EFFECTIVENESS OF THE LEVEE AGAINST FLOODING AT DIFFERENT RAINFALL RETURN PERIODS IN MANDULOG RIVER, ILIGAN CITY, PHILIPPINES

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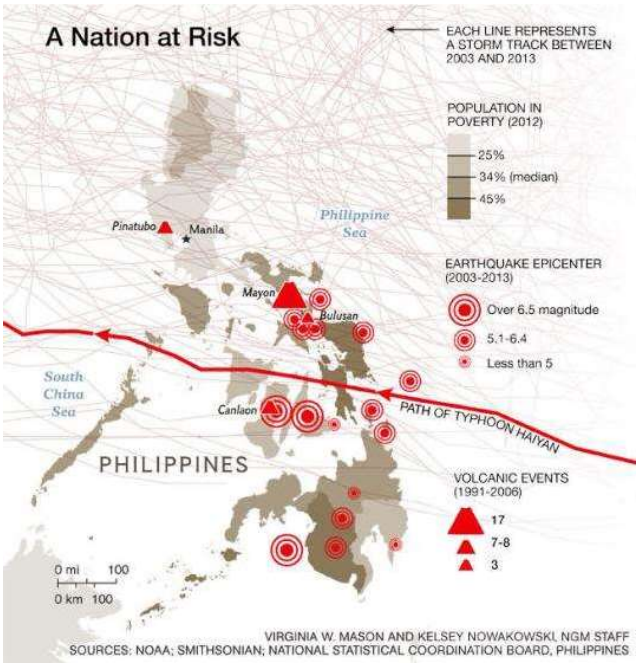
Outline of Presentation

- Introduction
- Objective / Methodology
- Results and Discussion
- Conclusion and Recommendation
- Acknowledgement

5 Reasons WHY the Philippines Is a Disaster Prone Country (Rank 3rd – 2017 World Risk Index)



5 REASONS WHY:

1. **Warm Ocean Waters(just above equator, facing West Pacific) – driving force of typhoons**
2. **Coastal Homes- in low-lying coastal islands**
3. **Deforestation**
4. **Ring of Fire - EQ and Volcano**
5. **Underdevelopment (high poverty rate)**

Source: By Dan Vergano, National Geographic

PAST TO PRESENT HISTORY

- Presently, Ave of 20 typhoons/year hit the Philippines
- 21 tropical cyclones made landfall in Mindanao island between 1883 and 1900 (17 yrs), or **about one a year**.
- 1945-2010 JTWC Data: **1 typhoon every 2 years** hit Mindanao (rare)
- **Same path** as T.S. Sendong(2011) CROSSING Mindanao – Dec 16-17, 1920 (91 yrs); and Dec, 1930 (80 years)
- But Sendong (2011) is followed immediately by Pablo (2012) hitting badly Mindanao;
- Hence, the **"typhoon-FREE Mindanao is no longer TRUE**

- (Source: Manila Observatory Report; and Garcia, et.al., JGR, 2007)

CAUSES for Higher CASUALTY in Mandulog River Flooding

- Massive amount of **debris** consisting of mud, huge logs, & vegetations
- The **type of bridge (with intermediate piers)** that traps debris and eventually resulted to the **damming of the bridge**
- The **breaking** of the bridge that released an onrush of force of flood water(**FLASH FLOOD**) and debris destroying everything on its path

CURRENT MAJOR FLOOD MITIGATION MEASURES – done by Government through DPWH (started 2013)

