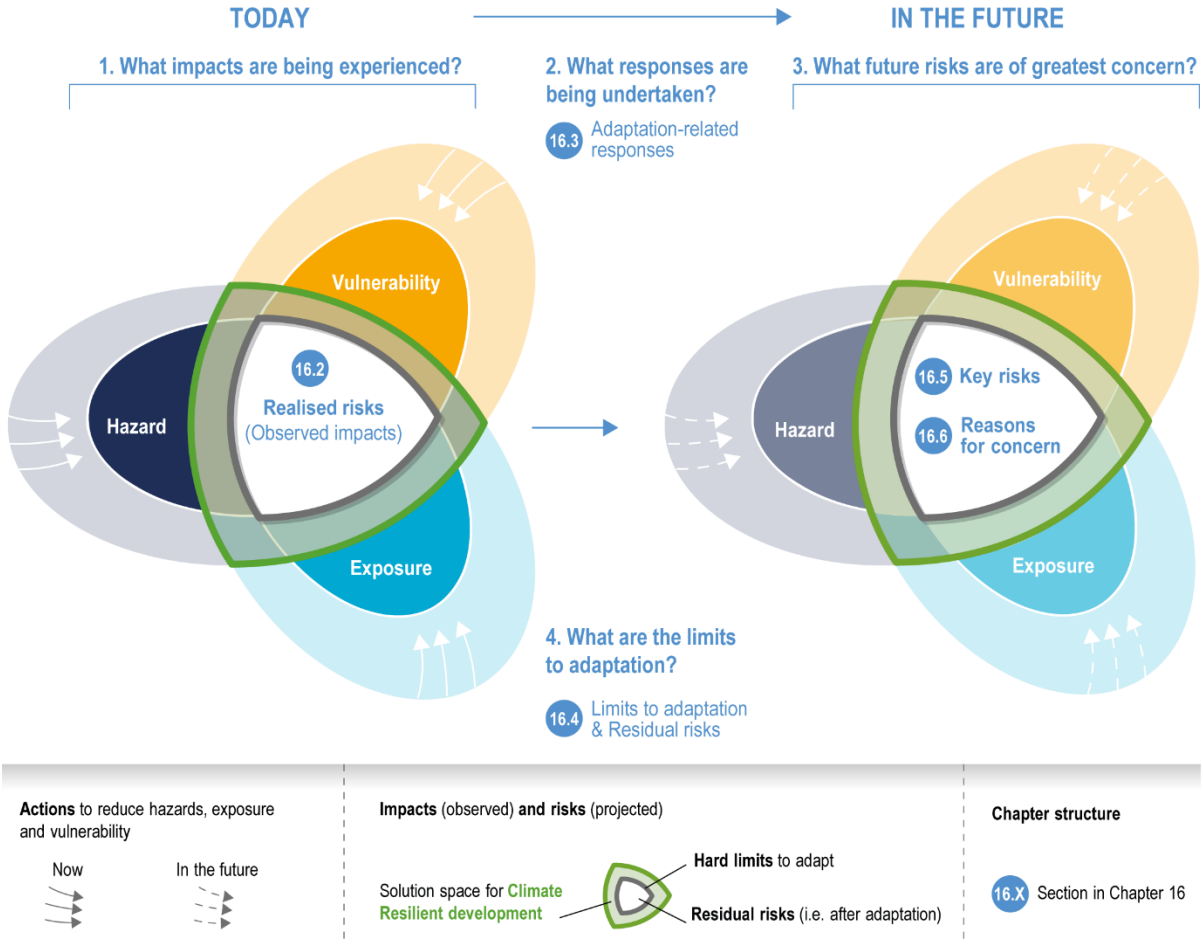
The project's research component used the Intergovernmental Panel on Climate Change (IPCC) risk framework for analysis to inform Project FRESH's key objectives written below:

1. Co-develop and popularize CC-DRR mitigation and adaptation strategies by integrating local knowledge into scientific research.
2. Improve local environmental health by piloting community-based, sustainable wastewater treatment technologies.
3. Co-create inclusive built environments by supporting slum upgrading and other community-driven actions

The updated risk framework of the IPCC in its Sixth Assessment Report (AR6) still recognizes that risk is a confluence of Hazard, Exposure, Vulnerability (note that capacity is the opposite of vulnerability). Thus the more severe the hazard, exposure, vulnerability, the greater the risk. In the image below, we get to assess the observed impacts (or the realized risks) based on an assessment of the interaction of hazard, exposure, and vulnerability. However, as we look into future risks, we reflect on the current realized risks and the changes in the hazards, exposures, vulnerabilities over time Those that cannot be addressed by adaptation-related responses will test the limits of adaptation and result to further losses and damages. To reduce current and future risks, there need to be specific actions directed at reducing hazards, exposures, and vulnerabilities.

In this study only an analysis of the realized risks have been assessed in the field research. The study will utilize the downscaled climate information at the Iloilo City level used in the City's Climate and Disaster Risk Assessment and an examination of KAISA BESA HOA's vulnerability and capacity potential to inform assessment of future risks.

Figure 16.1 illustrates the elements covered by the chapter, which can be summarised as four key questions



IPCC Sixth Assessment Report Risk Framework[1]

[1] Figure 16.1 in O'Neill, B., M. van Aalst, Z. Zaiton Ibrahim, L. Berrang Ford, S. Bhadwal, H. Buhaug, D. Diaz, K. Frieler, M. Garschagen, A. Magnan, G. Midgley, A. Mirzabaev, A. Thomas, and R. Warren, 2022: Key Risks Across Sectors and Regions. In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke,

V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 2411–2538, doi:10.1017/9781009325844.025.