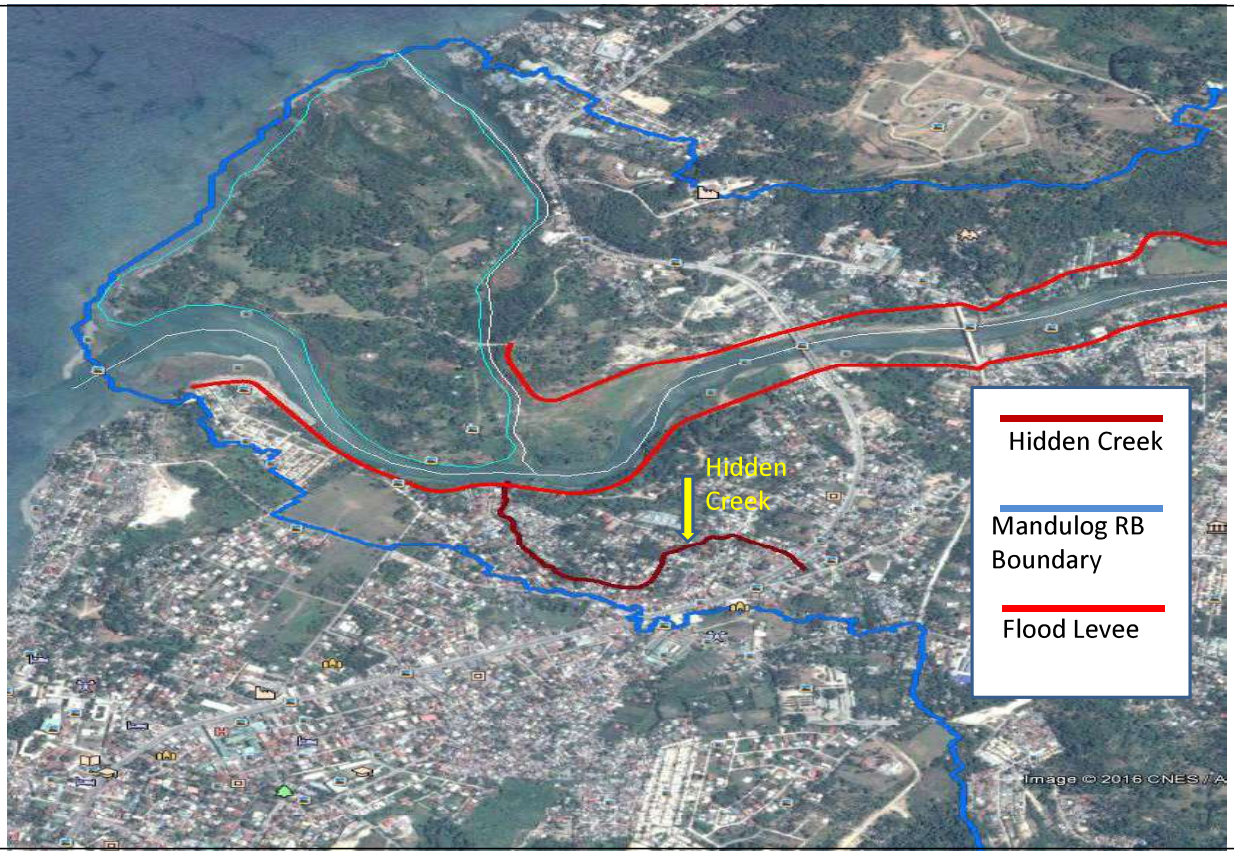
- **Construction of New Bridge and Flood Levee**

NEW CONSTRUCTED BRIDGE

Initial Assessment of the Flood Levee

- **Same** bridge type design (with intermediate piers)
  - The danger of the damming effect may repeat itself

- May **endanger** the communities outside the levee primarily due to the blockage of the "Hidden" creek draining into the river, as well as the runoff outside the levee areas
- **Hence, this study evaluates the Effectivity of the Levee against FLOODING**



Objective:

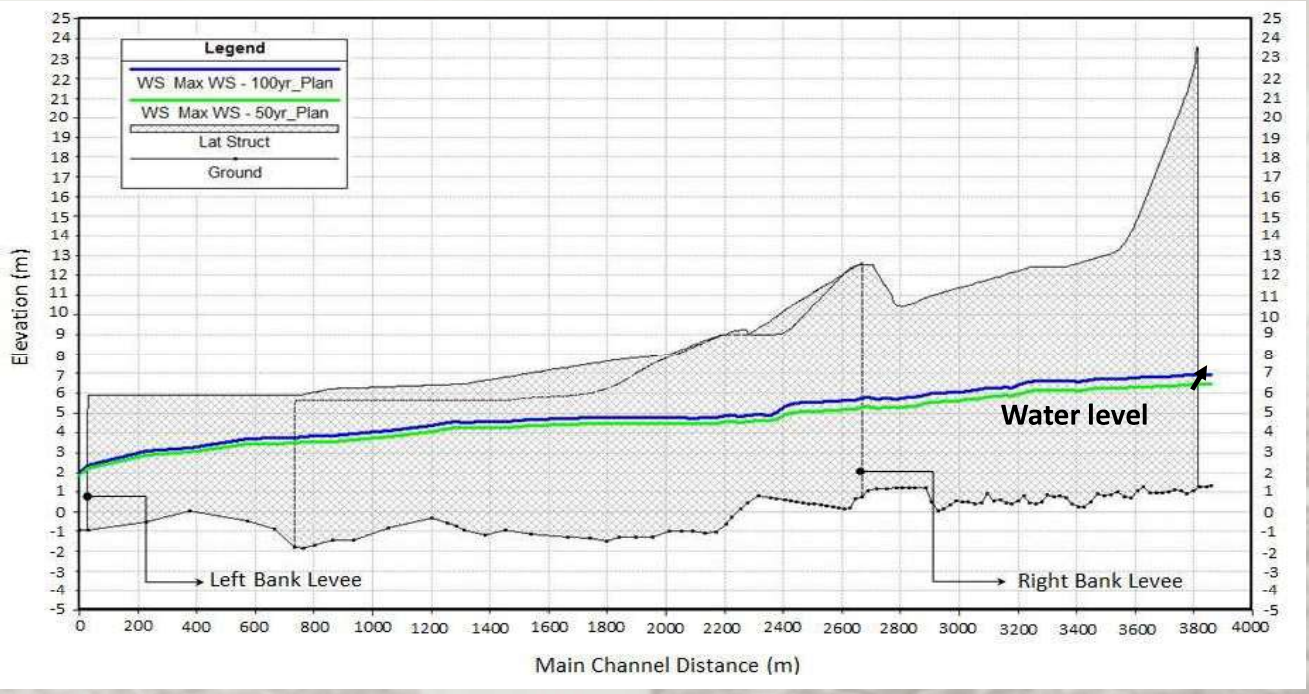
TO DETERMINE THE EFFECTIVENESS OF THE LEVEE AGAINST FLOODING AT 50 YEAR AND 100 YEAR RAINFALL RETURN PERIODS

Methodology:

Four (4) major steps involve:

1. Determine runoff (peak runoff, total volume runoff and lag time) using HEC-HMS 4.1
2. DEM using LiDAR
3. Flood simulation using HEC-RAS 5.03.
4. Post-processing of flood depth using ArcGIS

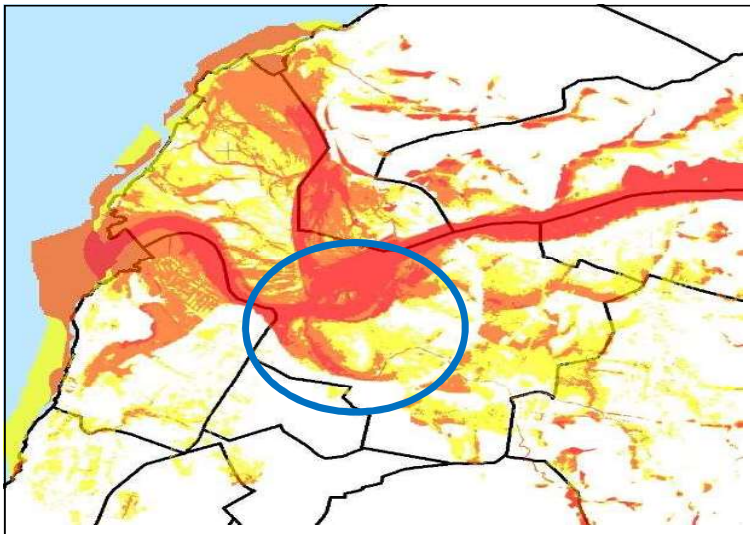
RESULT AND DISCUSSION:



Elevation of Water Level and Top of Levee (facing downstream)