ANALYSIS of DATA

The residents of the KAISA BESA HOA are nested in Zone 6 of Barangay Sambag in Jaro, Iloilo[2]. The barangay is roughly seven (7) kilometers from the city center and has access to national roads and highways. Based on the BDRRMP , the Registered Barangay Inhabitants 2021 data recorded a population of 1562 hourseholds in 1485 dwellings in the land area of 133.69 hectares[3]. Of the 1562 households, KAISA BESA HOA members constitute 63 of the households as of 2021[4] and now 67 of the households as of September 2023.

Flooding History

To the recollection of respondents and according to the BDRRMP of Barangay Sambag, the following are the key flooding moments in the area. The respondents associated the flooding with typhoons that were accompanied by heavy rainfall up until 2021. However, in 2022, they were met with flooding that were primarily due to extreme heavy rainfall accompanying the Southwest Monsoon season:

- 1980s - Typhoon Undang (30% of the barangay was flooded);
- 1990s - Typhoon Ruping (40% flooding in the barangay); Typhoon Pepang (60% flooding in the barangay);
- 2000s - Typhoon Frank (almost 100% of the barangay)
- 2021 - Typhoon Odette (partially damaged houses due to flooding)
- 2022- Heavy rains accompanying tropical depression Paeng;
- 2023 - Southwest monsoon accompanying Typhoon Egay[5] ; Southwest monsoon accompanying Typhoon Goring[6] triggered 256mm of rainfall in 24 hours and flooded 90 barangays in the City

The most impactful flooding reported were in 2008 and 2023. These were also the years identified by the KAISA BESA HOA during the survey. Whereas the BDRRMP of Barangay Sambag identifies that flooding normally occurs during the monsoon season (August- October), the flooding occurrences in the area of KAISA BESA HOA are reported by survey responses to mostly occur from June-November. June-September were adjudged by respondents as the months of heightened flood exposure.

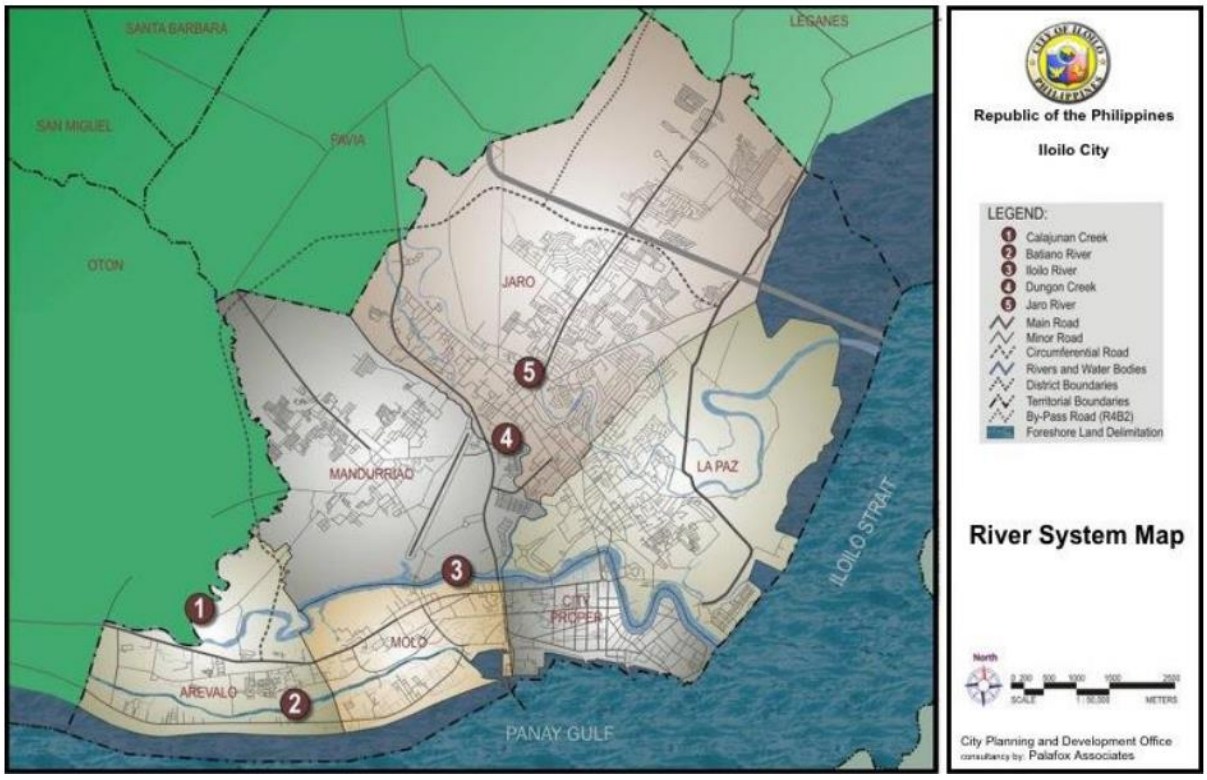
August 2023 Flood Monitoring Iloilo City[7]

[2] From the Barangay Sambag Profile
[3] From the 2022 Barangay Disaster Risk Reduction and Management Plan, Barangay Sambag, Jaro, Iloilo City
[4] Op cit., Barangay Sambag Profile
[5] https://www.pna.gov.ph/articles/1206578
[6] https://www.panaynews.net/iloilo-city-experiences-first-severe-flooding-after-frank/
[7] Ibid.