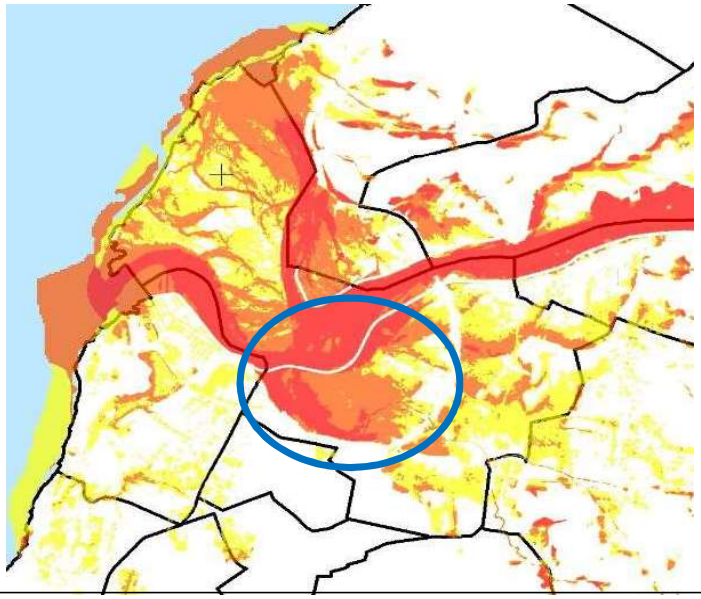
Levee Height and Water Surface Elevation at 50 and 100-year Rainfall Return Periods

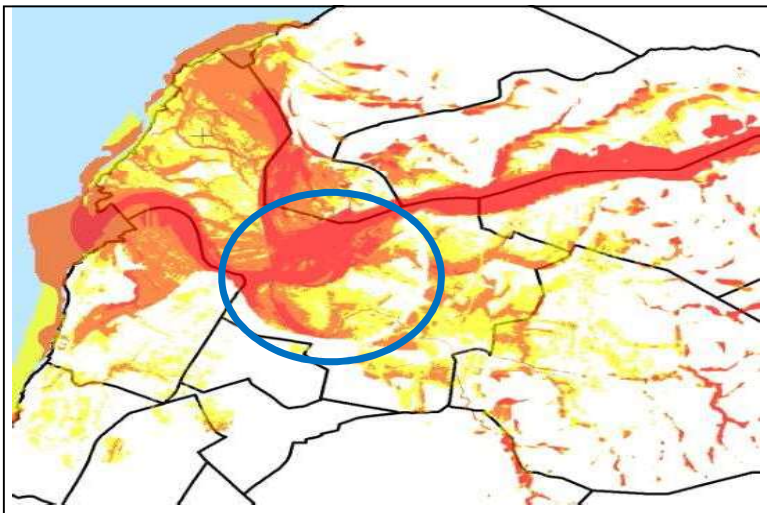
	(m)	Average Maximum Water Surface Elevation for 50-yr RRP (m)	Difference (m)	Average Maximum Water Surface Elevation for 100-yr RRP (m)	Difference (m)
Average Levee Height at Right Bank facing downstream	8.084				
Average Levee Height at Left Bank facing downstream	9.420				
Average	8.752	5.17	3.582	5.57	3.182



50-yr RRP Flood Extent without Levee

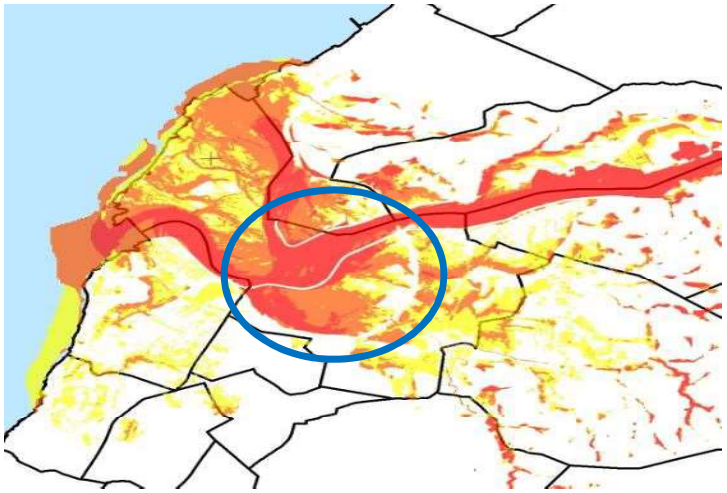
50-yr RRP Flood Extent with Levee





100-yr RRP Flood Extent without Levee

100-yr RRP Flood Extent with Levee



Conclusion and Recommendation:

- **The projected flood water inside the levee did not overtop the design levee. However, the effectiveness of the levee against flooding is REDUCED due to tributary blockage that results to flooding on areas outside the levee.**
- **Absence of pumping system to drain the water from the tributary (CREEK) will put to risk many people residing outside the levee.**

- **RESULTS OF THE STUDY MUST BE DISSEMINATED TO LGUs, RDC and national agency concerned such as DPWH for possible consideration of the impact study of the infrastructure done or to be done within the community.**

ACKNOWLEDGEMENT

- DOST – PCIEERD
- DOST – ERDT
- UP-DILIMAN LiDAR Team
- Geo-SAFER Mindanao Program
- NAMRIA
- MSU – Iligan Institute of Technology
- DPWH Region 10
- PARTNER LGUs

(Sec FDP) DOST Goal: " Science for the People".....

3 A's:

- **ACQUIRE (Develop)**
- **APPLY (Capacitate)**
- **ADOPT (Policy, Ordinances)**

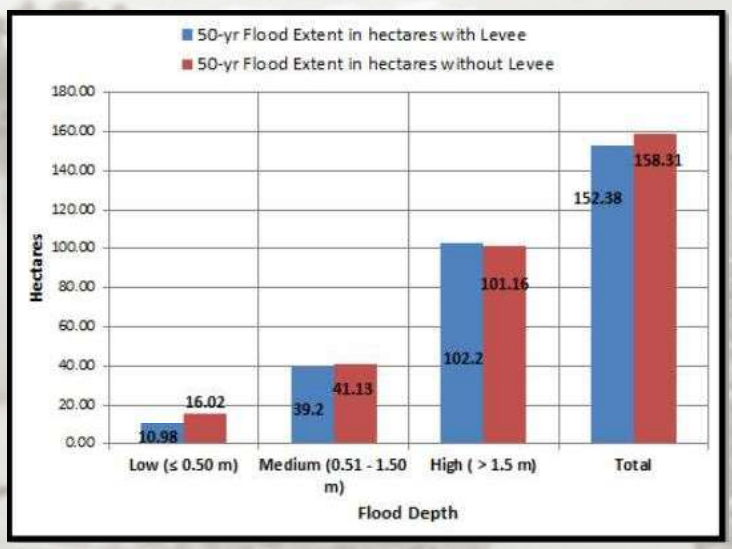
Our Challenge:

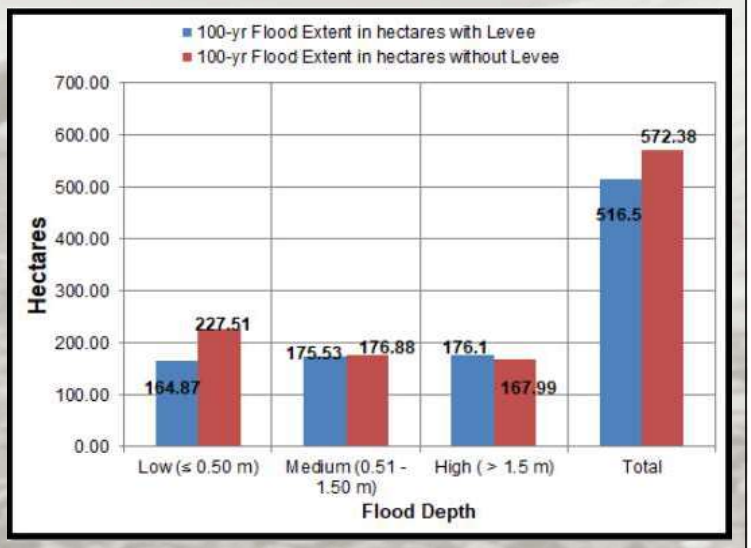
Engineering Flood Mitigating Measures is just a temporary solution and may eventually result to a greater disaster if COMPROMISED. THINK ABOUT THE SAFETY OF THE FUTURE GENERATIONS"..