Barangay Sambag's Flood Hazard Exposure

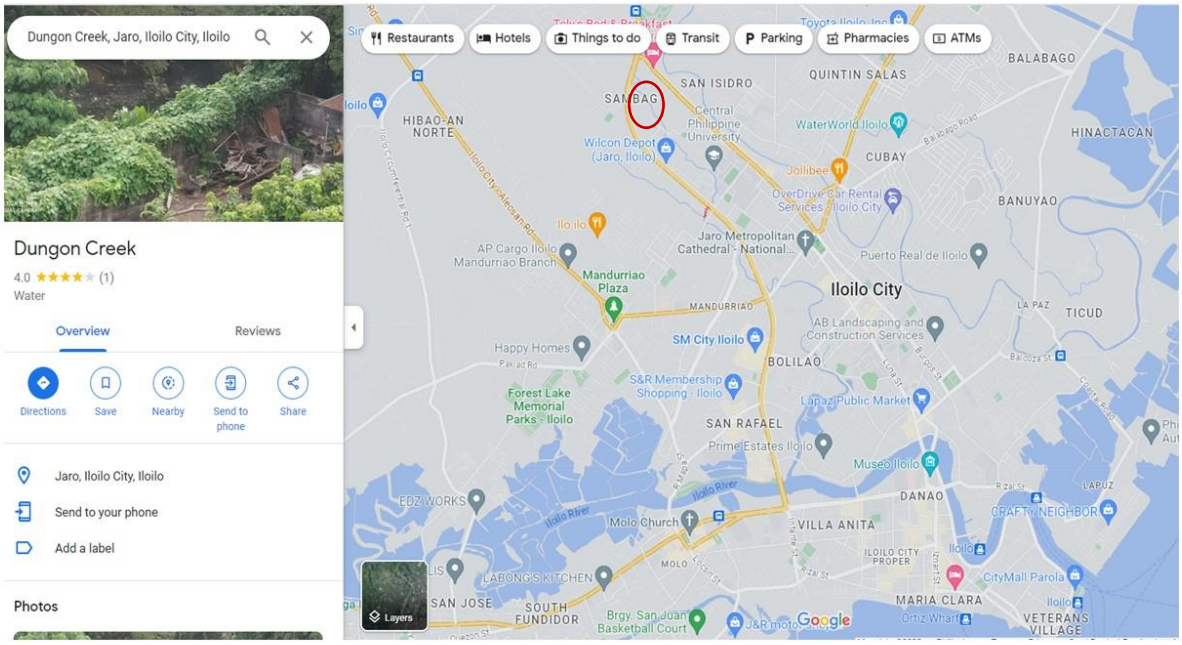
In Barangay Sambag's hazard severity ranking, flooding came in the first with 70% of its population affected. These are followed by typhoon and fire, respectively, according to the Barangay Disaster Risk Reduction and Management Plan of Barangay Sambag Jaro.[8]

Relevant to Barangay Sambag's exposure to flooding is the understanding of the waterways traversing in the said locality. The Dungon Creek traverses the Barangay Sambag and the floods in the area have been attributed the Creek's Overflow. The said Creek is a major tributary of the Iloilo River alongside Calajunan and Mambog Creeks.[9]



River System Map of Iloilo City[10]

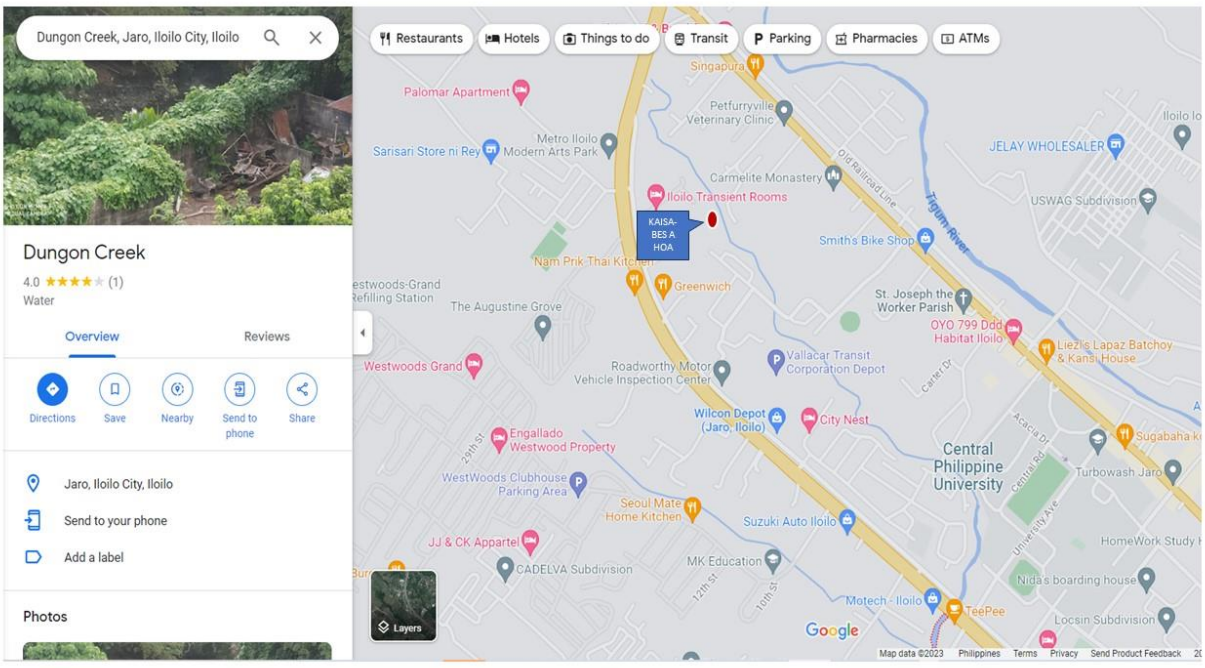
[8] 2022 Barangay Disaster Risk Reduction and Management Plan, Barangay Sambag, Jaro, Iloilo City
[9] EMB 6, 2022, Iloilo River Annual Assessment Report, CY 2021, https://r6.emb.gov.ph/wp-content/uploads/2021/08/AWQMU-Iloilo-River-Annual-CY-2020.pdf
[10] Palafox Associates and City Planning and Development Office, THE LOCAL SHELTER PLAN OF ILOILO CITY 2016–2025, https://iloilocity.gov.ph/main/wp-content/uploads/2021/10/Iloilo_City_Shelter_Plan.pdf



Barangay Sambag's Location in relation to Dungon Creek - a Tributary of Iloilo River

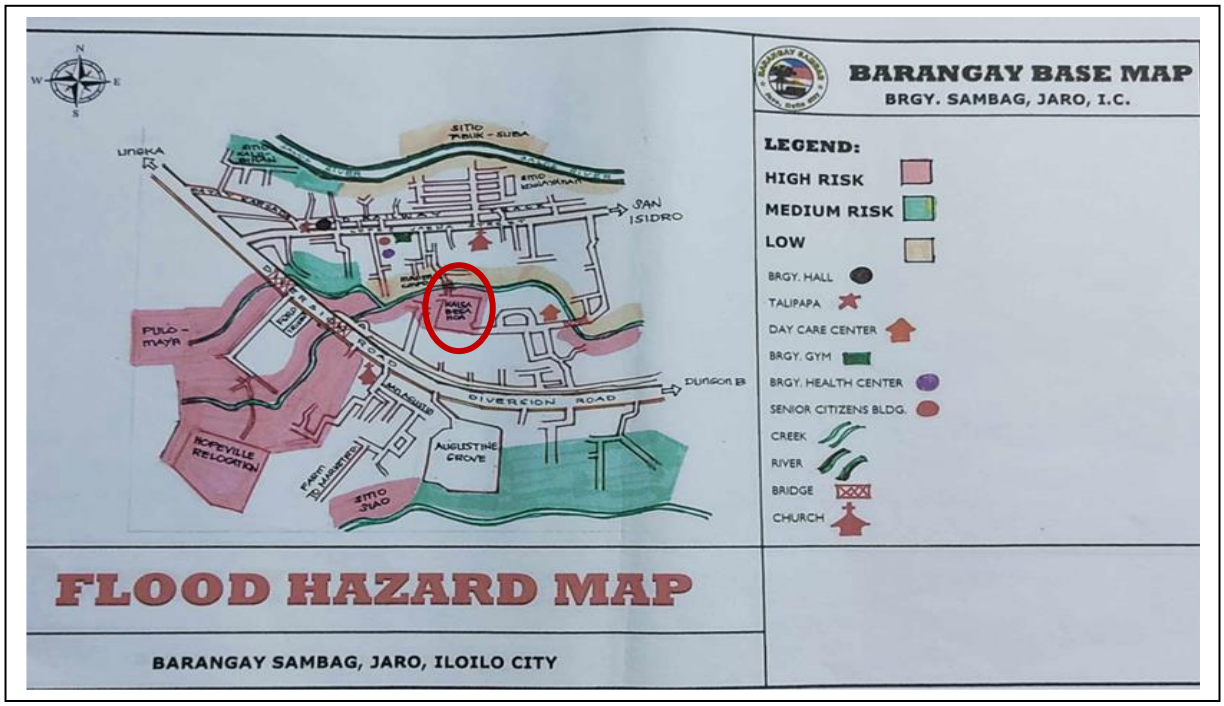
KAISA -BESA HOA residences exposure to flooding

Zone 6 of Barangay Sambag, Jaro, where the residences of KAISA-BESA HOA are located, is situated close to the Dungon Creek. Dungon Creek extends towards the Diversion Road (or still referred to as the Old Iloilo-Capiz Road in maps) but is seen in maps as disappearing as it crosses the Diversion Road. According to a key informant, as the waterway disappears in the map, Dungon Creek actually leads to what was once a huge water catchment where subdivision developments are now located. The image below also shows the narrowing of the Dungon Creek beyond the Central Philippine University and leading up to Barangay Sambag where KAISA BESA HOA settlement is located.



Narrowing of Dungon Creek beyond Central Philippine University Leading up to Barangay Sambag

According to the hazard assessment in Barangay Sambag, articulated in their BDRRMPlan. Barangay Sambag is very much exposed to flooding. The location of the KAISA BESA HOA settlement is considered a high flood risk area.[11] Majority of the survey respondents, 74.63%, believe that KAISA BESA HOA area is in the pathway of floodwaters.



KAISA BESA HOA Settlement Identified as a Flooding High Risk Area

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Zone 6, where KAISA BESA HOA residences are located, have been identified as an area highly exposed to flooding by the BDRRMP of Barangay Sambag[12].

[11] 2022 Barangay Disaster Risk Reduction and Management Plan, Barangay Sambag, Jaro, Iloilo City

[12] 2022 Barangay Disaster Risk Reduction and Management Plan, Barangay Sambag, Jaro, Iloilo City

EXPOSURE DATA

HAZARD	Levels at Risk	Location	Number of Houses Affected	Total Number of Families Affected	Breakdown as to Sex		TOTAL POPULATION AFFECTED	INFANT 0-11 MONTHS		CHILDREN (1-10 Y.O)		TEENS (11-17 Y.O.)		ADULT 18-59 Y.O.		ELDERLY 60 Y.O. & ABOVE		PWD		Livelihood	Infrastructure Affected
					M	F		M	F	M	F	M	F	M	F	M	F	M	F		
FLOOD	HIGH	ZONE 5	232	257	716	707	1,423	3	4	48	47	78	87	539	513	45	54	3	2	SARI- SARI STORE CARINDERIA HOG RAISING FARMING BUSINESSES PRIVATE OFFICES VENDORS	HOUSES APARTMENTS SCHOOLS COMMERCIAL BUILDINGS
		ZONE 6	171	196	475	518	993	5	3	53	68	51	62	313	325	49	57	4	3		
	MEDIUM	ZONE 7	98	122	305	283	588	4	5	37	22	49	58	194	176	17	21	4	1		
		ZONE 4	112	133	349	327	676	2	1	26	35	64	51	215	209	37	28	5	3		
	LOW	ZONE 3	55	68	144	132	276	3	1	11	9	12	15	102	96	12	8	4	3		
		ZONE 2	59	75	241	212	453	5	4	14	22	21	23	188	150	12	10	1	3		
		ZONE 1	85	93	285	227	512	6	3	28	27	36	53	192	132	18	11	5	1		
TOTAL:			812	944	2515	2406	4,921	28	21	217	230	311	349	1743	1601	190	189	26	16		