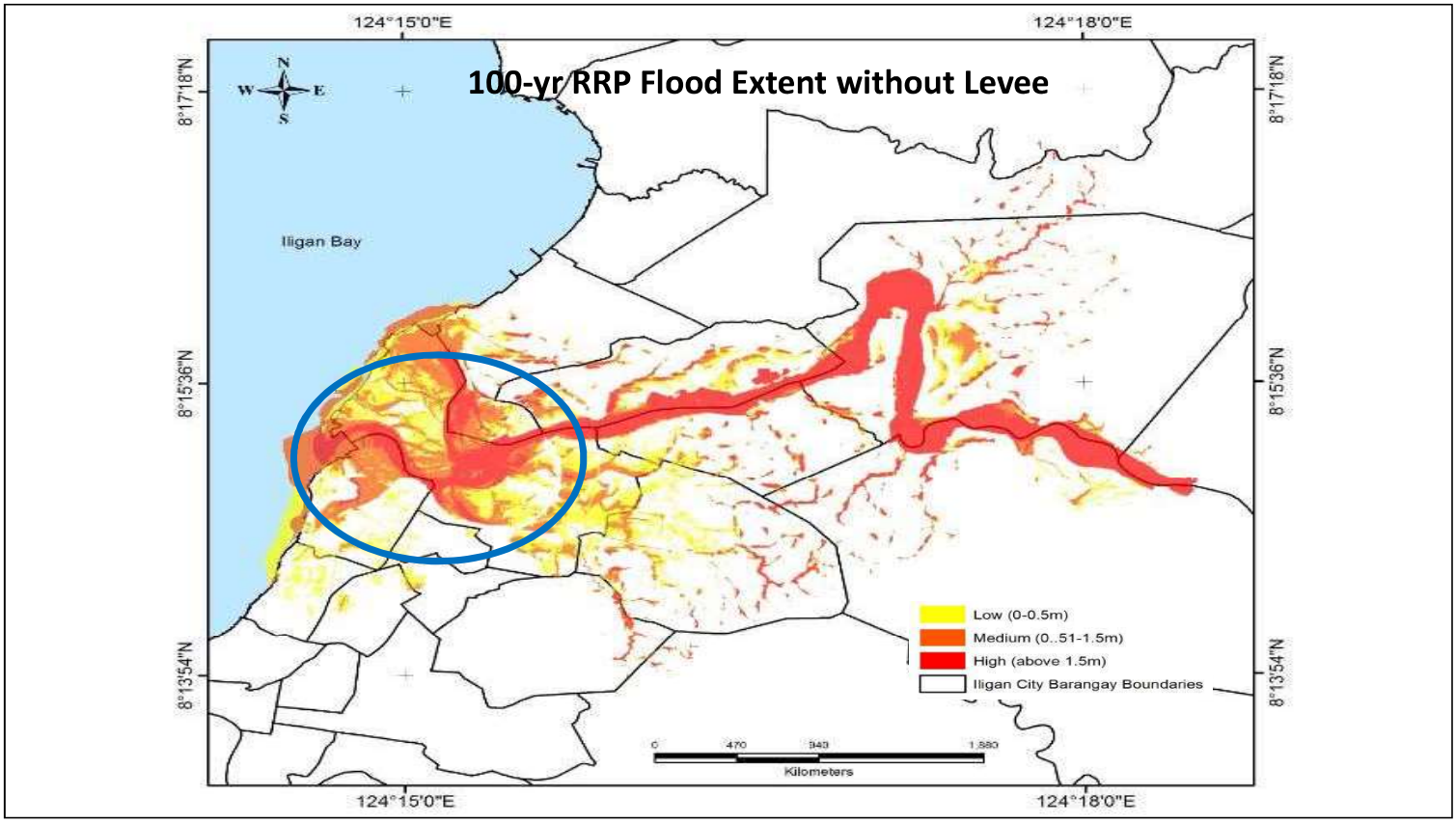
..... Prof. ALAN MILANO

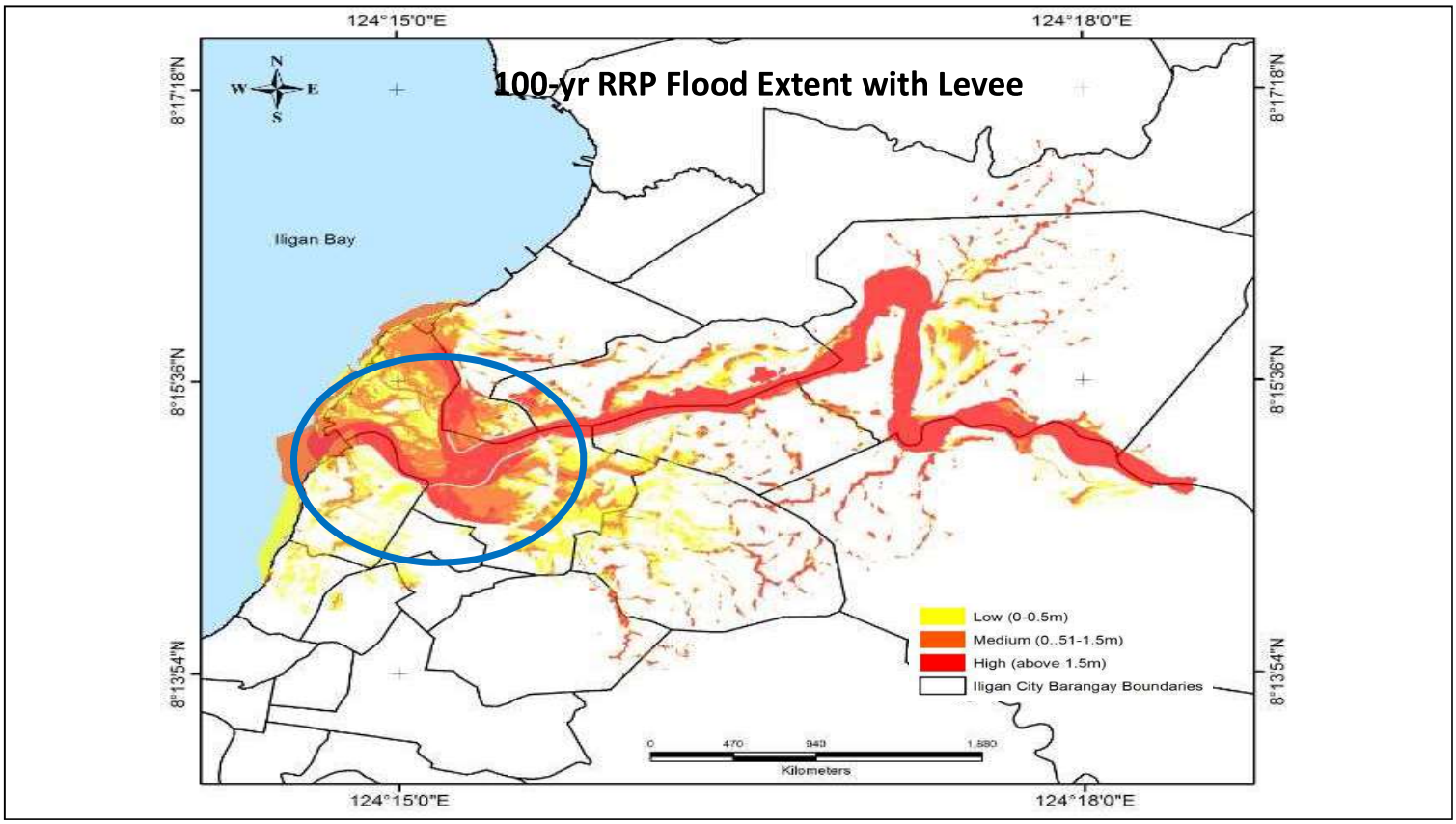
THANK YOU

FLOOD EXTENT








100-yr RRP Flood Extent with Levee
124°15'0"E
124°18'0"E
8°17'18"N
8°15'36"N
8°13'54"N
N
W
E
S
Iligan Bay
Low (0-0.5m)
Medium (0..51-1.5m)
High (above 1.5m)
Iligan City Barangay Boundaries
0
470
940
1,880
Kilometers