Further analysis using focused group discussions and spot-mapping yielded the identification of 16 KAISA-BESA HOA residences most exposed to flooding (those with dark red and purple rooftops in the image below):

KAISA BESA HOA Households Most Exposed to Flooding

The areas most exposed to flooding are those either adjacent to the Dungon Creek or those with lower elevation compared to other residential areas.

Assets that have been exposed to and still considered as exposed to flooding

Based on the experience of the survey respondents, the following are their most valued assets that have been exposed to and still at risk to floods:

- Furniture for the living room and bedroom (made of foam and bamboo), pillows, bedsheets, and household appliances; toiletries; toilet bowls; cleaning materials;
- Kitchen appliances (e.g gas stove and refrigerator); kitchenware, water supply; rice supply; noodles; canned goods; salt;
- Radio, mobile phones
- School or work clothes, shoes, school supplies; books, bags, documents;
- Most valued livelihood assets considered exposed to floods, carpentry machinery (e.g grinder, welding machine; shovel, hammer, pliers, saw, nails); cooking implements and clothes; tricycle; trisikad; construction-related materials; store or vending assets meant to be sold;
- Awards, photo albums (especially those that captured key moments like weddings, joining singin contests), diplomas, clothes and other personal items, other important documents (e.g. birth certificate), medicine kits; vegetable plots;
- Raised chicken, pig, goat
- Money kept in the house

Perceived causes of flooding

When asked what could have caused flooding in the area, the most survey respondents gave the following responses:

- Too much rainfall that cannot be accommodated by the Creek and the drainage system in the area
- Very heavy rainfall;
- Very heavy rainfall and the absence of natural waterways and drainage;
- Very heavy rainfall and clogged drainage (due to garbage, felled trees; ;
- Release of waters from the upland Dam (in the municipality of Maasin).

Those who have experienced flooding also attribute their flood experience to the following exposure factors: their houses are in the low elevation areas (50.75%). Other responses related to exposure dimensions include proximity to the Creek, construction of hotels around the area, deforestation in the upland area; lowland flooding during high tide; low elevation in KAISA BEA HOA area; exposure to climate change.

On the other hand, some respondents attributed flooding to vulnerability-related factors like poor preparations for flooding (20.9%) and they are not aware of flood warning (eg amount of rainfall in relation to flooding potential is KAISA BESA HOA area) (17.91%). Other vulnerability-related responses include the narrowing of the Creek, constructed bridge that should bring people to safety is also exposed to flooding, limited access to early warning from the barangay/City, and the failure to do pre-emptive evacuation.

Those who said they are less at risk to flooding as compared to other KAISA BESA HOA residents think that their homes are in higher elevation, they have more vegetation around the area, further away from the Creek, or their homes are shielded by other homes and community infrastructures.

Flooding in the KAISA BESA HOA area is perceived as life threatening when flood height exceed normal adult human height and beyond. Most threatening for them are flood heights beyond 3 meters.

Upon further inquiry and based on inputs of key informants, the flooding in areas near the KAISA-BESA area may be due to the following:

- Backflow of water from the water catchment area where the big subdivisions area because the portion of the Dungon Creek close to KAISA BESA HOA settlement because of the narrowing of the water channel upstream as a result of infrastructure development by the subdivisions;
- The unregulated backfilling of subdivision development that elevates the subdivision and moves water from precipitation to the lower portion of the Dungon Creek --- like the section near the KAISA BESA HOA;
- Concreting of the banks of the Dungon Creek that reduces the absorptive capacity of the land and increases run-off;
- Damming effect that may be caused by the garbage thrown into the Creek;
- Narrow water channel in the Dungon Creek in KAISA BESA HOA settlement;
- Shallow creek due to sedimentation and dumping that does not allow the Dungon Creek to accommodate more water during heavy precipitation;

Narrow channel at Dungon Creek with paved creek banks reducing absorptive capacity of the land

Vulnerabilities to Flooding

The BDRRMP identifies the barangay's vulnerabilities to flooding. These include physical vulnerabilities like impediments in the drainage and creeks including houses constructed in the easement; socially-rooted factors such as poor solid waste management with wastes thrown at creeks; and attitudinal factors such as the lack of a sense of accountability for the consequences of their acts or "bahala na" attitude and disinterest in participating in disaster prevention activities.[13]

When KAISA BESA HOA survey respondents were asked, about their vulnerabilities that may have caused them to be affected by flooding, the following are their responses:

- Houses made of light (e.g bamboo, flimsy wood products) and poor quality materials;
- Lack of access to or poor understanding of early warning;
- Lack of preparedness measures especially the capacity to evacuate valuable assets (including moving them to higher areas of the house or of the community) prior to flooding;
- Pre existing health condition (e.g. pregnancy, fatigue)

Perceived capacities

Of the assets mentioned, some respondents perceived that their personal well-being has been least affected. Their physical well-being has been less affected because they did not soak or wade in water. If they did, they immediately washed their feet/body with water and soap. They also followed prophylaxis protocols that have been encouraged by the barangay, participated in pre-emptive evacuation, pray, maintain presence of mind in challenging circumstances, proper diet and nutrition and use of vitamin supplements. Respondents also mentioned the importance of knowing one's priorities --- human life is far more important that the physical assets.

Practical decision-making skills that encouraged calibrated decisions and actions according to context-specific circumstances helped many residents. For instance, they now use light sleeping materials as they are easy to carry during evacuation and easy to wash in case of they are drenched by floodwaters. Moreover, some now assess potential floodwater height. Where possible, they move personal (e.g. wallets, mobile phones) and essential survival items (e.g. food items) in areas that cannot be reached by floodwaters. Moreover, respondents also think that a strong infrastructure (e.g. made of concrete) is more resilience to flooding. They have also used traditional practices such as tying parts of the house to pegs.

Articulated Flood impacts (Realized Risks)

Respondents in the survey highlighted that those assets that have been exposed to the floods were either damaged or lost. Those damaged were soaked it water, rot, and/or disintegrate. Those that have been lost are those which have been swept away (e.g. entire house, work and livelihood items, and other household goods, and other light materials that can be carried away by the force of the water).

Health impacts have also been expressed. Late night flood monitoring and fear of flooding caused sleepless nights. Hunger, flu, fever, cough, body aches and pains, headaches, skin diseases, and fatigue are among the health impacts on KAISA-BESA-HOA survey respondents.

Key informants during focused group discussions also shared the following impacts of flooding on the various dimensions of their lives below. From the information shared, there are negative impacts of flooding. However, the key informants also highlighted the positive consequences of flooding (in the shaded portions of the matrix below).

Physical	Economic	Political/ Institutional	Socio-cultural	Environment	Health	Sanitation

[13] Ibid.

Displacement of severely affected households (eg house swept away by floods) and their members	Loss of livelihoods due to loss or damage of livelihood implements	Activation of LGU response mechanisms	Social support due collective trauma	Waste segregation and collection ordinance	Water-related illnesses especially among children and elderly	Contamination of potable water sources
Loss of sleep due to flood monitoring	Drowning of animals used for livelihood	Apparent discrimination or preferential option in the distribution of relief goods	Culture of resilience	Destruction of natural assets (e.g. farmlands, vegetable gardens), loss of animals; felled trees	Poor nutrition and hunger due to livelihood impacts	Septic tank overflows
			Culture of sharing and giving was reinforced			
Damage to homes (of concern , to sleeping areas)	Inability to rear animals for livelihoods led to loss of extra income		Inequitable or unequal distribution of relief goods	Decaying cadavers of animals	Fatigue and body aches from post-flooding clearing and cleaning	clogged toilets
	Plants were submersed in water and rotted led to loss of income for farmers		Deep rooted anger among those who did not receive just support from government			
Damage to electrical lines	Farmers suffered from significant losses in income and became more in debt		The loss of extra income meant lack of sources for school needs (eg. Tuition)	Contamination of water sources	Flooding and post-flooding conditions challenged the elderly, those with co-morbidities, pregnant women	Garbage dispersion
	Cascading impacts oh lodging owners (note: loss of income among renters meant delayed or loss income to lodging facilities)		Inability to children to go to school			
	Income opportunities (e.g. cleaning bottles)		Dependency on social and economic safety nets			

			from the government			
			Disruption in daily lives of residents			

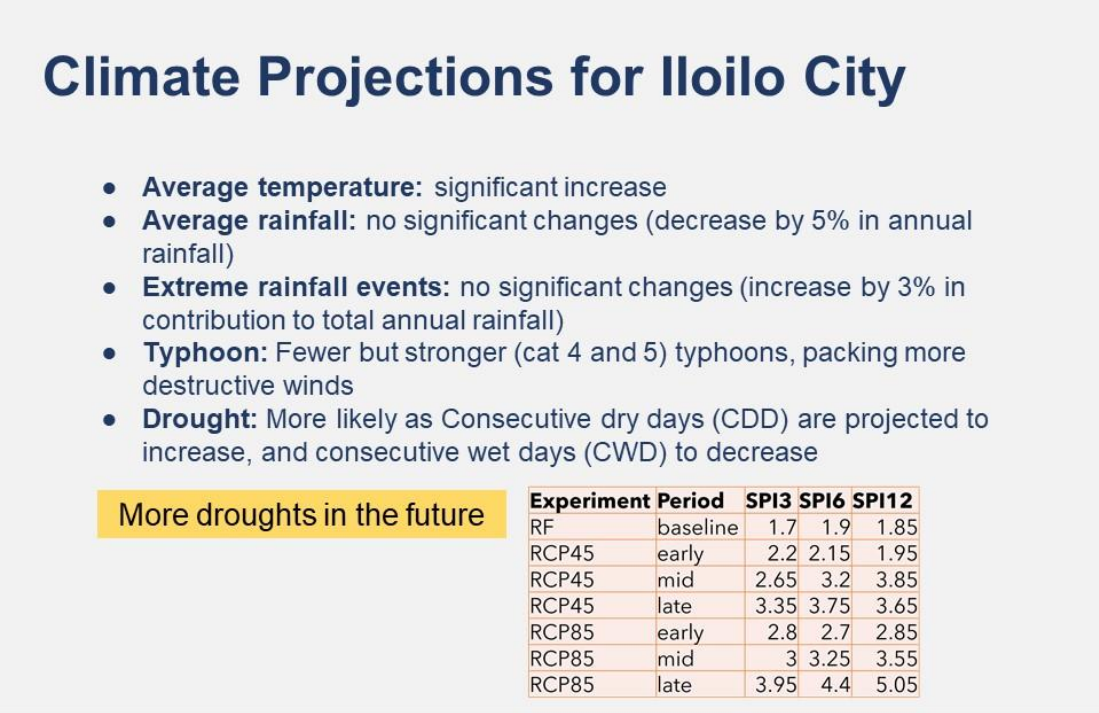
Current Risk Map

While we see many households that are exposed to flooding, there were those who were earlier identified as more exposed than others. However, when further analyzed in terms of vulnerability, there were those who had households with greater number of dependents that are both elderly, PWD, with co-morbidities, among other vulnerabilities. Using the risk framework earlier discussed, these households are considered more at risk to flooding.

Most at Risk KAISA-BESA Households

Future Risks

The climate risk assessment prepared by Manila Observatory with the Iloilo City Government as an input to the City's Climate and Disaster Risk Assessment yield the following result below. In the terms of rainfall associated with the climate impact driver (CID) which is flooding, an increase of 3% in the amount of rainfall will be due to extreme rainfall events. However, there is no significant change in the average rainfall foreseen. It is, however, important to note that a decrease of 5% in the annual rainfall is projected.[14]

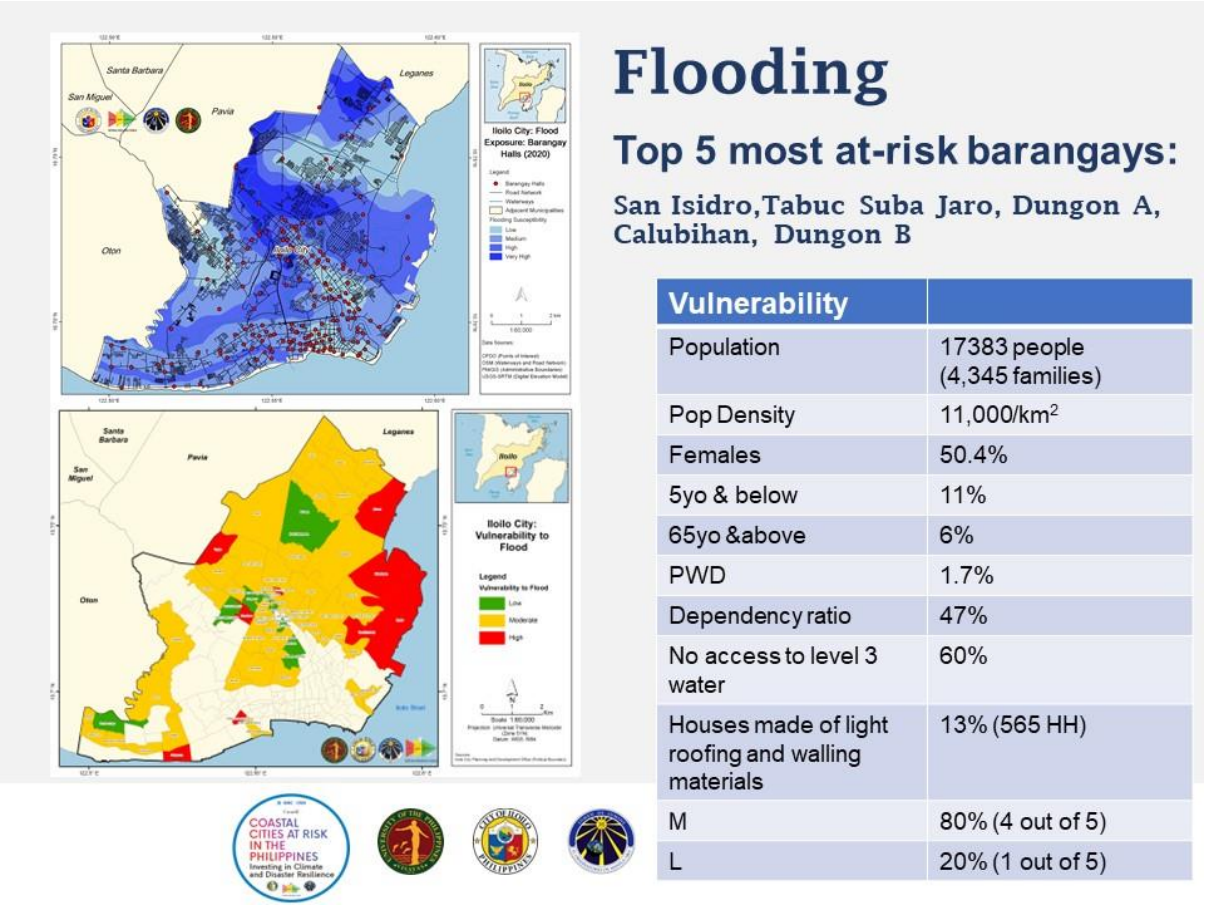


Climate Change Projections for Iloilo City[15]

[14] This transdisciplinary action research was carried out under the Coastal Cities at Risk in the Philippines: Investing in Climate and Resilience Project, with the aid of a grant from the International Development Resource Centre (IDRC), Canada, and implemented by the Ateneo de Manila University (ADMU), in collaboration with the Manila Observatory (MO), Ateneo Innovation Center (AIC), the National Resilience Council (NRC), University of the Philippines – Visayas (UPV), and the City Government of Iloilo.
This report was prepared by Ma. Laurice Jamero, Gay Defiesta, Franco Anthony Agudo, Alan Moscoso, Leah Araneta, Emilio Gozo, Marion Dimain, Maan Dela Paz, Donna Magno, Jessica Dator-Bercilla. The authors would also like to thank Emma Porio, May Celine Vicente, Faye Cruz, Dolly Zoluaga, Keith Camena, Sonia Cadornigara for sharing their insights.

[15] Prepared by Manila Observatory as an input to the Climate and Disaster Risk Assessment of Iloilo City. The major inputs to the CDRA came from a transdisciplinary action research that was carried out under the Coastal Cities at Risk in the Philippines: Investing in Climate and Resilience Project, with the aid of a grant from the International Development Resource Centre (IDRC), Canada, and implemented by the Ateneo de Manila University (ADMU), in collaboration with the Manila Observatory (MO), Ateneo Innovation Center (AIC), the National Resilience Council (NRC), University of the Philippines – Visayas (UPV), and the City Government of Iloilo. The report was prepared by Ma. Laurice Jamero, Gay Defiesta, Franco Anthony Agudo, Alan Moscoso, Leah Araneta, Emilio Gozo, Marion Dimain, Maan Dela Paz, Donna Magno, Jessica Dator-Bercilla. Other contributors include Emma Porio, May Celine Vicente, Faye Cruz, Dolly Zoluaga, Keith Camena, Sonia Cadornigara.

Further risk analysis examining flooding exposures to social vulnerabilities identified the Dungon Creek area near KAISA BESA HOA as high risk.



Flood risk assessment in the City of Iloilo[16]

The Climate and Disaster Risk Assessment of Iloilo City also pointed the following impacts from flooding[17]:

- Livelihoods disruption due to flooding will affect access to basic needs and services leading to food, health, livelihoods, and mental health insecurity (increased depression and suicide rates);
- Displacement and compromised health safety with prolonged exposure to flood waters;
- Water-borne diseases from water contamination increase need for resources to healthcare needs; increasing morbidity; possible increase mortality; increasing pressure in the health system

Pathways to Flood Resilience: Risk Management Options

Based on the responses of survey participants, the following were the identified measures to address the current risks and the future risks to flooding. The unpacking of resilience used is one that has been developed by the National Resilience Council from its work with Local Government Units including the City of Iloilo. The

[16] Ibid.
[17] Ibid.

original framework was put together in the Disaster Resilience Integrated Framework for Transformation (DRIFT): A new approach to theorising and operationalising resilience by Manyena, et. al. [18]

ADDRESSING CURRENT RISKS				ADDRESSING FUTURE RISKS	
Prevent	**Prepare**	**Absorb**	**Accommodate**	**Adapt**	**Transform**
Inform residents of their risks	Clear the Creek of impediments	Prophylaxis against leptospirosis	Cleaning of drainages	Retrofitting and/or raising of homes	Implement easement laws/ policies
Construct evacuation center in areas of higher elevation	Institutionalize a flood early warning system	Clearing the Creek of impediments	Proper waste management so that garbage do not become impediments in the water way	Construct alternative footbridges for people	Proper zoning in the barangay inclusive of waterways
Construction of proper drainage system	Construct an evacuation center	Full range of flood rescue equipment (eg ropes, life vests) and vehicles (eg. Rubber boats)	Dredging of the Creek	Ordinance to prevent full concreting of home lots to enhance water recharge	Compliance to laws/ policies that will help the barangay avert flood risks and impacts
Clear Creek of impediments	Awareness raising on flood risks and ways to prevent or avoid them	Water purification equipment or facility		Create new water catchment areas (e.g construct basketball courts in lower parts of the barangay and redirect floodwaters there to allow water to temporarily settle	Link up with scientists , engineers, architects for flood risk reduction and management innovations
Construct a more secure footbridge	Flood risk analysis	Savings program as a safety net against flooding		Look for livelihoods that can thrive amid floodwaters	Negotiate for a safe settlement areas
Prevent garbage dumping in creek	Ordinance that will help in averting floods	Participate in the clearing of the Creek from impediments		Continuous education of residents on flood risks, policies/ordinances for compliance	Change or redesign location of footpaths or road network in the area so that these will not be flooded

[18] Bernard Manyena, Fortunate Machingura, Phil O'Keefe,
Disaster Resilience Integrated Framework for Transformation (DRIFT): A new approach to theorising and operationalising resilience, World Development, Volume 123, 2019,
https://doi.org/10.1016/j.worlddev.2019.06.011.

Widen the Creek	Familiarization of flood risk areas	Participate in the cleaning of drainages so water can flow effectively and efficiently		Acquire rescue vehicles (eg rescue boats)	Change in leadership
Dredge the creek	Regular clearing of the Creek of impediments	Penalize those who throw garbage or pollute the Creek		Widen the bridge to allow larger vehicles that can help residents in times of flooding	
Retrofit houses in the low-elevation areas by raising the houses	Go bags for flooding	Enable survival skills for family members		Community solidarity-building to clear the Creek against impediments	
	Constituency building on flood preparedness	Develop a culture of compassion and sharing especially when there are community members that are severely impacted			
	Construct a covered gym with a second floor	City and barangay leader-led clearing of the Creek			
	Create a response preparedness team for flooding				
	Evacuation signal				

Relevant to this research, however, there were very few suggestions on environmental sanitation and health save for ensuring better waste management through compliance to garbage disposal policies as it relates to Creek and other waterway management.

Again, the Climate and Disaster Risk Assessment of Iloilo City also pointed to the following risk management measures:

- Promote alternative and supplemental flood-resilient livelihoods
- Enhancement of Iloilo City's Shelter Plan and Zoning informed by risk assessments (build vertical; land bank; resettle;)
- Enhance alternative clean water access in times of flooding and increase the scope of clean water access via MIWD

Further Reflections on the Research Output

The participants in the field research were very targeted in their response as to addressing current flood risks and named specific measures to reduce exposure and vulnerability to flooding. However, the measures suggested did not include interventions to address the root cause of the hazards (e.g. extreme heavy rainfall). They, nonetheless, mentioned vulnerabilities that rendered them more at risk to hazards. The respondents also had some understanding of adaptive and transformative measures that will help address their future flood risks. Where they see a gap in their internal capacities, they understand they can build on their linking capacity to reach out to experts that can support them and help them develop innovative measures to address future flood risks.